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Case Study

Vol. 4.2. Burgenland (Austria)

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Executive Summary

Burgenland is a NUTS-2 region with its own regional government (Landesregierung). According to the Environmental Goods and Service Statistics (EGSS) available for Austria at NUTS-2 level, there are 4,753 green jobs generating a turnover of 645 Million Euro in 2010. This is about four percent of all jobs, the green turnover corresponds to ten percent of total GDP in the region, which is about Austrian average. There was a growth between 2008 and 2010 of 131 green jobs and about 57 million Euro green turnover.

Burgenland is interesting from a green economic perspective because of its path towards energy autarky based on renewable energy production. For electricity, self–sufficiency based on renewable energy will be reached by the end of 2013. For total energy consumption, the share of renewable energy will be increased to 55 percent by 2020, the goal of a complete energy autarky through renewable energy shall be reached by 2050. The territorial capital is huge: over 40 % of the area is occupied by agricultural land with potential for high wind energy and biomass production. There is a strong governmental support for development of renewable energies. Key elements in the regional strategy for renewable energies are the expansion of biomass for district heating, wind energy, photovoltaic and fostering of applied research and development. Burgenland has a research and development infrastructure with six technology centres, one of them leading in renewable energy issues, and a university of applied science, forming together with policy and administration an eco-innovation network fostering renewable energy production, energy savings and thus climate protection.

1 General description of the Burgenland region

1.1 Geography

The Burgenland is an autonomous region located in eastern Austria. The Burgenland has a very specific geographical location as it has common borders with three EU member states. In the north-east it is the Slovak Republic, in the east Hungary and in the south-east Slovenia. This offers hub location between east and west Europe, new perspectives and enables cross-border partnerships and cooperation opportunities (Burgenland, 2013). In younger history, Burgenland was always a border region. Until 1919 it belonged to Hungary as part of the empire of Austria-Hungary. Since then, Burgenland is the youngest region of Austria.

Burgenland has a north-south extension of more than 160 km and an east-west width of between 4 and 60 km (Figure 1.1). The area is about 4,000 km^2, Burgenland is the third smallest state. In terms of population, Burgenland having about 287,000 inhabitants is the less populated Federal State (NUTS-2 level) of Austria. The population density of 72 inhabitants per km^2 is below the Austrian average of 93 inhabitants per km^2. This makes Burgenland to a sparsely populated and predominantly rural area (Statistic of Austria, 2013). The region has a high percentage of agricultural land, about 40 percent compared to about 20 percent in Austria. About 30 percent of the region is covered by forests (Austria 40 percent), which are mainly concentrated in the Mittelburgenland and Südburgenland. Another 15 percent is greenland (MECCA, 2013).

In Burgenland, the transition of the alpine mountain ranges towards the Little Hungarian Plain is accomplished. The Neusiedler See in Nordburgenland is one of the edges of the Pannonian lowlands and one of the most interesting fauna steppe regions of Central Europe. Geographically, Burgenland is divided into three parts: the substantially flat Nordburgenland around Eisenstadt, Neusiedl and Mattersburg, the hilly Mittelburgenland with the centre Oberpullendorf and the hilly Südburgenland around Oberwart and Güssing (Burgenland a, 2013).

Since Austria's accession to the European Union in 1995, Burgenland obtained as an economically disadvantaged region Objective-1-status. Burgenland is the only Objektive-1-Region in Austria (Burgenland, 2013b and c). This can be explained among other things by the fact that the Burgenland is not a part of the economic central regions of Graz and Vienna. In particular, the Süd- and Mittelburgenland are negatively affected. On the other hand, Nordburgenland, in particular the region Eisenstadt is economically benefiting from its proximity to Bratislava and especially to Vienna.

However, Burgenland is relatively rich in terms of natural resources, but these are not fully exploited. Limestone quarries are located at the edge of the Leitha Mountains and Foothills of the Rust, brown coal deposits in Tauchen, chalk in Müllendorf, chalcopyrite, sulphides pyrite and antimony ores occurring, as well as the unique serpentine occurring near Bernstein (AEIOU, 2013).

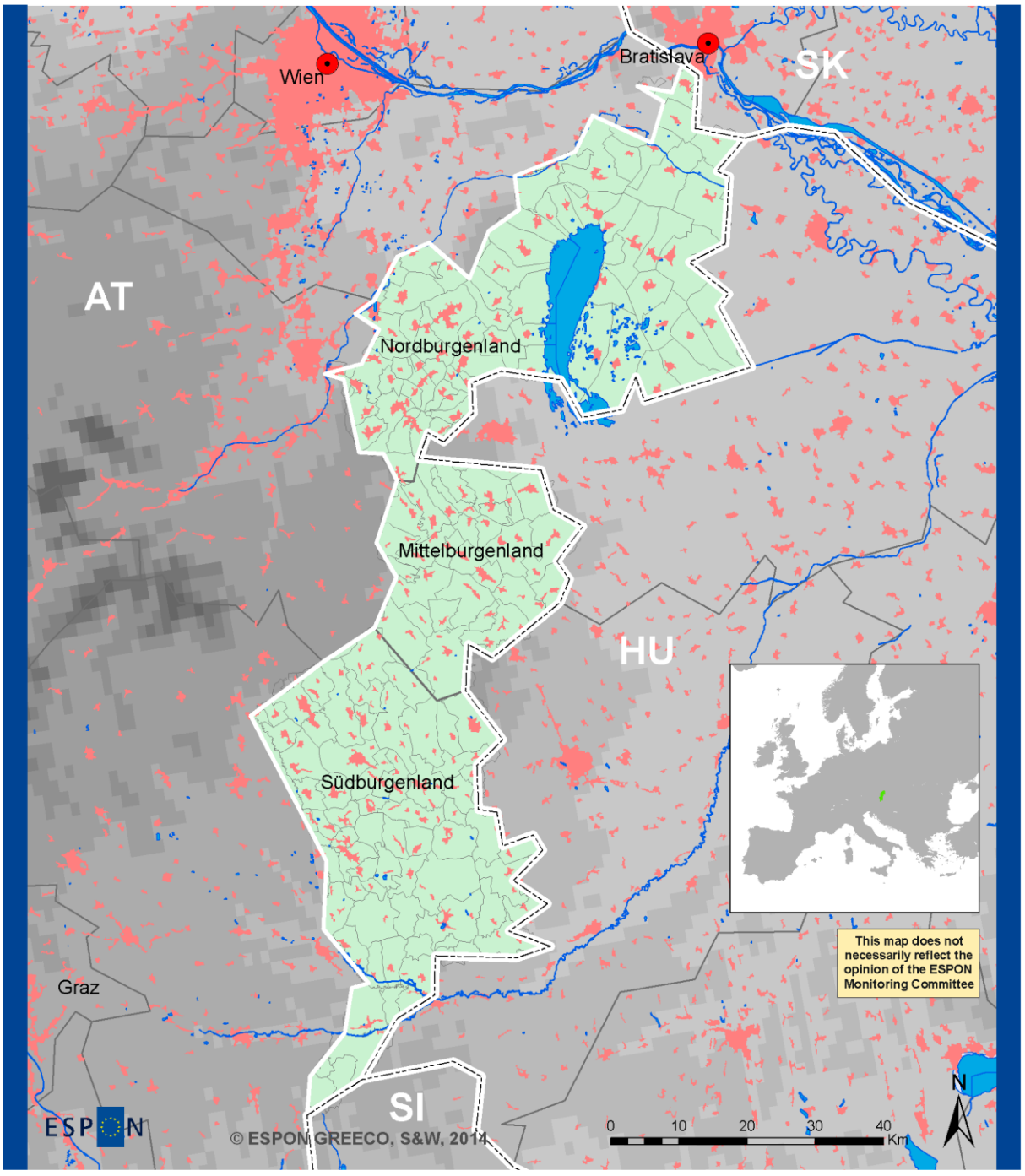


Figure 1.1. Settlement structure of Burgenland.

1.2 State of infrastructure

The main transport mode in Burgenland is road transport. Burgenland has a modern network of highways (3), expressways (2) and various federal motorways connecting the various parts of Burgenland with each other and with other regions of Austria. Especially the southern motorway has significance for commuters and second home owners. It connects the peripherally located southern part of Burgenland to the economic centres of Vienna and Graz. By this motorway, southern Burgenland is connected to the main labour markets and urban centres of the country, although the distance travelled is relatively large. Generally Eisenstadt is an important transportation hub (AEIOU, 2013).

The Industrial Association Burgenland (Industriellenvereinigung Burgenland IV) requested an extension of the railway infrastructure and the road infrastructure to strength the regional economy and to provide an easier connection to the labour markets of the major industrial centres for the work commuters.

A special need for expansion is with the cross-border transport links. In particular the development of the rail link from Graz vua Jennersdorf in Burgenland to Budapest is of key macroeconomic significance. This link would benefit not only the industry, but also the tourism industry of southern Burgenland. Another important advantage of such an infrastructure development would be the improved access for students to the University of Graz as well as a considerable relief for commuters of southern Burgenland. In addition to the development of rail infrastructure, an improved road infrastructure in Burgenland as well as to other regions of Austria is also requested (IV Burgenland, 2013).

1.3 Demography

In the last 130 years, the population in Austria has nearly doubled from 4.5 million to around 8.5 million inhabitants. In contrast, the population of Burgenland has remained relatively constant over the same period. In 1869, the population of the region was about 255,000 inhabitants and grew up to 287,000 inhabitants nowadays. Only about 3 percent of the Austrian population lives in Burgenland. (Burgenland, 2013d).

Considering the demographic development of the last 30 years, there is a steady growth of the Austrian population from 7,555,000 inhabitants in 1981 to about 8,450,000 inhabitants nowadays. This represents an increase of about 11 percent. Likewise, a continuous population growth can be observed in the NUTS 1 regions East Austria to which besides Burgenland also the NUTS-2 regions of Lower Austria and Vienna belong. In 2013, about 3,650,000 people are living in East Austria which is about 43 percent of the Austrian population. Compared to 1981, the population in East Austria has increased by almost 12 percent, but growth was below the Austrian average until 2008 due to initial losses in the 1980s. Since 2009, the growth rate of East Austria exceeds the Austrian. The Burgenland had as well a positive population development.. With a population growth of 6 percent since 1981, Burgenland gained slower than East Austria and Austria as a whole.

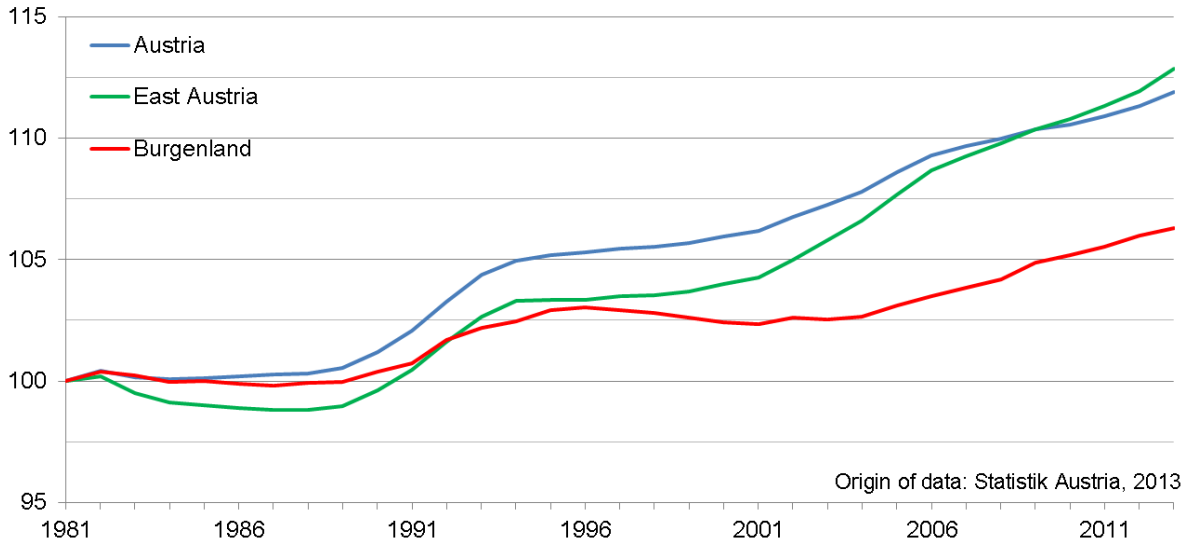


Figure 1.2. Population development in Burgenland, 2001–2013

The main reason for the population growth in Austria is a positive migration balance. Especially in the periods 1988 to 1993 and from 2005 up to today, Austria and particularly the NUTS-1 region of East Austria recorded strong gains in population due to migration.

Between 1988 and 1993, a positive net migration of 300,000 persons was recorded for Austria which was caused by increased receiving of refugees and politically persecuted persons from former Yugoslavia as well as by increased migration from Turkey and neighbouring countries of Central and Eastern Europe due to the opening of the iron curtain. Through the adoption of restrictive laws on entry and stay in Austria, the immigration from abroad was slowed down. The strong growth of population in the period from 2005 up to today is the result from the eastward enlargement of the EU in 2004. During the last decades, positive migration effected population growth in Austria much stronger than the slightly positive natural population development (Statistics of Austria, 2013).

The composition of population development in Burgenland is similar to that in Austria (Figure 1.3). However, natural population balance was slightly negative during the three decades, i.e. the positive population development is due to positive migration balance only. As in Austria as a whole, immigration strongly increased since the mid-1980s to the beginning of the 1990s. The peak was in 1991 in which the net migration balance was above 3,000 persons and the region grew by about 2,500 inhabitants. However, the relative migration effects were much lower in Burgenland than in Austria or in East Austria. With the overall low net migration during most of the 1990s and due to negative natural population development, Burgenland had a declining population between 1996 and 2001. Since the turn of the century net migration increased again, so that continuous population growth even with increased natural population losses could be observed.

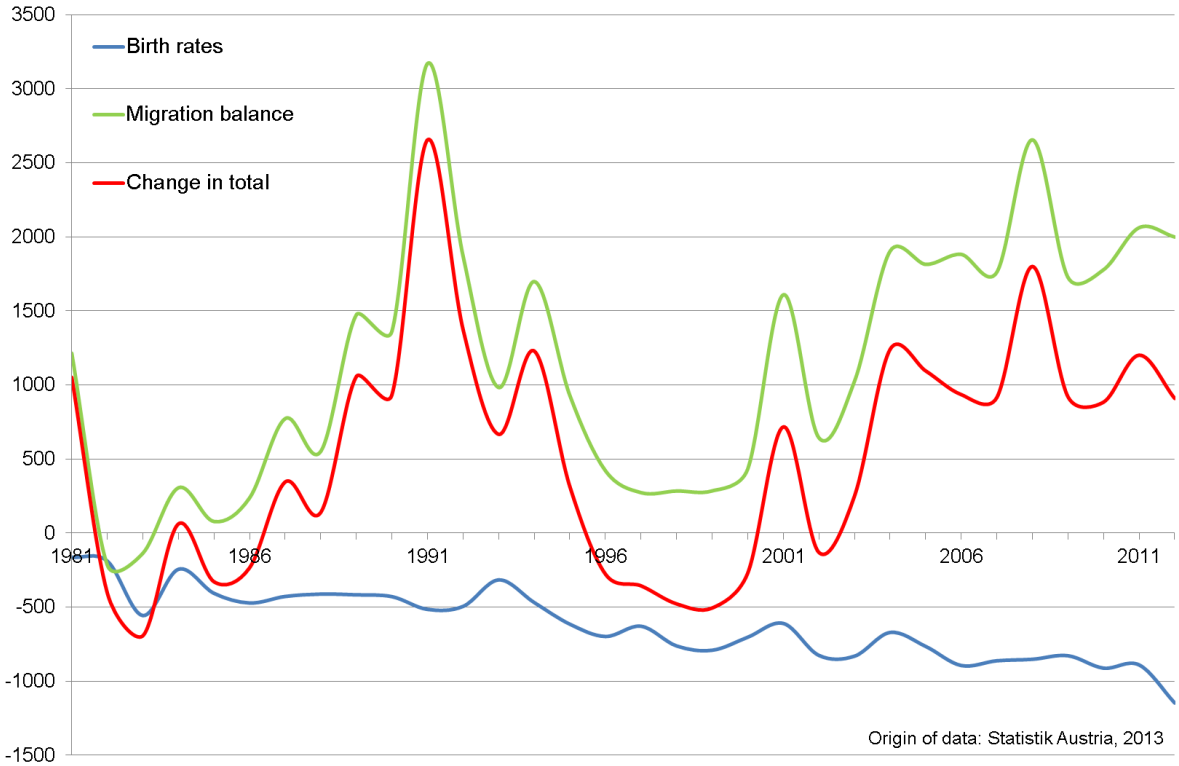


Figure 1.3. Composition of population development in Burgenland, 1981-2012

However, the population development within Burgenland is very heterogeneous. Looking at the three NUTS-3 regions, in which the North Burgenland is the largest with 151,600 inhabitants in 2013, followed by South Burgenland with 97,500 inhabitants and Central Burgenland with 37,600 inhabitants, the recent growth is solely attributable to North Burgenland (Figure 1.4). Since 2001, this region has a growth of seven percent whereas the population figures of the two other NUTS-3 regions were more or less stable. In North Burgenland, less natural population losses and internal migration from other Austrian regions contribute to the population growth. In contrast, Süd- and Mittelburgenland cannot compensate for the higher negative natural population development by net migration gains.

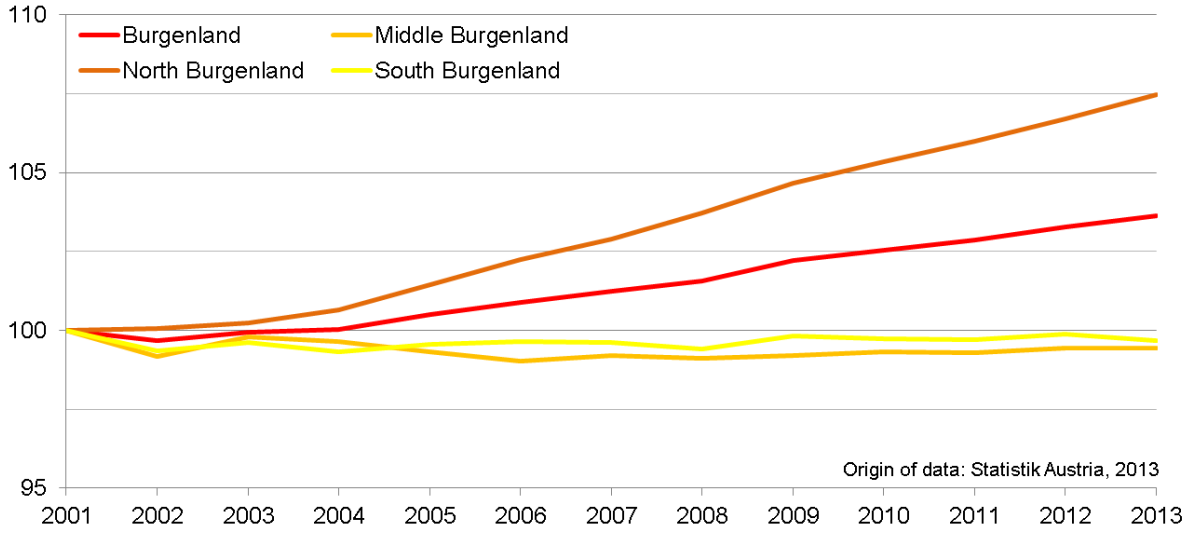
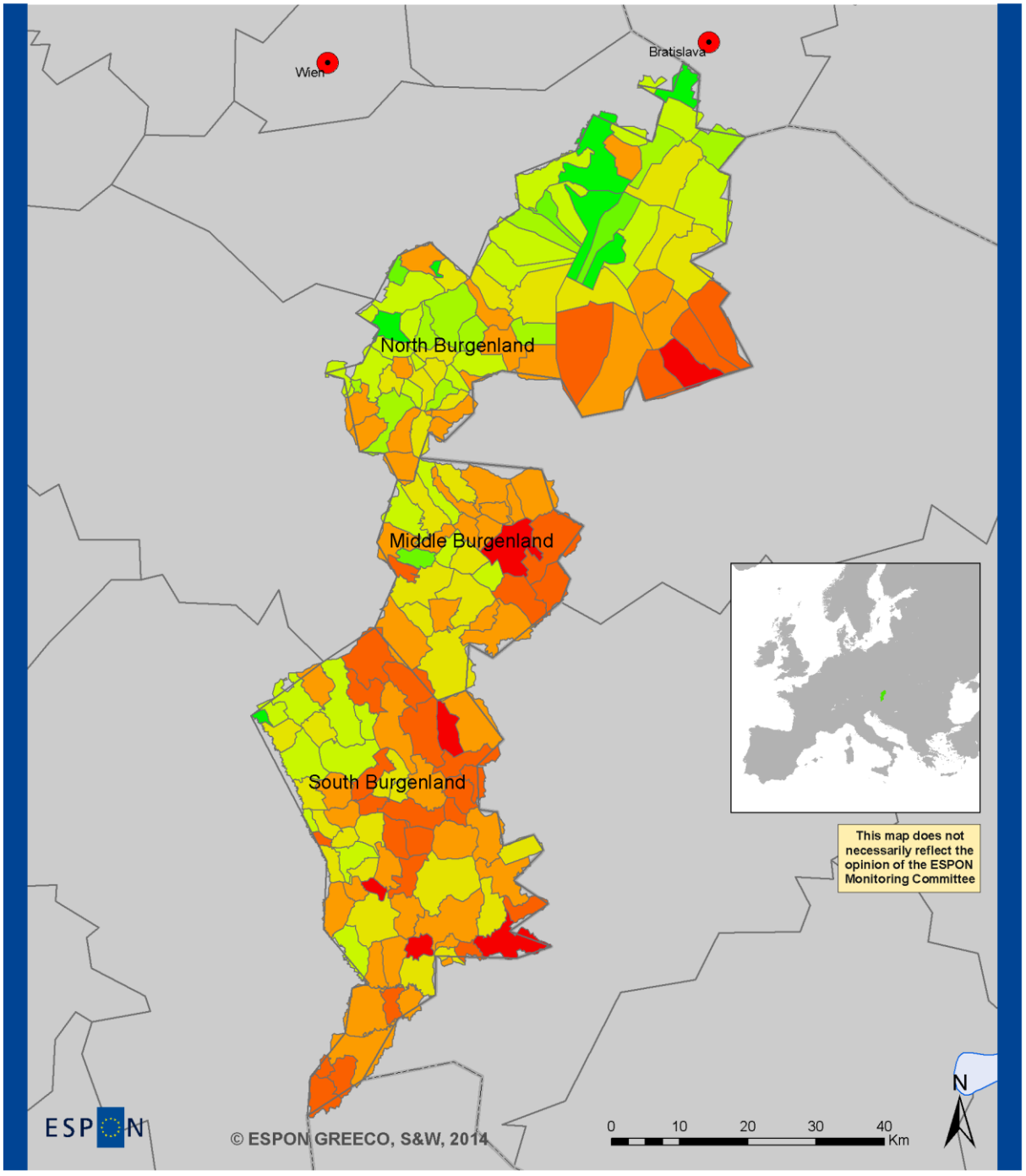


Figure 1.4. Population development in Burgenland, 2001–2013

Figure 1.5 shows population development between 2002 and 2012 for Burgenland at LAU-2 level. More than half of the municipalities had a positive population development. Here, a concentration of growing municipalities is observed in the western parts of the region, whereas the municipalities with population losses are mainly concentrated along the border with Hungary and at the boundary between Central and Southern Burgenland. Most of the municipalities of North Burgenland had population growth. Here are also the communities with the highest relative growth. This is especially the community Kittsee with a population growth of 34 percent and the communities of Neusiedl am See and Pardorf with a growth of about 30 percent each.

Municipalities in Austria are relatively small. Out of 2,358 communities in Austria only 72 cities have more than 10,000 inhabitants. Around 80 percent of all municipalities have less than 3,000 inhabitants (Bundeskanzleramt Österreich, 2009). Burgenland has no larger cities at all (Figure 1.6). The population size of communities in Burgenland ranges from 66 inhabitants only in Tschanigraben and 13,351 inhabitants in Eisenstadt (Statistic of Austria, 2013).

The Burgenland has an imbalanced population density with a spread between 20 inh./km^2 to 920 inh./km^2. The most dense communities are Bad Sauerbrunn (920 inh./km^2), Neufeld an der Leitha (748 inh./km^2) and Neudörfl (467 inh./km^2) which are located in North Burgenland. Overall, the middle and southern parts of Burgenland have lowest population density. Eisenstadt, the capital of the federal state of Burgenland has the highest total population figure with 13,351 inhabitants and a density of 312 inh./km^2 (Statistic of Austria, 2013).



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Population change in the Burgenland, 2002-2013 (%)

< -10	5 - 10
-10 - -5	10 - 15
-5 - 0	15 - 20
0 - 5	> 20

Figure 1.5. Population change in the municipalities of Burgenland, 2002–2013

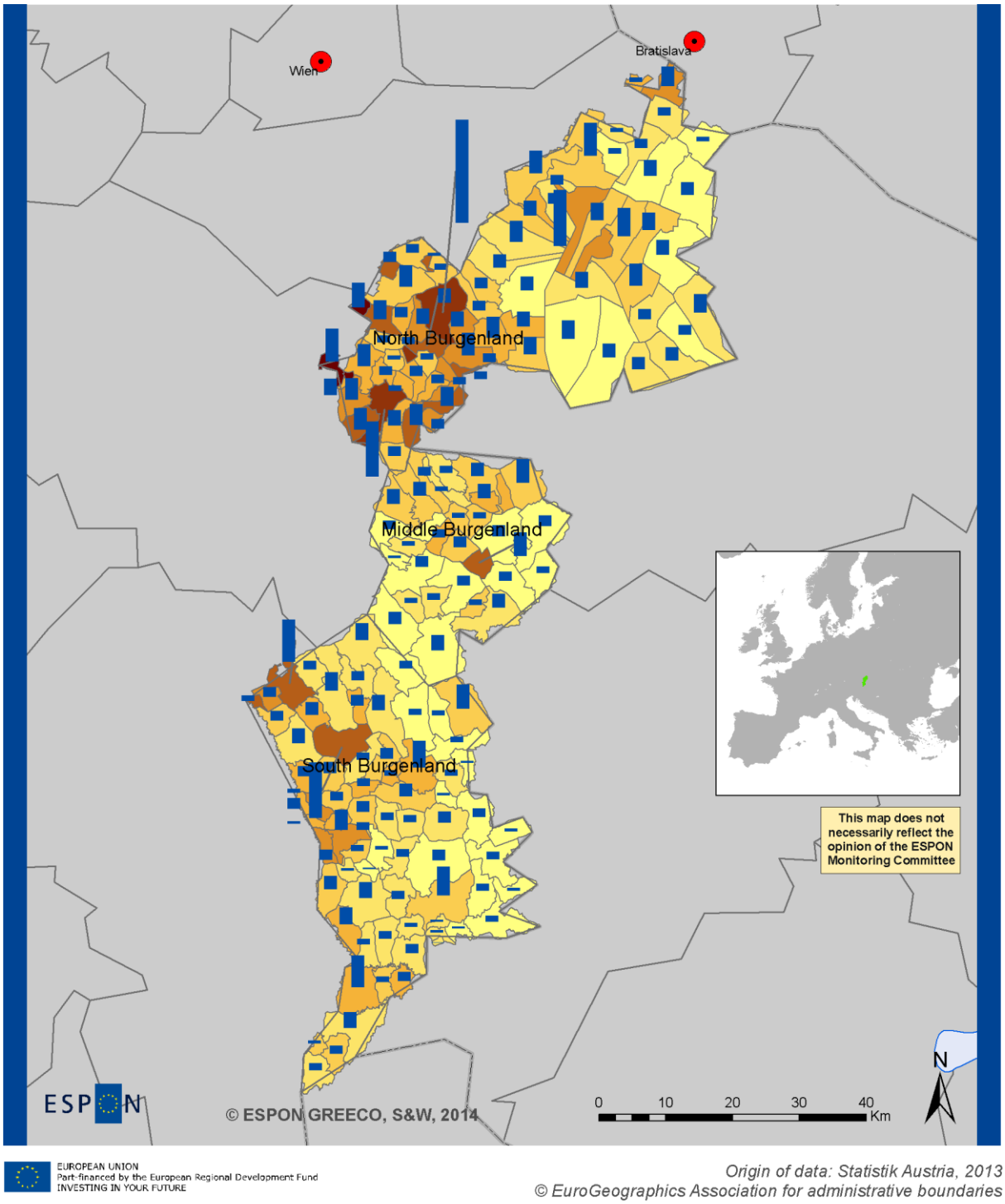


Figure 1.6. Population distribution in Burgenland, 2013

1.4 Administrative structure and governance

In Austria, there is a four level administrative structure: the Federal Republic, the states (Bundesländer), districts (Bezirke) and municipalities. The Federal Republic forms the NUTS-0 level. In contrast to other countries in Europe, the Federal State of Austria has no spatial planning competence and therefore no "competence framework" for the lower administrative levels. Therefore, there are no formal planning instruments for spatial control and development such as a federal regional planning act at NUTS-0 level. However, the federal government perceives by the Austrian Conference on Spatial Planning (Österreichische Raumordnungskonferenz – ÖROK) spatially relevant planning and actions of informal nature in forms of formulation of recommendations. The ÖROK is composed of representatives of the federal government, states' governments and local governments and serves as coordination and cooperation platform for regional development, spatial planning and regional policy at national level (ÖROK, 2013a).

Austria consists of three NUTS-1 regions: Ostösterreich, Südösterreich and Westösterreich. However, the NUTS-1 regions in Austria are statistical aggregates of states only that do not have any state administrative competence.

Austria is made up of nine Länder (NUTS-2 regions). The case study region of Burgenland is one of these and is part of the NUTS-1 region Ostösterreich. The state government has essential tasks of spatial planning. The provincial administration constitutes the framework and the basis for local and supra-local spatial planning in Austria by adopting legal principles such as a Spatial Planning Act (ÖROK, 2013b).

Burgenland consists of three NUTS-3 regions: Mittelburgenland, Nordburgenland and Südburgenland. However, as for the NUTS-1 regions, the NUTS-3 regions do not have any administrative function, but are mainly for statistical aggregates. (Bundeskanzleramt Österreich, 2009).

The district level forms an intermediate level between the federal states and the municipalities. The administrative districts are not independent authorities, but organisationally integrated into the state administration. Burgenland is composed of nine districts of which there are seven districts (Oberpullendorf in Mittelburgenland, Eisenstadt-surroundings, Matterburg, Neusiedl am See in Nordburgenland and Güssing, Jennersdorf and Oberwart in Südburgenland) and two relatively large independent municipalities which also have the function of an administrative district (statutory cities). These statutory cities are the state's capital city Eisenstadt and the municipality Rust which are both located in Nordburgenland. The district level is not reflected in the NUTS or LAU systematic of the European Union.

The lower level of administrative organisation in Burgenland is the LAU-2 level, which consists of 171 municipalities. Communities can use formal instruments such as the zoning plan and construction plan for spatial planning and can supplement these by informal planning instruments such as spatial development concepts. Many other municipal tasks are related to the provision of services of general interest. For the conduction of municipal tasks a distinct "cooperation culture" has developed between the communities in Austria. Therefore, the individual communities join together to community organisations to tackle the local tasks and objectives as efficiently as possible, especially in investment and labour-intensive matters (Bundeskanzleramt Österreich, 2009).

2 Regional economy

Since the mid-1990s, the economic development of Burgenland has been positive and shows an overall upward trend. This is due primarily to the effects of EU's structural funds and the successful implementation of the Objective 1 program in conjunction with the extensive structural changes. However, negative implications of peripheral location and the historical development of Burgenland with job shortages are the high number of out-commuters (70 percent) and a high movement of labour force to other regions (brain drain) (BMVIT, 2007).

The economic performance of Burgenland - measured in GDP per capita - has increased from 17,300 Euro in 2000 to 23,200 Euro in 2010. This corresponds to a growth of almost 35 percent. However, GDP per capita in Burgenland is significantly below the Austrian average of 34,100 Euro and just below the EU average of 24,500 Euro.

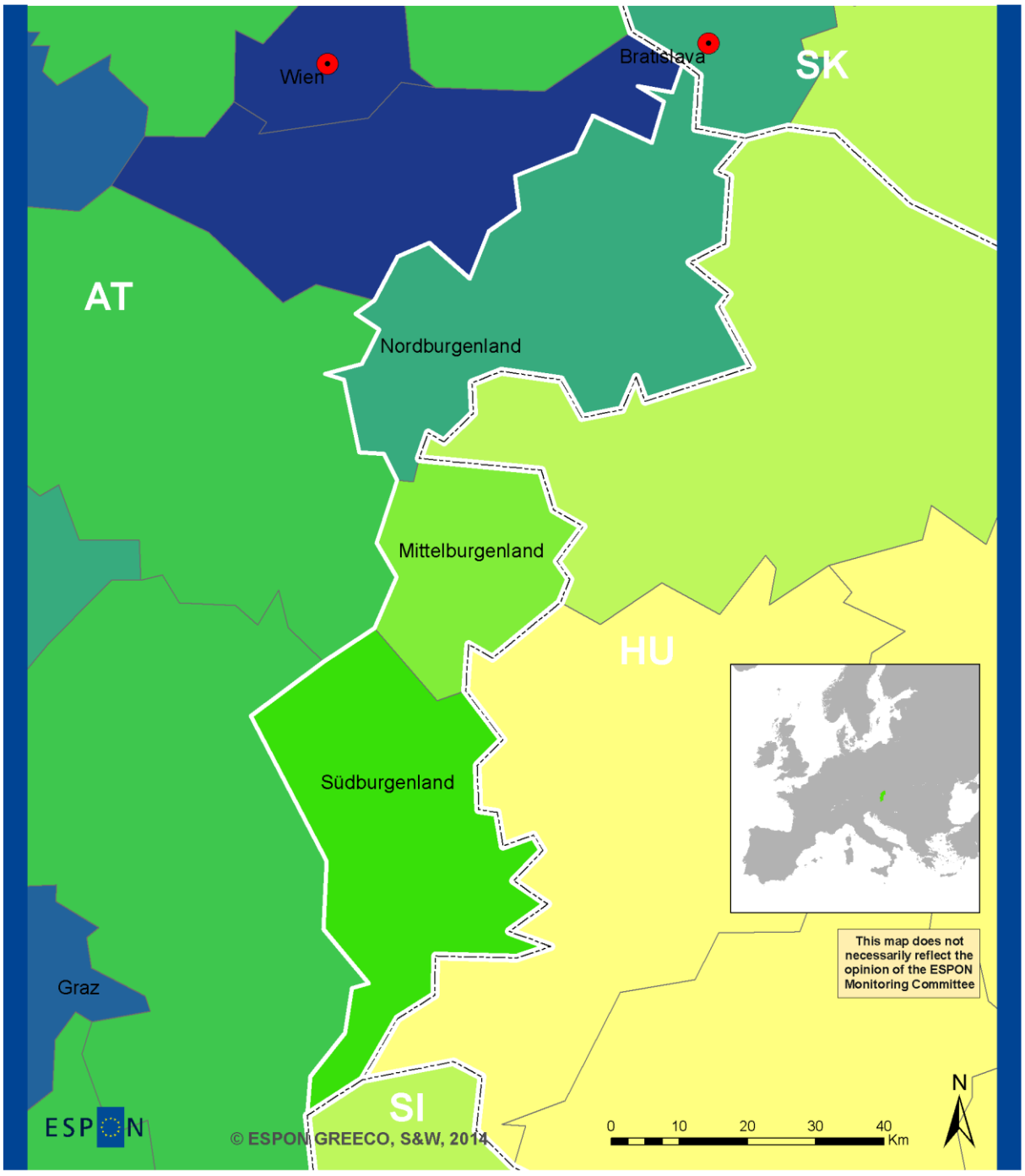
Figure 2.1 shows for Burgenland considerable regional disparities (Figure 2.1). While Nordburgenland is the economically strongest region with a GDP per capita of 25,500 Euro and laying above the EU average, Mittelburgenland with 19,600 Euro per capita and Südburgenland with 21,300 Euro per capita have the lowest values in the country and are also clearly below EU average. This is explained often by the peripheral location of these two NUTS-3 regions, whereas Nordburgenland is better connected with its nearby location and well-developed transport axes to the centres of Vienna and Bratislava. The city of Vienna with 44,300 Euro has the highest GDP per capita of Austria followed by Wiener Umland (40,800 Euro) and Graz (38,500 Euro) (Eurostat, 2013 and MECCA, 2013).

Gross value added and its spatial distribution provides a similar picture for Burgenland. Burgenland has with 5.977 billion Euro only a small proportion of the Austrian total of 259.029 billion Euro, an indication of the economic and structural weakness of the region. Also when looking at the spatial distribution of GVA the inhomogeneity of the Burgenland becomes apparent. Nordburgenland is with a GVA of 3.434 billion Euro the strongest economic region in Burgenland. Here, about 60 percent of Burgenland's GVA is being generated. By contrast, in Südburgenland generates a GVA of 1.879 billion Euro and Mittelburgenland a GVA of 664 million Euro only.

The development of gross value added between 2000 and 2010 shows a steady increase throughout Burgenland, although the regional growth rates differ significantly from each other (Figure 2.2). Burgenland's GVA grew by almost 40 percent which corresponds to the Austrian average growth of GVA. Nordburgenland increased its GVA by almost 50 percent in that period, i.e. had higher growth than the whole country. Südburgenland showed a positive,but below average economic development with an increase of GVA of 35 percent over the same period. With a very low GDP per capita and the lowest gross value added growth of less than 20 percent in that decade, Mittelburgenland is the most disadvantaged region in Burgenland and also in Austria.

Agriculture sector

The primary sector is characterised by an increasing loss of importance. In 2010, the share of agriculture and forestry in GVA in Burgenland is about four percent, throughout Austria about one percent (see Figure 2.3). Despite the very fluctuating trend and the marked decline in agricultural holdings between 2000 and 2010, the agricultural sector is an important economic sector in parts of Nordburgenland and Mittelburgenland, even if the share of the primary sector in gross value added is at four percent and six percent only.



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GDP per Capita 2010

< 10000	25000 - 30000
10000 - 15000	30000 - 35000
15000 - 20000	35000 - 40000
20000 - 22500	40000 - 70000
22500 - 25000	> 70000

Figure 2.1 GDP per capita in Burgenland, 2010

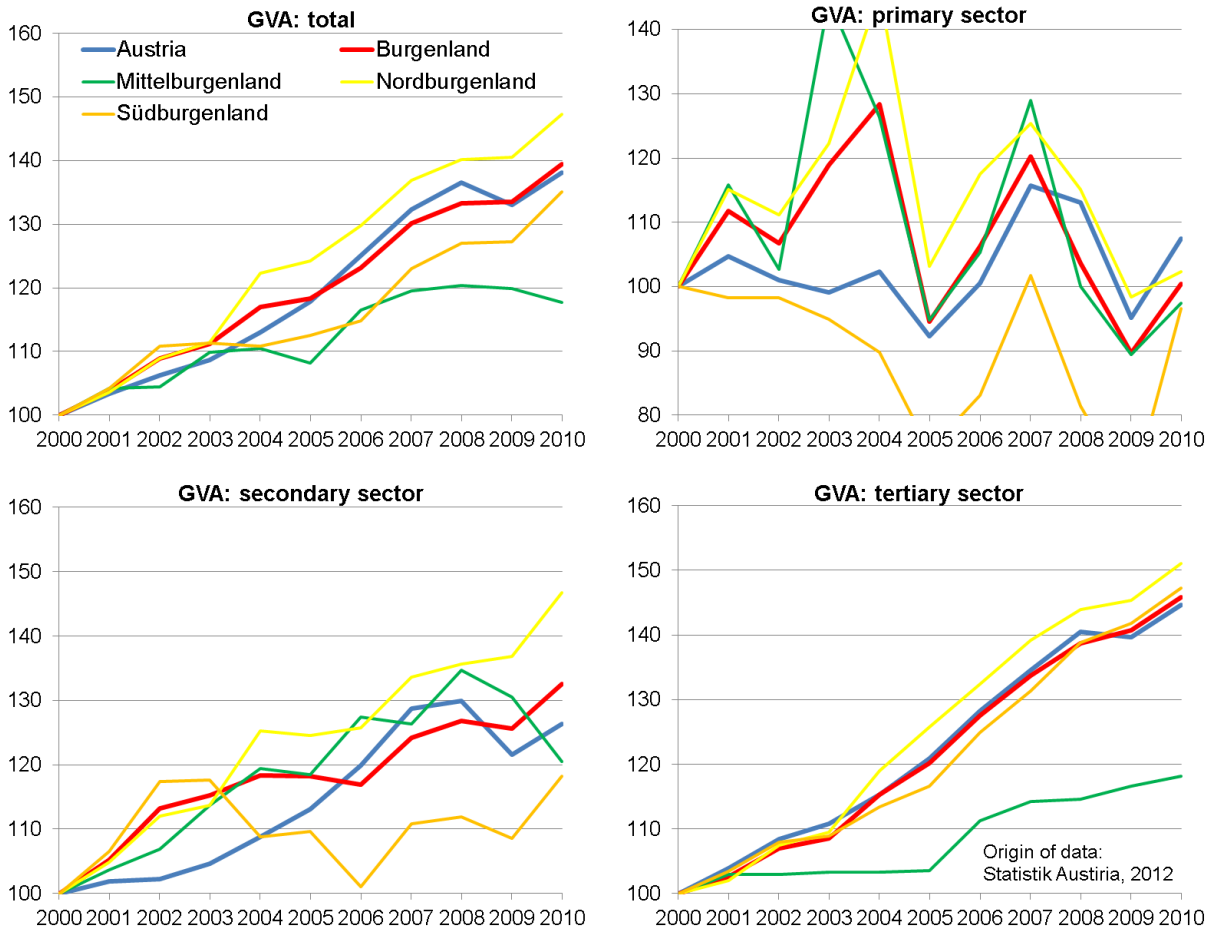


Figure 2.2 Gross value added in Burgenland by main economic sector, 2000-2010

Compared to the Austrian average, the GVA of the sector Agriculture and Forestry has an above average importance in Burgenland, the share is highest in Austria. Burgenland is one of the main agricultural production areas of Austria. The focus is on farming; about 50 percent of the area in Burgenland is used for agriculture. Wine production is important as well. Besides conventional wine production, Burgenland also has developed a biological wine production. Grassland management in Burgenland is not very pronounced, and therefore takes no decisive role (MECC A, 2013).

The secondary sector is the second most important economic sector. In Burgenland, the industrial sector has a share of 29 percent of total GVA (Figure 2.3). Especially in Mittelburgenland and Südburgenland the industrial sector with about 34 percent and 30 percent of GVA is even more important, however which fluctuates because of the global economic and financial crises since 2006 (Figure 2.2). Mittelburgenland lost almost 15 percentage points of GVA between 2008 and 2010. Nordburgenland, however, increased GVA by about 45 percent in the secondary sector between 2000 and 2010.

As Figure 2.3 shows, the economic structure in the regions of Burgenland is dominated by the tertiary sector which reaches almost the Austrian average of 70 percent. In Mittelburgenland, the share of the tertiary sector is about 60 percent only, while Nordburgenland (69 percent) and Südburgenland (67 percent) are clearly above. In the period of 2000 to 2010, especially in Nordburgenland the importance of the tertiary sector has increased significantly. In this period, GVA increase was almost 45 percent in Nordburgenland and about 47 percent in Südburgenland Thus, the growth of the tertiary sector in Nord- and Südburgenland was above the national growth However, GVA of the tertiary sector of Mittelburgenland increased by about 18 percent only.

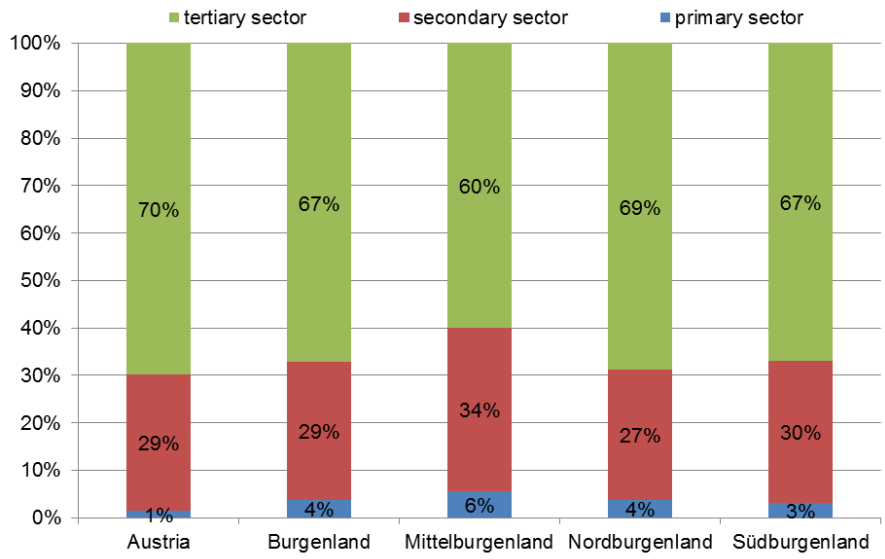


Figure 2.3. GVA share by main sectors, 2010

The labour market in Burgenland shows a similar trend with a similar north-south deviation as the previously described economic development of the region. Burgenland's unemployment rate of 7.5 percent (2011) is slightly higher than the national average of 6.7 percent. Nordburgenland shows better unemployment rates ranging from 5.0 percent to 6.1 percent. Südburgenland (6.7 percent) and Mittelburgenland (6.0 to 8.8 percent) have the highest unemployment rates in Burgenland (ÖIR et. al., 2012).

The overall employment development since 2000 is positive for Burgenland, although the growth is below the Austrian average (Figure 2.4). Nordburgenland and Südburgenland contributed to the employment growth whereas the number of jobs decreased in Mittelburgenland. This is due primarily to the drastic decline of almost 50 percent of employment in the agricultural sector in Mittelburgenland, while the decline of employment in the agricultural sector in Nordburgenland and Südburgenland is between 30-35 percent. Because these negative employment effects in Nordburgenland and Südburgenland can be compensated by positive employment development especially in the tertiary sector, the growth of employment in the secondary and tertiary sectors in Mittelburgenland is not large enough to offset the decrease in the agricultural sector.

As for GVA, the dominance of the tertiary sector is visible on the labour market in Burgenland (Figure 2.5). In 2010, 65 percent of employees in Burgenland are active in the tertiary sector. The tertiarisation of the labour market is compared to the rest of Burgenland more advanced in Nordburgenland.

This can also be seen in the development of employment by NACE sectors between 2000 and 2010. During this period, employment in the primary sector decreased by over 30 percent. The development of employment in the manufacturing sector is constant between 2000 and 2010. In contrast, number of jobs in tertiary sector increased by 17 percent (11,000 employees). Largest absolute gains were in trade, accommodation and food services, other services and human health and social works. Overall, a positive development in employment of five percent occurs

during that period in Burgenland (Figure 2.6).

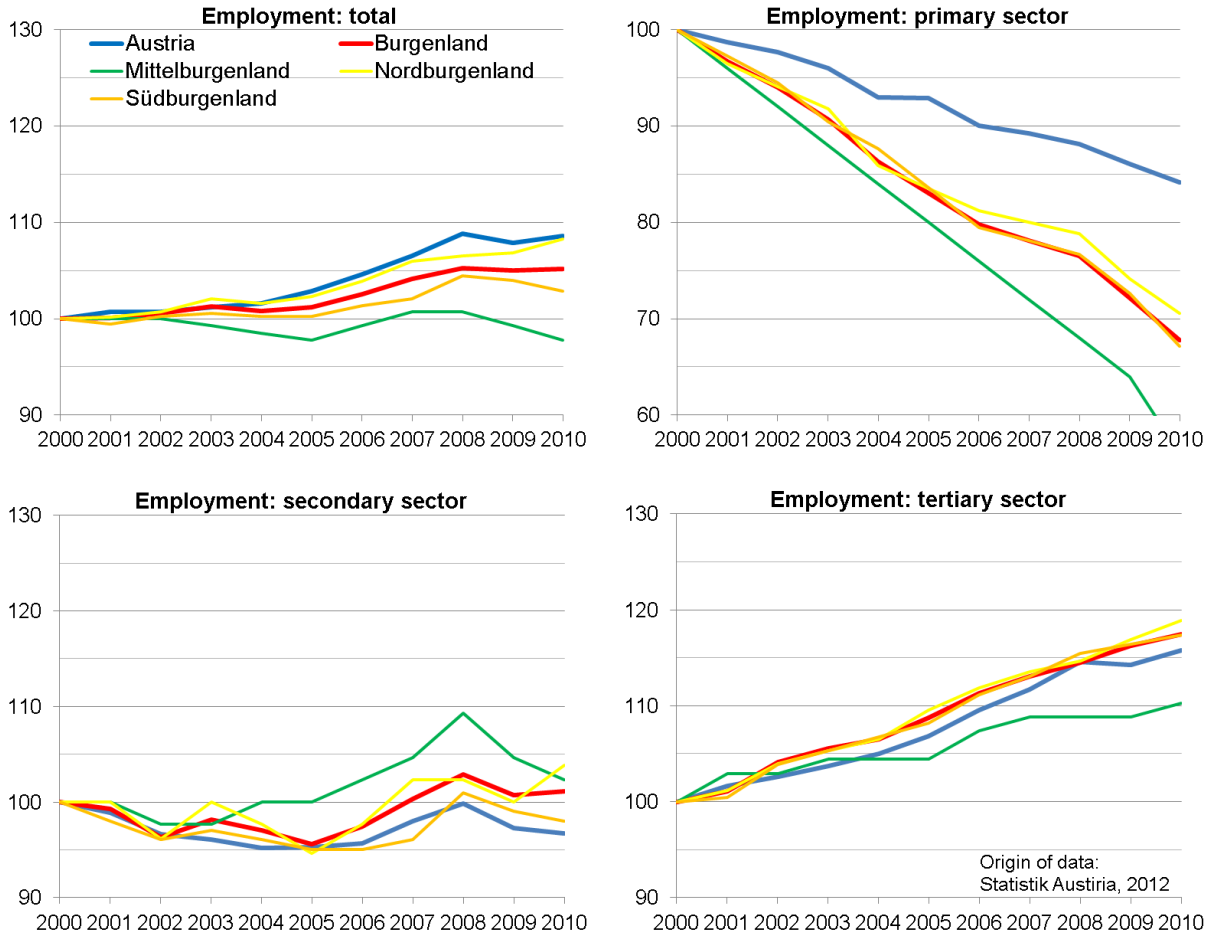


Figure 2.4 Development of employees in Burgenland by main economic sector, 2000-2010

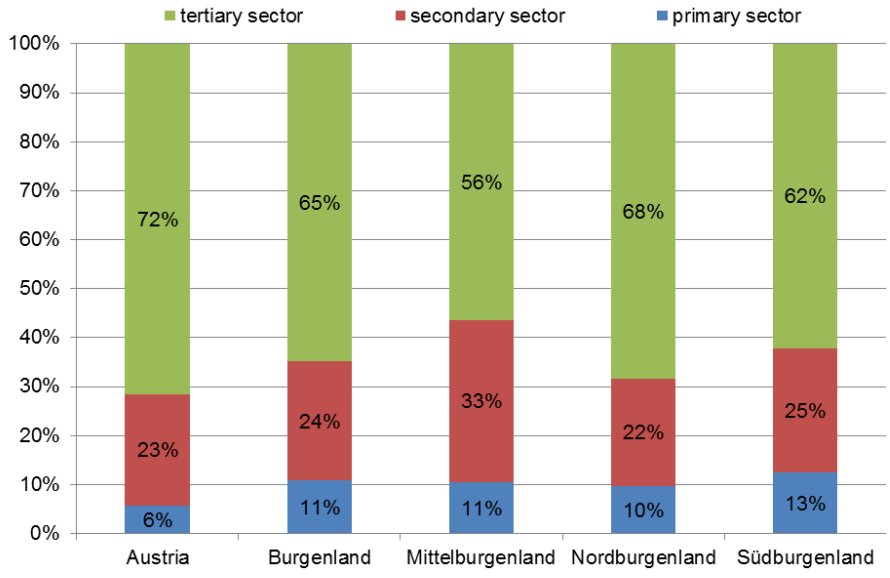


Figure 2.5 Share of employees by main sectors, 2010

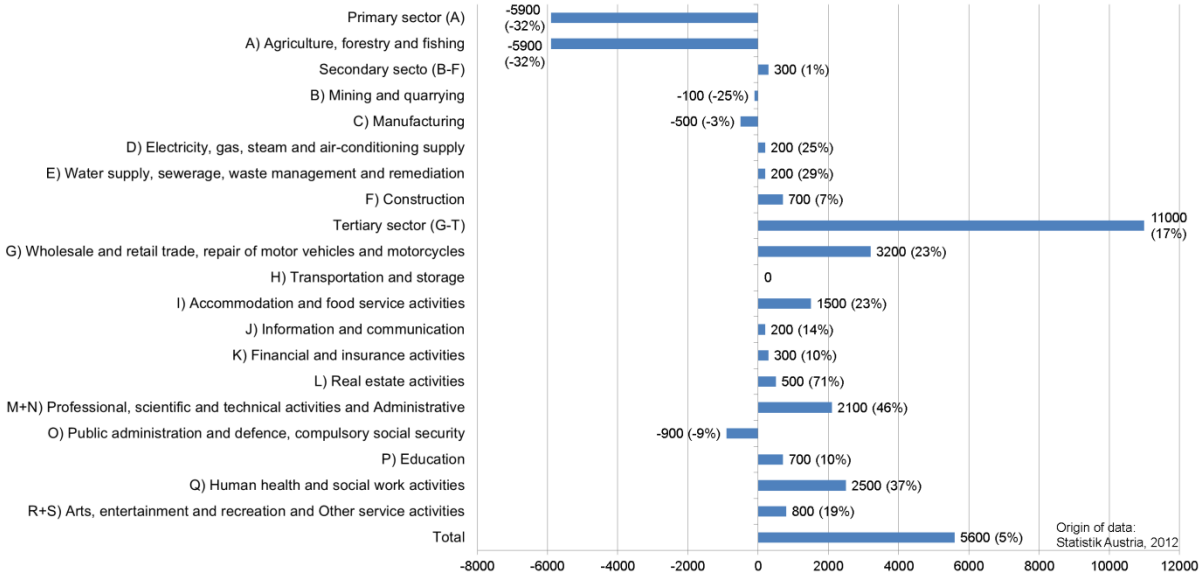


Figure 2.6 Employment change in Burgenland by ÖNACE 2008 sectors, 2000-2010

Green economic performance in Burgenland

Austria provides statistics on environmental goods and services (EGSS) by NUTS-1 regions and differentiated by economic sectors. Accordingly, the majority of economic sectors have a positive development of environmentally oriented employment between 2008 and 2010 (Figure 2.7).

Emphasised is the economic sector "energy supply" which includes the production of electricity and heat from renewable energies as well as the distribution of renewable energy. In Austria, there are around 22,300 employees active in the energy sector. Of these, 11,558 employees are in the field of environmentally oriented jobs. This corresponds to a share of over 40 percent. Considered relatively, the EGGS jobs in Burgenland are in a similar magnitude. Here, about 1,000 people are employed in the energy sector of which 283 jobs are to be considered as being “green”. Thus, the green jobs in the energy sector take approximately 30 percent in Burgenland for 2010.

Similarly, the sector of agriculture and forestry in Austria has an environment-oriented employment of 40,767, which corresponds to a share of employment in the sector of about 17 percent. In Burgenland 12,400 employees are in agriculture and forestry, of which 1,957 are green jobs. Burgenland has 16 percent green jobs in this sector which is about the Austrian average. In Burgenland, there is an increase in green jobs in agriculture and forestry by about 35 percent between 2008 and 2010 only.

The development of environmental employment in the construction sector in Austria and Burgenland (minus 20 percent) is negative between the years 2008 and 2010. Nevertheless, there are about 10 percent of green jobs in this sector. In total, there are 28,788 green construction jobs in Austria and 926 in Burgenland

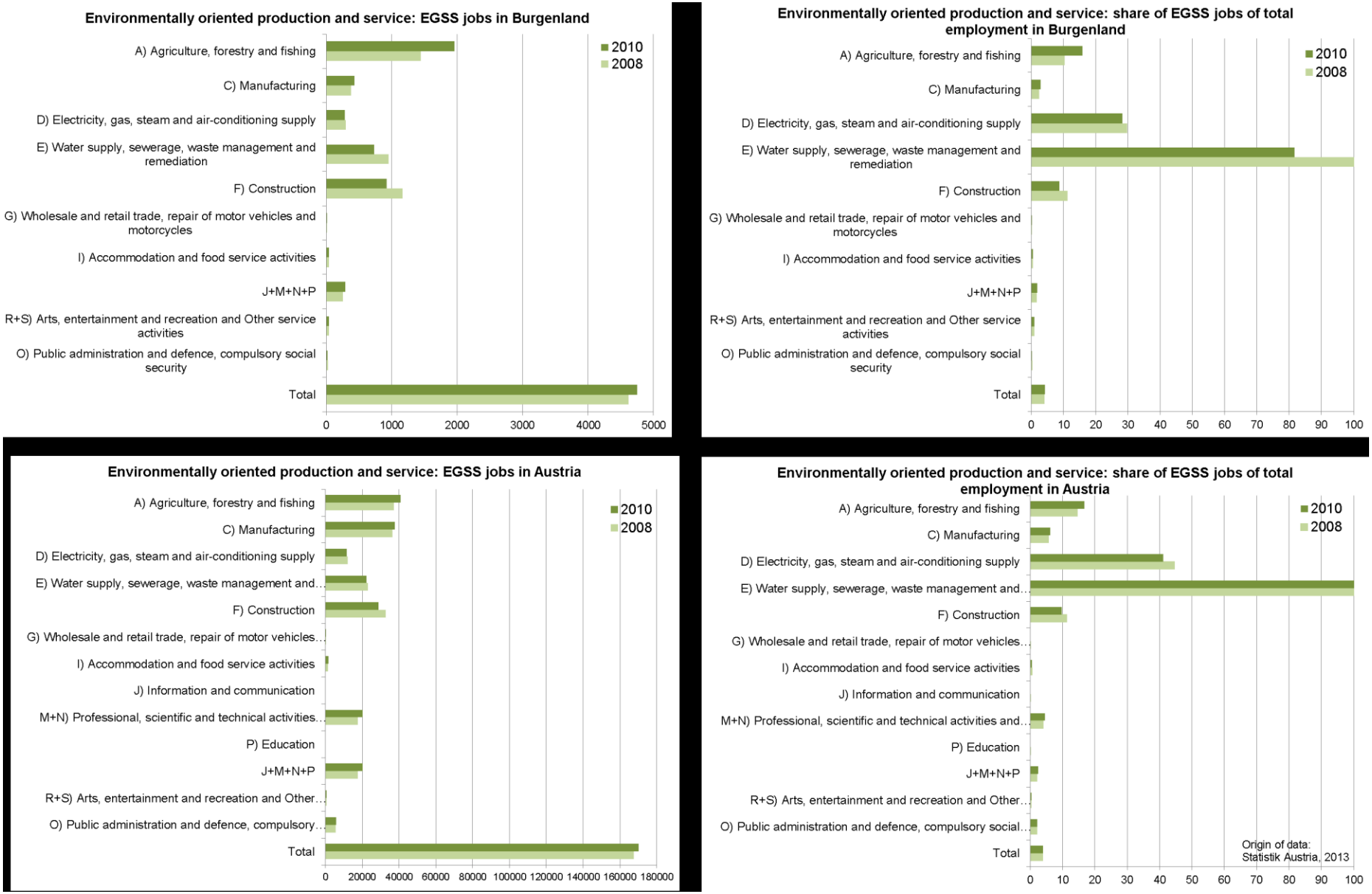


Figure 2.7 Development of green jobs in Austria and Burgenland, 2008-2010

In economic sectors such as manufacturing, professional, scientific and technical activities or the public administration, environment-oriented employment is rather low. The proportions of green jobs in these sectors are well under 10 percent.

Overall, the green jobs in Burgenland increased from 4,622 in 2008 to 4,753 in 2010. In relative terms, only four percent of employees are considered to have green jobs. The same tendency is also true for Austria as a whole. Here, the number of green jobs was extended from 167,000 in 2008 to 170,000 in 2010. Accordingly, the Austrian average with about 4 percent of all jobs being green is at same low level as in Burgenland.

The distribution of green jobs and green turnover to economic sectors in Burgenland is given in Figure 2.8. Most green jobs can be found in the sectors of agriculture and forestry with 30.4 percent, in manufacturing with 24.5 percent and in water sector with 20.1 percent. Comparing green jobs with greens turnover for 2010, however, it should be noted that the sectors energy and construction achieve with a relatively small proportion of environmentally oriented jobs the highest green turnover. Green turnover per green job in 2010 is 533,000 Euro in the energy sector and 313,000 Euro in the construction sector.

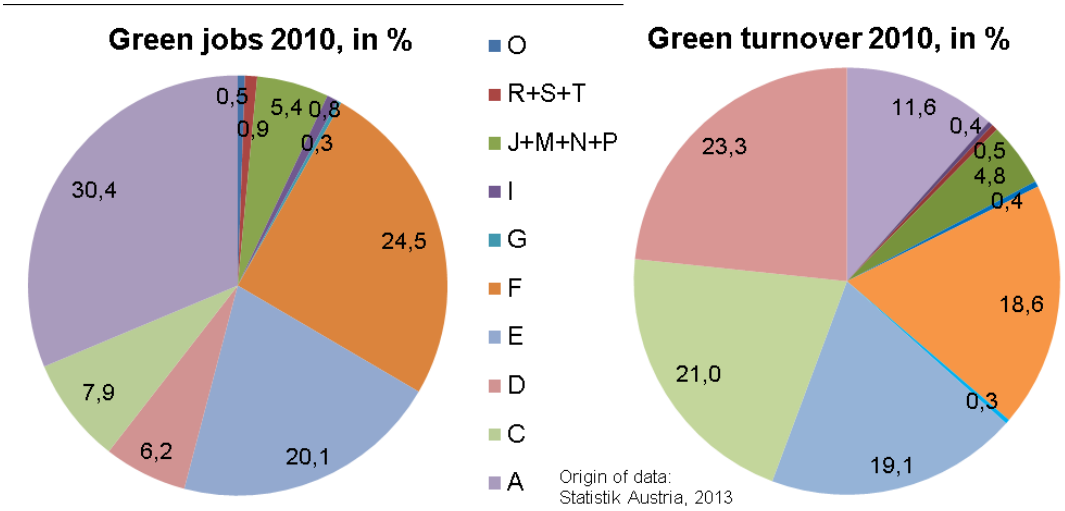


Figure 2.8 Green jobs and green turnover by economic sectors, 2010

The development of green turnover shows two sectors losing in the period between 2008 and 2010 (Figure 2.9). The water and waste sector lost about 20 percent, the construction sector lost three percent. All other sectors grew in terms of green turnover. Highest absolute and relative growth was in manufacturing, green turnover has more than doubled between 2008 and 2010. The electricity sector saw a growth of 7 percent in green turnover. Growth of the Burgenland economy in terms of green turnover was about 10 percent in that short period.

The spatial distribution of the importance of green jobs in Austria is presented in Figure 2.10. Highest shares of green jobs has Kärnten with about five percent of total employment. In contrast, Vienna has only a share of 2.5 percent of environmentally-oriented employment. Burgenland has a share of 4 percent and is in the upper top third.

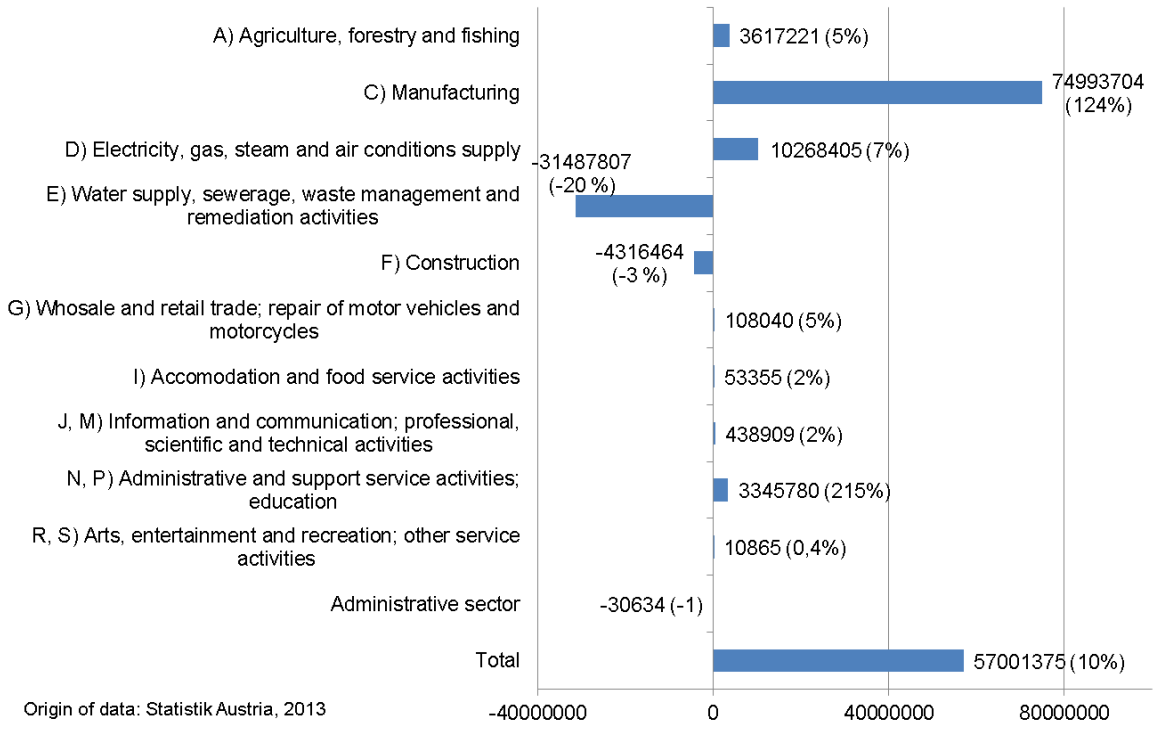


Figure 2.9 Change of EGSS turnover in Burgenland, 2008-2010

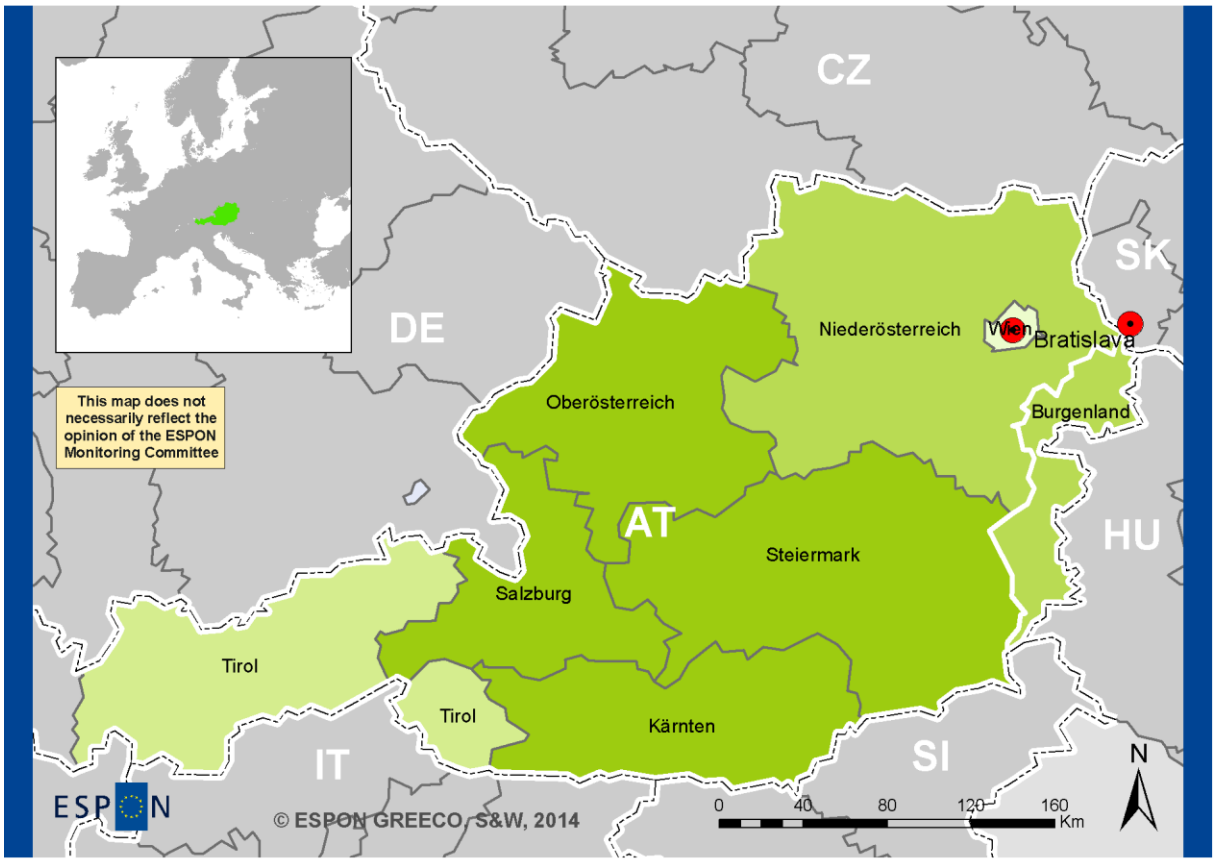


Figure 2.10 Share of green jobs (EGSS) in total employment, 2010

3 Eco innovation and renewable energy as key sectors for green economy in Burgenland

3.1 Performance of eco innovation and renewable energy sectors

The energy consumption in Burgenland in 2001 of about 8,183 GWh (29,633 TJ) increased steadily to 9,711 GWh (34,958 TJ) in 2011. This is an increase of approximately 18 percent which is mainly a result of declining household sizes as smaller households have higher energy consumption per head. About 95 percent of the energy input, especially fossil fuels, has to be imported from abroad or from other states of Austria which creates certain energy dependence for Burgenland (Statistic of Austria, 2013). Figure 3.1 shows that coal does not play an important role, and that gas consumption increased whereas oil consumption decreased in recent years.

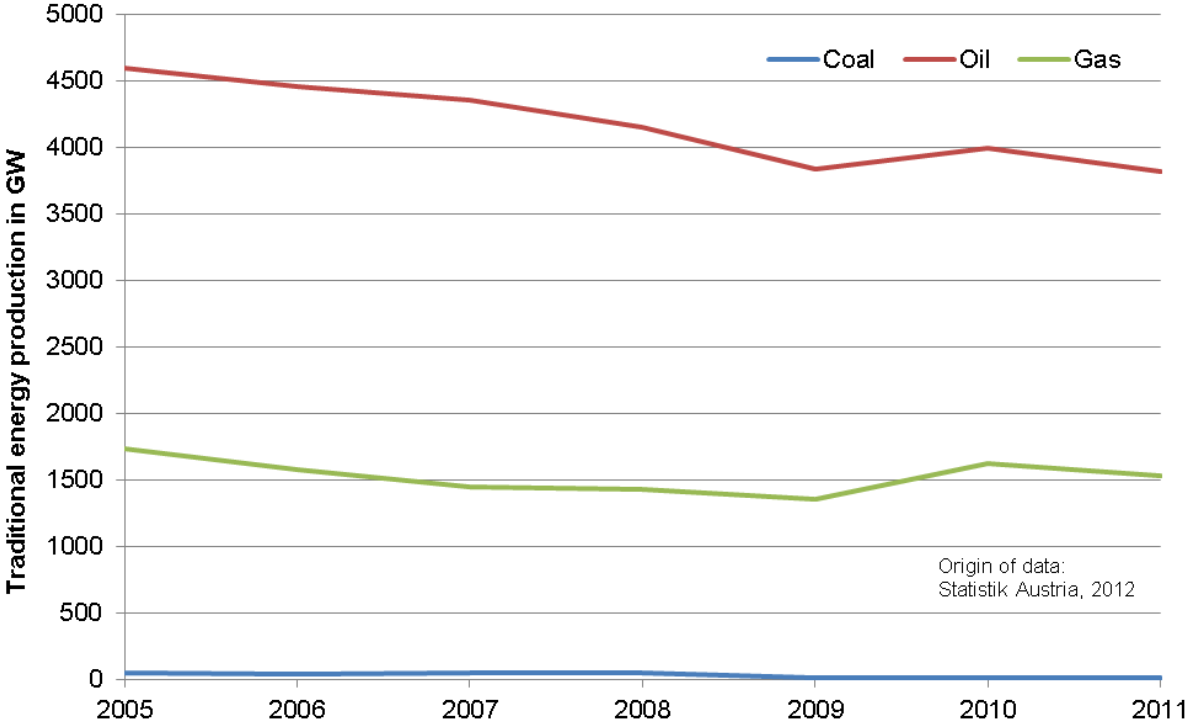


Figure 3.1 Energy consumption from non-renewable sources in Burgenland, 2005-2011

Total energy consumption in Austria is 302,551 GWh in 2011 which corresponds to a per capita consumption of 35,863 kWh. In Burgenland energy consumption per capita is 34,958 kWh, i.e. slightly below Austrian average. This is mainly due to the fact that Burgenland is a predominantly rural and agricultural embossed area with a relatively small share of industrial utilisation. Thus, the entire energy consumption is relatively low (Statistic of Austria, 2013 and European Commission, 2009). However, per capita energy consumption steadily grew during the last decade (Figure 3.2). As there is a population growth of about 10,000 inhabitants up to the year 2020 is forecast in Burgenland, total energy demand in the region is likely to increase, but not essential (European Commission, 2009).

Figure 3.3 shows that Eisenstadt and its surroundings comprise the highest energy consumption of all districts in Burgenland. Above all, the high proportion of fossil fuels is striking. Also the traditional fuels oil and gas in northern Burgenland are much more intensively used for heating than in southern Burgenland.

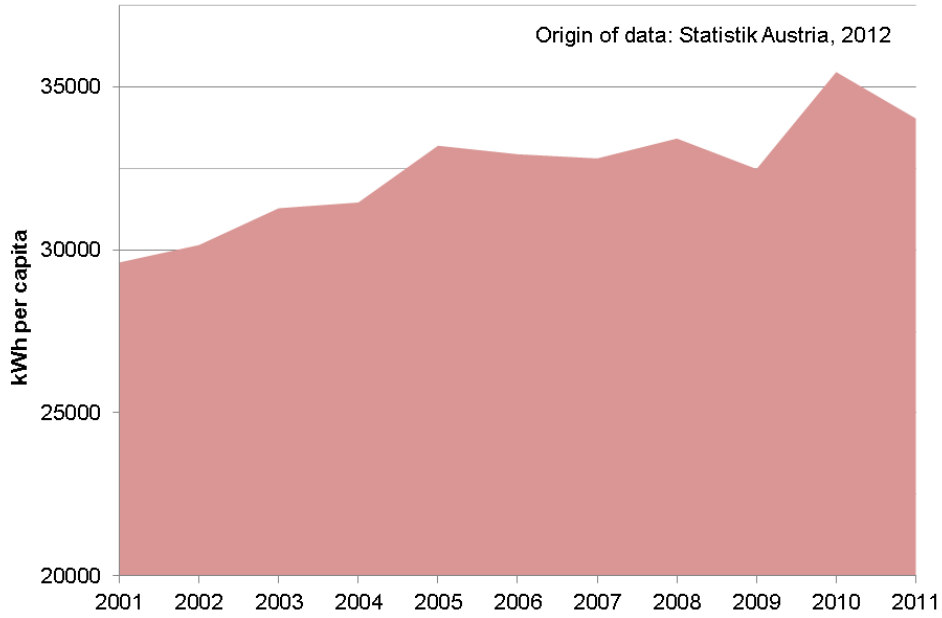
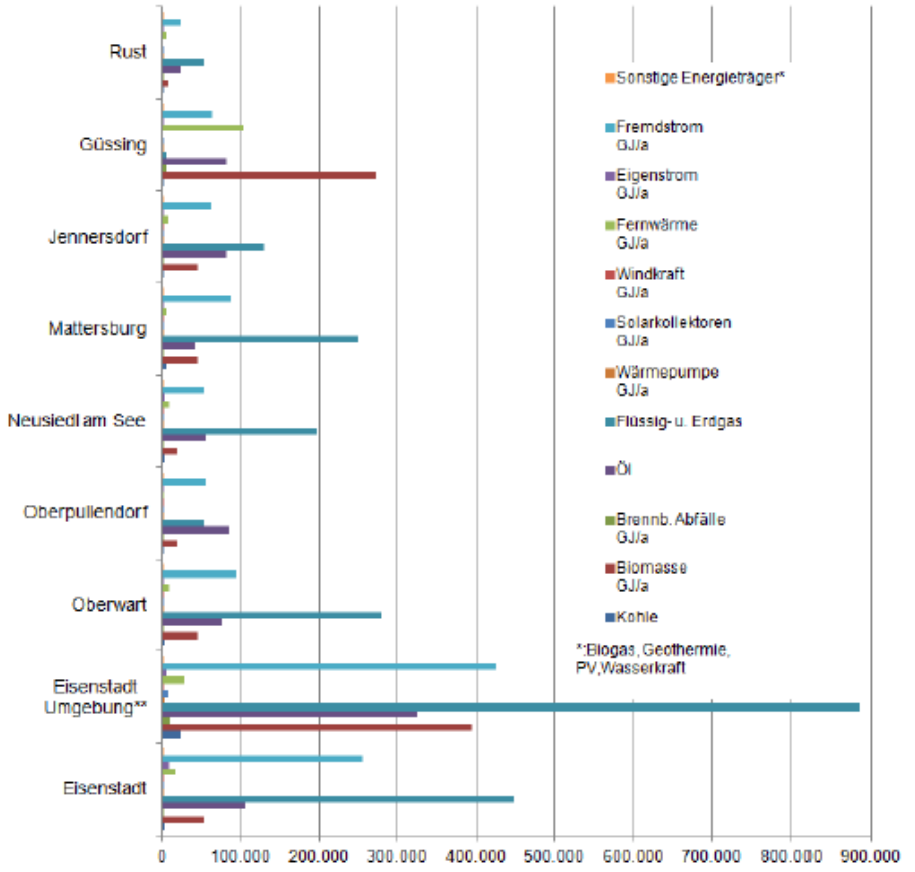


Figure 3.2 Development of final energy consumption per capita in Burgenland, 2001-2011



**: Breitenbrunn am Neusiedler See, Donnerskirchen, Großhöflein, Hornstein, Klingenbach, Leithaprodersdorf, Loretto, Mörbisch am See, Müllendorf, Neufeld an der Leitha, Oggau am Neusiedler See, Oslip, Purbach am Neusiedler See, Sankt Margarethen im Burgenland, Schützen am Gebirge, Siegendorf, Steinbrunn, Stotzing, Trausdorf an der Wulka, Wimpassing an der Leitha, Wulkaprodersdorf, Zagersdorf, Zillingtal

Quelle: Burgenländischer Energiekataster, 2009: eigene Berechnungen, eigene Darstellung

Figure 3.3 Final energy consumption by district and energy source (in GJ per year), 2009 (MECCA, 2013, 57)

However, in recent years Burgenland has developed in the field of renewable energy into an international model region. This development was accelerated mainly by the ambitioned objectives of the state government. It is the long-term goal up to the year 2050, to be a completely energy self-sufficient region. Furthermore, it is planned to reach energy self-sufficiency regards electricity already by now. In the medium term, the share of renewable energy shall be increased to 55 percent of total energy consumption by 2020.

In order to achieve energy self-sufficiency in Burgenland, the expansion of renewable energies is the focus on the political agenda. Key elements in the development of renewable energies are mainly the expansion of biomass, wind energy, photovoltaic and applied research and development purposes (MECCA, 2013). These four key elements are discussed separately below.

Biomass

The energy use of residual material from agriculture and forestry began in the mid-1990s. At that time, the local politicians recognised the ability to use the ERDF resources for developing prototypes in the district heating by using biomass. This trend continued in parallel with the decline in local farming and thus favoured the energetic use of biomass. In addition, new impulses for regional development were initiated and should stop or counteract the negative population growth in southern Burgenland.

Especially the small town of Güssing in Burgenland has a pioneering role for the technical conversion of biomass into energy. This applies in particular for district heating. In Südburgenland almost all technical possibilities for energy production from biomass are used. Also, new ways to use biomass are tested and explored in pilot plants. Here, the biomass resource is used in many ways.

In addition to the conventional combustion of residual wood for heat production, it can be converted into gas and as well as with the aid of the technology of Pyroforce. Then the produced gas can be converted into electricity using gas engines. Similarly, sawdust is used as a waste product of the regional wood processing plants such as the parquet industry energetically. This produces steam as a result of combustion. This can be used to generate electricity via steam turbines. In addition, the resource forest wood chips used in addition to electricity and heat production as a liquid fuel (BMVIT, 2007).

Already with the establishment of the first district heating systems in 1996, Güssing became interesting as a business location. By the availability of cheap heat (about 30 percent cheaper), it was managed to attract about 50 new companies in the city and region and to create more than 1,000 direct and indirect jobs in the renewable energy sector. The company settlement was supported by a special program. Thus, Güssing and its surrounding areas became an important location in the fields of manufacturing of parquet, drying of hard wood and environmental technology (BMVIT, 2007 and European Commission, 2010).

The financing of the first prototypes district heating and the following seven stages of development (last in 2006) was performed by ERDF resources, national funding and local subsidised loans. With the increased production of district heating from biomass an expansion of the district heating network was accompanied also. Therefore the inhabitants of the town of Güssing got the opportunity to connect to the district heating network and to obtain the local district heating produced directly. About 98 percent of the population in Güssing rare related to the heat produced from their own region. Similarly, the construction of a second heating unit in Güssing is required as a consequence of the increased heat demand and the use of new fuels from the parquet Industry. In this way, in addition to agricultural cooperatives the wood processing industry is integrated in the resources procurement cycle and is a part of the regional value added also.

The development of district heating production in Südburgenland shows also that traditional energy sources can be replaced in large part by biomass. In contrast, the share of fossil fuels in heat sector is much higher in Nordburgenland. Figure 3.4 shows that investments in biomass was mainly in Süd- and Mittelburgenland and relatively low in Nordburgenland.

However, the focus in Güssing is not only on heat production. In other pilot plants the generation of electricity from biomass will be explored among other things. Of particular note is the biomass power plant Güssing. This is a globally unique type of power plant, which enables the production of heat and electricity in a completely new system of combined heat and power based on biomass gasification. Also of key importance is another type of plant which can produce heat and electricity and gaseous and/or liquid fuels from different organic wastes and raw materials (polygeneration). In contrast to solid sources, biomass gas offers flexible possibilities for the generation of heat and electricity. In addition, there are other biodiesel, biogas and phyroterm plants in Güssing.

With the construction of the biomass power plant, Güssing achieved its energy self-sufficiency already in 2001 (BMVIT, 2007). Likewise, there can be attained Through the use of innovative heating systems a considerable return on investment can be attained. It is estimated, that about 18 million Euro per year are remaining in Güssing (European Commission, 2010).

The technological progress in Burgenland is also evident by the high efficiency levels of biomass power plants of 85 percent, which was made possible by highly innovative technologies. In contrast, the efficiency of bioenergy plants is indicated generally at 30 to 40 percent, with some plant also quite achieves higher efficiencies (RENET, 2013).

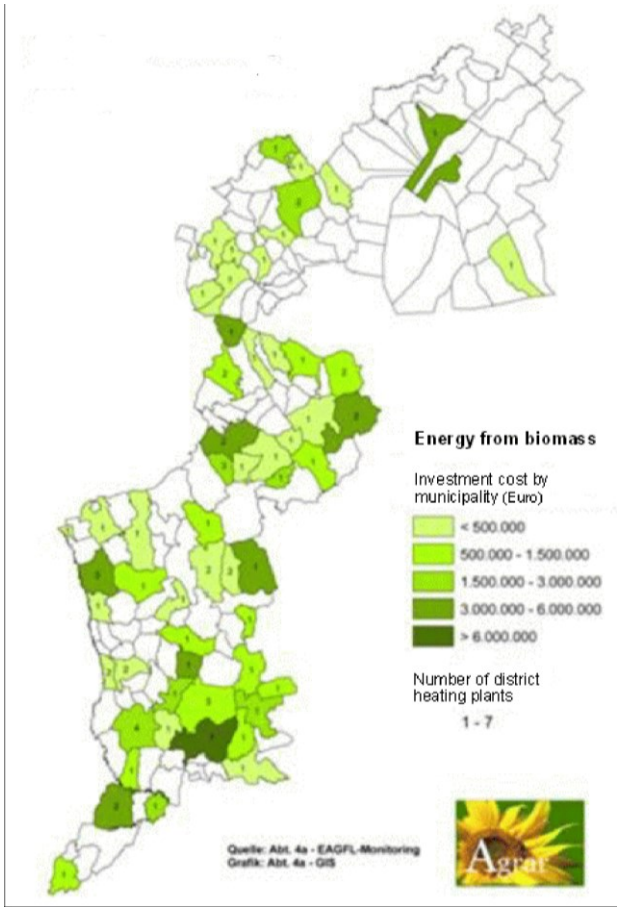


Figure 3.4 Biomass plants and investment costs in municipalities, 2008 (MECCA, 2013, 35)

The range or the strategic importance of the pilot plants in Güssing is particularly evident through the transferability to other regions. The results obtained in Güssing have a tremendous appeal for further projects. As recordable as a biomass power plant with the new technology of combined heat and power was built in Oberwart (Südburgenland) in 2004. Moreover, the example shows that Güssing is a technical development centre and driving force for regional development for adjacent regions in Austria and abroad.

The expansion of biomass may cause conflicts with competing uses in cultivation of food and feed industry. This problem, however, was recognised early by the authorities in Burgenland and taken into account in the energy strategy. It is therefore also considered for a further expansion of the biomass accordance with agriculture. (European Commission, 2009)

The production of energy from biomass from 1,108 GWh in 2005 has increased to 2,634 GWh in 2010. Accordingly, the production of energy from biomass in Burgenland has more than doubled in 5 years. The energy production from biomass of 2,634 GWh (2010) corresponds to a share of just over 25 percent of the total energy consumption of 10,081 GWh (2010).

Energy production from biomass can be divided into the sections biogenic fuels and propellant and heating wood. Biogenic fuels and propellant have a share of about 70 percent of production in 2010, the share of heating wood is about 30 percent. Biogenic fuels and propellant consists of a variety of raw materials. Among them are meant, wood chips, sawmill products, bark, straw, waste liquor from paper industry, biogas, landfill gas, sewage gas, rapeseed methyl ester r as well as meat and bone meal and animal fat.

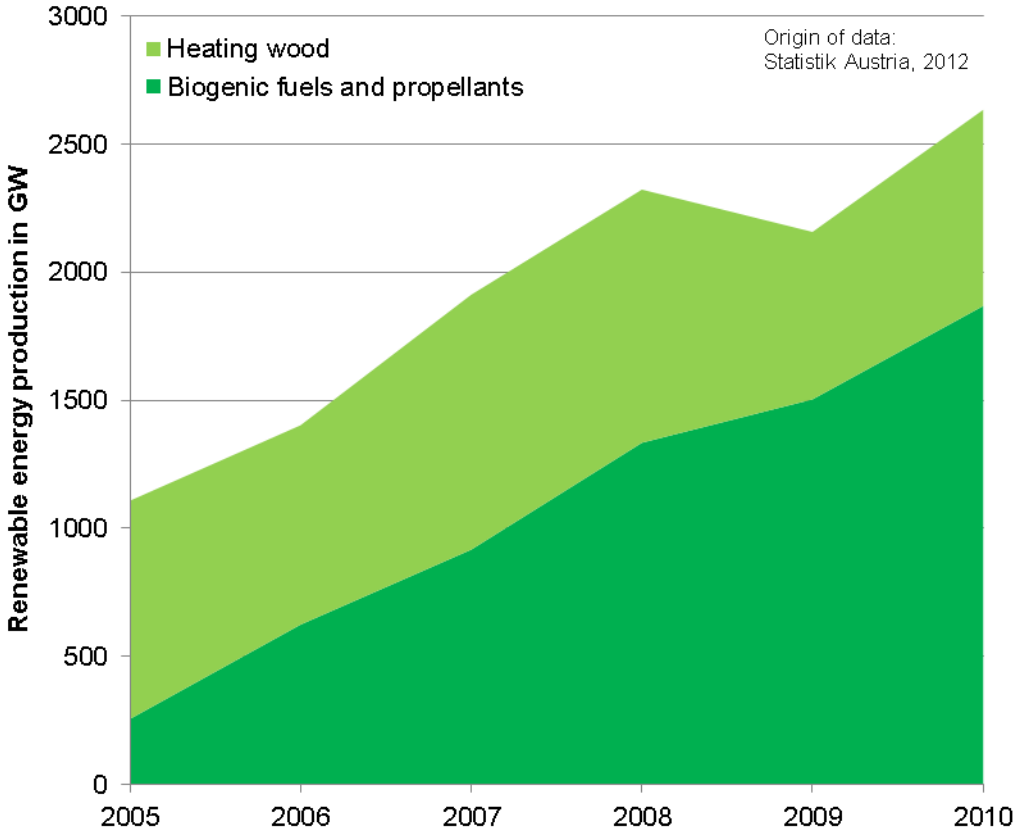


Figure 3.5 Energy production from biomass in Burgenland, 2005-2010

Overall, it should be noted that in the area of biomass, the focused use of European and national funding and the efforts of those involved has provided great achievements. Biomass has become the most important renewable energy in Burgenland and had a share of slightly below 75 percent of the renewable energy in 2010.

Because the district heating operation takes place almost exclusively on the resource biomass, large amounts of fossil energies can be replaced in this area. However, it should be noted that due to the sparsely populated areas in Burgenland as well as the low energy density of district heating systems results in high power losses. Accordingly, the district heating system in Burgenland can cause low or negative economic returns (MECCA, 2013).

Research and development purposes

At the national level, the Austrian energy research policy looks back to a long tradition. The first energy research concept was created by the Federal Ministry for Science and Research after the first oil crisis in 1974. In the same year, the International Energy Agency was established with the participation of Austria, which has in turn led to the first international research community in the field of energy technologies. However, it took 20 years until full participation of Austrian companies, researchers and scientists in the EU framework programs for research and development was possible due to Austria's accession to the EU in 1995.

In the past 40 years, the amount of public finance for energy research changed often. After the oil shock and the oil crisis in the 1970s, energy research got significant financial support. But later, due to the energy market development and the ever lower prices for natural gas and oil, the energy research budget was reduced. The financial support of energy research in Austria has increased again only with the gradual increase in energy prices. Moreover, the EU's climate change debates and the Kyoto Protocol had a positive impact on the research budget.

Public research funds increased significantly between 2000 and 2013 (Figure 3.6). Also energy research topics such as production, storage and distribution of energy as well as the sector of environmental protection benefitted from the higher research budget. The financial support for "energy" increased from about 21 million Euro in 2000 to about 46 million Euro in 2013. Thus, government spending has more than doubled. For climate change related research, an increase of funding of about 40 million happened between 2000 to 2013. However, it should be noted that public research funds for these research topics are very small areas compared to the total reserach investment; for the "generation, storage, and distribution of energy" it is only 1.8 percent of all funding in 2013, for "climate change" it is 1.8 percent.
Austrian researchers and developers have recognised their chance to be a part of the international energy research network despite limited financial resources. The strength of Austria is the technology development and implementation in current projects which are mainly to be found in the priority areas of the Austrian Energy Research of energy efficiency and renewable energy.

In 2009, the Austrian Research Council has formulated an energy research strategy with a long-term perspective up to 2050. This strategy has the overall objective to achieve the 20-20-20 targets. It recommend also to increase energy research funding in the medium term up to 100 - 120 million Euro to reach the funding levels of comparable countries such as Finland, Denmark and Switzerland. Long-term annual expenditure on research and development for energy research of 150 million Euro are recommended.

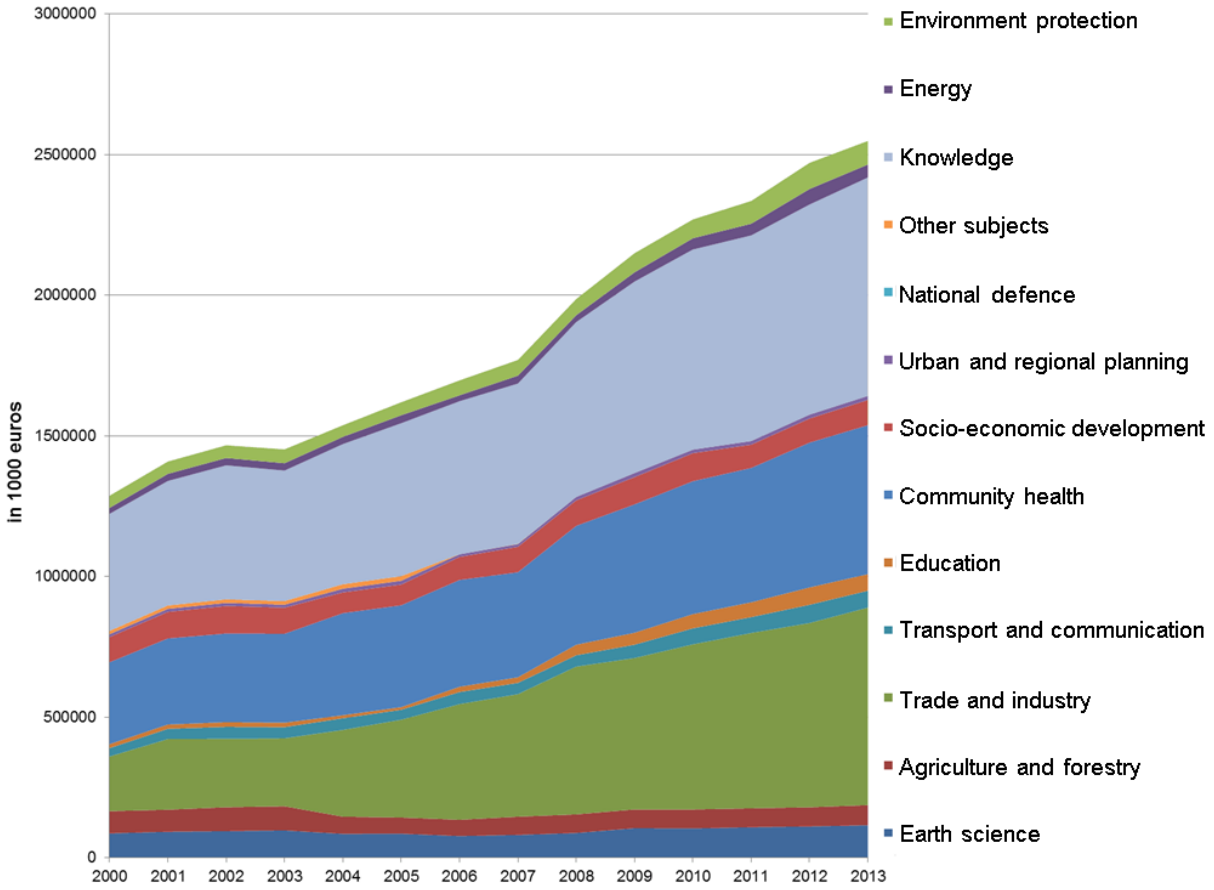


Figure 3.6 Federal research expenditures by subjects, 2000-2013 (Statistik Austria, 2013)

In Burgenland, it was recognised necessary to establish a coordination centre for renewable energy based on the success of the above mentioned biomass projects,. The "European Centre for Renewable Energy Güssing (EEE)" was initially founded as an association in 1996 and then converted to a company with limited liability (GmbH) in 2002. Since then, the institute has built an international recognition in the field of sustainable regional concepts for the use of renewable energy. For this, the EEE has repeatedly gained national and international awards. The EEE is working with partners from across Europe. The EEE is located in the Technology Park Güssing. Currently, 14 people are employed in EEE (EEE, 2013).

The success of the expansion of biomass as well as the impulses for regional development can be attributed to a large extent by the integration of research in Güssing. However, the EEE itself does not engage in active basic research, but takes the role of a classic networker and thereby promotes the cooperation with various research institutions and economic actors and system builders. In addition, about 30 plants of various technologies are partially administratively managed by the EEE (EEE, 2013).

The biomass power plant Güssing constitutes the core of the research and development of the EEE. At the same time it is the starting point for further eco innovations in the field of fuel cell technology, in the "biomass to liquid" and in BioSNG. Nowadays, there are more than a dozen technology centres and business parks located in Burgenland (Figure 3.7).

In addition to the academic partners of the Technical University of Vienna and Graz the University of Applied Sciences Pinkafeld is another component of EEE. The University of Applied Sciences Pinkafeld is the only university in Burgenland and was founded in 1994. In addition to the campus

in Pinkafeld, the University of Applied Sciences has another location in the state capital Eisenstadt. Overall, the university offers 16 degree programs with the so-called four competence areas; "Energy and Environmental Management", "Building technology and Building Management", "Sustainable Energy Systems" and the main area of "Energy and Environmental Management". The importance of the University of Applied Sciences Pinkafeld with a clear emphasis on climate change and the expansion of renewable energies in the context of energy policies is further growing. The innovative energy related subjects with the corresponding research can strengthen the Burgenland as an education and business location and might mitigate the current deficits of jobs.

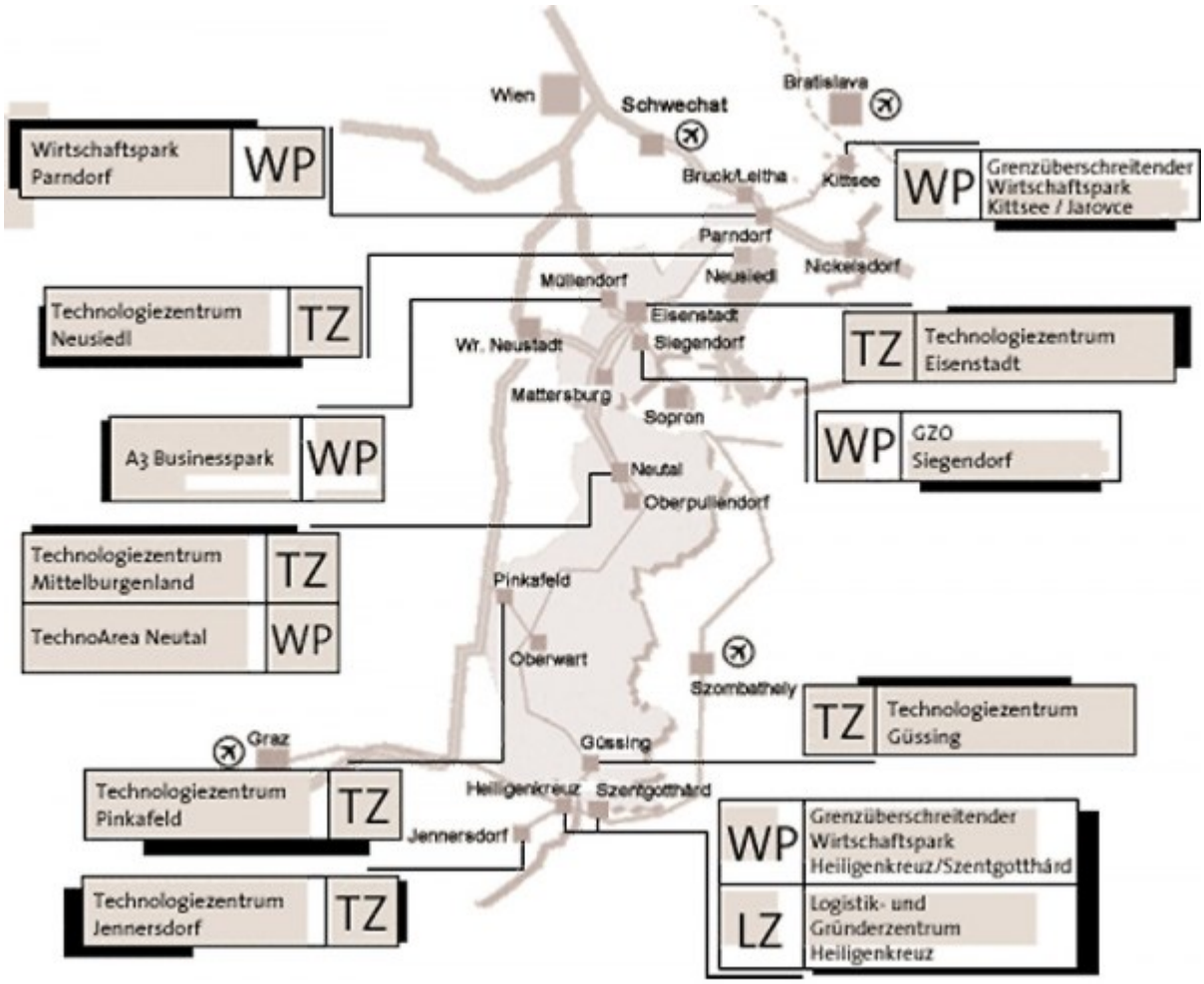


Figure 3.7 Technology centres and business parks in Burgenland (Burgenland, 2013j)

In the same line, the technology centre Pinkafeld can contribute significantly to this purpose. The technology centre is located next to the university and enables an intensive exchange between research and practice. The expansion of the existing laboratory areas to expand research and development capacity was supported with ERDF resources. The total cost of the expansion amounted to 981,522 Euro of which ERDF resources were used in the amount of 247,859 Euro.

In the use of ERDF funds, a special focus is put on the sustainable integration into the regional policy strengths and strategies. In addition, the synergies between education, research and practical application are to be strengthened. In Burgenland in addition to academic education the education of handicraft professionals in the field of climate protection and renewable energy is promoted as well.

Particularly noteworthy is the solar technician education that was originally created in Vienna in 1993 and nowadays is implemented in the EEE in Güssing. In the Solar School Güssing professionals are trained in the field of electrical and heating technology with a new, innovative approach to electricity and heat production from renewable energy sources. The EEE provides ideal conditions for the practically oriented work in the pilot plant and laboratories. The building of the solar school was funded by ERDF resources with an amount of 55,000 Euro. The total cost was about 110,000 Euro (European Commission, 2009).

Solar energy

The average global radiation shows with about 1,200 kWh/sqm a positive basis for energy production (Figure 3.8). However, solar energy in Burgenland has not such a pronounced pioneering role as the use of biomass. Nevertheless, it is an essential part of Burgenland's energy concept. And, research and development activities in the field of photovoltaic have become a second pillar of the EEE in Güssing.

The Green Electricity Act of 2001 created new incentive structures in form of feed-in tariffs. After an initially slow start, market diffusion accelerated between 2002 and 2004. However, since the scheme contained a cap, further solar market development stopped upon reaching the maximum threshold of 15 MWpeak installed capacity in 2004. Due to lack of further solar energy policy incentives, the photovoltaic market in Austria reached a minimum in 2006. New market impulses were set in 2008 only by the Climate Energy Fund (Stanzer et. al., 2010). However, financial incentives in Austria have a far lower level than the German feed-in tariff.

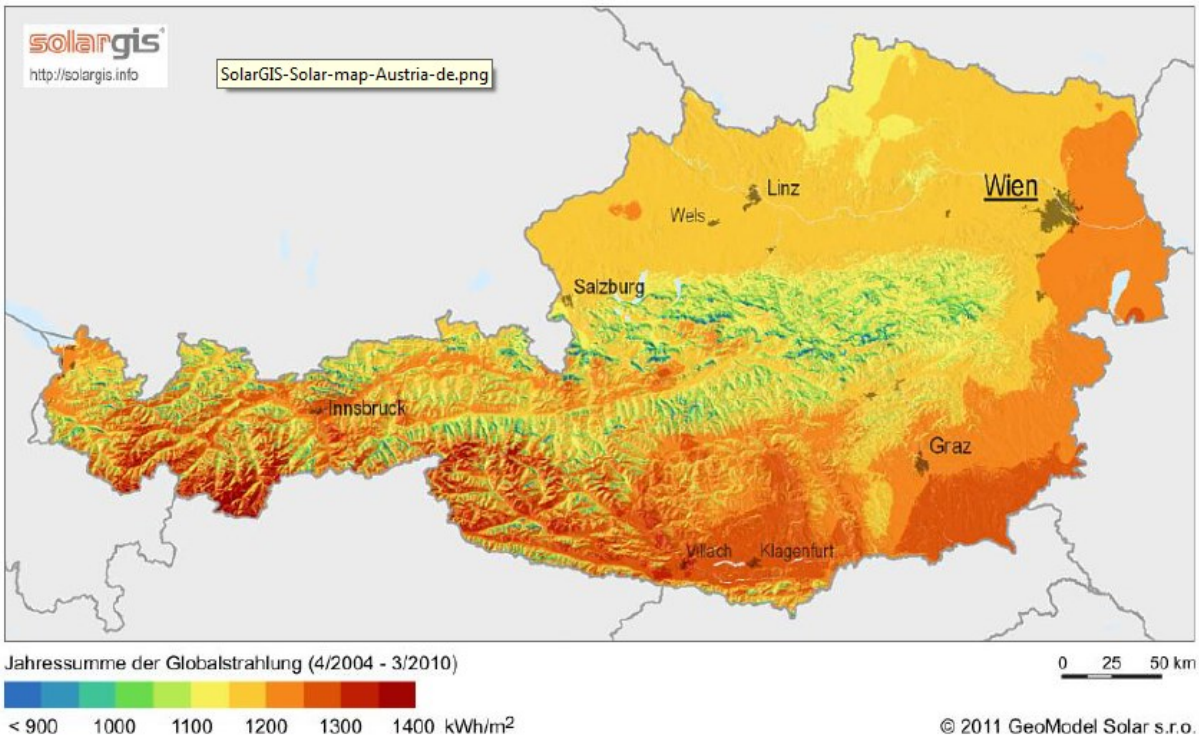


Figure 3.8 Annual totals of global radiation in Austria, 2004-2010 (MECCA, 2013, 81)

In contrast to bioenergy the number of providers in the photovoltaic market is rather low. Therefore, Burgenland sought cooperation with German market providers and found a partner in the Blue Chip Energy GmbH, one of the most innovative and global solar manufacturers. Blue Chip Energy built its manufacturing plant in Güssing and brought high-quality research and technical know-how to the region. In a "solar energy cluster" the Blue Chip GmbH worked with the research department of EEE and in cooperation with the University of Applied Sciences Pinkafeld and the Technical Universities of Vienna and Graz. The goal was the development of highly efficient mono-crystalline solar cells (blue chips). Since the establishment of the facility in Güssing Blue Chip employed 140 highly skilled employees.

However, it was necessary to raise substantial financial resources for this business settlement. The entire project cost were about 66 million Euro including around 12 million Euro ERDF funding (European Commission, 2009). However, in 2011 the Regional Court of Eisenstadt opened the insolvency proceedings against the assets of Blue Chip GmbH (Blue Chip Energy GmbH, 2013). As many other European, in particular German providers of solar technology, the company was not able to stand the price competition against Chinese products.

The EEE and its subsidiary, the PV Burgenland GmbH together with 16 municipalities of Burgenland have installed a photovoltaic system with a total capacity of approximately 320 kW. The two actors rely on direct citizen participation. With an amount of 1,000 Euro citizens can participate in a photovoltaic plant in their communities. In return they receive a profit share in the operation of the plant and independent earnings of 2.5 percent. On the one hand, citizens can have an active influence to climate protection and on the other side they can take an individually advantage of the project (PV Burgenland, 2013; EEE, 2013a).

Solar energy has a less important role in Burgenland. In 2010, just over 70 GWh of solar energy were produced (Figure 3.9). This amount of energy produced was almost exclusively used for the production of heat and only a very small part in the form of electrical energy. The low utilisation of solar energy in Burgenland is probably explained by the fact, that solar panels are mostly installed on buildings and Burgenland is settled, due to its rural structures only to a small extent.

Ground-mounted photovoltaic use is not a promising alternative in Burgenland. As defined in the Green Electricity Act, ground-mounted systems have much lower feed-in traffic systems on roofs (LEA, 2013). In addition, open space seems not to be available for large-scale ground-mounted systems. One reason is that Burgenland consists of about 30 percent forest areas and in general, these areas are not available for solar energy use.

Scenario-based calculations of the potential for solar energy give rather low perspectives. Figure 3.10 shows the potential of solar thermal energy for Burgenland. Even in the scenario with the largest potential a heat production of about 100 GWh per year would be possible only. This means that the potential has almost been utilised by 2010. Spatial differentiation by district is presented in Figure 3.11.

Also, the production of solar based electricity shows only a limited total potential of just over 40 GWh per year (see Figure 3.12). However, compared to almost no solar electricity nowadays, the potential is much higher than for solar thermal energy. Spatial differentiation by district is presented in Figure 3.13.

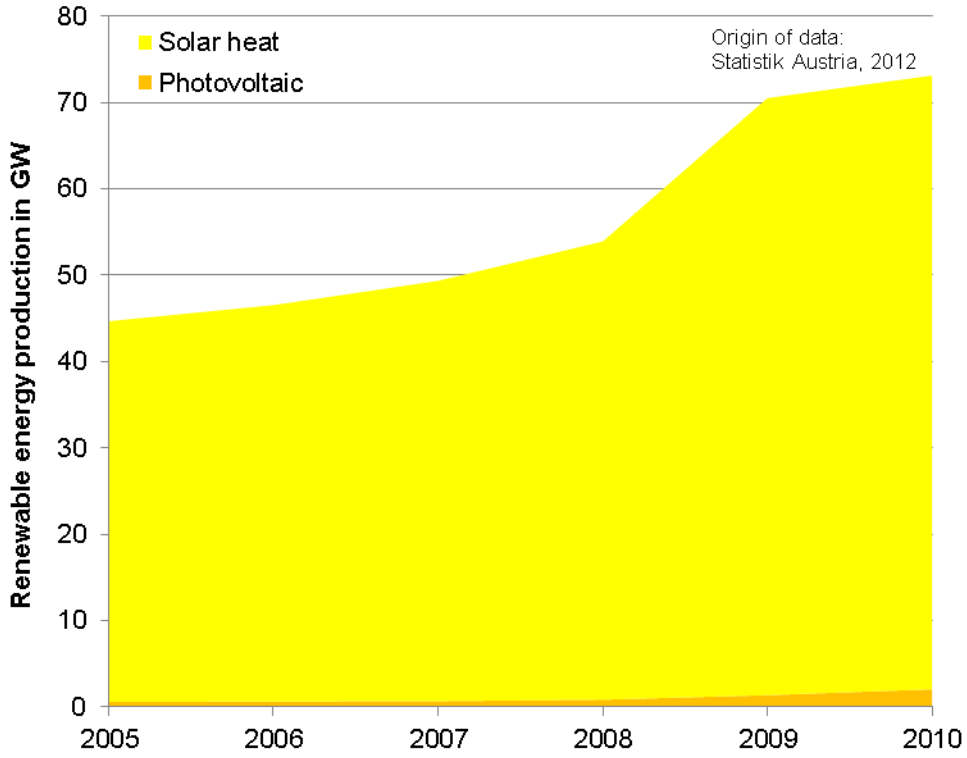


Figure 3.9: Energy production from solar energy in Burgenland, 2005-2010

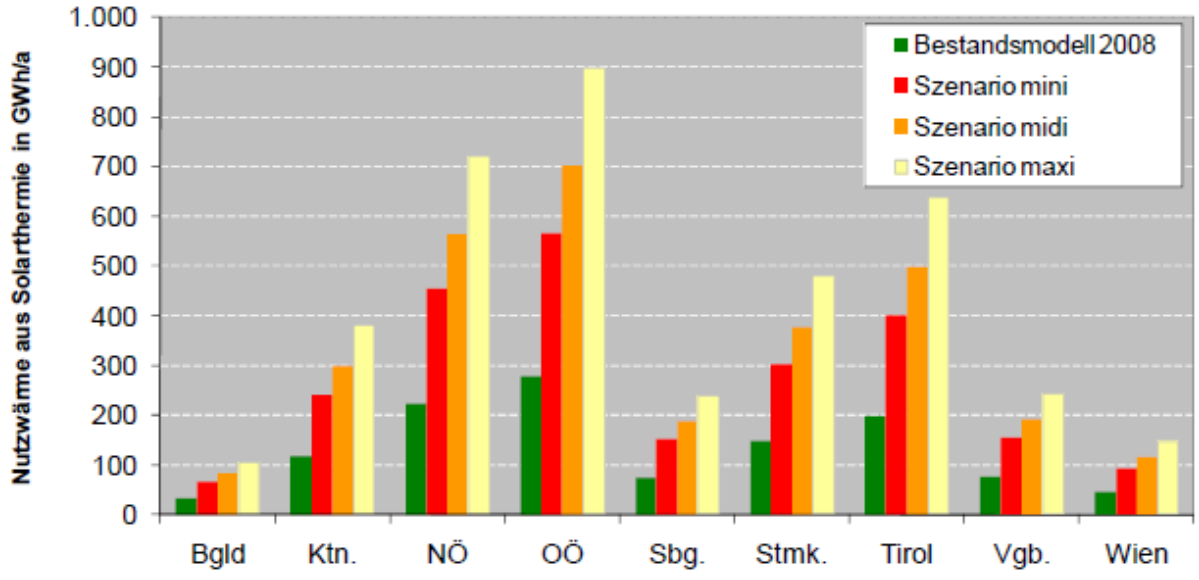
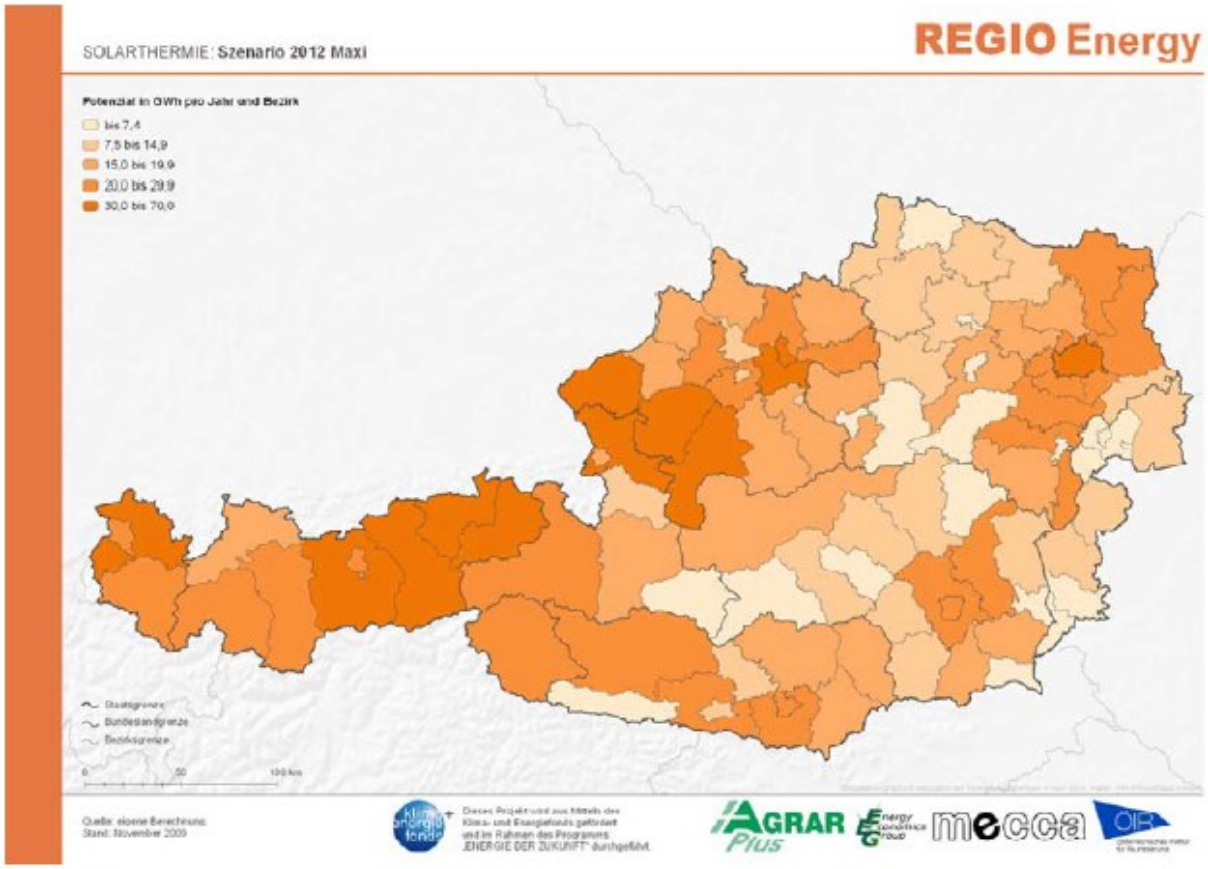
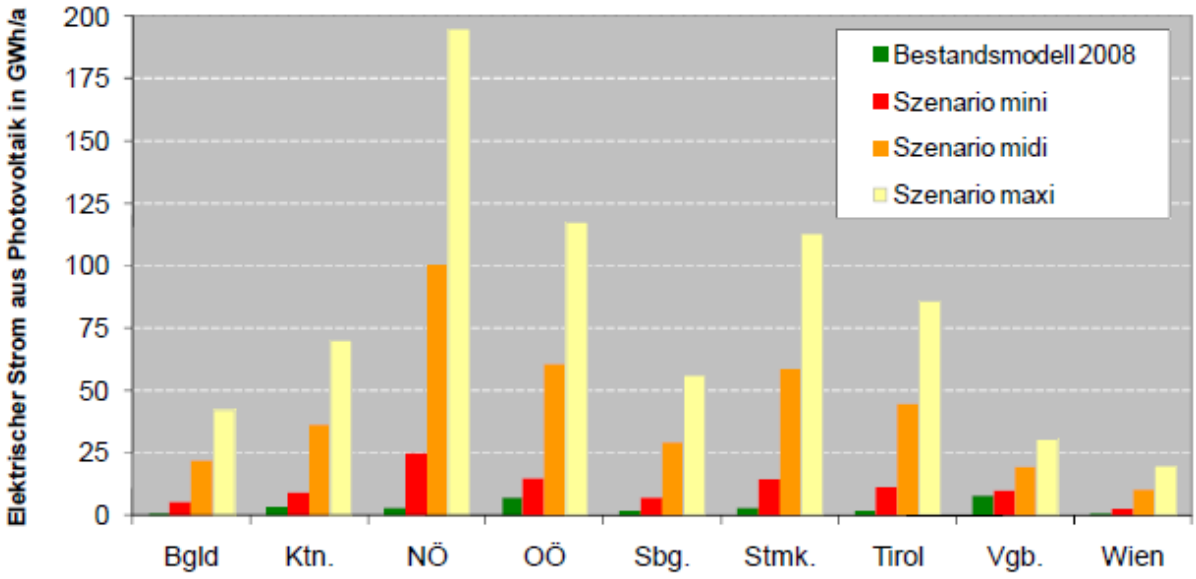


Figure 3.10 Potentials of energy production from solar energy by state (in GWh per year) (Stanzer et. al., 2010, 121)



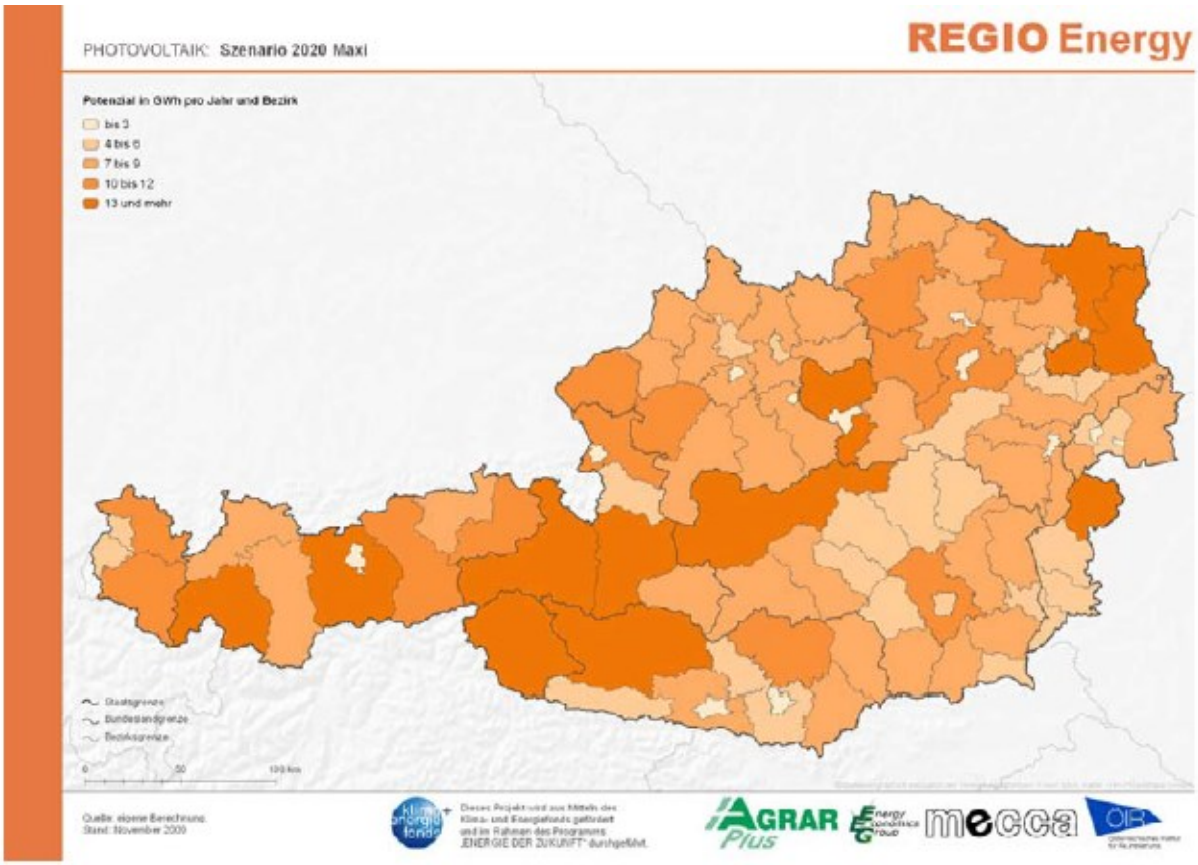
Quelle: EEG

Figure 3.11 Potentials of energy production from solar energy by districts (in GWh per year) (Stanzer et. al., 2010, 121)



Quelle: EEG

Figure 3.12 Potentials of energy production from photovoltaic by state (in GWh per year) (Stanzer et. al., 2010, 128)



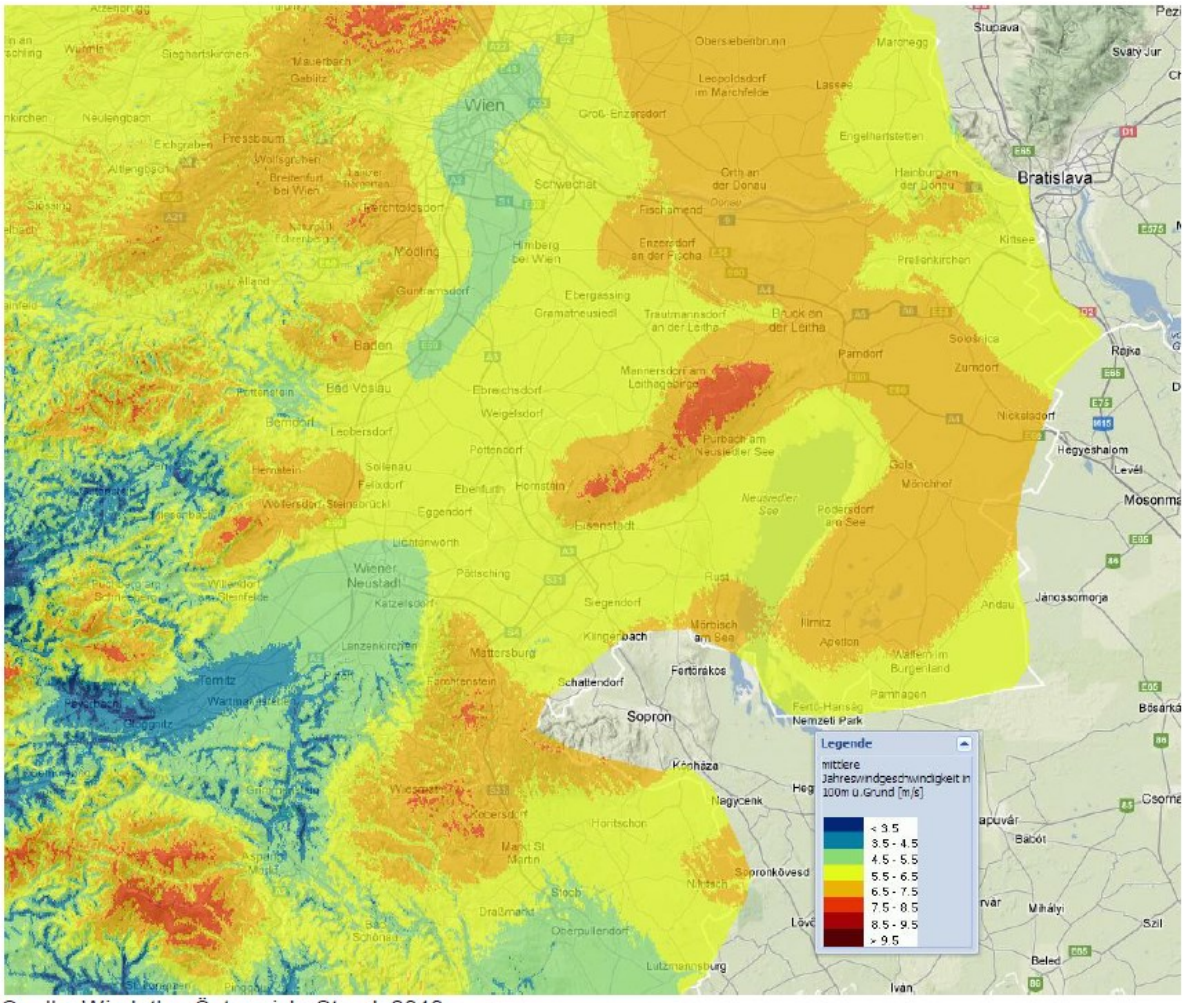
Quelle: EEG

Figure 3.13 Potentials of energy production from photovoltaic by districts (in GWh per year) (Stanzer et. al., 2010, 129)

Wind energy

The natural conditions for wind energy are very good in Burgenland. Therefore, the use of wind energy can contribute significantly to energy self-sufficiency. Especially at the Neusiedler See, there are average wind speeds of about 9 m/s at 100 meters high which is ideal for employing wind energy (Figure 3.14). The Neusiedler See has been identified as one of the most wind-intensive regions of Europe due to its location between the foothills of the Alps and the Carpathian Mountains.

At the beginning of wind energy exploitation in the early 1990s, there was very little experience concerning the use of wind energy. The investment risk for specialised wind energy companies or investors was very high. In addition, the spatial planning knowledge was missing and so the identification of suitable areas for spatial and environmentally sustainable wind energy was difficult. Large factors of uncertainty were the dimension of protective distances to residential areas, airports, traffic areas and special protection areas and the routes of birds, which is a particular problem at Neusiedler See due to the high diversity of species (European Commission, 2009).



Quelle: Windatlas Österreich, Stand: 2010

Figure 3.14 Average annual wind speeds at 100 m above ground, 2010 (MECCA, 2013, 77)

During the mid-1990s, first prototypes of wind plants were installed in the Parndofer Platte to investigate the use of wind energy. The success story of wind energy development began with the construction of six pilot plants in Zurndorf in the northern part of Burgenland. This pilot project was expanded to 13 plants by 2001 (European Commission, 2009; Burgenland, 2012). The aim of the prototypes was to gain experience in the use of wind energy and to draw attention of investors to the region. At the same time, a scientific study was commissioned to investigate the symbiosis of wind energy and the protection of species (European Commission, 2009).

In 2003, the intensive development of wind energy began with the construction of the wind park at Neusiedl am See. The quick implementation of the first wind initiative between 2003 and 2006 was possible through the large support of the state government and regional planning (Burgenland, 2012). Spatial planning in Burgenland harmonised the interests of inhabitants as well as of nature protection for a sustainable electricity production. Spatial planning has defined areas which are suitability for wind energy usage for entire Burgenland and thus created an ideal framework for the development of wind energy. Therefore, in Burgenland 225 wind turbines do exist with an installed capacity of 430.4 MW (MECCA, 2013).

The development of wind energy has been supported by the ERDF during the prototype phase between 2002 and 2005, but not beyond. In this phase, eight prototypes of wind turbines were built in the Pardofer Platte. This case, each plant has a capacity of 2 MW. Total project cost

amounted to 390,000 Euro of which about 60,000 Euro was financed by ERDF funds (European Commission, 2009).

In 2011, a second wind initiative started with the construction of the world's two most powerful wind power plants. These plants were built in the community Potzneusiedl. However, these systems remain for the time being exclusively pilot plants. Wind farms were built with 69 wind plants and a capacity of 207 MW in the villages Halbturn, Mönchhof and Nickelsdorf the year before. Also in 2012, the construction of the third largest wind farm in Europe began. In the communities Andau and Halbturn 79 wind turbines are built with a total capacity of 237 MW. These are ultramodern and powerful 3 MW turbines with a hub height of 135 meters and a diameter of 101 meters (Burgenland, 2012). A particular impetus for the rapid development of wind power was the fusion of the state utilities BEWAG and BEGAS (Burgenland, 2013e).

By the end of 2013 the number of wind turbines in Burgenland should be about 400. So it is probably that the potential for wind energy in Burgenland is exhausted. This means that to achieve the medium-term and long-term energy goals as well as greenhouse gas reduction targets other renewable energies must be reinforced (Burgenland, 2012).

Figure 3.15 shows the spatial distribution of wind turbines in Austria with its concentration in the eastern regions including Burgenland. One focus area is located in Nordburgenland in the region of Neusiedler See (MECCA, 2013).

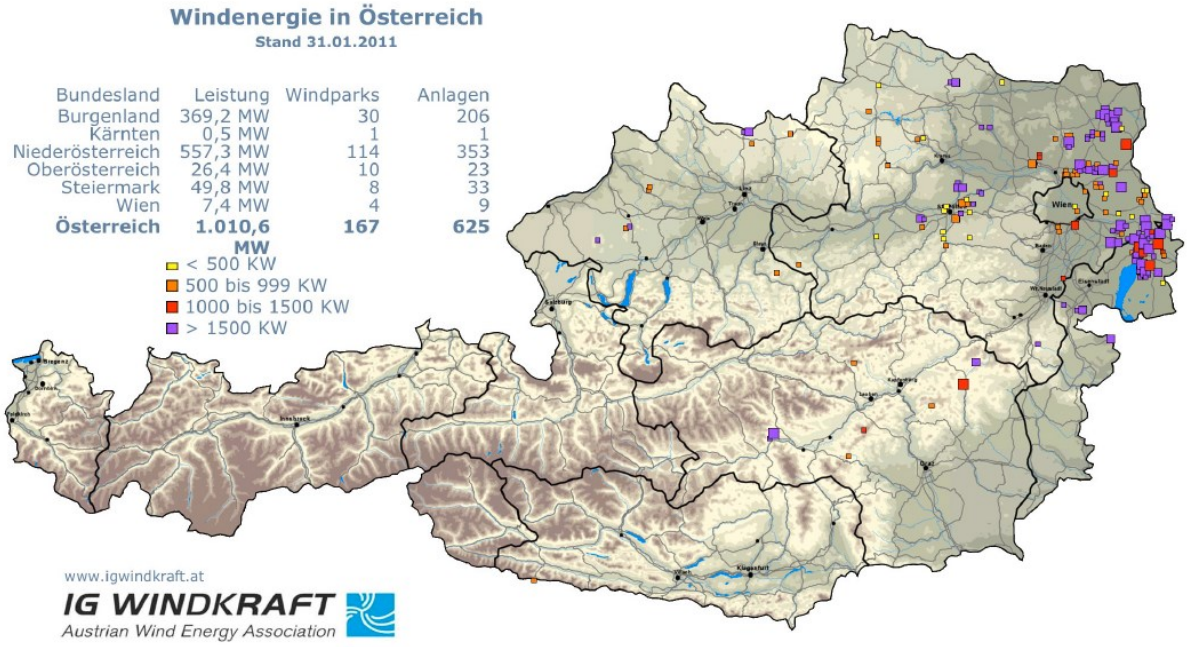


Figure 3.15 Existing wind turbines and their spatial distribution, 2011 (BMVIT, 2011, 8)

Due to the massive expansion of wind energy in the first and second phase of the initiative, Burgenland has very good chance to be power self-sufficient by 2013 and to reach the aim of the state government. Already in January 2013, 81 percent of regional electricity demand could already been covered by green electricity from the region. Thus, Burgenland can become the first current autonomous region in Europe in a purely mathematical sense. Wind energy has a significant meaning for this (Burgenland, 2013e). In Burgenland, the wind energy generated approximately 750 GWh in 2010 (Figure 3.16). This represents a proportion of total energy consumption by about 7.5 percent in 2010 (Statistic of Austria, 2013). Of this 672 GWh were produced in the district of Neusiedl See (Stanzer et. al., 2010).

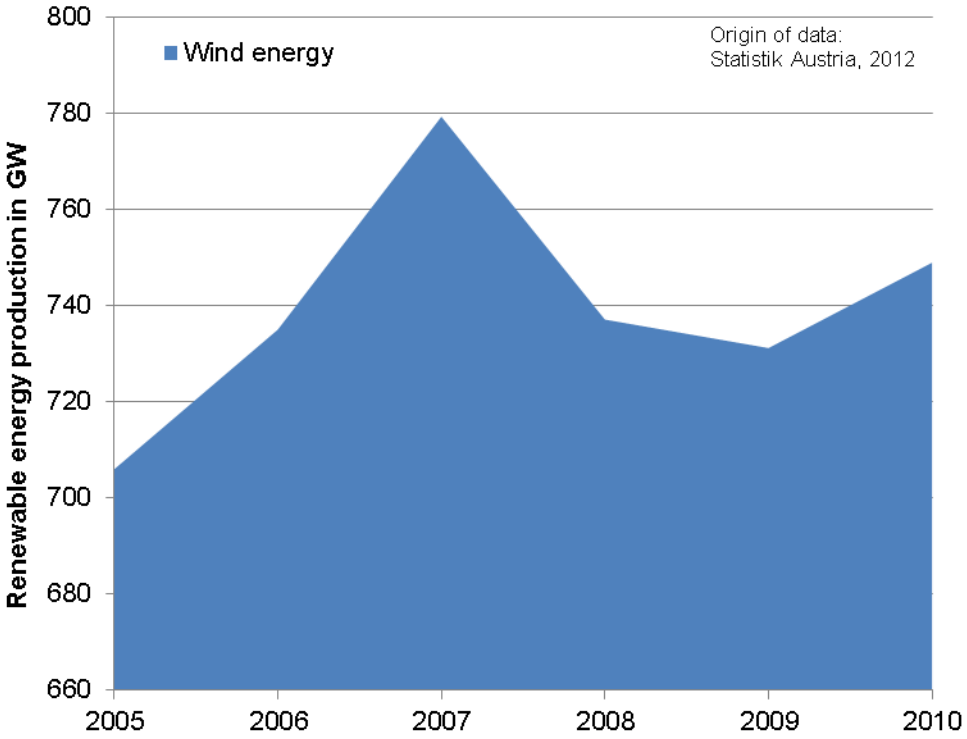


Figure 3.16 Wind energy production in Burgenland, 2005-2010

Total wind energy production in Austria was about 2,063 GWh in 2010. This means that around 35 percent of Austrian wind energy is generated in Burgenland. In 2012, Austria had 696 wind energy plants were in place with an installed capacity of 1,183 MW. Burgenland is behind the state of Niederösterreich the wind energy country number 2 in Austria.

A nationwide study has identified the potential of renewable energies. It shows in particular for wind energy that the potentials are not yet been exhausted neither in Austria nor in Burgenland. The potentials obtained can be used for the designation of new wind energy areas by spatial planning. Likewise the Re-Powering has great significance. Re-Powering meant the replacement of less productive turbines by modern multi-megawatt plants (Stanzer et. al, 2010).

In 2013, electricity of around 800 GWh was produced in Burgenland. With a further ongoing massive expansion and commissioning of additional wind turbines, this should rise to 2,000 GWh/year. For Burgenland a theoretical potential of 2,600 GWh/year was calculated for 2020 which has almost been reached today (MECCA, 2013).

Figure 3.17 shows the large wind energy potential in the eastern regions of Austria. This potential is mainly located in the states of Niederösterreich and Burgenland.

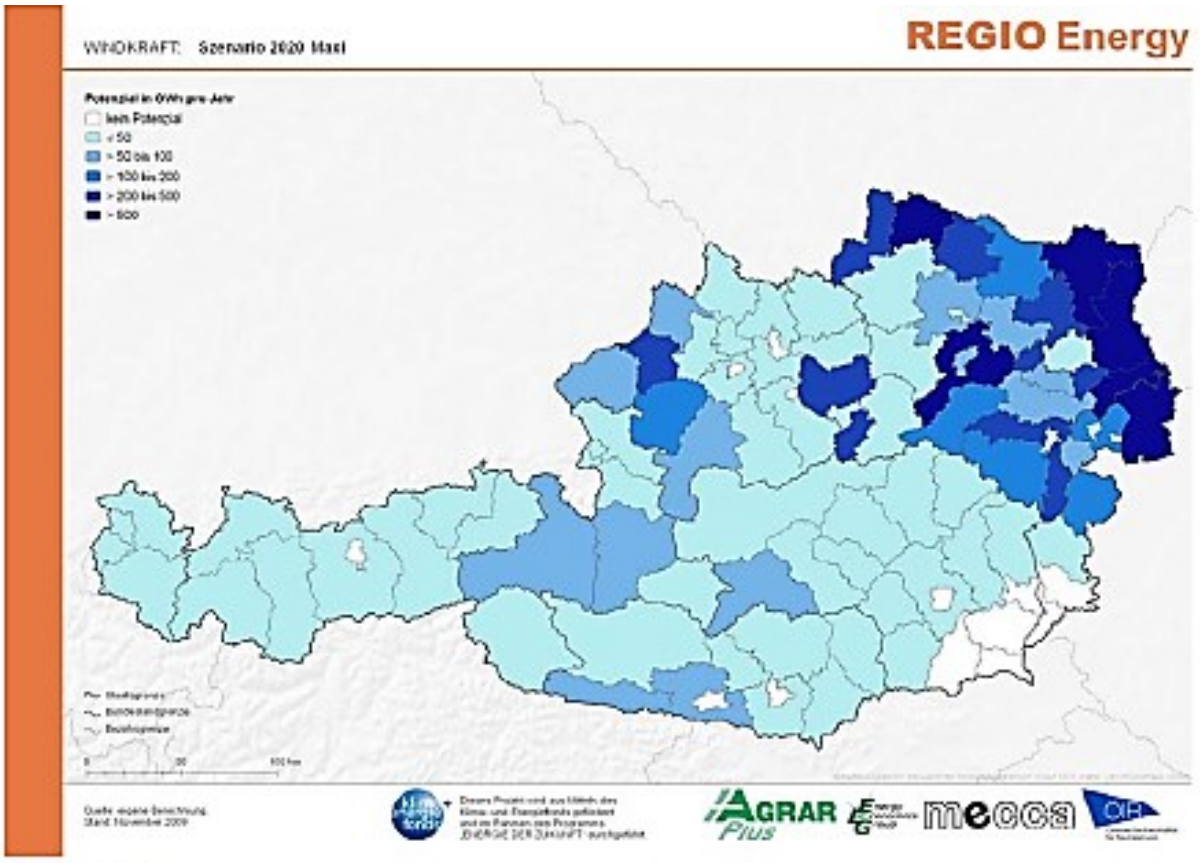


Figure 3.17 Potentials of energy production from wind by district (in GWh per year) (Stanzer et. al., 2010, 142)

Combined effects

With a share of about 40 percent of total energy consumption, Burgenland has developed positively (Figures 3.18 and 3.19). In comparison to Austria Burgenland is in fifth place. It should be noted, however, that Burgenland started with locational disadvantages into this development. Austria achieved a total share of renewables in final energy consumption by 31 percent in 2011. Thus, Burgenland is performing better than Austrian average.

There are good options in Burgenland to achieve the target of being "self-sufficient in electricity" soon. Currently, renewable energy sources have a share in the electricity sector of around 75 percent. Looking at district level, self-sufficiency is best in Nordburgenland (Figure 3.20).

Further Burgenland has the goal to expand the development of renewable energies, in particular wind energy, photovoltaic and district heating. Simultaneously, the expansion of renewable energies increases the regional added value and creates an additional set of "green jobs" (MECCA, 2013).

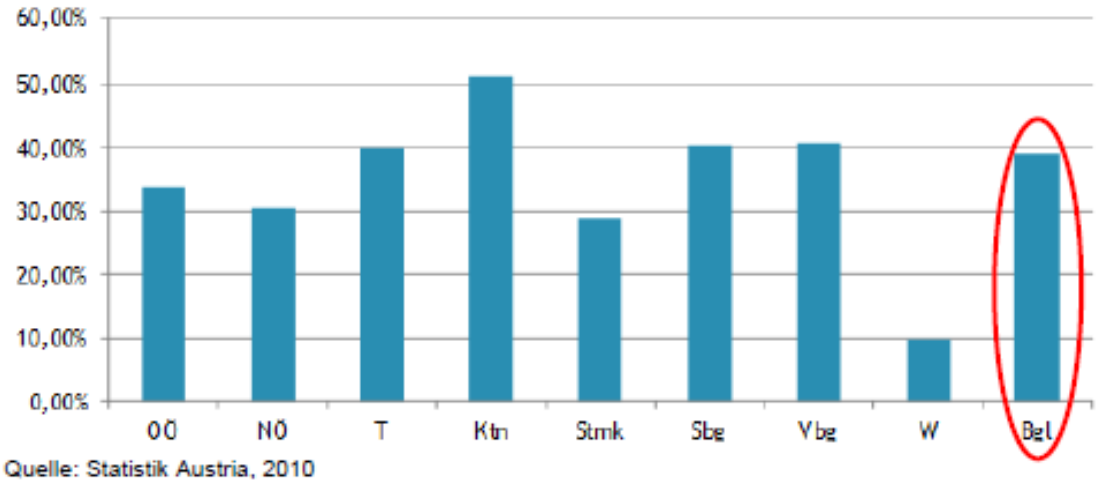


Figure 3.18 Share of renewable energies in final energy consumption, 2010 (MECCA, 2013, 30)

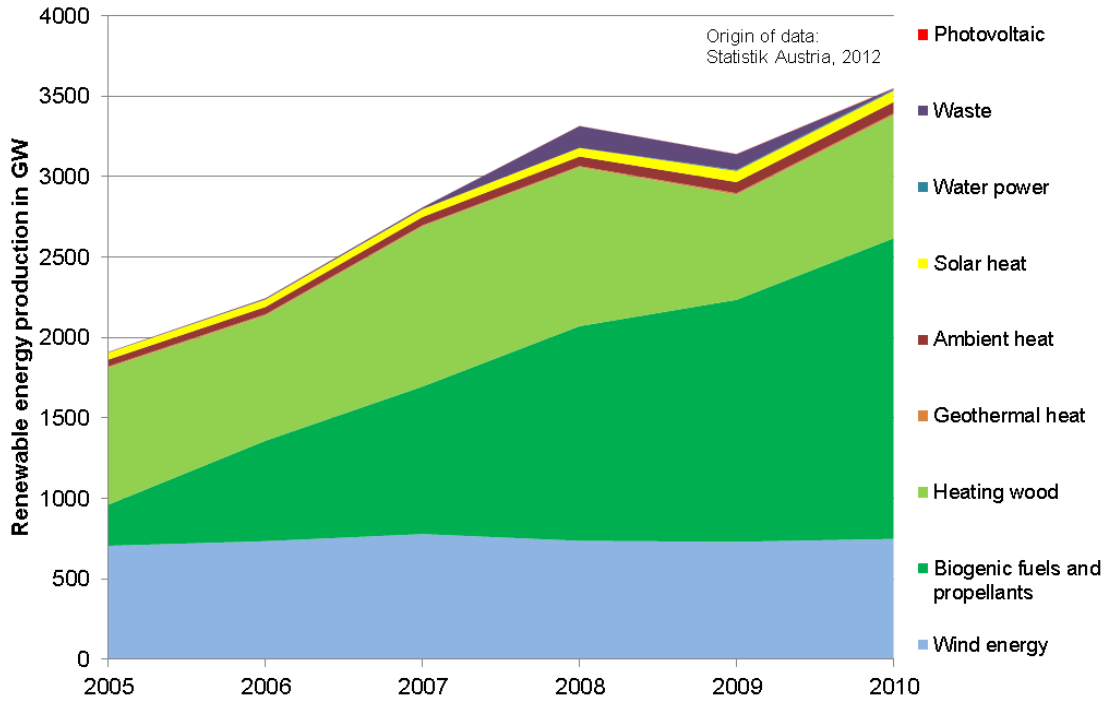
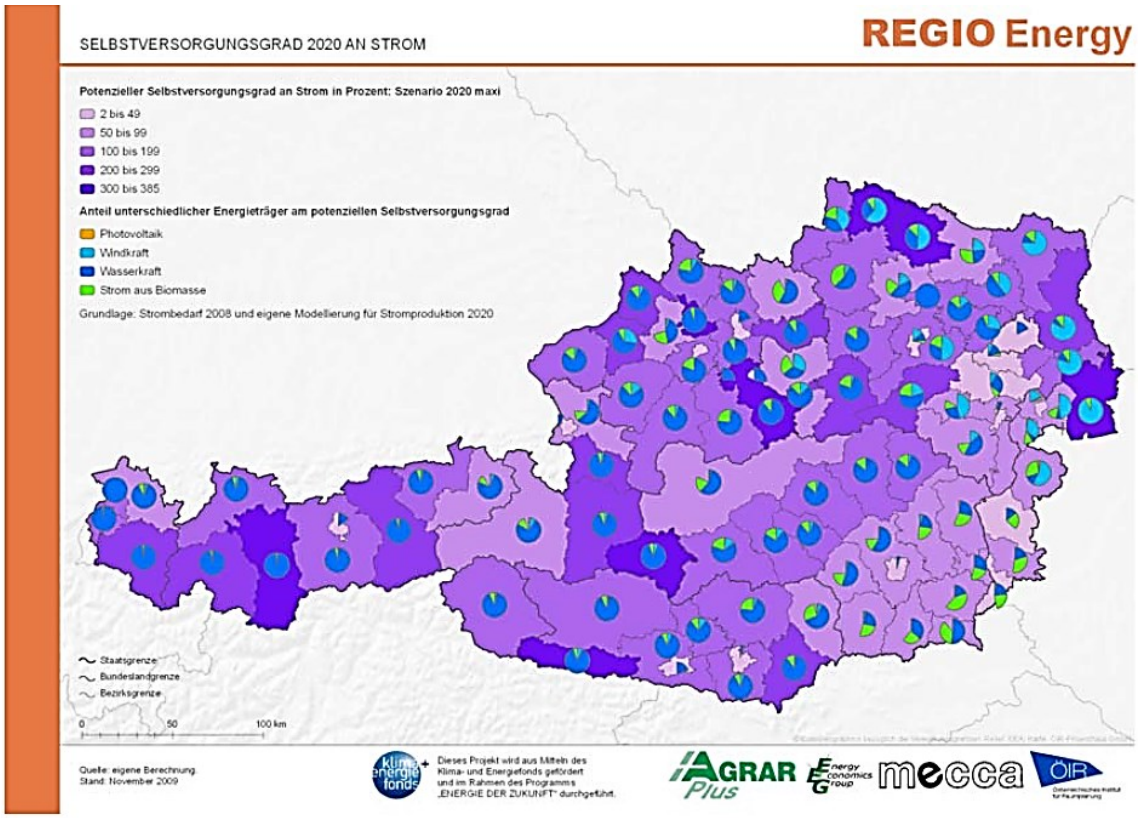


Figure 3.19 Energy production from renewable energies in Burgenland, 2005-2011



Quelle: REGIO Energy

Figure 3.20 Potential for self-sufficiency in electricity (in percent) (Stanzer et. al., 2010, 159)

3.2 Key milestones of the development of the sectors of eco innovation and renewable energies

The development of the sectors of renewable energies and eco-innovation are characterised by a number of milestones. The most important milestones are Austria's accession to the EU and the classification of Burgenland as Objective 1 region of Structural Funds. The development of renewable energies is closely connected to science and research, so in Burgenland, the policy was specifically set up to look for synergies. Great importance for the positive development of Burgenland is with the numerous actors from politics, business, academia, the public.

The city of Güssing is to be considered an enabler of green economic development in Burgenland. Already in 1990, a municipality decision was made to set the course for phasing out fossil energy; this was basically the foundations for a green future. The local government decision is now considered "the most important decision of all times". Through the development of numerous eco-innovations, especially in the field of heat supply, the municipality of Güssing is a kind of model project and has a model character for other regions (Österreichischer Städteverbund, 2009).

In addition to the planned end of nuclear power by 2015, the ambitious energy and climate goals of the federal and state governments are other milestones for the rapid expansion of renewable energy, especially wind energy. This is pursued through many policy instruments at different policy levels. Here, of particular relevance is the Burgenland Energy Strategy 2020. This is inter alia achieving self-sufficiency in electricity power by now.

3.3 Drivers, barriers and enabling conditions

Energy Strategy Austria

Austria is committed to comply with EU energy and climate targets. Accordingly, the share of renewable energies in gross final consumption must be increased to 34 percent (1100 PJ) by 2020 and the greenhouse gas emissions must be reduced by at least 16 percent from 2005 to 2020. For this reason, Austrian government developed between 2009 and 2010 the "Energy Strategy Austria" which has a strategic focus and contains a number of measures to achieve the ambitioned energy and climate goals. The proposed measures were developed in a participatory process.

The energy strategy stands on three pillars: energy efficiency, the development of renewable energy and the long-term security of energy supply. Other key elements of the energy strategy include an ecological tax reform to facilitate the energy and climate protection targets, the anchoring of goals in the spatial planning law of the Länder as well as initiatives for research, technology and innovation in the energy sector and the resulting effects on employment in the environmental field (BMWFJ and Lebensministerium, 2010).

Climate Protection Law

Another important pillar of the national climate protection is the Climate Protection Law. The Climate Protection Law was passed in 2011 and aims to facilitate the implementation of effective climate protection measures. The Climate Protection Law sets emission limit values for the six sectors of waste management, energy and industry, fluorinated gases, building, agriculture, and transport. In order to achieve the national climate change targets, a program of measures was developed by federal and state governments for the years 2013 and 2014. Further measures for the following years are currently in planning (Lebensministerium, 2013).

Green Electricity Act Austria

Due to the promotion of green electricity as part of the Green Electricity Act of 2002, an investment boom in renewable electricity plants was triggered. However, this boom was short term only. Because with the amendment of the law in 2006, the feed-in tariffs were cut and the funding budget was capped. This resulted in a stop of the expansion of renewable energy plants. An increase in the amount of electricity from renewable sources by the end of 2009 must be justified by the commissioning of the plant, which already been approved in previous years. Only with a further amendment to the law of 2009, based thereon on the feed-in tariff regulation from 2010, the framework conditions for investors were improved again. Thus, an increase in renewable energy systems can be observed especially in recent years. In the current Green Electricity Act short and medium targets for increasing green power are formulated. This Act came into force in 2012 (Umweltbundesamt, 2013).

Master Plan Green Jobs Österreich

In addition to the "Energy Strategy Austria" there is the master plan "green jobs" which is another tool to promote sustainable and green employment. The master plan "green jobs" is understood as a sustainable strategy paper. It has a guidance and coordination function and provides decision aid at national and regional policy level. Through a variety of already implemented measures the number of green jobs could be increased at the federal and state level. Especially in the area of environmental and climate protection about 25,000 jobs were created or saved. In Austria, 185,000 people working in "green jobs" generate a turnover of 29.8 billion Euro.

However, until 2020 about 100,000 more green jobs should be developed. To achieve this goal, numerous measures are required.

- increase the export quota (6,000 jobs)
- increase the demand for ecological tourism (about 135,000 jobs)
- promotion of the use of fossil biomass (about 6,500 jobs)
- investment in thermal retrofitting (about 35,000 jobs)
- expansion and improvement of public transport and regional transport (about 15,000 jobs)
- investments in the energy system (about 20,000 jobs)
- increased demand for environmental services (4,000 jobs)

The development of the measures was done in a participate process of politics, economy, agriculture and forestry, management, etc. (Lebensministerium, 2010).

The policy has already initiated various activities in Bur**genland**. The most important are (MECCA, 2013):

- the Sustainable Energy Scenario Burgenland 2012
- the Burgenland Energy Concept 2003
- the Burgenland Energy Strategy 2020, which is currently in preparation (realistic goal: until 2013 electricity self-sufficiency; 55% of total energy consumption is covered by renewable energy until 2020; 100 percent energy self-sufficiency by 2050)

All these documents have the main political objectives:

- comparisons of energy productivity in the regions
- determine the potential of renewable energy and to show energy saving opportunities in the regions
- development of measures to achieve the objectives

Burgenland Energy Concept 2003

With the Energy Concept Burgenland 2003, a contribution to the national and international climate change should be made. The Energy Concept's approach is to reduce energy consumption and increase energy efficiency to reduce CO_2 emissions and other pollutants. Based on scenarios, the energy consumption trend been forecast in Burgenland and also groups of measures have been developed for the reduction of energy consumption.

For this reduction, targets are formulated. Thus, households and the economy have to reduce energy consumption by 20 percent over the next 20 years. Furthermore, expertise will be further developed in the field of energy technology. With the aim to secure existing jobs and to create new jobs a contribution to regional value added will be made. Moreover, the share of biomass and wind energy is to be raised by 15 percent. (MECCA, 2013)

Energy Strategy Burgenland 2020

The Energy Strategy Burgenland 2020 has been developed within the EU ESPAN project. The University of Applied Sciences Pinkafeld was commissioned on basis of the Energy Concept 2003, to assess future energy consumption trends on basis of three scenarios (Sustainable energy scenario Burgenland 2012).

In creating the Energy Strategy 2020, the requirements and recommendations of the National Development Programme (LEP) of Burgenland are taken into account. In the LEP, the theme of "Energy and Resources" is established and it pursues the goal of energy self-sufficiency. The three main areas and measures of Energy Strategy 2020 are energy efficiency and savings, energy production and resources and energy management.

The focus on "energy production and resources" can again be divided into the following groups of activities: wind energy, photovoltaic, solar thermic, biomass, bio gas, residual materials, district heating systems, biogas systems and other energy production from renewable resources. For each of these fields, measures and targets will be developed.

In March 2012, first goals and visions were presented to the future energy strategy of Burgenland. Electricity self-sufficiency shall be achieved by the end of 2013. By 2020, 55 percent of the total energy consumption should be covered by renewable energy sources. And by 2050, 100 percent energy self-sufficiency is targeted. These objectives should be developed in an integrated energy concept under greatest possible participation by various actors (MECCA, 2013).

Financing as an internal driver

The regional economy shows substantial differences in regional development in Burgenland, in particular in Mittel- and Südburgenland. So Burgenland obtained as economically disadvantaged region Objective-1-status and became specific funding by the EU.

In the first Objective 1 program from 1995-1999, Burgenland was supported with 174 million Euro by ERDF funds from the European Union. Of these, approximately 3 million Euro have been invested in the development of renewable energies in Burgenland.

The second Objective 1 program in the 2000-2006 funding period has been made much more extensive. The ERDF funds amounts to 271 million Euro, which serves to promote Burgenland as a whole. The focus is on promoting small businesses and disadvantaged regions. As in the first ERDF funding period, the development of renewable energy is also being promoted in the second period, but only to a limited extent. This funding amounts to about 18 million for the period 2000-2006. This represents about 7 percent of the total funding only. During the same period with national funding's (federal and state governments) and by private actors, regional disparities should be reduced. Thus, the promotion of public and private actors was 1.5 billion Euro by 2006 (Burgenland, 2013f).

Another important aim of this funding period is to create and safeguard 4,750 new jobs in five main fields (European Commission, 2003):

• trade and industry;

• research, technology and development;

• tourism and culture;

• agriculture and forestry, fisheries and nature conservation;

• human resources.

During the following funding period 2007 - 2013 the promotion of Burgenland from public funds is approximately 167 million Euro, and the Community assistance through the ERDF is approximately 125 million Euro. The main objectives of the program "Burgenland 2007-2013 ERDF" is divided into three priority axes:

1. Competitiveness and innovation of regional economic structures
2. Infrastructure and sustainable regional development
3. Technical support

Here, the funding is oriented by the priority axes. The competitiveness and innovation of regional economic structures in Burgenland becomes highest support.

Förderprogramm	Anzahl Projekte	Förderbare Kosten	EU	National
Ziel 1995 - 1999 (EFRE)	4	15 735 299	2 865 890	4 412 469
Ziel 2000 - 2006 (EFRE)	15	95 900 644	17 741 507	9 607 864
Additionalität 2000 - 2006 (EFRE)	20	43 214 981	0	11 861 321
Interreg IIA	10	674 439	222 164	241 937
Interreg IIIA	4	922 646	461 323	276 879
LEADER+	10	1 954 736	892 045	250 292
Ziel 1 2000 - 2006 (EAGFL)	190	21 994 684	6 339 824	2 113 274
Gesamt	**253**	**180 397 429**	**28 522 753**	**28 764 038**

Figure 3.21 ERDF funding for renewable energy (in euro) (European Commission, 2009)

The EU funding has also the objective of strengthening the labour market in Burgenland. Thus, the creation of 577 new jobs is foreseen by the program. Of these 50 jobs should be created in the area of research and development.

As a consequence of the funds, further subsequent investments of 432 million euros are expected, which is about four times of the EU funding. Renewable energy production should be developed with a capacity of 8.5 megawatts. This would correspond to a reduction in greenhouse gas emissions by 95,000 tons per year (European Commission, 2013).

LEADER

Following the successful program periods LEADER I (1991-1993), LEADER II (1994-1999), LEADER + (2000-2006), a new LEADER funding period run from 2007 to 2013. The focus of the funding is to strengthen rural development. Disparities shall be reduced by implementing innovative strategies in the LEADER areas Mittelburgenland and Südburgenland. The aim is to integrate a variety of sustainable individual projects in a multi-sectoral approach in an overall concept to strengthen the rural regions. Here, the combination of the LEADER projects in the fields of tourism, nature, renewable energy, economy, regional development and transport is an important driver for the region. Among the funded projects, the European Centre for Renewable Energy in Güssing, the association "Eco-Energy Region", the training centre in the field of renewable energies, especially biomass and solar, as well as the establishment of a Green Energy tourism are included. For the realisation of these projects and to strengthen rural areas five percent of the total resources (21.8 million euros) of the funding program 2007-2013 are devoted. Compared to the period of LEADER+, this means a tripling of public funds (Burgenland, 2013g; Burgenland, 2013h.

INTERREG II, IIIA and IIIC

Burgenland is also funded by the EU program INTERREG. The aim of the INTERREG program is, to develop disadvantaged border regions in economic, social and cultural issues and to offer assistance for problems such as infrastructure or depopulation. In the context of cross-border cooperation synergies and potentials should be bundled. Important fields of activity are the development of regional labour markets, economic cooperation and a natural and spatially compatible regional development on both sides of the border area (Burgenland, 2013i; RMB, 2013). This includes, among other things, the implementation of renewable energy projects. As part of INTERREG II and III, these were funded with approximately 700,000 euros (see Figure 3.21).

4. The road ahead: transferability and conclusions

The greatest milestone for the positive development of Burgenland was certainly Austria's EU accession and the classification of Burgenland as a relatively small Objective 1-region. For the EU funds the foundation for green economic development of the region are considered a "window of opportunity". Because of its border location with Hungary, Slovenia and Slovakia Burgenland has a specific geographical location (European Commission, 2009).

Burgenland can take a pioneering role for countries or regions with a low green performance and similar problems like lacks of jobs, demographic problems, socio-economic inequalities or economic deficits. The Güssing model can be transferred to other regions. It shows that especially other Objective 1 regions and rural areas can be based on the development of Burgenland.

In general, it should be noted that EU funds are essential for green economic development of the region. The concentration of past funding periods was on tourism and renewable energy. Although the proportion in the area of renewable energy to the total investment of ERDF funding is relatively low, the strategic use the EU funding plays an essential meaning.

Also, the two very different areas of the past funding periods could be linked intelligently by the targeted use of funds. Thus, for example, the EEE has initiated green recreation and adventure tourism. Here tours are offered to renewable energy systems for example.

For the targeted use of EU funds, the interaction of the Austrian spatial planning at the country level with the federal strategies of regional policy in the Austrian Federal Office has a crucial importance. Because only with a powerful political commitment (from the State Governor to the Mayor) a successful implementation of an overall strategy is possible. The development strategy is pursued to optimise synergies by linking local and regional stakeholders from science, business and politics. The networking of know-how is a key aspect for the successful implementation of EU programs. At the same time this overall strategy was carried by the strong environmental awareness of the population. Similarly, the regional and sectoral concentration of EU funds was a key factor for the green economic development.

For example, the establishment of the first University of Applied Sciences of Burgenland in Pinkafeld and Eisenstadt was supported by ERDF funds. Thus, the development of renewable energy is linked to technical progress and also the research activities contribute to the development of renewable energies. In the context of cooperation between the public and private actors, the development of prototypes for research purposes in the field of combined heat and power plants or wind energy is going forward. So, the demonstration plants have been developed into marketable energy production plants and could be exported to other region (European Commission, 2009).

In addition, a consistent political framework is surely important for a green economic development in Burgenland. This is specified by the state government of Burgenland by several policy documents. The most important are the sustainable energy scenario Burgenland 2012, the Energy Concept Burgenland 2003 and the Burgenland Energy Strategy 2020. Especially the Burgenland Energy Strategy 2020 gives the participating actors goals in a fixed time horizon. Thus, the goal of the end of 2013 to cover their electricity demand is likely to be reached. In addition, renewable energy sources should cover in the medium-term 55 percent of total energy consumption until 2020. The long-term goal by 2050 is therefore a 100% energy supply from renewable sources (MECCA, 2013).

After Burgenland started to use biomass for district heating production, thereby opened up new perspectives. It was necessary to bundle the know-how. For this purpose and for the exchange of national and international knowledge, the EEE was established in Güssing. The development of new technologies of biomass has been the core element of the EEE. EEE is also the co-founder of the association "ökoEnergieland". The pilot project also combines the knowledge of the actors

from the region and implement efficiency measures and the development renewable energy. Members of the association are 18 municipalities of the districts Güssing and Oberwart (ökoEnergieland, 2013).

The European regional funding was used in the field of renewable energy very effectively. Despite the relatively small ERDF funding for the energy sector in Burgenland some impulses for regional development in the region could be set.

Based on visits to projects and interviews with responsible actors in the fields of politics, economy and science, the elements of success of regional development in Burgenland were evaluated. Among the interviewees included the former mayor of the town of Güssing Peter Vadasz, representatives of the Austrian Wind Power GmbH, the University of Applied Sciences Pinkafeld, the European Centre for Renewable Energy and the ERDF managing authority in Eisenstadt (European Commission, 2009).

- The early and targeted investment of ERDF funds in the process of developing innovative renewable energy effect large leverage impacts (impulse). These include projects such as the prototypes of wind energy, biomass power plant and modern systems of combined heat and power in Güssing and the production of solar cells.
- The creation of academic and craft training opportunities at University of Applied Sciences of Solarteur Pinkafeld and ensure the human capital for future developments.
- The holistic regional policy approach uses synergies
- The cooperation of various stakeholders (protection of species, trade and energy producers) allows good and conflict-free mobilisation of resources by increased acceptance
- For obtaining decentralised energy resources existing municipal supply systems were used. This concerns especially biomass and solar energy
- The continuous development of demonstration projects and the practical applications of industrial partners and the science creates incentive structures for other stakeholders. Especially in the area of biomass and solar energy. The rural embossed and peripherally located Burgenland serves as a laboratory for economic centres.
- Spatial planning must provide a framework for the development of renewable energies. This is especially true for the development of wind energy and the repowering.
- Because the cultivation of biomass is in use conflicts to agriculture, energy production from biomass must be produced where it allow the acreage. Because for regional identity as well as for the regional added value agricultural products are particularly important in rural areas.

Theoretically, the concept of Burgenland with a strategically targeted use of European Structural Funds is certainly applicable in the field of renewable energy to other regions. In particular, the Burgenland concept can have a model role for other Objective 1 regions. For example, these can include neighbouring regions to the east and south, which are also supported by EU funds. However, it should be remembered that the time for investment in renewable energy in Burgenland was very favourable. At the beginning of the 1990s, wind energy, biomass and solar energy were still in its infancy. Burgenland recognised this and used this opportunity and developed a concept with application-oriented research and development for renewable energy in a time in which agriculture declined and biomass could substitute this at a large scale.

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