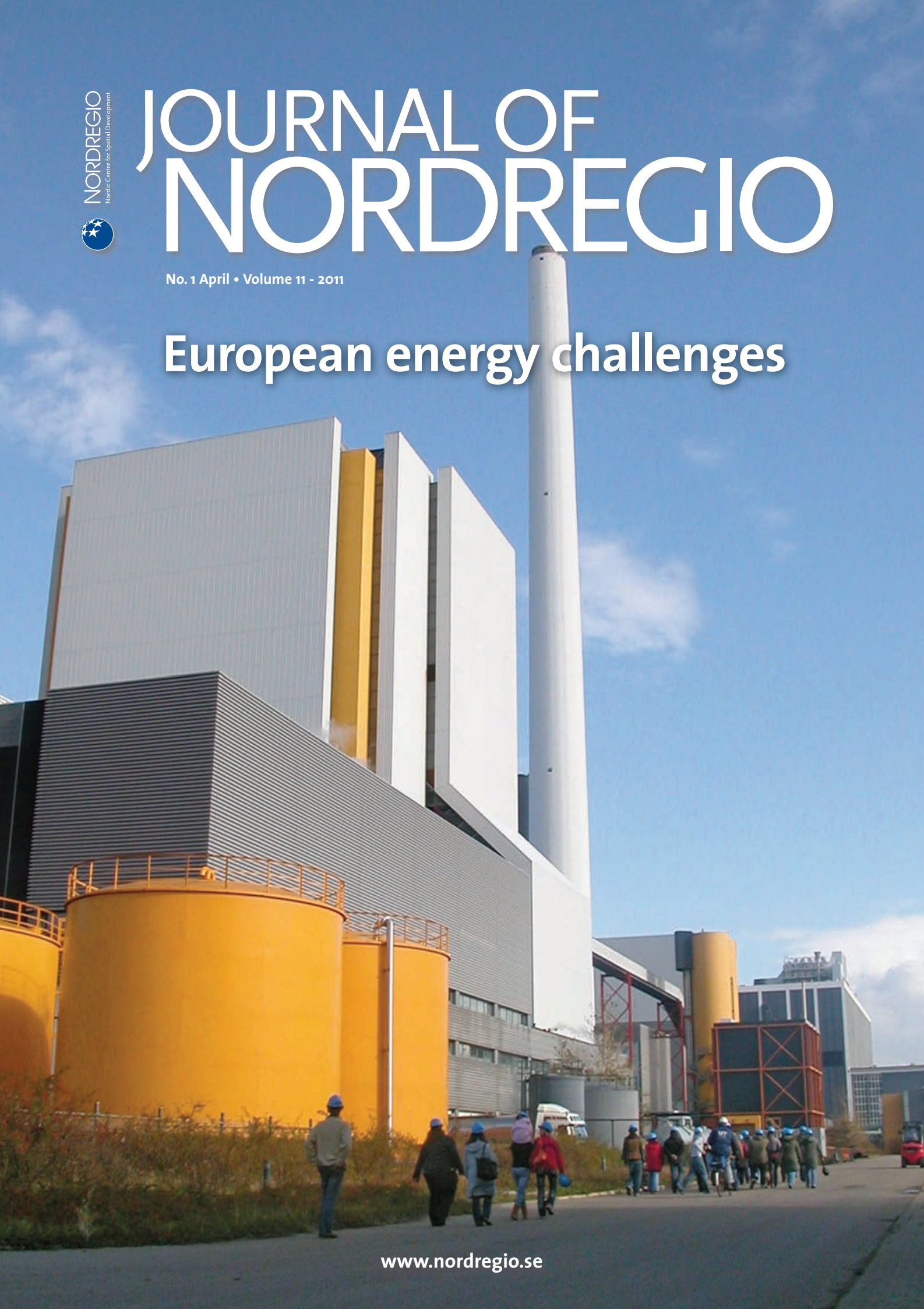
NORDREGIO
Nordic Centre for Spatial Development

JOURNAL OF NORDREGIO

No. 1 April • Volume 11 - 2011

European energy challenges



www.nordregio.se

Contents

Journal of Nordregio is owned and distributed by the Nordic Centre for Spatial Development (NORDREGIO). The journal appears quarterly and is distributed free of charge. All articles express the views of their authors. Subscription: www.nordregio.se

 ISSN 1650–5891

JOURNAL OF NORDREGIO

OLE DAMSGAARD Director
ODD IGLEBAEK Editor
CHRIS SMITH Language Editor

Graphic production: Svein Gangsø, Gevir kommunikasjon, Norway
Phone: +47 38 12 39 00 | Order number: 28202

Front page photo: Rasmus Ole Rasmussen
Coal fired Asnæs Power Station near Kalundborg, Denmark's largest power station, able to supply 1 057 MW of electricity and 502 MJ/s of heat.

NORDREGIO
Street adress:
Holmamiralens väg 10
Stockholm, Sweden
Tel.+46 8 463 54 00
Fax +46 8 463 54 01
www.nordregio.se

ODD IGLEBAEK
Nordregio
Box 1658
SE-111 86 Stockholm, Sweden
Tel.+46 8 463 54 05
Fax +46 8 463 54 01
E-mail odd.iglebaek@nordregio.se

NORDREGIO Nordic Centre for Spatial Development
norden Nordic Council of Ministers

Nordregio is a centre for research, education and documentation on spatial development, established by the Nordic Council of Ministers.

New Nordregio publications

Nordic Cross-border Cooperation Committees and Cross-border Authority Integration
Nordregio Electronic Working Paper 2010: 3 ISSN 1403-2511 © Nordregio 2010 Text: Lisbeth Greve Harbo

Part one of the paper gives an overview of the geographic context, organisational structures and project activities of the eleven Nordic Cross-border Cooperation Committees, as well as a comparison of the similarities and differences between the cross-border committees. Part two elucidates some key elements concerning the work of the cross-border committees: border obstacles, the integration of public authorities, as well as the importance of the Nordic Council of Ministers and the Interreg programmes. The appendix contains fact sheets from each of the eleven cross-border cooperation committees presenting their organisation and work in more detail.

The paper is published in Swedish, English, and Finnish.

EGTC - European Groupings for Territorial Cooperation

Nordregio Electronic Working Paper 2011:1 ISSN 1403-2511 © Nordregio 2011 Lisa Hörnström

The European Grouping for Territorial Cooperation (EGTC) is a new EU legal instrument established in 2006 to enhance and facilitate cross-border cooperation throughout the EU. Partners in an EGTC can be local or regional authorities or organisations as well as national authorities. The EGTC instrument differs from previous regulations of cross-border cooperation as it makes it possible to create a legal entity across national borders that can own property and have employees. The Nordic working group on globalisation and cross-border cooperation has published a paper which provides some background to the instrument and describes existing EGTCs. Most importantly, the paper discusses the possibilities of establishing EGTCs for cross-border co-operation in the Nordic Countries.

The paper is published only in Swedish.

Regional Development in the Nordic Countries

Nordregio Report 2010:2, ISSN 1403-2503, ISBN 978-91-89332-76-8, © Nordregio 2010, Editor: Maria Lindqvist

After a period of strong economic growth all five Nordic countries were hit by the global recession in the autumn of 2008. This, of course, has constituted an important challenge to all countries, but to Iceland in particular.

The report presents the recent development of human resources, economic growth and labour markets at national and regional level in the Nordic countries and provides a state-of-the art introduction to the current situation. Even if the Nordic countries are perceived as relatively homogenous, important differences continue to exist between regions. This has contributed to an increased focus in regional policy on growth strategies based on regional challenges and potentials. The report also includes more in depth analysis related to the core areas of research at Nordregio, for example on variations in migration patterns and the development of Nordic energy policy.

Step forward...Nordic Solidarity

On the 5th of April the foreign ministers of the five Nordic countries met in Helsinki to sign the 'Nordic declaration of solidarity'. The Ministers emphasised the strong community of values that exist between Denmark, Finland, Iceland, Norway and Sweden and that efforts to promote democracy, international law (including human rights), gender equality and sustainable development are integral parts of the foreign policies of the Nordic countries.

On the basis of common interest and geographical proximity it is natural for the Nordic countries to cooperate in meeting challenges arising in the area of foreign and security policy in a spirit of solidarity. In this context potential risks such as natural and man-made disasters, cyber and terrorist attacks etc., were discussed. Should a Nordic country be affected, the others will, upon request from that country, assist with relevant means.

This intensified Nordic cooperation will however remain fully in line with each country's current security and defence policy and is designed to complement not replace existing European and Euro-Atlantic cooperation.

Thus far there has however been little real public debate on the declaration although the process began as far back as June 2008 when Thorvald Stoltenberg the ex-Foreign Minister of Norway was asked by the Nordic foreign ministers to draw up proposals for closer foreign and security policy cooperation between the Nordic countries.

At the current time of writing it was rather the participation of Denmark, Norway and Sweden in the 'coalition forces' enforcing UN resolution 1973 in Libya, and of course the continuing discussions over the Nordic 'engagement' in Afghanistan that dominated the security debate, particularly in these three countries.

After the signing the Norwegian Minister of Foreign Affairs Mr. Jonas Gahr Støre underlined that: "This political declaration must now be translated into concrete measures, for example by building up a Nordic resource network against cyber attacks."

It is unlikely that anyone will object to this but, given current commitments, there are perhaps other more pressing issues on the Nordic defence and security agenda with a direct impact on Nordic cooperation.

Finland, for instance, is alone in having a long external EU border with a large and powerful non-EU neighbour. For this reason it seeks to maintain a military establishment that is rather traditional in character and thus increasingly different from the other three Nordic countries with military establishments. The 'threat perceptions' that worry Finland then are, in reality, rather more 'traditional' in nature than those highlighted in the solidarity declaration. Will this pose a problem for Nordic assistance in the broader security area?

Furthermore, Iceland is an island in the middle of a vast ocean, with a small population and no military forces of its own. The Americans have gone but they promise to return if required. What impact does this have on the mutually binding Nordic solidarity initiative?

It is also worth mentioning here the various aircraft renewal projects currently ongoing, primarily the Norwegian and Danish plans to replace their now ageing F-16 fleets. Denmark would like to replace its American F-16s with the new F-35, however this will not be available until 2018. In the interim Denmark is paying a lot to simply keep its planes in the air, and realistically it cannot wait until 2018 before replacing them – even if the defence budget allowed. A Swedish offer is still on the table for the much cheaper JAS- 39 'Gripen' as is a separate offer for the Eurofighter, but it seems likely that Denmark will stick with the Americans as indeed will the Norwegians. Again, one has to ask, what price Nordic defence cooperation?

In short, many unsolved traditional defence and security issues remain on the Nordic agenda. The Nordic solidarity initiative, dealing primarily with the impact of non-traditional security threats, is thus an interesting development but in a difficult period for the public finances it remains unclear how both traditional and non-traditional threats can be adequately addressed or indeed whether there is a new hierarchy developing between them.

Lacking European energy-solidarity

In this issue of the *Journal of Nordregio* we also draw attention to Europe's energy challenges and the possible scenarios that flow from them. The analysis here was undertaken on a regional basis and includes reference to a number of social constraints. The challenges can be summarised as follows:

Urgent measures are needed to help the most vulnerable regional economies, mainly located in the Eastern part of Europe, to cope with rising energy prices. Remote regions will have to prepare for higher prices for long-distance travel and air transport. This could easily have a negative impact on overall price levels and tourism, which is often important for local employment. Further, the European coordination of policy instruments on the local, regional, national and EU level to enhance access to energy efficiency measures should be improved.

From both a European and a global point of view, the main challenge seems to be to mobilise the considerable potential to generate renewable energy in regions that lack the financial resources to do this themselves. What then is the best way ahead here?

Odd Iglebaek,
Editor

odd.iglebaek@nordregio.se

EU energy challenges

How great is the EU region's vulnerability to rising energy prices and what is needed in terms of policy recommendations to cope with this challenge? Finding answers to these questions formed the core tasks of the ESPON ReRisk (Regions at Risk of Energy Poverty) project. This article focuses on the relationship between energy and regional development, the role of governance in energy development and the threats, opportunities and likely impacts of different policies. Measures designed to cope with rising energy prices and climate change mitigation are also discussed.

The availability of renewable as well as non-renewable energy resources is uneven. Therefore, regions lacking energy resources are generally exposed to shifts in energy supply. Energy-rich regions on the other hand are exporters, depending on demand but perhaps more on the availability of technological and institutional solutions for its exploitation, transformation and transmission.

The consumption of energy is first and foremost related to the type and scale of industries as well as the characteristics of settlement structures in the regions concerned. Heavy industries are usually located in rural or peripheral areas with easy access to primary energy resources. Households and services on the contrary are often concentrated in large urban areas usually well away from the main sources of energy. This implies that most of the energy consumed needs to be transmitted over long distances.

A wider distribution of living and working areas, as well as larger commuting distances, increases the need for energy transportation. Both sparsely populated regions and urban areas with high degrees of sprawl tend to show high energy spending *per capita*. In addition, high temperature fluctuations between seasons also play an important role in energy demand.

Knowledge transfer

Technology acts both as an asset and as a driver in energy and regional development. In Navarra (Spain) the import and deployment of wind energy turbines from Denmark during the 1990s led not only to the generation of wind energy, but equally importantly to the creation of a strong local wind turbine manufacturing industry which today is a global leader in this field.

Thus, new technologies make the utilisation of energy resources possible but also have the potential to bring in new knowledge, to stimulate business and to help generate new opportunities.

Reducing costs

The efficient transfer and adoption of technology is possible only if the right circumstances for innovation capacity and good governance are put in place. The four case studies in the ReRisk project show that the adaptive capacity of regions is chiefly dependant on innovation. As in any other sector, the development of new technologies for energy is the result of the accumulation of knowledge and experiences as well as the creativity of institutions and the population in general.

Communication has also proven vital in the sense that it facilitates knowledge exchange. In the case of Kalundborg for instance the communication of joint business interests and high innovation capacity materialised in an industrial symbiosis (IS) complex reducing production costs for the companies involved along with reductions in energy and water consumption as well as waste generation.

Consumer awareness on costs and the possible environmental impacts of energy spending is decisive in terms of the ways in which energy resources are consumed. One such example is Freiburg in Germany where environmental awareness has promoted 'green energy' rather than coal or nuclear power, something which has now materialised in an internationally recognised model on green housing.

National and regional policies

How resources are made available for consumers and who benefits from their exploitation and commercialisation is basically determined by the prevailing governance structures and policies. For instance, in highly centralised national governments the majority of the gains from natural resource exploitation are usually allocated to capital regions while decentralised regimes tend to see benefits go to the regions from which the resources were obtained.

Results from the ReRisk project show that while energy policy in Europe is generally concentrated at the national level, important differences exist between the national and regional levels regarding the character of emphasis on energy policy.

A general overview of the 41 regional agencies included in the ReRisk survey reveals that national authorities tend to have a stronger strategic focus on the issue of supply security. Regional and local levels tend, on the other hand, to emphasise energy efficiency and environmental protection, especially in connection with the exploitation of renewable energy resources. The survey also confirms that regional specificities better explain how regions respond to local energy challenges.

Fostering cross-sector awareness on energy consumption is an area in which national governments are strong, while local and regional governments often have a stronger position on governing domestic energy activities concerning households and the built environment.

The local emphasis on energy efficiency is regarded as dependant on the behaviour of consumers and solutions provided by the built environment. While knowledge on the

cultural context of regions is essential for promoting the need for energy consumption reductions by individuals, the built environment is often given by the spatial context of the region, for instance building techniques, materials available and climate.

EU agreements needed

The path followed by the Europe Union has been to decrease dependency on fossil fuels by increasing the share and volume of 'renewables' while also increasing energy efficiency within the context of achieving economic growth. Several questions however emerge from this energy paradigm each of which are addressed in turn in the context of the ReRisk scenarios. These questions include, among others; how new energy systems could be governed, what threats and opportunities may emerge for regional economies and how quality of life may be affected.

It is clear that the creation of a common European energy policy framework is indispensable for regional and energy development. National and transnational actors must agree upon and forward measures that foster the desirable development of mitigating climate change while securing the energy supply. The scenarios also suggest that regional and local approaches that recognise regional specificities are necessary. High energy prices will undeniably impact regional competitiveness and cohesion in the future though the degree and the character of the impacts will vary depending on the region's individual characteristics.

'Renewables' suggest local approach

The integration of renewable energy in the European energy mix may suggest the need for a more localised approach in the energy sector. Renewable energy is characterised by being diffused across the regions, compared to fossil energy sources where resources are usually highly concentrated, and the level of investment for their exploitation stretches from small solar and wind energy devices for houses to large offshore wind parks and thermo-solar parks.

This more decentralised character of renewables certainly demands that new institutional settings be put in place which can be better adapted to local needs. Both 'top-down' and 'bottom-up' approaches are therefore necessary for ensuring a sustainable energy sector while also ensuring that the regions involved find opportunities for development and benefit from the generation of renewable energy.

Urban must modernise

The goal of energy efficiency is as important for regional development and cohesion as the diversification of the energy supply. Industries should modernise their production processes putting in place efficient machinery and technology in order to be competitive in both local and international markets. Nevertheless, the further development of the knowledge and service sector implies that urban regions in Europe will continue to grow and with them the demand for energy will grow also. Therefore urban infrastructures need to be modernised both by means of the retrofitting of buildings and the deployment of efficient and comfortable public transport solutions.

A shift in consumer habits towards the rational use of resources is also necessary. This implies, among other things, increases in the recycling of waste as well as reductions in packaging and the disposal of commercialised products. Information campaigns will play an important role here in providing quality of life, by promoting simple behaviour changes in consumers and increasing awareness of affordable energy efficient technologies in illumination, appliances and other home devices.

Urban growth may also suggest that the transmission of energy over large distances will become ever more important, not only due to demographic and economic concentration, but also because major potentials in respect of renewable energy are often located in remote areas.

Transport needs a new global consensus

Challenges in all scenarios are most evident in the transport sector. Today's transport systems, not only in Europe but worldwide, are deeply rooted in fossil fuel use. Therefore, change requires a shift towards new systems which demand global political consensus, enormous investments and new technologies. As an example of this, the availability of suitable energy for vehicles is still far from being solved due to the complexity and resource demand in solutions such as batteries and fuel cells.

Measures such as bringing production closer to markets and the optimisation in logistics could be regarded as part of the future solution for the transport sector but nevertheless a spatial shift in these economies is still likely to be required. Increasing transport cost could, for instance, lead tourism to move closer to urban areas, resulting in negative economic impacts in remote tourist regions such as the islands in the Mediterranean Sea.

By Patrick Galera Lindblom,
Research Fellow
patrick.galera@nordregio.se

People in the EU's poorest region in Severozapaden in Bulgaria (photo) earn less than 12% of those in inner London Photo: www.undp-drp.org

Regional energy vulnerability

By analysing exposure to energy poverty on the regional rather than the national level a much clearer image of social disparities in Europe emerges. People living in the poorest region in Bulgaria (Severozapaden) earn less than 12% of the average income of those in inner London - measured in purchasing power standards (pps), which take into account different price levels - but Bulgarians pay on average 17.07 pps for 100 kWh of electricity, while the British pay less, in fact 15.37 pps. Industry, transport and households account for 84% of energy consumption in the European Union.

In the ReRisk project the regions' vulnerability to rising energy prices is tracked across three dimensions:

- Economic vulnerability, mainly due to regional specialisation in industries with high energy spending.

- The regions' dependence on (motorised) transport, both in terms of employment and transport uses.

- Social vulnerability, which refers to the segments of the population that may have problems paying their energy bills.

Differences in regional vulnerability are derived mainly from climate conditions, the economic and transport structure and the social situation in regions and cities.

On the demand side, responses to increasing energy prices in the short term have proven to be very limited. Price increases in the past have generally been too minor and too slow to have provoked changes in consumption patterns.

However, adjustments to demand in the medium and longer term can be accelerated with the right policy measures and with investments in energy efficiency, thus mitigating the expected negative impact of rising energy prices on the main economic variables and the most vulnerable population.

So, what do we know about the possible impacts of rising energy prices in the regions? The impacts in economic terms can be estimated by identifying the industries with the highest energy spending and by determining which regions are specialised in these economic activities.

Specialisation means that a considerable proportion of employment and/or wealth creation in the region depends on these industries. Our analysis shows that the negative effects on regional economies are not limited to industries which are known to be energy-intensive, such as paper or aluminium, but also affect other sectors, for example the food processing industry.

Inefficient industrial processes

Important differences exist between the EU countries with regard to industrial energy spending. Most of the Eastern European countries spend rather more on energy purchases (in terms of cost per unit of energy) across a number of industrial sectors, while in Western Europe, Luxemburg has particularly high energy costs.

These differences cannot be explained entirely by the levels of energy prices or general price indexes, so it must be assumed that energy is not efficiently used in some industrial processes.

The available data on industrial energy consumption seems to confirm this hypothesis. We find that, after Bulgaria, Romania is the country that employs the largest amount of energy per million € of industrial gross value added (16.06 TJ), followed by Latvia (12.46 TJ), Luxembourg (10.10 TJ), Estonia (9.17 TJ) and Cyprus (5.80 TJ).

The question is then whether these findings on national industrial energy consumption can be extended to the regional level. The analysis of industrial energy consumption in regions in France, Germany, Italy and the UK confirms that there is a positive correlation between the regional specialisation in industries with high energy costs and their actual energy consumption.

Highest economic vulnerability

The regions with the most unfavourable position in terms of economic vulnerability (>10% of employment in industries with high energy spending) are located in the Czech Republic and in Italy. In the latter case, the highly vulnerable regions combined represent more than 50% of industrial employment. However, Italian industries do not perform badly in the EU comparison with regard to energy spending, despite the relatively high energy prices in the country.

In the second group of regions, in which 7-10% of employment depends on industries with high energy purchases, we find some belonging to countries that fare worse in the EU comparison of industrial energy purchases: Romania (Centru), and Hungary (Észak-Magyarország and Dél-Alföld), as well as Estonia and Latvia.

Unfavourable industrial structures

By combining the results on industrial energy spending and regional wealth creation and employment, it is possible to identify those industrial processes which should be subject to an in-depth analysis on the regional level because they are inefficient at using energy. Some suggestions can be given for the regions with the most unfavourable industrial structure in Italy, the Czech Republic and Hungary.

Italy

In the Italian regions of Emilia-Romagna, Lombardia, and Veneto, special attention should be paid to the manufacture of cement, since energy purchases in this sector represent more than 30% of total purchases and energy spending is almost 10% higher than the EU average.

A second critical sector is the manufacture of glass fibres, in which more than 18% of purchases are dedicated to energy, and energy spending is 8.6% above the average level of spending in the EU.

The sector encompassing the manufacture of other non-metallic mineral products, to which both cement production and the manufacture of glass fibres belong, employs more than 30 000 people in Lombardia and Veneto and more than 46 000 in Emilia-Romagna. Although cement production is regionally oriented and is therefore less exposed to international competition, improving efficiency would help to reduce the elevated level of industrial energy consumption in these regions.

Czech Republic

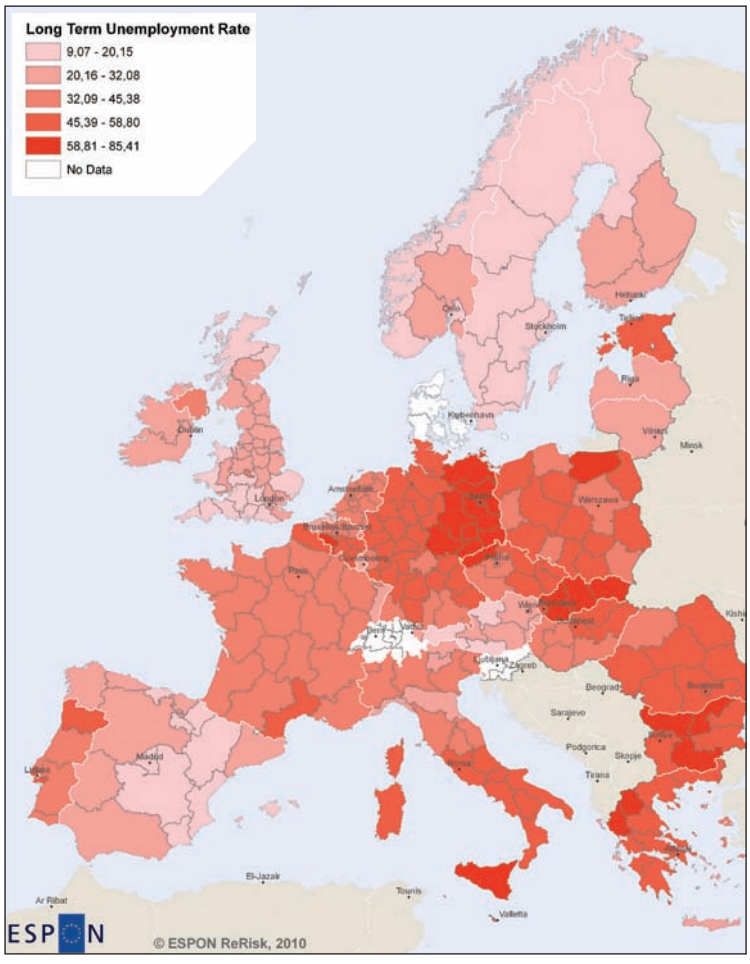
In the Czech region of Severovýchod production processes in the sector of other non-metallic mineral products should be analysed, since energy spending in this sector is 10% above the EU average on the national level and local companies in this branch employ 21 564 persons.

Moravskoslezsko also has a very high level of employment (28 388 persons) in the basic metals industry. Special attention should also be paid here to processes related to forging, pressing, stamping and roll forming of metal; powder metallurgy, for which energy spending is about 5% higher than the EU average and represents 7.65% of total purchases. Additionally, Moravskoslezsko ranks first with regard to wealth creation in sectors with high energy-spending, with more than 25% of regional GVA (Gross Value Added) coming from these industries.

All of the above-mentioned regions in the Czech Republic (Moravskoslezsko, Střední Morava, Severovýchod, Severozápad and Jihovýchod) should analyse the performance of one branch subsector of the chemical industry, manufacture of industrial gases, since energy spending is 10% above the EU average and energy represents close to 20% of total purchases. Employment levels in the chemical sector range from 4 225 in Moravskoslezsko to 7 943 in Severozápad.

Hungary

In the case of Hungary, decision-makers from Észak-Magyarország should take a close look at the manufacture of fertilizers and nitrogen compounds, since, on the national



Long Term Unemployment Rate in the EU Regions (NUTS II, 2007)

level, this industry spends 40% more on energy purchases than the EU average for the industry and energy purchases amount to almost 60% of total purchases. Észak-Magyarország ranks second among the Hungarian regions in employment in the chemical sector (6 215 employees), after Közép-Magyarország with 15 073 employees.

Carbon leakage

Differences in energy spending with regard to Europe are also considerable in the manufacture of starches affecting in particular the region of Dél-Alföld, where 25 444 persons work in the food-processing industry.

The data collected here makes it possible to identify potential weaknesses in regional economies derived from higher than average levels of energy spending and thus sheds some light on the hitherto obscure question of industrial energy use in the European regions.

The methodology can also be employed to add information on the risk of "carbon leakage", i.e. the possibility that companies decide to transfer activities to countries outside the EU if production costs rise as a result of carbon taxes [EC 2009b].

Carbon leakage seems to be a major threat to the Belgian provinces of Brabant Wallon and Antwerpen, which should analyse the situation in the sub-sectors dealing with the manufacture of other organic basic chemicals as well as fertilizers and nitrogen compounds, since these spend more than the EU average on energy purchases.

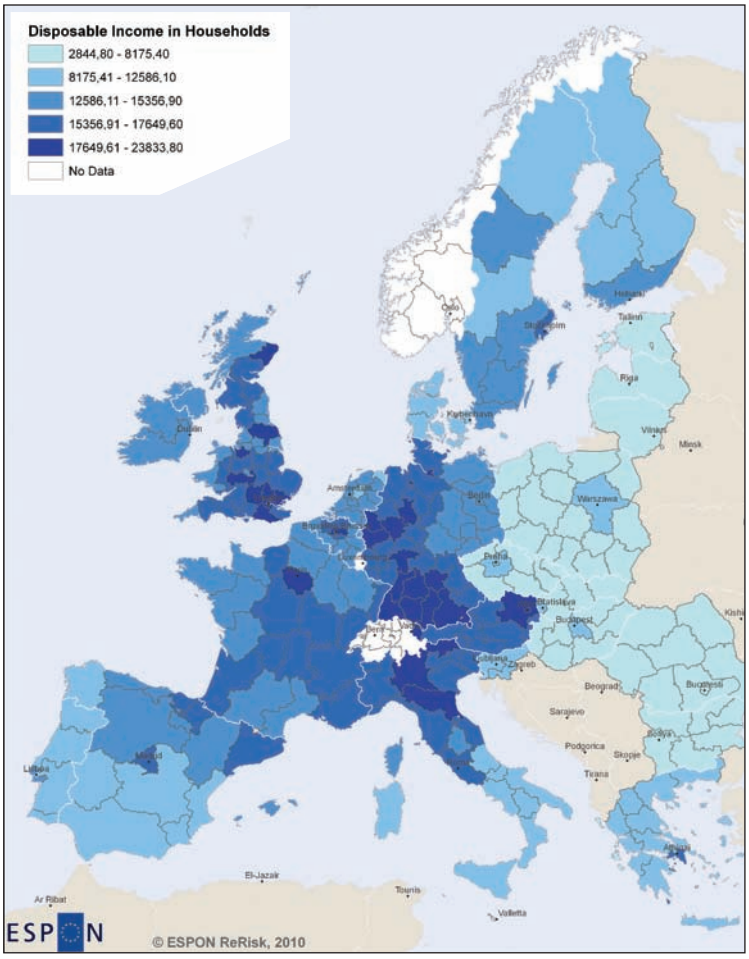
The British regions of East Yorkshire and Northern Lincolnshire may also be exposed to the risk of carbon leakage by companies dedicated to the manufacture of other inorganic basic chemicals, which do not perform well with regard to the sub-sector's average spending on energy.

Within the two countries most affected by the risk of carbon leakage, Poland and Finland, two specific problem regions can be identified: Swietokrzyskie, with 21.24% of industrial employment in sectors facing the risk of carbon leakage and Pohjois-Suomi (where 34% of industrial employment is in the critical sectors).

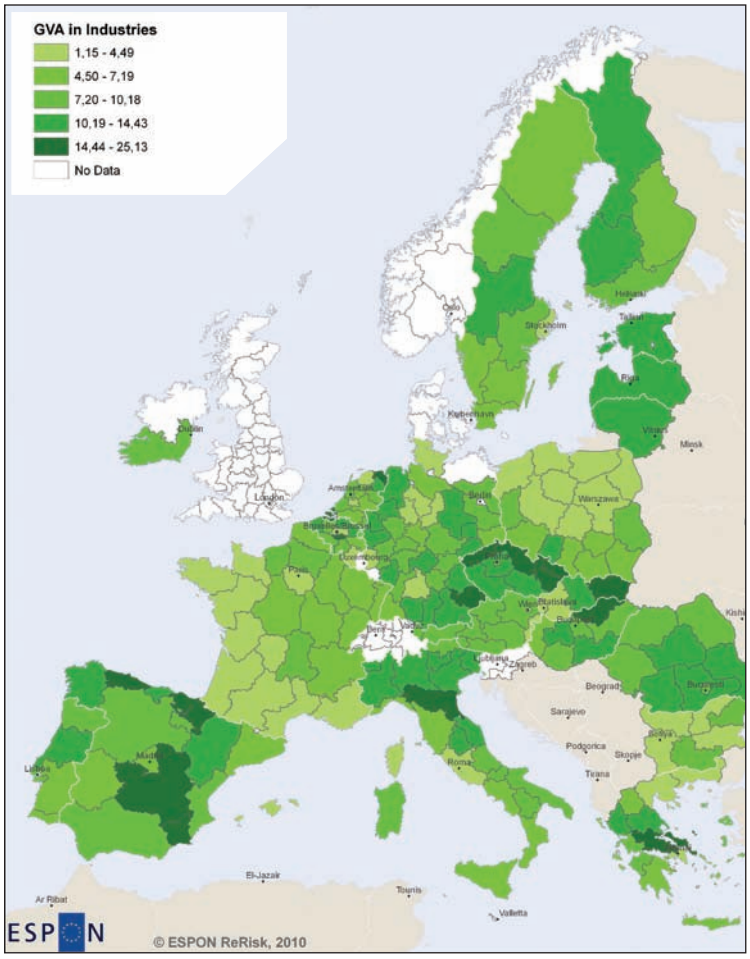
Transport dependence and social vulnerability

To measure transport dependence, several attributes have to be taken into account such as employment in the transport sector, commuting, the cost of freight transport and the need for air travel in remote regions and islands.

Differences among EU regions are considerable in each of the above-mentioned categories. The combination of transport indicators reveals that the most vulnerable regions are the large logistics centres, peripheral and island regions, but some rural regions are also dependent on working opportunities in nearby urban poles or agricultural regions with high export levels.



Disposable income in Households in the EU Region (NUTS II)



Regional gross value added (GVA) in Industies with High Energy Costs, 2005.

The costs of commuting or those associated with other car uses directly affect the budget of households, while increased costs for freight in the region will affect the general price level of goods, with further negative effects on available income.

Additionally, households will have to face higher heating and electricity bills, such that the total energy expense may become a serious burden for families already struggling to make ends meet. This is the third dimension of 'energy poverty' that was analysed in the ReRisk project.

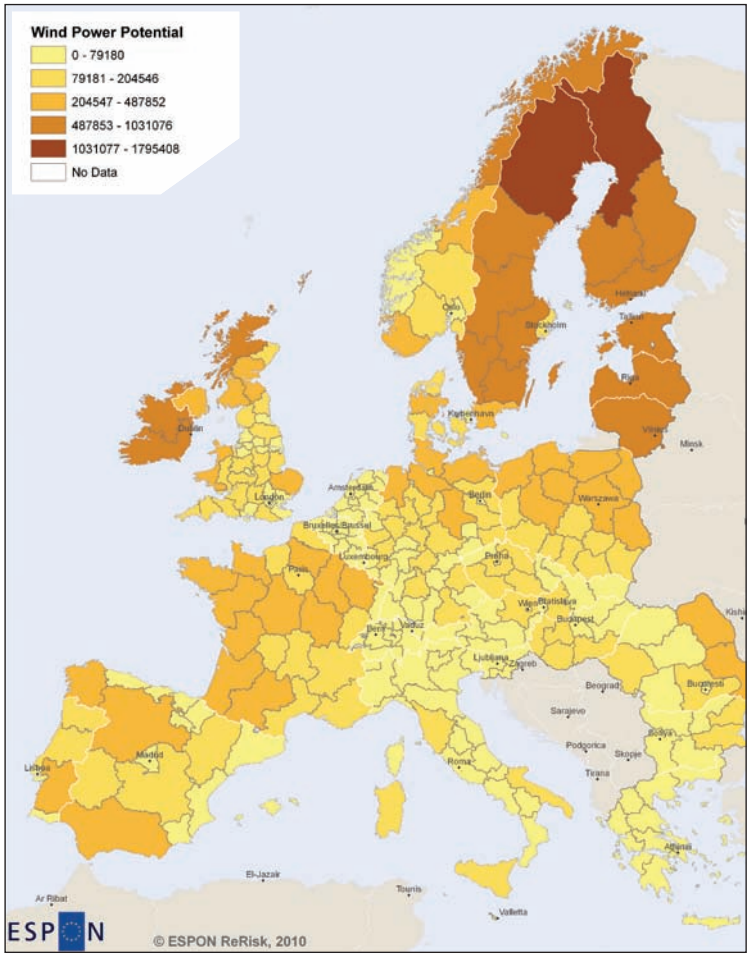
The current economic crisis is already having an effect on the energy sector. The Italian electricity company *Enel* for example, reports that the number of customers who cannot pay their bills rose during 2008, to 600 000 (up 30% since 2007). This is not so much because of rising energy prices, but rather due to declining incomes, though the effects are similar.

Social vulnerability is obviously strongly related to the levels of poverty in the regions. Despite the importance of this problem no indicators are available to measure the risk of poverty in the regions directly. People slide into poverty in different types of circumstances and long-term unemployment and low rates of economic activity are considered to be the main reasons for this. In 2007, 16 regions in Europe, plus the French overseas territories, had a long-term unemployment rate above 60%.

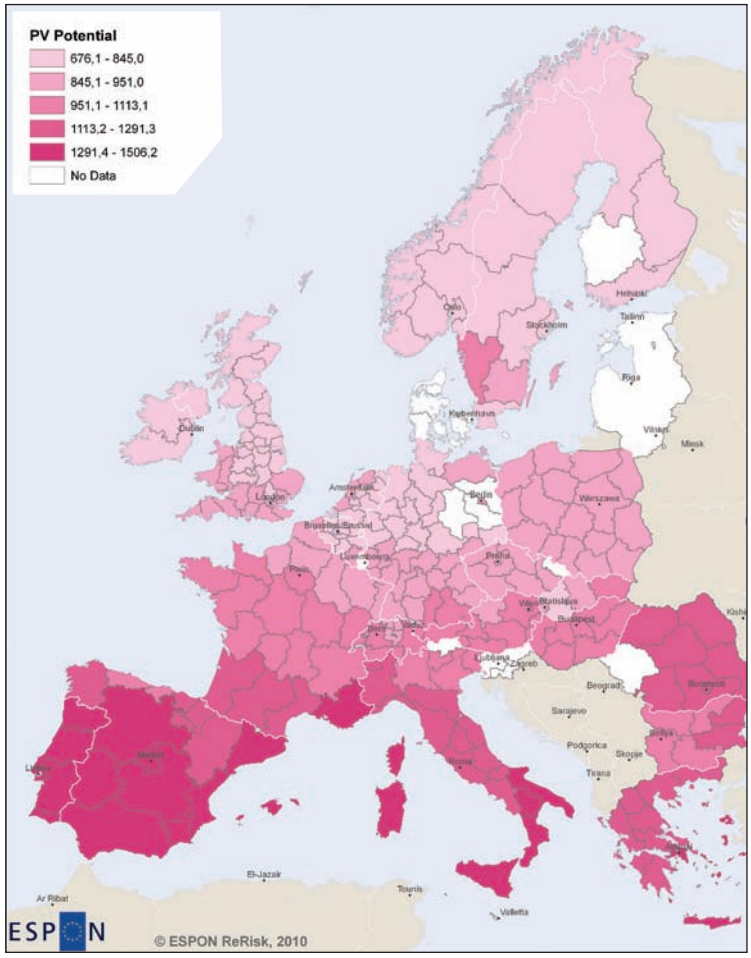
The list comprises a number of regions in Eastern Germany, as well as three regions in Bulgaria and two of the four Slovakian regions: Stredné Slovensko and Západné Slovensko. Activity rates below 50% are frequent in the Southern regions of Italy, and in four regions in Hungary: Észak-Magyarország, Észak-Alföld, Dél-Alföld and Dél-Dunántúl. Severozapaden in Bulgaria also belongs to the group of regions with the lowest levels of economic activity (less than 43%) with another two regions from this country (Severen tsentralen and Yuzhen tsentralen) following closely behind.

Rising energy prices are bound to become a serious social problem in the area, which extends from Eastern Germany to the New Member States, especially those with very low disposable incomes, such as Bulgaria, Romania, Hungary and Poland. Energy costs represent a much greater strain on household budgets in these regions, which in addition have a high demand for heating in the winter time.

By Daniela Velte
Senior Researcher
Tecnalia
daniela.velte@tecnalia.com



Wind Power Potential in the EU Regions (NUTS II)



Photovoltaic (PV) potential for a 1kWp system mounted at optimum angle.

The energy clusters

According to the information provided in the context of the ReRisk project Europe's 237 (NUTS) regions can be categorised as follows:

91 regions "with problems and potential" (1a)
Two groups of regions with low exposure to rising energy prices for industry: the service-oriented urban centres (the heart of the Pentagon) and semi-rural, often tourist-oriented coastal and island regions in the south of Europe. The high photovoltaic (PV) potential of many of the regions in this latter group is an important asset for the future and could help to ease the strain of the need for cooling in the summer time. However, the capital areas must be prepared for possible changes in transport patterns as a result of rising energy prices, both in terms of commuting (incoming labour) and loss of traffic volumes in the transport hubs. In addition, the higher than average unemployment rates witnessed in 2007 are an indicator of the emergence of social problems in both the semi-rural and capital areas.

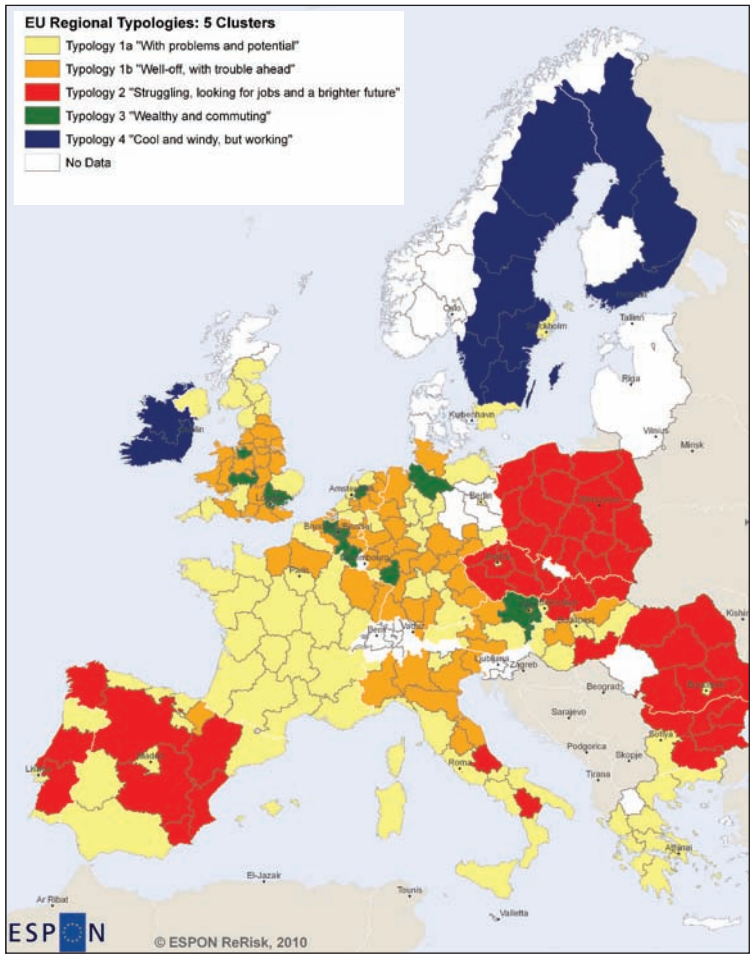
73 regions "well-off but with trouble ahead" (1b)
These are central, industrialised regions, including the more industrial coastal (harbour) and Pentagon areas, with a low potential for the development of wind and solar energy. The competitiveness of these regions could be severely affected by rising energy prices if efforts to improve energy efficiency in industry and transport fail, but their starting position is much more favourable than that of regions grouped in typology 2.

47 regions "looking for jobs and a brighter future" (2)
The most vulnerable regions in terms of social cohesion, located mainly in Eastern Europe, with high energy demand both for heating and cooling. These mostly peripheral regions do have potential to develop renewable energy systems, but lack the resources to do so.

15 regions are "wealthy and commuting" (3)
Mostly regions belonging to the Pentagon "hinterland", in which wealth creation is dependent on accessing near-by centres of economic growth. The main challenge related to rising energy prices in these regions is that of guaranteeing affordable mobility. There is a high potential for polycentric development in these regions, but fewer possibilities for using wind and solar power.

11 regions are "cool and windy, but working" (4)
The greatest concern is the heavy industrial base, combined with extreme peripheral location on the coastline and the high energy demand for heating in these, mostly Nordic, regions. Opportunities for the further development of wind energy are however considerable while the risk of energy poverty in households will remain low as long as the job situation remains as it was in 2007.

By Daniela Velte
Senior Researcher
Tecnalia
daniela.velte@tecnalia.com



Regional typologies of energy poverty

For all maps pp 7-10:

EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Regional level: NUTS II
Source: ESPON ReRisk, 2010
Origin of data: Own elaboration, 2010

Europe's future energy Scenarios

Discussions derived from scenarios on the future of energy development are as varied as the conclusions derived from them. One of the aims of the scenarios in the *ReRisk* project was to illustrate some of the likely impacts of rising energy prices as well as identifying the various policies available to cope with this challenge. What seems to be consistently expressed in most of the available scenarios is the notion that energy is a limited resource. Energy shortage not only will, but is already, having an impact on the global economy and on people's everyday lives. In what follows we set out the four scenarios that the *ReRisk* project, ultimately, produced.

1 Green high-tech

In scenario 1, international agreements on more ambitious Greenhouse Gas (GHG) quotas have been reached and emissions trading schemes are operational worldwide. Demand for renewable energy has increased significantly while the demand for nuclear energy and especially for fossil fuels has been reduced. Europe has also witnessed a new balance between centralised and decentralised solutions, in which large and small-scale renewable energy installations are interconnected by a new network of ocean and land-based power grids.

While the overall level of innovation capacity in Europe has increased over the last 20 years, the European economy continues to be characterised by growth dominated by the knowledge and service industries. New economic activities have appeared in some rural areas, especially in relation to renewable energy production, while urban areas continued to witness population and economic growth. A more polycentric organisation in urban areas has characterised the development of many European cities over the last two decades. The share of public transport in terms of total journeys, especially railways, trams and metros has increased and private car transportation has declined.

2 Energy efficiency

This scenario presupposes a decline in the total level of energy demand. Demand for coal and oil has been almost excluded from the industrial and residential sector while an increase in the demand for natural gas has been accompanied by phasing-out programmes for nuclear reactors. Energy efficiency has become the main mitigation measure against climate change in Europe. Consumption patterns have changed towards the rational use of energy and natural resources based on the increasingly easy availability of clean energy technologies for producers, new policies and information campaigns. Prices for fossil fuels are now very high thus making clean energy technologies much more competitive.

Europe is moving towards a more regionalised and balanced economy. Higher prices for raw materials and transportation have created new markets favouring some primary industries. Economic and social growth is evident in both urban and rural areas. Hybrid and electric private cars are affordable and therefore favoured as the mode of transport especially in rural areas where investment in public transport has not been sufficient.

3 Nuclear energy but only for "big" regions

In this scenario nuclear energy is the main priority for energy development in Europe. Renewable energy deployment has witnessed significant growth, but not to the same degree as nuclear. The energy demand for fossil fuels had decreased as electricity replaced coal and oil in the industrial and residential sectors. Priorities on climate change policies prevail in Europe despite the fact that the most energy-intensive countries have not signed global agreements on GHG emissions.

The dominance of nuclear energy has resulted in a centralised energy sector where only a few large actors have been able to invest. The development of small-scale energy solutions has been largely restricted to remote and isolated areas which are not connected to central grids. The initial substantial increase in energy generation from nuclear reactors in the 2020s resulted in an increase in energy demand and with renewable and energy efficiency technologies becoming less competitive. Europe's innovation capacity has been moderated. The economy is characterised by major economic growth in the manufacturing and primary industries, though these sectors have gone through a process of modernisation. Due to the growth of manufacturing, primary industries and in overall population, energy consumption in Europe has increased. Urban areas continue to witness major social and economic growth dominated by the service sector, while industries will proliferate especially in the urban outskirts and nearby regions. Investments in both public and private transport have been significant as progressive efforts to electrify the transport system have been made but the balance between public transit and private car use from the early 2000s has been maintained.

4 Business as usual

Scenario 4 is characterised by a significant demand for coal and natural gas and a limited increase in renewable energy. Production from nuclear sources has been reduced. The lack of technological advances in terms of renewable energy and energy efficiency, in combination with a lack of appropriate energy policies, has led to increased energy demand. Globally, energy-intensive countries are not part of the agreements on GHG-reductions. Clean energy technologies are expensive and thus only available for large energy producers. Economic growth has been negative due to a slowing of the rate of innovation, higher energy prices, a lack of capital and a lack of the appropriate policy instrument to foster the necessary adaptation capacity to the new market conditions. All sectors of the economy are present, though the most energy-intensive industries have been modernised while others have disappeared. Urban areas are still the only centres of economic and population growth while depopulation has continued to affect rural regions. Poverty and social problems have increased due to rising unemployment and higher prices for basic products. Further, private car transportation has increased due to declining investment in the public transport infrastructure. Old cars predominate on the roads as new energy-efficient ones are too expensive for average consumers.

By Patrick Galera Lindblom, patrick.galera@nordregio.se

Samsø landscape with wind turbines. Photo: Rasmus Ole Rasmussen

Samsø Island 100% wind

Good examples of adaptation towards the rational use of energy and climate change mitigation are evident in some European regions and municipalities. The following case studies shed light on how energy challenges have been addressed in Kalundborg (DK), Samsø (DK), Freiburg (DE), and the Region of Navarra (ES). The case studies not only illustrate how technological and institutional solutions have been implemented, but most importantly in the regional development context, they show how public and private actors in those localities have funded new opportunities for business and economic growth derived from challenges arising from energy shortages and climate change policies.

Samsø is an insular municipality with a population of 4 100 located on the east coast of Jutland. The major economic activities on the island are agriculture and tourism. As with other small island communities Samsø is struggling with issues related to a falling population. Due to the lack of opportunities many young people leave as soon as they finish secondary school.

The development of wind energy materialised after Samsø won a competition for funding, launched by the Danish Ministry of the Environment, in 1996. Over a period of ten years (1998-2008) the winner was tasked to prove that it was possible to convert an entire local community to renewable energy. In addition it should be noted that the new energy policy put in place by the Danish government in 1990 helped the shift towards renewable energy sources.

Wind energy generation in Samsø has materialised in the form of eleven land-based wind turbines and ten offshore wind turbines. At the project's initiation in 1997 only 5% of the island's electricity consumption was generated by local turbines. By 2005 however locally generated wind power covered more than 100% of the island's electricity consumption.

The decentralised planning system in Denmark gives extensive decision making power to the municipalities, and the involvement of the local authorities as well as the community in general was central to the success of the Samsø-project. Initially, the ambition of local authorities to stimulate the economy through wind energy development was met with scepticism from the island's citizens. They generally disagreed with the project due to the adaptations required to the natural and cultural landscape. The public debate was however opened up and the solution adopted was to allow local ownership of the turbines. In fact, eleven land-based turbines came to be owned by farmers and a further two by island cooperatives.

The subsequent construction of ten offshore wind turbines involved major investment by the municipality as well as from the Ministry of the Environment. Five of these are owned by the municipality, three by investors from Samsø, one by a cooperative and one by a financing company. Two organisations were established on the island: the Samsø Energy Academy which oversaw the technical part of the renewable energy deployment, and the Samsø Environment and Energy Office which dealt with the public participation process.

Initially the new job opportunities were available for craftsmen in the building of the turbines. This led to the creation of a specialised workforce, not only in wind energy but also in district heating and solar energy. Moreover, the work on the Samsø Energy Academy has evolved into a centre of knowledge that attracts R&D investments and thousands of visiting renewable energy professionals every year.

Photovoltaic panels producing electricty in Navarra. Photo: Rasmus Ole Rasmussen.

Navarra moves towards self-sufficiency

The Autonomous Region of Navarra is located in northern Spain and has 578 210 inhabitants. Navarra can be characterised as a small, predominantly rural, region with only a few urban agglomerations and good access to natural assets. Economically, Navarra is committed to the growth of its industrial sector. Car manufacturing, machinery and equipment production have historically predominated.

Until 2003, Navarra was dependant on imported energy and the region has no traditional sources of primary energy. However by the end of 2008, 'renewables' provided 65% of the region's electricity consumption with wind power alone accounting for 70% of this.

A well established energy policy fully supported by the region's authority, the region's historical development of the industrial sector dominated by the automobile industry, and the active involvement of the private sector have all contributed to Navarra's renewable energy boom.

Initially, in the late 1980s, attention focused on the possibility of expanding hydroelectric power generation though this, ultimately, proved to be unworkable. In terms of wind power, the first pilot project was launched in the outskirts of Pamplona in 1994. The initiative came from the regional government and the Hydroelectric Energy Corporation of Navarra.

The first turbines in Navarra were provided by the Danish turbine manufacturer *Vestas*. This paved the way for the first factory making wind turbine components to operate in the region under a joint venture between *Gamesa Eólica*, *Vestas* and the Government of Navarra. By 2003, more than 50 companies were active in the renewable energy sector in Navarra.

The *Regional Energy Plan 1995-2000* aimed to make Navarra the first region in Spain to become independent from foreign electricity supply, and to produce 100% of their electricity from renewable energy sources. Alongside direct investments made by the Government of Navarra private companies were granted direct subsidies for renewable energy development.

By 2009, 38 wind farms, with 1100 turbines, had been constructed in the region. A National Renewable Energies Centre (CENER) was established in 2000. The wind energy sector is today an exporting industry covering 16% of the global demand for wind turbines. Further, the development of wind energy has laid the basis for the development of solar power and bio-energy. At present, approximately 6 000 persons work in the renewable energy sector of which 4 200 are connected to the wind energy industry.

Small domestic sun-panels in Navarrra. Photo: Rasmus Ole Rasmussen

Piping at the Industrial Symbiosis plant in Kalundborg. Photo: Rasmus Ole Rasmussen

Industrial symbiosis in Kalundborg

The municipality of Kalundborg in Zealand, Denmark, has a total population of 49 743. The municipality is predominantly rural with a few small urban agglomerations. The major economic activities in Kalundborg are industry, construction, and agriculture.

The Industrial Symbiosis (IS) grouping of businesses in Kalundborg was formed into a cluster of industries focused on increasing groundwater protection. This was supported in the early 1980s by the county of Western Zealand. The defining concept here was that one company's by-product becomes an important resource for one or several of the other cluster-members. The outcome was cost reduction and resource-savings as well as environmental protection.

Kalundborg's IS is a network of seven companies: *Dong Energy* Asnæs Power Station, the plasterboard factory *Gyproc A/S*, the pharmaceutical plant *Novo Nordisk A/S*, the enzyme producer *Novozymes A/S*, the oil refinery *Statoil-Hydro A/S*, the recycling company *RGS 90 A/S*, the waste company *Kara/Noveren I/S* and Kalundborg Municipality.

Current projects deal with water recycling, the transfer of energy and the recycling of waste products between the independent symbiosis partners. They also benefit financially from the co-operation because the entire project is based on commercial principles. At present the network has 6 energy-exchange projects, 12 on water recycling and a further 8 on the recycling of waste products.

Excess heat from the Asnæs Power Station is distributed to the town of Kalundborg through a district heating network. Steam is provided to *Statoil*, *Novo Nordisk* and *Novozymes* for industrial processes. Reductions in the level of water demand have been achieved by treating waste water, including the recovery of sulphur from the combustion process at Asnæs Power station, which again is used for the production of gypsum and plasterboard. Furthermore, by-products from the yeast fermentation process from the production of insulin at *Novo Nordisk* are used in the production of fertilizer.

The planning and establishment of the initial IS was carried out by the directors of three large processing industries in Kalundborg: *Dong Energy*, the pharmaceutical company *Novo*, and the oil refinery, *Statoil*, all familiar with each other and their companies. The level of trust existing between the parties was an important factor here because it facilitated the development of the network, which in turn served as the baseline for the reaching of agreements between partners.

The Kalundborg IS has attracted both international attention and R&D investments as well as becoming a model for other regions. Today, the Kalundborg Symbiosis Institute coordinates the activities of the network.

Distribution at the Industrial Symbiosis. Photo: Rasmus Ole Rasmussen

Sun-panels produce electricity in Freiburg. Photo: Institution of Civil Engineers, www.ice.org.uk

Green housing in Freiburg

The City of Freiburg, with a population of 216 300, is located in the State of Baden-Württemberg. Freiburg has a successful local knowledge economy with a high level of innovation performance.

Initiatives designed to promote renewable energy substitutes for fossil fuel and nuclear power began some 35 years ago. Green housing in Freiburg has been developed, predominantly, in the districts of Rieselfeld and Vauban.

The overall concepts have been effectively realised through the application of Passive House and Plus-Energy House techniques, the installation of residential renewable energy as well as district heating systems. Operative measures include new energy standards and programmes for retro-fitting buildings combined with public awareness campaigns. All this has aimed at reducing energy spending by promoting changes in consumer behaviour.

The International Council for Local Environmental Initiatives' (ICLEI) European Secretariat and the International Solar Cities Initiative are based in Freiburg. Freiburg's extensive education sector also paved the way for the city's strong innovative capacity and has provided the knowledge base for a rapidly growing green sector. This again has helped provide a diverse and flexible economic base for the region.

The local environmental movement in Freiburg is also rooted in the active participation of both private companies and non-governmental organisations. The research institute for solar energy systems in Freiburg has played a key role in promoting innovation. Today, the environmental sector comprises over 1 500 firms which employ more than 10 000 people and generate more than 500 million Euros annually.

In terms of both economics and ecology, Freiburg has been most successful in the fields of renewable energy research and marketing. Solar panels can be found on the roofs of the Badenova Stadium and the City Hall, on schools, churches and private houses, on facades and towers.

Looking further afield, wind turbines rise from the Black Forest. With more than 1 800 hours of sunshine each year and an annual radiation intensity of 1 117 kilowatts (kW) per square-metre, Freiburg is one of the sunniest cities in Germany.

Factors such as the citizens' high level of environmental awareness, political priorities and targeted economic development, have allowed Freiburg to become a solar capital. Here, the opportunities offered by solar energy, in terms of climate protection, the economy and urban development were recognised earlier than anywhere else.

A bird's eye view of the Solar Settlement in Freiburg. Photo: wikipedia

City policies and resource efficiency

Now home to more than half the world's population, cities play a central role in the consumption of resources. As cities continue to grow they increase the pressure on land, energy and resources, which can lead to greater environmental threats. At the same time, their increased importance means that environmentally sustainable solutions for urban areas have significant potential for mitigating resource consumption.

Cities do not however exist in a vacuum, they need to be considered within the unique development context that exists in each region. Bearing this in mind, Work Package One of the EU FP-7 project, Sustainable Urban Metabolism for Europe (SUME), coordinated and led by ÖIR – The Austrian Institute for Regional Studies and Spatial Planning - evaluates the respective potentials that urban regions have to improve resource efficiency between now and 2050; mainly through interventions in terms of land-use, energy consumption from buildings and transport, as well as material and water consumption.

In light of this, one of the key aspects of the project is to determine the impact of sustainable land use and transport planning for the reduction of land consumption in urban areas. Based on these results, impacts on energy consumption for buildings and transport can be forecast. Stockholm, Marseille and Newcastle are three regions that present interesting results and illustrate the variation in challenges and possibilities that exist.

By comparing current spatial patterns with two possible scenarios for the future it is possible to measure how population growth and changes in the urban fabric will affect resource consumption in relation to transport. Perhaps more interestingly, it is also possible to compare how different policies can affect resource efficiency.

The BASE score indicates how the future urban fabric will develop if the region maintains the status quo, in terms of planning policies; while the SUME score illustrates the results if the region adopts more resource-aware policies.

The difference between these two scores shows the region's capacity to influence resource efficiency through the decisions that they make – the smaller the variation, the fewer steps remain to be taken. It follows that each city's efforts to promote resource efficiency, and thus one aspect of sustainability, are best measured in this variation.

The spatial development scenarios generate an overall distribution of residents and jobs for cells (787 in Stockholm) within the Urban Morphological Zone (UMZ) set between now and 2050. Each cell has been assessed on the basis of its impact on transportation, and the associated energy consumption. This qualitative assessment, referred to as the urban diversity pattern (UDP) indicator, is made up of three measures; accessibility to high level public transport, proximity to central functions and the mix of economic and residential functions and density that exists within the cell. The highest rating a cell can reach for each of the measures is 4 points, which allows for a maximum overall score of 12 points per cell.

A comparison of Marseille, Newcastle and Stockholm illustrates how each city is responding to the unique challenges faced. Marseille's high overall score is indicative of its dense urban form. While floor space per person is increasing; limited population growth coupled with the extension of the public transport network is expected to minimise the future impact on resource consumption and thus maintain a relatively high UDP score.

Conversely, Newcastle's relatively fragmented urban form, coupled with a stable population, offers the potential to increase resource efficiency through future policies.

Given the high population growth that is forecast for Stockholm and the accompanying pressure on the current urban fabric; a decline in overall resource efficiency is expected.

A comparison of the three cities provides interesting results in itself; however the most useful findings come from comparing each city's BASE result with its SUME result. Here, Stockholm's difference of 0.26 points indicates that resource-aware planning is already taking place to a fairly high degree. Conversely, Newcastle's difference of 0.43 suggests that considerable room remains for improvement.

Conclusion

Marseille, Newcastle and Stockholm are developing within distinct regional contexts. These unique situations require a range of measures that are suited to the respective situations. However, all three cities have the ability to shape their development to some extent. The way in which they choose to do so will leave an indelible mark on the regional landscape and shape how these cities will function. Population growth and increased resource consumption are certainly related, but this connection is not absolute, the choices planners and politicians make will have an important effect on our cities of the future.

By Mitchell Reardon
Research Assistant
mitchell.reardon at nordregio.se

and Ryan Weber
Research Assistant
ryan.weber at nordregio.se

High density, due in part to natural constraints including the Mediterranean Sea, has contributed to the resource efficiency of Marseille's urban form. In the coming years, the region will have to deal with pressures associated with renewed population growth.

Marseille - sprawl continues

As the oldest and second most populous city in France, Marseille has experienced generations of transformation. Spreading outward from the old port, the city's dense structure gives way to a more spread out, suburban form, the prevalent type of development during the latter half of the 20th century. This was restricted by the region's landscape however; which, with the Mediterranean Sea and the rugged Garlaban and Etoile mountain ranges, continues to be central in shaping regional development.

After a period of decline, Marseille is expected to grow from its present 940 000 residents to 1 135 000 by 2050. Coupled with this, an increase in living space, from the current 36m² to 43m² per person is expected to generate an additional 180 000 people looking for homes by 2050. In total, this means that there will be approximately 375 000 people seeking accommodation, and a related number of jobs, in Marseille between now and 2050. While this growth will undoubtedly place some strain on the region's existing urban form and resource consumption, the impact can be managed to some extent through the planning policies that are adopted throughout the region.

The expansion of the public transit system and the inner city renewal project, *Euro Méditerranée*, slated to house more than 38 000 people and provide 35 000 jobs, indicate that more resource-aware planning is taking place. Sprawl continues however. Despite efforts to renew Marseille's dense structure, adherence to the current planning paradigm will still require a 40km² expansion of the existing urban fabric, with 135 000 residents in these newly developed areas by 2050. A more ambitious, resource-aware, plan could eliminate the need for expansion however. In this case, denser development within areas just beyond the urban core and along public transport corridors could ensure that all of the region's growth takes place within the existing built environment. While there are many factors at play, paramount to Marseille's development are the questions of how willing the *Marseillais* are to maintain, and beyond the city centre, increase, density levels or further embrace market trends towards significantly more living space.

Table B1 Marseille UMZ – Basic Inputs

	2001	2050 BASE and SUME
Population	944 785	1 137 000
Jobs	358 557	431 505
Population change (in %)		+ 20.3%
Jobs change (in %)		+ 20.3%
Population change (absolute)		+ 192 215
'Dwelling seekers' (leaving existing housing stock)		183 708
Total population to be allocated		**375 932**
floor space per capita (m²)	**36**	**43**
Increase of floor space per capita (in %)		+ 19.4%

Northward view of Newcastle's city centre across the River Tyne. While the immediate city centre acts as a robust hub of social and economic activity, the surrounding inner city is plagued by insufficient building quality and failing housing markets.

Newcastle is hollowed out

Bound to the east by the North Sea, the area around the Tyne and Wear Rivers urbanised during the 19th century. Driven primarily by industrial development, the result was a relatively dense urban core of heavy industry along the rivers, surrounded by residential areas. Over the past 50 years, the forces of globalisation have reshaped Newcastle's economy; away from heavy industry and mining and towards the service and knowledge economy.

Economic change has contributed to a large supply of underused economic and residential buildings in the city core and sprawled development toward the margins of the city. As a result, the inner city of Newcastle – while containing a vibrant commercial zone - is characterised as being hollowed out and faces significant socio-economic problems such as high unemployment, poverty, deprivation and the complete market collapse of some neighbourhoods. This has prompted people and businesses to shift their investment toward the suburbs in search of better conditions, which has a direct impact on car dependency. Despite having a local Metro, commuting ridership was most recently measured at 21% in 2001.

The population of Newcastle fell by 5% between 1981 and 2008; however it has begun to rebound and is expected to return to its 1981 level by 2030. A population increase from the current 1 060 000 to 1 180 000, coupled with a *per capita* increase of living space per person, from 40m² to 45m² means that there will be approximately 260 000 dwelling seekers between now and 2050. Efforts to respond to this growth by re-focussing development inward toward the city centre exist, yet inner-city projects are confronted by competition from suburban communities offering large detached and semi-detached homes.

While the policy discourse in Newcastle indicates the existence of a more resource-aware planning mentality, the reality is that planning ideals and market forces continue to dovetail. Currently, there are no specific plans to extend Metro coverage in Newcastle due to the lack of available public capital, and the demand for detached housing with private gardens is exacerbating urban sprawl. As a result, the continuation of the status quo will require an additional 15km² of urban expansion to distribute the 65 000 residents who will not fit into the existing UMZ. Considering the large plots of land available for redevelopment and the relatively slow growth rate in Newcastle, this is a significant expansion.

However, this pattern can be reversed if planners and policy makers are able to facilitate a transition toward more resource-aware approaches based on public transit provision and higher density living. The SUME perspective not only indicates that growth can be accommodated within the current UMZ, but space for an additional 45 000 residents would be provided through the redevelopment of existing underused neighbourhoods.

Newcastle UMZ- Basic inputs

	2001	2050 BASE and SUME
Population	1 058 070	1 182 922
Jobs	468 247	530 656
Population change (in %)		+ 11.8 %
Jobs change (in %)		+ 11.8%
Population change (absolute)		+ 124 852
'Dwelling seekers' (leaving existing housing stock)		132 259
Total population to be allocated		**257 111**
floor space per capita (m²)	**40**	**45**
Increase of floor space per capita (in %)		+ 12.5%

Stockholm City Hall in front of the city centre. Stockholm's inner city is characterised by a demand for property that far exceeds supply. This has led to further densification approaching the limit of what is viewed as appropriate in the city.

Stockholm stays tailor-made

Consisting of thirteen islands, a series of associated waterways and a number of vast green spaces, Stockholm's unique geography underlines the importance of solutions that are tailored to the local context. Development has expanded from Gamla Stan (Old Town) and has followed a star-shaped pattern, whereby five fingers have spread across the landscape, divided by green wedges and bodies of water. These open spaces ensure rapid access to nature for city dwellers.

They figure prominently in Stockholm's identity, and are fiercely defended against encroachment. These spaces are seen as an important reason for the high quality of Stockholm's urban area, but also limit potential inner city development and lead to greater distances being travelled between various areas; which raises the costs associated with transport infrastructure and increases travel times.

The challenge of accommodating new residents has grown in recent years, particularly in the inner city, where after a number of decades of out-migration, the housing market has exploded. This trend is expected to continue until at least 2050, by which time the region is forecast to grow by 565 000 residents, or more than 40%.

Further, an additional 160 000 people will need to find housing as a result of an increase in living spaces from 40m² to 45m². This means that Stockholm will have to accommodate an additional 725 000 people, something that will place significant strain on the region's resource efficiency. The challenge is compounded by the limited space that is available for densification in the inner city of a decidedly monocentric urban form.

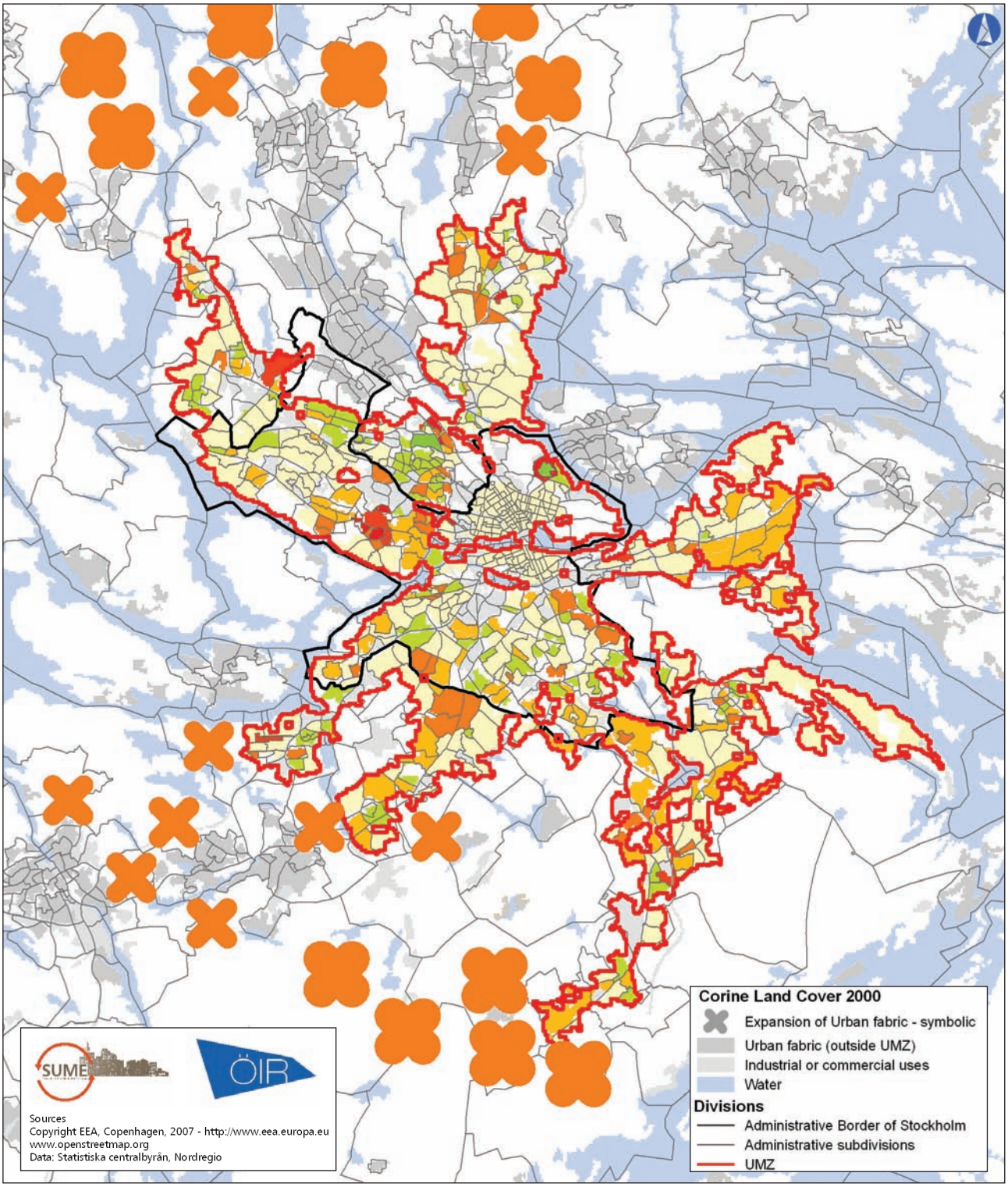
In accommodating this growth, Stockholm has several assets however. The region's public transit network is quite well developed, is well used and is closely linked to the region's continued spatial development. Planning authorities are aware of the challenges at hand and have responded with active strategies. In the inner city, this has led to infill projects on brownfield sites, including the Hammarby Sjöstad and Norra Djurgårdsstaden mixed use projects which will provide 11 000 and 10 000 apartments respectively, along with a great deal of office and commercial space.

At the regional scale, a strategy to promote a more polycentric development pattern that corresponds to the transit network and encourages a more balanced structure has been implemented to reduce dependence on the inner city in terms of employment, leisure and transport. These initiatives indicate that planning authorities in Stockholm have recognised the need to foster more resource-efficient strategies to limit the adverse effects that can accompany growth.

The sheer scale of the population growth that is forecast for Stockholm is however likely to cause some decline in the region's overall resource efficiency. While considerable efforts have been made to promote environmental sustainability in the region, the continuation of current planning strategies in the face of significant growth is forecast to entail a 155km² expansion of the urban fabric between now and 2050.

Stockholm - Basic inputs

	2001	2050 BASE and SUME
Population Jobs	1 280 450 763 629	1 848 000 1 102 102
Population change (in %) *Jobs change (in %)*		+ 44.3% + 44.3%
Population change (absolute) 'Dwelling seekers' (leaving existing housing stock) **Total population to be allocated**		+ 567 550 160 056 **727 606**
floor space per capita (m²) *Increase of floor space per capita (in %)*	**40**	**45** + 12.5%

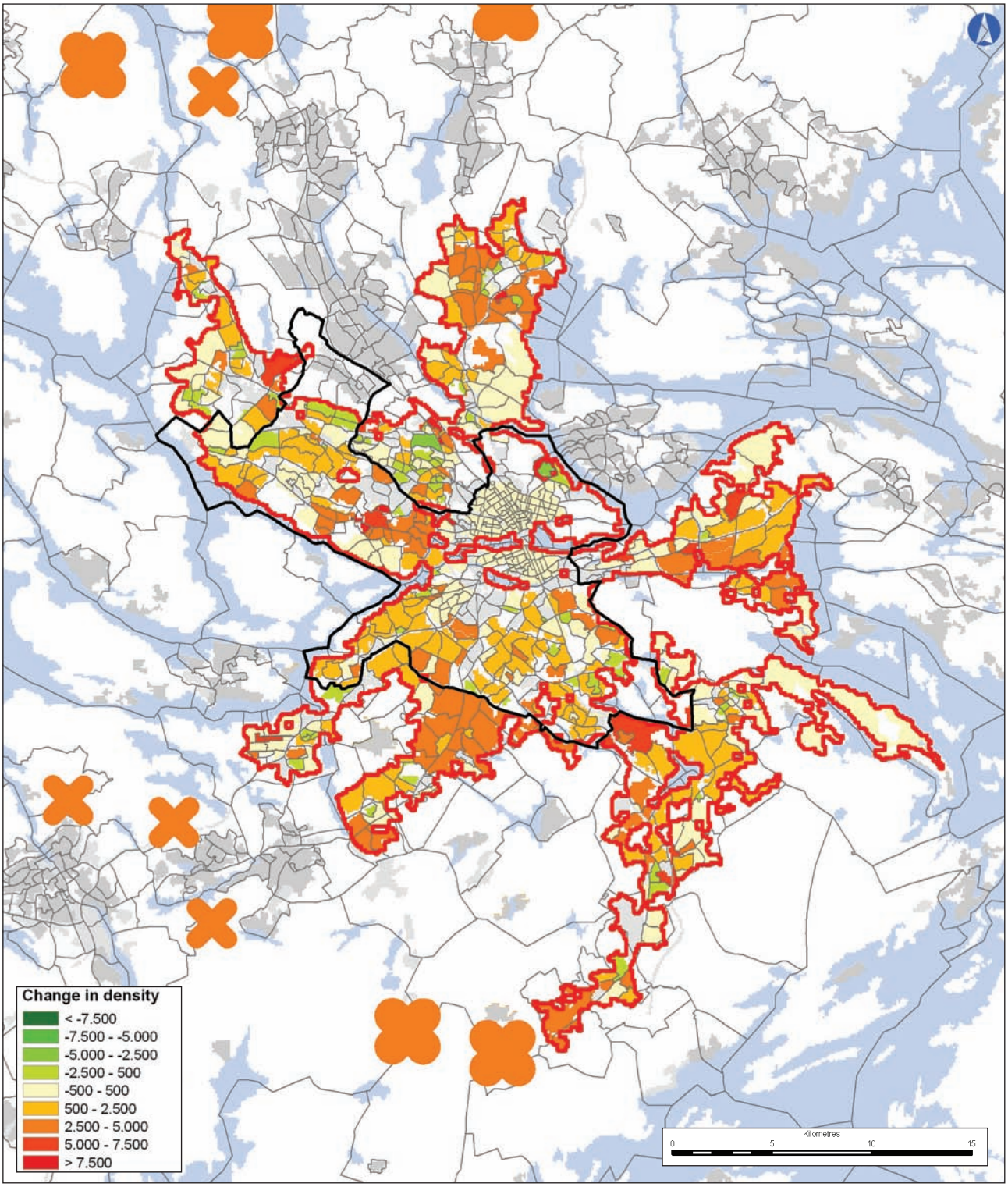


Stockholm: Change of population and workplace density 2001 - BASE

The true scale of this expansion is evident in the number of residents, approximately 460 000, who would live in these new areas. Conversely, an even greater focus on resource-aware development, specifically through increased, though realistic, densities concentrated along existing public transport corridors and around the inner city could have less of an impact on the region's resource consumption.

In this scenario, the urban fabric would only expand by 65km^2, providing homes for just under 250 000 people. Planning bodies in Stockholm have adopted fairly ambitious strategies for environmental sustainability; however as one of the fastest growing cities in Europe, even greater efforts will be required if Stockholm is to maintain its position as one of the greenest cities on the continent.

By Mitchell Reardon, Research Assistant
And Ryan Weber, Research Assistant



Stockholm: Change of population and workplace density 2001 - SUME

The SUME and BASE - Stockholm as an example

The maps at pp 20-21 show the level of densification in the Stockholm Urban Metabolic Zone (UMZ) for 2050 under two scenarios. The BASE scenario, on page 20, projects a continuation of current development trends, while the SUME scenario, on page 21, emphasises a more resource aware planning approach. Comparatively lower densities in the BASE scenario are foreseen as leading to greater sprawl, as shown by the increased number of orange "X's" beyond the existing UMZ boundary. Conversely, a concentration of development along transport corridors and regional growth hubs creates higher densities in the SUME scenario, and therefore reduced sprawl. This is illustrated by the increased presence of orange areas within the UMZ and the fewer number of "X's" outside the UMZ boundary.

Source: *ÖIR* - The Austrian Institute for Regional Studies and Spatial Planning

Dr. Wolfgang Wagner (left) and Kristen Huthman from GESBAU Public Relation presents the future of Märkishes Viertel. Photo: Odd Iglebaek

Energy saving for 13 000 flats in Berlin

Berlin: Märkisches Viertel is a huge public housing complex located in Reinickendorf in the northern suburbs of the German capital. It was built in the early 1960s to house some of the many millions of Germans uprooted by World War II. The scheme was designed with the motto "Urbanity through density" and was a very modern mixture of tower-blocks and medium-rises all sculptured into a green landscape.

However, insulation was poor and heating has grown very expensive. Much of the infrastructure has become outdated, the buildings have not been properly maintained and, in general, the area gives the impression of being worn and run down. The entire area is however currently undergoing a major process of renovation.

"One aim is to reduce energy consumption by approximately 50%", explains Wolfgang Wagner. Wagner is head of portfolio management at GESOBAU. The housing company, which is owned by the municipality of Berlin, owns 15 000 flats in the area and put in place a major plan to modernise 13 000 flats in 2007. Märkisches Viertel was originally designed to house some 40 000 people in 17 000 flats. The flats are for rent.

"Before we started energy consumption was calculated at 174 kWh per m^2 annually. We hope to get this down to between 70 and 80 kwh per m^2. We hope to do this through a mixture of means such as new windows, better insulation and, new heating systems - as well as introducing individual control of not only electricity but also heating in each flat."

"People will be able to see how much energy they are consuming, and on what, and pay accordingly. It is no longer seen as appropriate to regulate heat from radiators by opening windows. In short we want to show that large residential developments are also environmentally viable for the future", he adds.

Social housing

Märkisches Viertel was built as an experiment in social housing. One important element in this was loans subsidised by the government. Already some years ago GESOBAU decided to leave this system behind and instead borrow on the private market. – "In fact, it is cheaper both for us as a company and the residents, since the conditions for the loans are better", explains Wagner.

"Berlin has some 100 000 empty flats and before we started improving Märkisches Viertel our vacancy rate was usually 10-12%. We aim to get this down to 3-4%. This, combined with cheaper loans, indicates that we will manage to maintain the rent at a stable level. At present this is 7.81 euros per m^2 per month, including heating."

The scheme has some 1 000 different floor plans and the size

Renovated high-rise housing in Märkishes Viertel. Photo: Odd Iglebaek

of flats varies from 40m² one-room units to 110m² five-room units. Single-person households comprise 37% of all households, 36% are two-person units, 12% three-person units and 15% four or more person units. The ratio of small households has increased significantly and the number of people living here has been reduced to 36 200, or by around 10% during Märkisches Viertel's two-generation lifespan.

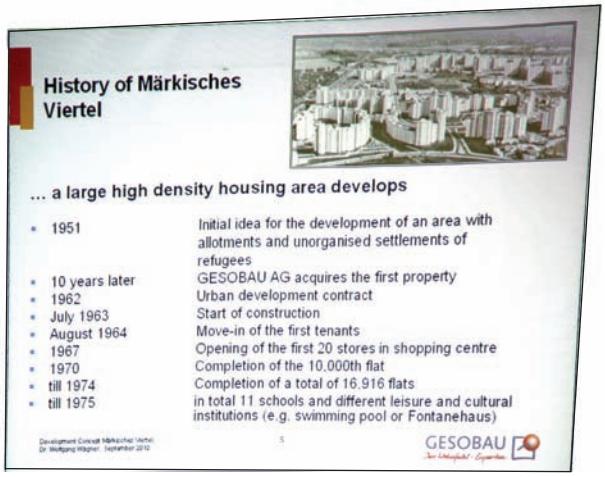
Another major change is that the number of people living on social benefits, or transfer income as it is called in Germany, has been rapidly declining among newcomers to Märkisches Viertel. "For people now moving here it is around 10% or approximately half of what it used to be", says Wolfgang Wagner. For Berlin as a whole the figure is also 20%.

Originally the houses had garbage chutes. Due to the fire-risk this caused however they were closed when the houses were refurbished. Today the garbage is collected from containers on the ground-floor level. There are bins in the vicinity of each house for recyclable materials like plastics, paper and glass.

The renovation-scheme does not have any particular policy with regard to cars. At present there is one parking space for each flat.

The renovation of Märkisches Viertel commenced in 2008 and the plan is for it to be concluded by 2015. The total cost is estimated at 480 million euros.

By Odd Iglebaek



Poster presenting the history of Märkisches Viertel.

International conference
Urban Development 2050
Planning resource-efficient cities

May 3rd, 2011, 09:00-18:00, Vienna,

More information at: www.sume.at/Conference

With the climate change agenda in mind we are working on ways to implement the Europe 2020 strategy. A key question here is how far can urban planning and the far-sighted management of urban development/growth/change contribute to greater resource efficiency in urban life?

Re-building cities is an ongoing, long-term, process of which the replacement of old buildings with new, energy-efficient units is but one aspect. Another equally important question here concerns the possibility of adapting urban layouts and spatial structures to provide for more compact cities, better adapted to future transport systems. This is a new challenge which has to be faced in some very different contexts; in growing, stable or declining cities and in cities with varying densities, forms, cultures and climatic conditions. The conference will discuss some of the possible ways to integrate these new tasks with contemporary urban planning practice.

A number of selected European cities namely, **Athens, Munich, Newcastle upon Tyne, Porto, Stockholm** and **Vienna** will present their views of the challenges and the approaches and perspectives they have adopted.

In the context of the conference we will present a number of alternative spatial development scenarios. These scenarios are based on population projections up to 2050 and focus on land and energy consumption. In three parallel sessions we present and discuss **a methodology to estimate the impact on energy use** and that of other resources (the "urban metabolism"), on the **resource impact assessment** of large urban development projects and related **urban development policies** in various European settings.

The conference is part of the research project **SUME** (Sustainable Urban Metabolism for Europe, funded by the European Community's Seventh Framework Programme FP7/2007-2013). The project is led by the Austrian Institute for Regional Studies and Spatial Planning (ÖIR) based in Vienna and comprises ten partners from Europe and China.

Nordregio is involved here as a partner contributing its expertise in particular to research topics such as the "Future dynamics of urban development" and the "Impact of (future) urban forms and structures on use of resources and energy" *(cf. also the article by Mitchell Reardon and Ryan Weber at pp 16-21 in this issue of the Journal of the Nordregio)*.

This conference will be of particular interest to:

Urban development policy makers, urban planners and administrators, climate change researchers, urban networks and NGOs.