PRINCIP

For climate smart municipalities and regions

This brochure gives an overview of specific results and conclusions from the PRINCIP project. The first part focuses on our work with visions and scenarios for new energy systems. The second part is an inspiration catalogue with specific initiatives and examples plus barriers and means regarding a climate smart energy system.

CO_2 knows no borders

The purpose of the PRINCIP project (PRoactive and INtegrated Climate change In resource Planning) has been to highlight how it is possible to reach proactive and integrated climate changes through planning of resources. The context of PRINCIP is the challenges that regions and municipalities in the Kattegat-Skagerrak region will meet in their objectives of reducing CO_2-emissions with climate smart energy solutions.

Visions and scenarios

We have looked at possible solutions for a climate smart energy system in Gothenburg and Frederikshavn, based on the methodology used in the creation of the energy plan 2050 for Aalborg Municipality.

The visions are being concretized considering a number of local possibilities, resources and constraints. The vision of Gothenburg is “In 2050 Gothenburg has a sustainable and equitable level of emissions of CO_2”.

» The PRINCIP project has redefined the vision into an objective of Gothenburg’s energy system being based solely on renewable energy in 2050.

In Frederikshavn the vision is that the energy system in the municipality is free of fossil fuels already in 2030.

Our recommendations for climate smart energy scenarios are summarized as follows.

We can reach the goals

Calculations in the project show that it is possible both for Gothenburg and Frederikshavn to restructure for a climate smart energy system that does not require fossil fuels. In Gothenburg the change is strongly dependent on the future structure of industries that today are directly or indirectly linked to the production of fossil fuels.

Is there enough biomass?

Our analysis of the scenarios confirms the challenges regarding resources. This has been underlined in the energy plan of Aalborg municipality. The access to biomass resources is a significant challenge if Gothenburg and Frederikshavn are to be independent of imported fuels in the long run. The local availability of biomass resources is the most limiting factor for the climate friendly energy system – at least when we look at the already existing and tested technologies. According to our scenario analysis both Gothenburg and Frederikshavn will to some degree be dependent on biomass resources from neighboring municipalities. Aalborg, on the other hand, expects to have sufficient biomass resources in relation to the municipality's energy system in 2050.

Regional and municipal strategies for biomass production should be supported by a national action plan. The plan should prioritize collaboration between municipalities with the purpose of common utilization of the biomass instead of the municipalities competing for the biomass. This should secure a sustainable utilization of the Danish biomass resource.

» The limited and geographically uneven distribution of biomass resources, requires the preparation of a national biomass action plan and regulation, to secure a sustainable utilization of the Danish biomass and to ensure that all municipalities have equal access to biomass resources.

The government and the municipalities should investigate how to increase the local potentials of biomass. In Gothenburg and Frederikshavn this could be the utilization of waste biomass or the growing of new types of biomass like aquatic biomass (algae) or elephant grass. It is important that the new types of biomass do not outcompete other uses of biomass such as e.g. food and materials. In this context it is also relevant to make an assessment of the local economy and employment.

Energy savings is a prerequisite

In the scenarios of both Gothenburg and Frederikshavn the consumption of electricity and heat in the households has been reduced by 50% and the fuel consumption efficiency of industry has increased significantly. At the same time we must increase efficiency of the transport sector, e.g. by use of electrical personal transports as electric cars. The initiatives of savings and increased efficiency can give a 40% lower fuel consumption in a future energy system in Gothenburg. In Frederikshavn the initiatives will reduce the consumption of fuels with 50%.

» To reach the goals of a climate smart energy system free of fossil fuels, increased efficiency and savings in our energy consumption are necessary.

We must reduce our energy demand

A more active national policy and a stronger local effort is required to implement the aforementioned energy savings and efficiencies. A reduced energy demand is a prerequisite if other initiatives and changes in the energy system should be implemented in an effective socio-economical way.

» We should prioritize reduction of our energy demand to a much greater extent.

This applies to energy renovation of buildings as well as electricity consuming equipment, energy savings in the industry, reduction of transportation needs and consumption of fuels in the transport sector.

Energy consumption in buildings

It is a major challenge to reduce our energy consumption in buildings especially for areas supplied by district heating and for rural areas. We highlight several initiatives that the government could put forward. Danish suppliers of district heating should have incentives to eliminate the fixed costs of district heating. Furthermore a fund for heat savings could be created to grant subsidies for energy renovation projects. An energy counseling service should support the fund and the subsidy for energy renovation could be around 20% during the first years. Additionally all building owners should have access to long-term loans with a low interest e.g. of 3% in 30 years. Then we can increase the number of energy renovation projects.

» A network within energy renovation in Frederikshavn is testing the connection between loan conditions and competent energy counseling. Such initiatives should be supported by the state.

Electricity and biomass for transport

Conversion of the transport sector to a renewable energy base is, just like the other parts of the energy system, depending on biomass resources. Our principles in the energy scenarios have therefore been to make the highest possible use of electricity based personal transportation.

Coherent Energy and Environmental System Analysis (CEESA) suggests that an effective use of surplus electricity is made by connecting the surplus to the gas system and biogas production through electrolyze and synthetic fuels. However, the technologies are not ready for the market yet. The government ought to support research and development in this field, especially by supporting systems for test and demonstration in the municipalities.

» The state should define guidelines regarding utilization of biomass for transportation purposes in short and medium term.

Inspiration catalogue

PRINCIP would like to inspire planners and decisions makers to support different initiatives regarding climate smart energy solutions. On our webpage http://climatesolutions.plan.aau.dk you can find various examples, and you can also see short movies on the cases.

Energy savings in buildings

In Gothenburg, Frederikshavn and Aalborg there are several different energy renovation initiatives which are of importance for the reduction of CO_2 emissions.

In the PRINCIP-project we describe initiatives and challenges regarding energy renovation. We have different experiences regarding climate and energy goals. In Frederikshavn the "Energi City Frederikshavn" should be supplied with 100% renewable energy in 2015. In 2030 the same goal should be reached for the entire municipality. The target of Gothenburg is that Gothenburg in 2050 should have a sustainable and equitable level of emissions of CO_2. This can partly be fulfilled by energy savings.

Renovation and energy optimization

In the PRINCIP-project we have defined initiatives and barriers for energy renovations. In Frederikshavn, for instance, they have good experience with 22 building professionals who collaborate to perform larger energy renovation tasks. The requirement for the professionals to participate is an extra education with focus on energy optimization and interdisciplinary cooperation.

A major part of Gothenburg's houses are built between 1960 and 1975. Several of the houses are about to have a thorough renovation and at this point it is important to include energy optimization as part of the process.

Economy is an important element in energy renovation and the cost of capital is of great importance when evaluating whether energy optimization projects are cost-effective. In Denmark a cost of capital of 5% has been used, while using a lower in e.g. Germany. This means that the investment pays off earlier in Germany than in Denmark.

Brogården and Katjas gata are examples of renovation projects fulfilling the passive house standard with a significant reduction of the energy consumption. Read more at http://climatesolutions.plan.aau.dk.

Impartial energy counseling

In Frederikshavn there are good experiences of offering house owners in the municipality free impartial counseling about energy in the building. The local banks use the energy counseling as background for a loan. This way it is easier for the individual house owner to get loans from the bank to fulfill energy renovation. The energy counseling has been a success, and several of the suggested actions have been implemented.

The experiences from the inspiration catalogue stress the significant saving possibilities through energy renovation. There are examples of new buildings fulfilling passive house or low energy building regulation standards and renovation of buildings that all result in significant reductions of the energy consumption.

An example is the multiarena in Aalborg. Energy renovation creates a saving of 0,5 million kWh of both electricity and heat by fulfilling initiatives with a payback time of less than 7 years. In the different cases described in PRINCIP there has been major saving in heat and electricity consumption.

Read more at http://climatesolutions.plan.aau.dk.

Transportation

There are several initiatives with the purpose of reducing transportation by cars and instead motivate people to use bikes or public transport. The partners behind PRINCIP, wish to highlight the following initiatives:

In the CIVITAS-project the goal has been to increase the availability and comfort for bikes in Aalborg. One of the implemented initiatives is changing the right of way, and thus giving cyclists the right to drive first. A special lane for turning right has been made at light crosses that makes it easier for cyclists to come forward in traffic and reduce waiting time. There is no data available yet on what impact the initiatives have had on the transportation on the stretch.

The project "Leva livet" focuses on making the inhabitants consider how they can reduce their effects on the environment. This is done through carpooling and a higher degree of use of public transport to work. In the project the CO_2-emissions were reduced by 14%.

A congestion tax system is being installed in Gothenburg to reduce traffic. The goal is to increase the use of public transport. At the same time initiatives are made to improve and expand the public transport.

In Frederikshavn the municipality has installed a central control system for the vehicle of the municipality. The purpose is to give an overview of the need of cars and hereby look at the potentials for carpooling and change of transportation habits for the employees in the municipality. The result is that five cars have been changed to electric cars. Frederikshavn has also assessed the pros and cons of changing the public transportation from diesel to biogas.

» The transport sector has major impact on the total consumption of fossil fuels and it is so far the sector where it has been most difficult to enable a sustainable conversion.

Small and mediumsized enterprises

There is a significant potential for savings and efficiency improvements of the energy used by industry but there are also several barriers for achieving it. Among the barriers are highlighted the costs of stopping the production, lack of time, other priorities and the low cost of energy compared to total costs. Big energy consuming companies often have special agreements on energy vision, implementation of energy optimization and CO_2 –emission reduction goals. But the small and mediumsized enterprises usually do not have these requirements and lack the competences needed to make their own energy optimizing initiatives.

The energy utility companies have an obligation of reducing the energy consumption but because the potentials are highest in large industries, the action is focused on these. Therefore, no direct actions are taken towards small and mediumsized enterprises who are those who need support the most.

Aalborg municipality has two initiatives:
Together with "The energy service" they offer the green shops to get an overview of and recommendations for energy savings. Read more at http://climatesolutions.plan.aau.dk.

» There is a need for the municipalities to consider how they can offer support towards small and mediumsized enterprises.

If you would like to know more

This brochure has given you a short overview of some of the experiences and examples we have found. You can read much more and see detailed descriptions and short movies at our WIKI-site CLIMATESOLUTIONS. It is also possible to upload your own good examples.

Link for website:

climatesolutions.plan.aau.dk

DEN EUROPÆISKE UNION
Den Europæiske Fond
for Regionaludvikling

Göteborgs Stad

NordDanmarks EU-kontor
Aalborg-Bruxelles

IVL Svenska Miljöinstitutet

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