# Cities of the Future
## City of Stavanger

Covenant of Mayors
Committed to local sustainable energy

STAVANGER KOMMUNE

SANDNES KOMMUNE


Hidlefjorden
Tau
RV521
Åmøyfjorden
Horgefjorden
Strand Kommune
Jørpeland
Randaberg
Byfjorden
Vassøyosen
Hogsfjorden
Botnafjorden
Pinå
Kvernavik
Stavanger
Rag
Sølborg
Hillevåg
Riskafjorden
Hinna
RV516
Hølen
RV509
Gandafjorden
RV13
Stavanger lufthavn, Sola
Sandnes Kommune
Sandnes
RV510
Riaren
RV508
Ganddal
Blegje
Oltedal
kuleberget
Krosshaug
RV45
Figgjo

## Foreword

The European Union (EU) is leading the global fight against climate change, and has made it a top priority. Its ambitious targets are enumerated in the 'EU Climate Action and Renewable Energy Package, which commits Member States to curb their $CO_2$ emissions by at least 20% by 2020.

The Covenant of Mayors is an ambitious initiative of the European Commission that will bring together mayors of Europe's most pioneering cities in a permanent network to exchange and apply good practices across these cities and beyond to improve energy efficiency significantly in the urban environment. The Covenants of Mayors was launched at the Second EU Sustainable Energy Week in January 2008. A draft text, based on informal consultations with different cities and networks, was presented. It is the response of the most active cities to global warming; a formal commitment by the cities to go beyond the targets set for the Member States and reduce their CO2 emissions beyond the EU's 20% objectives.

On 22nd September 2008, the Stavanger City Council, as the first city in Norway and outside of the EU, voted with a vast majority to participate in the Covenant of Mayors. On 10th February 2009 more than 370 cities from thirty countries, together with top representative of the EU institutions, attended a prestigious signature ceremony. All told, these Mayors represented over 60 million citizens across Europe. The Mayor of Stavanger, Leif Johan Sevland, attended the ceremony together with representatives from the city of Stavanger.

The city of Stavanger is also participating in the 'Cities of the Future' project (Framtidens byer), which was initiated by the Norwegian Minister of Environment in the spring of 2008. The initiative was a response to a Report to the Parliament Stortinget on Norwegian Climate Policy and the compromise agreement on climate policy from early 2008. Through the 'Cities of the Future', the Government and the cities, which will prepare individual action plans, will work closely together in order to create cities with a better urban environment.

In reaching the targets detailed in the process-oriented Covenant of Mayors, Stavanger is employing the action plans from the 'Cities for the Future' as a tool.

In the 'Cities for the Future,' the twin cities of Stavanger and Sandnes were requested to prepare joint action programmes in specific areas. This request was accommodated through successful cooperation between the two cities. Work on the action plan was subjected to political discussion and internal working groups in both cities.

In the action plan, emphasis was placed on strategic goals and measures. Both cities are working to revise their municipal master plans and are facing large-scale regional development tasks. At the same time, the Partial County Plan for Long-Term Urban Development in Jæren will set guidelines for urban development throughout the region. The action plans will emphasise:

**1. Transportation**

This is the area where the potential for reduction of greenhouse gas emissions is the greatest. The city of Stavanger has a huge challenge with private transportation; about 65% of all CO2 emission comes from private transportation. The action plans emphasise the importance of developing environmentally friendly transport, technology and motor vehicles and efficient logistics.

**2. Energy efficiency**

Coordination of energy efficiency plans, district heating/cooling and choice of energy sources are the main challenges related to stationary energy consumption.

**3. Consumption and waste**

Waste reduction and waste management is organised by IVAR. Stavanger and Sandnes have established good cooperation with respect to the municipalities' procurement policies. The most important challenges in this area are reductions in material consumption, reduced emissions and conversion from methane to $CO_2$ through combustion, reduced pollution and changed consumption patterns.

**4. Climate change adaptation**

The climate changes in Stavanger and Sandnes will be similar in character. Rising sea levels, increased precipitation during the winter season, more extreme weather conditions in the form of precipitation intensity and strong winds are factors which will have significant adverse impacts on health, environment and civil protection. Research on the consequences on health and the natural environment will prove to be important as well as preparedness for extreme incidents. It is however vital that cities are able to adapt and respond to the unforeseen changes in the climate that most certainly will occur.

# Table of Contents

# 1 Introduction

## 1.1 Background

The Ministry of the Environment has invited thirteen cities to participate in a project whose objective is to reduce greenhouse gas emissions and promote good urban environments.

The Report to the Storting no. 34 on Norwegian Climate Policy sets many goals and strategies for how to reduce our negative impact on the climate and particularly heavy emphasis is placed on the importance of the larger cities in this work. Through this project the possibilities for significant reductions in greenhouse gas emissions in Norway will be considerable.

Cities which lie close to each other and which to a large extent can conduct joint projects are encouraged to cooperate as twin cities. Stavanger and Sandnes now have such a role, and joint goals for the two municipalities are therefore formulated in this action programme.

References to relevant plans compiled in Stavanger and Sandnes are referred to in Chapter 3.1 and in the foreword.

The goals that are set in the action programme are assumed to be binding on the cities' authorities, and it will be important to commit to ambitious and realistic measures for achieving these goals.

In 2007 two large national meetings were arranged to coordinate the work and to contribute with suggestions for further work. On 3 December a brainstorming session was held for Stavanger/Sandnes and was attended by key figures including representatives from Rogaland County Municipality and the Norwegian Public Roads Administration. Group work will serve as the basis for further work.

## 1.2 Main goals

There are several ways of calculating a municipality's emissions. The table below shows direct emissions from activities in the two cities and will be used here as the starting point for percentage-wise reductions.

The table shows the reductions in tonnes when the goal is 20% but can be adjusted in relation to other percentage goals. The total of the measures that arise under each area of commitment in the course of this chapter will contribute to making the necessary reductions in greenhouse gas emissions. The premise is that the measures are followed up and are sustained. More measures will be necessary in order to achieve continued improvement and to stem further increases in traffic, energy consumption and waste.

| | Current $CO_2$ emissions (% equivalent) | 1991 emissions in tonnes (Stavanger /Sandnes) | Current emissions in tonnes (Stavanger / Sandnes) | 20% reduction in current rate is equivalent to: (tonnes) (Stavanger/Sandnes) |
|---|---|---|---|---|
| **Land use and transport** | 67% | 171 000 / 110 000 | 192 000 / 129 500 | **38 000 / 26 000** |
| **Stationary energy consumption** | 19% | 72 000 / 35 000 | 62 000 / 26 000 | **12 000 / 5 000** |
| **Consumption and waste** | 14% | 14 000 / 57 000 | 14 000 / 55 000 | **3 000 / 11 000** |
| **Climate adaptations** | | | | |
| **Stavanger/ Sandnes in total** | | 256 000 / 203 000<br>459 000 | 268 000 / 210 000<br>478 000 | **53 000 / 42 000**<br>**95 000** |

*Table 1.2 Annual reductions of $CO_2$ emissions if target of 20% is to be achieved.*

The table shows that the areas of commitment under the theme of land use and transport must be afforded considerable weight in order to achieve the adopted target for reductions of $CO^2$ emissions.

## 1.3 Children and youth

In November 2008 the Sandnes Youth City Council adopted its own resolution concerning the Cities of the Future project the resolution highlighted the following issues:

- Public transport must be expanded. An urban railway must be established. It should be cheap to travel by bus/train.
- More and better bicycle lanes must be built.
- Sports and leisure facilities in all of the city districts.
- Parks and green lungs in the city are important.

Sandnes and Stavanger will consult with children and young people and listen to their recommendations during the development work done on the Cities of the Future project.

## 1.4 Concerto

Dale Eiendom, a company owned by Rogaland County Municipality, has applied to the EU to participate in the Concerto programme. The application includes parts of the building mass which originally belonged to the old Dale psychiatric hospital. The purpose is to renew the buildings in an environmentally friendly and energy-efficient way (low-energy buildings). New buildings would hold an energy standard equivalent to that of a passive house.

Rehabilitation of old hydroelectric power plants, use of solar energy and heat pumps are some of the elements that are included in the programme. The area should serve as an example for other development areas.

## 1.5 ANSWER

The Cities of the Future project coordinates several ongoing projects, both jointly in the county and individually for the two cities.

A tool for measuring and presenting greenhouse gas emissions in the municipality – as well as for individual schools – is now under development through an EU project in which Stavanger and Rogaland County participate. ANSWER is the name of this project, and it falls under the Interreg IVB North Sea Region Programme (http://www.northsearegion.eu/ivb/home/). It began in September 2008, will last for three years, and has participants from Norway, England, Belgium and Sweden. The main purpose is to render an area's or school's greenhouse gas emissions visible and to challenge communities/schools to reduce these emissions. The philosophy is that knowledge about one's own greenhouse gas emissions generates incentives to do something about them. In addition to this, the educational element is important for schools.

In the Cities of the Future project we view the "climate barometer" as a dynamic measuring instrument which can illustrate the degree of success of measures taken within transport, energy consumption and waste management.

# 2 The four areas of commitment

The main goal for the project is to reduce greenhouse gas emissions as much as possible. In practice it will be difficult to achieve the goals without taking some drastic steps, and it is important to find measures within the main areas of commitment that will have the greatest effect, particularly in the short term. In addition to the larger, individual measures that are highlighted, it is also important to get across that long-term work on attitudes and many smaller measures are also vital if emissions are to be reduced in the long term and not increase again in a short space of time.

## 2.1 Land use and transport

The road transport sector accounts for the clearly largest share of emissions of $CO_2$. In addition to this, a large portion of the challenges related to transport are due to land use. Indeterminate land use contributes to greater travel distances and increased dependency on energy-demanding modes of transport.

### 2.1.1 Status/Background

The extent of transport and transportation work in Jæren will, according to all forecasts, increase significantly in coming years. Jæren has a strong and steady population growth rate and a corresponding growth in the number of jobs, particularly in the petroleum and energy sectors. Jæren is also an important destination for freight and an important transport artery, with the E39 coastal trunk road through the region and Risavika as an important hub port. In addition to these, Sola Airport, Ganddal and Dusavika are also important logistical hubs.

A regional land use strategy lies at the heart of development of the region. The strategy contains a closely-knit and integrated urban structure. The main urban area lies in Stavanger city centre, Sandnes city centre and on the axis along National Road 44 in between. The area around Forus has also grown into a very large employment area and the region has a number of integrated development axes.

The road transport sectors in the municipalities of Sandnes and Stavanger account for approximately 67% of direct emissions of greenhouse gases, amounting to 192,000 and 129,500 tonnes respectively per year (2006). This also means that it is here that much of the reductions need to be made.

The distribution of modes of transport in North Jæren for all trips is as follows (National Travel Survey 2005 for persons aged 13 years and above).

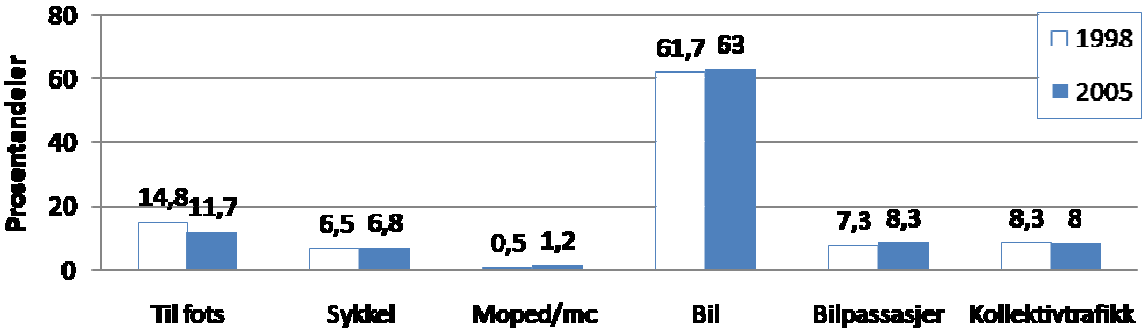


**Figure 1 shows the number of travellers distributed by different modes of transport.**

The car is the dominant mode of transport and the one with the greatest potential for reducing $CO_2$ emissions. The number of trips per person during the period has risen from 3.6 to 3.8, meaning an increase in travel activity per person. According to the National Travel Survey, the change in mode of transport was chiefly due to longer travel distances; in other words not just a change in the mode of transport along existing travel routes.

Transport can be divided into different purposes of trips (National Travel Survey 2005):

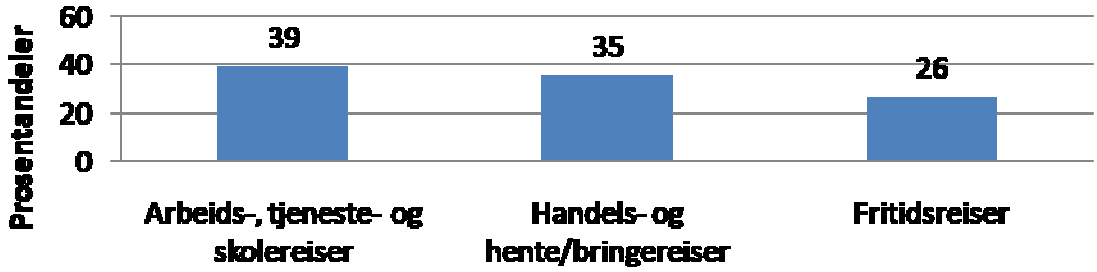


**Figure 2 shows the number of trips in percentages distributed by different purposes of trips.**

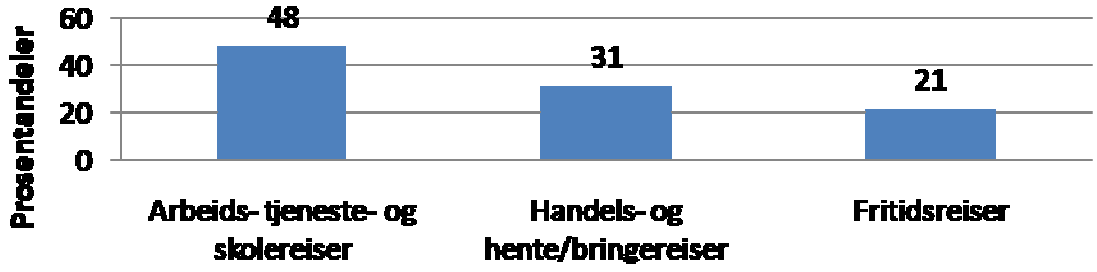


**Figure 3 shows travelling time in percentages distributed by different purposes of trips.**

Work-related travel and, to some extent, shopping and picking up/dropping off children is notably static in form, i.e. these trips are repeated in respect of both time of day and travel route. These trips are therefore easiest to plan for in terms of both location and infrastructure policy. Travel related to work and school account for the longest travel times per trip. A good deal of these trips has several purposes one after the other, i.e. serial trips. The car and, to some extent, the bicycle are particularly well suited to these in terms of flexibility.

Three regional plans/studies are particularly important to use as a basis when Stavanger and Sandnes are to draw up plans for the work to be done in the Cities of the Future project:

- Choice of Concept study for the transport system in North Jæren.
- Partial County Plan for Long-term Urban Development in Jæren.
- Transport Plan for Jæren.

These documents will now be prepared/revised in the given order.

### 2.1.2 Challenges

The programme shall be based on a balanced economic growth in North Jæren. Another premise is that one subgoal in the letter of intent is to improve the physical urban environment in terms of, for example, health, experience and residential environment. A reduction of $CO_2$ of 20% from the 1991 level must take into account increased traffic volumes and emissions due to a growth in population up to 2020. The annual rate of increase of emissions within the transport sector between 1991 and 2006 was approximately 0.9%. With a corresponding annual rate of increase up to 2020, the increase between 1991 and 2020 will amount to a total of approximately 30%. This means that, with today's growth trend, the reduction rate in 2020 must be approximately 40% if the goal is to be achieved. Drastic reductions in emissions must therefore be achieved at the same time as a drastic growth in transport volume occurs. The region's participation in the Cities of the Future project will entail a need for powerful instruments, including heavy restrictions. It will probably be a matter of finding completely new principles for organising the urban areas. The measures mentioned below should lead to a shift in the direction of the development, but reaching the 20% target will demand an immense effort.

Land use and location trends have led to Stavanger city centre and Forus/Lura in particular strengthening their positions as employment areas. At the same time, Stavanger has a considerable residential settlement in close proximity to the city centre. The Forus/Lura area has not undergone a corresponding settlement growth. Sandnes city centre has in recent years weakened its position as an employment area. Transforming the Forus/Lura area from a car-oriented area to one with high market shares of public, pedestrian and bicycle transport is a challenge.

The traffic trends for the region are headed in the wrong direction. The most notable changes in the overall traffic situation over the past ten years have been that, while car traffic has gained a further 2.5% of the total traffic volume for passenger traffic for all modes of transport, pedestrian traffic has lost 3.5% of the total traffic volume for all modes of transport measured by number of trips. This is partly due to longer trips and partly due to changes in mode of transport for the existing trips.

The complexity of development in central transformation areas means that a large part of the development occurs in decentralised and less complex areas. The distance between residence and place of work has increased, something which reduces the option of walking or cycling to work. Furthermore, the commitment to public transport is neither robust nor independent of traffic jams, a factor which is decisive for being able to compete better with the car.

With the county municipality, the Norwegian Public Roads Administration and Sandnes and Stavanger municipalities, the region currently has good arenas for facilitating cooperation. The Partial County Plan for Land Use and Transport is a clear example of this, as is the Transport Plan for Jæren, which was established in 1989. Major challenges lie ahead in respect of getting sufficient and coordinated force behind steering the land use and transport commitment in a more environmentally friendly direction.

Measures must be evaluated on the basis of their potential for impact in the form of reduced tonnes of $CO_2$. The measures can be simple and quick to implement or more demanding and long-term but with significant long-term effects. In order to achieve the main goal of reducing $CO_2$, the goal has to be operationalised in commitment areas with appropriate operational goals. The commitment areas build on ongoing work linked to the Energy and Climate Plan for Rogaland, which defines the following commitment areas:

1. Land use: Active location policy and concentrated development (reduced number of kilometres per trip).

2. Infrastructure: Measures for increased share of public, pedestrian and bicycle transport (reduced emissions per km).

3. Operation: Increased commitment and more efficient logistics/operation (reduce the number of kilometres driven in cars).

4. Regulations and R&D: Motor vehicles and technology (reduce emissions per kilometre).

The local and regional levels must take on particular responsibility for the first three areas listed above. The fourth and final area is of vital importance to the overall emissions situation but is to a large degree dependent on entrenchment in government regulations and incentive schemes. The region must contribute by following up whatever comes from government authorities. These points are explained in more detail below.

An active location policy and concentrated land development entails the optimum location of functions in relation to each other (the right activity in the right location) and high utilisation of existing, developed centrally located areas of land. This also applies to land space inside the influence areas of the most centrally located public transport axes that already exist or in extension to these. The purpose of the measures is to reduce the number of kilometres per trip.

A commitment to infrastructure measures to increase the proportions of public, pedestrian and bicycle transport would give reduced rates of emissions per kilometre because environmentally friendly modes of transport would increase their market shares. These measures could also contribute to achieving shorter distances, shorter travel time, improved standards, etc.

Greater commitment to operation and more efficient logistics/operations could apply to increased frequency of public transport or stronger focus on logistics inside areas such as allocation of places in day-care centres. This is so as to reduce the number of kilometres driven, particularly in cars.

Reduced $CO_2$ emissions per kilometre driven in cars means smaller, more efficient engines and more environmentally friendly forms of energy.

The following section contains a review of measures based on the requirements to measures mentioned here.

### 2.1.3 Measures

Many measures have the potential to curb an increase in $CO_2$ emissions. The challenge, however, lies in reducing the emissions despite the increase in the volume of transport.

The measures are evaluated according to how large a share of emissions each measure would affect, the size of the emission-mitigating effect each measure would have on a relevant volume of emissions and the time perspective for implementing them. Responsibility for each measure is also given.

**Land use: Active location policy and concentrated development**
These measures should contribute to a reduction in the number of kilometres per trip.

- Ensure that the municipality has many and large building plots ready for development in central urban areas at any given time. This entails finding, developing and making ready building land. Urban land consolidation must be a central instrument for stepping up progress. Delimitation must be defined between what lies inside city centre areas and the influence area of the most central and high-frequency public transport routes. Delimitation can be directly related to the boundaries between the accessibility profiles mentioned above. This includes the possibility of sequencing requirements and postponed development in areas outside this boundary. The boundary must be revised regularly and evaluated in relation to needs and progress made in making ready central building areas. This measure is considered to have a large scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

- Active location policy with the right activity in the right location. Ideally, location requirements related to large residential areas should follow the principle of walking and cycling distance to at least one large employment area and proximity to high-frequency public transport to other large employment areas. This measure is considered to have a large scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

- A self-sufficient local community is envisaged. Residential areas must cover the need for everyday functions such as local shops, day-care facilities, primary and lower secondary school, sports and culture etc within an acceptable walking distance. Much has been done with respect to this measure. New measures are considered to have a large scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

**Infrastructure: Measures for increased share of public, pedestrian and bicycle transport**
These measures should contribute to reducing emissions per kilometre.

- Parking space for cars in an area shall be restrictive and shall act as an incentive to travell by public, pedestrian and bicycle transport. Parking space must however be adapted to the accessibility to the area and other environmentally friendly modes of transport and must be coordinated with the rest of the region. The maximum requirement for car parking will be considered if it give good accessibility to other modes of transport. The accessibility profiles for different areas in both cities can be compiled through, for example, the municipal plan. All zoning plans are evaluated in relation to these. Requirements to mobility plans in plans/building permit matters that are related to the accessibility profiles.
- Co-location of residential/commercial car parks with public transport hubs for greater equality of status between modes of transport. Parking in large development projects shall be organised as communal garages/public car parks. Car parks above ground level shall have the possibility of being converted into other types of activity at some time in the future. Free parking facilities shall be actively used. Vacant bicycle parking should always be available. This measure is considered to have a large scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.
- Establish a public transport infrastructure that can give a robust and predictable public transport service between city centre areas and central residential and employment areas and that can operate independent of car traffic. This measure is considered to have a large scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

- Develop a bicycle route network of a high and uniform standard, reduce the number of conflicts with existing networks and establish new routes for shorter travel distances and times to centrally located employment areas. This measure is considered to have a medium scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

- Building on new land space must be done in extension to existing centrally located main public transport routes to ensure the possibility of increasing the frequency of route services rather than creating a need for establishing new, secondary routes. This measure is considered to have a medium scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

- Tax parity between car driving and use of car parks connected to workplaces and using public transport to and from work. This measure is considered to have a medium scope, a medium effect and a short time horizon for implementing. The state has a regulatory responsibility.

- Regional sports and cultural facilities must have high levels of accessibility to public transport from the entire region. This measure is considered to have small scope, a significant effect and a long time horizon for implementing. The region has a heavy responsibility.

**Operation: Increased commitment and more efficient logistics/operations**
These measures should contribute to reducing the number of kilometres driven in cars.

- Provide a very high frequency public transport service to all central main routes. This measure is considered to have a large scope, a significant effect and a moderately long time horizon for implementing. The region has a heavy responsibility for implementation.

- Resources must be established to work on and serve as a motivator for increasing the efficiency of the logistics and operations linked to transportation to different functions in the city area. The purpose of this is to minimise the need for travel and car driving. For example, allocation of places in day-care centres should be determined on the basis of specific place of residence. Car pool schemes to encourage less driving in cars. Car pool schemes in city centre areas reduce the need for driving passenger cars to and from work. This measure is considered to have a medium scope, a significant effect and a short time horizon for implementing. The region has a heavy responsibility.

- Restrictions should be set on long-term parking, with a view to reducing parking in connection with driving to work. This measure is considered to have a medium scope, a significant effect and a short time horizon for implementing. The region has a heavy responsibility.

- Parking charges in all shopping centre and commercial trading areas so as to harmonise the competitive conditions between these areas. Dependent on government policy instruments. This measure is considered to have a small scope, a medium effect and a moderately long time horizon for implementing. The region has a heavy responsibility.

**Regulations and R&D: Motor vehicles and technology**
These measures should contribute to reducing emissions per kilometre.

- Road pricing, with high rush-hour rates to encourage an increase in transition to alternative modes of transport. Road pricing is regulated according to a car's emission level. At the same time the investment profile, based on revenues from the charges, must be moved in a more environmentally friendly direction. It should be possible to use revenues from toll roads/road pricing on both investment in and operation of public transport. This measure is considered to have a large scope, a significant effect and a short time horizon for implementing. The region has a heavy responsibility. Regulations concerning the use of toll road revenues for operating public transport and the taxation of car use according to emission levels must be considered by the government. The region has a heavy responsibility for following up and implementing.

- Regulations for direct and dramatically favourable tax treatment of low-emission cars for vehicles run on fossil fuel, hybrids, environmentally friendly energy carriers, electric cars and vehicles powered by renewable energy. A system for ensuring the environmentally friendly production of energy must be included in the calculations. This measure is

considered to have a large scope, very a significant effect and a moderately long time horizon for implementing. The Ministry of Finance has a heavy responsibility.

- Research into renewable energy sources, energy carriers and better combustion of fossil fuels is of extremely high importance. This measure is considered to have the possibility to influence a large share of emissions to great effect and to have a long time horizon for implementing. The state has a heavy responsibility. The region should be responsible for local follow-up of government incentives and regulations.

### 2.1.4 Future work

For the achievement of goals and the implementation of measures to be successful, the measures must be accompanied by a clear division of responsibilities between actors. Necessary processes/collaborative constellations, incentives and resources must also be established.

In the following the areas of commitment will be specified and described more closely in terms of details about measures, time perspectives, effects, etc.

The cities must also define more clearly their commitment areas in terms of effects and will therefore do more work on prioritising between them. In any case it will be extremely important so commit to measures that strengthen efforts in two areas: location management and parking policy. In order to be able to introduce a soundly based and restrictive parking policy it will be necessary to strengthen the environmentally friendly transport resources.

## 2.2 Stationary energy consumption in buildings

### 2.2.1 Status

The Stavanger/Sandnes region has the mildest and most stable climate in the country. It also has a very windy climate and periods with a lot of rain. Heating and cooling of buildings account for 19% of the region's total greenhouse gas emissions (2006).

Stavanger municipality has practised an active development policy through procuring large areas of land for so-called "main development areas" which should contribute to an integrated development and also through energy solutions during the past 10 years, with mandatory connection to district heating plants in the Urban Sjøfront, Krosshaug Loen, Jåtten Øst, Søra Bråde and Jåttåvågen areas. These represent more than 2,500 houses and apartments and the work has been carried out in cooperation with Lyse, the regional energy supplier.

Today heat pumps and water-borne systems are installed in all new buildings and buildings to be rehabilitated in the municipality of Stavanger.

Sandnes municipality has established that owners and tenants of buildings shall satisfy national targets for energy efficiency and energy conversion. These entail the following:

- The municipality shall reduce energy consumption equivalent to 10% of its energy consumption in municipal buildings by 2010, measured in kWh/$m^2$.
- The municipality shall reduce energy consumption and convert to renewable energy sources equivalent to 25% of its energy consumption in municipal buildings by 2016, measured in kWh/$m^2$.

In the case of new buildings and rehabilitation of municipal buildings over 500 $m^2$ the following shall apply:

- Low-energy buildings must be built.
- Building work must be carried out in such a way that renewable energy sources can be brought into use. This entails the use of waterborne heat for heating, hot water heating and residual heat from ventilated air.
- Establish efficient control systems that contain an energy monitoring system (EOS). It should be possible to coordinate the system between buildings.

### 2.2.2 Plans and projects

The currently valid Climate and Energy Plan for Stavanger, which was adopted in 2002, will be rolled out this year. The primary goals of facilitating energy flexibility, low-energy buildings and the use of environmentally friendly energy for heating and hot water are adhered to and the plan will place an even stronger focus on how to implement goals in specific action programmes as well as plans for ensuring good implementation and operational management of the goals.

The Energy and Environment Plan for Municipal Buildings in Stavanger Municipality, adopted in June 2008 contains ambitious goals, strategies and measures for energy efficiency, use of renewable energy and reduction of greenhouse gas emissions from municipal buildings. The plan specifically concerns itself with new buildings, the rehabilitation of buildings and the operation/management of entire building masses.

Discussions on the Partial County Plan for Energy and Climate (2020) will be completed in the course of 2009 and will contribute to an overall management of a more environmentally friendly energy planning policy.

The current municipal plan for Stavanger requires the preparation of quality assurance programmes for plans for 100 houses or commercial buildings over 10,000 $m^2$. The quality assurance programme shall account for energy-efficient solutions, energy consumption, energy sources and distribution systems.

In future zoning plans there is a wish to manage energy systems and sources by means of regulations: “Buildings shall facilitate heating with waterborne heat. The buildings shall be connected to district heating plants.”

The Environmental Plan for Sandnes 2007-2020 contains its own strategy for energy and greenhouse gas emissions for **East Sandnes**. This strategy includes performance measurements for emissions of $CO_2$ and for energy consumption. It also describes subgoals and measures for the following areas:

- The municipal’s own building mass.
- New buildings and development areas.
- Greenhouse gas emissions from municipal activities.
- Developers, business and industry and inhabitants.
- Land use planning, transport and urban development.

New planning and building acts will give the municipalities new possibilities to set requirements to energy and environmentally friendly solutions for buildings and development areas. This concerns requirements to waterborne heat, sequencing requirements which presuppose that the energy supply solution has been determined before development work can take place, etc. These provisions will be particularly important in the work on planning/developing new developments, where getting the long-term solutions already established when the development work is being started will be crucial.

**Environmental and energy projects**

Special projects that generate knowledge for future development work are:

New buildings: Through the S2009 project Norwegian Wood, Stavanger municipality has taken the initiative to undertake several low-energy building projects in Stavanger. The follow projects have been realised: Self-build housing in East Jåtten (Energy Class B), apartment blocks, terraced housing and day-care centre (four sections) in Egenes Park (Energy Class A), Marilunden (Energy Class A) and Lierdal Farm (biofuel system). In addition to these, Aibel and Tralfa built low-energy office buildings which were completed in 2007/2008.

Operation and maintenance Pilot project on preventing legionnaire's disease in public buildings. Today hot water is used to prevent legionnaire's disease, and 75,000 litres of hot water is run through the hot water systems every month, but the effect of this in terms of risk of infection is not known. The project looks at the possibility of using special filters for avoiding legionnaire's disease and saving a lot of energy at the same time.

Communication/dissemination/competence-building The exhibition entitled Norwegian Wood: A Laboratory in 2008 presented both building projects and the four quality criteria, including that of energy efficiency. The exhibition opens at the the National Museum of Art, Architecture and Design in Oslo in the beginning of February 2009 and will later tour the country.

### 2.2.3 Challenges

The list below contains a number of challenges which one would like to highlight and which also form the background for some of the main ventures and measures that are proposed:

- The lack of guidelines/regulations from the overall regional plan regarding choice of energy solutions.
- Electricity is still too cheap to encourage the use of other energy sources.
- Lyse has more or less a monopoly on energy supplies to the Stavanger region
- Improve communication between local authorities and Lyse whereby the municipality must make the most of its role as owner, be more active and play a more prominent role in energy planning.
- Low-energy housing/passive housing has such low energy consumption that they are not attractive as customers for district heating plants.
- Waterborne systems are attractive to customers but they are not yet willing to pay extra for low-energy solutions.
- Regulation: Valuable square metreage is lost through having well insulated walls.

- (At present it is too expensive to convert from electrical heating (wall heaters) to waterborne heating and heat pumps/biofuel systems. It does not pay; even if you save on running costs, the initial investment is too expensive).
- Waterborne systems contribute to 'hiding' energy consumption (vanishes from the electricity bill), something which is unfortunate with respect to behaviour/consumption.
- Simply satisfying the new Technical Regulations (TEK) concerning Requirements for Construction Works and Products for Construction Works is a major challenge, particularly in the case of rehabilitation projects. This is particularly due to lack of competence on the part of contractors and craftspeople, among others.
- Poor competence in/knowledge of the energy field among architects, engineers, administrators, contractors, craftspeople and suppliers.
- The topic of energy involves many disciplines. Organisation of and routines for project planning and building processes are currently not incorporated with this in mind (such as in tendering material and cross-disciplinary cooperation during the process).
- The new Technical Regulations apply regardless of location. In the Stavanger region windproofing is more decisive for actual heat loss than is insulation thickness. This is the opposite case in, for example, Røros. Local solutions should therefore be developed which take the local climatic conditions into account.

### 2.2.4 Goals

The goals for the work will be:

1. Develop an integrated regional energy and heating plan in which consumption and energy sources are considered.
2. Reduce energy consumption in existing building masses.
3. Develop passive energy buildings and new buildings with low-energy profiles.
4. Develop the organisation, plans, planning tools and management systems that assure quality, from goals to the daily running and management.
5. Establish good statistics and reporting systems for documentation and communication.
6. Enhance regional competence.

### 2.2.5 Measures

**Develop an integrated regional energy and heating plan in which consumption and energy sources are considered**

The Partial County Plan for Energy and Climate will outline clear goals for plans and measures in Rogaland, setting the same goals for reducing $CO_2$ as those under the Cities of the Future project. The plan will be adopted around the turn of the year 2009/2010. It will provide guidelines for compiling a regional energy and heating plan for the Jæren region. Based on their plans, Sandnes and Stavanger municipalities can request implementation of the regional plan already in 2009 as part of the Cities of the Future project. The objective is to achieve unified thinking, good solutions and agreement on which solutions are best suited to the different parts of the municipalities. The following problems will be discussed there: surplus heat from district heating systems and low-energy buildings, areas for district

heating/cooling, areas for local heating, areas with no infrastructure, which energy sources should be used and other challenges as mentioned. The municipalities can work in parallel on its projects according to its current plans.

**Reduce energy consumption in existing building masses**

- Reduce energy consumption in municipal buildings. Stavanger municipality has set the goal of reducing energy consumption in its existing building mass by 15% by 2015. A designated project manager has been appointed and organisation of the work is already under way. This initiative is aimed at procuring an EOS (energy observation system) for connecting buildings and land space to energy meters. Establish control centres for the technical areas of electronics and automation/building automation and control systems. Strategies for plans and measures will be prepared; one for buildings that are to be rehabilitated and one for new buildings.
- Reduce energy consumption in existing residential and commercial buildings. A long-term goal is to realise the savings potentials that lie in the existing building mass. This requires initiatives in the form of advisors to owners and administrators of residential and commercial buildings, organising such work, and guidance on and money for implementing the measures and systems for measuring the effects. The idea is that it should be possible to compare consumption per $m^2$ between different types of buildings, i.e. dwellings, institutions and commercial buildings, and also between geographical areas and urban districts. The municipalities could then present annual awards for energy efficient buildings and energy-saving districts. The plan is to begin with one to two pilot areas where this will be tried out. Close cooperation with important actors is envisaged in this connection. Along with the municipalities, the regional power company and the Fire and Chimney Sweep Department are important local actors. Enova is an important national actor.
- Establishment of a regional organisation based on the above-mentioned pilot projects. The objective for this organisation is to serve as an advisory body with the financial resources to reduce the consumption of energy in existing buildings and to convert to renewable forms of energy. The organisation, scope and need for resources will be clarified after the pilot project has been completed. In this connection a regional fund with regional resources and resources from Enova are also envisaged.

**Develop passive energy buildings and new buildings with low-energy profiles**

- Evaluate the pilot projects under the Norwegian Wood project with a focus on energy consumption in cooperation with NAL/Ecobox (a self-reliant unit of the National Association of Norwegian Architects) and Innovation Norway. Reporting to Enova so that the low-energy concepts can be further developed/improved.
- Evaluate two to three large commercial buildings with low-energy profiles (e.g. new buildings by Aibel or Tralfa).
- Initiate new projects based on the knowledge gained from the evaluations. In Stavanger's case this may be relevant in new follow-up projects under the Norwegian Wood project, but it will also be relevant for other municipal and private buildings.
- The municipalities have created low-energy profiles for their new buildings and these will now be followed up in new development projects. These will be followed with

documentation of effects and new learning insights in mind. In parallel with this, the municipalities will challenge some local private actors to contribute with new pilot buildings. The experiences gained will provide useful knowledge that can be incorporated as guidelines and provisions in new plans.

**Develop the organisation, plans, planning tools and management systems that assure quality, from goals to the daily running and management**

For a policy for reducing energy consumption and emissions of greenhouse gases to be successful it is important to have an overall and coordinated policy from regional level and down to the individual municipalities and activities. It is hoped that such organisation will be built up through the programme and the subgoals and measures mentioned above.

The municipalities also want to further develop and use more actively quality assurance programmes for development areas where climate change and energy are two of a number of topics, but ones that will ensure that the intentions, from goals to operation and management, actually work. It is therefore important that all phases in the work have adequate tools and competence and really fulfil the ambitions set. This is dependent on competence, planning tools, systems and attitudes all the way through to the consumer. It is hoped that this will be developed. The municipalities also want to start using new tools such as life cycle analyses and greenhouse gas auditing tools as bases for deciding which type of buildings should be built.

**Establish good statistics and reporting systems for documentation and communication**

- The municipalities want to create and develop a register which gives an overview of the energy consumption of all municipal buildings. Status reports for each building, itemised according to function (altogether approximately 800,000 $m^2$ for Stavanger) should be ready in the course of 2009. This register will contain full information on consumption by energy source and system in the buildings. The register can be used for comparing buildings, for measures and for monitoring.
- The municipality will invite the regional energy company to develop statistics on consumption per square metreage of building by different groups of buildings and by energy source. This is a type of statistics that should be included in the national figures (Statistics Norway's statistics) and the municipalities will therefore apply to become a pilot region for such statistics. The regional energy company Lyse, the Norwegian Water Resources and Energy Directorate, Enova, the Norwegian Pollution Control Authority, the Norwegian Association of Local and Regional Authorities and Statistics Norway will all be key actors in developing this type of work. Lyse was the first company in the country to adopt the use of diagrams to show the consumption trends of consumers.
- Stavanger municipality will integrate an Interreg project, ANSWER, as part of the Cities of the Future project. This involves developing a system that will give direct connections between emissions of greenhouse gases hour by hour, day by day, etc in Stavanger. This will in turn be displayed on a large monitor in the city centre, in central meeting places and on a website. The system is planned to be developed in 2009 and installed in 2010.
- The municipalities will also develop management by objectives systems for a sustainable development, which will be incorporated into the municipalities' action plans and

budgets. These will show energy consumption and greenhouse gas emissions by different purpose groups in the same way as financial figures. This work will be undertaken in close cooperation with the Norwegian Association of Local and Regional Authorities.

**Enhance regional competence**

There is a strong need for enhancing competence in energy in buildings. This applies to all levels, from planning to development, operation and management. The programme will include further development of specialist networks and create arenas for exchanges of experience, seminars, field trips, courses, etc. What is perhaps the most important task here is to bring forward model projects – learning by doing. This will be done in cooperation with national, government actors: Husbanken, Enova, SINTEF, Norwegian Building Research Institute, Innovation Norway and the Cities of the Future network.

Local competence communities and collaborative partners would be: the University of Stavanger, the International Research Institute of Stavanger, Lyse, the oil companies (StatoilHydro, Shell, etc), SMI-gruppen, Sweco-Grøner, YIT and others.

## 2.3 Consumption patterns and waste

### 2.3.1 Status/Background

A dramatic reorganisation has been going on since 1990 to achieve better utilisation of waste resources in Norway in both the municipalities and in business and industry. This has led to waste being treated to recycling of materials or used to produce energy to a greater extent.

For several years now, Stavanger and Sandnes municipalities have actively cooperated on developing joint projects for more future-oriented refuse disposal solutions, with increased waste sorting and recycling as primary goals. This has resulted in the region today achieving a material recycling rate for domestic waste of 65% and in most of the remaining 35% of domestic waste being used for energy utilisation – something which gives the region a leading position among the best municipalities in waste management in the country.

In parallel with this, however, an increase in consumption and corresponding increase in waste volumes has been observed, not least in Rogaland. Measures for waste reduction and for preventing the generation of waste have so far had no visible impacts on this trend.

From the perspective of global resources and sustainability, the world's material consumption should be halved in relation to today's level and, from a global principle of equality, the industrialised countries, which today account for 80% of the total material consumption, should reduce their material output by factor 10, i.e. consume only 10% of today's level. Such a trend would also have immediate, positive effects on energy consumption and, consequently, on greenhouse gas emissions. Less material consumption – whether through less consumption or smarter solutions – would be a very effective instrument in the battle against greenhouse gases.

In stark contrast to this perspective, however, are the very limited possibilities which Norwegian municipalities have for doing something with consumption and material input. Hardly any instruments exist at local level for limiting general consumption in society or in manufacturing patterns in industry.

Another obstacle lies in the thinking on the Kyoto mechanisms, which are based on national obligations. A local reduction in consumption would not have a visible impact on the reduction of greenhouse gas emissions in the same place, but this greenhouse gas reduction will as a rule be achieved in totally different parts of the world. A local – or national – input to the consumption pattern would not be "rewarded" with a corresponding reduction in $CO_2$ here at home, but the effect would be accredited to other countries. In other words, from a climate policy perspective there is a lack of a local incentive for local reductions in consumption.

Even inside Norwegian municipalities' traditional areas of responsibility, namely waste management, the power to manage has become smaller rather than greater. In 2004 changes introduced in the Pollution Control Act meant that the municipalities now only had responsibility for domestic waste while all industrial waste was handed over to the free market. Consequently, the municipalities have control of only half of the waste that is generated within their own boundaries.

Despite all these limitations, Sandnes and Stavanger municipalities want to make use of the room for manoeuvre which nevertheless exists at local level for improving waste management and more environmentally friendly consumption.

**Ongoing projects that are relevant:**

**Stavanger:**

- **Local Agenda 21:** This project is a collaborative effort between Stavanger municipality, Grønn By ("Green City") and Grønn Hverdag ("Green Living"). Agenda 21 is a worldwide environmental action plan for the 21st century which was adopted by the UN Conference on Environment and Development in Rio de Janeiro in 1992. Stavanger municipality has been working since 1997 on its local Agenda 21 projects. The target group is the city's inhabitants and in Stavanger the local Agenda 21 work is divided into 12 projects for which consumption reduction is one of the themes More information on the projects is available here (in Norwegian only).
- Furthermore, Stavanger has signed the **Aalborg Charter**, the **Aalborg Commitments** and the **Fredrikstad Declaration**, under which the municipality obligates itself to reach a number of environmental goals in the course of the coming years.
- Political decisions that all municipal enterprises should achieve environmental certification by the end of 2009. This work is well under way.
- Stavanger municipality supports and uses the www.Klimaklubben.no.
- Stavanger municipality supports various consumer campaigns directed at its inhabitants.
    - Mobility Week
    - Folkefrokost ("Communal breakfast"): free organic, local produce and fair trade food.

    - Pre-Christmas shopping-free campaign
    - Cloth nappy campaign – everyone who buys a starter pack of cloth nappies gets a NOK 500 discount.
- Stavanger has an organic food canteen in the town hall and Stokka industrial kitchen delivers organic food to seven retirement and nursing homes.

**Sandnes:**

- **Sunn By ("Healthy City") and Sykkelbyen ("Bike City") Sandnes**
- "Sunn By" is an umbrella term for work done on fulfilling obligations to the World Health Organisation, environmental protection tasks and Local Agenda 21. The Sunn By project has a board of directors, a forum and an administration. There is a separate voluntary centre which coordinates work between volunteers and inhabitants.
- Eco-Lighthouse scheme in day-care centres in Sandnes in cooperation with Grønn Hverdag: Sixteen day-care centres in Sandnes municipality will be certified as Eco-Lighthouse enterprises by the end of 2009.
- Organic canteen in the town hall.

**Joint initiatives:**

**Motivation and awareness-raising, incentives:**

- In connection with Klimaklubben from Grønn Hverdag, people can form their own clubs within companies and municipalities. These set tasks and goals linked to what can be done at work and can have a motivating effect on employees. These tasks are consistent with the general industry requirements in the Eco-Lighthouse scheme www.klimaklubben.no.
- Courses in green rehabilitation of buildings
- Environmental fund for employees → municipal employees can apply for funding to carry out environmentally friendly initiatives at home.
- Green Christmas gifts for employees.

**Awareness-raising initiatives:**

- "Drive green" campaigns in the workplace.
- Active Schoolchildren/Walk to School initiatives in schools.
- More education on sustainable development in schools.
- Campaigns in connection with the *Biff, Bil og Bolig* sustainable consumption initiative.
- Grønt kart ("Green Map") in Sandnes municipality www.greenmap.no, corresponding to the Stavanger version.
- Independent think tanks.

### 2.3.2 Challenges

Within the area of commitment of waste and consumption the possibilities of influence at the local level are, as already mentioned, rather limited. However, Sandnes and Stavanger municipalities can:

- make their own activities as environmentally friendly in terms of resources and waste;
- thereby serve as a good example for inhabitants and local business and industry;

- give inhabitants motivation and incentives for lower consumption;
- optimise waste management with respect to greenhouse gas emissions.

Direct vs. indirect instruments: In some instances measures may be automatically linked to reducing greenhouse gas emissions; e.g. conversion to biogas in municipal vehicles. But in most instances the instruments will have an indirect effect, something which means that the actual environmental impact can be difficult to quantify. This does not mean that these indirect instruments are of no interest – on the contrary. The goal of reducing greenhouse gas emissions presupposes a fundamental change of attitude by the man in the street and in the way in which goods and services are produced. The power of small but good examples can in the long term have a more far-reaching effect than that of collecting an extra ton of methane gas from a discontinued waste disposal site.

Sandnes and Stavanger municipalities do not want to limit the instruments to initiatives that only have environmental impacts within municipal boundary lines, either. On the contrary; a global perspective has been adopted which maintains that it must be possible for positive environmental impacts to occur far beyond Norway's national borders. Again, this leads to problems in terms of being able to measure results, but global problems demand a global perspective – at the local level, too.

### 2.3.3 Measures

The following section describes a number of planned or ongoing measures along the lines of the four areas of activities described above.

*Consumption-conscious municipal activities:*

- Environmental certification of all municipal activities. All municipal divisions and activities should at the least have Eco-Lighthouse certification. Grønt Flagg ("Green Flag") certification for day-care centres and schools. Particular emphasis is placed on an environmentally friendly approach in certification.
- Active use of environmental requirements for municipal procurements: Environmental requirements are emphasized for all public procurements where municipal purchase agreements are used, including expected environmental impact in particular. This also applies to the municipality as construction client.
- Purchase of $CO_2$ emission quotas for selected activities: Emission quotas purchased for some selected types of activities such as official air travel. Quota costs are charged to the individual divisions in order to make environmental costs more visible.
- Introduction of organic food in all municipal canteens/industrial kitchens. All municipal kitchens will significantly increase the use of organically produced food, cf. goals defined in *Økoløftet* (a commitment to use organic food products).
- Pilot projects: *Avfallsminimering i virksomheten* ("Waste Minimisation in Enterprises"): One to three enterprises per municipality are selected and given the challenge of optimising material resources in their daily activities. This will be documented before and after and evaluated.
- Balanced scorecard with resource and environmental indicators: Both Sandness and Stavanger use balanced scorecard systems. These should be supplemented

with some indicators for resource consumption and greenhouse gas emissions linked to individual activities.

*Communicating good municipal examples:*

- Marketing of the municipality as an environmentally conscious buyer: Potential suppliers of goods and services will be made aware of the municipality's clear environmental profile and will be motivated to provide/develop resource-efficient and greenhouse gas-efficient products.
- In-house focus on resource efficiency in the workplace: Sandnes and Stavanger have more than 12,000 municipal employees in all. These represent a considerable means of reaching the rest of the local population. Efforts will therefore be concentrated on in-house information campaigns, incentive campaigns, courses (e.g. environmentally friendly driving), intranet-based second-hand marketplace, in-house competitions and other competitions relating to environmentally friendly use of resources and minimising greenhouse gas emissions.
- Calculated media strategy: Sandnes and Stavanger municipalities will behave (towards inhabitants) as serious actors who make pragmatic and conscious efforts to increase resource and environmental efficiency..

*Incentives towards lower consumption:*

- Intensified promotion of and support for existing individual measures. For example: shopping bags, second-hand markets, recycling points, cloth nappies, home composting and "No to advertising" stickers.
- New individual measures: free advertisements in local newspapers for people who want to give away reusable items; subsidised rental scheme for sturdy tableware, cutlery, cups etc and mobile dishwasher for using at events (instead of using disposable items); mobile phone recycling campaigns with a view to recycling for use in developing countries.
- New municipal management tools. Sandnes and Stavanger municipalities want to have the opportunity available to them at top level to introduce local regulations such as imposing charges on disposable plastic bags, disposable tableware, cups, cutlery, etc and reversing the right to refuse junk mail with respect to unaddressed advertising.
- VAT relief on repair work. As a five-year pilot project, companies located in Sandnes and Stavanger who undertake repairs (on, for example, household electrical items, electronic goods and clothes) will be exempted from VAT for carrying out repairs on goods that are more competitive compared to new purchases. The measure will be evaluated.

*Optimising waste disposal solutions in terms of greenhouse gas emissions:*

- Increase the sorting rate for domestic refuse from 65% to 75%. This will be done by building a fully automated high-technology sorting plant for residual waste. Studies indicate that material recycling is generally more favourable from an environmental perspective than incineration.

- Use of biogas in refuse collection vehicles. Two plants are in the planning stage in the region, for production of biogas from wet organic waste. The gas will be available throughout the region via Lyse's gas network. Refuse collection vehicles fuelled by natural gas can also use biogas and will therefore be climate neutral.
- Environmental audits on all refuse collection measures. Stavanger municipality is in the throes of preparing an environmental audit on domestic refuse collection. The plan is to revise the audit every year and use it as a basis for evaluating new refuse collection measures.
- Buried waste containers for optimum refuse collection logistics. Sandnes and Stavanger will expand the use of buried waste containers. Each container will replace up to 70 plastic containers and will be emptied on demand, i.e. the containers' filling rate is measured automatically and the data is sent to the control centre.
- Local managerial prerogative concerning parts of industrial waste:
  a) In city centres and surrounding areas it would be sensible to organise uniform solutions for refuse collection from both households and business and industry so as to minimise driving by refuse collection vehicle in the streets. Sandnes and Stavanger would like to have the possibility to introduce "compulsory refuse collection" for businesses in defined areas.
  b) Handling of building/construction waste is regulated by national regulations. Sandnes and Stavanger would like to have the authority to actively manage the waste flow of certain waste fractions from building and construction (e.g. gypsum) so as to ensure the establishment of regional recovery schemes where such schemes are not currently in place.

## 2.4 Climate adaptation

### 2.4.1 Status/Background

Norwegian municipalities face major challenges when the climate changes. There is therefore a need for knowledge about vulnerability to climate change and potential strategies for climate adaptation. Since global warming will have different regional and local impacts, the municipalities themselves must possess the competence to formulate local adaptation strategies. The municipalities will therefore need interdisciplinary knowledge about environmental challenges, potential impacts on different sectors and areas of society and possible ways in which the community can address them.

These are some of the impacts which climate changes are expected in have in our part of the country:

- Higher water level (0.75 m – 1 m in the course of this century)
- Milder winters with more precipitation.
- Higher temperatures and long dry periods during the summer season.
- More extreme weather conditions in the form of strong winds and high precipitation intensities.

Extreme weather conditions can lead to an increased risk of flooding of water courses, posing a hazard to infrastructure, buildings, agriculture and the countryside. As a result, sewage treatment plants could be overloaded by flooding in densely built-up areas. When planning

new development areas it will be important to make use of nature's own mechanisms for flood control by, for example, preserving existing swamps and wetlands.

### 2.4.2 Challenges

Climate adaptation will be on the agenda in the coming years, not least in the Cities of the Future project. Before Stavanger and Sandnes can implement good climate adaptation measures they must acquire better competence in climate change. Stavanger municipality will issue invitations to its own climate seminar at the beginning of May 2009. The target group is the so-called "BIS group" (Beredskapsmessige hensyn i samfunnsplanleggingen ("Emergency Preparedness Considerations in Civic Planning")). We have also invited Oslo, Bergen and Trondheim municipalities as well as our neighbouring municipalities. The invited speakers will come from institutions such as CICERO (Center for International Climate and Environmental Research – Oslo), UNIS (University Centre in Svalbard) and the Polar Institute.

In order to be able to prevent and reduce the scope of damage caused by climate changes it is necessary to first identify risk and vulnerability. To be able to do this, good tools are required in order to systemise the work. At present no such tool exists. Stavanger municipality has taken the initiative to carry out a pilot project with a view to outlining a project (working title: "Klima-ROS" ("Climate – Risk and Vulnarability")) for developing an appropriate tool. The work carried out in the Cities of the Future project could contribute to making this project even more relevant.

The work on climate adaptation will require a good system for visualizing and presenting necessary information. The amount of such information is considerable. A good, general system is GIS (Geographical Information System) and digitalised maps. However, GIS must be adapted to suit the purpose, such as symbol usage. Stavanger municipality has already initiated a pilot project with a view to outlining a BIS project (working title: "Klima-GIS"). We expect to be able to run simulations and analyses.

As a participant in the NORADAPT project (Community Adaptation and Vulnerability in Norway), we will be receiving many (23) different climate scenarios in the course of January 2009. The scenarios are prepared by the Norwegian Meteorological Institute and are specific to our district. The scenarios include:

- Temperature
- Precipitation
- Wind
- Wave height
- Sea level

The climate scenario will be the "admission ticket" to the start-up of Klima-ROS.

Stavanger and Sandnes want to organise and prepare to ensure that climate changes cause the least possible damage to health and the environment. Planning and preparation work will at all times be based on the most up-to-date knowledge about climate change and its impacts.

### 2.4.3 Future work

Once the pilot projects (ROS and GIS) have been completed, the climate seminar held and the climate scenarios gathered, the following activities will be started up:

1. Risk assessment Undertake the Klima-ROS project, including:
    a. Climate change vulnerability in the housing sector
    b. Climate change vulnerability in other sectors (industry, oil and gas, etc)
    c. Climate change vulnerability in the water and sewage sector
    d. Climate change vulnerability and health
    e. Climate change vulnerability and critical civic infrastructure
    f. Climate change vulnerability and tourism
    g. Climate change vulnerability and biological diversity
2. Mapping/simulating Undertake the Klima-ROS project.
3. Prepare action plans (based on items 1 and 2).
4. Prepare communication plan, including identification of those measures that will ensure cooperation.
5. Focus on the risk perception.
6. Undertake training, courses and drills.
7. Coordinate climate adaptation work in the region.
8. Mapping of previous incidents.

# 3 Regional strategy

The municipalities will formulate some common principles and guidelines for reducing greenhouse gas emissions. However, if they are to succeed it is also important to achieve a broad mobilization and broad ownership among business and industry, organisation and inhabitants. Everyone has and must take on responsibility. This we can do together.

Geographically speaking, the **urban belt between Sandnes and Stavanger** is the main axis. The urban belt comprises both Sandnes and Stavanger city centres. For Stavanger it is natural to regard the extension to Urban Sjøfront as part of the urban belt's main route network. The Jåttåvågen urban development area is situated in the middle. Measures and pilot projects will be defined for each area of commitment.

The programme will provide opportunities to give the region's competence levels a lift in all the areas that have been mentioned. However, if this is to pay off, it will be important to:

- draw the national actors who we know possess the competence and resources into the projects (such as Enova, Husbanken, Norwegian Building Research Institute, SINTEF, etc);
- engage regional specialist communities including the university, the International Research Institute of Stavanger, business and industry and other organisations as far as possible;
- encourage a good mobilization and participation in the areas/projects that are started and undertaken;
- tie in different projects that are in progress in the Cities of the Future project as far as this is possible; for example the Interreg projects Concerto and ANSWER as mentioned in the introduction.

Good learning happens through projects and evaluation/follow-up of these. Measures and projects can have a stronger effect by implementing several measures within certain well-defined areas. These could be:

- Stavanger city centre with the axis East Stavanger and Urban Sjøfront. Here everything from transport policy to development of Siriskjer (Norwegian Wood), the rising sea level and waste management could be rendered concrete and be documented.
- Hinna Park (Jåttåvågen).
- Sandnes city centre and eastward extension.
- The university area, with a focus on transport solutions, exciting energy projects in the area, establishment of a possible sustainability centre in Ullandhaug and, not least, link the projects to the university's teaching and research communities.

# 4 Relevant ongoing plans

**Important plans and processes in Sandnes:**

- Municipal Master Plan for Sandnes 2007-2020.
- Environmental Plan for Sandnes including a separate energy and climate change strategy
- Master Plan for East Sandnes. Ongoing planning work that should set guidelines for the next revision of the municipal master plan with respect to developing East Sandnes.
- The partnership project and bicycle and walking paths in regional green structure in the west of Sandnes.
- Annual action programme for Bike City Sandnes.

**Important plans in Stavanger:**

- Municipal Master Plan 2006-2021, adopted in 2006.
- Environmental Plan 1997-2009, adopted in 1997.
- Climate and Energy Plan 2002-2010, adopted in 2002.
- All these plans are currently being rolled out and will remain valid until 2025.

**Other relevant plans:**

- Partial County Plan for Urban Development in Jæren.
- Partial County Plan for Energy and Climate, expected to be adopted in 2009.
- Transport Plan for Jæren, currently under revision.
- Jæren Package 2, under development.
- Choice of Concept Study for the Transport Systems in Jæren.
- Municipal Sector Plan for Trunk Road for Bicycles in North Jæren.
- Double track on the Jærbanen Railway Line, construction work ongoing.
- Light/urban railway in Jæren, planning work ongoing.