

EGCA 2018, Umeå, Sweden

1. Climate change: Mitigation & Adaption

The carbon emissions in Sweden and Umeå have decreased gradually since 1999 and constantly remained below the level of 1990. New studies 2013 shows that, complementary to renewable energy initiatives etc, one explanation for this decrease on a national level relates to global changes in the location of production facilities. With that in mind, one major challenge on both national and local level is to decrease emissions from the consumption of goods. Umeå's local work on climate change is presented in this global, European and national context.

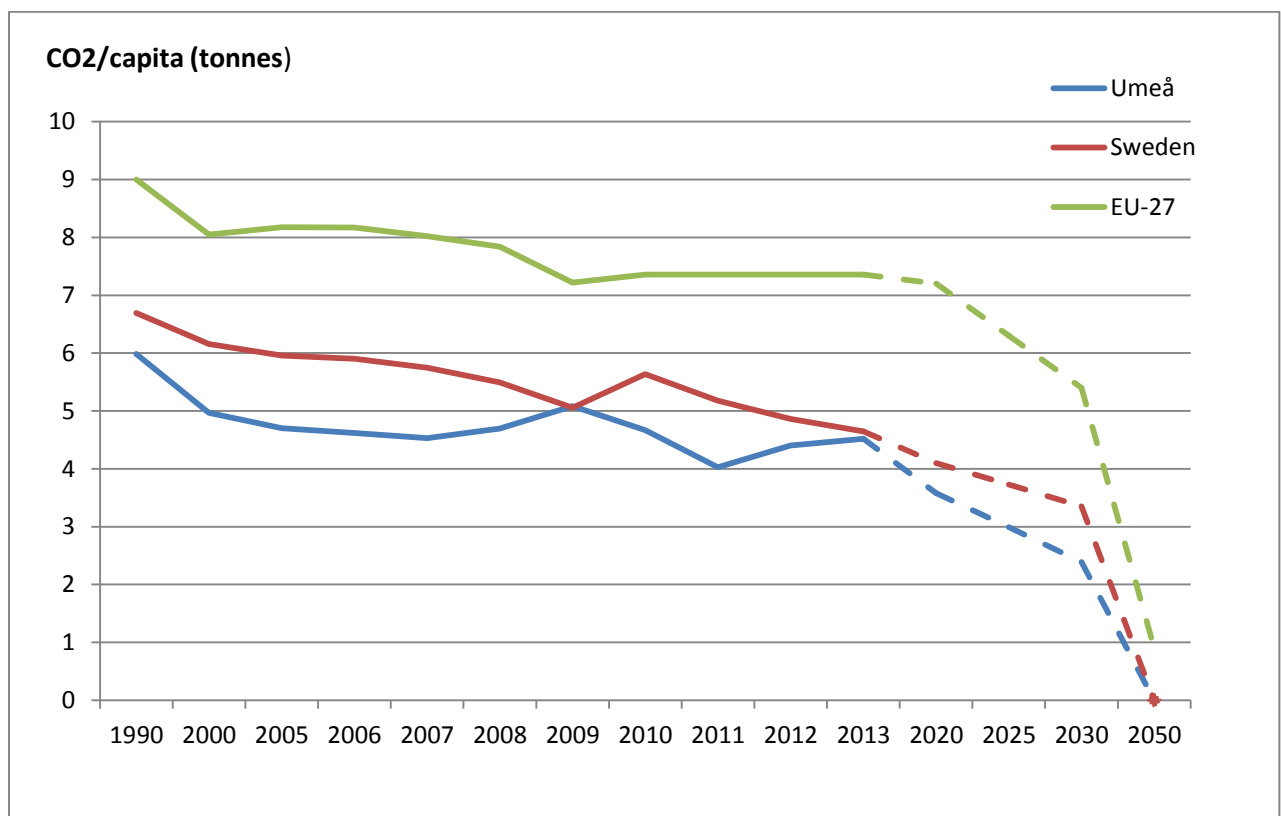


Figure 1A1: Total CO2 emissions from fossil fuels (tonnes)/capita for Europe, Sweden and Umeå from 1990 to 2013 and projected scenarios for future reduction targets. (TCO Rio Ranking Report(Europe), Swedish environmental protection agency(Sweden) and Statistics Sweden(Umeå))

1A Present situation

1A.1, 1A.2 Total CO₂ emissions per year and total CO₂ emissions per capita per year

Total CO₂ emissions from fossil fuels in Umeå 2013 are 534800 tonnes. Umeå, as a fast growing city, have decreased its emissions from 6.0tonnes/capita in 1990 to 4.5tonnes/capita in 2013, a reduction by 25 %¹. In Sweden the average CO₂ emissions/capita in 2013 is approximately 4.7 tonnes CO₂ /capita. (Source: Swedish environmental protection agency).

Umeå has invested strategically in district heating since 1960s and the switch from oil to biofuel in the fuel mix is a key factor behind the reduction of CO₂ emissions and many investments was implemented before 1990. Further on the city's comprehensive plan facilitate for sustainable living within existing city infrastructures such as district heating, electricity and public transport networks.

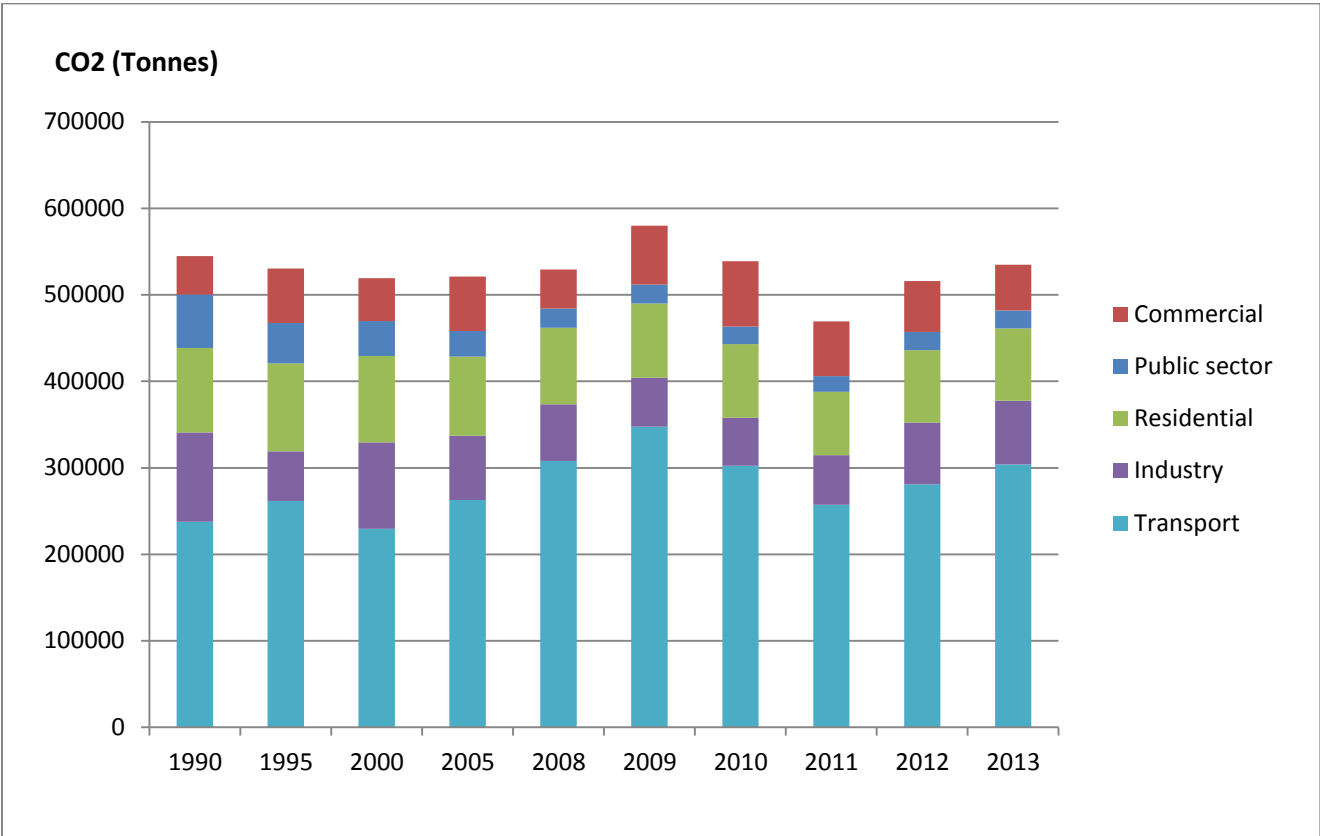


Figure 1A2: Total CO₂ emissions (tonnes) in Umeå for 1990 - 2013 Source: Statistics Sweden

¹ The emission inventory is based on methodology from covenant of mayor and is used together with national guidelines from the organisation "klimatkommunerna". The statistics are collected from Statistic Sweden. The inventory is made by the city's environment and health department.

1A3. CO₂ emissions per capita resulting from fuel used in transports

For Umeå the toughest challenge and the single largest sectorial source of CO₂ emissions is fossil fuels used in transports, see Figure 1A.2. Umeå has reduced its emissions from transports by 4 %, from 2,6 tons/capita in 1990 to 2,5 tonnes/capita in 2013. The increase of sustainable travel opportunities and services, development of more effective car engines and admixture of ethanol in petrol has most likely the biggest impact.

City Reduction Targets	Base Year	Target Year	% Reduction
	1990	2025	50 %
CO ₂ Emissions / capita	t CO₂/inh - Total	Transport t CO₂/inh	Total (less transport) t CO₂/inh
	4,5	2,5	2
Total CO ₂ emissions (tonnes) per year	534800	Tonnes	2013
Total CO ₂ emissions per MWh electricity consumed	0,02 ²	Tonnes/MWh	2013

Table1A3. Indicators and targets for Umeå

1A.4 CO₂ emissions from electricity consumed

Umeå's energy system far exceeds Sweden's national targets in Renewable Energy Directive (2009/28/EU). Umeå is a net exporter of renewable electricity, with an annual production of 2300GWh, far exceeding the 1500GWh electricity used locally. Electricity production in Umeå comes mainly from Stornorrfor's hydropower plant (Sweden's largest, 25% city-owned), complemented by a large expansion of CHP, wind power, and photo-voltaics.

² Carbon emissions from electricity produced in Sweden. Umeå is though net exporter of renewable electricity.

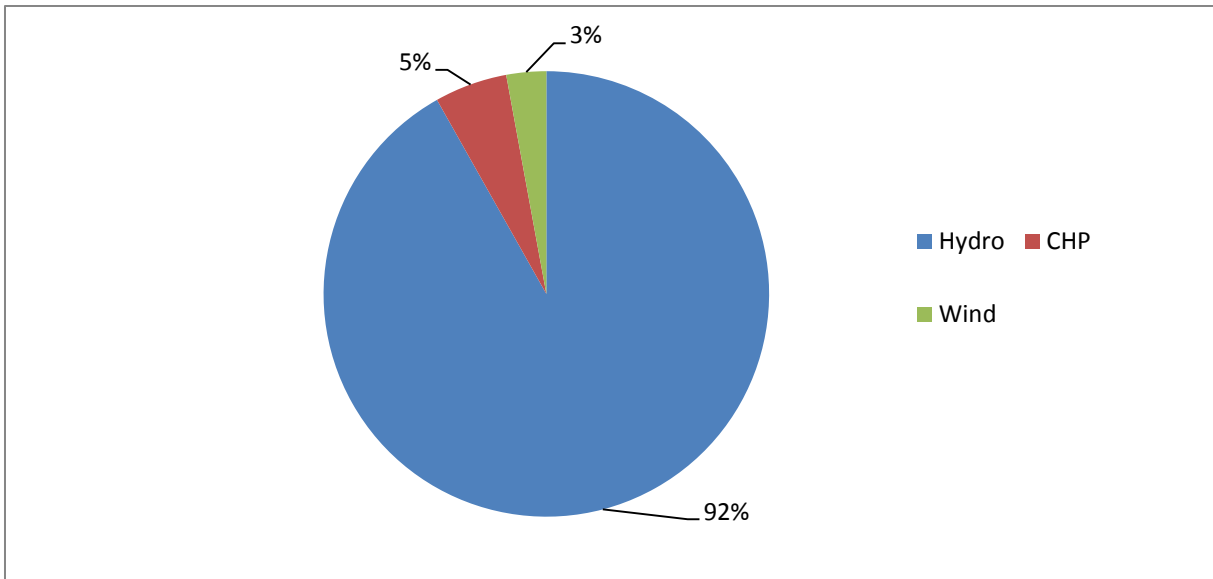


Figure 1A4. Electricity produced in Umeå 2013.

Umeå Energi, the municipality owned energy company, offers 100% renewable electricity to its customers, with Guarantees of origin. About 80 % of Umeå’s residents and companies buy electricity from Umeå Energi, the remainder (20%) buys from other energy companies. Overall Sweden has a large amount of renewable electricity production in its energy mix. The CO₂-emissions from electricity produced in Sweden is approximately 0.02 tonnes CO₂/MWh.

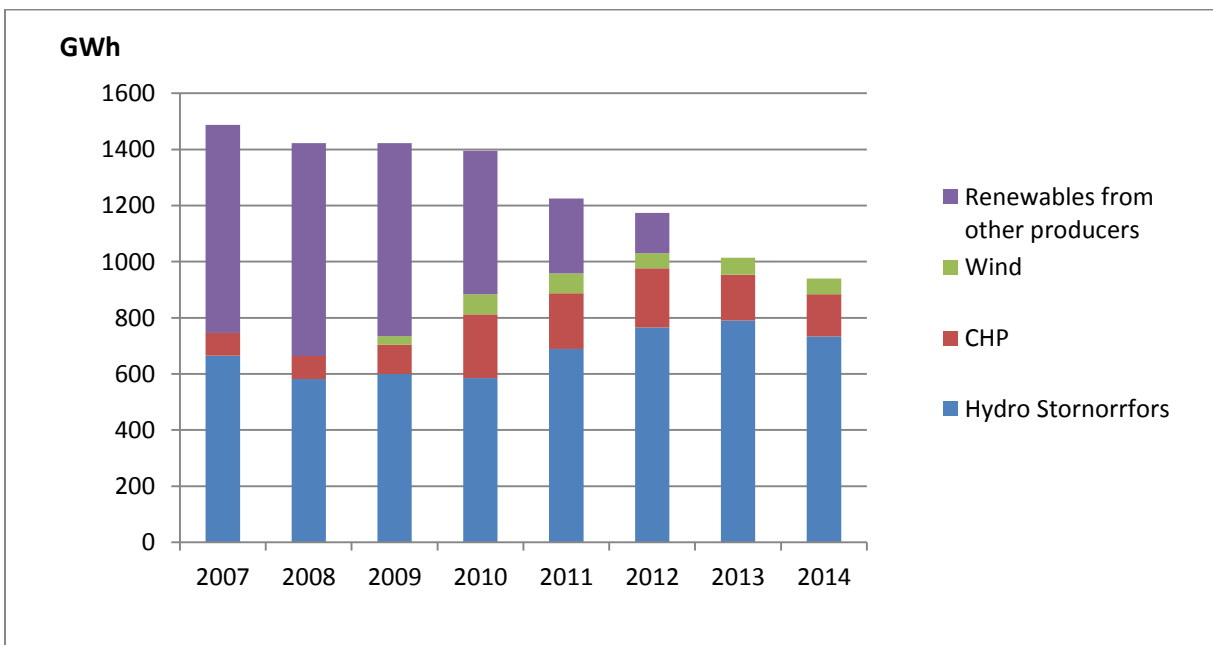


Figure 1A5. Electric power sold by Umeå energi 2007-2014

1A.5 CO₂ emissions reduction targets

Umeå is influenced both by national and European climate policy instruments. Some key overarching strategies and goals for decreased CO₂ emissions in the short and long term include:

European commitments

In 2011 Umeå signed the Covenant of mayors initiative to underline its ambitions with an aim to meet and exceed the European Union 20% CO₂ reduction objective by 2020.

Municipality of Umeå

- Umeå's growth is reached with social, ecological and economic sustainability aiming towards the vision of 200 000 citizens in 2050.
- CO₂-emissions from fossil fuels shall be reduced by 50% in 2025 compared to 1990.
- Target for energy reduction in municipal buildings 20% reduction from 206kWh/m² in 2008 to 165kWh/m² by 2020

Municipality owned companies

- Umeå energi, climate neutral energy system in 2018
- Bostaden, housing company – all self-produced and purchased energy to be renewable by 2016.

Swedish National objectives

- 40% reduction in GHG emission by 2020 compared to 1990.
- 20% reduction in energy use by 2020 compared to 2008.
- 49% renewable energy of total energy by 2020.
- Net zero-emission of GHG on national level by 2050.
- Fossil fuel independent vehicle fleet by 2030.



Figure 1A6. During Earth hour, every year in mars, the citizens can place their personal "leaf of promise" on an Umeå birch tree of promise.

1B Past performance

1B.1 Strategies for adaptation/mitigation

The overall strategy for reaching a sustainable development, including climate change: mitigation and adaptation, is the comprehensive plan. It's complemented with several strategies and action plans; one is the *Action plan for decreasing greenhouse gases*.

Adaptation strategies	Adoption	Summary
Comprehensive plan of Umeå	2011 (monitored by the City council every 4 th year)	The municipality's overall strategy of reaching a sustainable development based on the Aalborg commitments. 6 strategies have been formulated to provide for urban planning and urban development to work strategically with environmental/climate, health, social, economic and cultural issues.
Detailed comprehensive plans of the Ume river and the coast line	2012 and 2013 (monitored by the City council every 4 th year)	The plans are handling issues of climate change, both mitigation and adaptation. Including approach and guidelines for future land use according to high water flows and landslide.
Risk and vulnerability analysis	2012	A tool to determine how small and larger risks in the municipality can be avoided and managed in the best way. The analysis contains a number of categories of risks, including; high water flows, persistent snowstorms, storm and dam breaks.
Action plan for climate change adaptation	2014 (by the County Administrative Board of Västerbotten, regards all municipalities in the county)	Contains assessments of vulnerability, identification of ongoing adaptation work, analysis and identification of the need for adaptation and recommended action. The action plan is divided in 6 different areas; transport, buildings, technical supply, health, business/industry and cultural heritage.

Action plan for fresh water and waste water	Final phase, due to be adopted 2016	A strategy for how and when to connect rural areas houses (with private sewage solution in vulnerable and sensitive areas) to the municipality owned pipelines for water and waste water. To ensure environmental high quality and sustainable development. The action plan is a part of the municipality's work on climate change adaptation.
Dam failure scenarios	County Administrative Board of Västerbotten 2015	Analysis of water levels at dam failure including new climate scenarios
Mitigation strategies	Adoption	Summary
Comprehensive plan of Umeå	2011	See table above.
Action plan for decreasing greenhouse gases	2009 (monitored by the City council once a year)	Contains 28 different mitigation measures in 8 different areas; building, energy efficiency, waste, transports, planning etc. The action plan complements other existing strategies.
Air quality management plan	Updated version 2014/2015 (monitored by the City council once a year)	The program includes actions to reach environmental quality standards for NOx. The strategic work is expected to have an effect on long-term also on CO ₂ emissions. The suggested actions are divided in the areas of urban planning, behavioural impact and transports.
Waste management plan	2010	The action plan for waste management is focusing on management of resources and supports sustainable consumption and production. The main objective is to decrease the amount of waste produced in the region.
Energy plan	2003	Strategy for energy efficiency and increase of renewable energy. Also focusing on reliable supply of energy to the city.

Table 1B1. Local strategies regarding mitigation and adaptation of climate change.

1B.2 Mainstreaming of climate protection measures across municipal services and in key areas of action such as energy efficiency in residential and commercial buildings, public transport and waste management. Highlight any innovative schemes for the built environment such as low carbon zones;

Sustainable Ålidhem – Award winning neighborhood

Although Umeå focuses on systemic city wide approaches, one example of a scheme which could also be seen as a “low carbon zone” is Sustainable Ålidhem. It’s a national pilot with focus on large-scale sustainable renovation of 1960s and 1970s buildings, side-by-side with new low-energy buildings. The overall objective is to transform Ålidhem into a more sustainable neighborhood by halving the energy use in the area with sustained rent levels. About 400 kW of Photo-voltaic cells have been installed on the roofs, which will supply the area with a third of the building electricity. The project is a co-operation between housing company Bostaden and Umeå Energi, the municipality and Umeå University who coordinates an integrated research and monitoring project using open data from the project partners. The project won the Sustainable Energy Europe award in 2013.

Sweden’s largest EPC project

In 2008 an energy performance contracting project was adopted. One of Sweden’s largest energy efficiency projects in existing buildings, in order for Umeå to reach the EED (2012/27/EU) target. The project includes 130 properties and 425.000m² floor area, 50%+ of total area of the municipality owned buildings. Total investment is € 15.2million. The project has a calculated energy reduction of 20% and decreases CO₂-emissions by 5.800ton/year. Energy efficiency actions include: heating systems, ventilation with heat recovery, additional insulation, windows, water saving measures, more efficient lightning etc.

All new buildings owned by the municipality and Bostaden shall not use more energy than 65kWh per m², compared with the national legislation guidelines of 130 kWh per m².

The municipality is also a part in the regional vision to be world leaders of sustainable construction and building maintenance in cold climate by 2020. The vision is developed together with relevant industrial practitioners, public sector and academia, a joint effort to create markets for sustainable buildings in northern Sweden.

Climate neutral district heating

In 2010 a new CHP plant (total investment €110million) was opened using biofuels such as logging residues, wood chips, bark, sawdust and peat. The facility dramatically reduces the amount of oil in the fuel mix down to 1% (2013). The plant also improves the environmental performance as well as security of supply in the overall DH-heat production. Umeå has invested strategically in infrastructure in district heating since the 1960s and today 80% of the buildings in Umeå are connected. Astonishing 99.8% of all municipal buildings and homes are connected to district heating or heated by other renewable energy sources.

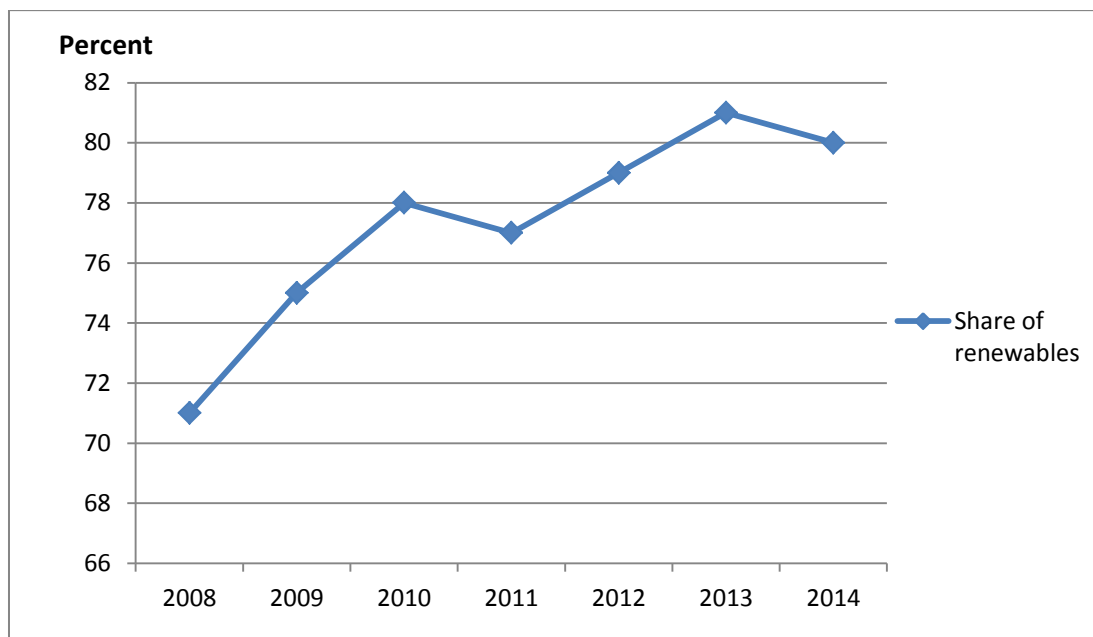


Figure 1B2. Share of renewable energy in the district heating system, 2008-2014 (Umeå energi). The remaining non-renewable energy comes primarily from non-renewable household waste fractions.

Electric transport system

In a growing city, added pressure is put on the transport system. With Umeå's well-developed renewable electricity network, opportunities for electric vehicle transport solutions are excellent. Existing and planned development initiatives include: Designated semi-quick charging places for PEVs are today scattered in car parks and other strategic locations, a dozen more will be operating in the coming year. By 2016, Umeå Energi in cooperation with fuel company OKQ8, will have three quick-charging stations installed. Umeå Energi is also developing a product for those who want to provide the opportunity for their customers to recharge vehicles (e.g. supermarkets, hotels).



Figure 1B3. In 2016 nine new fully electric buses with ultra-fast charging technology will operate the public transport system of Umeå. In October of 2015, Umeå received the CIVITAS Award for Technical Innovation for the initiative.

Umeå is investing in fully-electric buses and ultra-fast charging stations for the local bus system. In the beginning of 2016, a total of nine fully-electric buses will be operating. By 2019, 24 additional buses will be implemented, for a total of 33, or more than 70 percent of the bus fleet. With renewable wind and hydro-electric power available in Umeå the new buses will result in close to zero GHG emissions.

The local bus network covers most of central Umeå, with 95 percent of the city's population living within 500 metres of main lines. Since 2005 local public transport journeys has increased by 57 percent.

Municipality owned vehicle fleet is continuously switching over to electric and hybrid cars. For the moment there are 27 PEV and 7 PHEV which correspond to 6% of the stock.

Sharing Umeå – Circular economy initiatives

“Skjutsgruppen”, a web application for car sharing has been developed by a non-profit car-sharing movement and Be Green Umeå. “Skjutsgruppen” has more than 60 000 active members all over Sweden.

Delbar (Shareable), a website developed in Umeå where people can borrow things from each other, everything from tools to apartments.

Citizens engagement

The City of Umeå has been working with mobility management since 2008. In 2010 EC granted funding for the project "Green Citizens of Europe/Be Green Umeå". For six years the project motivated and helped citizens change their travel behaviour through activities and campaigns. Since the project was successful the City of Umeå has adopted the most effective activities and continues working with mobility management.

Since 2009 property owner Riksbyggen annually offers climate change education to their tenants. The education includes both lectures and visits to interesting initiatives in the city. For the initiative Riksbyggen have been both locally and national awarded.

The city of Umeå provides free energy and climate advice for companies, organizations and citizens. The main purpose is to raise awareness on climate change and give personalized advice on how to switch to more sustainable lifestyles.



Figure 1B4. Campaign ad – “The bicycle battle”. The campaign was coordinated by the City of Umeå in 2015, with 39 cities taking part. Umeå was ranked first of the Swedish participating cities and third on the Best cycling city leaderboard for Europe.

1B.3 International partnerships and mechanisms

Umeå - the progressive role model

The city of Umeå wants to be a progressive role model and as such has applied to the Earth hour city challenge in cooperation with the ICLEI/WWF platform. The city has also coordinated several European-wide projects, current examples include:

- Green citizens of Europe (Life plus, 2010-2015)
- European capital of culture 2014 – With focus on sustainable growth and city development through culture. Supporting the UN10YFP on sustainable consumption.

Umeå has signed several important European commitments, including

- Covenant of Mayors
- CEMR declaration on gender equality between women and men,
 - Umeå pioneers in gender planning and takes consideration of womens more sustainable travel patterns in the development of the city.
- RFSC, Reference framework for sustainable cities
- Aalborg commitment

Umeå is also very active in national and international networks and projects:

Name	Summary
Global sustainable cities network, GSCN	International platform for sharing knowledge and expertise in sustainable city planning. Co-ordinated by the Swedish energy agency. Umeå has been selected as one of five cities to represent Sweden.
CIVITAS Network	Connecting around 200 cities across Europe for “cleaner and better urban transports”, Umeå is currently represented in the Political advisory committee.
Union of Baltic cities	Umeå is currently vice-President in the 100+ city network on sustainable development around the Baltic Sea. Umeå is also coordinating the UBC Gender equality initiative.
National reference group for UN10YFP, United Nations	Umeå is selected as the only municipal representative in the national reference group by national

framework program for sustainable consumption and production.	coordinator the Swedish Environmental Protection Agency.
ICLEI	Umeå is one of over 1,000 city members globally in ICLEI-Local Governments for Sustainability impacting 20 % of the world's population. The network of towns and metropolises is committed to build a sustainable future, including low-carbon, resilient, eco-mobile, biodiverse, resource-efficient and productive, healthy and happy cities, with a green economy and smart infrastructure.
Nordic city network	19 cities in Sweden, Denmark, Norway and Finland. All member cities are growing, have universities and play an important regional role but isn't capitals. Dedicated to developing Nordic Cities as attractive, innovative, sustainable and democratic Knowledge Cities.
Biofuel region	A regional network for the transition to renewable energy by increasing production and infrastructure for biofuels in Northern Sweden. Focusing specially on transport and sustainable fuels based on raw material from forestry.

Table 1B5. National and international networks and projects.

The city's approach to adaptation to the impacts of climate change

The detailed comprehensive plans of the river and the coast line (2012 and 2013) are handling change, both mitigation and adaptation, including approach and guidelines for future land use according to high water flows and landslide.

The action plan for climate change adaptation for the county Västerbotten (adopted 2014) contains assessments of vulnerability, identification of ongoing adaptation work, analysis and identification of the need for adaptation and recommended action. For Umeå, the plan specific points out landslides along the riverside as one consequence of climate changes. The future increase of precipitation and heavy rain is also a challenge to consider, especially regarding future densification of the city.

To identify and improve the adaptive capacity and its vulnerability a Risk and vulnerability analysis was made and adopted by the city council in 2012. It's a tool to determine how small and larger risks in the municipality can be avoided and managed in the best way. The analysis contains several different categories of risks, including; high water flows, persistent snowstorms, storm and dam breaks.

1C Future plans

Future short and long term objectives and proposed approach for further emissions reduction

Comprehensive plan for the sustainable city

Umeå adopted a new comprehensive plan in 2011 focused on strategies for sustainable growth. These strategies aim at building a denser, more land-use and transport efficient city.

The comprehensive plan is aiming to accomplish a shift from car dependency towards sustainable transport modes. The majority of urban growth should be within a 5 kilometres radius and along the public transport system main lines, to make it easier for people to get around by foot, bicycle or public transport. Pedestrians, bicyclists and public transport passengers are prioritized.

The comprehensive plan outlines the development of the city with an outlook to 2050. To reduce climate change impact from the city it is fundamental to implement the outlined strategies.

Climate neutral energy system in 2018

Umeå energi has a strong focus on mitigation of climate change with an overall objective to be climate neutral in 2018, Umeå energi has a market share of approximately 80% of all heating and electricity in Umeå. Prioritized actions and measures are: Energy efficiency measures (peak load management, reducing electricity grid loss), Production of new renewable energy, Carbon offset through CDM (Clean Development Mechanism).



Figure 1C1. In all its new buildings Bostaden charges tenants individually for electricity, cold and hot water, visualizing their consumption (see above) on a display in the apartment.

Climate proofing and adaptation

Expected future changes in Umeå related to climate change is higher temperature and more extreme precipitation. One specific area of climate proofing relates to the Ume River running through the city centre. To prevent flooding and landslides on the river banks, safeguard measures and risk assessments are included in relevant planning processes. There are a number of threats related to climate change, like changed biodiversity and health issues like new risks of infection.

In order to learn more how this effects Umeå there are plans to co-operate with Umeå University which holds international acclaimed expertise in climate changes effect on public health.



Figure 1C2. View over the city and the Ume River that's running through it.

Smart sustainable planning for attractive urban developments

The municipality of Umeå is currently working with a new comprehensive planning model for the near-city village of Röbbäck. The aim is to achieve attractive urban development, adaptation to climate change (minimize risk for flooding in the run off creek and integrating smart storm water management) combined with a high quality living environment. The example integrates sustainable growth both in the existing village and for a large development area planned for 2200 future inhabitants, is based on ambitious dialogue with local residents and will work as a future model for comprehensive planning.

Green parking payoff

“Green parking pay off” is a pilot, based on an agreement between the city, the parking company and property developers. Through the agreement the extent of employee parking on commercial properties can be reduced if property developers provide sustainable mobility services in return (i.e. provide bicycle facilities, connect the property to a carpool and allocate resources to a mobility management fund). Forecasts show the potential of Green parking payoff is a 41 percent shift from car to sustainable transport modes at real estate level.

Planned measures with climate change impact in Umeå (individual budget allocations apply)

In the Comprehensive plan for wind-power the theoretical potential for the Umeå region is 620,000 MWh electricity/year (or 40 % of electricity use in Umeå), several projects under way.

Umeå Energi has created an online map for solar energy potential of every building in the city area, a way for house owners to visualize the potential for producing their own energy from the sun. Estimated potential for PV-installations are 350 000m² roof area and Umeå Energi now offers solar PV-packages for both small houses and larger residential buildings for future expansion of solar power in Umeå.

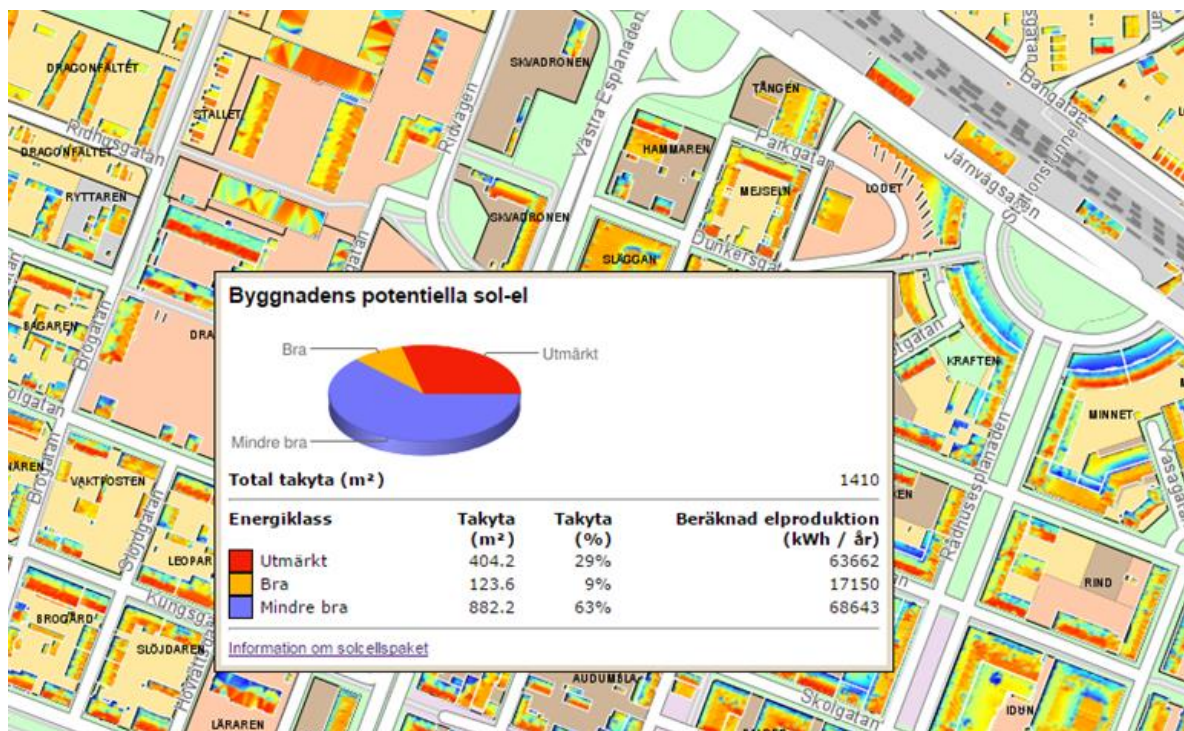


Figure 1C3. An online map for solar energy potential of every building in the city area shows the potential for solar power in the city.

3d-printing of sustainable buildings

A constellation of industrial and academic partners have started a three year journey to build a wooden house using additive manufacturing, coordinated by Umeå University. In 2018 a 3D printed sustainable house will be unveiled.

Smart University City

A public-private partner initiative to develop the university campus area (3 700 inhabitants) focusing on sustainable mobility, integrated infrastructures and low-energy built environment is scheduled for implementation 2016-2020.

The initiative builds on previously agreed political objectives – to establish Umeå as a Northern hub for cleantech and sustainable city solutions. To this end an agreement of collaboration on sustainable urban development and cleantech has been signed with Umeå University, and is now further developed, along with other interested stakeholders.



Figure 1C4. Students are building the northern-most single family houses certified to passive house standard. To meet future energy regulations it's important to educate craftsmen with the know-how and workmanship needed to go the extra mile.

Other measures affecting the climate change impact in the city, e.g.

Since 2010, Umeå has a new stronger rail connection for cargo and passengers via the new Bothnia railway, which cuts hours off rail-transport to southern Sweden and enables rail-commuting in the region. The northern extension of the Bothnia railway to Haparanda is at an advanced planning stage.

Umeå also invests heavily in other regional renewables infrastructure: biogas-production and distribution through the BioFuel region initiative.

A novel environmentally friendly natural gas-ferry connecting to Vasa in Finland plans to be in operation in a couple of years.



Figure 1C5. In 2010 a new train railway was officially inaugurated which makes the commuting from nearby municipalities quicker and easier. Two new traveling centrals have been built to meet up the increasing demand for train travels.

1D References

Umeå comprehensive plan (2011, in Swedish)

<http://www.umea.se/umeakommun/kommunochpolitik/planerochstyrdokument/utvecklingochplanering/stadsplaneringochbyggande/oversiktsplan.4.bbd1b101a585d7048000168114.html>

Action plan for climate change adaptation for Västerbotten county (in Swedish)

<http://www.lansstyrelsen.se/vasterbotten/SiteCollectionDocuments/Sv/miljo-och-klimat/klimat-och-energi/Klimatanpassa%20V%C3%A4sterbotten.pdf>

Swedish greenhouse gas emissions (Swedish Environmental Protection agency)

<http://www.naturvardsverket.se/Sa-mar-miljon/Statistik-A-O/Vaxthusgaser--nationella-utslapp/>

Swedish emissions, compared to global CO2 emissions from 1900 (index=100) to2009
(Source: Carbon dioxide information analysis center)

<http://www.ekonomifakta.se/sv/Fakta/Miljo/Utslapp-internationellt/Koldioxid-per-capita/>

Energy plan for sustainable development (adopted 2003, in Swedish)

<http://www.umea.se/download/18.bbd1b101a585d704800082836/1106584827471/energiplan.pdf>

Action plan for decreasing greenhouse gases in the municipality's own buildings and transports (adopted 2009, In Swedish)

[http://carbonn.org/uploads/tx_carbonndata/atgardsprogramfullm%C3%83%C2%A4ktige2\[1\].pdf](http://carbonn.org/uploads/tx_carbonndata/atgardsprogramfullm%C3%83%C2%A4ktige2[1].pdf)

Air quality action plan (2015, in Swedish)

http://umea.se/download/18.6e56e1f514f42fbe66749e3e/1444743793664/%C3%85tg%C3%A4rdsprogram+f%C3%B6r+luft_2015-10-13.pdf

Comprehensive plan for wind power (in Swedish)

<http://www.umearegionen.se/download/18.1a5fea8a1437b3e6e52889e/1390483495150/oppvindraftlagupplöst.pdf>

Sustainable Ålidhem

<http://www.bostaden.umea.se/hallbara-alidhem> (partly in English)

Swedish strategy for a fossil fuel independent vehicle fleet in 2030 (in Swedish)

<http://www.regeringen.se/rattsdokument/kommittedirektiv/2012/07/dir.-201278/>

Bostaden Miljöfokus programme (Environment focus program)

<http://www.bostaden.umea.se/miljofokus> (only in Swedish)

Umeå energi Environmental information (in Swedish)

<http://www.umeaenergi.se/Om-Umeaa-Energi/Produktion/Produktion-och-Miljoe.ept>

Energy performance contracting project in municipal buildings (in Swedish)

<http://umea.se/umeakommun/kommunochpolitik/planerochstyrdokument/utvecklingochplanering/projekt/pagaendeprojekt/byggaboochmiljo/energiprojektet.4.5708ed531242736fbb80002163.html>

Green parking payoff (in Swedish)

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On-line map for solar energy

https://secure.app.umea.se/mapserver2015/fusion/templates/mapguide/Small_template/index.html?ApplicationDefinition=Library%3a%2f%2fUmeaEnergi%2fSolkarta_sma2.ApplicationDefinition

+project, 3d printing of houses

<http://www.sliperiet.umu.se/en/making-and-thinking-start/plusproject/>

Skjutsgruppen car-sharing system (in Swedish)

<http://skjutsgruppen.nu/>

delbar sharing web site (in Swedish)

<https://www.delbar.se/>

Be Green Umeå – webpage guide to sustainable behaviour (in Swedish)

<http://www.begreenumea.se/>