Helsinki Metropolitan Area Climate Strategy to the Year 2030

Summary

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Controlling climate change as a fundamental element of urban planning and decisions

The Helsinki Metropolitan Area Climate Strategy to the Year 2030 is a report prepared by YTV in association with the cities of Helsinki, Espoo, Vantaa and Kauniainen. The Helsinki Metropolitan Area Council approved this strategy on 14 December 2007. The cities approved the strategy in February – March 2008 for incorporation into their operations. The intention is to continue strategic work through declarations of intent and action programmes concluded between the YTV cities incorporating the principal measures of the cities and their partners in reducing greenhouse gas emissions. A broad range of environmental protection, planning, traffic and public transport specialists from the cities, YTV specialists in traffic, solid waste management and regional development, and representatives of energy companies and interest groups were involved in preparing the strategy.

This summary sets out the climate objectives, operating policies and practical greenhouse gas emission reduction measures of the strategy. The strategy and associated materials may be viewed in full on the YTV website at www.ytv.fi/climatechange.

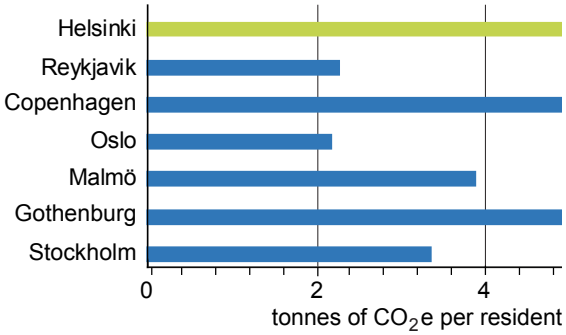


Figure 1. Greenhouse gas emissions per resident in Nordic cities (Lund 2006).

Objectives of the strategy report

The goal of the climate strategy is a common vision and appreciation of operating policies to reduce greenhouse gas emissions in the Helsinki Metropolitan Area. The aim is to ensure that greenhouse gas emission cuts become a consistent element in the objectives imposed by various city agencies for their own operations. The Helsinki Metropolitan Area climate strategy mainly focuses on instruments that fall within the purview of city authorities and can be realised through operations and guidance measures. In addition to work by city authorities, the actions of residents and businesses will have a major impact on emission reductions. The emission reduction effort is a demanding goal that will require broad common resolve. The lively public debate on controlling climate change, together with international conventions, also require cities to work in ways that reduce emissions of greenhouse gases.

The Helsinki Metropolitan Area climate strategy to the year 2030 seeks to reduce the per capita carbon dioxide emissions of the Helsinki Metropolitan Area by 39 per cent of the 1990 level by the year 2030. This will mean reducing per capita emissions by about one third of the 2004 level by the year 2030.

According to the climate strategy vision, the YTV cities must provide their residents with good living conditions in a manner ensuring that use of natural resources is sustainable and climate change can be effectively mitigated. It is possible to reduce both greenhouse gas emissions and the use of natural resources and energy without compromising well-being and competitiveness.

A) Greenhouse gas emission trends in the Helsinki Metropolitan Area and how to influence them

1. Greenhouse gas emission trends

Emissions arising in the Helsinki Metropolitan Area have been studied from the point of view of energy consumption, i.e. the emissions created in generating the energy consumed in the region have been calculated. Emissions and emission trends are estimated per resident. The aim was to identify those choices that affect the energy consumption of residents and that have a major impact on greenhouse gas emissions.

Calculated on the basis of consumption, the total greenhouse gas emissions of the Helsinki Metropolitan Area were about 6.2 million tCO_2e in 2004, which was about 8 per cent of emissions for the whole of Finland. This works out at about six tonnes of carbon dioxide equivalent per resident annually. A large portion, 43 per cent, of emissions in the Helsinki Metropolitan Area is due to heating buildings. Electricity consumption causes 28 per cent and transport accounts for nearly one quarter of emissions. Fuel consumption by industry and machinery and treatment of solid waste and wastewater together account for only five per cent of total emissions.

The most rapid growth in emissions has occurred in electricity consumption. Emissions from transport have also been growing in recent years. Emissions from solid waste management, on the other hand, have fallen significantly due to efficient collection of landfill gases. Emissions from district heating have fallen substantially, mainly as a result of on-going conversion by Helsinki Energy from the use of coal to natural gas in generating thermal power. As there have been no significant changes in productions-form in the present decade, however, the favourable trend in emissions has come to an end. The growth in district heating emissions over the period from 2000 to 2004 is the result of connecting industrial plants and other separately heated buildings to the district heating network. However, converting to district heating reduces per capita greenhouse gas emissions. (see Figure 2)

Emission growth from electricity consumption has been rapid. Emission reductions achieved in district heating generation and solid waste management have been able to compensate for this, however, and per capita emissions in the Helsinki Metropolitan Area have fallen by ten per cent since 1990. (see Table 1)

Emissions in the Helsinki Metropolitan Area have begun rising again in recent years, however, and total emissions were 12 per cent higher in 2004 than in the year 2000. Greenhouse gas emissions are also set to continue rising in the medium term

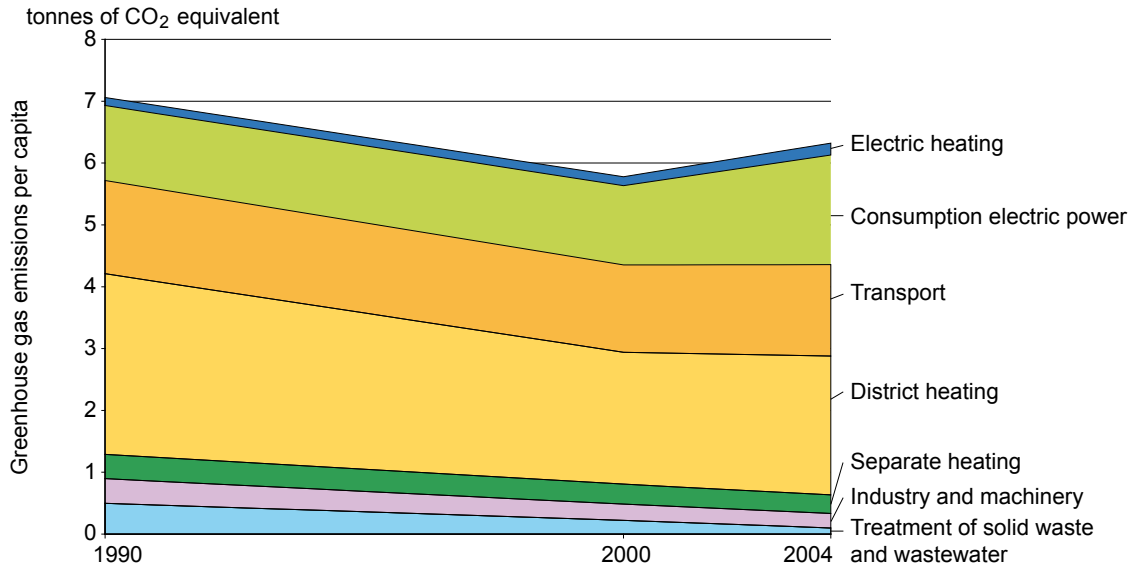


Figure 2. Emission trends in the Helsinki Metropolitan Area by form of energy consumption in 1990–2004.

unless new and effective emission reduction measures are taken. Homes remain the largest source of emissions, but services are almost equally important. Industry accounts for only about eight per cent of emissions (see Figure 3).

2. Trend forecast to the year 2030

If no special measures are taken, it is estimated that overall greenhouse gas emissions of the Helsinki Metropolitan Area in the year 2030 will remain at roughly the 2004 level (see Figure 4). The YTV trend calculation assumes that the trend will continue in a broadly similar manner to the period 1990 to 2004 with respect to the principal variables affecting energy consumption, while emissions from energy generation allow for international conventions and the emission reductions that they require.

The trend calculation also allows for current legislation, and for the energy efficiency requirements that this imposes on new buildings. These requirements are assumed to become even more exacting, resulting in a fall in specific heating consumption. An improvement in the energy efficiency of the existing building stock is also forecast as energy prices increase and legislation becomes more stringent. The current distribution of heating modes for buildings is expected to continue, with district heating remaining the main choice. Electric heating will continue to be an important form of heating for smaller buildings, and there will be little or no conversion to other energy sources in old buildings with oil-fired heating systems. The specific emissions of district heating are expected to fall significantly due to international agreements such as the Kyoto Protocol and as a result of internal emissions trading system within the European Union.

Table 1. Total and per capita greenhouse gas emissions in the Helsinki Metropolitan Area in 1990, 2000 and 2004.

	Total emissions $mtCO_2e$	Per capita emissions tCO_2e
1990	5,8	7,06
2000	5,5	5,78
2004	6,2	6,33
Change 1990–2004	*+7 %*	*-10 %*

Electricity consumption is forecast to grow at its present rate regardless of electricity price increases. However, the specific emissions of electricity generation are expected to fall significantly as a result of international conventions.

Growth in emissions will largely be checked by a fall in the specific emissions of energy generating and consumption in buildings and construction. Emissions from waste treatment will also fall. Emissions in other sectors will either remain stable or increase. The trend calculation indicates that traffic emissions will show the greatest proportional rise. This is the only sector in which both overall emissions and per capita emissions will increase. Growth in electricity consumption is also a very disturbing trend, especially in the event that emissions from electric power generation fail to comply with European Union targets.

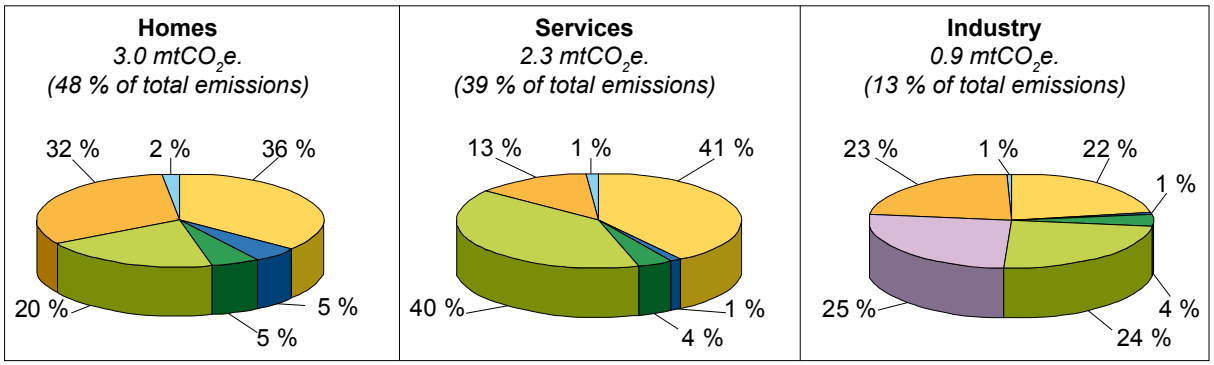


Figure 3. Distribution of total greenhouse gas emissions of the Helsinki Metropolitan Area by energy consumer and form of consumption in 2004.

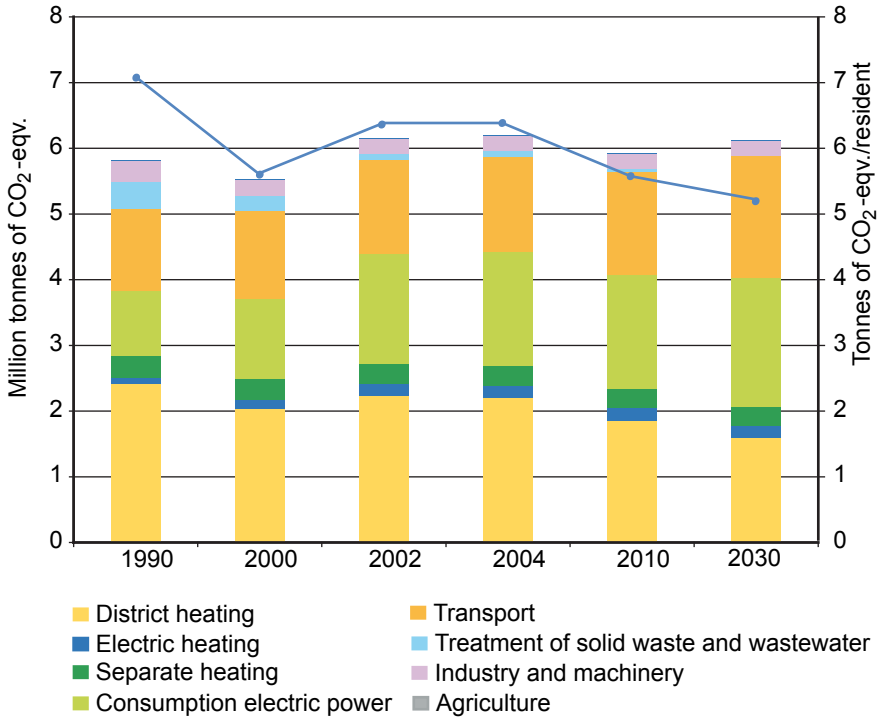


Figure 4. Trend calculations for changes in Helsinki Metropolitan Area emissions to the years 2010 and 2030, and comparability figures by energy form for the period 1990–2004. The columns describe overall emissions and the line describes calculated per capita emissions.

3. Prospects for the cities to encourage emission reductions

3.1 Transport

Transport is the third largest source of emissions in the Helsinki Metropolitan Area, causing 20 per cent of all emissions. Besides significant greenhouse gas emissions, increased traffic has other substantial drawbacks such as traffic congestion, impaired air quality, increased noise levels and deteriorating road safety.

Passenger transportation clearly causes the largest share of traffic emissions, at nearly 65 per cent. The remaining 35 per cent of emissions arise from goods transportation. Per capita growth in overall emissions from traffic was minimal over the period from 1990 to 2004 despite a rapid increase in traffic volumes. This was due to a fall in the specific energy consumption of motor vehicles. However, this trend has come to an end in recent years. The specific emissions of motor vehicles depend on fuel type and fuel consumption.

The energy consumption and greenhouse gas emissions of various forms of transport differ substantially. Generally speaking public transport is a more environmental alternative than private motoring. For example, the unit fuel consumption of private passenger motor vehicles is thirteen times higher than that of the metro railway system per passenger. The energy consumption rates for buses, trams and commuter trains fall between these levels (see Figure 7). The unit fuel consumption per passenger of waterborne and air travel is higher than that of travel by passenger motor vehicle.

Promoting public transport remains one of the most effective ways of influencing emissions from transport. The popularity of public transport may be influenced significantly by economic guidance and planning. Low ticket prices, rapid transport connections, frequent services and high quality standards are the most important factors for the competitiveness of public transport.

Until 1995 journeys by public transport rose at a clearly slower rate than journeys by private passenger motor vehicle, and the relative popularity of public transport has fallen continually (see Figure 5). However, this fall levelled off at 39 per cent for a brief period when public transport prices were controlled and improvements were made in the public transport system. A large number of dwellings were

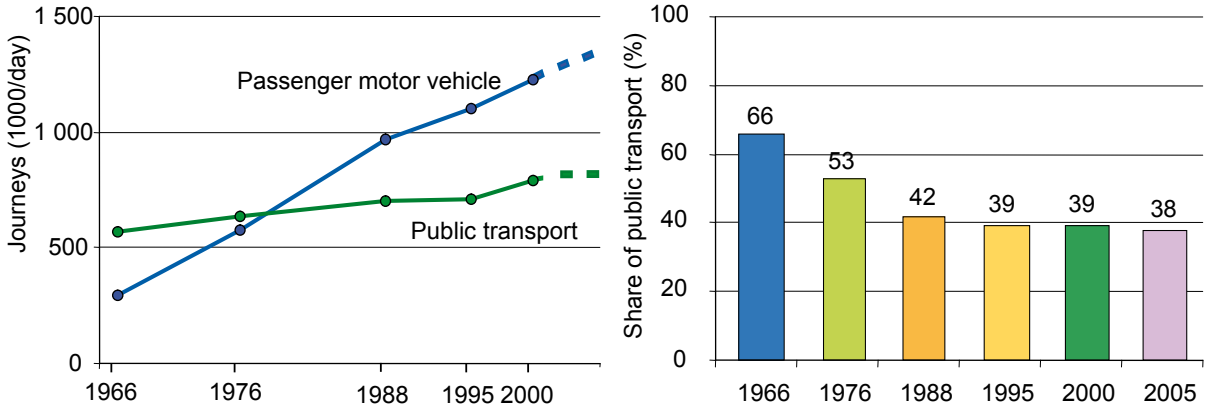


Figure 5. Trends in number and shares of passenger motor vehicle and public transport journeys from 1966 to 2000 in the Helsinki Metropolitan Area and trends in popularity of public transport to 2005 (YTV 2007).

also constructed in the centre of Helsinki along good public transport connections and near to workplaces. The popularity of public transport has begun falling again in recent years and was about 38 per cent in 2005. Traffic volumes have nevertheless remained stable in the city centre since 1990, with growth occurring in Espoo and Vantaa and in the outlying regions of Helsinki.

About 40 per cent of all journeys are made by public transport, but these cause only about ten per cent of greenhouse gas emissions from transportation. The private passenger motor vehicles used for 60 per cent of journeys account for more than 50 per cent of such emissions. Every percentage point rise in the popularity of public transport would therefore immediately cut greenhouse gas emissions from transport by about 0.6 per cent. With the consequent fall in traffic congestion, the actual impact is somewhat greater than this. Encouraging use of public transport thus enables the greatest and swiftest reductions in traffic emissions.

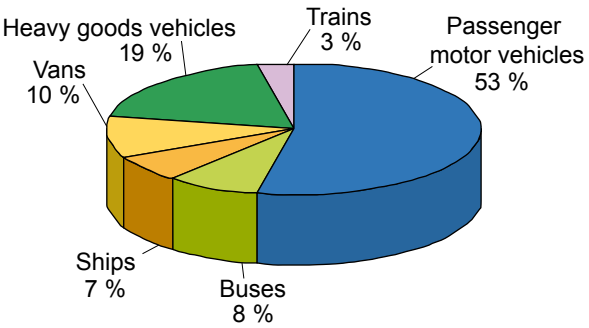
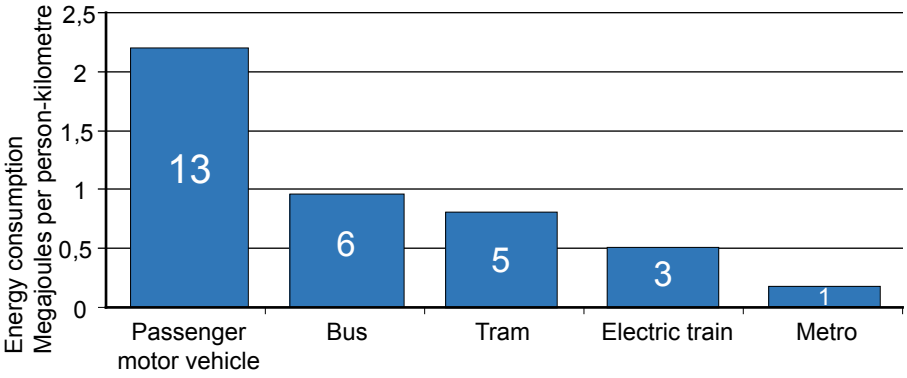


Figure 6. Distribution of greenhouse gas emissions from transport by type of vehicle in the Helsinki Metropolitan Area in 2004 (excluding air traffic).

The habitation structure of the Helsinki region has already spread over a broad area with increases in employee commuting and other transportation consequences. The Helsinki Metropolitan Area transport system review (PLJ) estimates that traffic volumes will rise by 45 per cent by the year 2030, with a corresponding increase of 25 per cent in greenhouse gas emissions. Traffic volumes are forecast to grow by even more than this elsewhere in the Uusimaa region, with a 60 per cent rise in traffic resulting in 30 per cent higher greenhouse gas emissions. While it would be desirable to reduce the travel needs of residents in terms of overall mileage, many urban development factors tend to have the opposite effect. Good urban planning can also effectively encourage people to walk or cycle.

National taxation policy can guide the choice of motor vehicles towards low-emission alternatives. By making greenhouse gas emissions a criterion of competitive tendering it is likewise possible for the cities to guide their own procurement towards the purchase of low-emission motor vehicles for use by city agencies and their use in transportation services purchased by the cities. It is also important for the cities to provide information on alternative modes of transportation in an optimally accessible and timely manner that most effectively meets the needs of residents.

The Port of Helsinki is used by 55 per cent of Finland's passenger transportation, 71 per cent of heavy goods vehicle traffic, 30 per cent of container traffic, and nearly one quarter of all unit freight



5 Energy consumption per person-kilometre at average load compared to metro transportation.

Figure 7. Energy consumption per person-kilometre using various vehicles (VTT, HKL 2006).

haulage. The total carbon dioxide emissions of passenger vessels and freighters calling at the Port of Helsinki in 2005 amounted to approximately 110,000 tCO_2e. An increase in shipping volumes has also resulted in a rise of 60 per cent in carbon dioxide emissions from this source in the Helsinki Metropolitan Area since 1990.

Greenhouse gas emissions from shipping are not covered by the Kyoto Protocol or European Union emissions trading system. No substantial international or national measures have yet been initiated to control carbon dioxide emissions from ships. Indeed it has been calculated that restrictions imposed on conventional emissions of shipping, such as sulphur dioxide and nitrogen oxides, have actually increased global carbon dioxide emissions.

The airports of the Helsinki Metropolitan Area, principally Helsinki-Vantaa International Airport, convey about 75 per cent of Finland's total air passenger traffic. Air traffic passenger volumes increased by 48 per cent between 1996 and 2006. The number of passengers carried on international flights has seen particularly substantial growth (80 per cent). Carbon dioxide emissions have risen at a slower rate, however, with technological progress reducing specific energy consumption by as much as 70 per cent over the last 40 years.

The total carbon dioxide emissions of air traffic in the Helsinki Metropolitan Area amounted to 165,000 tonnes in 2006, arising from fuel consumption of just under 52,000 tonnes, which represented about ten per cent of overall emissions from transport. This figure also includes emissions from Finavia ground transportation vehicles. The carbon dioxide emissions of air traffic in the Helsinki Metropolitan Area increased by 58 per cent between 1990 and 2004.

Air traffic emissions will be reduced in future chiefly through technological progress, optimised use of air space and emissions trading. The European Commission has prepared legislation to phase air traffic into fixed source emissions trading from the beginning of 2011.

3.2 Land use

Planning of land use and settlement structure is very important from the point of view of greenhouse gas emissions, because the effects of construction extend far into the future. The location of dwellings, workplaces and services affects the growth of traffic and access to district heating, thereby influencing greenhouse gas emissions.

The growth of the Helsinki Metropolitan Area in recent decades and the spread of settlement structures have resulted, in particular, in a rapid increase in passenger motor vehicle traffic and a fall in the popularity of public transport. Work-related journeys within the region have extended and employees are also commuting over longer distances to work in the Helsinki Metropolitan Area. Leisure time traffic has also increased substantially. This dispersed regional structure is manifest in a high rate of fuel use for transportation. The Helsinki Metropolitan Area and the City of Helsinki differ in this respect from other European cities, and find their main parallel in the automobile cities of the USA (see Figure 8).

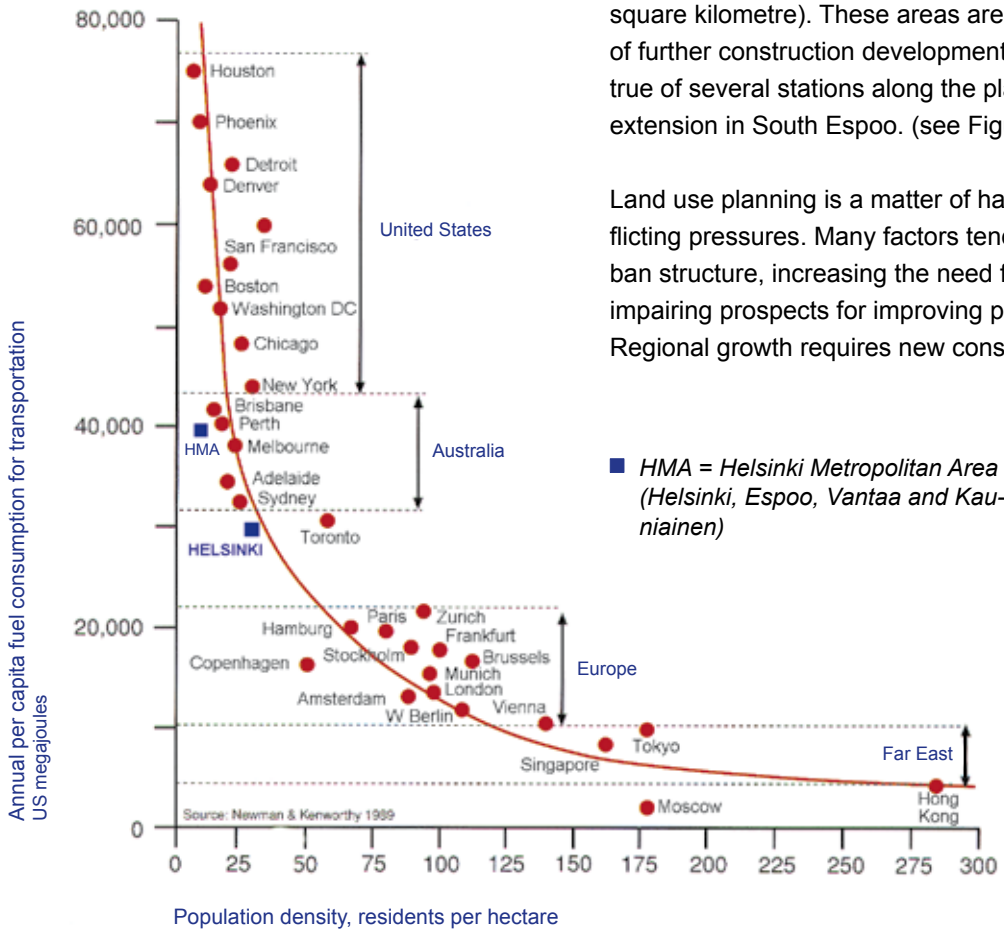
By European standards, construction in the Helsinki Metropolitan Area is dispersed over a wide area. The floor area ratio for built areas, i.e. the ratio of built floor area to ground area, averages 0.25 for the entire region. Most of the built areas of the Helsinki Metropolitan Area clearly fall below this average figure for area efficiency. The most concentrated structure is limited to the centre of Helsinki. (see Figure 9)

Much of the currently developed area is in places that are highly advantageous for access to public transport. Three out of four residents of the region live and more than four-fifths work within the “public transport city”. This is the area lying within a 400-metre walking distance of the nearest public transport stop providing at least 70 services to the centre of Helsinki and at least 50 connections to the nearest district centre every day.

Just under one half (44 per cent) of the region’s population lives, and 54 per cent of workplaces are located, less than one kilometre away from the nearest train or metro station. Viewed by the strictest criteria, the user potential of many public transport station areas is underutilised. Full use would require more than 20,000 residents and jobs per square kilometre within a 600-metre radius of a station. (see Figure 10)

The residential density in the vicinity of a large proportion of stations is adequate from the point of view of the user potential of public transport, however (5,000–10,000 residents and jobs per square kilometre). This density may be classified as “good” in the vicinity of four stations, meaning that it lies between 10,000 and 20,000 residents and workplaces per square kilometre. At 17 stations the residential and workplace concentration is either “inadequate” or “wholly inadequate” from the point of view of public transport profitability (density of less than 5,000 residents and workplaces per square kilometre). These areas are clearly in need of further construction development. This also holds true of several stations along the planned metro extension in South Espoo. (see Figure 10)

Land use planning is a matter of harmonising conflicting pressures. Many factors tend to disperse urban structure, increasing the need for transport and impairing prospects for improving public transport. Regional growth requires new construction areas,



■ *HMA = Helsinki Metropolitan Area (Helsinki, Espoo, Vantaa and Kauniainen)*

Sources: Towards an Urban Renaissance, Urban Task Force 1999 and YTV

Figure 8. Annual per capita fuel consumption for transportation and population density.

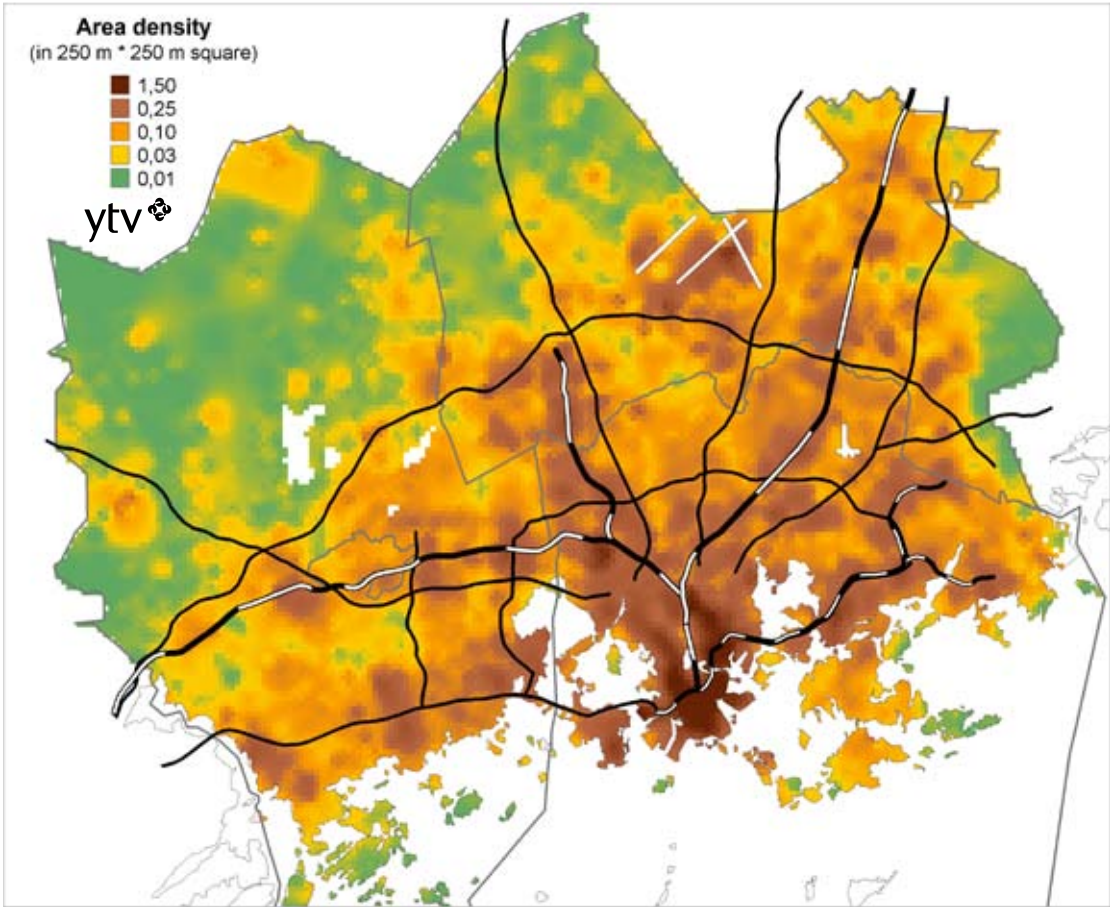


Figure 9. Area efficiency in built areas of the Helsinki Metropolitan Area (YTV).

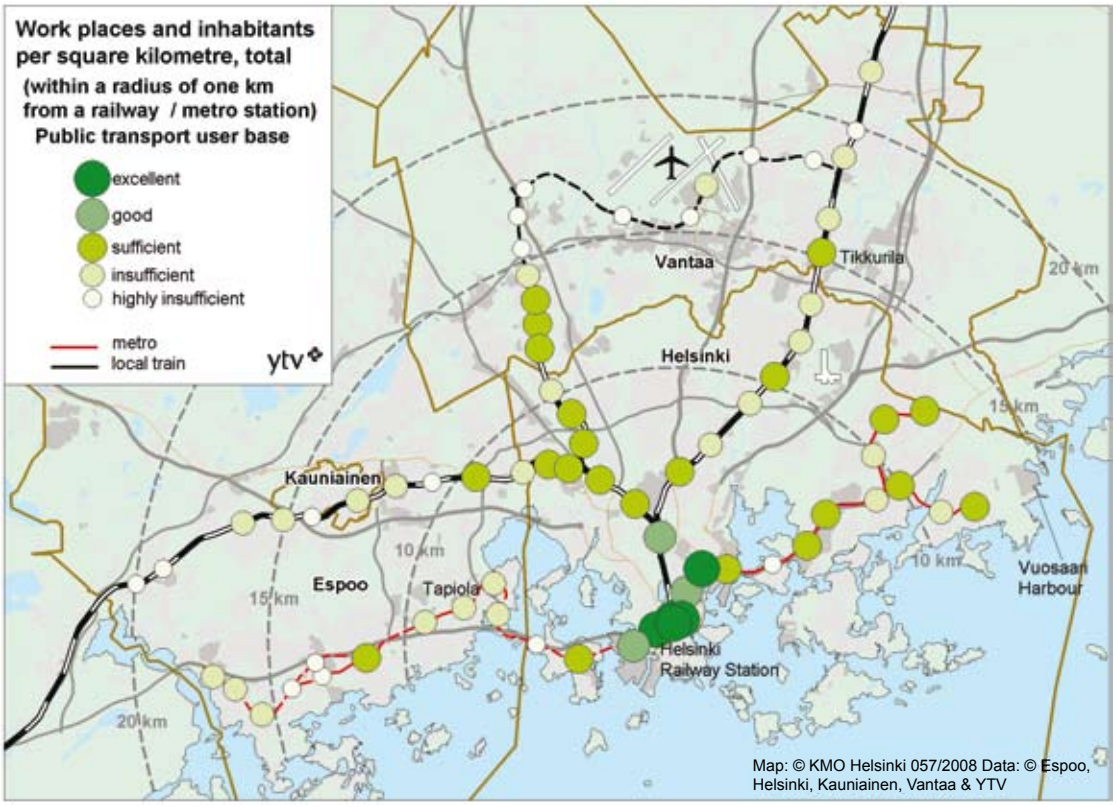


Figure 10. User potential of public transport within a 600-metre radius of stations. Assessed by calculated population (2007) and workplace (2004) densities (YTV 2007).

while demand for smaller buildings increases dispersed construction and the need for planning detached house residential areas. The concentration of retail trading in major hypermarkets increases traffic. Ageing of the population and growth in the number of small families and sole occupants also affect the location and type of new dwellings, conditions for mobility, and the demand for and accessibility of services.

The need to cut greenhouse gas emissions requires a reduction in traffic growth and a shift away from passenger motor vehicle use towards non-motorised transportation and use of public transport. The principal challenge for regional land use planning and competitiveness is that of how to ensure regional growth and diversity in dwelling construction, provide small building areas that are readily accessible by public transport and, in particular, discourage growth in passenger motor vehicle traffic.

3.3 Electricity consumption

With a 31 per cent share, electricity consumption (including electric power for heating) is an important cause of emissions in the Helsinki Metropolitan Area. Electricity consumption is also increasing rapidly, and is one of the greatest obstacles to controlling greenhouse gas emissions. For this reason electricity consumption deserves particularly close attention, even though the cities have rather limited powers to influence electricity consumption directly other than in their own operations. Planning and public information services will be the primary means of pressing for improvements in the energy efficiency of heating and cooling systems in buildings.

Figure 11 shows the distribution of electricity consumption by operating sector and the proportion of electric heating in this consumption. Consumption electric power here denotes all electricity consumption apart from electric power used for heating. Per capita electricity consumption in the Helsinki Metropolitan Area has risen at a rate of about one per cent annually, which matches the average for Finland as a whole. Services have an exceptionally large impact on electricity consumption in the Helsinki Metropolitan Area. The proportion of electricity used for heating homes is also significant.

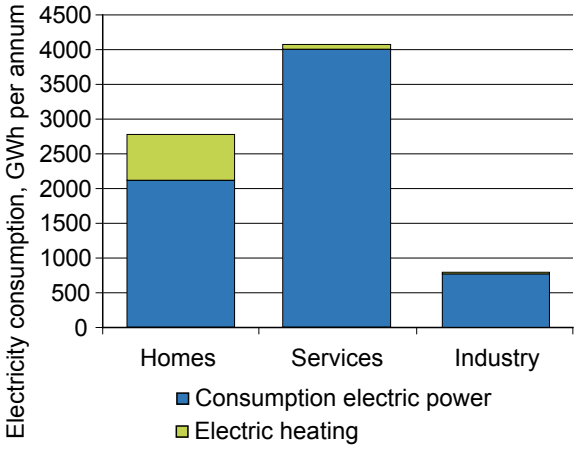


Figure 11. Distribution in use of consumption electric power and electric heating by energy user in the Helsinki Metropolitan Area in 2004.

Electricity consumption has grown rapidly in both services and homes. The growth in electricity consumption by services arises from such factors as the spread of office automation, and particularly computers, which continued at a rapid rate throughout the early 1990s. High consumption electrically operated cooling systems are also becoming more widespread. Extended occupation of buildings is an important factor increasing consumption in service facilities such as schools and commercial areas, with consequent increased use of heating energy and electric power. On the other hand versatile use of existing public buildings is eco-efficient if this can obviate the need for constructing new facilities. Electric heating is clearly the largest factor increasing electricity consumption in homes.

District cooling is a permanent solution comparable to heating systems. Conversion to district cooling may mainly be promoted by the same means as are used to guide the choice of heating solutions for buildings and the energy efficiency of buildings.

The private and public service sectors consume 60 per cent of all electric power in Helsinki. By contrast, homes in Espoo are the largest single consumer group. Consumption by homes and private services is roughly equal in Vantaa, where industry accounts for about one fifth of consumption: a proportion that is twice that of industry in Espoo and Helsinki. There has been no substantial change in the distribution of electricity consumption since 1990. The differences in patterns of electricity

consumption between the cities are surprisingly large and not readily explicable. The reasons for growth in electricity consumption and the means of influencing this will certainly have to be investigated in order for appropriate steps to be taken.

Using the opportunities provided by educational services and in other ways, local authority public information functions can improve the awareness of regional residents of ways of making electricity consumption more efficient and their appreciation of the importance of this for climate change. A city may use competitive tendering to guide its own procurement in a more energy efficient direction by making the energy consumption of appliances one criterion for selecting the winning bid, and by assigning a higher priority to the operating costs of appliances. In construction and property development a city may require careful consideration of energy efficiency at the planning stage and inclusion of operating costs as a criterion in bid selection. Monitoring of consumption must be improved so that users of electric power pay according to their actual consumption.

3.4 Heating of buildings

Heating of buildings causes more than 40 per cent of greenhouse gas emissions in the Helsinki Metropolitan Area. The emissions of electrically heated buildings and of buildings with separate individual heating systems per heating energy unit consumed are clearly higher than those of buildings that use district heating. Most heating emissions arise from district heating, which is used widely in the Helsinki Metropolitan Area (see Table 2). Electric heating and on-site boilers are each used for heating about 10 per cent of total built floor space.

Even though district heating is mainly provided through efficient cogeneration of heat and electric power, the emissions caused by buildings with district heating per unit of built floor space are not really lower than in buildings heated by electric power or oil-fired systems. This is largely due to the clearly lower specific energy consumption of small buildings with electrical or oil-fired heating compared to that of apartments blocks connected to district heating networks. Most small buildings with electrical or oil-fired heating were constructed in recent decades, which explains their lower heat consumption compared to the apartment building stock. On the other hand, the lower emissions of district heating compared to other forms of heating are most clearly manifest in new constructions.

Table 2 shows the shares of various forms of heating in the cities and throughout the Helsinki Metropolitan Area. There have been no major changes in this distribution since 1990. The share of district heating has increased by a few per cent in Espoo and Vantaa. There has been a slight increase in the proportion of electrical heating in all of the cities, as small buildings were largely constructed with electrical heating over the period from 1990 to 2004.

A substantial fall in specific heat consumption occurred in all of the cities during this period. The heat consumption of homes per resident also fell to some extent, even though residential density decreased by about ten per cent at the same time. The most important factor in overall consumption is the growth in heat consumption of residential buildings, as these buildings account for more than half of all consumption. Services and the public sector account for over one third and industry for about ten per cent of heating consumption.

There has been a clear rise in heat consumption per job in services. The specific consumption of buildings has fallen, however, and so the growth in consumption is due to growth in built space.

Table 2. Sources of heating for buildings in the Helsinki Metropolitan Area in 2006 by floor space.

	Helsinki Metropolitan Area	Helsinki	Espoo and Kauniainen	Vantaa
District heating	78 %	86 %	67 %	68 %
Electricity	10 %	6 %	17 %	17 %
Separate heating	9 %	6 %	15 %	13 %
Unknown	2 %	3 %	2 %	2 %

Most separately heated buildings have oil-fired heating systems. There are about 6,500 of these buildings in Helsinki and in Espoo, and about 1,000 fewer in Vantaa. Growth in the number of buildings with oil-fired heating was fairly small over the period from 1990 to 2004, amounting to only a few hundred buildings in all. This means that there are now about twenty thousand oil-fired boilers in the Helsinki Metropolitan Area causing about five per cent of the region's greenhouse gas emissions. Most of these boilers will reach the end of their usable lives over the next 20 years. Conversion to renewable energy or connection to a district heating network could reduce these emissions significantly.

The energy efficiency of new buildings involves major potential for cost-effective emission reduction. According to a study by VTT (Technical Research Centre of Finland), consumption of heating energy in new apartment buildings could be reduced by 70 per cent compared to current construction methods by using low-energy construction approaches. This would only increase construction costs by two to three per cent, and there would be no need to build new facilities for generating district heating. Stricter energy efficiency and emission impact requirements really should be imposed on new building stock and renovation projects.

There is major potential for reducing emissions both by enhancing the energy efficiency of buildings and by selecting modes of heating. While investment subsidies and other economic guidance instruments are effective in both of these areas, the cities would probably need external support in order to employ such methods. Construction investments should be based on whole life cycle costs. It is particularly important to influence the behaviour of large property developers.

The cities are well placed to use public information as a guidance instrument, as builders are always required to liaise with city authorities. Information guidance may be used when seeking to improve the heating of buildings with oil-fired heating systems or promoting their conversion to either renewable energy sources or district heating, and when affecting the number of electrically heated buildings. Investment subsidies can be used to encourage existing users of electrical heating to enhance energy use in buildings. Construction supervision functions should focus on energy counselling. The cities have not yet been able to decide on the mode of heating of new buildings, for example, at the planning stage, and this matter has been left up to developers.

Regulations remain the most effective way to guide construction. A local authority can set an example and serve as a pioneer by implementing solutions on its construction sites that improve energy efficiency. Energy efficiency requirements could be equated with the requirements imposed on building façades or motor vehicle parking lots. Cities can also lead the way in signing up to energy efficiency agreements. Correct use and maintenance of buildings have a major impact on consumption of heating energy, and so measures such as training of building maintenance staff are important.

3.5 Procurement, consumption and waste

Collectively or individually, the cities of the Helsinki Metropolitan Area are important purchasers. According to financial statements for 2005, the combined value of Helsinki Metropolitan Area public procurement including fixed assets was about EUR 2.5 billion. This means that the cities have a duty to set an example in procuring products and services that are sustainable from the point of view of controlling greenhouse gas emissions.

City procurement mainly focuses on materials in Helsinki, services in Vantaa and investments in Espoo. By requiring and selecting tenders of energy-efficient products, a good innovation environment can be created for eco-efficient businesses and products.

A buyer will seek the best value for money within the terms of reference of a procurement. Environ-

mental protection and controlling climate change must be included in the criteria forming these terms of reference. When assessing bids this means that the cheapest bid will not necessarily provide the best value for money. Through jointly agreed procedures, the cities may substantially influence emission control by incorporating eco-efficiency in procurement processes. Within procurements this may also mean higher levels of recycling of equipment and materials by the organisation and more efficient use of existing facilities, with consequent lower purchasing requirements.

Finnish legislation on public procurement was revised in 2007 (Act on Public Contracts – Laki julkisista hankinnoista, no. 348 of 2007) to include the principle of considering environmental aspects when implementing procurements. Public procurement incorporates substantial opportunities for energy saving. One fifth of the European Union's Kyoto targets would be achieved by using "green electricity" in all public buildings.

A report into the prospects for establishing a common procurement unit for the cities of the Helsinki Metropolitan Area and alternative organisational formats proposes progress in areas such as procurement co-operation, common procurement, logistics and procurement documentation. The adoption of environmental criteria and procedures aimed at controlling greenhouse gases would go a long way towards promoting reductions in greenhouse gas emissions from the region.

Solid waste

By 2004 landfills were giving rise to only about one per cent of greenhouse gas emissions in the Helsinki Metropolitan Area. The methane emissions of solid waste processing have fallen considerably since the 1990s owing to stricter environmental legislation on landfills, which requires such measures as efficient collection of landfill gases. These emissions will continue to fall when the old Ämmässuo landfill area is closed and covered over. This will improve the efficiency of gas collection and also reduce the quantity of gas generated to some extent. With enhanced recovery of landfill gases and reprocessing of all biodegradable solid waste, the calculated net emissions of landfills and wastewater treatment will fall almost to zero.

The Helsinki Metropolitan Area will then benefit from about 200 GWh of energy per year generated from gas collected at the Ämmässuo, Vuosaari and Seutula landfills. This will achieve an annual reduction in greenhouse gas emissions of some 60,000 tonnes compared to combustion of coal, corresponding to just under one per cent of such emissions in the Helsinki Metropolitan Area. Utilisation of landfill gas can be further increased by about half. The wastewater treatment plants at Viikinmäki and Suomenoja also use a further 50–60 GWh of energy generated annually from biogas derived from wastewater sludge.

In spite of improved waste sorting, some of the biodegradable content of mixed waste continues to consist of paperboard, cardboard and paper that would be suitable for recycling by the pulp and paper industry. Improved energy and materials efficiency in production and consumption can substantially influence the quantity of waste created and effectively reduce the greenhouse gas emissions of production, consumption and solid waste management. Waste prevention may be promoted in particular by providing public information. People can also be encouraged to sort waste more effectively and reduce waste quantities through economic guidance and solid waste management regulations.

Although the share of greenhouse gas emissions caused by current solid waste processing and the favourable impact of new processing and utilisation solutions on these emissions in the Helsinki Metropolitan Area as a whole remain relatively minor, the importance of reducing greenhouse gas emissions from waste processing is amplified by the fact that these measures can be readily implemented. Waste management solutions could reduce the total greenhouse gas emissions of the Helsinki Metropolitan Area by about three per cent. For example

changes in the processing of biological waste could reduce the region's greenhouse gas emissions by about one per cent and use of mixed waste as an energy source could achieve a reduction of up to 1–2 per cent in emissions.

3.6 Energy generation

District heating and electric power are mainly co-generated in the Helsinki Metropolitan Area at combined heat and power plants. This method accounts for more than 90 per cent of the energy generated in the Helsinki Metropolitan Area. District heating alone is also generated at separate district heating plants, but in most years the proportion of overall heating output at such plants is less than 10 per cent. The emissions of peak-hour power plants generating electricity alone are negligible in the Helsinki Metropolitan Area. The Helsinki Metropolitan Area is self sufficient in generating district heating.

Emissions from energy generating in the Helsinki Metropolitan Area mainly arise in generating electric power and district heating, and currently constitute some 75 per cent of greenhouse gas emissions in the Helsinki Metropolitan Area. Over the period under review from 1990 to 2004 greenhouse gas emissions from energy generation in the Helsinki Metropolitan Area grew by about 27 per cent, from 4.7 to 6.0 $MtCO_2e$. At the same time, however, output of electricity and district heating energy increased by 60 per cent, from 12.3 to 19.8 TWh. The specific emissions of energy generation in the Helsinki Metropolitan Area also clearly fell on account of improved efficiency in energy generation and conversion from the use of coal to lower-emission natural gas.

The specific emissions of energy generation vary according to fluctuations in Nordic hydropower generation and annual changes in average temperatures. The energy companies of the Helsinki Metropolitan Area generate more electricity in dryer years. The need for heat and the generating rates are also higher in colder years, which increases emissions from district heating generation. At the same time, however, this gives rise to more cogenerated electric power, which replaces condensation power otherwise purchased on the Nordic market.

Internal emissions trading within the European Union will have the most substantial impact on emissions from energy generation. The first phase of emissions trading lasts from 2005 to 2007 and only applies to carbon dioxide emissions. Other greenhouse gases may then be included in the second phase from 2008 to 2012. The scope of emissions trading includes plants of thermal power exceeding 20 MW and plants falling wholly within a district heating network. The centralised energy generation of the Helsinki Metropolitan Area is wholly included in the scope of emissions trading.

Under the principle of emissions trading, emission rights are distributed to operators falling within the scope of a national distribution plan. The State imposes a common emissions ceiling on operators that cannot be exceeded. For the period 2008–2012 the Finnish government issued 23 per cent fewer emission rights for district heating than would correspond to projected carbon dioxide emissions for the said period. The reduction for condensation electric power was 70 per cent. The carbon dioxide emission reduction target for energy companies in the Helsinki Metropolitan Area is one fifth over the period from 2008 to 2012.

In theory the volume of emissions arising from the emissions trading sector in the European Union as a whole will be a constant over the emissions trading period 2008-2012. Emission reductions are probably justified in the longer term with the probable tightening of emission targets.

The emissions trading calculation for the Helsinki Metropolitan Area has included discussion on the prospects for counting CHP plants and heating centres as part of the same network from Kirkkonummi in the West to Vuosaari in the East and as far north as Kerava. This system is a single entity comprising various units operating in the most rational manner at any given time in respect of economy, efficiency and emissions.

Thanks to cogeneration of electric power and district heating, the fuel consumption and carbon dioxide emissions of energy generation are 40 per cent lower than they would be using corresponding separate generating methods. From the point of view of

both emissions and efficient energy generation, it is important to optimise utilisation of cogeneration in the Helsinki Metropolitan Area.

Improved energy efficiency avoids investment in further generating capacity with respect to power plants, distribution and fuel production. Energy efficiency can be improved, for example, by increasing the efficiency of energy generating, reducing transmission losses, and utilising district heating return flows more effectively. Improved energy efficiency becomes even more important for emission reduction when accompanied by increased use of renewable energy sources.

The proportion of renewable energy sources currently used for generating district heating in the Helsinki Metropolitan Area is about 2 per cent. About 8 per cent of district heating generated in Espoo and Kirkkonummi was derived from renewable energy sources in 2005, while the corresponding share in Vantaa and Helsinki was less than 1 per cent. Almost all of the renewable energy consisted of landfill gas from the YTV solid waste processing centre at Ämmässuo, which is used for generating district heating at the Kivenlahti thermal power plant. Following commissioning of the Katri Vala heat pump facility in 2006, the proportion of renewable energy sources used in generating district heating in Helsinki will increase to about 3 per cent.

The proportion of renewable energy sources currently used for generating electricity locally in the cities of the Helsinki Metropolitan Area is about 0.3 per cent. While local electricity generation exceeds consumption in Helsinki, generation in Espoo only covers about half of the city's electricity consumption. Local electricity generation in Vantaa meets about two-thirds of this city's requirements.

The expansion of district cooling systems continues to improve the efficiency of the energy generating system. These systems use an absorption heat pump to utilise the thermal energy generated in a combined heat and power plant to generate cooling energy for buildings in summer. Cold seawater and treated wastewater are also utilised as renewable energy sources.

The time at which renewable energy sources and other low-emission technologies become economically competitive will largely depend on the technology of energy generating facilities in district heating networks and the price of emission rights. Policy-making for decentralised energy generation outside of district heating networks will naturally depend on the relative prices of fuels and technologies. Heating technologies based on renewable energy sources are currently highly competitive compared to fossil fuels. The city may promote their introduction by providing public information.

Solar panels on the roof of residential buildings in the Viikki district of Helsinki. Photo by Tekes / Niko Nurmi

B) Objective and visions of the Helsinki Metropolitan Area climate strategy

1. Seeking to reduce emissions by the year 2030

The aim by the year 2030 is to reduce energy consumption in the Helsinki Metropolitan Area and cut per capita greenhouse gas emissions by 39 per cent of the 1990 level.

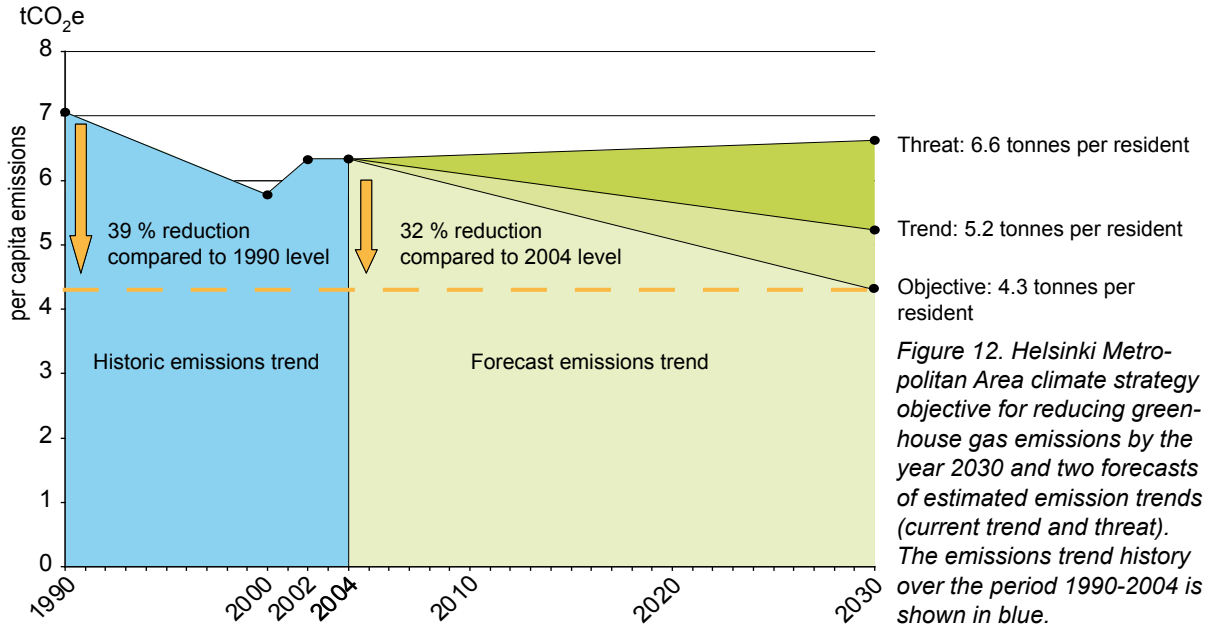


Figure 12. Helsinki Metropolitan Area climate strategy objective for reducing greenhouse gas emissions by the year 2030 and two forecasts of estimated emission trends (current trend and threat). The emissions trend history over the period 1990-2004 is shown in blue.

In 2004 the Helsinki Metropolitan Area produced 6.3 tonnes of carbon dioxide equivalent for every resident. The aim is to bring about a reduction of one third of this emissions level by the year 2030 to reach a level not exceeding 4.3 tonnes of carbon dioxide per resident.

Under the trend forecast compiled as a reference point, per capita emissions will fall to 5.2 tCO_2e. It is estimated that this forecast scenario will be achieved with no special measures (the Business as Usual forecast). Emission levels are then forecast to behave in roughly the same way as over the period 1990–2004. However, the trend forecast allows for increasingly strict legislation to improve such matters as energy efficiency of the building stock. This forecast assumed that emissions from transport will increase with continuing urban sprawl and the rising popularity of motor vehicles. The forecast of emissions from energy generating allows for current international treaties and the emission reductions that they require.

Under an alternative scenario (threat), per capita emissions may increase to 6.6 tCO_2e, meaning a five per cent rise in emissions compared to the 2004 level. The forecast underlying this threat assumes continued rapid growth in electricity consumption due to such factors as urban sprawl, increased use of motor vehicles, greater reliance on electrical heating, the spread of separate cooling appliances and the collapse of emissions trading.

The YTV cities can help to bring down greenhouse gas emissions by cutting energy consumption. Rapid measures will also be needed in the field of energy generation where emissions trading will play a significant role.

About one third of the emission reduction can be achieved through energy savings and the remaining two thirds will depend on solutions in energy generation.

2. Helsinki Metropolitan Area climate vision for the year 2030

Improved energy efficiency and sparing use of natural resources leads to a fall in greenhouse gas emissions in the re-gion and to improved competitiveness.

A Helsinki Metropolitan Area climate vision for the year 2030 has been prepared as the starting point for the strategy (see Figure 13). This vision comprises a main vision and six sectoral visions. These seven visions together provide a comprehensive view of the future target state towards which the Helsinki Metropolitan Area must strive in order to achieve its greenhouse gas emissions reduction objective. The vision has been compiled through broadly-based collaboration involving specialists representing the concerned sectors in each of the YTV cities.

The aim of the jointly formulated vision is to guide city planning and policymaking towards congruent operating policies and methods. Without a guiding idea of the future, the measures and means proposed for the strategy will remain fragmented and disharmonious.

The operating policies implementing the vision have been tailored to match the scope of influence of the cities. The future involvement of various partners and their commitment to achieving the common vision will also be important.

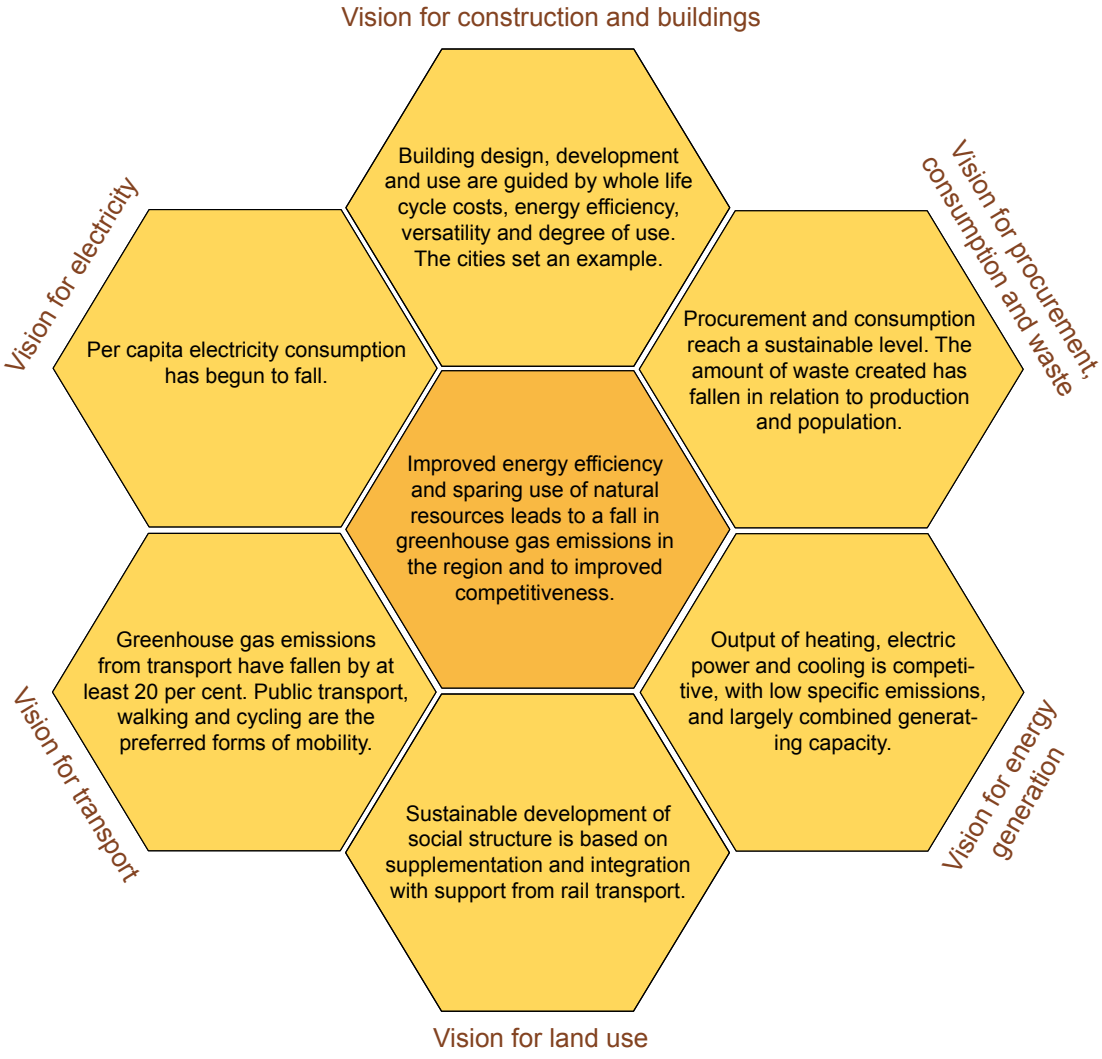


Figure 13. Helsinki Metropolitan Area climate vision for the year 2030. Responsibility for controlling climate change must be viewed as a fundamental element of urban planning and policymaking.

3. Operating policies and means for realising the vision

3.1 General operating areas

a) Influencing national and international policymaking

The Helsinki Metropolitan Area will participate in the national debate on the measures required for controlling climate change. The region will actively seek to influence such matters as legislative reform to more effectively support greenhouse gas emission reductions in the region.

b) A common vision: Establishing collaborative practices between various administrative branches to reduce greenhouse gas emissions, and improving co-operation between the cities of the region

The impact of proposals on greenhouse gas emissions will become one of the main factors in policymaking. Operating policies will be integrated into current city functions. The operating policies required for implementing the climate strategy cover a very wide range of administrative branches in the cities. These measures will affect the work of every city employee. The commitment of local government policymakers and senior city officials will be essential for successfully implementing the strategy.

The current management systems and energy efficiency agreement will be used for integrating the strategy into city procedures at all levels.

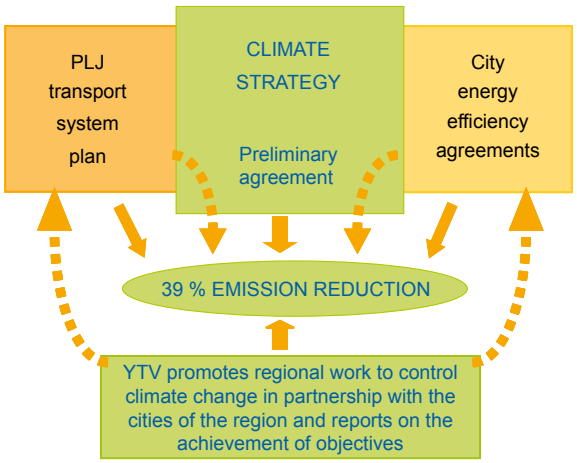


Figure 14. Work to reduce emissions through a wide variety of programmes, plans and agreements.

YTV will co-ordinate regional implementation of the strategy. This will avoid reduplication of effort, ensuring co-operation in public information and other projects and sharing of experiences, and providing central monitoring and reporting of the outcome of the strategy as appropriate.

c) Energy efficiency agreements

The energy efficiency work of the cities will be guided by energy efficiency agreements concluded with the Ministry of Trade and Industry. The cities will implement the duties specified in these agreements, which concern city functions. The agreements impose a nine per cent quantitative energy saving objective over a nine-year period, together with operational targets. These targets apply not only to buildings, but also to procurements, street lighting, vehicles, transportation, water supplies, solid waste management and other functions. The visions, operating policies and measures set out in the Helsinki Metropolitan Area climate strategy are consistent with energy efficiency measures. The agreement provides for the Ministry of Trade and Industry to establish a steering committee to oversee implementation measures. An annual situation report will be compiled by Motiva Oy. The cities will also encourage local enterprises and organisations to sign up to energy efficiency agreements in their own business sectors.

d) The cities will set an example and serve as pioneers

The cities will actively inform the public about their work to reduce emissions and energy consumption. They will encourage the spread of good practices and improved technology into the private sector.

e) Motivation, education, training: Controlling climate change will be included in education and training at all levels, including training for city employees and public information programmes for city residents. Work in this area will proceed in dialogue with enterprises and other stakeholders.

More information on controlling climate change will be provided for the curriculum and other activities of nursery schools, comprehensive schools and other educational levels. The cities will enhance their in-house training systems to ensure that all employees are familiar with effective methods of cutting energy consumption. Instructions for efficient energy use will be included in the induction programme for new employees.

Local authority public information services will help the region's residents to appreciate their own capacity to control climate change. New methods will be devised for improving interaction with the enterprises and stakeholders that are most important for the climate strategy.

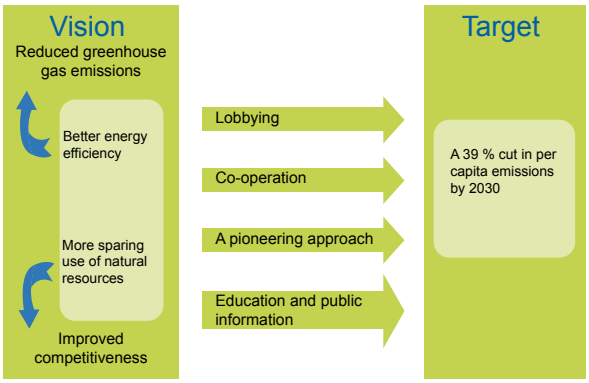


Figure 15. Vision, means and objective of the climate strategy.

A. Influencing national and international policymaking

Means	Examples of responsible city agencies
Influencing legislation (e.g. Land Use and Building Act, building regulations, public procurement legislation, taxation of renewable energy and fuel, taxation of work-related travel).	Parties responsible for the function concerned
Seeking to influence international policymaking through lobbying organisations and networks.	Parties responsible for the function concerned
Incorporating greenhouse gas emission reduction in new national land use objectives.	Parties responsible for the function concerned

B. Common vision

Means	Examples of responsible city agencies
Consideration of the climate strategy and its inclusion in the strategies, programmes and management systems of cities and their administrative boards.	Entire administration
Promoting the climate strategy through the work of the Helsinki Metropolitan Area Advisory Board.	Entire administration
Establishing a common vision between various administrative branches to reduce greenhouse gas emissions, and improving co-operation between the cities of the region.	Entire administration

C. Energy efficiency agreements

Means	Examples of responsible city agencies
The cities implement the duties specified in energy efficiency agreements.	Entire administration
The cities encourage local enterprises and organisations to sign up to energy efficiency agreements in their own business sectors.	Entire administration

D. The cities set an example and serve as pioneers

Means	Examples of responsible city agencies
The cities take their own active measures to cut greenhouse gas emissions and inform the public of exemplary operations.	Entire administration
Trials of entirely new operating formats and projects to reduce greenhouse gas emissions and evaluations of them.	Entire administration
Evaluation and enhancement of the utility of strategy implementation projects.	Entire administration, YTV
Assessment of greenhouse gas emission reduction as part of project planning and monitoring.	Entire administration
Each local authority in the Helsinki Metropolitan Area establishes/appoints an in-house expert agency for energy saving.	City executive boards
Measuring and monitoring the energy efficiency of all public building use, and reducing their greenhouse gas emissions.	City councils and executive boards

E. Motivation, education and training

Means	Examples of responsible city agencies
Establishing a regional advisory centre for material and energy efficiency.	City councils, YTV
Including climate change and its control in the curriculum for all levels of education and training, from preschool education to training of city employees and public education of city residents. Collaboration with enterprises and other stakeholders.	Entire administration, education departments, YTV
Solar and wind energy installations become part of school buildings in the near future as one aspect of encouraging public awareness.	Education departments, real estate departments, energy companies, developer organisations

3.2 Transport

Vision

Per capita greenhouse gas emissions from transport have fallen by at least 20 per cent. Public transport, walking and cycling are the preferred forms of mobility.

Operating policies

a) Influencing the volume of traffic and patterns of mobility by improving the status and service standards of public transport, walking and cycling

Transport mileage will be reduced. Use of public and non-motorised transport will be increased by modifying land use and vehicle parking policy. Measures to encourage alternative modes of transport will help to ensure that connections for public transport, cycling and walking offer a real alternative to using passenger motor vehicles.

To control climate change while ensuring the service standards and effectiveness of public transport, it is important for the transport system to be enhanced in an integrated manner through versatile application of the five strategic components in the PLJ 2007 development plan.

The PLJ strategic components are:

1 Influencing demand for mobility and modes of transportation
2 Improving public transport services
3 Encouraging more efficient use of the transport system through transport management and information
4 Theme programmes and projects to improve the transport system
5 Infrastructure development projects

New economic guidance instruments for transport will be reviewed as potential future instruments for guiding demand in the event that other transport system development measures prove insufficient for maintaining reasonable transportation conditions. The most effective measures will reduce transport demand at times and in places where congestion is most severe, such as charges levied according to time, location and distance travelled.

Major overhauls of the public transport network are focusing on enlarging the city rail and metro systems and improving cross-town connections. Public transport service standards will be improved by using high quality low-emission vehicles and capable staff. These aspects will be given greater prominence in competitive tendering.

A permanent transport service centre will be set up in the Helsinki Metropolitan Area to promote walking, cycling, public transport and eco-efficient motoring. The new centre will provide mobility planning services and advice for the cities of the region, and for employers and individual residents.

Standards of comfort and safety at public transport stations will be improved, with better access to current transport information. Services will become more punctual with smoother transit changes. Suggestions from motorists for improving public transport will be studied with a view to encouraging changes in personal transportation patterns.

The costs of public transport will be reduced in comparison to motoring and public transport connections will be improved, particularly in cross-town traffic. Effective public transport services will be included in area planning and the effectiveness of the system will be assured from the moment residents begin to move into the area. This will require transport service planning and implementation to include sufficiently long-term reviews of the economic sustainability of services.

The cycle path network will be enlarged and improved with better services for cyclists, such as secure and attractive cycle parking lots. The point of view and needs of pedestrians and cyclists will be incorporated into planning and implementation.

Zoning plans will allow space for cycle parking lots. A substantial increase in the number of secure, covered and readily accessible cycle parking lots could reduce the number of motor vehicle parking lots required in zoning plan regulations.

b) Reducing transport emissions from city functions

The cities will study the prospects for improving logistics in goods transportation and will take the necessary measures to do so. Energy efficiency and low emissions will become criteria of competitive tendering for public transport and city transportation functions. The cities will make motor vehicle greenhouse gas emissions a selection criterion in competitive tendering for public procurements of haulage services and of motor vehicles and machinery. The cities will develop systems of common motor vehicle use to increase the vehicle utility rate. Fuel consumption by motor vehicles and machinery will be more effectively monitored.

The cities will encourage economical motoring skills by regular retraining of employees who drive frequently and by awarding prizes for low-consumption driving. The cities of the Helsinki Metropolitan Area will provide a public transport ticket to all of their staff. They will also improve the opportunities of these employees to commute to work and engage in work-related travelling by bicycle or on foot by such means as arranging proper cycle parking and washroom facilities at workplaces.

c) Promoting the use of low-emission vehicles

Use of low-emission motor vehicles and biofuels of minimal greenhouse gas emissions impact will be promoted in the Helsinki Metropolitan Area by such means as affording them privileges in traffic control arrangements. The cities may set an example by favouring biofuels in their own functions.

d) Improving logistics

City logistics for goods transport and distribution will be improved and made more efficient.

Car pooling will be encouraged by providing improved parking opportunities for vehicles used in this way.

A. Influencing the volume of traffic and patterns of mobility by improving the status and service standards of public transport, walking and cycling

Means	Examples of responsible city agencies
Transport prices, infrastructure and service standards favour public transport, walking and cycling.	YTV, urban planning, building supervision
Transport pricing to provide incentives for using public transport.	City councils, transport planning
Direct and agreeable connections for pedestrians and cyclists to stations, stops and services prioritised in planning. Routes also indicated on zoning plans within areas and blocks.	Urban planning, building supervision, public works departments
Routes for non-motorised transport are constructed, managed and maintained in winter to a high standard.	Public works departments, street maintenance units
Construction of adequate and secure cycle parking space stipulated for public transport stops.	City councils, public works departments, building supervision
Sizing standards for cycle parking in planning of commercial, service and industrial buildings, with adequate and secure cycle parking space constructed at public transport stations.	Urban planning, city councils
Preparing commuting plans for employees and promotion of distance working.	Urban planning, city councils
Improving safety perceptions, connection pleasantness and real-time information for public transport.	YTV, Helsinki City Transport
Creating conditions for enlarging pleasant pedestrian precincts in city centres.	Urban planning, transport planning
Discontinuing free motor vehicle parking arrangements for city employees.	Entire administration, real estate departments

B. Reducing transport emissions from city functions

Means	Examples of responsible city agencies
Stipulating low-emissions for procurements and imposing low emissions as a procurement criterion.	Procurement centres and other agencies responsible for procurements and competitive tendering
Widespread introduction of public transport subsidies for commuting.	Entire administration

C. Promoting the use of low-emission vehicles

Means	Examples of responsible city agencies
Economic guidance favouring low-emission vehicles.	Agencies responsible for procurements and competitive tendering
Stipulating and publicising environmental zones based on motor vehicle emissions.	Environment centres, urban planning
Abolishing parking charges and granting other benefits for low-emission vehicles.	City councils

D. Improving logistics

Means	Examples of responsible city agencies
Improving the logistics of city goods traffic and distribution (e.g. introduction of RFID technology in optimisation of transport routes and logistics).	Entire administration
Encouraging car pooling by providing improved parking facilities for vehicles used in this way.	Technical departments

Connections for public and non-motorised transport must offer a better alternative to use of passenger motor vehicles. Photo by YTV / Hannu Bask

3.3 Land use

Vision

Sustainable development of social structure is based on supplementation and integration with support from rail transport.

Operating policies

a) Integrating the habitation structure

The urban structure of the region will be developed by supplementing current settlements in a manner that retards the growth in traffic. Existing infrastructure such as transport networks and the district heating and cooling system may also be utilised more effectively. Most new residences, workplaces and services will be constructed within walking distance of current or new railway or metro stations. This will enable an increasing proportion of transportation to occur through non-motorised and rail traffic.

Urban development will be based on rail transportation. Policy and planning will avoid creating built up areas that are separate from the existing urban structure and tend to increase urban sprawl.

Further transport construction projects will focus on enlarging the rail network and strengthening existing rail connections.

The impacts of significant new construction or changes in use on mobility requirements and the transport network must be assessed when setting land use objectives. Comparisons of alternative land use proposals must demonstrate how greenhouse gas emissions can be reduced. Depending on the scope of the undertaking, reviews must describe the broader mobility requirements that it causes within the Helsinki Metropolitan Area and alternative ways of achieving mobility while minimising greenhouse gas emissions.

Zoning will pay particular attention to planning and allocating space for good, direct routes for non-motorised traffic, both between areas and within built precincts. Connections to stations and public transport stops must be arranged with particular care.

New construction areas will be designed and located so that they can be connected to a district heating network. Land use planning will reserve adequate space for local services. Large retail outlets will be located in urban centres or in places that are readily accessible by public transport.

The energy consumption and greenhouse gas emissions impacts of major urban structure development plans must be separately investigated.

b) Creating conditions for increasing renewable energy generation and energy conservation

Land use planning will allow for the zoning requirements of renewable energy generation (including wind power and bioenergy) and fuel supplies (including transportation and storage of biofuels). The location of buildings will allow for opportunities to make use of solar power. Zoning and building codes will create favourable conditions for using renewable energy.

A. Compacting community structure

Means	Examples of responsible city agencies
A joint memorandum of understanding on regional land use and transport (PLJ transport system plan).	City executive boards, YTV
Assessing greenhouse gas impacts in master plans and regional plans.	Urban planning, Uusimaa Regional Council
Preparing a joint master plan for the cities of the Helsinki Metropolitan Area.	Urban planning, City councils
Creating a joint regional implementation plan for land use and transport in support of greenhouse gas emission reductions.	Urban planning, transport planning, City executive boards
Adequate area efficiency in land use planning from the point of view of public transport services.	Urban planning
More effective zoning and implementation for areas surrounding rail transport stations.	Urban planning, real estate departments, developer organisations
Higher occupation rates for undeveloped sites within existing public utility service areas (including easy access to details of ownership, higher real estate taxes).	City executive boards, urban planning, real estate departments
Including greenhouse gas emission calculations when assessing options and impacts in master plans, important zoning plans and major construction projects.	Urban planning, public works departments
Locating new shopping centres in the vicinity of the existing habitation structure and effective public transport connections.	City councils, urban planning
Allocating fewer motor vehicle parking lots in the city centre and other areas with a high concentration of public transport services to improve construction prospects.	City planning departments
Improving conditions for local services.	Urban planning, real estate departments

B. Creating conditions for increasing renewable energy generation and energy conservation

Means	Examples of responsible city agencies
Paying attention to renewable energy generation at all planning levels and in construction arrangements.	Urban planning
Requiring energy-efficient construction as a condition of releasing construction lots when realising new development areas.	Urban planning, real estate departments, building supervision, developer organisations
The planning process must guide construction trends and volumes to improve conditions for using solar energy in individual buildings.	Urban planning, building supervision, developer organisations

Regional implementation plans for land use and transport may compare the impacts of various modes of transportation and the emissions to which they give rise. Photo by Hannu Vallas / Lentokuva Vallas Oy

3.4 Electricity consumption

Vision

Per capita electricity consumption has begun to fall.

Operating policies

a) Improving city procurement procedures in support of higher energy efficiency

Procurement will be steered towards the most energy efficient products by including energy efficiency as a criterion of competitive tendering or by arranging competitive tendering. This can facilitate the market access of new and superior technology.

b) Allocating energy costs to the consumer and improving the availability of information in this respect

The improved energy consumption monitoring abilities offered by new technology will be introduced to ensure that the costs of energy consumption are borne by the actual consumer. Metering will also be improved to give consumers more details of where, when, how much and for what purpose energy is consumed.

c) Information

The cities will advise and instruct their staff, residents and enterprises on the connection between appliance procurement and energy consumption and operating costs. The cities will also provide guidance in expedient use of appliances.

A. Improving city procurement procedures in support of higher energy efficiency

Means	Examples of responsible city agencies
Preparing procurement and competitive tendering guidelines that allow for energy efficiency.	Procurement units, all agencies performing procurements, developer organisations
Introducing the latest and most energy-efficient technology for indoor and outdoor lighting and illumination control systems.	Responsible departments for lighting, developer organisations
Reducing energy consumption by office equipment and computer hardware.	All agencies

B. Allocating energy costs to the consumer and improving the availability of information in this respect

Means	Examples of responsible city agencies
Improving and enlarging real-time metering of energy consumption.	Developer organisations, energy companies
Improving leasing procedures so that energy invoicing is based on actual consumption and opportunities for saving are notified at the time of invoicing.	Premises centres, agencies responsible for administering sites and dwellings leased by the city

C. Information

Means	Examples of responsible city agencies
Training city employees through campaigns to improve awareness in both procurement and equipment use. Preparing guidelines for saving electricity in various functions.	All agencies, agencies responsible for procurements and energy saving
Continuing and improving public education campaigns in schools and nurseries. Launching energy saving campaigns for the general public in partnership with other cities and national government. Utilising information technology in public information services.	All agencies

3.5 Buildings

Vision

Building design, development and use are guided by whole life cycle costs, energy efficiency, versatility and degree of use. Buildings cause minimal emissions over their entire life cycle. The cities set an example.

Operating policies

a) Improving energy efficiency in new buildings

Life cycle costs for construction development by the cities will be investigated at the planning stage by reviewing options and making investments on the basis of these reviews. The cities will set an example to others and promote the introduction of new technology onto the market. They will encourage and adopt low-energy construction methods.

Financial incentives will be created for energy efficient building, for example through pricing of planning permission or site rents. The cities will take advantage of opportunities provided by building regulations to impose desirable criteria on all buildings.

b) Improving energy efficiency in the existing building stock

Planning and building regulations will be revised to support energy efficient renovation construction that respects whole life cycle costs. Energy reviews of city buildings will continue and improve, together with implementation of other energy studies and of the energy saving measures that these studies recommend. The cities will disseminate the results of reviews and also promote energy reviews in the private sector.

c) Guiding choices of heating and cooling systems

The choices of heating and cooling systems made by the owners and builders of small buildings will be guided by improving the information available to builders regarding the whole life cycle costs, environmental impacts and associated future risks of various forms of heating and cooling. Homebuyers will also be advised of the costs and environmental impacts of various heating methods. Owners of private buildings and condominium housing companies will be advised of cost-effective energy investments.

d) Improvements in maintenance and assessment of space requirements

Building management will be improved by such measures as encouraging the use of maintenance logs and training staff. Consumption monitoring of energy and water and its use in maintaining energy efficiency will be improved. Consumption metering will also be improved to record and provide more details to consumers. The aim will be to ensure that energy costs are charged to the actual consumer.

A. Improving energy efficiency in new buildings

Means	Examples of responsible city agencies
Improving procurement and policymaking processes so that whole life cycle costs guide planning and construction in city building projects.	City executive board, premises centres, developer organisations
Preparing planning and implementation guidelines for real estate projects that allow for energy efficiency.	Developer organisations
Launching new technology projects (including low-energy buildings). Stimulating demand.	Premises centres, developer organisations
Including energy efficiency as a selection criterion to be applied by planners, contractors and maintenance organisations.	Subscribing organisations
Adjusting the pricing of construction rights and site leases to incorporate energy efficiency.	City executive boards, real estate departments
Providing economic incentives for low-energy construction.	Parties responsible for the function concerned
Converting to low energy housing construction by the decade beginning in 2010 and minimal energy housing construction by the decade beginning in 2020.	City councils, developer organisations

B. Improving energy efficiency in the existing building stock

Means	Examples of responsible city agencies
Preparing planning and construction guidelines for renovation projects.	Premises centres, developer organisations
Participating in new technology development projects for renovation construction and launching test construction projects.	Premises centres, developer organisations
Continuing and enhancing energy reviews of city buildings and making energy saving investments.	Premises centres, authorities responsible for energy use in buildings
Establishing and maintaining various financing (e.g. saving guarantees) and grant procedures to encourage energy efficiency and effectively publicising these procedures. Benefiting energy savers (revolving funds).	Premises centres, developer organisations, authorities responsible for housing affairs
Actively publicising opportunities for saving energy, preparing guidelines/ brochures, and continuing energy saving campaigns.	Agencies responsible for energy saving, all agencies
Advising the public and city employees on energy consumption and the impact of energy saving measures in buildings (energy certificates such as Display).	Parties responsible for the function concerned

C. Guiding choices of heating and cooling systems

Means	Examples of responsible city agencies
Preparing guidelines/brochures and advising the public at the time of seeking planning permission etc. on the whole life-cycle cost impact of various heating and cooling methods	Building supervision, developer organisations, environment centres, energy companies
Maintaining and improving various financing and grant procedures (saving guarantees) to encourage energy efficiency and effectively advising the public of these procedures.	Premises centres, developer organisations, authorities responsible for housing affairs
Promoting district cooling instead of separate cooling appliances in buildings.	Developer organisations, premises centres, real estate management units
Promoting the introduction of heat pumps in areas outside of the district heating network.	Developer organisations, premises centres, real estate management units
Favouring solar electricity systems in residential buildings. Adopting solar-powered lighting systems at suitable sites.	Developer organisations, premises centres, real estate management units

D. Improvements in maintenance and assessment of space requirements

Means	Examples of responsible city agencies
Continually retraining building service staff and helping them to maintain and enhance their vocational skills.	Real estate management units, educational units
Making more active use of servicing logbooks and benefiting from the associated opportunity to improve energy efficiency.	Premises centres, real estate management units
Improving consumption metering to ensure that energy costs can be allocated to the end consumer. Energy costs to be itemised in building rents.	Developer organisations, premises centres, real estate management units
Developing, introducing and benefiting from new control and guidance technology for information and buildings in maintenance and energy consumption analysis.	Developer organisations, real estate management units
Allowing for energy efficiency when setting rents for buildings and sites.	Premises centres, real estate management units
Ensuring that energy saving investments do not cause internal rent increases.	Premises centres, real estate management units
Improving the introduction of servicing logbooks and ensuring that maintenance staff are trained when new building projects are released for occupation.	Premises centres, real estate management units
Using space more efficiently and carefully investigating the market availability of existing space before engaging in further construction projects.	Premises centres, real estate management units

Rigorous measures are needed for controlling climate change. Otherwise the costs of adapting will become unreasonably high. Photo by Samuli Lehtonen

3.6 Procurement, consumption and waste

Vision

Procurement and consumption reach a sustainable level. The amount of waste created has fallen in relation to production and population.

Operating policies

a) Promoting material and energy-efficiency and low emissions in city procurement.

The cities of the Helsinki Metropolitan Area will seek to prevent solid waste formation in all of their operations. City procurement operations will always allow for environmental aspects and especially for material efficiency. Environmental aspects and avoidance of solid waste will be considered at all stages of the procurement procedure, from procurement planning to the selection of bidders and drafting of procurement agreements. Selection of bids will refer to the environmental costs of the product and to a calculation of its whole life cycle costs.

b) Advising the population on how to avoid solid waste

Preventing the creation of solid waste will be part of the curriculum in nursery schools and other educational establishments, and an element of public information for consumers.

The cities will work to implement programmes promoting prevention of solid waste. Public information on preventing solid waste will also involve other stakeholders.

c) Continuing work to prevent solid waste in industry and service functions

Environmental permits issued to industry will incorporate a duty to prevent solid waste.

An information system will be maintained for comparing waste quantities from service functions. This will help to ensure that service functions in the Helsinki Metropolitan Area continue to employ waste comparison methods (the YTV Petra waste benchmarking system). Arrangements for rewarding successful prevention of solid waste will continue.

d) Enhancing material recycling

To enhance recycling of waste material, collection of household refuse in the Helsinki Metropolitan Area will be optimised in the light of environmental considerations, costs and technical effectiveness. A comprehensive review will help in selecting waste elements that should be collected separately, solid waste management regulations will be issued with collection requirements for various types of building, and collections will be arranged for buildings and area collection points. Waste producers will be advised on how to improve sorting at the point of origin.

e) Allowing for whole life cycle emissions in waste management arrangements

Solid waste management arrangements in the Helsinki Metropolitan Area will be based on an order of implementation in accordance with the waste hierarchy and on a whole life cycle approach. The choice of waste management solution will allow for the environmental emissions, including greenhouse gas emissions, arising in the course of collecting, transporting, processing and final disposal of solid waste. Technical solutions will be employed to minimise atmospheric emissions arising from final disposal of solid waste.

A. Promoting material and energy-efficiency and low emissions in city procurement

Means	Examples of responsible city agencies
Allowing for whole life-cycle environmental emissions and material efficiency in selection processes.	Procurement departments
Creating a procurement format for local authorities (also including a computation model with statistical analysis and monitoring of results, performance measure and objective).	Hankintatoimi, YTV
Promoting procurement and use of low-emission vehicles.	Procurement departments, YTV
Formulating common environmental criteria for procurement.	Procurement departments, YTV
Procuring electricity generated from renewable energy sources in buildings.	Procurement departments, premises centres, real estate management
Applying environmental criteria in foodstuffs procurement.	Procurement departments
Replacing disposable products with durable products based on whole life-cycle studies.	Procurement departments
Establishing environmental criteria for working machinery specifying fuel consumption and carbon dioxide emissions.	Procurement departments, public works departments, Helsinki City Transport, YTV

B. Advising the population on how to avoid solid waste

Means	Examples of responsible city agencies
Educating residents on preventing waste creation and incorporating this theme in the plans of nurseries and schools. Working with public authorities, non-governmental organisations and specialists.	YTV, consumer counselling, social services departments, education departments

C. Continuing work to prevent solid waste in industry and service functions

Means	Examples of responsible city agencies
Including a duty to prevent waste formation in environmental permits. Promoting prevention of waste and material efficiency in the operations of small and medium-sized businesses.	Environment centres
Annual public benchmarking of enterprise waste quantities (Petra waste benchmarking system). Creating statistical records of the rate of sorting and recycling.	YTV, environment centres
Economic guidance of waste policy, which may be influenced by adjusting refuse collection charges.	YTV
Awarding an annual prize for saving natural resources.	YTV

D. Enhancing material recycling

Means	Examples of responsible city agencies
Improving collection of reusable material with new sorting obligations in solid waste management regulations where necessary.	YTV
Refuse counselling to improve the efficiency of point of origin sorting.	YTV
Optimising refuse collection logistics and using low-emission fuel in refuse collection vehicles.	YTV

E. Allowing for whole life cycle emissions in waste management arrangements

Means	Examples of responsible city agencies
Utilising the energy content of waste.	YTV
Whole life-cycle comparisons of waste processing solutions.	YTV

3.7 Energy generation and distribution

Vision

Output of heating, electric power and cooling is competitive, with low specific emissions, and mainly combined generating capacity.

Operating policies

Promotion of renewable energy sources refers to timber and other biomass, biogas, hydropower, solar energy, wind energy, the biodegradable component of fuel from waste, and the use of energy derived from the heat content of the ground, waterways, wastewater or the atmosphere.

a) Utilising the opportunities arising from an increasingly compact urban structure in more efficient energy generation and distribution. Energy enterprises will further improve energy efficiency by enhancing their operations in accordance with the European Union energy efficiency directive.

Improving energy efficiency will depend on solutions in both energy generating and energy consumption. The success of such undertakings often calls for cooperation with other involved parties (planners, construction developers, buildings, water utilities).

From the point of view of both emissions and efficient energy generation, it is important to optimise utilisation of cogeneration in the Helsinki Metropolitan Area. Thanks to modern cogeneration of electric power and district heating, the fuel consumption and carbon dioxide emissions of energy generation are 40 per cent lower than they would be using corresponding separate generating methods.

Extension of district cooling systems improves the efficiency of the entire energy generation system, as it uses the thermal energy arising in a combined heat and power plant to generate cooling energy for buildings in summer. Cold seawater and treated wastewater are also used as renewable energy sources. Utilising the return flows of district heating systems, for example at low-energy sites or in district cooling, substantially increases the efficiency of energy generation.

The energy saving agreement concluded between the Ministry of Trade and Industry and the energy industry also helps to improve the energy efficiency of generation and distribution.

b) Centralised energy generation falls wholly within the scope of increasingly strict emissions trading rules. Through diminishing emission rights, the European Union emissions trading system is guiding centralised energy generation towards lower emission solutions.

Centralised energy generation falls wholly within the scope of increasingly strict emissions trading rules. The time at which renewable energy sources and other low-emission technologies become competitive in centralised energy generation will depend on the technology of existing generating facilities and the price of emission rights. The guidance mechanism for emissions trading favours renewable and other low-emission energy.

Prospects in the Helsinki Metropolitan Area include increased use of natural gas and the use of energy generated from waste (combustion of waste that is unsuitable for recycling). Progress in clean coal technology will be closely monitored. The potential and prospects for using renewable energy sources will be studied. Electric power generated from renewable energy sources will be offered to customers.

c) Promoting eco-efficiency of decentralised energy generation and increasing use of renewable energy sources

Introduction of renewable energy sources and other low-emission technologies will be promoted outside of district heating networks. The potential for using renewable energy sources and the prospects for this approach in individual and electrically heated

buildings will be studied in partnership with the cities of the region.

d) Expanding the district heating network and investigating the constraints to such expansion

The cities and public authorities will take steps to investigate and eliminate the constraints on district heating networks.

e) Increasing energy saving advice and research

Saving energy is one of the most important ways of cutting emissions. Energy companies also stress the primary importance of saving energy to the customer. Methods include continuing and improving energy saving training and public information and participating in public awareness campaigns. Measures to promote energy saving include improving the ability to access and understand real-time consumption data, providing directions on how to dimension indoor temperatures, and giving advice for sites of various kinds. One effective method would also be to link consumer pricing to actual use, i.e. by introducing a peak period energy charge. Other instruments can also be developed for more effective consumer pricing. These could include personal emissions trading, the prospects for which could be studied. Energy companies will work together to develop databases, research (e.g. through the National Technology Agency of Finland - TEKES) and mutual exchanges of information.

A. Utilising the opportunities arising from an increasingly compact urban structure in more efficient energy generation and distribution. Energy enterprises will further improve energy efficiency by enhancing their operations in accordance with the European Union energy efficiency Directive.

Means	Energy companies and examples of responsible city agencies
Optimising the benefits of cogeneration in the Helsinki Metropolitan Area.	Energy companies
Using the best available technology and optimising the generating ratio of district heating and electric power and power plant fuels where possible to improve efficiency.	Energy companies
Arranging for energy companies to take part in studies with other operators to investigate the use of district heating return flows at suitable sites (e.g. for heating wastewater sludge and for cooling).	Energy companies, urban planning, building supervision
Participation of energy companies together with other operators in studies investigating waste heat sites and heat recovery prospects at small (e.g. condensation heat from ice rink refrigeration) and large (e.g. wastewater treatment plants) sites.	Energy companies, real estate administrators
Implementing energy saving agreement measures such as auditing, energy reviews and rewards for suggestions in energy sector generating operations, district heating, and transmission and distribution of electric power.	Energy companies
Extending district cooling networks and replacing separate cooling installations in buildings. Investigating and testing the prospects for district cooling using the latest technology also outside of the city centre (in apartment blocks, shopping centres and large commercial buildings).	Energy companies, building supervision

B. Centralised energy generation falls wholly within the scope of increasingly strict emissions trading rules. Through diminishing emission rights, the European Union emissions trading system is guiding centralised energy generation towards lower emission solutions.

Means	Energy companies and examples of responsible city agencies
Energy companies promote the use of renewable energy sources and are involved in regional research and utilisation projects for renewable energy.	Energy companies
Electric power generated from renewable energy sources will be offered to customers.	Energy companies
Promoting use of clean technology for coal and natural gas.	Energy companies
Replacing some coal and natural gas in the Helsinki Metropolitan Area with fuels of waste origin and electric power generated from renewable energy sources (e.g. wind power, biopower, solar power).	Energy companies
Seeking suitable sites for wind power generation (e.g. an offshore wind farm, industrial and warehousing estates).	Uusimaa Regional Council, energy companies

C. Promoting eco-efficiency of decentralised energy generation and increasing use of renewable energy sources.

Means	Energy companies and examples of responsible city agencies
Promoting the introduction of renewable energy sources and other low-emission heating technologies such as geothermal heating outside of district heating networks.	Urban planning, energy companies, developer organisations
Preparing a review of potential in individual local authority districts and in the broader region regarding renewable energy sources in the area and utilisation prospects in association with the cities.	Urban planning, energy companies, Uusimaa Regional Council
Promoting utilisation of solar electric power and heating.	Energy companies, urban planning, real estate servicing, developer organisations

D. Expanding the district heating network and investigating the constraints to such expansion

Means	Energy companies and examples of responsible city agencies
The cities and public authorities will take steps to investigate and eliminate constraints on district heating networks. Emissions trading will strongly influence the operating conditions and expansion of centralised district heating based on cogeneration. Decentralised thermal energy generating in built-up areas may gain a competitive edge owing to its exclusion from emissions trading, even though this is not a favourable option from the point of view of climate change and clean air.	Energy companies
Energy companies will actively market the expansion of district heating to buildings in prospective areas.	Energy companies

E. Increasing energy saving advice and research

Means	Energy companies and examples of responsible city agencies
Continuing training and public education on energy saving in schools, participating in public information campaigns (Energy conservation week etc.) and stressing the prime importance of energy saving to customers.	Energy companies
Promoting the development and use of real-time consumption data for district heating and electric power in all buildings.	Energy companies
Guidelines and advice on indoor temperature control at sites of various kinds.	Energy companies
Improving consumer pricing of energy. Investigating such approaches as linking pricing to use in the form of an “energy congestion charge”.	Energy companies

A motor vehicle uses energy in winter even before the journey begins. Photo by Hannu Vallas / Diabox

Conclusions

Restraining climate change to a level at which the effects would be tolerable for human life will require a global cut in emissions possibly exceeding 80 per cent of the year 2000 level by the year 2050. An increase in global average temperature of no more than two degrees Celsius compared to pre-industrial times has been imposed as a target level in the European Union. Under a decision taken by the European Council in spring 2007, the European Union is committed to reducing carbon dioxide emissions by 20 per cent of the 1990 emission level by the year 2020. The European Union has also promised a corresponding cut of 30 per cent in emissions if other substantial producers of greenhouse gases, such as the USA and China, sign up to similar objectives.

Reducing greenhouse gas emissions in line with these targets also calls for effective measures in the Helsinki Metropolitan Area.

Controlling climate change must be viewed as part of the effort to achieve sustainable consumption of natural resources and to improve general material efficiency. Large-scale conversion to renewable energy as the principal source of energy without creating new environmental and economic problems will be possible only through simultaneous and rapid improvements in energy efficiency. Planning of land use and settlement structure is very important from the point of view of greenhouse gas emission trends, because the effects of construction extend far into the future. Urban sprawl currently increases emissions in the Helsinki Metropolitan Area. Traffic volumes are increasing, and land use solutions also affect the prospects of benefiting from district heating and cogeneration of heat and power.

Sustainable development is possible by integrating and supplementing land use with particular attention to rail connections and access to efficient public transport. Dwellings, workplaces and services should be constructed within walking distance of existing railway and metro stations. Urban planning should favour solutions that improve connections for non-motorised and public transport. The objective must be to achieve a habitation structure in which daily mobility does not require use of a passenger motor vehicle.

Electrical heating and cooling systems in buildings are one of the principal factors increasing electricity consumption, and their use can only be expected to increase. Energy efficiency in buildings provides major potential for cost-effective emission reduction. Energy efficiency must be improved both in new buildings and in the existing building stock, with the choice of heating and cooling systems guided in a direction that favours minimal emissions.

Secure access to adequate energy supplies remains one dimension of sustainable natural resources consumption. Energy consumption must remain at a level that can be achieved through both economically and ecologically sustainable means. The cities can most effectively influence greenhouse gas emissions within their boundaries by taking measures regarding transport systems, land use, in-house operations, procurement procedures, construction and education. Controlling climate change must be viewed as a fundamental element of urban planning and policymaking.

Cutting emissions will be a challenging task and a drain on resources. To do nothing, however, would be even more costly. Control of climate change will also give rise to a huge global market for low carbon technologies. This market will have both the capacity and the need to adopt new technological and social innovations, which in turn may give rise to a new, dynamic global market of its own. It is in the interests of both Finland and the cities of the Helsinki Metropolitan Area to take an active position with a view to benefiting nationally from these changing conditions.

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