MEASURING URBAN SUSTAINABILITY

Analysis of the European Green Capital Award 2010 & 2011 application round

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1. INTRODUCTION

The European Green Capital Award, background and objectives

The European Green Capital Award (EGCA) is the result of an initiative taken by 15 European cities and the Association of Estonian cities in May 2006 in Tallinn. The 15 cities were Tallinn itself, Helsinki, Riga, Vilnius, Berlin, Warsaw, Madrid, Ljubljana, Prague, Vienna, Kiel, Kotka, Dartford, Tartu and Glasgow. The initiative was turned into a joint Memorandum submitted to the European Commission in which they proposed the establishment of an award rewarding cities that are leading the way in environmentally friendly urban living.

The aim of the award is to promote urban sustainability and the sharing of best practices between cities.

The Award's objectives are threefold, namely to:
a) reward cities that have a well-established record of achieving high environmental objectives,

b) encourage cities to commit to ambitious goals for further environmental improvement and sustainable development, and

c) provide a role model to inspire other cities and promote best practices and experiences in all other European cities.

All cities from EU Member States, Candidate Countries and European Economic Area countries which have more than 200,000 inhabitants can apply for the award.

Read more at: www.europeangreencapital.eu.

Theoretical framework for the Award

The title rewards a number of different elements of environmental achievements in a city. The evaluation criteria are based on the following 3 aspects:

1. *The 'greenest' city*
The Award rewards the 'greenest' city in Europe based on the city's state of the environment as defined by the performance levels relative to each of the proposed indicators.

2. *Implementation of efficient and innovative measures & future commitment*
The Award rewards the city that has implemented the most innovative and efficient environmental measures and which has shown that it is committed to do the same in the future.

3. *Communication and networking*
The Award rewards a city which can act as a role model and inspire other cities to boost their efforts towards a greener urban environment by sharing experiences and promoting best practice among European cities and beyond.

The indicator areas

Evaluation of the cities' efforts is based upon the following 10 environmental indicator areas:

- Local contribution to global climate change
- Local mobility and passenger transportation
- Availability of local public open areas
- Quality of local ambient air
- Noise pollution
- Waste production and management
- Water consumption
- Waste water management
- Environmental management of the local authority
- Sustainable land use.

The 35 applicant cities for 2010 & 2011

Applicant cities 2010 and 2011 awards

- Amsterdam, Netherlands
- Bordeaux, France
- Bremen, Germany
- Bristol, United Kingdom
- Cluj-Napoca, Romania
- Copenhagen, Denmark
- Dublin, Ireland
- Espoo, Finland
- Freiburg, Germany
- Hamburg, Germany
- Hannover, Germany
- Helsinki, Finland
- Kaunas, Lithuania
- Lisbon, Portugal
- Łódź, Poland
- Magdeburg, Germany
- Malmø, Sweden
- Munich, Germany
- Murcia, Spain
- Münster, Germany
- Oslo, Norway
- Pamplona, Spain
- Prague, Czech Republic
- Riga, Latvia
- Rotterdam, Netherlands
- Sabadell, Spain
- Stockholm, Sweden
- Tampere, Finland
- Toruń, Poland
- Valencia, Spain
- Vienna, Austria
- Montpellier, France
- Vilnius, Lithuania
- Vitoria-Gasteiz, Spain
- Zaragoza, Spain

Evaluation of the 2010 & 2011 applications

In 2009, the first evaluation round took place in order to select Europe's Green capitals for 2010 and 2011.

Thirty-five cities, covering 17 European countries, applied for the 2010 and 2011 European Green Capital Awards.

The applicant cities sent applications describing results achieved, measures taken and short and long term commitments for each indicator area, as well as their proposed programs of actions and events to disseminate experiences and best practices.

The eight finalist cities

The data produced by the 35 applicant cities was assessed by the Evaluation Panel with the specific purpose of selecting eight finalist cities. Various methods of evaluation (quantitative and qualitative, objective comparisons or individual expert assessments, final cross check evaluations, etc.) were applied by the Evaluation Panel to analyze the data.

The eight finalists were:

- **Amsterdam**
- **Bristol**
- **Copenhagen**
- **Freiburg**
- **Hamburg**
- **Muenster**
- **Oslo**
- **Stockholm**

On the basis of an additional transparent evaluation process, the European Green Capital Award Jury made their final decision and announced the City of Stockholm as the 2010 European Green Capital, and the City of Hamburg as the Award winner for 2011.

The aim of this report

The aim of this report is to make the data from the finalists' applications available to other cities in a systematic manner in order to inspire and provide them with ambitious benchmarks.

This has been done by:

- In depth analysis and reporting on the eight finalists' achievements, goals and practices in a useful manner;
- Providing evidence on the best results and highlighting the best practices, in order to promote positive competition aiming to achieve the most ambitious goals possible;
- Reporting the available quantitative data in a clear manner, with tables and graphs and, where possible, with appropriate comparisons;
- Integrating quantitative data with qualitative descriptions of good practices, in a manner that inspires other cities.

Structure and approach of this report

The report is organized in eight Chapters (eight and not ten), because the analysis of four indicator areas, Local public open areas / Sustainable land Use and Water consumption / Waste water management have been integrated into two chapters).

Policies are described with qualitative information, and a selection of local, best practices developed by the eight cities are highlighted.

The report elaborates on the data which was presented by cities in accordance with the Award application forms and on additional documentation provided during the evaluation rounds. In a few cases, where data provided by cities was not comparable, (e.g. different years or units of measure, only qualitative answers available, etc.), other data sources (e.g. EEA or Eurostat) have been used, or the "benchmarking" approach has been avoided. The reporting activity was structured towards producing as much useful information as possible with the available data.

2. LOCAL CONTRIBUTION TO GLOBAL CLIMATE CHANGE

Introduction

Climate change is at the top of the World global Agenda. EU has set ambitious targets (20-20-20 climate and energy package[1]) and cities are to play an important role in meeting these targets.

Local policies aiming to reduce CO_2 emissions and increase energy efficiency and renewable uses, generally part of city strategy, are already in place in the form of activities to reduce and avoid air pollution, reduce car congestion, improve water and waste management and increase green areas.

In their applications the cities were asked to provide information on the baseline as well as the policies and targets in relation to the following indicators:

- CO_2 per capita and trends (1990 – 2005)
- Carbon content in electricity
- District heating
- Greenhouse gas reduction target

CO_2 per capita and trends

CO_2 calculation methods, when applied at local level, often differ greatly so comparison data must be evaluated carefully.

None the less, interesting information emerges when studying the information from the eight finalists.

[1] The 20-20-20 'climate and energy package' was agreed by the European Parliament and Council in December 2008 and came into force in June 2009. The three main targets of the package are:

- a reduction in EU greenhouse gas emissions of at least 20% below 1990 levels;
- 20% of EU energy consumption to come from renewable resources;
- a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

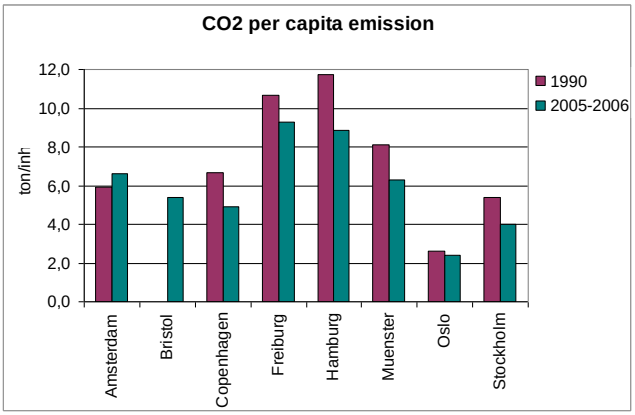
Oslo is the city which shows the lowest CO_2 per capita emission (2.4 t/inh). This data may be explained by the widespread use of electricity based on hydropower, a district heating system based to a large degree on heat derived from waste incineration, and a well developed, rail-based public transport system.

Oslo is followed by Stockholm where the per capita emissions of 5.4 t registered in 1990 decreased to 4.0 t/inh in 2005. Part of this improvement can be related to the transport sector, where the emissions decreased from 1.6 to 1.3 tonnes per capita between 1990 and 2005. This is again thanks to the low car share of the modal split (this is further explained in the next chapter on local mobility and passenger transport) and to the fact that 70,000 vehicles in Stockholm (9%) are ethanol, biogas, hybrid-electric or ultra-low emission vehicles. All inner city buses operate on biogas or ethanol and 50 % of the waste-lorries and 40 % of the taxis are bio fuelled or Hybrid. 75% of fuel stations offer ethanol or biogas and all petrol sold in the city contains 5 % ethanol.

Like Stockholm, Copenhagen scores a 26% CO_2 per capita reduction in the period 1990-2005, reaching 4.9 t/inh. A significant causative factor in this reduction is the full expansion of the district heating network and cleaner fuels in CHP stations (CO_2 emissions from CPH stations has halved since 1984).

CO2 EMISSIONS			
City	t/inh	% from transport	1990-2005
Amsterdam	6.6	33%	12%
Bristol	5.4	na	na
Copenhagen	4.9	20%	-26%
Freiburg	9.3	22%	-13%
Hamburg	8.8	41%	-25%
Muenster	6.3	32%	-22%
Oslo	2.4	58%	-8%
Stockholm	4	33%	-26%

The German cities, Freiburg and Hamburg in particular, show the highest per capita emissions: respectively, 9.3 t/inh and 8.8 t/inh. At the same time, Hamburg is the city that has experienced the highest emissions decrease (in absolute value), being able to cut the per capita emissions by 2.87 t (-25%). Main factors were: A decrease in energy consumption from housing and a decrease of the electricity consumption of households and small businesses. Since 2004, emissions from transport have been falling in accordance with the national emissions, due to higher fuel prices. Since 1997, Hamburg is subsidising solar thermal plants and, as of today, more than 36,000 m² of solar collectors have been installed. The same programme subsidised bio-energy plants, with a total power capacity of 14.5 MW. The municipally owned housing associations have also improved the energetic performance of some 65,000 residential units in the past 10 years. This has made it possible to avoid 75,000 t of CO_2 per year, which represents a 22% reduction in emissions.



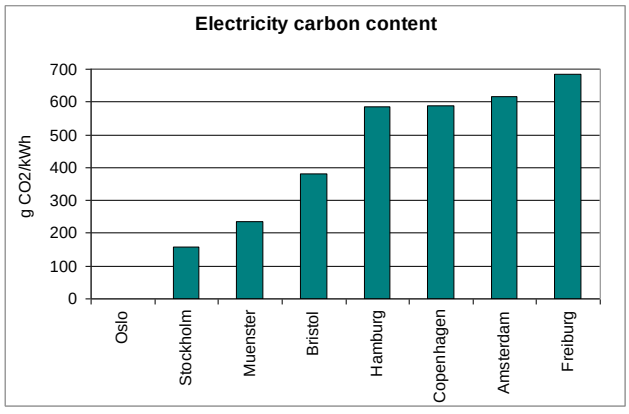
In Freiburg, the drop in CO_2 emissions (-13%) was achieved by active local policies which have led to decreased energy consumption by industry, households and businesses, as well as in transport. Today 50% of Freiburg's electricity is generated within the city, largely through combined heat and power generation and the percentage of nuclear energy has also been reduced below 25%. Approximately 4% of electricity is currently generated from renewable energy sources: 1.5% wind energy, 1.6% biomass, 0.85% solar panels and 0.2% hydropower. Freiburg has 9.8 MW of solar PV panels and 13,000 m^2 of solar thermal panels installed.

Amsterdam is the only city where the per capita emissions increased from 5.9 in 1990 to 6.6 in 2006, despite a rather good diffusion of renewable energy, particularly wind power. Today 80 megawatts of wind energy is produced within the city limits, including the port area. The port wishes to expand this to 100 megawatts.

No available data for Bristol.

Carbon content in electricity

Although data on electricity consumption derived from Renewable Energy Sources (RES) are difficult to compare, the available data on the carbon content of electricity are analysed as follows.



Regarding the carbon content of electricity, the cities tend to report a value related to the national energy mix, not being able to account for the local electricity production's ratio.

For example, Amsterdam (where 37% of households use electricity from RES) considers the composition of the Dutch fuel mix largely

representative for the fuel mix of the city (1 kWh of electricity produces 616 g CO_2). Hamburg imports “only” 80% of its electricity from the national grid but reports the emission factors of the national energy production (584 g CO_2/kWh). The city declares a 12% of electricity produced from RES.

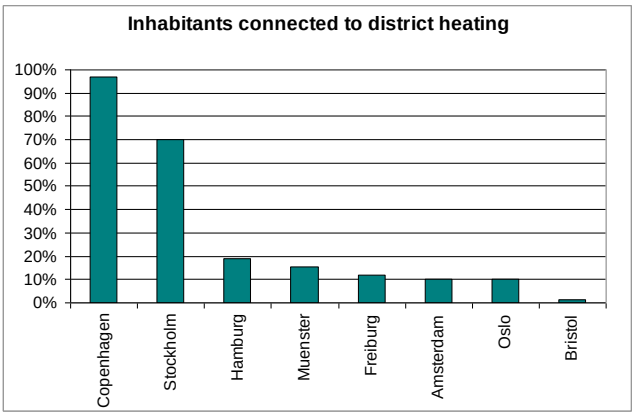
Freiburg does not use the German factors and the value reported - based on the GEMIS methodology - is higher than Hamburg's (683 g per kWh). A record of the CO_2 intensity of the overall energy consumption of the city ($kgCO_2$/kWh) has not been kept in Freiburg (they declare a 4% of electricity produced from RES).

In Oslo most of the electricity supply comes from renewable hydropower. During limited periods the electricity supply may contain a fraction of fossil derived energy imported from overseas; however this is more than compensated by exports of hydropower out of Norway at other times. Even if precise figures for the size of this fossil fraction are not available, they consider the CO_2 content equal to zero.

Also in Stockholm the carbon intensity is very low (103 grams of CO_2 per kWh in 2005), thanks to the widespread use of renewable energy (as national average the data provided is 61% and 70% is used for the district heating). About 70% of the municipal administrations use electricity from renewable resources (hydro and wind). There are also 12% of households buying electricity ecolabelled as from RES.

District heating

Scandinavian cities have a long tradition in the development of district heating technology and show the highest percentages of connected inhabitants. Today, 97% of Copenhagen is connected to a district heating system. District heating is mainly a product of surplus heat from electricity and/or industrial production, energy from waste incineration plants and bio fuels and other renewable energy sources.



In Stockholm almost 70% of the population has access to district heating. The share of renewable energies used for the energy production is about 70% (including waste recovery). The emissions of greenhouse gases have dropped with 593,000 t since 1990 as a result of conversion from oil to district heating. Furthermore, a new district cooling system contributes to an annual environmental gain of approx. 60,000 t CO_2.

The other cities, with the exception of Bristol, show a percentage of connected inhabitants ranging from 10% to 20%.

In Amsterdam not only household, but also 500 large companies are connected to the network. A lot of the heat is produced by the Waste and Energy Company which converts biomass from waste and biogas from the sewer.

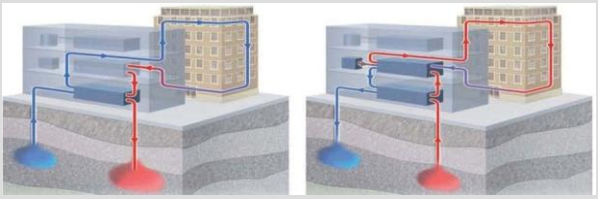
Long Term Energy Storage (LTES) in the eastern port area of Amsterdam

On the Oosterdoks island, a long term energy storage (LTES) will be realised in order to supply energy to 180,000 m^2 of commercial and industrial buildings (offices, other facilities).

The LTES system has a heat and cold distribution network from where all the required cold and heat for the buildings is supplied at the right

temperature. Heat is generated centrally with reversible heat pumps, supplemented by bio-fuel powered central heating boilers at peak demands. The cold is also generated with reversible heat pumps. The pumps utilise the stored heat and cold from the ground water to provide the necessary heating and cooling. All buildings have separately metered connections, so that users can be charged for their own usage.

Compared to traditional installations (gas-fired boilers and air-cooled compression cooling machines) it is forecast an annual amount of approximately 3,200 tonnes in terms of CO_2 emissions that will be cut. This corresponds to the amount of CO_2 avoided that could be provided by means of approximately 8,050 solar panels a year.



Greenhouse gas reduction targets and strategies

All the cities have in recent years adopted specific strategies to cut their greenhouse gas emissions. Some of them, like Copenhagen, Hamburg and Stockholm, identified both short period targets (to be reached by 2015) and targets related to a longer period (20-30 years and also 50 years long). Copenhagen and Stockholm committed themselves to become carbon neutral cities.

CO2 EMISSION TARGET (BASE 1990)

City	Short period (2015)	Medium period (2020-2030)	Long period (2050)
Amsterdam		-40%	
Bristol			-80%
Copenhagen	-20% (base 2005)	carbon neutral	
Freiburg		-40%	
Hamburg	-20%	-40%	-80%
Muenster		-40%	
Oslo		-50%	
Stockholm	-25%		carbon neutral

Stockholm City Council has adopted a target to reduce the greenhouse gas emissions to 3.0 tonnes CO_2 per capita by 2015. The City Council has also set a long-term target to continue to reduce emissions of greenhouse gases at the same rate as between 1990 and 2005. This is a step towards Stockholm becoming a fossil fuel free city by 2050.

In 2007 the city council of Copenhagen adopted “The Metropolitan Milieu” with the aim of reducing carbon dioxide emissions by 20% from 2005 levels by 2015. The plan will consider possible ways of achieving a climate-neutral Copenhagen within 20 years.

In a comprehensive “Strategy for Climate Protection” published in late 2007 and updated annually, Hamburg committed itself to reduce CO_2 emissions by 2 million tonnes until 2012 – about 20% less than the 1990 figure, representing a per capita reduction of approximately 25%. The city aims to reduce CO_2 emissions by 40 % until 2020, and endorses the joint European target to reduce CO_2 emissions by 80% until 2050.

The City of Oslo adopted a strategy for reducing climate gas emissions in 2003. This laid the foundations for Oslo’s climate and energy action plan which was adopted by the City Council in 2005 and stated that by the year 2030, Oslo’s climate gas emissions will be reduced by 50% compared to 1990. The Oslo region’s public transport company has decided that by the year 2020, use of fossil fuels for its buses will be phased out. Heating oil will be phased out in municipal buildings by the end of 2011 and fossil energy for heating will be phased out entirely by 2020.

The Freiburg municipal set the City's new objective for climate protection in 2007: a 40% CO_2 reduction by 2030. Short period targets have been set to obtain 10% of electricity from renewable energy sources by 2010. 1.2% of

the city's electricity should come from solar panels.

In 2007, the Municipality of Amsterdam approved the New Amsterdam Climate, a strategy that aims to achieve a 40% CO_2 emission reduction by the year 2025 for the entire city (compared to the level in 1990). In addition, the municipality itself aims to set a good example becoming climate neutral by 2015. Buildings, public lighting and the municipal transport facilities must consume less energy and must make as much use as possible of sustainable energy. For functions where fossil fuels are still unavoidable, possibilities for carbon setoffs will be investigated.

The first target adopted by the city of Muenster aimed at cutting down one quarter of the CO_2 emissions from 1990 to 2005. The communal climate protection balance for the year 2005 showed a factual saving of 21%. Due to these encouraging results a new target has been set by the city council in March 2008: to cut CO_2 emissions by the year 2020, by at least 40% (reference year 1990). Furthermore, the renewable energies are supposed to obtain a 20% share in communal energy supply.

In 2004, the city of Bristol adopted the Bristol Climate Protection & Sustainable Energy Strategy and set the target to reduce CO_2 emissions by 60% by 2050, from 2000 baseline. This is 1.2% per annum. Between 2005 and 2006, the first years of quality assured, comparable data, emissions were reduced by 2%. In 2008 a new Green Capital Action Plan was adopted and the previous reduction target is currently being reviewed as part of a research project with Bristol University which will set 5-yearly voluntary targets.

3. LOCAL MOBILITY AND PASSENGER TRANSPORTATION

Introduction

Mobility patterns and policies are of paramount importance for the urban environment and quality of life. A strong dependency by cars and the quality of public transport affect parameters such as air quality, noise, street accidents, city livability and children safety, health depending on mobility lifestyles, fossil energy consumption and production of CO_2.

The Data analyzed in this report concerns the eight EGCA finalists' efforts in reducing car dependency and shifting modal split towards means which are more sustainable.

The indicators include:

- Availability of cycling infrastructures, with a special focus on cycle tracks and lanes (km, km/inh, km/m2)
- Public transport (population leaving <300 m from PT stop; low emission PT)
- Private car ownership (n/inh)
- Modal share (%), with a focus on trips not longer than 5 km.

Availability of cycling infrastructures

Cycling infrastructures contribute to promoting cycling by making it faster, safer and more comfortable to cycle, even if it is clearly not the only factor of importance. The infrastructure offered by the finalist cities varies significantly. For example, Amsterdam has more than 500 km of cycle tracks and lanes, but there are also 900 km of roads (60% of the total amount) with speed ramps and a maximum speed of 30 km/h, a traffic management solution that could be considered very bicycle friendly. It really makes the difference because if we consider only cycle tracks and lanes, the Amsterdam per capita availability is 0.67 m/inh, while considering the “enlarged cycling network” the value rises up to 1.87 m/inh.

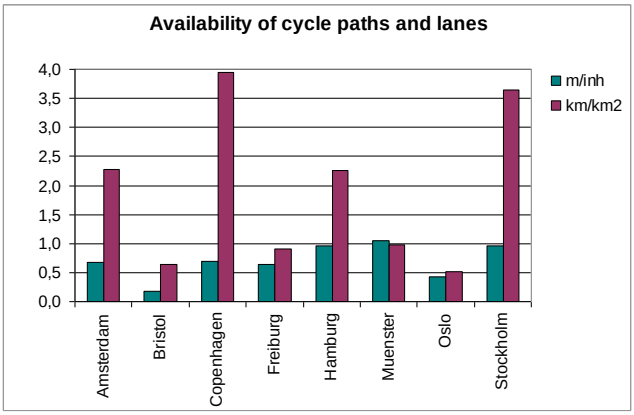
CYCLING INFRASTRUCTURES				
City	Separated tracks	Signed with lanes	Routes, pathways	Street easy to bike
	km	km	km	km
Amsterdam	400	100	na	900
Bristol	39	32	95	na
Copenh.	309	40	39	na
Freiburg	120	20	149	130
Hamburg	1,500	200	630	1,755
Muenster	293	3	210	na
Oslo	201	30	14	6
Stockholm	760		na	na

In Hamburg, as well as an extensive cycle lane network of 1,700 km, there are an additional 630 km of cycle routes and pathways along green areas and 1,755 km of streets with a maximum speed of 30 km/h.

Due to the fact that this type of data is not available for all eight cities, the following analysis has only reported on cycle tracks and lanes.

CYCLE TRACKS AND LANES			
City	km	m/inh	km/km2
Amsterdam	500	0.67	2.28
Bristol	71	0.17	0.65
Copenhagen	349	0.69	3.95
Freiburg	140	0.64	0.91
Hamburg	1,700	0.97	2.25
Muenster	296	1.06	0.98
Oslo	231	0.42	0.51
Stockholm	760	0.96	3.64

With regard to the availability of cycle tracks and cycle lanes, Muenster, Hamburg and Stockholm have the highest per capita values (about 1m/inh).



Hamburg, also due to its dimension, has the most extensive cycle network, with a total length of 1,700 km. It consists of tracks running parallel to roads for motor vehicles as well as of independently routed cycle paths, and has been in existence for over 30 years.

However, if we consider the length of the cycle network compared to the extent of the municipal area, Copenhagen scores the maximum "cycle network density" value, accounting 3.95 km of cycle tracks and lanes for each km^2. The Stockholm area is well covered too (3.64 km/km^2) followed by Hamburg and Amsterdam (about 2.3 km/km^2).

Copenhagen and Muenster: priority to the bike

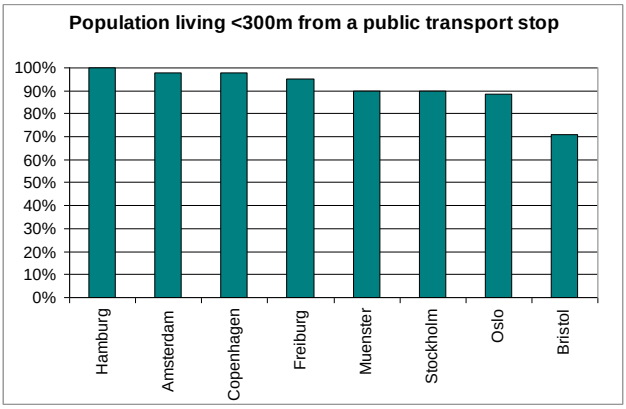
Copenhagen has set the objective of becoming the world's best cycling city. Today 36% of the capital's inhabitants use a bicycle to go to work or study. The municipality wants to increase this share to 50% by 2015. It is therefore investing in new cycle tracks, trails, parks and safety projects. The Green Wave is the sequenced traffic lights for commuters put on several of the city's main arteries which have been set so that cyclists do not have to stop for red lights. In the municipality's road projects, very high value is given to cycle tracks, often over cars or parking needs.

In Muenster, bicycle transport is also a top priority. The entire municipal area is crossed by a network of safe bicycle trails. The fact that the citizens of Muenster make use of the area-wide bicycle lane network gladly and frequently is helped by three factors:

- the bicyclist-friendly topography of the city;
- the installation of 304 km of separate bicycle lanes along all main artery roads;
- the car-free promenade of 4.5 km all around the old town which is reserved for cyclists and pedestrians and fulfils important functions (up to 1,500 cyclists per hour, at peak times, make use of this "bicycle highway").

Public transport

The density and service level of the public transport network plays a very important role in the sustainable mobility of a city. In Hamburg, Amsterdam and Copenhagen the share of population living within a 300 metre radius of local public transport stops (hourly or more frequent) is very close to 100%. In Copenhagen, 98% of the population lives within 350 metres to the high frequency lines. With the exception of Bristol, all the cities score very high, around 90% to 100%.

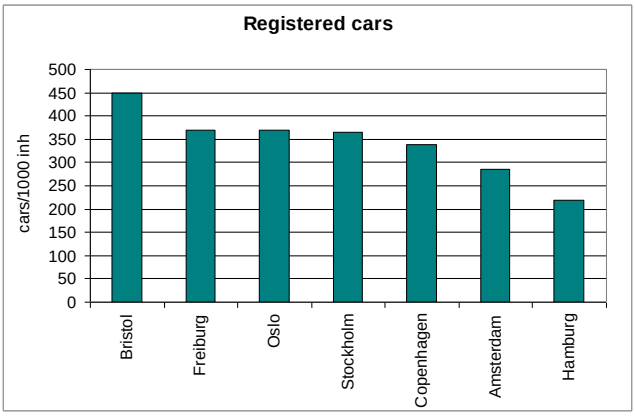


Data about low emission public fleets is rather difficult to compare because each city provides different interpretations of the technical features required for a public means of transport to be considered "low emission" (buses with emissions which are 50% or more below EURO IV standards as regards NOX or particulate matter). Nevertheless, Stockholm

and Amsterdam seem to be the cities which have invested most resources in reducing the emissions related to their public transport fleet.
In Stockholm County 65% of the public transport (based on person-km) is classified as low emission, including rail traffic. All rail traffic operates with certified renewable electricity. All buses operating in the inner city run on renewables. Some 50 buses run on biogas and the number will be doubled the coming years. Stockholm Transport also uses some 400 ethanol buses and a few ethanol hybrid buses. In 2008 25% of the bus fleet in the whole region ran on renewables, and the target for 2011 is 50%.
In Amsterdam only 20% of all public transport journeys is by bus. The other 80% of journeys by public transport is by emission free trams, metro or trains with no local emissions. 98% of buses are equipped with a CRT filter: (Continuously Regenerating Trap) that reduces fine particles more than twice as low as the EURO IV norm. Although, NOx emissions do not reach a similar level. 15% of the buses of the transport company meets the - stricter - EEV NOx norm, but does not achieve the required 50% NOx of the euro IV norm.

Private car ownership

The car's ownership rate (Source: Eurostat) is very low in the eight cities (except for Bristol) if compared with the EU15 national average (around 500 cars every 1,000 inhabitants).
Amsterdam and Hamburg show very low values, under 300 cars/1,000inh.



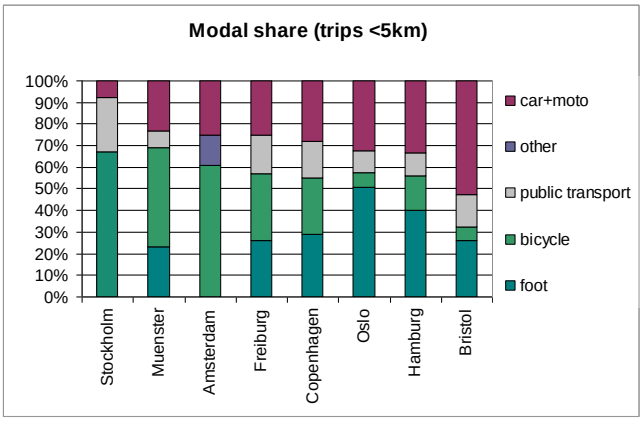
Modal share

Even if some differences could be due to different morphological conditions, innovative policies and mobility lifestyles have a great influence in the modal share, especially referring to short distances (less than 5 km, that generally are the high majority of urban trips).

MODAL SHARE (TRIPS < 5km)

City	Foot	Bicycle	Public transport	Car+moto	Other
Amsterdam		61%		25%	14%
Bristol	26%	6%	15%	52%	
Copenhagen	29%	26%	17%	28%	
Freiburg	26%	31%	18%	25%	
Hamburg	40%	16%	11%	34%	
Muenster	23%	46%	8%	23%	
Oslo	50%	7%	10%	32%	
Stockholm	68%		25%	8%	

All the cities – with the exception of Bristol – aim to contain the car use. Stockholm has reached definitely the best results, with only 8% of short trips made by car, while the other cities' values are between 20% and 30%. In particular, policies aiming to increase the "soft" mobility have been successful: in Amsterdam, Muenster and Stockholm more than 60% of short trips are done walking or by bicycle. Also other cities record a value which is higher than 50%.



In Amsterdam 38% of all journeys are currently made by bicycle and in the city centre this increases to 57%. Amsterdam residents now use a bicycle on average more frequently than a car.

Amsterdam: low-traffic city centre and widespread car sharing system

Amsterdam residents decided on a low-traffic city centre in a referendum in 1992. The number of car journeys from and to the city centre has dropped strongly from 58,900 in 1995 to 40,100 in 2007: a fall of 32% (whereas the population remained stable). This drop in car traffic seems to have no negative economic effects, in view of the increase in price per square metre for offices and housing in the city centre over the same period.

The centre of Amsterdam has the highest car sharing use of the Netherlands, with 200 car sharing spots. Since 1995, the municipality makes fixed parking spaces available to car sharing providers. Amsterdam as a whole city has 740 car sharing spots. 90% of all housing in Amsterdam is within 400 metres of a car sharing spot and in the Ring, where 60% of all housing is concentrated, 80% has a car sharing spot within less than 100 metres (96% within less than 250 metres).

In Stockholm 68% of all trips in the inner city (usually not longer than 5 km) is done walking or by bike and 25% by public transport. The car use has been limited only at 8%. During peak hour 78% of all trips to the inner city are by public transport.

The congestion charge in Stockholm

After a seven month testing period, from August 2007 the congestion charge in Stockholm city centre is permanent. The fee is imposed on Swedish registered vehicles driving into and out of the Stockholm inner city zone on weekdays between 6.30 a.m. and 6.29 p.m. Vehicles are automatically registered at “control points”. Traffic and emissions in the city centre decreased by at least 10-15 percent. The emission reduction due to the congestion fee has been calculated to be equivalent of 30,000 tonnes of CO2 for the year of 2006.

Before the introduction of the congestion scheme there were a majority opposing it, but once people saw the benefits many citizens changed their minds. At the referendum in September 2006 the majority voted for the continuation. It was re-launched on 1 August 2007 and the opinion polls now show a majority in favour of the scheme.

In recent years Freiburg has been successful in introducing sustainable mobility measures in its long term planning documents. The Land Development Plan (LDP), approved in 2006, requires that all new residential and commercial areas would be assessed in terms of their potential ramifications on the transport system. The latest version of the ‘markets and commercial centres concept’, approved in 2008, has the aim to prevent commercial centres from appearing in the “open countryside” This is to ensure that local populations continue to be supplied with everyday necessities avoiding unnecessarily long journeys.

Freiburg: new car free district

Two new districts have been created in Freiburg during the past 10 years: the 'Rieselfeld' district (11,000 inhabitants) and the 'Vauban' district, (5,000 inhabitants). For both of these districts a major objective was to provide them with an environmentally friendly traffic scheme.

As the Rieselfeld district was developed it was simultaneously connected to the tram network. The tram runs right through the heart of the district, in such a way that no housing or workplaces are more than 500 m away from the nearest stop. The tram was in operation right from the beginning of the development, so that new residents could get used to basing their travel choices on local public transport.

Connection to the tram network was an issue of central importance also for the Vauban district. Here however, even more ambitious objectives in terms of environmental policy were pursued: a large section of the residential area is car-free, or more precisely 'parking space-free', i.e. residents may bring goods to their front doors using their vehicles but must park the vehicles themselves in collective garages outside the area. Residents can declare themselves 'car-free', in which case they do not have to purchase a parking space. This project is by far the largest car-free project in Germany and has attracted much attention worldwide.

4. SUSTAINABLE LAND USE AND AVAILABILITY OF LOCAL PUBLIC OPEN AREAS

Introduction

The land use pattern, as part of the urban design, lays out the conditions under which cities can function. Compact cities with high densities of people and jobs per built up area and brownfield re-developments enable cities to reduce their ecological footprint by reducing the urban land take and soil sealing, the energy demand for heating and cooling, and the transport demand per capita. Furthermore compact cities patterns could help in enabling more walking, cycling and more efficient public transport.

Nevertheless, compact development needs to be balanced with sufficient green urban areas as a prerequisite for a liveable city. Cities are human habitats; thus, good access to green urban areas, their high quality and multiple usability are even more important than their absolute share of the municipal's area.

Data analyzed in this report shows the eight EGCA finalists' efforts in these directions.

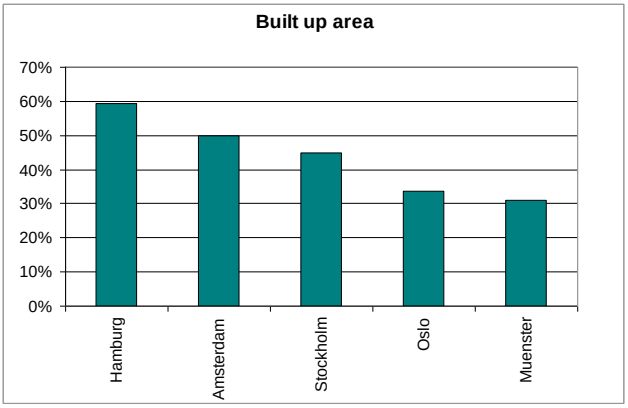
Indicators used are:

- Built up area
- Population density
- Building on brownfield
- Availability of public green areas
- Population living <300m from a public open area

Built up area

In Hamburg the land used for housing and traffic purposes accounts for a 60% share of the total area. In Amsterdam this share is about 50% and in Stockholm 45% (35% are business and residential areas, and 10% consists of roads)[2].

Roads or buildings take up only 1/3 of Oslo's and Muenster's municipal area.



The Oslo strategy of preventing urban sprawl

The population of Oslo has grown with 50,000 new inhabitants the last 10 years (10% of total population). Virtually all new housing in Oslo has been built within the existing building zone, and not on virgin land outside the building zone. The densification takes place in most parts of the city built up area, mainly in the more central parts of the city.

The overall strategy of preventing urban sprawl has been Oslo's policy for many years. This strategy primarily includes densification around collective transport networks and nodes as well as improvement of the public transport system. In addition, building in the green belt around the city is strictly prohibited. The policy for coordinated urban land use and transport was adopted in the Urban Ecology programme 2002 and the City master plan in 2004.

The goal is to develop favourable conditions for being able to live in the city without owning a car. The main strategy to obtain this goal is to improve the public transport system. Nine nodes in the public transport system were designated as prioritized areas for urban development and densification. An important pre-requisite for this

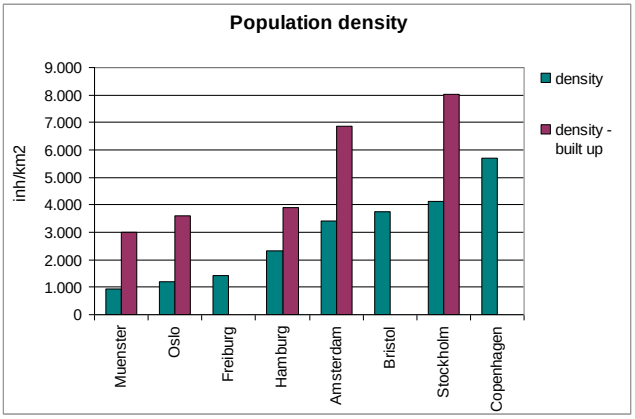
[2] No available data submitted in the applications of Copenhagen, Freiburg and Bristol.

strategy is a development with low car parking coverage.
The municipal master plan adopted in June 2008 assumes an increase of 60,000 households by the year 2025, with 2/3 to be built within or close to the inner city. If this prediction is realized, the density of inhabitants in the inner city is expected to increase by more than 25 %, while the density of the outer city will see a more moderate increase of up to 15%. The development of the new Fjord city (redevelopment of harbour brownfields), with a total area of 226 ha is expected to absorb a significant amount of projected growth in the inner city.

Population density

Copenhagen is the most compact city, with a population density of 5,708 inhabitants for each km^2, followed by Stockholm (4,141 inh/km^2) and Bristol (3,732 inh/km^2). The lowest densities (about 1,000 inh/km^2) are the ones of Oslo and Muenster.

If we consider the density of built up areas (data available only for 5 cities), Stockholm and Amsterdam show values (respectively 8,000 and 7,000 inh/km^2) that are, more or less, twice than the average densities of Hamburg or Oslo. Muenster has the lowest density, also referring to built up areas (3,000 inh/km^2).



The new development schemes in Copenhagen, mainly consisting of mixed uses (dwellings, office, space, retail, leisure etc), are characterised by a very high density: 350-400 inhabitants per Ha, three times more than Stockholm (112 inh/Ha) and Bristol (140 inh/Ha).

DENSITY			
City	Density	Density built up areas	Density new developments
	inh/km^2	inh/ km^2	inh/Ha
Amsterdam	3,412	6,856	100
Bristol	3,732	Na	140*
Copenhagen	5,708	Na	350-400
Freiburg	1,434	na	120
Hamburg	2,331	3,918	200
Muenster	925	2,983	100
Oslo	1,211	3,595	38
Stockholm	4,141	8,032	112

Hamburg's urban planning has identified significant areas (30%) within the inner city consolidation that will be progressively realised through the development of vacant sites and by adding floors. HafenCity is a new development project for reuse and requalification of part of the harbour area, with a very high population density: one third of the area (60 ha) is being used to build 5,500 residential homes for 12,000 new inhabitants, equating to a population density of 690 inh/Ha. At the same time, Hamburg's residential building policy also provides for new terraced and detached housing of a considerably lower population density in the peripheral urban regions, such as the new city district of Neu-Allermöhe (12 inh/Ha).

In Freiburg, during the 1990s, the construction of two new large districts that now host nearly 7% of total population began: Rieselfeld (11,000 residents) and the former military site of the Vauban (5,000 residents). Both districts' proximity to the city centre and good local transport connections enable and demand high but manageable population densities about 120 inhabitants per Ha.

Amsterdam's development within city limits is aimed at creating municipal environments in high densities. High offices around the Amstelpark and in the Zuidas new district are the trend even if the highest numbers of residents and employees can still be found in the centre (>250 residents + employees per hectare). About ten sites have been transformed into residential-work areas, with a joint share of approximately 25 % residential. Over the next decades this may well grow to 50%. In most cases the population density in these new projects amounts to 100 residents per hectare or more.

Building on brownfield

Not all cities adopt a harmonized definition of the "brownfield" concept so the following data should be taken with some care.

Bristol, Oslo and Copenhagen show the best capacity in containing the urban sprawl, avoiding new developments on virgin and undeveloped land.

In Bristol all new offices and light industries and most residential developments have been built on brownfield areas (since 1997, 93% of 16,000 new homes). The percentage is lower for industrial and warehouse developments (nearly 45%).

Building on previously undeveloped land plots in Oslo was limited during the period 2002 to 2006 to 20% of new buildings over 100 m^2, while 80% were built on previously developed or brownfield sites.

From 2001 to 2007 a total of 14,400 new dwellings were built in Copenhagen. Approximately 80% was on brownfield sites either as densification in existing neighbourhoods or in relation to major redevelopment schemes.

In the same period, 25,000 new apartments were built in Stockholm; more than 1/3 were built in larger brownfield areas. Similar percentages have been recorded in Muenster, where approximately 25% of the residential building areas (1,825 dwelling units) were provided in derelict or reorganisation areas during the period from 1997 to 2004. This share rose to more than 38% from 2005 to 2007.

BUILT LAND		
City	Built land	Building on browfields
	%	%
Amsterdam	50%	na
Bristol	na	45%(industrial) - 93% (houses) (1997-2007)
Copenhagen	na	80% (2001-2007)
Freiburg	na	na
Hamburg	60%	na
Muenster	31%	38% (2005-2007) 25% (1997-2004)
Oslo	34%	80% (2002-2006)
Stockholm	45%	30% (2000-2007)

Freiburg is a continually growing city with a current total of almost 220,000 inhabitants. Space-saving housing developments became the chief aim of the new Land Development Plan (LDP) 2020 (effective in law since Dec 2006). The Plan is based on a realistic demand forecast incorporating the potential for central urban development, which is to be exploited as a priority. In terms of results, the LDP 2020 has taken the decision to reduce by 34 hectares the land available for housing than its predecessor of 1980.

Availability of public green areas

Stockholm is the city with the highest availability of public green spaces[3], 6,870[4] Ha, 36% of all land area. This means that there are

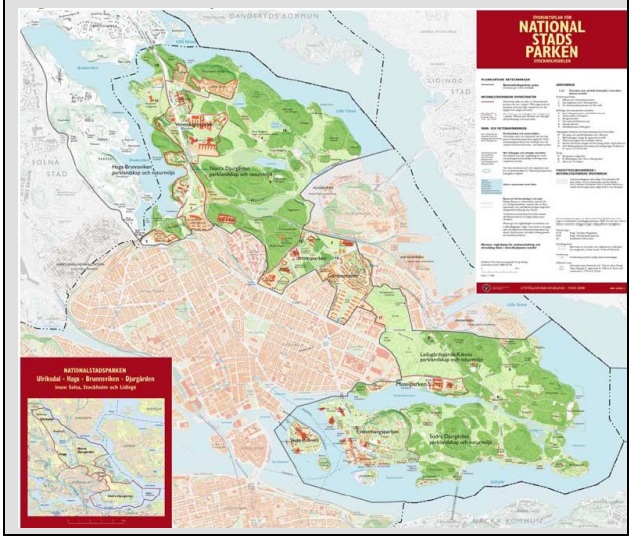
[3] Not all cities adopt a harmonized definition of the "green areas" concept so the following data should be taken with some care.

[4] Only the total amount has been given, without specifying the different kind of green areas (parks, allotments, recreational areas, sport facilities, etc….)

86 square meters of green areas for each inhabitant. Within the city of Stockholm eight areas of natural and cultural reserves are protected to secure biodiversity and accessibility for the citizens. The green areas of Stockholm are still of a coherent structure in many parts of the city, the so called ecological infrastructure, which is also of great importance for the flora and fauna in the community.

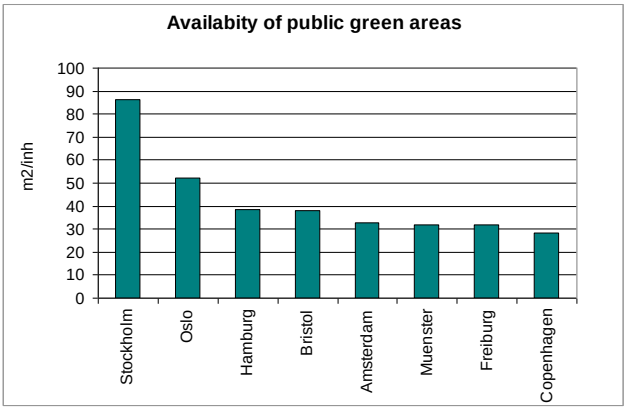
Stockholm's Ekoparken

Nationalstadsparken also called Ekoparken, is unique in the world. In 1994 a large piece of land and water area in a big city area was set apart and protected by a special law in order to preserve its nature and culture in our time and for future generations. Nationalstadsparken is a unique experiment in cohabitation of city and nature, a method for keeping a heritage in culture and nature alive in a world of change.



The other city showing a very high value of per capita public green areas is Oslo, with 52 m^2/inh. The central third of the municipality of Oslo consists of built-up area, whilst the outer two thirds are protected forested areas known as "Marka". The Oslo City Council has decided to protect the Marka because of its importance for the city's visual character and environment, as well as for recreation (lakes for bathing, rivers and lakes for fishing, marked cross-country skiing trails…).

Hamburg and Bristol have just less than 40 m^2/inh of public green areas, while the other four cities record values around 30 m^2/inh.



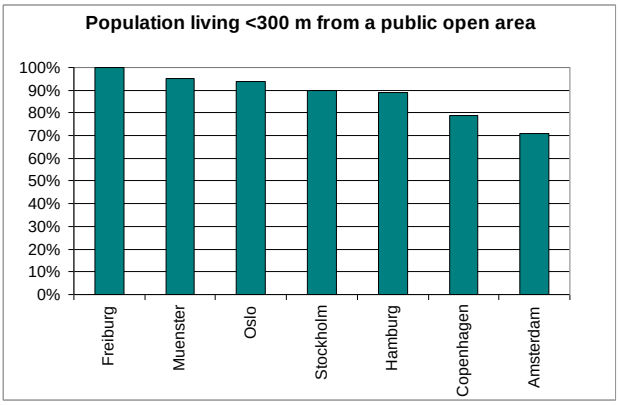
PUBLIC GREEN AREAS		
City	Public open areas m^2/inh	pop living < 300 m from public open area
Amsterdam	33	71%
Bristol	38	na
Copenhagen	28	79%
Freiburg	32	100%
Hamburg	39	89%
Muenster	32	95%
Oslo	52	94%
Stockholm	86	90%

Accessibility of public open areas

The accessibility of public open areas is very high in all the cities. Amsterdam shows the lowest rate of population living less than 300 m from a public green area (70%[5]), followed by Copenhagen (80%). All the other cities[6] evaluated that more than 90% of their citizens comply with this standard of accessibility to public open areas.

[5] 96% including waters
[6] No available data for Bristol

In 2007 a citizen poll in Stockholm showed that 8 out of 10 citizens estimated that they visited close situated parks and green areas regularly every week. 9 out of 10 were satisfied with the possibilities of access to public green areas.
In Freiburg the green areas are distributed relatively evenly throughout the city and can therefore be reached on foot within a matter of minutes. On average, citizens of Freiburg are a maximum of 150-300 metres away from their nearest free time and leisure area. This is the results of urban development policies aiming at increasing the amount of green spaces, but also their closeness to the new settlements.



The presence of a networked system of open spaces is an important prerequisite in order to guarantee to the citizens the highest accessibility to green areas. In Hamburg it has been considered also a fundamental prerequisite for ecological and social development of the city as well as for maintenance the structural qualities in terms of natural landscape. Radial landscape axes and the two tangential green rings form the principal structural elements of the open space network. This basis is supplemented by recreational hubs serving half-day and all-day recreation: district parks, regional parks and local recreation areas. In order to sufficiently provide the population with green and open areas for leisure, sport and recreation within an appropriate distance of residential areas, the landscape axes and green rings are complemented with a compact open area structure comprising individual spaces such as parks, playgrounds, sports fields and allotments. These individual areas are interlinked with each other as well as with the landscapes axes and green rings via a network of green corridors and paths. Thanks to this network, approximately 90% of Hamburg's population, live within a maximum distance of 300 metres from a public open area.

The green ordinary Muenster

In 1965, Muenster was one of the first cities in Germany to establish a green structures policy:
A comprehensive conception for the development of open spaces that has a decisive bearing on the urban development. It was advanced constantly - and still is until the present day. When it comes to making decisions as regards the development and utilisation of green areas and free spaces, the green ordinary of Muenster constitutes a reliable basis for politics and administration. It provides for the development of green, leisure, and recreational areas as well as the area-wide supply of playgrounds, allotments, and cemeteries.
It guarantees the city's ecological and climatic qualities to persist and even be expanded in the future. Furthermore, it is a substantial contribution to the land utilisation plan, thus establishing principles to base decisions on as to which open spaces have to persist at any rate, due to their significance for the city, and which ones are to be developed further.
In 2004, the council of the municipality of Muenster decided to introduce the integrated city marketing and urban development concept, aiming at cultivating Muenster into a city with both maximum quality of life and of experience. In terms of this purpose, Muenster is perpetually evolving also as regards both size and quality of its green spaces. In this context, the surface of public green spaces and playgrounds has been increasing, within the past decade, by a total of 23%.

5. QUALITY OF LOCAL AMBIENT AIR

Introduction

Air pollution in European cities is still a critical issue, due to the impacts that pollutants concentrations have on citizen health, particularly severe for elders and children. Most of the EU cities have still not achieved the goals established by the EU Air Directives.

Data analyzed in this report show the eight EGCA finalist cities' efforts in reducing pollutants concentrations and people's exposition to them.

Air quality data from cities' applications (provided to the European Green Capital Award) are not completely homogeneous. In order to fill the gap, the authors of this report have used the European air quality database (managed by European Topic Centre on Air and Climate Change) to cover the missing data and make the comparisons more reliable[7].

Data showed for each city (year 2007) could be represented as:

- the average value of all the values registered by the monitoring stations
- the maximum value registered by the worst monitoring station .

Values are referred to air monitoring stations installed within the urban area, divided into traffic and background stations[8]. In some cases (Amsterdam, Copenhagen and Muenster) only one traffic or background monitoring station has been reported.

The indicators used are:

- Fine Particulate Matter (PM10)
- Nitrogen dioxide (NO_2)
- Ozone (O_3)

Fine particulate matter (PM10)

With regard to fine particulate matter (PM10) concentrations: the annual means' average values are all under the 2010 limit value of 40 µg/m^3 (Directive 2008/50/EC), both for background and traffic stations. The limit value related to the maximum number of days (35) per year with a daily mean over 50µg/m^3, has been exceeded only in Copenhagen and Stockholm. Copenhagen's value is related only to a single traffic station, while in Stockholm the 59 days reported are the average value coming from three traffic stations (the maximum value recorded is 75 days)[9]. All the urban background stations show pollution levels respecting the limit values.

PM10 ANNUAL CONCENTRATIONS (AVERAGE VALUES)

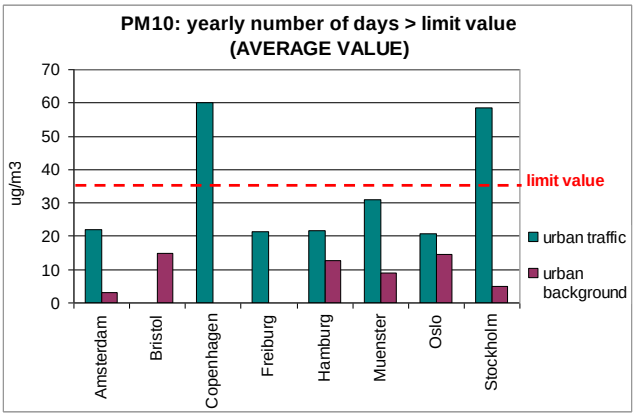
City	Days > limit value (traffic)	Days > limit value (background)	Annual mean (traffic)	Annual mean (background)
	number	number	µg/m^3	µg/m^3
Amsterdam	22	3	32	26
Bristol	Na	15	22	20
Copenhagen	**60**	na	34	24
Freiburg	22	na	33	Na
Hamburg	22	13	29	23
Muenster	31	9	32	23
Oslo	21	15	27	22
Stockholm	**59**	5	36	17

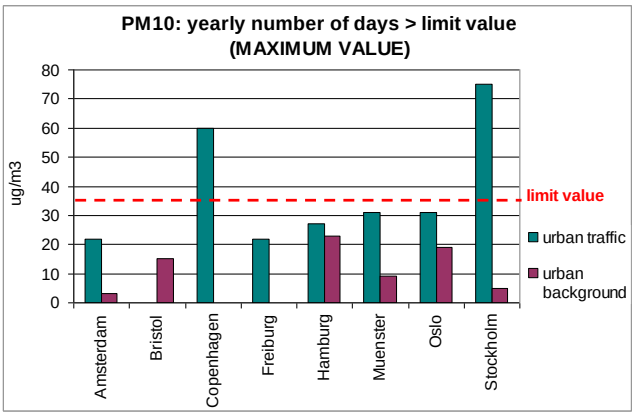
[7] In cases where the data reported by the city in their application has differed from data reported in the Air Quality Database, the data from the application has been chosen.

[8] Traffic station: monitoring station located where the pollution level is determined predominantly by the emissions from nearby traffic (roads, motorways, highways).
Background station: monitoring station located where the pollution level is not influenced significantly by any single source or street, but rather by the integrated contribution from all sources upwind of the station (e.g. by all traffic, combustion sources etc. upwind of the station in a city, or by all upwind source areas (cities, industrial areas) in a rural area).

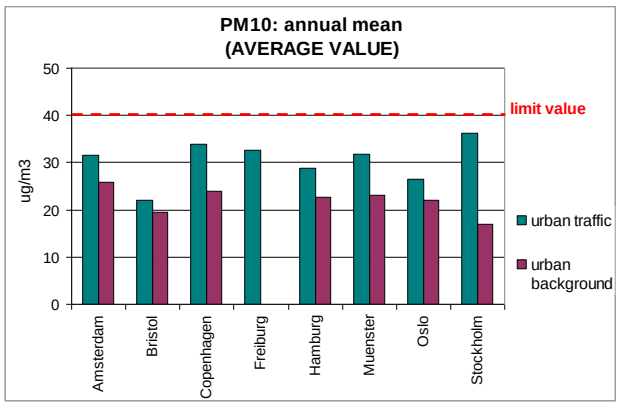
[9] Almost all the exceedances occur in the winter period November to April mainly due to the use of studded winter tyres in Sweden.

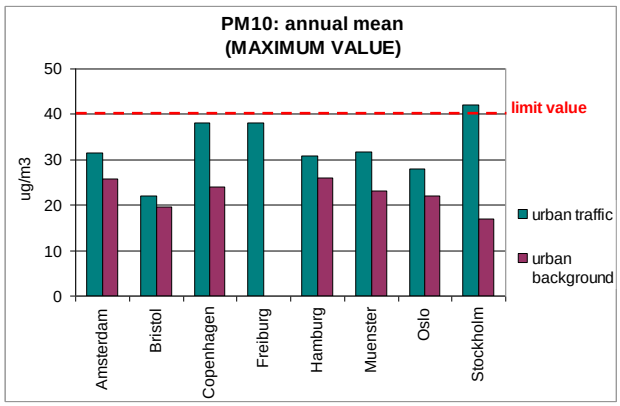
PM10 ANNUAL CONCENTRATIONS (MAXIMUM VALUES)				
City	Days > limit value (traffic)	Days > limit value (background)	Annual mean (traffic)	Annual mean (background)
	number	number	µg/m^3	µg/m^3
Amsterdam	22	3	32	26
Bristol	na	15	22	20
Copenhagen	**60**	na	38	24
Freiburg	22	na	38	na
Hamburg	27	23	31	26
Muenster	31	9	32	23
Oslo	31	19	28	22
Stockholm	**75**	5	**42**	17





The annual mean limit value of 40 µg/m^3 has been respected in all monitoring stations, with the exception of Stockholm, which has a maximum value of 42 µg/m^3.





However, the two cities are in a favourable position for achieving a definitive improvement as described in the following.

In Copenhagen, PM10 remained at the same general level between 2002 and 2007. Levels varied only slightly during this period, largely due to meteorological conditions. The municipality had declared the objective of achieving 10 concrete initiatives in 2010 which will result in fewer Copenhageners being affected by traffic pollution: the PM_{10} concentrations are predicted to fall by 10% in relation to the 2007 level.

In Stockholm, the trend for PM10 has remained unchanged over the past five to ten years in urban background, while in traffic hotspots a slight downward trend has been monitored. The public transport system has been a crucial factor to improve air quality: the share of trips to Stockholm city centre taken by public transport increased from 57% to 64% the last

ten years. In the morning peak hour the share increased from 72% to 77%.This trend is expected to continue due to relevant political initiatives.

Use of charges and subsidies to reduce PM_{10} concentration in Oslo

The air quality action plan of Oslo has resulted in a steady improvement in the figures for the number of exceedances of the daily mean value for PM_{10}: in 2007 - for the first time - none of Oslo's measuring stations recorded more than 35 exceedances.

A combination of several measures, including charges and subsidies, has been effective in reducing PM_{10} concentrations. In particular:

- The introduction of a charge on the use of studded tyres has increased the share of stud-free tyres from 50% to more than 80% and reduced dust created by road wear. (see Figure) The measure is self-financing and any profit made is invested in improved winter road maintenance.
- In order to reduce congestions and to finance the necessary investments in the public transport system, Oslo City, Oslo Region and the Ministry of Transport agreed on the introduction of a toll ring taxing car traffic entering the central part of the city. 20% of the toll income went to investments in public transport, and the rest to build tunnels under the city to save the built up area from pollution, traffic accidents and barrier effects, and to improve car traffic flow on the main road network.
- Reduce particle emissions from wood burning stoves. There are around 63,000 wood burning stoves in Oslo. In order to increase the share of clean burning stoves, citizens can apply for a grant from the City of Oslo's Energy Efficiency Fund. In the period 1998-2008, a total of NOK 12.3 million has been granted for the replacement of ca. 4,400 stoves with new and more efficient ones. This is estimated to have reduced the annual particle emissions in Oslo by 35.2 tonnes.

Nitrogen dioxide (NO_2)

As regards the annual mean for nitrogen dioxide (NO_2), the EU limit value is in the Directive 2008/50/EC set to 46 µg/m^3.

In Hamburg, Freiburg, Amsterdam[10] and Bristol the average values registered by traffic stations exceeded this limit. Both in Hamburg and Freiburg the concentrations monitored in background stations are about 1/3 of the concentrations monitored in traffic stations.

NO_2 AND O_3 ANNUAL CONCENTRATIONS (AVERAGE VALUES)

City	Annual mean NO2 (traffic)	Annual mean NO2 (background)	Days ozone > limit value
	µg/m^3	µg/m^3	number
Amsterdam	**53**	31	2
Bristol	**47**	30	3
Copenhagen	45	19	3
Freiburg	**58**	20	33
Hamburg	**65**	25	7
Muenster	**48**	23	18
Oslo	44	na	4
Stockholm	44	13	0

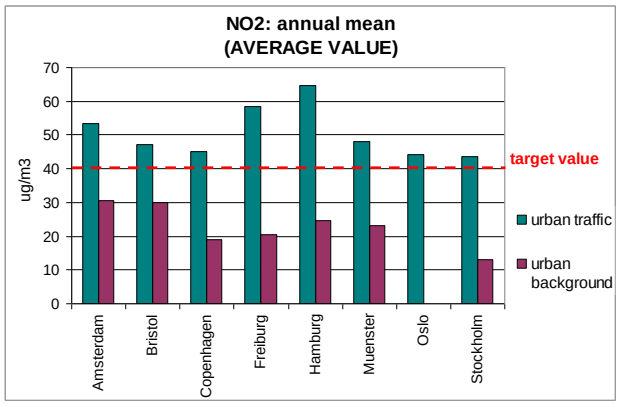
NO_2 AND O_3 ANNUAL CONCENTRATIONS (MAXIMUM VALUES)

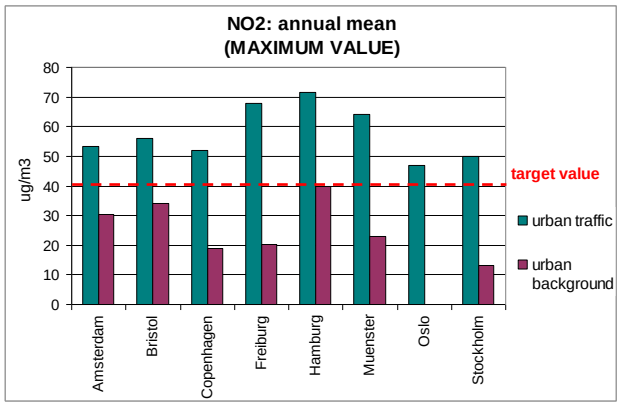
City	Annual mean NO2 (traffic)	Annual mean NO2 (background)	Days ozone > limit value
	µg/m^3	µg/m^3	number
Amsterdam	**53**	31	2
Bristol	**56**	34	3
Copenhagen	**52**	19	3
Freiburg	**68**	20	33
Hamburg	**72**	40	11
Muenster	**64**	23	18
Oslo	**47**	na	4
Stockholm	**50**	13	0

If we consider the 2010 target value of 40 µg/m^3, all the cities, with the exception of Muenster, have not still reached the target at the street stations, and the maximum values registered were all above the limit of 46 µg/m^3 expected for 2007. The three German cities

[10] Only one monitoring station has been reported.

show the highest maximum values, more than 40% higher than the limit value. Considering the average levels, Oslo, Stockholm and Copenhagen are rather close to the 2010 target (only about 10% above), while other cities like Amsterdam, Freiburg and Hamburg are still far from it (from 32% to 63% above). All the background annual means, with the exception of the Hamburg's maximum value, are below 40 µg/m^3.





Almost all cities have introduced good measures and future plans with the aim of reducing NO_2 concentrations.

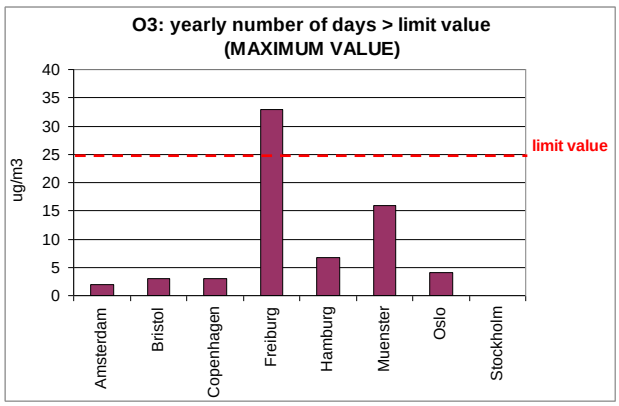
In 2006, the Freiburg Regional Council together with the City of Freiburg approved the Freiburg Clean Air Plan with the aim to reduce the NO_2 levels. The Plan contains a technical programme with the objective to comply with the EU standard for NO_2 by 2010. In addition to numerous measures (e.g. planning and building a tunnel within the city; and improving local public transport), the Clean Air Plan also prescribes traffic bans in the Freiburg low emission zone affecting Euro 1 and older cars from 2010 onwards and Euro 2 and older cars from 2012 onwards.

The City of Hamburg presented a clean air plan in October 2004 and an air quality management action plan in December 2005 aiming to improve air quality and reduce NO_2 concentration. Hamburg's municipal and public enterprises have strongly committed to increase the use of vehicles fuelled by natural gas, including an incentive system for the introduction of 1,000 new "Green Taxis" with gas-fuelled engines. As of today, 20 natural gas fuelling stations exist in the Greater Hamburg area, to supply and service public and private natural gas vehicles.

Ozone (O_3)

Ozone is a pollutant which strongly depends on meteorological conditions characterised by solar intensity and high temperatures. Therefore northern cities perform in general better than the southern ones.

Freiburg, having higher NO_2 concentrations (one of the most important ozone precursors) and a higher solar intensity, is the only city that exceeds the number of days per year on which the ozone value was above 120µg/m^3 (8h mean)[11].



[11] Limit value identified in the Directive 2008/50/EC

In 2007 there were 33 days, 8 more than the 25 allowed. In Freiburg electronic display screens are provided in various locations throughout the city to indicate air pollution levels. The population and visitors are thus kept constantly informed of air quality. In summer, the City of Freiburg additionally runs an ozone hotline that gives the current ozone values measured and also issues 'ozone warnings' in the event of excessive ozone levels (180 µg/m³ per day) including behaviour indications (the first city in Germany to do so, introduced in the 1980s).

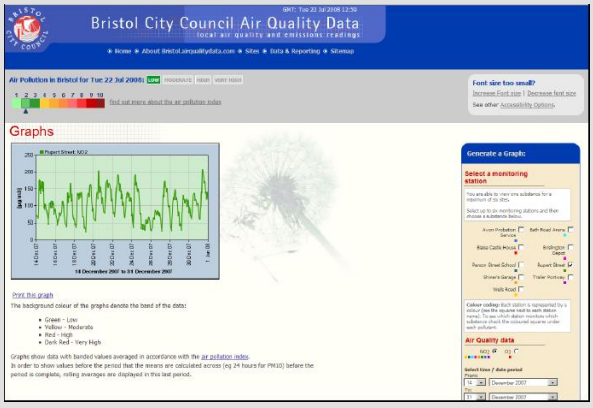
Bristol is participating in the European project CITEAIR. Bristol has, in particular, been involved in the development of a Common Operational Website (COW) which enables participating cities across Europe to compare air quality data in close-to real time using a Common Air Quality Indicator (CAQI). A CAQI for background and roadside pollution is shown on the COW.

Bristol uploads a data file to (www.airqualitynow.eu) on an hourly basis and the web site displays current and recent air quality classifications for roadside and background locations. The site has been running with high reliability for about three years.

Public Information on Air Quality in Bristol

A number of methods are used to communicate air quality matters to the public, ranging from surveys and consultations on specific schemes to bespoken web sites for public issues. A bi-annual newsletter is published and distributed to residents and partner organisations to notify customers of developments in air quality.

Bristol's web site on Air quality was set up to deliver close to real time air quality and meteorological data to the public and researchers (http://www.bristol.airqualitydata.com). Data from ten monitoring stations are available via the site. The web site was further developed to provide a "kiosk" type product, which can be viewed by the public in council building foyers etc.



6. NOISE POLLUTION

Introduction

Noise affects urban quality of life, both during the day and at night and stems from numerous sources such as public works and loud music. However, traffic is the main and more continuous source. Most EU cities have difficulty in achieving the goals set by the Noise Directive, either because they do not respect noise value limit and/or are late in adopting the correct noise measurements and plans.

Data analyzed in this report show the eight EGCA finalist cities' efforts within this field.

The quantitative indicator used is the number of people exposed to road noise. Information is completed by a review of the main policies adopted by cities.

People exposed to noise

The Noise Observation and Information Service for Europe (NOISE) database of the European Environment Agency provides a picture of the numbers of people exposed to noise generated by air, rail and road traffic in 102 large urban agglomerations. EEA data about the % of people exposed to road traffic are available only for Amsterdam, Bristol, Copenhagen, Hamburg and Stockholm.

PEOPLE EXPOSED TO ROAD NOISE		
	People exposed to Lden >55	People exposed to Lnight >50
Amsterdam	35%	20%
Bristol	95%	78%
Copenhagen	36%	32%
Hamburg	18%	13%
Stockholm	35%	20%

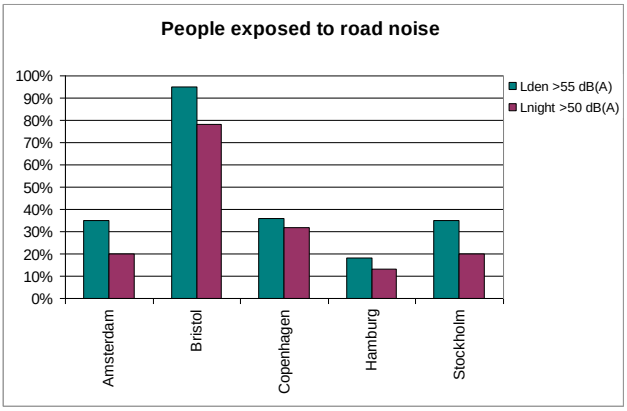
These data differ quite a lot from the data reported in the applications submitted by cities for the European Green Capital Award[12].

Regarding people exposed to Lden > 55dB(A), only for Stockholm and Hamburg data reported in the application are similar to the EEA database[13].

Comparisons cannot easily be made as data in the applications are not consistent.

For example, Muenster reports very recent data (2008), but related only to areas subjected to major exposure (main roads traffic) and older data (2000) with a higher coverage. Copenhagen, on the other hand, reports the values of people exposed to road noise with Lden at over 58 dB(A), which is the national guidance limit for new buildings, instead of 55 dB(A).

Hamburg's values about the percentage of people exposed are clearly divided into different source of noise: road, rail, air, industry and commerce. In other cities this difference is not so clear.



Considering only the EEA database, Bristol is the city with the highest noise values. Nearly all the population (95%) is exposed to Lden higher

[12] Data reported for Amsterdam, Freiburg, Muenster and Oslo refers to overall noise and not to road noise.

[13] Regarding people exposed to Lnight, the EEA database reports 50-55 dB(A) as the lowest band, so it is not possible to calculate the percentage of people exposed to Lnight >45 dB(A), as required in the application.

than 55 dB(A) and 78% to Lnight higher than 50 dB(A). The situation is better in the other cities, especially in Hamburg where only 20% of people are exposed to Lden > 55 dB(A) and Lnight > 50 dB(A).

About 1/3 of the inhabitants of Amsterdam, Stockholm and Copenhagen are exposed to Lden > 55 dB(A), while the percentage of people exposed to Lnight values > 50 dB(A) ranges from 20% (Stockholm and Amsterdam) to 32% (Copenhagen).

Stockholm's noise abatement policies

The city of Stockholm has assessed noise since the early 1970s. Since 2002 the whole Stockholm area has been mapped to fulfil the European noise directive. Today the noise map is very detailed (2 x 2 m grid). Ten years ago two continuous monitoring stations, where the noise level is measured on an ongoing basis 24 hours a day were installed.

Since the beginning of 1970 until now, about 50 km of noise barriers have been built and about 46,000 windows in more than 15,000 dwellings along 110 km roads has received reduced noise as a result of protective actions. Environmental zones for heavy goods traffic have been introduced and vehicles older than eight years are prohibited to go to the inner city of Stockholm. The trial with congestion charges were introduced in 2006 and have been studied with respect to noise. The results of these noise abatement policies are significant. In 1970 220,000 people in Stockholm were exposed to levels above 35 dB(A) inside their homes, and today this number is reduced to 20,000.

Policies against noise pollution

Denmark has imposed traffic noise requirements for new residences since 1984. In Copenhagen, new constructions must meet requirements for acceptable noise levels with regard to traffic. Noise on the most heavily affected side of the building may not exceed 68 dB(A) and there must be one façade where the noise level is lower than 58 dB(A). Outdoor spaces should not have noise levels above 58 dB(A). Indoor noise levels should not exceed 33 dB(A). The municipality of Copenhagen has for the last 10 years taken part in tests using noise-reducing asphalt for maintenance and new construction of roads which carry more than 2 000 cars per day and where the speed limit is over 40 km/h.

In Amsterdam, the concentration policy to manage the control of car traffic - introduced in 1994 - has resulted in a main car network: motorways, provincial roads and local main routes with a high traffic volume. The high concentration of traffic on these main roads has caused significant localised air and noise pollution, while other roads and residential districts have been spared (especially 30 km/h zones). In comparison with a greater spread in traffic control, the concentration policy ensures that fewer people are exposed to higher (noise) pollution from traffic. The most important measures identified by the municipality to restrict the nuisance for these residents are:

- Housing construction projects subjected to high noise levels should receive compensation, e.g. extra conservatories or closable balconies.
- Houses must have a quiet side: a wall that is not directly exposed to noise levels above the threshold value.
- When work is being carried out on the roads in the main network, noise-reducing asphalt is used as a rule for all new road surfaces.

Some of the cities' efforts to reduce exposure of the populations to noise (especially from road) have been concentrated in improving or preserving the acoustical environment in particular "quite areas" where the noise level is lower than the average level of the urban area. Measures or provisions to implement or

increase quiet areas were especially highlighted by Oslo.

Quite areas in Oslo

The Oslo's noise mapping has identified a number of areas which may be suitable for designation as quiet areas. Defining, establishing and protecting such areas through traffic management, noise screening and regulation of industrial activities will be an important part of noise management in Oslo. Quiet areas have been defined as "Areas which can offer recreation, outdoor experiences and/or cultural activities in surroundings sheltered from or distant from dominant noise sources". Noise levels should preferably be below 50 dB (A) in at least part of the quiet areas. Projects involving the placing of road traffic in tunnels, especially along the seafront, will be an important part of city planning activities, and is likely to greatly improve conditions in a number of potential quiet areas. A number of small scale projects have also been suggested, such as pilot projects for various types of acoustic design, noise barriers and means of access to quiet areas. Quiet road surfaces, a focus on cycle lanes and footpaths are also important measures within the city centre.

Muenster's policies tackling the noise problem have been mainly concentrated in traffic calming measures. More than 150 municipal residential areas were transformed into 30 Km/h zones by the late 1990s. In addition, there are several areas that incorporate zones with traffic-calming devices. The measures package of the municipality of Muenster also includes the introduction of a traffic management system ensuring fluent traffic at low speed levels along the major axes.

Also in Freiburg speed restriction to 30 km/h, primarily in residential areas, has been one of the main policies to reduce noise pollution. It has been evaluated that 90% of Freiburg inhabitants live on roads where the speed is limited to 30 km/h. For new constructions or significant changes to transport infrastructure measures, noise certificates are also drawn up as part of obtaining planning permission and noise protection measures are set down. Over the past 10 years, numerous active (grass railway embankments, low-vibration rail support systems) and passive noise protection measures (noise protection for buildings) were carried out as part of the construction of the new tramlines. For over 10 years now, the City of Freiburg has on a voluntary basis and with the help of State subsidies promoted the construction of noise protection windows in heavily affected areas of the city. Around 2,500 residences have already been equipped in this way.

Hamburg airport's take off and landing fees

In 2001, Hamburg airport introduced take-off and landing fees that are incremented in line with noise levels. While an aircraft designated under noise class 1 (less than 72dB(A)) will be charged just 5.50 euro for each take-off and landing, an aircraft of noise class 7 (more than 87 dB(A)) will be required to pay 1.35 euro Over and above this, restrictions on nocturnal air traffic are also in place. Scheduled take-offs and landings for regular charter and scheduled flights of passenger aircraft are permissible between 6 a.m. and 11 p.m. Any traffic between 12 midnight and 6 a.m. requires an exemption certificate in each individual case. In addition, take-off and landing fees also increase after 10 p.m. (take-off) and 11 p.m. (landing).

7. WASTE PRODUCTION AND MANAGEMENT

Introduction

Waste was chosen as one of the key evaluation parameters for the EGC award as it is one of the most critical aspects of living and environmental protection. It also impacts significantly on other parameters including saving of non renewable raw materials, climate change and protection of soil and water production sources.

Data analyzed in this report show the eight EGCA finalist cities' – and citizens' – efforts in reducing, collecting and managing waste as sustainably as possible. Indicators used with the aim of underlining good performance in waste reduction and good practices in increasing waste recycling, energy recovery and landfill use avoidance, are:

- Household waste production (kg/inh and variations in the last 5 years),
- Waste management: household waste disposal (% of recycling, incineration with energy recovery and landfill).

Waste definition

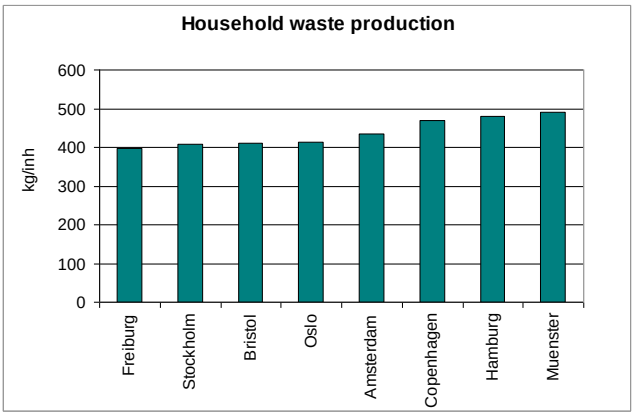
To analyse waste data it is important to highlight the definition of "municipal" waste: "the total of household and commercial waste collected together but excluding industrial waste"[14]. It must be noted this definition, deriving from EU law and policy, is not used in the same way across the eight cities. In Hamburg, for instance, an extensive interpretation of the definition has been used, accounting for a big amount of commercial and industrial waste. On the other hand, in Bristol, Oslo and Muenster municipal waste is about only 10% higher than the household waste alone. Copenhagen and Amsterdam do not use the concept of "municipal waste" at all, because they have separate management and accountability systems for household waste and for commercial and industrial waste.

For this reason the data in the table below, under column "Municipal" should not be used for comparison.

The focus, more appropriate for comparisons, should be the production and the management of the waste fraction strictly defined as "household waste".

Waste production

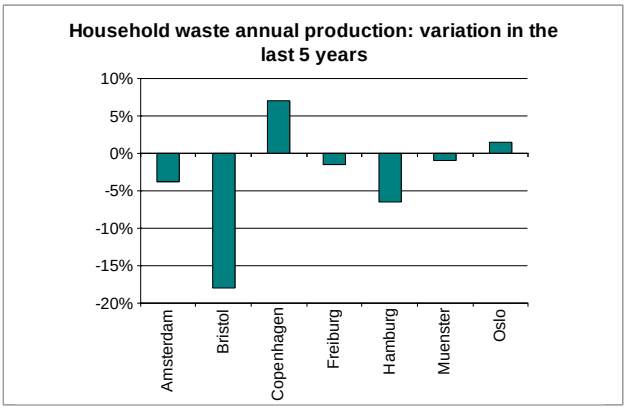
The household waste production ranges from 397 kg/inh to 490 kg/inh. Freiburg managed to contain the household production under 400 kg/inh, while Stockholm, Bristol and Oslo have a per capita production around 410 kg/inh.



WASTE PRODUCTION			
City	Household	Municipal	Household (variation last 5 years)
	kg/inh	kg/inh	%
Amsterdam	436	na	-4%
Bristol	410	448	-18%
Copenhagen	469	na	7%
Freiburg	397	na	-1%
Hamburg	479	865	-6%
Muenster	490	549	-1%
Oslo	413	467	1%
Stockholm	409	597	na

[14] Directive 2006/12/EC

In Bristol the amount of household waste generated per person in the last five years has fallen from 500 kg/inh in 2002 to 410 kg/inh in 2007, a reduction of 18%. In Hamburg, for the same period, the fall has been 6% and in Amsterdam a reduction of 4% is seen. The data demonstrates that a reduction in waste production is clearly possible thus decoupling waste generation from economic activity. Copenhagen appears to be the only city showing a relevant increase of household waste production (7%).



Freiburg: promotion of waste-preventing behaviour

The City of Freiburg applies waste fees as an incentive to avoid waste. The citizens can choose between residual waste bins with a capacity of 35, 60 or 140 litres, and a weekly or fortnightly collection. Several households in a single residence can join forces to form a single 'disposal community' and use one or more residual waste bins together. Many large residences have waste chutes to enable residual waste to be collected individually and charged for according to the household generating it. The €8 per year "compost discount" promotes home composting. Parents also receive a financial subsidy if they use reusable cloth nappies for their babies and toddlers. Freiburg citizens thus profit directly from their commitment to the cause.
The 'commodities market' is another measure designed to prevent waste. Freiburgers can dispose of their second-hand goods at bulky waste collection sites and recycling plants. Any furniture, household goods, books etc. received in good condition are then sold on a 'commodities market' – at a small fee – to any takers. Extending the lifespan of second-hand articles is an excellent way to avoid waste.

Household waste management

The following table shows how the eight cities manage their waste.

WASTE MANAGEMENT

City	Recycling	Incineration with energy recovery	Landfill
	%	%	%
Amsterdam	43%	57%	0%
Bristol	37%	0%	63%
Copenhagen	25%	74%	2%
Freiburg	67%	33%	0%
Hamburg	28%	72%	0%
Munster	74%	na	na
Oslo	30%	65%	5%
Stockholm	27%	71%	2%

In Freiburg, a well functioning integrated waste management system enables very high performances in the recycling of materials (67%). The remaining amount of waste is incinerated with energy recovery, therefore resulting in zero landfill. Also Muenster shows a very high recycling rate (over 60%) thanks to a waste management system that combines household separate collections and Mechanical Biological Treatment for residual waste (it must be clarified that the Mechanical and Biological Treatment 'products or outputs' have to be further treated by landfill or by incineration).

Muenster: separated collection and recycling

In 1996, the largest portion of waste in Muenster was disposed in landfills. Based on its waste management concept, the city intended to reduce this level of landfilling, also in order to comply with

the legal requirements. In 2006, landfilled waste was reduced by 83,000 tonnes compared with 1996 figures. In return, the utilisation ratio has increased from 50% to 84%. This is due to the development of a door-to-door system for the separate collection of waste and to a mechanical-biological treatment plant for residual waste.

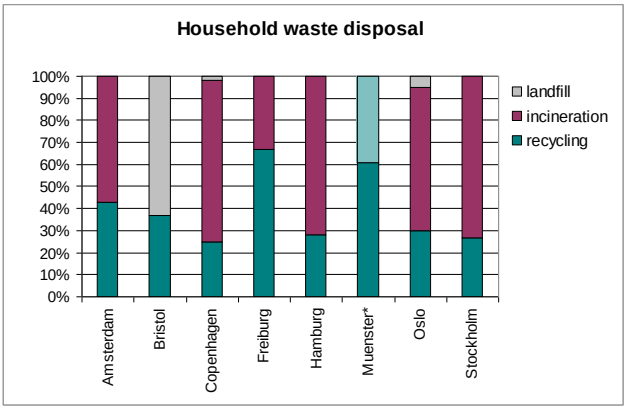
Four separate waste bins, each with its own colour are provided to households for residual waste, biowaste, paper and plastic and aluminium and tin-plate. Glass can be put in containers provided in residential areas. Ten recycling points accept all sorts of waste, large amounts of garden waste, batteries, metal etc. and ensure proper disposal of these materials. Unwanted household goods as well as garden waste, larger electrical appliances and furniture are collected once a month directly from the citizens' homes.

Furthermore, incentive systems for waste avoidance based on bin size and type has been created. A "free of charge" paper bin has been introduced to minimise residual waste, together with a very small and thus cheap bin for residual waste (35 litres). Additionally, in order to reward waste separation, the bio-waste container is subsidised as opposed to the residual waste bin.

The mechanical-biological waste treatment (MBT) plant extracts further recyclable material from the residual waste, leaving the residual material to be landfilled.

In Hamburg, Stockholm and Copenhagen the household recycling rate is under 30%, but only a very small portion of waste goes to landfill. This is due to very high levels of incineration (+70%) with high levels of energy recovery.

Stockholm's district heating uses the energy produced from household waste, about 60 GWh heat is produced annually (9% of the total amount of heat), which supplies more than 16,000 households. The incineration of household waste with energy recovery generates ash which is landfilled. This is equal to 2.4% of the total amount of household waste collected in the City of Stockholm. The incineration process also generates clinker; this is equal to 16% of the household waste arising and is used for landfill capping or as a construction material.



In Hamburg there are currently five incineration plants within the city limits, which treat municipal waste thermally for energy recovery by cogeneration of heat and power. In total, these plants produce 1,270 GWh heat, supplying the district heating network and 231,678 MWh electrical power (year 2006).

In Copenhagen the incineration plant is also connected to the central heating system. In total the waste generated by the Copenhagen municipality (household, commercial and industrial waste) supplies 140,000 households with heating and electricity (829 GWh heating and 202 GWh electricity).

Stockholm: mechanical waste collection system

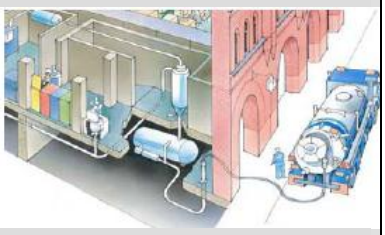
In the city district Hammarby Sjöstad – internationally known as an eco-profiled residential and business area – mechanical and pneumatic systems for waste collection have been introduced. These systems require less manual collection resulting in a safer worker environment and reduced environmental impact from waste collection and associated transportation of waste. Mechanical waste collection system are:

- stationary and mobile vacuum suction systems;
- large compacting containers and large

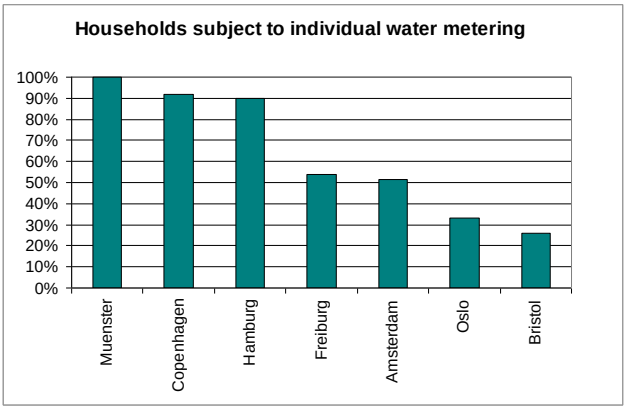
containers partly under ground;

- waste collection systems with waste grinders for food waste.

Another innovative project is food waste disposers connected to tanks. A food waste disposer grinds the food waste which is then transported to a tank by water flushing or vacuum action. This solution presents a number of advantages when compared to the conventional one. The personnel in the kitchens don't need to walk with bags to the garbage room. Collection from these tanks is by sludge vehicles. Furthermore, the food waste now doesn't need to be pre-treated and can be used to produce biogas for vehicle fuel at the waste water treatment plant using Anaerobic Digestion.



8. WATER CONSUMPTION AND WASTE WATER MANAGEMENT



Introduction

Water is the basic resource for human life. Its quality and uses impact significantly on citizen health, soil and nature quality, urban life. Climate change will affect water availability and increase risks related to bad land and water management. A good water management could contribute to minimize energy consumption and related climate gas emissions.

Data analyzed in this report show the eight EGCA finalist cities' – and citizens' – efforts in reducing water pollution and consumption. Indicators, used with the aim to underline good performance and good practices are:

- Households subject to individual water metering
- Per capita household water consumption
- Water losses in pipelines
- Separated rain water management
- Phosphorus and nitrogen's abatement rate

Water metering

The proportion of urban water supply subject to individual water metering is about 100% in Muenster (included all municipal buildings) and 90% in Copenhagen and Hamburg. Oslo and Bristol show the lowest percentages, ranging from 20% to 30%.

In Copenhagen, since 1999 the law has demanded that water meters be installed for all properties connected to the general water supply. For properties consisting of several apartments, only one water meter for common invoicing is provided, but it is possible to have voluntary agreements for apartment-based water invoicing using individual water meters.

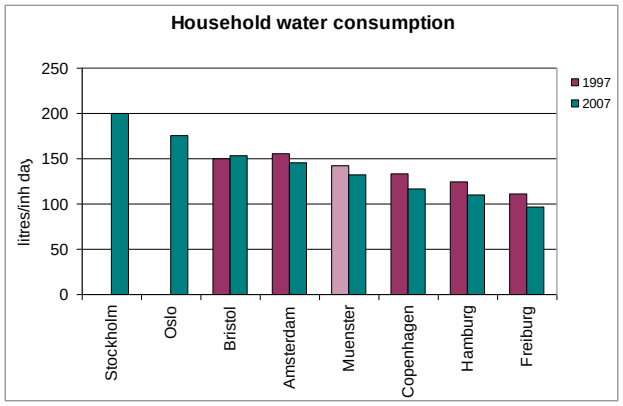
The installation of apartment water meters is prescribed also under the Hamburg Building Regulation. These regulations have applied to new buildings since 1987, and since 1994 it has been prescribed that all old buildings must be retrospectively fitted with apartment water meters by 2004. Hamburg is the only federal state in Germany to have implemented the retrospective obligation to install apartment water meters in old buildings. The Senate has given financial subsidies for the retrofitting of apartment water meters.

In Stockholm, all water sold is metered but only detached houses have individual metering. For flats in apartment houses, there is generally a meter for each property and the residents pay a standard rate.

WATER CONSUMPTION				
	Household consumpt.	Household consumption (10 years variation)	Pipeline losses	Household having water meters installed
	l/inh day	%	%	%
Amsterdam	146	-6%	3,0%	52%
Bristol	153	2%	18,7%	26%
Copenhagen	117	-12%	8,0%	92%
Freiburg	97	-13%	11,0%	54%
Hamburg	110	-12%	4,2%	90%
Muenster	132	-7*%	3,9%	100%
Oslo	176	-18**%	20,0%	33%
Stockholm	200	na	17,0%	na
* related to the period 2001-2007				
** related to total consumption				

Water consumption

Water consumption data related to the business sector is generally limited and not comparable, therefore, only the domestic consumption will be analysed, being fully aware that this represents only a part of the total consumption. But local policies can achieve important results in this field as already demonstrated. Cities differ from each other in relation to water availability, so water saving policies can assume a different priority level in local agendas.



In Freiburg water consumption fell from 111 litres per inhabitant per day in 1997 to 97 litres per inhabitant per day in 2007 (-13%), the lowest value of the eight cities. A similar decrease has been monitored in Hamburg, where per capita daily consumption has reached 110 l/inh (-12%). Both cities are significantly below the national German average for water consumption (126 litres per inhabitant). Copenhagen is the third most performing city, with an average household consumption of 117 l/inh and the political commitment to reduce this value to 110 litres per person by 2010 and 100 litres per person by 2012.

The highest consumption has been monitored in Oslo 176 (l/inh) and Stockholm (200 l/inh).

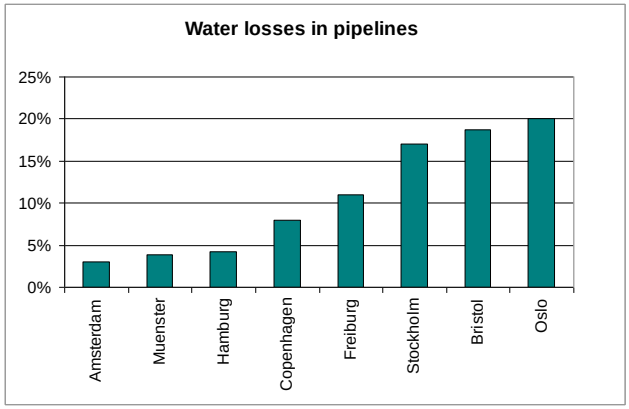
Water losses in pipelines

Amsterdam, Muenster and Hamburg show the lowest rates of pipeline losses (less than 5%).

Amsterdam's water network has a very low percentage of leakage losses, about 3%, and in two neighbourhoods this percentage decrease to 1,6%.

Muenster have managed to minimise the water leakages (3,9%) thanks to acoustical leak detection and continuous piping network review. In Hamburg, approximately 1/5 of total pipelines water network is inspected every year. The introduction of an active leak monitoring system allowed Freiburg to reduce leakages from 15% to 11% over the past 6 years.

Total water losses in the pipeline network, in general, have been calculated as difference between the amount of pure water supplied and the total water consumption, including unmeasured usages or measuring differences. In Hamburg, for example, the conveyance losses in the pipeline network excluding measuring differences represent 75% of the overall water loss. Copenhagen, on the other hand, reports that water loss in the mains network is approximately 5% whereas true unmeasured usage is approximately 3%.



Proactive Leakage Management of Copenhagen's network

KE Water has sought to keep leakage at a low level by systematically conducting leakage surveys, rehabilitation and management of the pipeline network.

The pipeline network has been systematically investigated since 2001. The investigations are done by area, with the loss in an area being recorded and possible leakages found with the help of electronic equipment. During the first investigation in 2000-2004 an average of 35 leakages were found each year, amounting to a water loss of 500 000 m^3 (1% of the total water volume supplied in 2004).

In 2001 it was decided to rehabilitate the network on the basis that the entire mains would be rehabilitated over a 100 year period. This means that 1% has to be renovated per year, approximately 9 km. Pipeline renewal is carried out according to rehabilitation plans which are adjusted on an ongoing basis. The speed of rehabilitation has been determined using an estimate of what is needed to assure a high security of supply through continual rehabilitation of the pipeline network. Focus has been on the rehabilitation of supply lines in inner Copenhagen and of main supply lines made of cast iron in areas subject to heavy traffic.

Rain water management

In Amsterdam, 75% of the sewage system operates with separated rain water management; in 25 % of the area, water is collected by a combined sewer system.

Approximately half of the municipality area of Freiburg uses separate channels for sewage and rainwater. Over 90% of the organic pollution load transported in Freiburg via channels in the form of domestic sewage or rainwater is directed to the central treatment facility. Combined waste water overspills and discharge points for rainwater channels are fitted with treatment facilities so as to prevent placing excessive loads on the water system's natural ability to clean itself.

WASTE WATER TREATMENT				
	Connectivity to waste water treatment	Rain water separated management	Removal of substances from all treated waste water	
	%		% P	% N
Amsterdam	99,6%	75%	91%	87%
Bristol	100%	0%	na	na
Copenhagen	100%	na	90%	84%
Freiburg	100%	50%	92%	80%
Hamburg	100%	0%	na	78%
Muenster	99,8%	na	97%	94%
Oslo	99,6%	0%	93%	69%
Stockholm	100%	50%	98%	70%

In Stockholm about 50% of the storm water (urban run-off) is transported along with the waste water to treatment plants. The rest is transported to minor lakes. Stockholm has many lakes and water sheds which are highly valued for recreational purposes. These lakes and water sheds have been classified with respect to recreational and environmental value and the impact of storm water has been taken into consideration on each one of them.

In order to reduce the load on central treatment plants, the new Waste Water Treatment Plan of Copenhagen undertakes to perform rain water drainage of new city developments and of larger renovation projects according to SUDS (Sustainable Urban Drainage Systems) principles. The new Ørestad district which was founded in 1996 and today covers 150 hectares was equipped with a tripartite system. This sends black water to treatment plants, roof water runoff to recreational channels and road runoff to be purified before being discharged into recreational channels.

In Copenhagen the discharge of waste water to receiving waters has also been reduced by establishing draining basins. The frequency of annual overflows has been reduced from 20-70 per year to 2-6 per year. The volume of water

discharged to the harbour has thus been reduced from 1.6 million m^3 waste water per year to less than 300,000 m^3 per year.

Stockholm's storm water strategy

Stockholm City has adopted a strategy which defines the need to treat different kinds of storm water entering different receiving waters. The strategy focuses on 4 principles; source control, detention and infiltration, a scheme for treatment and cost effectiveness. Stockholm Water Co. has a special storm water charge which encourages property and estate owners to treat storm water locally. Several storm water treatment facilities have been built in Stockholm in recent years.

Lake Älta, purification of storm water from roads.

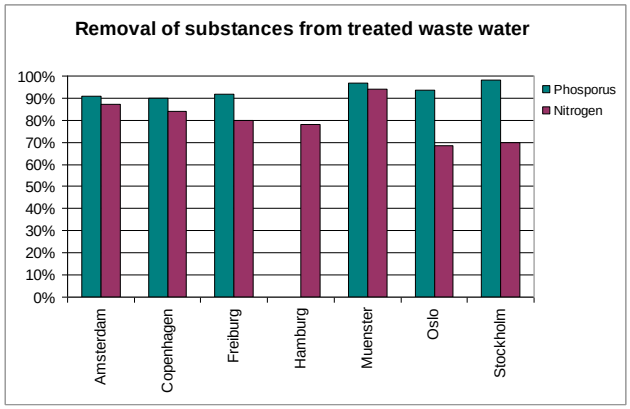
Surface water runoff from a nearby road is received in Kasby bay in Lake Älta. To prevent dispersal of the pollutants, a shield, an artificial basin consisting of rafts with textile-screens below water level, has been built in the inner part of the bay area. The rafts are also used as a pedestrian link between the opposite shores in the bay. The main aim is to reduce heavy metals and organic compounds.

Purification of storm water flowing to Årsta bay

Årsta bay-area, a part of Lake Mälaren, receives large amounts of storm water from buildings, industries and roads. More than half of the total inflow of storm water arrives through two tunnels. These tunnels have been rebuilt to handle purification of storm water. Large sedimentation-tanks that clarify the water have been constructed close to the mouths (completed in 2007). A pumping plant, aiming to remove sediment from a lower part of the Årsta tunnel, will be constructed during the next few years as well a process for removing oil from the storm water.

Waste water treatment

The waste water treatment plants of Stockholm, Muenster and Oslo are able to remove more than 90 % of phosphorus (P). In Muenster the nitrogen's (N) abatement rate is over 90% too, while in Stockholm and Oslo it is only 70%.



Very high percentage of removal, both for P and N, are related to the treatment plants of Amsterdam, Copenhagen and Freiburg (all ranging from 80% to 90%).

Separation of yellow waters in Hamburg

Sustainable waste water management has been a top priority in Hamburg for more than a decade. In addition to the urban concept for public toilets in Hamburg, which are all equipped with energy and water saving technologies, urinals have been installed in critical and overly polluted locations. The urinals operate without water, and the urine is separately collected and transported to reduce waste water volume.

Urine makes up only around 1% of the volume of waste water, but is responsible for the majority of nutrients contained in it. Furthermore, specific pharmaceuticals are introduced into waste water via urine. Without treatment, such undesired residue medication ends up in lakes and waterways. The separate collection of urine is also significant because nutrients and phosphorus can be removed (85% of nitrogen and over 90% of phosphates), separated by pharmaceutical and – as recyclable materials –

used for alternative purposes, such as fertilisers. On the basis of these positive results, Hamburg is endeavouring to develop the separate collection of urine on a larger scale.

In Amsterdam the purification sludge that is released during the purification process is transported to the Waste and Energy Company in two flows: biogas (methane) and sludge. Both flows are power sources for the Waste and Energy Company (as well as solid domestic waste). 94% of the potential energy of the residual flows is recovered in this way. The heat and electricity released in the Waste and Energy Company is returned. All waste water treatment plants, sewer pumps and other installations or buildings obtain electricity from the waste and energy centre. The heat is used for the digestion process and the electricity for the purification process.

9. ENVIRONMENTAL MANAGEMENT OF THE LOCAL AUTHORITY

Introduction

Integrated approaches and new management tools are very useful to deal with the amount of different environmental aspects the cities have to tackle.

A vision, a strategy, an action plan should be set. Moreover Environmental Systems or Agenda 21 cycles provide, by means of target setting, monitoring procedures, audits, public participation, a structured way to support this comprehensive approach.

To strengthen local government credibility, all commitments assumed in local Action Plans should be first of all applied to the local administration itself, so giving the good example in managing properly “its own house”. A rationale and innovative energy management of the public buildings and a green public procurement policy could positively influence the local market and citizen behaviors.

This chapter reports how the eight EGCA finalist cities perform in relation to the following criteria:

- Environmental Management Systems (EMS);
- Green Public Procurement (GPP);
- Energy efficiency and management in public buildings.

Available information from the cities varies significantly rendering quantitative comparison quite hard. Consequently, the cities' information has been analyzed in a more qualitative way, in an effort to showcase best practices and a source of inspiration for other cities.

Environmental Management Systems (EMS)

Amsterdam

Three ISO 14001: Waternet, the organization responsible for supplying drinking water and purifying the waste water; Waste & Energy Company; and District Osdorp, one of the districts of Amsterdam with a population of 50,000.

In 2007, the Port of Amsterdam was awarded the PERS-certificate (Port Environmental Review System).

Bristol

The City Council has been developing and implementing environmental management systems since 2000. Currently six out of the seven council departments (approximately 80% of total council employees) are registered EMAS and ISO 14001. The one remaining department is to be completed during 2009.

The Council’s Direct Service Organization (Contract Services), which provides transport, catering, cleaning, grounds maintenance, and joinery services, has a certified environmental management system (EMAS).

Freiburg

Environmental management activities are rather common in the public administration’s work but there are no offices or services certified EMAS or ISO 14001.

Copenhagen

The number of employees working at institutions with a certified environmental management system has more than doubled from 3,800 to 7,700 in 2007. Furthermore, approximately 12,000 employees are working in institutions which are in the process of introducing environmental management. In this way, there is an important and necessary progress in relation to the goal to introduce environmental management in all institutions.

Hamburg

Hamburg Municipal Sanitation Department and Hamburg Water Company are EMAS certified. Eleven municipal bodies have participated in the Ecoprofit project with the aim of systematically implementing cost-saving environmental measures. Additionally environmental management procedures have been adopted and can be used as the basis for the future adoption of certified environmental management systems such as ISO 14001.

Muenster

In Muenster, quality and environmental managements have been introduced throughout the Civil Engineering Office.

The forest cemetery, a public administration building (hosting 300 workers) and the public utility company have been certified according to the EMAS scheme.

Oslo

There are 291 municipal units with certified environmental management systems. 13 are certified according to ISO 14001, this includes large agencies and enterprises such as Agency for Waste Management, Agency for Urban Renewal, Oslo Port Authority and Oslo Metro Operations. The rest are certified according to the national standard Eco Lighthouse (smaller agencies and offices, urban district administrations, schools, day care facilities etc.).

Stockholm

In the City of Stockholm, an Integrated Management System (IMS) is used by all departments and municipal companies. Environmental aspects are integrated into the Integrated Management System and all organizational decision-making. The Integrated Management System covers factors such as environment, quality, and public procurement

Three housing companies and the water company are certified ISO 14001.

Green Public Procurement (GPP)

% OF ECO-LABELLED, ORGANIC, ENERGY-EFFICIENT PRODUCTS				
	paper	food	vehicles	green electricity
Amsterdam		40%		
Bristol	61%			14%*
Copenhagen		50%		
Freiburg	72%		70%	
Hamburg	30%			100%
Muenster	100%			
Oslo	97%			
Stockholm		12%	55%	70%

* 14% municipal buildings and schools; 100% street lighting

Amsterdam

Sustainability is standard in Amsterdam's municipality wide framework contracts, not only giving priority to environment aspects, but also to social aspects (e.g. social return and compliance with ILO standards).

Sustainable procurement is standard in:

- public lighting
- cleaning services
- work clothing
- public space furnishing
- pew buildings (sharp EPC requirements, FSC quality label, CO2 neutral (since 2008)
- renovations of old buildings

The purchase amount cannot be indicated yet, but a cautious estimate is that the total amount of framework contracts amounts to approx. 20% of the purchase volume.

Amsterdam is targeting 100% sustainable procurement in 2010. This is the case for all central framework contracts.

Bristol

The percentage consumption of eco-labelled, organic and energy-efficient products as share of the total consumption is not measured directly. However, energy efficient and other sustainable products are considered in corporate procurement arrangements. For example:

- the latest fleet of pool cars consume less than 120 g/ km CO_2;
- use of FSC/ CSA certified sustainable timber in the municipal joinery (53%);
- 54% of stationery is recycled, or from suppliers with ISO14001/ EMAS registration;
- 61% of paper purchased is from recycled or FSC sources;
- 45% of soil compost used in nursery gardens is peat-free;
- 14% of green electricity purchased for municipal buildings and schools; 100% of electricity purchased for street lighting is from renewable sources.

Copenhagen

By the end of 2009, 60% of food served in the municipal kitchens and canteens should be eco-labelled (75% by 2011).

Freiburg

In accordance with a decision of the municipal Council, construction products must meet the 'Blue Angel'[15] criteria in order to be permitted for use. Following this fundamental decision, the Blue Angel criteria are already used as a basis for tenders by the municipal administration in various sectors. All government agencies when procuring electrical equipment have to give priority to products meeting the Blue Angel criteria.

Printing and photocopying is now predominantly done on recycled paper (72% in administrations and schools).

Municipal canteens now use exclusively Fair Trade coffee, tea and cocoa.

Under a decision from the municipal Council, the municipal vehicle fleet is to be upgraded as soon and as extensively as possible to vehicles powered by natural gas or biogenic fuels. Accordingly, more than 2/3 of current leased company cars run on natural gas (35 vehicles).

Hamburg

Including the share of renewable energy contained in the national production mix (approximately 13% in 2007), 100% of the electricity used for public buildings in the years 2008 – 2010 can be attributed to renewable energy sources.

Muenster

Since the early 1990s, 90% of the recycling paper has been procured with the "Blue Angel". An increase of the portion to 100% by 2010 is envisaged due to the high quality of new recycling papers. The procurement of copiers with the "Blue Angel" has also been mandatory since 2004, with the portion amounting to almost 100% today. Computer and screens have been required for many years to be certified according to Energy Star 4.0 or an equivalent standard. The portion of this equipment is 100% by now.

The municipal canteens pay attention to predominantly local products. Furthermore, some products are procured from ecological cultivation and/or fair trade: potatoes (100%), vegetables (30%), coffee, tea, and cocoa (100%).

Oslo

The only available data is about office paper: 97% is eco-labelled (Nordic Swan label). The

[15] The Blue Angel was the first and one of the most well-known eco-labels in Europe

municipality has 40 different binding procurement contracts including criteria to promote sustainable products and services. The main categories are: working clothes, small and medium sized cars, electricity, computers and printers, soaps and detergents.

Stockholm

The city used approximately 532 GWh electricity in 2007 and two thirds (370 GWh) was eco-labelled. This includes 25 out of 33 administrations in a joint agreement. In the coming purchases of electricity, the other eight administrations will sign agreements for eco-labelled electricity when the present agreements run out in 2010. Thus Stockholm will have 100 % eco-labelled electricity in 2010. The objective for the city of Stockholm is to apply the Purchasing Policy and Guidelines at 100 % of the city's purchases.

Energy efficiency and management in public buildings

Data on energy performance in public buildings are quite difficult to compare. The table below shows that good energy performance is possible, as in Freiburg (117 kWh/m^2, even if related to one single building) and in Muenster (135 kWh/m^2). Other cities score around 180 kWh/m^2 (even if in Amsterdam and Oslo the cases relate only to schools).

ENERGY CONSUMPTION IN MUNICIPAL BUILDINGS

City	energy consumption (heating) kWh/m^2	energy consumption (electricity) kWh/m^2	energy consumption (total) kWh/m^2
Amsterdam			181
Bristol			
Copenhagen	150	50	200
Freiburg*	97	20	117
Hamburg	141	42	183
Munster	120	15	135
Oslo			181
Stockholm			181

*Consumption related to a single building

Good measures beyond good results

Amsterdam

Since 2004 the municipality has applied the 'ten-year-pay-back period measure': all (energy) measures that pay themselves back within ten years are compulsory for municipal buildings. Thanks to this measure, in the new district office Zuideramstel, for instance, completed in December 2008, 70 to 80% energy can be saved compared to an average office.

Copenhagen

Between 2002 and 2006, thanks to saving measures, electricity consumption fell by 5% and heating consumption by 7 %.

Freiburg

7million€ are invested yearly for energy refurbishment in schools.

Hamburg

In 2008, a renovation programme started for 30 buildings saving energy of up to 40%.

Muenster

Several communal administrative buildings have been refurbished during recent years. 80% of all employees work in three of these buildings. Heat consumption in two of these administrative buildings adds up to 43 kwh/m² and 83 kwh/m².

The target towards nearly zero emission public buildings

The recast of the Energy Performance of Buildings Directive (November 2009) calls for "nearly zero emission public buildings" by the year 2018. The target could be reached also by using renewable energies and rational use of energy, but buildings' standard target is the most important action a local government could adopt.

Amsterdam

By 2015: city's own energy use must be CO^2 neutral; schools must reduce energy consumption in new buildings to 105 kWh/m^2 and in rehabilitated buildings to 120 kWh/m^2 (current consumption is 181 kWh/m^2).

Freiburg:

At present: the construction of all new buildings, including municipal buildings must provide <40 kWh/m² (yearly heat consumption).

By 2011: the construction of all new buildings, including municipal buildings, must provide the passive house standard (<50 kWh/m², yearly heat consumption).

Hamburg

By 2012: renovation of all schools <200 kWh/m² per year (in 60 schools CO_2 savings will be more than 20%)

Muenster

At present: the construction of new municipal buildings must provide <50 kWh/m² (yearly heat consumption).

By 2015: existing buildings' average consumption are to be decreased, thanks to technical measures and a comprehensive campaign, to <100 kwh/m² within a period of five years ((current consumption is 135 kwh/m²).

Oslo

Phase out 95% of all oil burners in municipal buildings to be replaced with district heating, biomass or geothermal heating/heat pumps.

Stockholm

2006-2011: the city's own energy use must be decreased by 10%; the construction of new municipal buildings must provide less than 30% consumption below the compulsory Swedish standard (80 kWh/ m² instead of 110 kWh/ m²).

http://www.europeangreencapital.eu