

## Energy action plan and CO<sub>2</sub> inventory for Frankfurt am Main





Energierferat Stadt Frankfurt am Main

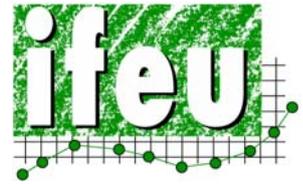
Galvanistraße 28

60486 Frankfurt am Main

Telefon:069 212-39193

[energierferat@stadt-frankfurt.de](mailto:energierferat@stadt-frankfurt.de)

[www.energierferat.stadt-frankfurt.de](http://www.energierferat.stadt-frankfurt.de)



ifeu -  
Institut für Energie-  
und Umweltfor-  
schung  
Heidelberg GmbH



# **Energy action plan an CO<sub>2</sub> inventory for Frankfurt am Main 2008**

## **Summary of End Report**

**Commissioned by the City of Frankfurt am Main**

Markus Duscha (Project Manager)  
Frank Dünnebeil  
Elke Dünnhoff  
Benjamin Gugel  
Hans Hertle  
Carsten Kuhn  
Sebastian Traub

ifeu - Institut für Energie- und Umweltforschung Heidelberg GmbH  
Wilckensstr. 3, D – 69120 Heidelberg  
Tel.: +49 (0)6221/4767-0, Fax: +49 (0)6221/4767-19  
E-mail: ifeu@ifeu.de, Website: www.ifeu.de

**Heidelberg; Status: October 2008**  
(includes changes up to June 2009)

## Table of contents

<b>1</b>	<b>Summary</b> .....	<b>2</b>
	Package 1: Saving electricity offensive for households.....	6
	Package 2: Refurbishment initiative for households.....	7
	Package 3: Focus on energy efficiency in non-residential buildings .....	8
	Package 4: Focus on clubs and churches .....	9
	Package 5: Publicly-owned buildings .....	9
	Package 6: Sustainable energy supply.....	10
	Package 7: Climate protection for Frankfurt .....	10
1.1	Climate Alliance Climate Alliance: Where is Frankfurt/Main? .....	15
1.2	Tables containing detailed results (energy, CO <sub>2</sub> ).....	17

# 1 Summary

## Objectives and procedures

The City of Frankfurt commissioned the IFEU Institute for Energy and Environmental Research (IFEU Institute) to develop a 'Climate Protection Concept' for the City of Frankfurt am Main. The concept supports the City in achieving the climate protection objectives that it set itself within the context of the Climate Alliance. To achieve these objectives the City wishes to reduce emissions within the City of Frankfurt by 10 percent every 5 years.

A systematic overview of the more important measures undertaken in the city over the last few years was drawn up as part of the groundwork for drawing up the concept. This revealed that a large share of the measures undertaken over the last years was initiated by the city. There were also many other actors undertaking their own activities in the field of climate protection, with Mainova at the forefront.

The approaches taken are widely diversified. These range from technical measures, such as extending combined heat and power cogeneration to more households, to district and long-distance heating networks through to indirect measures such as providing information as well as advanced and further training of individual target groups or building up networks of actors in Frankfurt.

Due to this host of measures the primary objective of the climate protection concept is to intensify existing activities, to coordinate them better and, if necessary, to supplement them with new measures. The climate protection concept is intended to demonstrate ways and means that bring Frankfurt, in particular as the "City of energy efficiency", as close as possible to the objectives of the Climate Alliance.

An updated energy and CO<sub>2</sub> *inventory* for the year 2005 is a fundamental component of the concept; this was drawn up to cover both the energy and, for the first time, transport sectors of the City of Frankfurt.

Building on this inventory it was possible to calculate the *savings potentials* for different sectors (not including transport) with the aid of specific data from the City of Frankfurt and findings from various German-wide studies of potentials.

In parallel to the building blocks described a *catalogue of measures* was drawn up for the energy sector. One important criterion, amongst others, when drawing up a catalogue of this kind was that from the point of view of the authors there is a good chance that the measures will be implemented in the future. Interviews, workshops and a number of events held by the Local Energy Initiative Frankfurt (LEIF) provided the platform to coordinate the measures.

### CO<sub>2</sub> inventory<sup>1</sup>: Status quo 2005 and the development beforehand

Calculations carried out by the IFEU Institute have provided the City of Frankfurt with an energy and CO<sub>2</sub> inventory for the year 2005. In addition to the inventory from 1995 the transport sector was also taken into consideration for 2005 and the inventory for 1995 supplemented accordingly.

- CO<sub>2</sub> emissions for 2005 amounted to 8.32 million tons (including process chain and equivalent emissions). That equates to 12.8 tons per inhabitant per annum.
- Industry accounts for 35% of this figure, commercial businesses 25% with private households and the transport sector each accounting for 20%.

The review depicted in the graphic below shows that CO<sub>2</sub> emissions fell slightly by 3.7% between 1995 and 2005. This fall in emissions was reflected across all sectors.

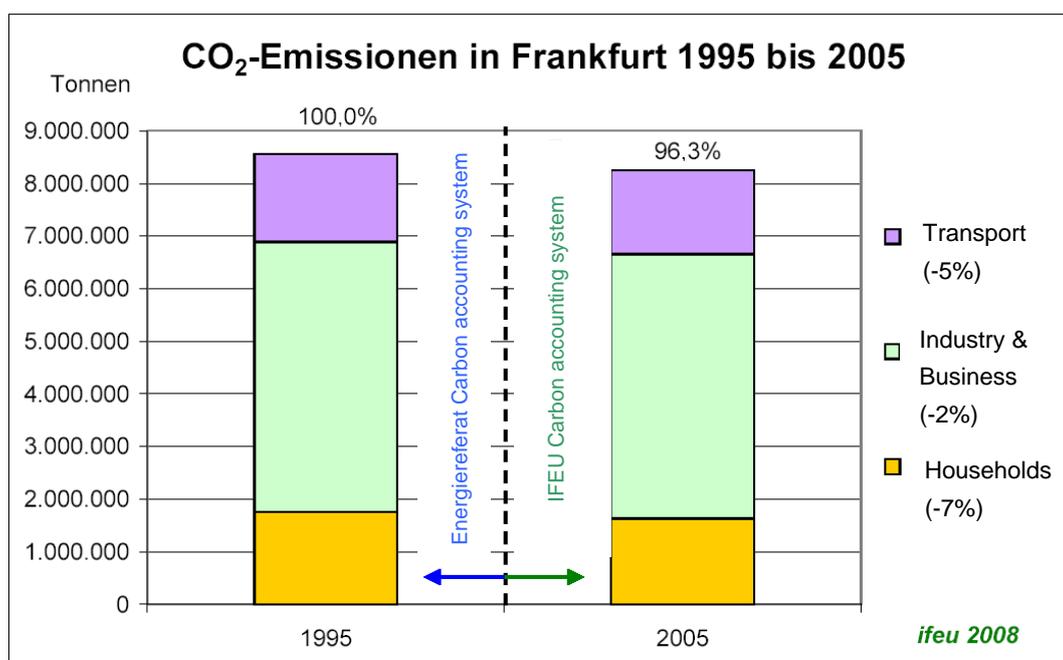


Fig. 1: Development of CO<sub>2</sub> emissions in Frankfurt

If one considers the development since Frankfurt's first CO<sub>2</sub> inventory in 1987 (not including transport) it can be seen that savings amounting to approximately 6% have been made since then. This can be attributed to reductions in the industrial and commercial business sectors, in which savings amounting to 9% were achieved. At the same time CO<sub>2</sub> emissions in the private household sector rose by 4%. However, this must be seen against the background of a 5% increase in the population over the same period, that domestic living space rose by 15% and that the number of persons per household has continually decreased.

<sup>1</sup> CO<sub>2</sub>: here always CO<sub>2</sub> equivalent and process chain

In 2005 transport-based emissions in the City of Frankfurt amounted to the equivalent of around 1.6 million tons of CO<sub>2</sub>. Thus, they were about 5% lower than the 1995 figure of 1.67 million tons. This reduction can be attributed exclusively to a reduction in emissions achieved in the passenger transport sector (MIT - Motorised Individual Transport - and LPT - Local Public Transport) by the use of more efficient vehicles. Climate-relevant emissions from motorised individual transport (MIT) fell by 10% and by 13% from local public transport (LPT). By comparison an increase in the use of low-weight commercial vehicles and lorries has seen climate-relevant emissions from road freight transport rise by 16% between 1995 and 2005.

**Potentials**

To establish priorities for choosing measures calculations were made of the potential for economic and technical reductions that could be achieved in the coming 10 years in Frankfurt am Main.

Fig. 2: potential CO<sub>2</sub> reductions in Frankfurt am Main

Sector	Topic	Heat	Electricity
		10 Years	10 Years
Private households		4,2%	3,4%
Business, trade, services		2,5%	4,0%
Industry		2,7%	3,6%
<i>IFEU 2008</i>			

Energy	Topic	Heat	Electricity
		10 Years	10 Years
CHP/long-distance heating/conversion to gas-fired generation		8,7%	
Solarenergy		0,03%	0,02%
Decentralised biomass		0,2%	
Central Biomas		0,8%	
<i>IFEU 2008</i>			

Taken together the calculated potential reduction could lead to a reduction in CO<sub>2</sub> emissions of up to two million tons<sup>2</sup> within the next 10 years, if all meaningful economic and technical reduction measures are actually introduced across the board. That corresponds to approximately 31% of CO<sub>2</sub> emissions in the energy sector (not including transport) for the year 2005. Fundamentally, it would be possible to achieve the goal of saving 20% of emissions within the next 10 years by realising the potentials demonstrated here. However, there are a lot of obstacles to be overcome, which will require the active support of the City of Frankfurt, central government and many other actors. The measures suggested in the concept are designed to help contribute towards that part that the City of Frankfurt and its inhabitants can accomplish.

Fig. 2 offers an overview of the distribution of potential reductions across the sectors in question. The potential for reductions through *increased efficiency in the use of energy* in the respective sectors can be viewed in the top part of the table. The greatest economic potentials for making savings are to be found in particular in the heating (heating energy) of private households as well as in the use of electricity in the commercial sector. The greatest savings potentials on the power generation side are to be found most of all in the conversion from coal to gas fired generation and in extending district and long-distance heating networks. The potential contribution of renewable energies will not be very big in the next 10 years, but will play a greater role thereafter.

### **Packages of measures**

In cooperation with local actors and Frankfurt's Department of Energy the IFEU Institute has created a catalogue containing more than 50 individual measures. The measures focus on addressing seven focal topics; in the concept these are called *packages of measures*:

1. Saving electricity offensive for households
2. Refurbishment initiative for apartment buildings
3. Energy efficiency in non-residential buildings
4. Focus on clubs and churches
5. Publicly-owned buildings (focus on city and university)
6. Sustainable energy supply
7. Climate protection package Frankfurt/Main

From both a qualitative and quantitative point of view each of the individual measures on its own has a potential to measurably advance the climate protection cause in Frankfurt. These measures cannot achieve all of the established technical and

---

<sup>2</sup> Approximated demonstration of the total potential (potential savings in energy efficiency and energy supply taken together). Basically, however, these cannot be added together as energy-efficiency potentials interact with energy-supply potentials. This would be taken into account in a scenario calculation, which is not a component of this concept. Furthermore, technical innovations are not considered.

economic potentials, as local authorities have only limited resources at their disposal. However, implementing the suggested measures can improve the framework conditions and provide incentives to initiate the first steps along the way towards achieving these potentials. Many of the local-authority measures address different groups of actors on what are often similar topics. In order to efficiently and effectively move the measures forward when implementing the climate protection concept these topics will be grouped to topic domains within the framework of packages of measures. The topic domains mirror the more important areas where action is necessary to force progress in climate protection.

Combining the measures to packages will make it possible to identify where these overlap and recognise where working on a measure in isolation could lead to unnecessary additional work. Instead, the measures can complement one another and be coordinated. That also applies against the background of numerous programmes available on state, federal and EU levels that could be sensibly enhanced by local-authority measures.

Fig. 3: The package: saving electricity offensive in households

<b>Package 1: Saving electricity offensive for households</b>	
<i>Overall concept climate protection communication (O1)</i>	<i>Appliance replacement programme and provide grants (HH2)</i>
<i>House of the future (O2)</i>	<i>Optimise advice on energy saving (HH4)</i>
<i>Enlarge Department of Energy (O7)</i>	<i>Mainova climate partner programme (HH9)</i>
<i>Electricity saving programme (HH1)</i>	<i>Cariteam energy saving service (H10)</i>
<i>Climate Protection Concepts Frankfurt a.M. IFEU 2008</i>	

There was no reduction in the consumption of electricity in private households in Frankfurt between 1995 and 2005. For that reason particular attention will be focused on this sector when drawing up measures. One important measure has already started in the form of the electricity saving programme, which was initiated in the spring of 2008. Parallel to this programme close interaction between competitors, seamless public relations and advice work in the city and its more important actors in conjunction with this topic are of immense importance. Information and advice is not only in this package of central significance. That is why the measures working towards a house of the future and optimising advice on energy saving measures play an important role in many packages.

Fig. 4: The package: refurbishment initiative for apartment buildings

<b>Package 2: Refurbishment initiative for households</b>	
<i>Overall concept climate protection communication (O1)</i>	<i>Investment promotion by the City of Frankfurt (HH6)</i>
<i>House of the future (O2)</i>	<i>Ecological rent table (HH7)</i>
<i>Topic-related events (O3)</i>	<i>Comprehensible heating bills (HH8)</i>
<i>Contracting campaign (O4)</i>	<i>Mainova climate partner programme (HH9)</i>
<i>Enlarge Department of Energy (O7)</i>	<i>Climate protection forum Frankfurt trades (M1)</i>
<i>Guidelines and framework planning (O8)</i>	<i>Qualification programme multipliers (M2)</i>
<i>Frankfurt quality standard energy efficient refurbishment (HH3)</i>	<i>Loans for passive houses in Frankfurt (M5)</i>
<i>Optimise advice on energy saving (HH4)</i>	<i>Biomass information campaign (ES4)</i>
<i>Energy pass quality assurance (HH5)</i>	<i>Cariteam energy saving service</i>
<i>Climate Protection Concepts Frankfurt a.M.</i>	
<i>IFEU 2008</i>	

One of the greatest potentials in Frankfurt is to be found in the sector energy efficient refurbishments. As a central building block in this package the concept envisages a "Frankfurt quality standard for energy efficient refurbishments". It is designed to support standards that are significantly closer to an economic optimum than the current legal requirements. It is envisaged that a part of the other measures will be oriented towards maintaining and linked to this (still to be developed) standard.

Fig. 5: Package focus: energy efficiency in non-residential buildings

<b>Package 3: Focus on energy efficiency in non-residential buildings</b>	
<i>Overall concept climate protection communication (O1)</i>	<i>ECOPROFIT: Information and further training for commercial businesses (BS6)</i>
<i>House of the future (O2)</i>	<i>Energy efficiency campaign for businesses (BS7)</i>
<i>Topic-related events (O3)</i>	<i>Electricity saving programme for businesses (BS8)</i>
<i>Enlarge Department of Energy (O7)</i>	<i>Mainova climate partner programme (BS9)</i>
<i>Information circular for companies (BS1)</i>	<i>Climate protection forum Frankfurt trades (M1)</i>
<i>Benchmark pool office buildings (BS2)</i>	<i>Qualification programme multipliers (M2)</i>
<i>Competition energy efficiency in non-residential buildings (BS3)</i>	<i>Climate protection platform for businesses in Frankfurt (M3)</i>
<i>Implementation and energy efficient optimisation of framework plan for high-rise buildings (BS4)</i>	<i>Loans for passive houses in Frankfurt (M5)</i>
<i>Cooperation and exchange experiences industry/City of Frankfurt (BS5)</i>	
<i>Climate Protection Concepts Frankfurt a.M.</i>	
<i>IFEU 2008</i>	

As a financial and commercial services metropolis Frankfurt has huge potentials in the non-residential buildings sector. That is why the target groups of this package are large banks and insurance companies as well as small to medium-sized companies. This package attempts to exploit the economic potentials in this sector by offering opportunities to exchange experiences, receive information and learn about incentives, such as an electricity savings programme for businesses.

Fig. 6: Focus on clubs and churches

<b>Package 4: Focus on clubs and churches</b>	
<i>Overall concept climate protection communication (O1)</i>	<i>Energy grants model for clubs (CC3)</i>
<i>Topic-related events (O3)</i>	<i>Expand checklists for advisors to state sports associations (CC4)</i>
<i>Enlarge Department of Energy (O7)</i>	<i>Refrigerator replacement programme (CC5)</i>
<i>Energy team projects in kindergartens (E2)</i>	<i>Climate protection programme for churches and parishes (CC6)</i>
<i>Energy efficient sport facilities development programme (CC1)</i>	<i>Biomass information campaign (ES4)</i>
<i>Mainova climate partner programme (CC2)</i>	<i>Public roof space for PV systems (ES5)</i>
<p><i>Climate Protection Concepts Frankfurt a.M. IFEU 2008</i></p>	

On the one hand clubs and churches are responsible for a certain amount of CO<sub>2</sub> emissions from their buildings; on the other they offer potentials for social diffusion of energy and climate-protection topics through the multiplier effect of their members. Consequently, it is envisaged that the activities of clubs and churches are supported through funding measures, such as the energy efficient sport facilities development programme and through the availability of information.

Fig. 7: The package: publicly-owned buildings

<b>Package 5: Publicly-owned buildings</b>	
<i>Enlarge Department of Energy (O7)</i>	<i>Climate protection forum Frankfurt trades (M1)</i>
<i>Climate protection partnership universities and city (BS10)</i>	<i>Qualification programme multipliers (M2)</i>
<i>Expand school projects (ES1)</i>	<i>Public roof space for PV systems (ES5)</i>
<i>Energy team projects in kindergartens (E2)</i>	<i>Optimise energy management of municipally-owned buildings (PB1)</i>
<i>Pilot scheme user motivation at universities (E3)</i>	<i>Optimise procurement of energy-consuming devices (PB2)</i>
<p><i>Climate Protection Concepts Frankfurt a.M. IFEU 2008</i></p>	

With this package we particularly wish to address municipally-owned buildings and universities in Frankfurt. The suggestions contained in the concept for local authorities

are extremely diversified. By implementing the measures the city and the state can be seen to be fulfilling their role model function.

Fig. 8: The package: sustainable energy supply

<b>Package 6: Sustainable energy supply</b>	
<i>Overall concept climate protection communication (O1)</i>	<i>Study into biomass strategy (ES2)</i>
<i>Contracting campaign (O4)</i>	<i>Partial substitution of fossil fuels through the use of a biomass furnace in a long-distance heating network (ES3)</i>
<i>Enlarge Department of Energy (O7)</i>	<i>Biomass information campaign (ES4)</i>
<i>Optimise advice on energy saving (HH4)</i>	<i>Publically-owned roof space for PV systems (ES5)</i>
<i>Continue to expand district and long-distance heating networks (ES1)</i>	<i>Support federal and state guidelines on the use of renewable energies (ES6)</i>
<i>CHP campaign (ES7)</i>	
<i>Climate Protection Concepts Frankfurt a.M. IFEU 2008</i>	

In Frankfurt, the supply of energy offers the greatest calculated potential in the medium term. With Mainova as partner the expansion of district and long-distance heating solutions will be driven forward by increasing networks and user density as well as through the substitution of fossil fuels in the central thermal generating stations. In addition, it is envisaged that public relations work and promotional activities support decentralised CHP solutions and renewable energy systems. The concrete technical and economic aspects of implementation should be examined with regard to the measures encouraged in this context.

Fig. 9: The package: climate protection for Frankfurt

<b>Package 7: Climate protection for Frankfurt</b>	
<i>Overall concept climate protection communication (O1)</i>	<i>Climate protection funds (O6)</i>
<i>Topic-related events (O3)</i>	<i>Enlarge Department of Energy (O7)</i>
<i>Climate protection alliance Frankfurt (O5)</i>	<i>Climate protection district officer (M4)</i>
<i>Climate Protection Concepts Frankfurt a.M. IFEU 2008</i>	

To ensure that individual measures are not implemented without keeping an eye on the overall objective and that climate protection can become ingrained in people's minds it is envisaged that a climate protection pact concentrate under one umbrella all activities

relating to climate protection in the city. The content and aim of such a climate protection pact is to institutionalise climate protection, for example within the framework of a Climate Alliance, and in doing so involve large sections of society. At the same time there should be a debate about the installation of a climate fund for Frankfurt that could also help finance measures contained in this concept in the medium term.

The past shows that the Department of Energy in Frankfurt has initiated a large number of activities and today acts as a central coordination point for matters relating to energy and climate protection in Frankfurt. To ensure the concept can be implemented to the best advantage it is of the utmost importance that staff numbers at the Department of Energy be increased so that more attention can be devoted to the associated tasks in future.

**Individual measures**

The individual measures contained in the packages of measures are described and evaluated in the climate protection concept. Table 1 offers an overview of the individual measures sorted according to target groups. The evaluation from the measures sheets are included next to the titles. The more points awarded the better the measure has been evaluated against the respective criterion. The greyed-out fields cannot be evaluated as the robustness of the measures<sup>3</sup> is unclear.

To implement all of the measures the City of Frankfurt would, on average, need to invest 3.5 million euros every year to cover start-up costs. The concept demonstrates a detailed financing plan and schedule for the next 11 years.

In addition to the 3.5 million euros mentioned above further costs would also be incurred by participating actors.

Table 1: Overview: individual measures and evaluation matrix

Pos.	Short title of measure	Priority	Savings potential	Efficiency regards start-up costs*	Robustness of measure
<b>Overall measures (O)</b>					
O 1	<b>Overall concept climate protection communication</b>	●●●●●			●
O 2	<b>House of the future</b>	●●●			●●
O 3	<b>Topic-related events</b>	●●●			●
O 4	<b>Contracting campaign</b>	●●●			●●

<sup>3</sup> "Hard" measures (such as funded measures) receive more points, if their emissions reductions can be calculated or assessed; by comparison "soft" measures (such as general promotional measures) receive a maximum of three points depending on the measure.

Pos.	Short title of measure	Priority	Savings potential	Efficiency regards start-up costs*	Robustness of measure
○ 5	Climate protection alliance Frankfurt	●●●●●			●
○ 6	Climate protection funds	●●●●	●●●●	●●●	●●●●●
○ 7	Enlarge Department of Energy	●●●●●			●●●
○ 8	Guidelines and framework planning	●●●	●	●●●●●	●●
○ 9	Enforce passive house building methods when selling municipally-owned land	●●●●●			●●●●●
<b>Private households (HH)</b>					
HH 1	Electricity saving programme	●●●●●	●●●●	●●●	●●●●●
HH 2	Appliance replacement programme	●●●	●●	●	●●●●●
HH 3	Frankfurt quality standard energy efficient refurbishment	●●●●●	●●●●	●●●●	●●●●
HH 4	Optimise advice on energy saving	●●●●			●
HH 5	Energy pass quality assurance	●●●●			●
HH 6	Investment promotion by the City of	●●●●	●●●●	●●●	●●●●●
HH 7	Ecological rent table	●●●●●			●●
HH 8	Comprehensible heating bills	●●			●●
HH 9	Mainova climate partner programme	●●●	●●●	●●●●●	●●●●
HH 10	Cariteam energy saving service	●●●	●●●	●●●	●●●●
<b>Business, services, trade, small and medium enterprises (BS)</b>					
BS 1	Information circular for companies	●●●			●●
BS 2	Benchmark pool office buildings	●●●			●●
BS 3	Competition energy efficiency in non-residential buildings	●●			●●
BS 4	Implementation and energy efficient optimisation of framework plan for	●●●●			●●
BS 5	Cooperation and exchange experiences industry/City of Frankfurt	●●●			●●
BS 6	ECOPROFIT: Information and further training for commercial businesses	●●●	●●	●	●●●●
BS 7	Energy efficiency campaign for businesses	●●●●			●●

BS 8	Electricity saving programme for businesses	●●●●	●●●●●	●●●●	●●●●●
BS 9	Mainova climate partner programme	●●●	●●	●●●●●	●●●●
BS 10	Climate protection partnership universities and city	●●●●			●
<b>Education (E)</b>					
E 1	Expand school projects	●●●●			●●●
E2	Energy team projects in kindergartens	●●●			●●●
E3	Pilot scheme user motivation at universities	●●			●●●
<b>Clubs and churches (CC)</b>					
CC 1	Energy efficient sports facilities development programme	●●●●	●●●	●●●	●●●●
CC 2	Sport climate partner programme	●●●	●●	●●●●●	●●●●
CC 3	Energy grants model for clubs	●●			●●●
CC 4	Expand checklists for advisors to state sports associations	●			●
CC 5	Refrigerator replacement programme	●●	●	●	●●●●●
CC 6	Climate protection programme for churches and parishes	●●	●●	●	●●●●
<b>Measurements for multipliers (local artisans, architects, service engineers, banks) (M)</b>					
M 1	Climate protection forum Frankfurt trades	●●●			●
M 2	Qualification programme multipliers	●●●●●			●●●
M 3	Climate protection platform for businesses in Frankfurt	●●			●
M 4	Climate protection district officer	●●●●			●●
M 5	Loans for passive houses in Frankfurt	●●●			●●●
<b>Energy supply (ES)</b>					
ES1	Continue to expand district and long-distance with CHP systems	●●●●●	●●●●●	●●●●●	●●●●●
ES2	Study into biomass strategy	●●●●			●
ES3	Partial substitution of fossil fuels through the use of a biomass furnace in a long-distance heating network	●●●	●●●●●	●●●●●	●●●●●
ES4	Biomass information campaign	●●●			●
ES5	Publically-owned roof space for PV	●●●	●	●●●●●	●●●●●

ES6	<b>Support federal and state guidelines on the use of renewable energies</b>	●●	●●●	●●●●●	●●●●
ES7	<b>CHP push</b>	●●●●●	●●●●	●●●●	●●●●
<b>Public buildings (PB)</b>					
PB1	<b>Optimise energy management of municipally-owned buildings</b>	●●●●●	●●●●	●●●●●	●●●●
PB2	<b>Optimise procurement of energy-consuming devices</b>	●●●	●●	●●●●●	●●●●

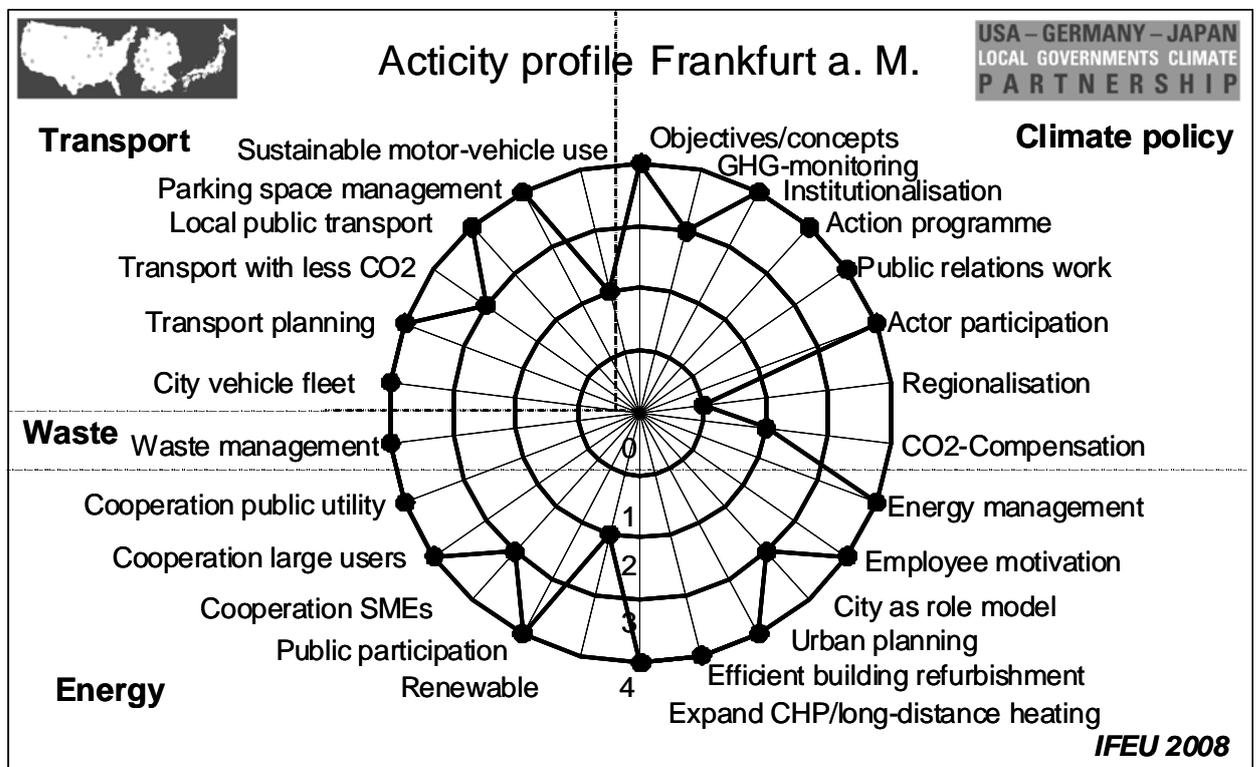
\* Start-up costs do not include implementation costs for individual actors except for the city

The IFEU Institute would like to thank everybody who provided information and suggestions during the concept development phase and in so doing helped to make this concept possible. We would be pleased if this concept proves to be a helpful guide for the City of Frankfurt on the path to climate protection.

### 1.1 Climate Alliance Climate Alliance: Where is Frankfurt/Main?

The activities described above demonstrate that climate protection is a matter of importance in the City of Frankfurt's political arena. Since last year it has been possible to depict where Frankfurt stands with regard to its activities in comparison with other German cities with the aid of a Climate Alliance drawn up by the Climate Alliance with the support of the IFEU Institute.

Fig. 10: Comparison of Frankfurt activity profiles with the average standing of German cities of comparable size



This involved drawing up a multiple-layer benchmark system that evaluates the practicality and success of climate protection measures already in place in local communities. Amongst other things this benchmark system makes it possible to compare the activities of German cities<sup>4</sup>.

Fig. 10 is the result of the first part of the benchmark system. It shows the comparison of activities in Frankfurt in different topic domains relative to the average of other German cities based on the information given by the City of Frankfurt. In addition,

<sup>4</sup> Cities included in the assessment are Bonn, Dresden, Frankfurt, Freiburg, Hanover, Heidelberg, Offenbach, Lubecke, Mainz, Münster and Cologne

questions were posed about the activities across different local authority areas of activities and their "lows" before they were depicted in a net diagram.

The result shows that in comparison with other cities Frankfurt's activities are either equal to or above the German-wide average in virtually all sectors.

With 16 points the City of Frankfurt already fulfils the maximum possible aspects in terms of content examined by the survey. This is spread evenly across all sectors; for example actor participation in the climate policy sector, transport planning in the sector transport, energy management in the sector energy and waste management. According to this survey Frankfurt has undertaken more than other German cities by comparison, above all in activities in the waste management sector, public relations work and in several points in the transport sector (for example, local public transport).

In contrast there are relatively few points in which Frankfurt still has potential to do more in areas in which other cities are in part already more active. The missing or low level of activity towards cooperation with neighbouring towns and the surrounding region in the field of climate protection is mentioned in this context. And it is not just in the comparison with other cities that there are also many possibilities to intensify its activities with regard to cooperation with SMEs. The same applies to the field of renewable energy, in which other cities exhibit more intensive efforts.

However, there are also other reasons for a lack of activities. Points such as the sustainable use of motor vehicles are a problem in nearly all cities in Germany, which despite the more than obvious slumbering potential is not mirrored by corresponding activities. Activities on the point of public participation improved significantly not least of all during the development of this concept in comparison with the time when the survey was carried out. In the end it is hoped in Frankfurt to achieve climate protection through energy efficiency, and as a result activities regarding so-called compensation are largely rejected.

## 1.2 Tables containing detailed results (energy, CO<sub>2</sub>)

Energy consumption Frankfurt 1987								According to sectors and energy carrier
<b>EE 1987</b>								
Sector	Nat. gas [GWh/a]	Long dist. heat [GWh/a]	Long dist. steam [GWh/a]	Heating oil [GWh/a]	Coal etc. [GWh/a]	Others [GWh/a]	Electricity [GWh/a]	Total [GWh/a]
Households	2.852	210	0	669	226	0	774	4.731
Business	1.414	933	0	1.018	255	0	2.086	5.706
Industry	4.646	40	0	299	955	0	2.404	8.344
<b>TOTAL</b>	<b>8.912</b>	<b>1.183</b>	<b>0</b>	<b>1.986</b>	<b>1.436</b>	<b>0</b>	<b>5.264</b>	<b>18.781</b>

Energy consumption Frankfurt 1992								According to sectors and energy carrier
<b>EE 1992</b>								
Sector	Nat. gas [GWh/a]	Long dist. heat [GWh/a]	Long dist. steam [GWh/a]	Heating oil [GWh/a]	Coal etc. [GWh/a]	Others [GWh/a]	Electricity [GWh/a]	Total [GWh/a]
Households	3.250	241	0	734	215	0	862	5.302
Business	1.938	1.035	0	963	0	0	2.630	6.566
Industry	4.393	40	0	1.091	120	0	1.830	7.474
<b>TOTAL</b>	<b>9.581</b>	<b>1.316</b>	<b>0</b>	<b>2.788</b>	<b>335</b>	<b>0</b>	<b>5.322</b>	<b>19.342</b>

Energy consumption Frankfurt 1995								According to sectors and energy carrier
<b>EE 1995</b>								
Sector	Nat. gas [GWh/a]	Long dist. heat [GWh/a]	Long dist. steam [GWh/a]	Heating oil [GWh/a]	Coal etc. [GWh/a]	Others [GWh/a]	Electricity [GWh/a]	Total [GWh/a]
Households	3.202	259	0	619	202	0	872	5.154
Business	2.008	1.138	0	811	0	0	2.648	6.605
Industry	3.832	33	0	340	195	0	1.613	6.013
<b>TOTAL</b>	<b>9.042</b>	<b>1.430</b>	<b>0</b>	<b>1.770</b>	<b>397</b>	<b>0</b>	<b>5.133</b>	<b>17.772</b>

Energy consumption Frankfurt 2005								According to sectors and energy carrier
<b>EE 2005</b>								
Sector	Nat. gas [GWh/a]	Long dist. heat [GWh/a]	Long dist. steam [GWh/a]	Heating oil [GWh/a]	Coal etc. [GWh/a]	Others [GWh/a]	Electricity [GWh/a]	Total [GWh/a]
Households	3055	357	0	506	48	0	836	4.802
Business	759	550	564	733	0	124	1916	4.646
Industry	1635	119	2558	47	0	424	2563	7.346
<b>TOTAL</b>	<b>5.448</b>	<b>1.026</b>	<b>3.121</b>	<b>1.286</b>	<b>48</b>	<b>548</b>	<b>5.315</b>	<b>16.794</b>

ifeu 2008

CO2 emissions Frankfurt 1987								
According to sectors and energy carrier								
<b>CO2 1987</b>								
<i>ifeu 2008</i>								
	Nat. gas	Long dist. heat	Long dist. steam	Heating oil	Coal etc.	Others	Electricity	Total
Sector	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]
Households	718.704	53.340	0	214.749	97.858	0	480.654	<b>1.565.305</b>
Business	356.328	236.982	0	326.778	110.415	0	1.295.406	<b>2.325.909</b>
Industry	1.170.792	10.160	0	95.979	413.515	0	1.492.884	<b>3.183.330</b>
<b>TOTAL</b>	<b>2.245.824</b>	<b>300.482</b>	<b>0</b>	<b>637.506</b>	<b>621.788</b>	<b>0</b>	<b>3.268.944</b>	<b>7.074.544</b>

CO2 emissions Frankfurt 1992								
According to sectors and energy carrier								
<b>CO2 1992</b>								
<i>ifeu 2008</i>								
	Nat. gas	Long dist. heat	Long dist. steam	Heating oil	Coal etc.	Others	Electricity	Total
Sector	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]
Households	819.000	65.070	0	235.614	93.095	0	591.332	<b>1.804.111</b>
Business	488.376	279.450	0	309.123	0	0	1.804.180	<b>2.881.129</b>
Industry	1.107.036	10.800	0	350.211	51.960	0	1.255.380	<b>2.775.387</b>
<b>TOTAL</b>	<b>2.414.412</b>	<b>355.320</b>	<b>0</b>	<b>894.948</b>	<b>145.055</b>	<b>0</b>	<b>3.650.892</b>	<b>7.460.627</b>

CO2 emissions Frankfurt 1995								
According to sectors and energy carrier								
<b>CO2 1995</b>								
<i>ifeu 2008</i>								
	Nat. gas	Long dist. heat	Long dist. steam	Heating oil	Coal etc.	Others	Electricity	Total
Sector	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]
Households	806.904	65.527	0	198.543	87.466	0	596.448	<b>1.754.888</b>
Business	506.016	287.914	0	260.487	0	0	1.811.232	<b>2.865.649</b>
Industry	965.664	8.349	0	109.140	84.435	0	1.103.292	<b>2.270.880</b>
<b>TOTAL</b>	<b>2.278.584</b>	<b>361.790</b>	<b>0</b>	<b>568.170</b>	<b>171.901</b>	<b>0</b>	<b>3.510.972</b>	<b>6.891.417</b>

CO2 emissions Frankfurt 2005								
According to sectors and energy carrier								
<b>CO2 2005</b>								
<i>ifeu 2008</i>								
	Nat. gas	Long dist. heat	Long dist. steam	Heating oil	Coal etc.	Others	Electricity	Total
Sector	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]	[t/a]
Households	769.740	70.067	0	162.465	20.801	0	605.486	<b>1.628.559</b>
Business	191.169	107.834	182.042	235.396	0	19.128	1.387.077	<b>2.122.646</b>
Industry	412.025	23.281	516.634	15.085	0	84.776	1.855.802	<b>2.907.602</b>
<b>TOTAL</b>	<b>1.372.934</b>	<b>201.183</b>	<b>698.676</b>	<b>412.945</b>	<b>20.801</b>	<b>103.904</b>	<b>3.848.365</b>	<b>6.658.807</b>

## Further Information

[www.energiereferat.stadt-frankfurt.de](http://www.energiereferat.stadt-frankfurt.de)

[www.frankfurt-spart-strom.de](http://www.frankfurt-spart-strom.de)

[www.oekoprofit-frankfurt.de](http://www.oekoprofit-frankfurt.de)

[www.greenbuilding-frankfurt.de](http://www.greenbuilding-frankfurt.de)

[www.klimaschutzstadtplan-frankfurt.de](http://www.klimaschutzstadtplan-frankfurt.de)

[www.kwk-kampagne-frankfurt.de](http://www.kwk-kampagne-frankfurt.de)

[www.caritas-frankfurt.de](http://www.caritas-frankfurt.de)

[www.umweltfrankfurt.de](http://www.umweltfrankfurt.de)

[www.klimasparbuch.net](http://www.klimasparbuch.net)