

City Transformation Agenda Hamburg

31/03/2015

Executive Summary

Status Quo & Vision

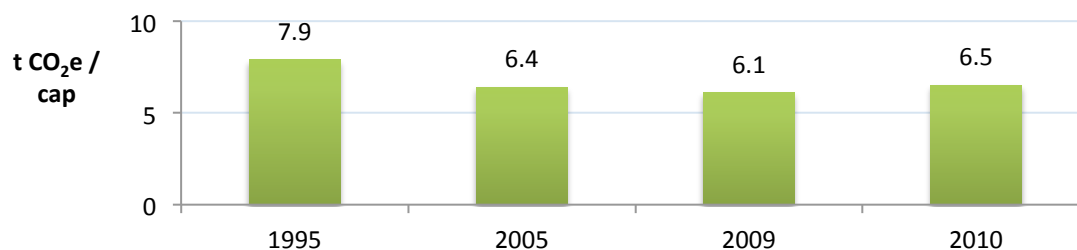
The TA is addressed to decision makers and stakeholders that are engaged in the development of the energy strategy in Hamburg.

In 2007 Hamburg decided to play an active role regarding climate change. Hamburg's target for 2020 is a reduction of 30% in CO₂ emissions, aiming to substantially contribute to the national goal of 40% CO₂ reduction by 2020 compared to 1990. By 2050, emissions of carbon dioxide may not exceed 4 million tons, which is a reduction of 80% compared to 1990. The City Transformation Agenda Hamburg is building on the already existing energy strategy 'Master Climate Action Plan' as the following programme to the 'Climate Action Plan' (SEAP).

To work out the Vision 2050 of the Master Climate Action Plan the method of Backcasting (the feasibility assessment of desired future) has been used. In order to reach the CO₂ reduction **Vision for 2050**, the approach has to be dynamic. It needs to be taken into consideration that the political boundary situations might change and the technical development is unforeseeable.

Therefore, a dynamic management model has been used: the "**Transformation Cycle**" which illustrates the nonlinear dynamic City Transformation Process – modelling the implementation, adjustments and corrections of the City concept.

According to the analysis illustrated in the following figure the development of CO₂e per capita is close to the target of 7t for 2020 and only needs to be stabilised. Hamburg aims to further reduce the emissions per capita to 2 t CO₂e per annum until 2050.



These ambitious goals are politically, financially and regulatory supported by the **Action Plan 2020**, which includes a complete list of more than 50 measures that summarize the specific projects within the multiple fields of action. The estimated saved CO₂ emissions from 2013 to 2020 are nearly 2 million tons.

Gap Analysis

Hamburg supports the Energy Transition and therefore developed the Energy Transition Triad, which involves:

1. increasing energy efficiency,
2. converting energy networks, and
3. expanding renewable energies.

Action Plan

The most important areas for climate action in Hamburg have been outlined in the 'Master Climate Action Plan', which is the basis for this Transformation Agenda. The areas of action are

1. Energy / Energy Supply (Electricity & Heat)
2. Industry, Trade & Port
3. Buildings
4. Mobility & Transport¹
5. Consumption & Disposal
6. Integrated Consideration of Climate Action: Urban Development
7. Education
8. Research & Science
9. Integrated Consideration of Climate Action: Adaptation to Climate Change

The monitoring of the 50 measures included in the Action Plan 2020 occurs every two years. Hence, the years 2013 and 2014 have been planned with the available budget for this two-year period. The budgets for 2015 and 2016 is currently being evaluated and assigned to the measures.

Conclusion

The Master Plan, as a long-term development plan for climate action and the climate change impact adaptation in Hamburg, has to be regularly adapted to the current developments and results from the evaluation of the climate change concept: The recommendations from the evaluation of the climate change concept 2007-2012 were taken into account in the preparation of the Master Plan or will be reviewed when it comes to its implementation.

Examples of Impact & Adjustments of Hamburg's Energy Strategy are the Heat Concept, the development of innovative projects by HAMBURG ENERGIE, including solutions for topics like Control Reserve, Virtual Power Plants and the increase of photovoltaic installations in Hamburg. Furthermore, studies about the Transformation Process on the spatial level have been conducted and will be taken into account for further adjustments of the 'Master Climate Action Plan'.

The TRANSFORM project shows that it is very important to focus on those actions that are measurable, have a high impact and are easy to apply. Additionally, actions have to be taken on themes that are more difficult to implement, but are having a high impact. The Transformation Process is not static, but rather dynamic and needs to involve as many stakeholders and decision makers as possible in order to reach the objectives. This Transformation Agenda is not a new energy strategy for Hamburg, it rather emphasizes the actions that have already been taken and points out the importance of the further development, monitoring and evaluation of these actions.

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Introduction

As part of Work Package 2 of the TRANSFORM Project, each city has to produce a Transformation Agenda (TA) (i.e. Deliverable 2.2 of the Description of Work). The TA is not a new energy strategy, it is rather a document explaining the current situation of energy planning and how the existing city strategy can be improved. Therefore, many parts of this report relate to the existing energy action strategy in Hamburg – the **Master Climate Action Plan Hamburg**¹. External sources will be indicated in the footnotes. The TA is addressed to decision makers and stakeholders that are engaged in the development of the energy strategy in Hamburg.

Objective and Frame of the City Transformation Agenda Hamburg

The Free and Hanseatic City of Hamburg is already one of the leading cities regarding climate and energy related research and science in Germany. Hamburg has a long tradition of climate and energy policy, leading to a comprehensive Transformation Process – ecologically, economically and socially².

1. With the **Master Climate Action Plan** Hamburg contributes to the objective that CO₂ emissions of central key fields of action for Hamburg are reduced to a minimum by 2050.
2. Climate action is strongly linked to another key strategy in Hamburg – the **Energy Transition**.
3. The study “Green, inclusive, growing city by the water – **Perspectives on Urban Development in Hamburg**”³ (until 2030) exemplifies the strategic commitment to urban development.

The environmental, economic and socio-political challenges resulting from this must be mastered in order to limit global warming and to curb dangers and costs on the basis of climatic events. The Hamburg climate action policy works with an integrated climate action approach with the intent to reduce CO₂ emissions by 40% by 2020 and by at least 80% by 2050, in order to limit global warming to 2°C as prescribed under international law. Therefore, decisive boundary conditions arise from the consistent implementation of energy transition and a responsible fiscal policy.

The City TA Hamburg incorporates knowledge that was gained through previous projects and programmes. The gathered information and TRANSFORM project results are utilized to work out a set of comprehensive recommendations to city administration and decision makers to improve the city energy strategy at both the strategic and thematic levels.

Overview of the Content of the City Transformation Agenda Hamburg

Part A: The Story (Status Quo, Vision & Quantitative Goals). presents the general framework of Hamburg’s city concept: the Starting point (Status Quo Report), Master Climate Action Plan linked to Energy Transition and Urban Development, Vision for 2050 and the Action Plan 2020.

Part B: Evaluation of the City’s Energy Strategy (ex. SEAP) and Transformation Process. In this section the city will proceed to an evaluation of its SEAP with regard to the European 20-20-20 targets to compare its real development with the ideal one (Gap Analysis). This is achieved by coupling two approaches: the concept of transformation (City as complex adaptive system) and the City Concept Assessment. Based on the results of these two approaches, the city will identify the themes and strategic elements they will have to improve in order to achieve their energy and climate goal (i.e. the Transformation Process they will have to go through) which leads to Part C.

Part C: Improving Abilities to Implement – Selected Themes. In this section, the city describes the Transformation Path it will have to go through to improve its energy strategy in order to meet its energy and climate objectives. This will be done at two levels: the thematic level (by detailing concrete measures on the 3/5 themes selected during the intake workshop) and the strategic level (as a result of the city concept and strategic working groups). This includes stakeholder mapping and financial impacts.

Part D: What has been achieved so far and impact on the existing City Energy Strategy. This section details the first steps achieved by the city to implement above detailed measures, as well as the plan of the city to use above outputs to improve their energy strategy. Especially elements of controlling, reporting and further development of the city concept, as well as proposals for adjustments will be shown.

¹ <http://www.hamburg.de/contentblob/4316146/data/master-plan-for-climate-protection.pdf>

² Further information on current action on the ecological, economical and social level can be found in the Status Quo Report Hamburg.

³ [http://www.hamburg.de/contentblob/4357518/data/broschuere-perspektiven-englisch\).pdf](http://www.hamburg.de/contentblob/4357518/data/broschuere-perspektiven-englisch).pdf)

PART A: Status Quo, Vision & Quantitative Goals

1. Status Quo

The Free and Hanseatic City of Hamburg is a federal state (“Bundesland”) and municipality in the Federal Republic of Germany. With a population of 1.8 million it is the second largest city in Germany and seventh largest in Europe. The economic region ‘Hamburg Metropolitan Region’, which includes parts of Lower Saxony, Schleswig-Holstein and Mecklenburg-Western Pomerania, has a population of about 5 million people.⁴ The city area covers approximately 755 km². More than 16% of the city area consists of vegetation, parks and recreation areas. Water covers 8% with streams, ponds and lakes, e.g. inner and outer “Alster”. About 74 km² of the city area are port spaces; it is the second largest container handling port in Europe.

Detailed information about the economy, governance, the standard of living, resource consumption, traffic and transportation as well as the urban and environmental policy can be found in Hamburg’s Status Quo Report (SQR)⁵ which gives a synopsis of current policies and activities in Hamburg. These outcomes are an intermediate result of sustainable measures which have led to the Green Capital Award 2011⁶. These activities are set into the geographical, economic and environmental conditions of the city which build the indispensable framework and starting point for successful strategies and upcoming implementations – especially for the transformation towards a “Smart Energy City”.

The City context delivers boundaries, framework and selective conditions for key elements, key performance categories and key performance indicators. 10 Key Elements have been chosen to characterize Hamburg. Focusing on the subjects of energy, climate protection and environmental policy 5 themes (key elements) are prioritized in the SQR: Governance, Resource consumption, Urban and Environmental Policy, Climate Policy, Cooperation and Communication – referring to the PESTLE Approach (Political, Economic, Sociological, Technological, Legal, Environmental).

1.1 Energy Consumption & CO₂ Emission Methods

Hamburg reorganised its method for CO₂ balancing in 2003. The emissions balance is conducted by the regional statistics agency (“Statistikamt Nord”). There are two methods to calculate CO₂ emissions: the sources method and the polluter method.⁷ From 1990 until 2011 a downward trend in CO₂ emissions in Hamburg can be observed. The polluter balance’s highest share is tracing back to the consumption group “Households, Trade, Commerce, Services”. The negative impact of this group is also visible in the sources balance. However, the consumption group “Road Transportation” has an even higher impact on the sources balance.⁸ Hamburg decided that neither the polluter nor the sources balance is completely applicable for a city like Hamburg, since it mainly refers to the past development. Thus, Hamburg (in cooperation with the “Wuppertal Institut”) developed a balancing method that improves future projection, which is a modified version of the polluter method within a bottom-up approach. This means: all climate affects in- and outside Hamburg that are achieved through measures implemented in Hamburg are recognized. Hence, Hamburg works with a balancing method that suits the city’s actions.⁹

Hamburg has set a target for 2020 with respect to the personal contingent of CO₂e emissions for each inhabitant amounting to 7 t. According to the analysis illustrated by Figure 3 (see Appendix No. 3) the development is close to the target and only needs to be stabilised. Hamburg aims to further reduce the emissions per capita to 2 t CO₂e per annum until 2050. A step towards the decoupling of economic growth and CO₂ emissions is identified by the analysis of CO₂e Intensity – CO₂e Emissions

⁴ www.hamburg.de

⁵ See Status Quo Report Hamburg

⁶ The Status Quo Report is therefore mainly based on data of the Green Capital Award (more information can be found on <http://ec.europa.eu/environment/europeangreencapital/winning-cities/2011-hamburg/>)

⁷ See PART C “6. CO₂ Balancing” and Annex 1 “Methodology of CO₂ Balancing” for further explanation

⁸ See Appendix 1 & 2: Polluter Balance & Sources Balance

⁹ See Annex 1 “Methodology for CO₂ Balancing”

per Gross Regional Product and annum. A reduction of ca. 35% in CO₂e Intensity has been achieved between 1995 and 2010.¹⁰

1.2 Energy Transition Regulatory & Financial Framework

In 2007 Hamburg decided to play an active role regarding climate change. Hamburg's target for 2020 is a reduction of 30% in CO₂ emissions, aiming to substantially contribute to the national goal of 40% CO₂ reduction by 2020 compared to 1990. By 2050, emissions of carbon dioxide may not exceed 4 million tons, which is a reduction of 80% compared to 1990.

The Hamburg Senate decided to focus efforts towards climate mitigation in one programme and to conduct the **Climate Action Plan**¹¹ – the Hamburg SEAP – from 2007 until the end of 2012 including the financial contribution. The responsibility for the programme content and the allocation of the funds from the Climate Action Plan has been and will be lying in the newly founded Coordination Centre for Climate Issues (“Leitstelle Klimaschutz”) in the Ministry of Urban Development and Environment (“Behörde für Stadtentwicklung und Umwelt”). All ministries of the city were involved, either for coordinating climate issues or for special projects (some of the participants were financed from particular climate action funds). From 2008 until 2012 the Senate evaluated annually the progress and continuation of the programme and of the projects included. In June 2013, the Senate presented a Master Climate Action Plan as the following programme to the Climate Action Plan.

Between 2008 and 2012 150 projects were financed with 115.5 million Euros within the Climate Action Plan Programme. In 2013 and 2014 the Master Plan Climate Action has been funded with 13.4 million Euros each year. There will be further funds, but the amount is still discussed. 54% of the projects are financed with more than 30 Euro per ton CO₂, 35% of the projects receive less than that – only 11% do not receive funding.¹²

For responsible handling of public funds, inexpensive and efficient CO₂ reduction measures with promising pilot nature and market launch potential are implemented.

The main fields of action regarding the financed CO₂ reduction projects are “Industry, Commerce and Port” as well as “Energy (Supply)” and “Buildings”. These three categories make up almost 90% of all projects being financed.¹³

2. Vision & Quantitative Goals 2013, 2020, 2050

The Hanseatic City of Hamburg has already set climate action goals and supports energy transition. The Master Climate Action Plan outlines Hamburg's strategic vision referring to the goals for 2020 and 2050 as mentioned above. The City is committed to advancing the energy transition in order to secure energy supply, economic efficiency and competitiveness.

Beneath the Master Climate Action Plan lie the qualitative measures of the Action Plan 2020. The distinctive feature is that all measures are workable in practice, effective, economical, attributable to the originator and take into account the performance efficiency of those affected. Moreover, projects with high climate action potential are being favoured such as the improvement of energy efficiency of buildings in industry, trade and port. However, in many areas the achievement of the objectives depends on the development of the climate action policy of the EU and the Federal Government. In this, Hamburg will assert its influence even more.

¹⁰ See Appendix 3 & 4: CO₂e per Capita & CO₂e Intensity

¹¹ http://www.co2olbricks.eu/fileadmin/Redaktion/Press/Documents/Hamburg_Climate_Action_Plan_2007-2012_Update_2011_2012.pdf

¹² See Appendix 5: Distribution of Projects according to Cost Categories

¹³ See Appendix 6: CO₂ Reductions with Respect to Fields of Action

The ambitions are promising, since Hamburg is already strong in many fields of action:

- ✓ Research and science
- ✓ Main location of wind energy sector in Germany,
 - Cooperation with grid providers
 - Partially owning the grids
 - Established the municipal green energy provider HAMBURG ENERGIE in 2009
- ✓ Hamburg Port is a leading logistic location

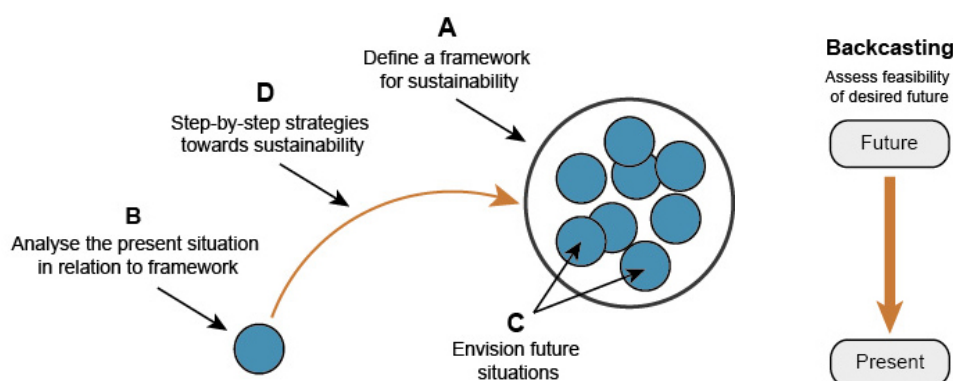
For the senate, climate action can only be achieved by the whole community. Thus, not only the industry, but also the citizens are critical for the success of many planned actions.

Most important areas for climate action, energy change and life in the city:

1. Energy / Energy Supply (Electricity & Heat)
2. Industry, Trade & Port
3. Buildings
4. Mobility & Transport¹
5. Consumption & Disposal
6. Integrated Consideration of Climate Action: Urban Development
7. Education
8. Research & Science
9. Integrated Consideration of Climate Action: Adaptation to Climate Change

The **Action Plan 2020** includes a complete list of more than 50 measures that summarize the specific projects within the multiple fields of action. The estimated saved CO₂ emissions from 2013 to 2020 are nearly 2 million tons.^{14/15} The monitoring of these measures occurs every two years. Hence, the years 2013 and 2014 have been planned with the available budget for this two-year period. The budgets for 2015 and 2016 is currently being evaluated and assigned to the measures.

To work out the Vision 2050 of the Master Climate Action Plan the method of **Backcasting** (the feasibility assessment of desired future) has been used:



In order to reach the CO₂ reduction **Vision for 2050**, the approach has to be dynamic. Therefore, it needs to be taken into consideration that the political boundary situations might change and the technical development is unforeseeable. Hence, the Master Climate Action Plan summarises today's available knowledge and outlines the emerging trends. A detailed overview of the **Vision 2050 for Hamburg** identifies what is required in order to successfully mitigate CO₂ emissions of about 80% compared to 1990.¹⁶

¹⁴ See Annex 2: List of Measures defined in the Action Plan 2020

¹⁵ For information regarding budgetary impact see Master Climate Action Plan (P. 24 + Appendix 2)

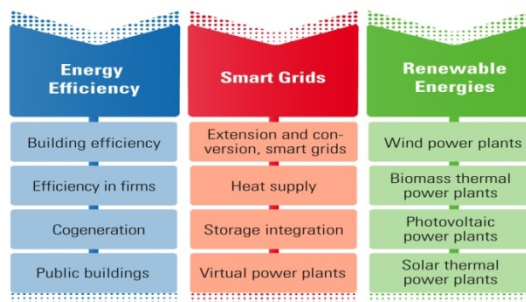
¹⁶ See Annex 3: Overview of the Vision 2050 for Hamburg

2.1 The Energy Transition

Linked to this long-term climate action concept – as a main essential for Hamburg Transformation Agenda – is the strategy of Energy Transition.

Hamburg’s Energy Transition Triad¹⁷ involves:

4. increasing energy efficiency,
5. converting energy networks,
6. expanding renewable energies.



1	Energy Efficiency	The smartest way to protect the climate is still to reduce energy consumption – with advantages for quality of life and economic strength. In alliance with business, we initiated a programme called “Companies for Resource Protection”, whereby companies are encouraged to take action to help foster the energy transition. The city provides consultation and award subsidies, generating potential savings in energy, water and raw materials. Up to now, some 1,800 companies have taken part in the programme and around 275 million Euros have been invested in climate and resource-saving measures.
2	Smart Grids	In the future, we need to harmonize fluctuating production from renewable energies with a varying demand situation. To this end, the electricity and natural gas grids, heat supply and energy storage need to be further developed. An outstanding project in the area of long-distance energy is certainly the replacement of an old hard coal-fired power plant by a new state-of-the-art, efficient gas and steam cogeneration plant, including an innovative storage system that can convert wind energy into heat and store it. Consequently, some 250,000 tons of carbon dioxide will be saved annually.
3	Expansion of Renewable Energies	Here, the activities undertaken by the Renewable Energies Cluster play a central role. Thanks to the many companies that operate in this branch of technology, Hamburg has now become an international wind energy metropolis. The Renewable Energies Cluster has made a major contribution to this favourable development.

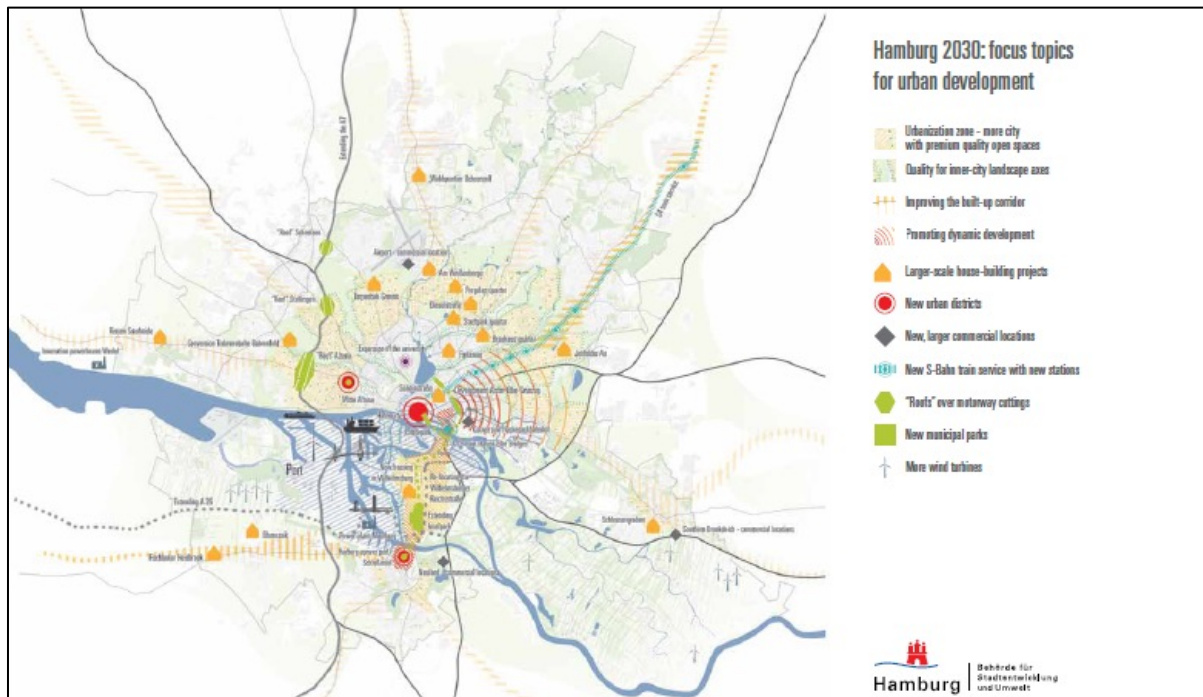
2.2 Urban Planning

Urban growth and a top quality environment will not be mutually exclusive in the future. Technical progress in production and mobility, conservation of resources, the turnaround in energy policy and society’s changing values are important foundations of sustainable urban development and offer completely new prospects for social cohesion in the city.

Hamburg will take numerous steps to implement the energy turnaround. The big city offers enormous potential to create a smart network between power & heat generating companies and their customers and thereby achieve environment-friendly solutions and greater energy efficiency. The task for the coming decades will be to develop the requisite technical innovations, to create a favourable climate for their use and ensure that the new applications are affordable.

In a densely built and populated city such as Hamburg, the future belongs to a mix of central and decentralized utilities. It is most important to reap the economic and ecological benefits of infrastructures that have already evolved, such as district heating systems. Nevertheless, greater use must be made of local sources of heat and power than hitherto, employing innovative methods. For example, the solar bunker in Wilhelmsburg supplies electricity to around 1,000 households and heating to about 3,000 homes, thus, taking a big step towards the goal of making the Elbe Island energy self-sufficient. Hamburg will act on the results of ongoing investigations into local heating systems and apply for grants under Federal and EU development programmes to help the city design strategies to increase supplies fed into the heating grid by using waste heat, combined heat and power generation and renewable energies. The municipal energy provider HAMBURG ENERGIE is a strong partner in the development of innovative solutions. Examples of successful projects can be found in PART C, Pt. 5.

¹⁷ <http://www.hamburg.de/energiewende/energiewende-in-hamburg/3737996/hamburger-energiewende/>



Short Overview of Hamburg's Guidelines for Urban Planning as the third part of the City TA¹:

- A More City in the city
- B The inclusive City
- C Green and Environment-Friendly City
- [...]
- C4 The City Rises to the Challenge of Climate Change
- C5 Hamburg's Energy Turnaround
- D Urban Development in the Business Metropolis
- E Hamburg Opens Up to New Perspectives

PART B: Evaluation of the City’s Energy Strategy and Transformation Process

1. Introduction – The Conditions of Transformation (in Complex Adaptive Systems)

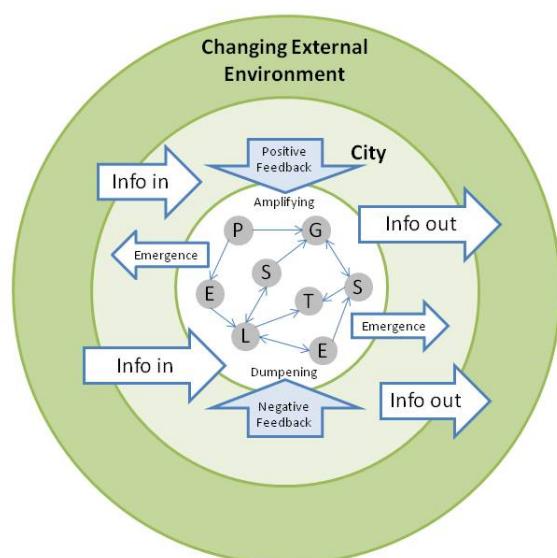
It is essential that especially Transition or Transformation strategies and measures should be improved and adapted to (often quickly) change conditions in the economic, technological or environmental spheres. Transition and Transformation refer to dynamic processes of socio-ecological-technical change – showing a complex behavior of systems. “Our society is composed of complex adaptive systems in which individuals and organizations [may] self-organize within the limits set by physical, institutional and informal structures, and [can] experience the emergence of e.g. technological or social innovations”¹⁸. These characteristics are referring to (political and/or administrative) actors who direct or orchestrate system change towards certain targets, e.g. energy change, climate action etc. This societal interaction means governing activities of social, political and administrative actors. Strategic adaptation and shifts – with view of keeping the overall objectives – therefore should be an indicator of good/smart governance.

Hamburg shows several of these characteristics, i.e.

- There is an ongoing government (Senate) concerning climate and energy policy inspite of changing electoral behaviour
- Stakeholders and actors of the civil society influence significantly Hamburgian policy
- An important network of domestic industry in Hamburg sets targets for CO₂ reduction
- There is remarkable resilience concerning economic, social and technical adaptation

Regarding to these results it is possible to create a ‘simple’ model of a City as a complex adaptive system, where the system elements are chosen as PESTLEGS elements, which represents agents/actors (citizens and stakeholder) and institutional components (see picture below).

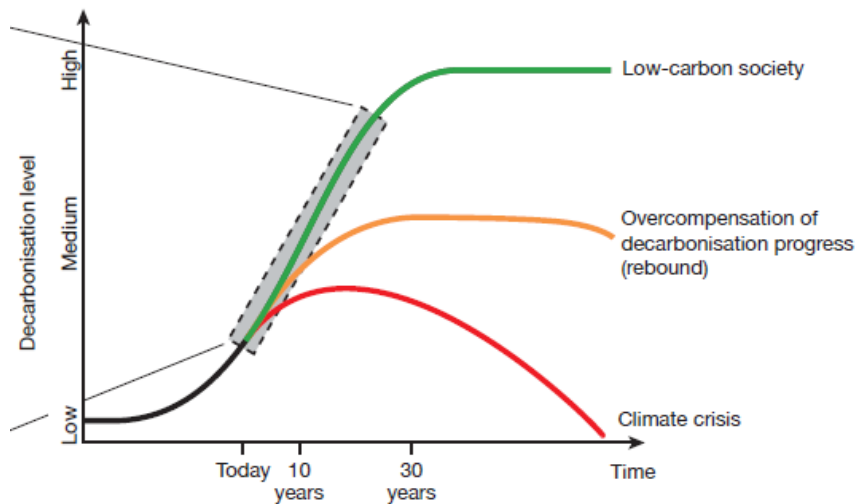
City as “Complex Adaptive System”



¹⁸ cf. Loorbach et al (2009)

The model above shows and illustrates the City Transformation conditions in general. The specific situation in Hamburg will be described in the following chapters. The whole background information is described in detail within the Generic TA.

Furthermore, we need another ‘simple’ model of Transformation that describes the Transition Process to achieve a low-carbon society and to avoid rebound effects and climate crisis. A first approach is illustrated in the figure below.



Modeling the Transformation Process:

- 1st Approach: The Transformation’s temporal **non-linear** Dynamics and Action Levels
- 2nd Approach: **Topography of the Transformation:** turning the city society’s status quo into low-carbon is the overcoming of obstacles (shown here as an increasing of social costs)

Source: WBGU

Hamburg is aiming to strengthen and underline the “Favorable Factors” (see above), which is supported by the ‘Master Climate Action Plan’ that is linked to the ‘Energy Transition’ and the ‘Guidelines for Urban Planning’. The improvement of the Transformation Modelling into a ‘Transformation Cycle’ will be found in Part C, Pt. 7.

2. City Concept Assessment

The TRANSFORM Cities worked out a rough assessment of their currently used main City Concept. Therefore guiding questions for assessment of the Energy/Climate Concept have been developed and applied correspondingly – in Hamburg to the **Master Climate Action Plan**¹⁹.

In Annex 4 shows 12 guiding questions concerning the city concept Hamburg (the other TRANSFORM cities answered the same questions) – with the aim to get a first approach/overview of the city concept. The following questions and answers underline specific characteristics of the Hamburg city concept.

¹⁹ See Annex 4: Guiding Questions Hamburg

Examples of Guiding Questions and Answers:

2. What is the underlying “philosophy” of the plan?

The plan follows a holistic and comprehensive approach

4. Is the achievement of objectives monitored?

The Master Plan, as a long-term development plan for climate protection and the Climate change impact adaptation in Hamburg, has to be regularly adapted to the current developments and revised. To this end, the Senate updates it every two years.

6. Does the plan reflect the spatial differentiation in terms of city scales (eg. building-, quarter-, district- or area-scale)?

*The City Plan is focused on the entire city space.
In total the spatial dimension has to be improved.*

8. What is the role of Stakeholders?

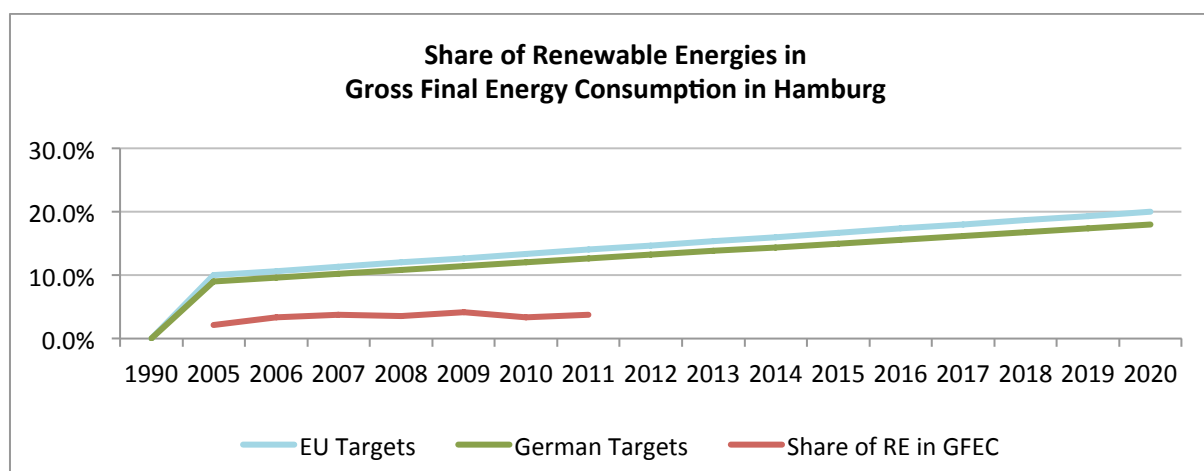
During the development process of the city concept the overall objective was: the technical and strategic master plan process is to “map” the relevant bodies and organizations of the city as a whole. In future, new, targeted participation formats will be designed to bring environmental and sustainability issues more close to the width of society.

10. Does the plan ensure a coordinated action within the administration?

Climate action and energy policy is not only operated by the Ministry of Urban Development and Environment, but is equally integrated into the sectoral policies of the other Departments of the Free and Hanseatic City of Hamburg.(see answer 2.)

3. City “Gap” Analysis

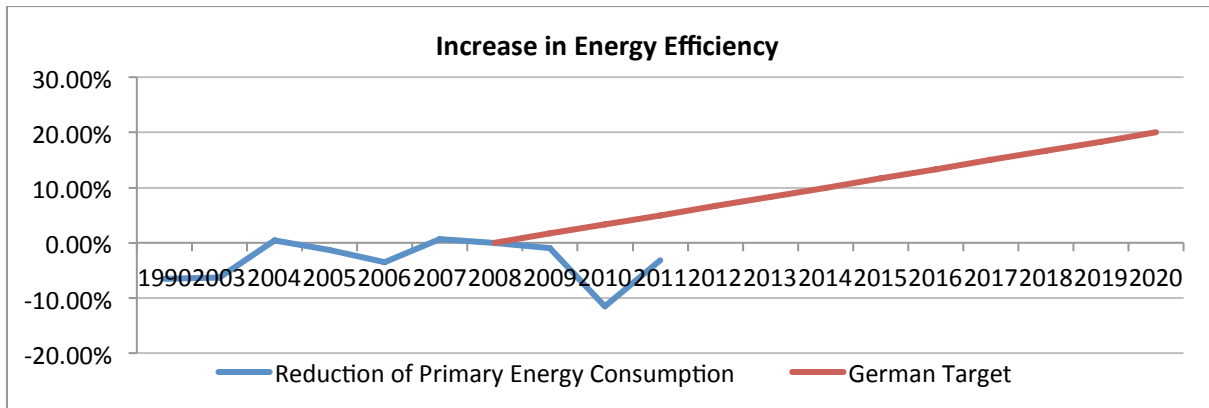
A brief quantitative “gap” analysis shows Hamburg’s development in the past tense till 2011 with regard to the European 20-20-20 targets²⁰ – the three aspired (linearised) paths for the reduction of greenhouse gas emissions as announced by the EU, Germany and Hamburg. In addition the progress of each applied CO₂ balancing method is depicted, visualizing that Hamburg is well on track according to the sources balance and Hamburg’s targets announced. With respect to the polluter balance Hamburg is on track to meet the European targets for CO₂ emissions, but still has to make progress towards its own targets. **The share of renewable energies in Gross Final Energy Consumption as shown in the figure²¹ below indicates that Hamburg is far away from European and German targets.** The **Action Plan 2020** (as a part of the Master Climate Action Plan) shows in chapter III.1 three elements of a strategy for improving renewable energy till 2020: Bioenergy funding, Photovoltaic and solar thermal systems and new construction and/or repowering of wind turbines. The development of renewable energies within the city’s territory is difficult due to limited space. A successful expansion of renewable energies in Gross Final Energy Consumption can only be realised in cooperation with the surrounding region. Perhaps some targets can only be achieved by national or even international cooperation – the successful integration of renewable energies possibly depends on European Collaboration.



²⁰ See Appendix 5: Reduction of Greenhouse Gas Emissions – Targets EU, Germany & Hamburg

²¹ Source: “Länderarbeitskreis Energiebilanzen” 2013

The development in Hamburg as depicted in the figure below reveals a **decrease in energy efficiency since 2008** and thus a deviation from the German targets with baseline year of 2008. An increased Primary Energy Consumption is visible that is highly depending on the oil industry which calls the significance of this indicator in question.



The **Action Plan 2020 (III.1)** named concretely the expansion of combined heat and power technology (CHP) as well as intelligent load management and consumption in commercial enterprises to improve energy efficiency.

The “gap” analysis and the real development of renewables and energy efficiency till today should be subject of the Master Climate Action Plan monitoring report 2015.

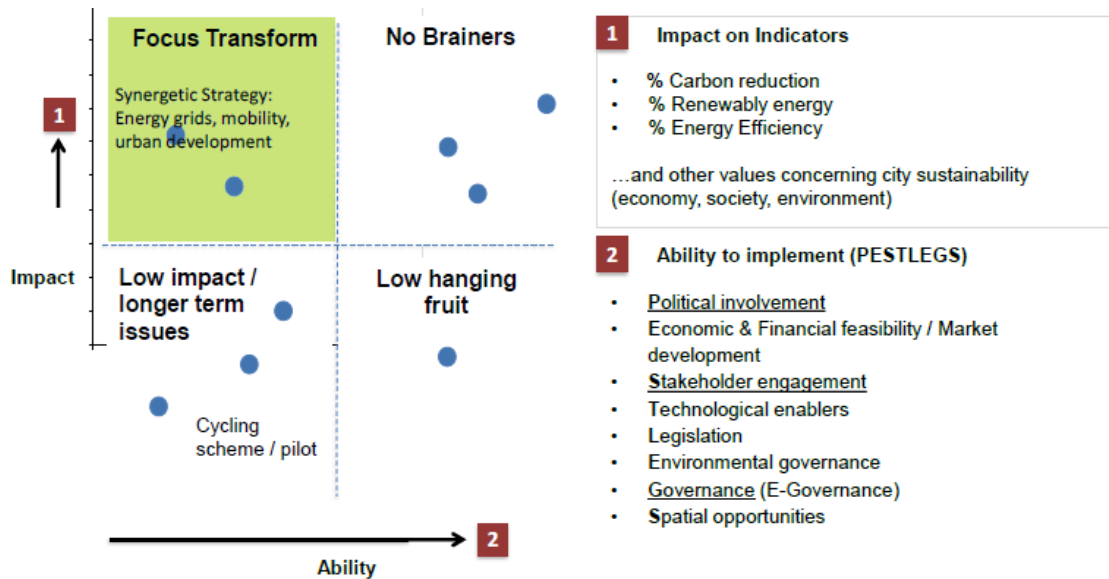
The contents and results of the city energy strategy for the future will be taken up in **PART D**.

PART C: Improving Abilities to Implement

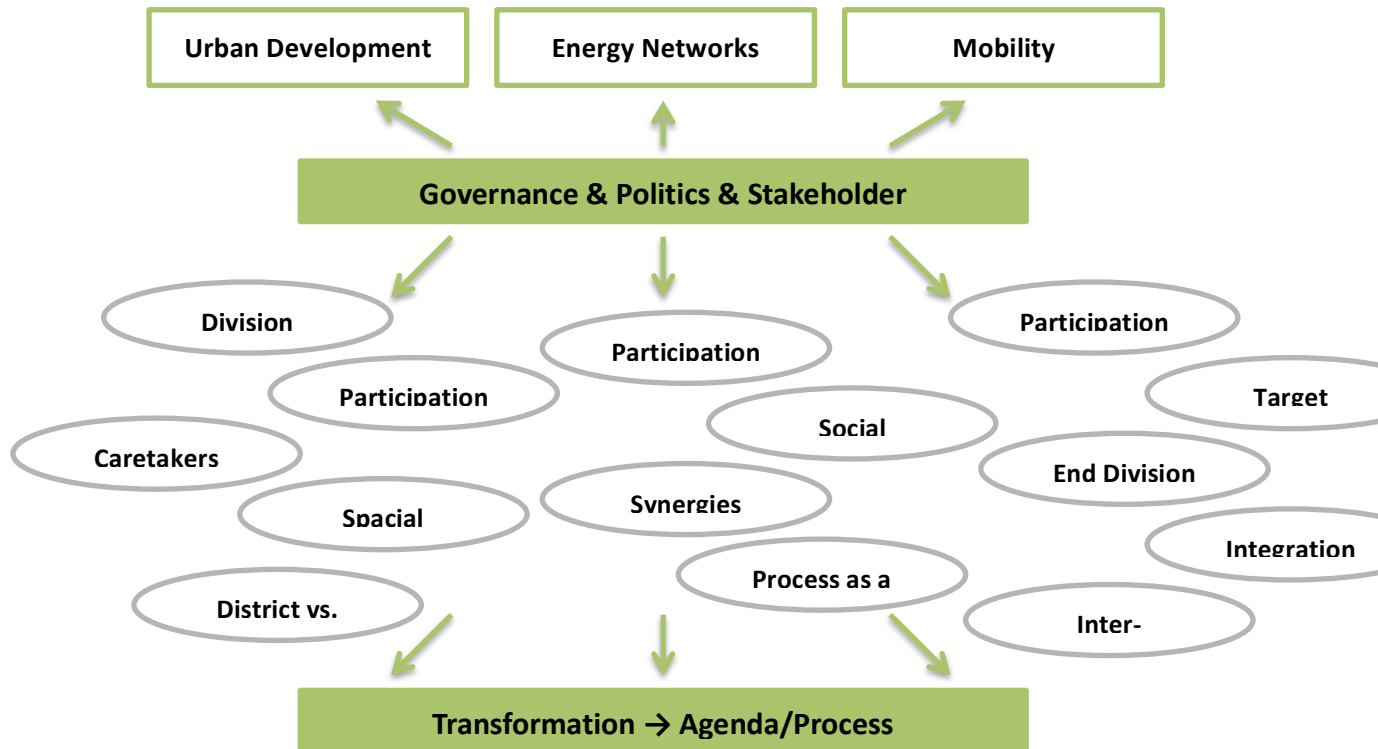
1. Introduction – Intake Workshop

Intake Workshops (IW) should be seen as a first step towards a future Transformation Cycle whose ideas, goals and recommendations are fed into the city process. The IW Hamburg was held on November 7-8 2013 with the main result to focus on a synergetic strategy from the PESTLEGS Analysis.

Within the TRANSFORM Project the focus lies on themes that have a relatively high impact and that are difficult to implement.



The graphic above shows that the three topics of focus in Hamburg are Urban Development, Mobility, and Energy Networks (representative for the entire City Transformation). **Governance**, **Political Involvement** and **Stakeholder Involvement** are the most important factors regarding the ability to implement. The results of the Intake Workshop also indicate that other factors such as participation or synergies are significant to work towards transformation.



In order to visualize the SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis' outcomes, the figure below presents the aggregated results of the topic "Energy Networks" concerning the ranking in the SWOT filter (high, middle, low):

	Weaknesses	Threats
Politics	High	High
Economy	Middle	Middle
Social	Low	Low
Technology	Middle	Middle
Legislation	Low	Low
Environment	Middle	Middle
Governance	High	High
Space	Low	Low

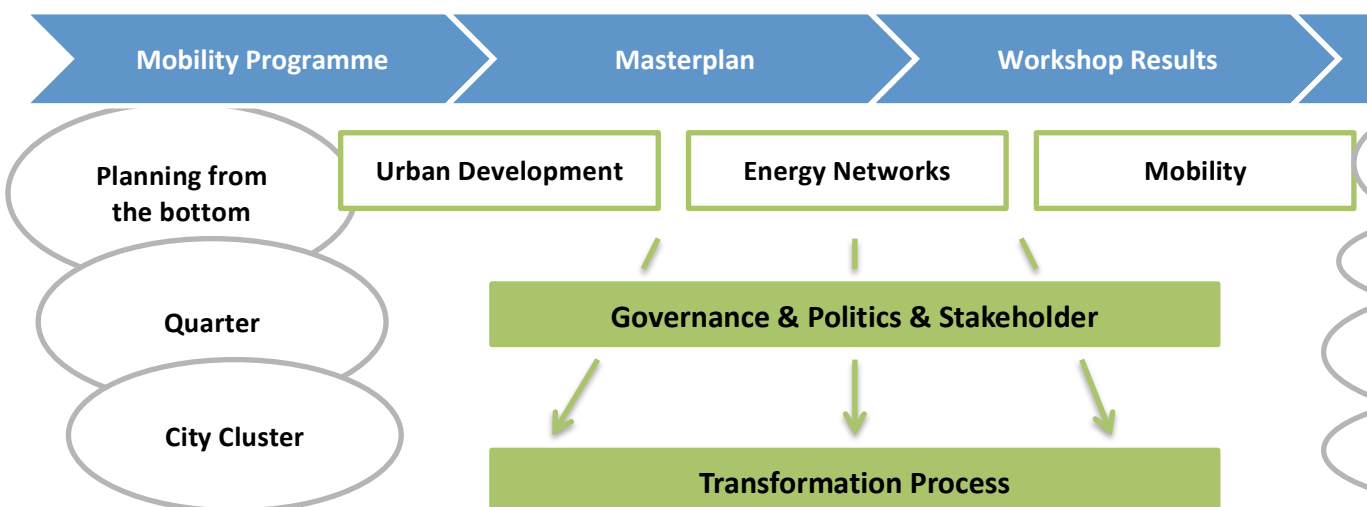
Exemplary Result:

Politics and Governance have a high ranking in the SWOT filter.

This means that the importance regarding the Transformation Process is high.

This shows that political involvement and more importantly commitment is key for a successful Transformation Process. The figure below summarizes the initial brainstorming regarding the workflow from the Mobility Programme towards the Transformation (Agenda). The tables identify necessary "ingredients" for a successful process and agenda.

POLITICAL COMMITMENT



Improve / Expand	Transform Process		
	Public	Mainstream	Li
Involve Science	Canvassing	Carpe Diem & Rotation	Ac
Economy & Finances	Raget-oriented Participation	Concrete Implementation Strategy	Ti
Critical Competence, Increase Competence, Channels & Resources	"Matchmaking"	(Stimulus) Funding	Er
	Funds	Social Mainstreaming	In
	Media		H

Transformation Agenda

Transformation Agenda	
Atlas & Monitoring	Tools - Simulation
(Stimulus) Funding	Funds
Transparency	Information Pass
Mobility - Data?	Social ...; ...; ...
Districts	Open Data Portal
Language diversity	

2. Mainstreaming

It is important to state that the Master Climate Action Plan is not limited to the energy sector. Climate action should even be stronger than it is today and should be part of interdepartmental city policy at all levels, which is integrated into a canon with various objectives. The Master Climate Action Plan therefore is an **integrated approach** that requires continuous monitoring, as it is a dynamic process. This strategic concept is called **Mainstreaming** and has already been the basis for the Climate Action Plan 2007-2012. It means that not only the Department of Urban Development and the Environment is responsible for working on the Climate Action objective. In fact, Climate Action is equally integrated into the sectoral policies of the other Departments of the Free and Hanseatic City of Hamburg. With the Master Climate Action Plan, this Mainstreaming process should be continuously improved and strategically developed.

3. Participation

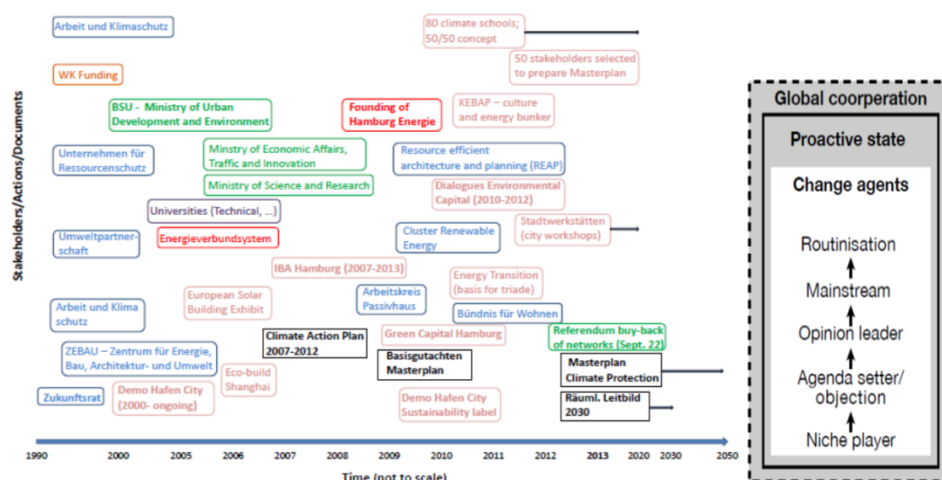
The technical and strategic master plan process is to "map" the relevant bodies and organizations of the city as a whole, both within and outside the Ministry of Urban Development and Environment and the authorities. As already begun in the context of the discussion of the "basic expert opinion report" (public events, website, environmental capital city dialogues), the development of the Hamburg Master Climate Action Plan was continued in dialogue and participation of Hamburg

stakeholders. The aim was to include both the scientific community as well as representatives from Hamburg's economy and society. Constructive participation of Hamburg's stakeholders in the development of the Master Climate Action Plan is an important prerequisite for the acceptance of the measures and the subsequent successful implementation. The European Green Capital dialogues in 2011 and 2012 opened up many possibilities for the external (trade) participation in the Master Climate Action Plan. In the context of the development of the Master Plan, there were both contributions from experts from the public authority for urban development and the environment and other authorities, as well as support from external experts such as from science and research. On the basis of a position paper and a detailed outline, a participation of about 50 external stakeholders and multipliers of the city took place. On the one hand, these consisted of associations and companies. On the other hand these stakeholders were expressed by civil society groups and non-governmental organizations, which were invited to a hearing and were also asked to provide written comments. Suggestions and proposals have been extensively tested and have been partially incorporated into the Master Climate Action Plan. Other suggestions will be taken into account in the implementation of the Master Plan.

4. Stakeholder Mapping & Change Agents

As shown in the outcomes of the Intake workshop “Stakeholder engagement” has an important meaning for the City Transformation. A next step is therefore stakeholder mapping. The actors and individuals named on the long-list are analyzed by mapping them out – using different categories. Actors are categorized according to differences in backgrounds, competences, interest profiles, interests, relevance, or types of power regarding to the issue. It also helps in distinguishing between groups, determining gaps in the presence of groups and thus in gaining a refined view of the actors in the field. Actor mapping is an analytical and creative process. It is important to inventive as transition team in how to map actors while always focusing on the issue that is addressed within the transition management process. Before we outline simple mapping examples for a transition management process, we will first sketch the basic categories specific to actors in transition management processes: the frontrunners and change agents.²²

A first approach is a rough list of stakeholders, actions and important documents which illustrates a “Roadmap Energy Transition Hamburg”:



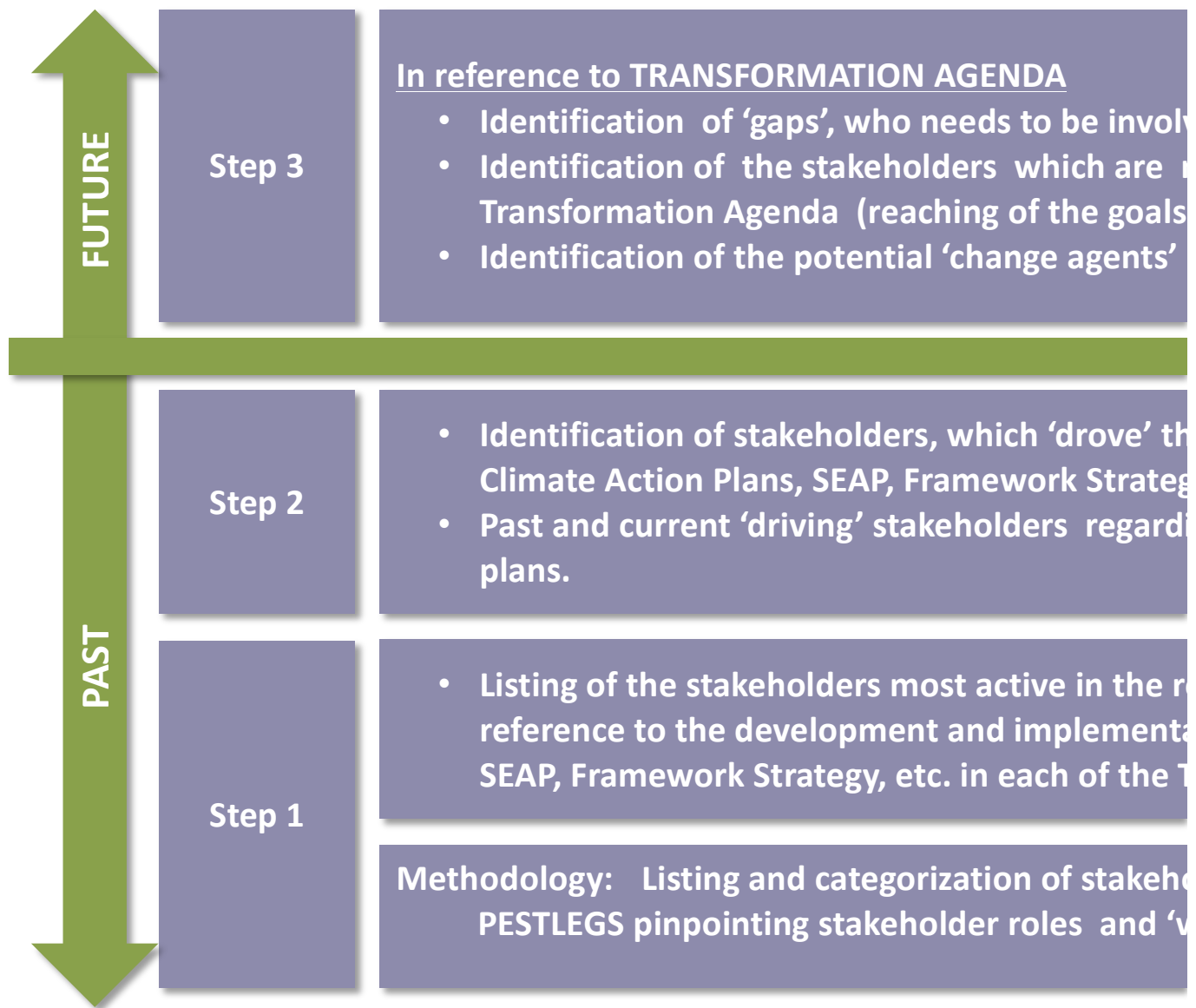
First results for important change agents in Hamburg:

- The Senate (Government)
- Industry and Port (Hamburg Environmental Partnership, Industry voluntary commitment 2013 – 2018, Smart Port Initiative)
- Civil Society/NGO (Referendum for re-buying the grids)

²² From „Transition Management in Urban Context” by Drift (Dutch Research Institute for Transitions) (November 2012).

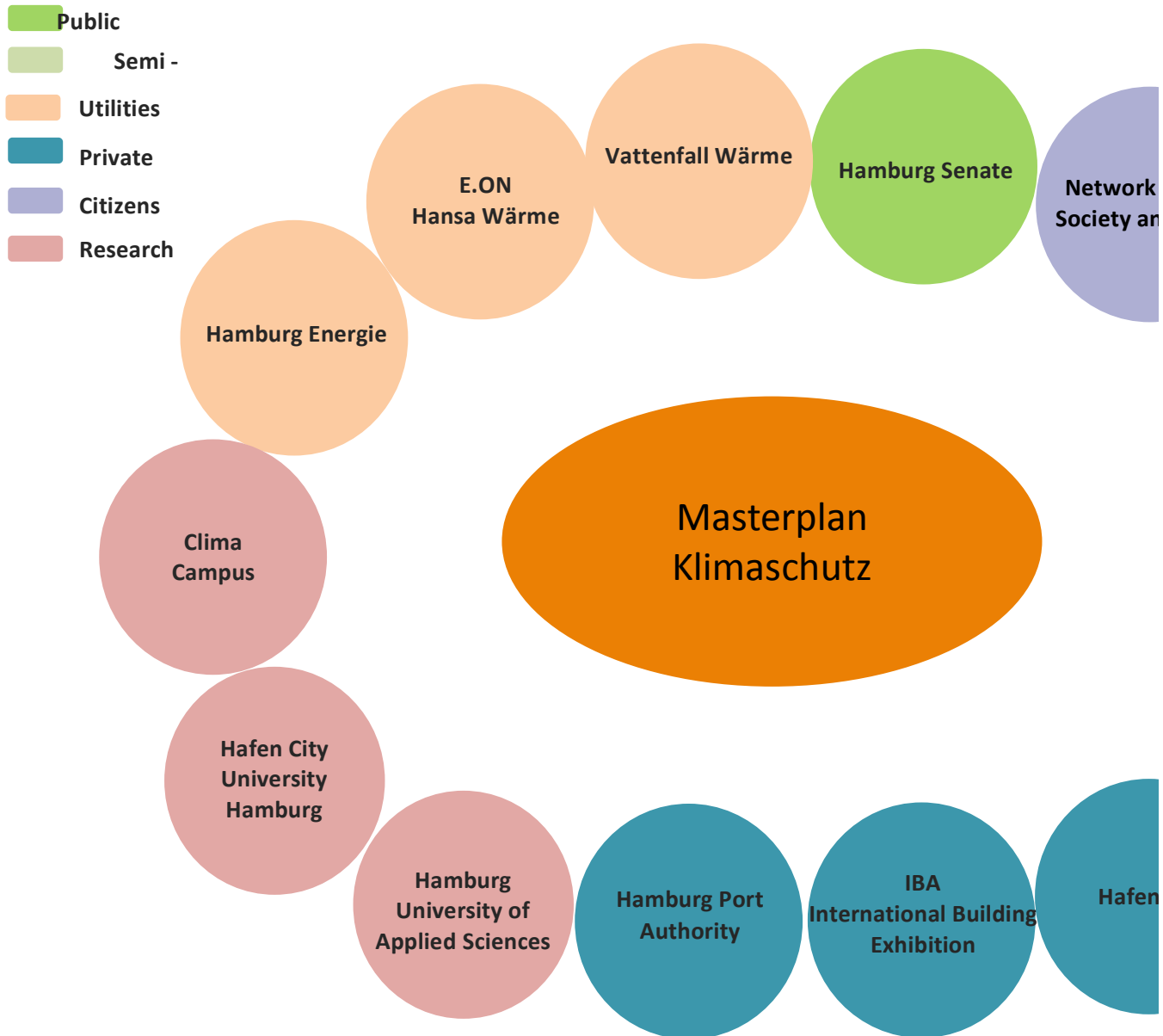
A second approach has been developed by AIT in a more detailed Stakeholder Mapping:

Aim and Steps of Stakeholder Mapping in Transform

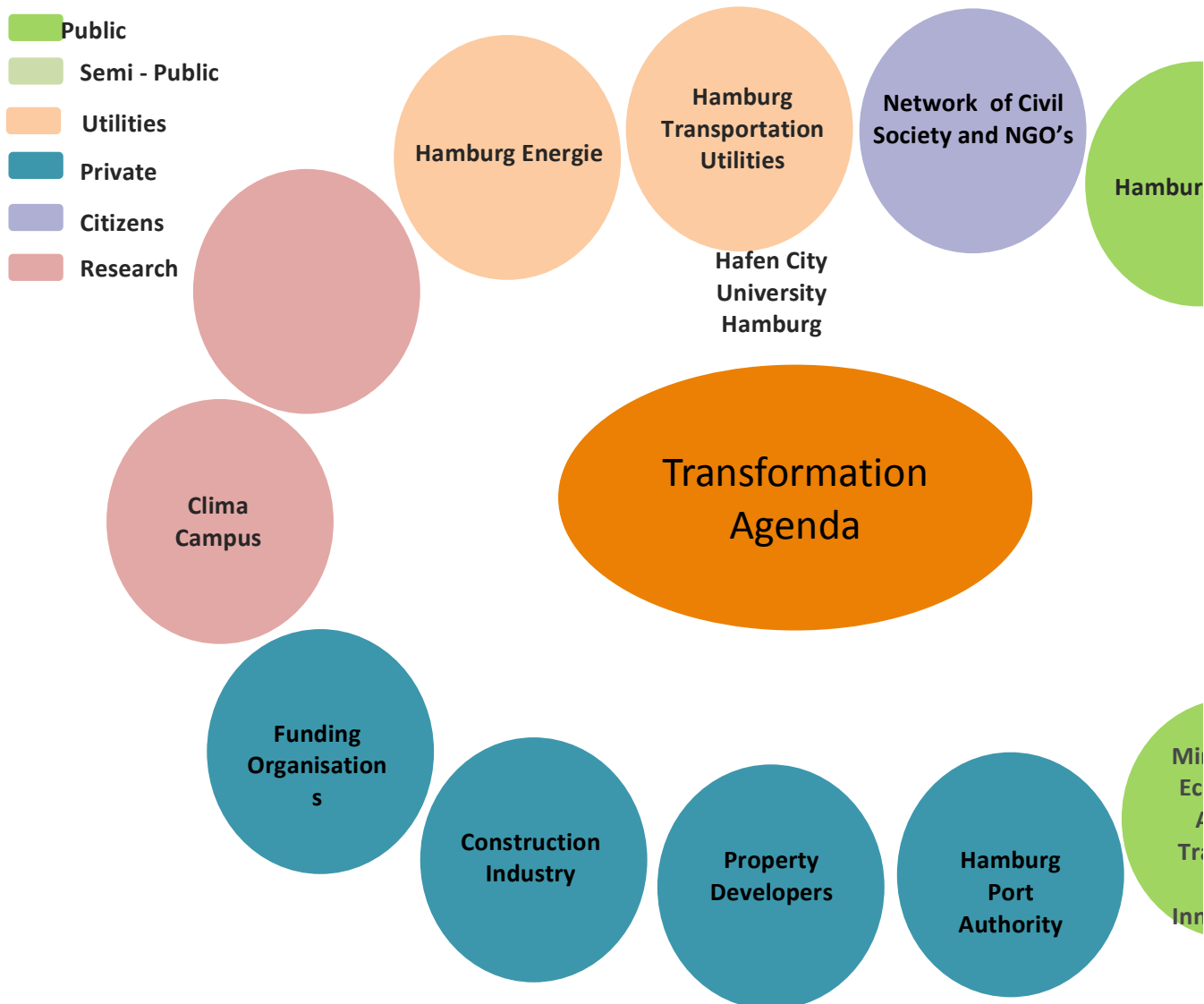


The analysis by AIT shows the following first results for driving stakeholders in Hamburg:

Driving Stakeholders at present and in the recent past (Masterplan



Key Stakeholders to be considered in TA



5. Examples for Budgetary & Financial Impact

5.1 Example 1: “Hamburgische Investitions- und Förderbank“ (IFB Hamburg)

The Hamburgische Investitions- und Förderbank (IFB Hamburg)²³ is the City of Hamburg’s special credit institution which is responsible for promotional tasks and activities. It is the legal successor to the Hamburgische Wohnungs-baukreditanstalt and was established as a public law institution on 1 August 2013. The city of Hamburg is the sole shareholder. The institution supports the Hamburg’s Senate in its structural and economic policies, especially in housing, urban development, economic development, environmental protection, innovation and in the performance of public functions.

²³ <http://www.ifbh.de>

Activities:

- Promotion, in particular financing
- of housing
 - of urban planning
 - of environmental protection
 - of business, industry and trade
 - of specific subject areas assigned on an individual basis by the Senate
 - of measures with exclusively social aims
 - Participation in projects that are in the interest of society
 - Fiduciary and administrative transactions of public funds
 - Financing for regional administrative bodies

Ownership Structure

The City of Hamburg: 100%

The IFB Hamburg is backed by state guarantees that take the form of maintenance liability and guarantor liability. The City of Hamburg is fully liable for the institution's debts. The bank's legal basis is the law on the Hamburgische Investitions- und Förderbank dated 5 April 2013.

5.2 Example 2: Master Climate Action Plan

The Master Climate Action Plan includes measures with very different requirements for funds. A considerable part of these requirements will be met in the 2013/2014 budget, from the budgeted funds in the respective departmental budgets, or by external funding.²⁴ The usually supplementary funds of the Master Climate Action Plan are made available to the authorities and agencies on application during the year by way of the target transfer.

5.3 Example 3: HAMBURG ENERGIE – Heat Supply Contracting

The energetic standards for real estate such as energy efficiency and primary energy consumption are currently undergoing a great development in Germany and shall prepare a transition to a climate neutral building stock by 2050. Latest changes mainly concern new buildings and renovation projects. Building owners need a competent partner to align their projects to the new requirements, especially with respect to the key component: heat supply. Since each real estate is different regarding number of dwelling units, size and location, customized solutions are key. The concept of heat supply contracting with long-term planning security facilitates the application of cutting-edge system technology. Energy/heat is generated directly where it is needed, which increases efficiency and minimizes losses. Additionally many more options to design a comprehensive, sustainable and economic concept for heat and electricity supply can be exploited with a contracting partner who masters the complexity of legislation, of technology and of project management.

As an example HAMBURG ENERGIE offers solutions, which comprise a high level of self-produced electricity from CHP plants, for large properties with a considerable number of dwelling units. Building these plants requires a high investment from the contracting partner who solely carries the investment risk. The energy efficiency orientated solutions also aspire the right balance between measures for thermal insulation and innovative system technology for the heat supply in order to minimize problems with massive thermal insulation for buildings.

This new concept with focus on self supply of heat and electricity represents a challenge in light of the liberalized energy market in Germany and is rarely to find yet.

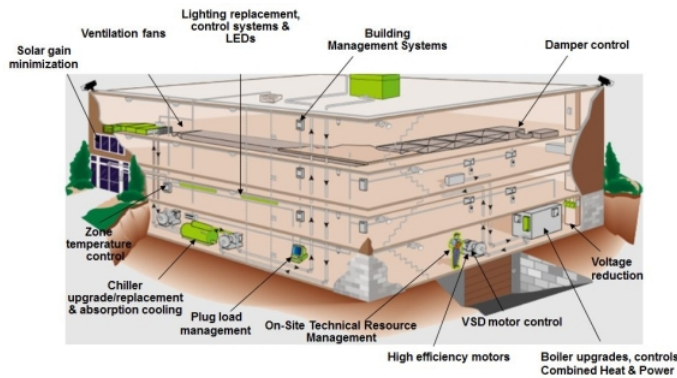
5.4 Example 4: Siemens – Energy Performance Contracting (EPC)

According to the Directive on energy efficiency, Energy Performance Contracting (EPC) means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings. EPC has been used in the European Union (EU) since the 1980s. However, the market remains underdeveloped, notably in comparison with North America (the United States and Canada). The Energy Performance Contracting model is highly replicable in the EU and internationally recognised as a guaranteed, cost effective and scalable procurement method for reducing the operating costs and environmental impacts of buildings. EPC represents a proven tool used in Austria, Germany, Czech Republic and Scandinavia, to some extent initiated in the United Kingdom and France but lessor not used at all in other EU countries. Our objective is to promote EPC at the EU level and address key barriers such as lack of awareness and/or lack of knowledge, lack of policies and support mechanisms, lack of common definitions and harmonised processes, etc.

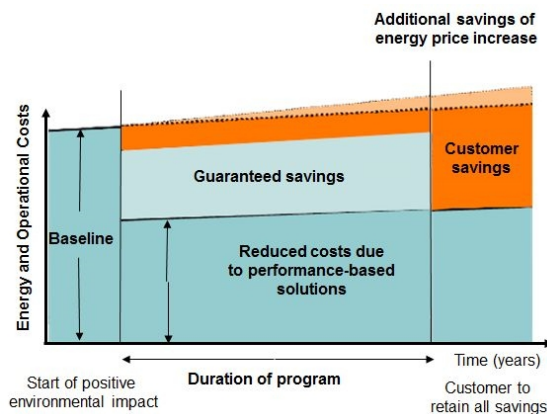
In practice, under a performance contract, an Energy Services Company (ESCO) provides a comprehensive building retrofit, which can include the replacement of boilers, insulation, cooling

²⁴ See Annex 4, pt. 11

systems, lighting and temperature automation controls, as well as the integration of energy data management software and on-site renewable energy systems.



The ESCO takes complete “turn-key” responsibility for the project, meaning it covers all aspects of the project from start to finish: preliminary energy audits, detailed design and engineering, business case, analysis, installation, commissioning, and performance measurement and verification. The ESCO acts as an overall project manager and will divide the retrofit works into specialised areas, which will be contracted to local specialised partners, the ESCO keeping the overall responsibility for the work and the guaranteed energy savings. For that reason, EPC projects are using local Small and Medium Enterprises (SMEs) and in turn this contributes to the development of the local job market. Moreover, the most important for this model is that the ESCO assumes performance risk for the project in the form of a long-term financial guarantee to ensure that the projected energy and operational cost savings materialise and are preserved over time. If promised energy savings are not realised, the ESCO must pay the difference to the building owner.²⁵



5.5 Example 5: Siemens AG – Infrastructure and Sustainable Cities

The megatrends urbanization, climate change, globalization and demographic change will shape the future of cities. With the need to improve the quality of life and economic competitiveness, cities have to become more resource-efficient and environmentally friendly.

Technologies are major levers and base for further sustainable city development. An effective infrastructure contributes to economic prosperity, improving quality of live. Urban residents need clean air, potable water as well as security. They need efficient buildings, a reliable power grid and capable mobility solutions.

The complexity involved requires a holistic view and sustainable solutions for cities. Siemens has the portfolio, know-how, and consulting expertise to make cities more livable, competitive, and sustainable.

²⁵ www.eu-esc.org, About EPC. For more information: www.buildingtechnologies.siemens.com

Hence, Siemens delivers solutions for city infrastructure and offers products and concepts that focus on holistic solutions rather than individual actions.²⁶

6. CO₂ Balancing

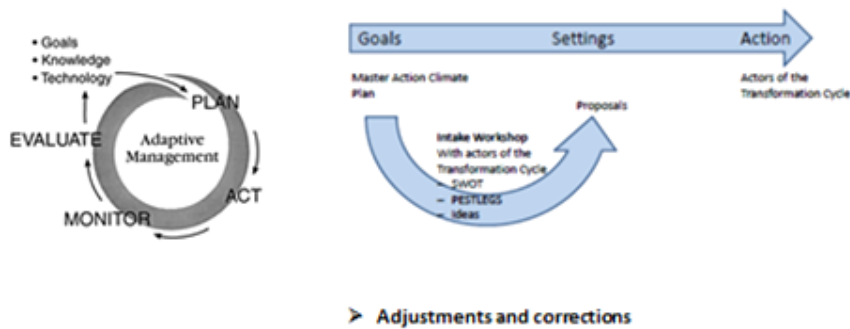
There are roughly two approaches of CO₂ balancing²⁷:

1. **Top-down approach** (e.g. polluter balance). Problem: The polluter balance is also subject to a number of influences that can affect Hamburg only to a very limited extent (e.g. economy, federal policy).
2. **Bottom-up approach** (e.g. Hamburg): All climate effects (also outside Hamburg) are recognized that are achieved through measures implemented in Hamburg. **The Master Plan is restricted to predictable reduction potentials that can be influenced in Hamburg.**

7. Implementation, Organisation & Development of the Master Plan / City TA

Concerning the development and implementation of the City TA, the **modelling** in Part B Pt. 1 will be continued into a **third approach** of the Transformation Process. Therefore, a dynamic management model has been used: the “Adaptive Management Cycle” has been improved into a more concrete **Transformation Cycle** which illustrates the nonlinear dynamic City Transformation Process – modelling the implementation, adjustments and corrections of the City concept.

Adaptive Management Cycle:



Transformation Cycle:

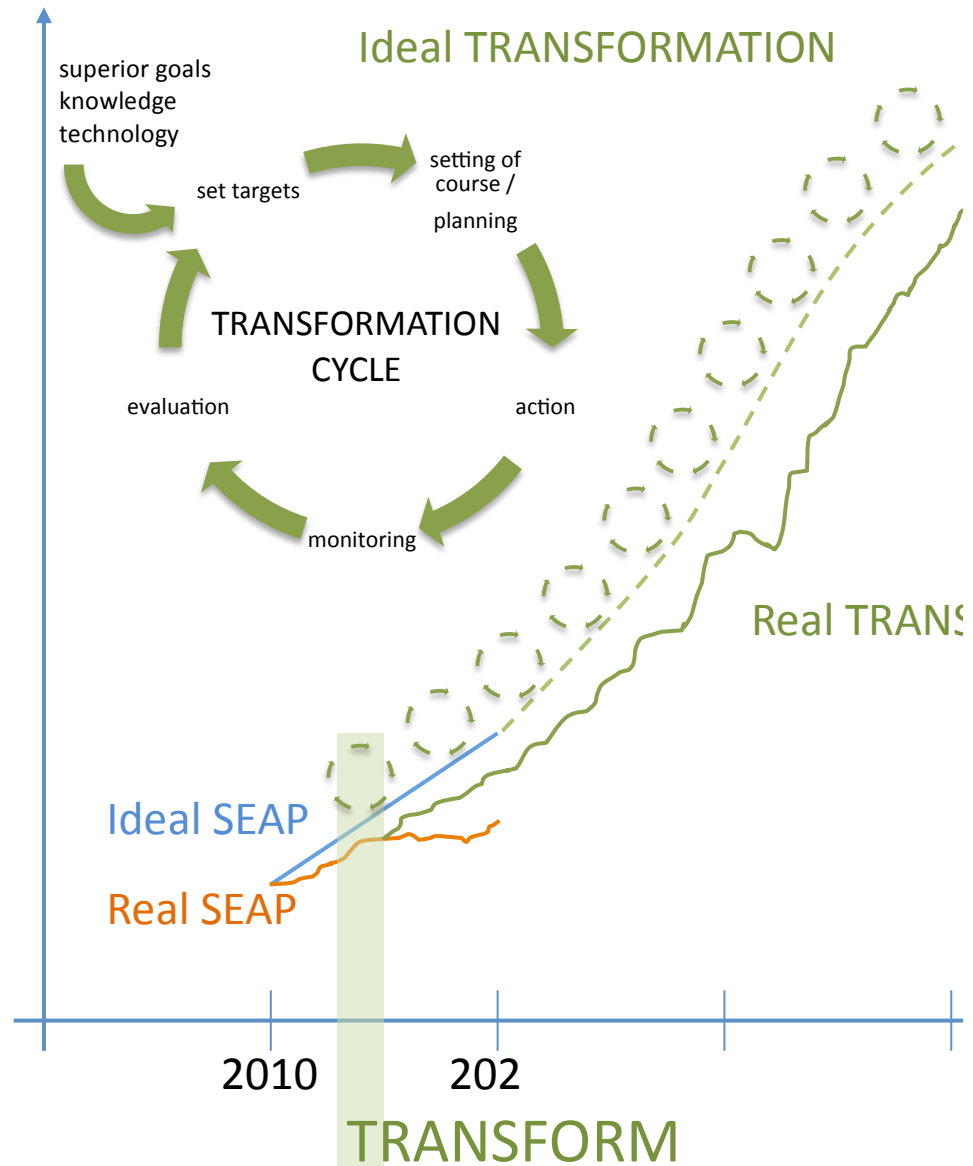
²⁶ <http://www.siemens.de/topics/de/de/nachhaltige-stadtentwicklung/Pages/home.aspx>

²⁷ See Annex 1 “Methodology of CO₂ Balancing”

Relative Targets

Decarbonisation
Increase Renewable Energies
Increase Energy-Efficiency

100 %



The individual measures within the framework of the Master Plan will be controlled and further developed in the following manner.

Implementation & Operationalization of Measures:

A part of the measures of the Action Plan 2020, in particular in the fields of building and energy, is already sufficiently substantiated and can be implemented immediately. The implementation of other measures is a regulating task to be developed even further in the coming years.

The generation of individual measures follows the standards:

Development of criteria for project funding, control of the use of funds, budgets for individual projects, long-term assignments for multi-year projects/funding programs, award process with the further development of the proven application procedure, support for the implementation of measures. These requirements are derived inter alia from the recommendations of the evaluation of the climate change concept 2007-2012 and ensure its continuity. The established procedures for the granting of climate protection funds are adapted to new circumstances. The necessary steps will be examined in the context of the further Master Plan Implementation (shortening of the procedure etc.).

Monitoring:

The measures financed from climate protection funds and the CO₂ reducing measures in Annex 1 will be subjected to ongoing monitoring, as well as the measures not yet completed that are to be financed by the Climate Action Plan 2007-2012. For the field of climate protection, the existing methodology, the tools and the criteria used for CO₂ revised. To this end, the Senate updates it every two years and resorts to the existing structures of the Climate Action Plan 2007-2012. In the update, the monitoring results of individual projects, the achievement of objectives in individual fields of action and projects, project development (completed and newly created measures) as well as changes in the framework conditions are presented in different levels of detail. The criteria for project funding will be developed further. The responsible authority shall involve the other agencies and external partners in the climate protection report.

Assimilation Climate Action Plan, Master Plan, adaptation to climate change:

After the basic strategic decisions for adaptation to climate change have been made and are integrated into the Master Plan, the Master Plan will in future be the strategic umbrella for two complementary pillars of the regional climate policy: climate protection and climate change adaptation. With the inclusion of the climate consequence monitoring and the climate change adaptation that is intended as part of the updating, this pillar is also integrated into the Master Plan. This update ensures the continuity of the Hamburg Climate Policy, e.g. by supporting the specific individual measures such as the launching or continuation of funding programs and the funding of innovative projects.

Network activity:

Hamburg can only achieve its climate protection goals if as many stakeholders as possible get involved. Therefore the competent authority not only promotes the master plan, but also initiates projects with partners in the city. Appropriate measures will be evaluated and can be partly financed from climate protection funds. The appropriate measures carrier will be supported in the project planning. For projects that cannot be funded, the competent authority provides advice of other funding opportunities (e.g. in the area of Federal funding). In the area of industry, commerce and the Environment, the Partnership Hamburg Port plays an important role with almost 1,000 environment partners and contacts to several thousand other businesses. To be highlighted here are the annual Environmental Industry Summit, the intensive networking and the outreach energy and environmental consultancy of chambers, which addresses the small and medium-sized enterprises. Monitoring which have been developed in the context of the climate change concept 2007-2012, in cooperation with the Wuppertal Institute and the Institute for Applied Ecology, will continue to be used. The design (type and extent) of the monitoring of further measures (mainstreaming) will be clarified with the agencies involved in the course of the further process. For Climate change impact adaptation, the plan is to establish Climate Impact Monitoring as a medium and long-term controlling instrument by 2015.

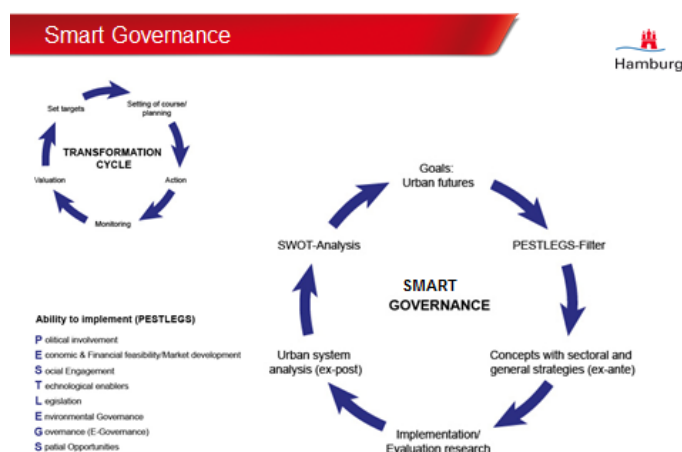
Participation

In future, new, targeted participation formats will be designed to bring environmental and sustainability issues more close to the width of society. Here, beyond the scope of awareness, the focus in particular should be on the conveying of practical guidance and practical knowledge and incentives to participate and incentives for do-it-yourself. These formats should also be used for the implementation of the Master Plan. The "City workshops" are one way for the mutatis mutandis continuation of the dialogue that was started.

PART D: What has been achieved so far and impact on the existing City Energy Strategy

1. Controlling, Reporting & Further Development of the Master Plan

The Master Plan, as a long-term development plan for climate action and the climate change impact adaptation in Hamburg, has to be regularly adapted to the current developments and results from the evaluation of the climate change concept: The recommendations from the evaluation of the climate change concept 2007-2012 were taken into account in the preparation of the Master Plan or will be reviewed when it comes to its implementation. For instance, the demands for inter-operable and hierarchical goals are met in the Master Plan. Precisely because the focus is on CO₂ reductions, especially in regard to achieving the savings target by 2050, it is necessary to formulate the criteria for non-direct CO₂ saving measures accurately. Also, the recommendations for reducing the project portfolio are met. The measures of the Action Plan are reduced to a level that ensures effective implementation and external representation. Projects that are not financially supported will continue, if they contribute to CO₂ reductions. The Master Plan was discussed in advance with environmental organizations and chambers, which also corresponds to a recommendation from the evaluation. Furthermore, the established application process has been further developed, as proposed in the evaluation, and adapted to new conditions. The recommendations related to participation in networks and goal-oriented public relations will be fulfilled in the implementation of the plan.



2. Examples of Impact & Adjustments of Hamburg's Energy Strategy

The **Energy Strategy** consists of several partial strategies that undergo constant development and improvement. Besides the objectives of the Master Climate Action Plan, the reorganization and restructuring of the electricity, gas and heat grids is currently of high importance. In order to provide additional examples on energy related concepts in Hamburg, the Heat Concept and the system level service "control reserve" will be outlined in the following.

2.1 Example 1: Hamburg's Heat Concept

According to a request of Hamburg's parliament in 2012 concerning a Hamburg's Heat Concept the detailed answers of the ministries administration were published in 2015²⁸.

One important result is: The entire Transformation of heat supply to renewables is single-handed in Hamburg not possible. The assumed heat demand in 2050 is about 14 TWh/a, the potential of heat production from renewables is about 3,5 TWh/a which is equal only to 25% of the demand.

Hamburg needs the surrounding area of Northern Germany.

²⁸ Circular 20/14648 (FN) <https://www.buergerschaft-hh.de/ParlDok/vorgaenge/48111/1>

2.2 Example 2: HAMBURG ENERGIE – Control Reserve

The municipal energy provider HAMBURG ENERGIE develops innovative projects within the Information and Communication Technology (ICT) in order to find solutions for intelligent energy supply.

In so-called Virtual Power Plants (VPP) many decentralized renewable energy resources can be pooled, allowing an intelligent control for a tailored energy production. This also enables one regenerative energy generation plant to substitute for another, hence, guaranteeing a stable energy supply if necessary. In those intelligent interconnections renewable energies are able to provide control reserve – a system-level service used by Transmission System Operators (TSO) to maintain the nominal power frequency. Integrated as system-level service into a VPP control reserve can deliver a considerable yield. It is expected that due to the increased use of volatile (renewable) energy sources, the need for control reserve will increase.

The VPP implemented by HAMBURG ENERGIE is generally open for all energy generation plants free from coal and nuclear. HAMBURG ENERGIE trades with the bundled power. By inserting the surpluses into the grid, unnecessary losses can be avoided. Through decentralized renewable energies the end consumer is not dependent on one big power plant and the proximity to customers minimizes losses due to transportation. In the future, VPPs will combine storage and consumption units additionally to generation. The current plants for control reserve exist in the suburbs of Hamburg, though it is planned to integrate more of them into the urban area in the near future.

With the development of such a model, HAMBURG ENERGIE proves that it is technically possible to combine renewable energy sources in a VPP in order to provide control reserve, and grid stability. In the long term, energy should originate 100 percent from renewable sources.

2.3 The Spatial Dimension

The Master Climate Action Plan is focused on the entire city space – with measures and projects.

Within the action field ‘Urban Planning’²⁹ spatial differentiation is reflected:

In the context of urban development planning, existing and advanced climate tools will be applied to B-plans, to calculate simply and quickly CO₂ emissions depending on specific plan content. Plan areas are subjected to climate protection and adaptation simulations, different scenarios are described, in order to achieve optimizations such as the one concerning innovative and efficient energy supply for neighborhoods and the entire city. A first overview is already provided by the application of the computational tool developed in the context of the Climate Action Plan for the detection of CO₂ savings. Urban Development & Planning visualizes the subject of climate protection and adaptation and makes a contribution to GIS-based spatial analysis on the subject of energy and climate protection. It identifies data, trends, and potential for climate action and adaptation to climate change. However, in total, the spatial dimension has to be improved.

First steps towards improving data collection and visualizing energy supply have been achieved:

2.3.1 Solar Energy – “10 Megawatt” Project by HAMBURG ENERGIE

HAMBURG ENERGIE generates energy by using multiple kinds of renewable energies, such as solar energy generated through by photovoltaic plants.

In order to estimate the solar potential, the roofs in Hamburg were scanned, data collected and analyzed. The result was very positive. In corporation with its subsidiary HAMBURG ENERGIE SOLAR, HAMBURG ENERGIE has started and successfully finished the “10 Megawatt” Project in 2011. The installed PV units provide power for more than 3.000 households. Hamburg’s citizens were able to take part in this project and support its development by either renting their rooftop spaces (if bigger than 1.000 m²) or by assets. The installations can for instance be found on the roof of the well known soccer club “FC St. Pauli” or on historic buildings from the 1950s.

²⁹ See Master Climate Action Plan, Page 18-19

As of today, HAMBURG ENERGIE operates with 26 solar power plants with an overall production capacity of 12 MW, providing electricity for 4.000 households. This results in a CO₂ mitigation of 6.200 t per year.³⁰

2.3.2 “Solaratlas” by the Ministry of Urban Development and Environment & HAMBURG ENERGIE

The citizens in Hamburg can become part of the climate action ambitions and install a photovoltaic plant on their roof. HAMBURG ENERGIE and the Ministry of Urban Development and Environment³¹ have developed the “Solaratlas” which helps interested citizens to evaluate their roof’s potential for solar energy. Citizens can access the “Solaratlas” for free via the website of Hamburg Energie. The usability is high – only address and house number need to be inserted and the user immediately receives information about the potential of his/her rooftop.³²

2.3.3 Expertise Transformation Process on a spatial level (Ecofys 2014)

In the City of Hamburg the already existing local Master Climate Action Plan will serve as basis for the Transformation Agenda. In addition the spatial matching of relevant key performance indicators is essential for a successful climate protection strategy. This relates particularly to the alignment of energy consumption and energy supply as well as to the social background and the implementation options of specific urban areas. Accordingly, to provide a holistic approach for a transformation process the technical and social data should be joined. Only an appropriate analysis, which includes the qualification of the sociotechnical system, the urban structure and the system of agents/actors for a particular form of energy, can lead to an energy optimised planning. An integrated planning process should therefore be established combining diverse topics based on a cross sectoral approach. Hence, the potential for energy efficiency measures should be identified on a spatial level based on the existing options of the diverse urban areas.

Moreover the creation of a “decision support model” is planned in the context of the Transform project. Therefore this present study refers to the spatial correlation of the diverse key performance indicators and especially the relation of characteristics of the Urban Lab “Wilhelmsburg” with the whole city area. With the help of existing energy, climatic and socio-demographic data similarities and relationships have been analysed and located within the urban space and exemplarily quantified as basis for the planning and decision making process. As in the past energy efficiency topics were mainly focused on technical approaches, local barriers and drivers on social level were not identified. Considering both will lead to an increase of certainty in the decision making and planning process. Making those relations visible will help to steer the transformation process and will support the development of the decision support tool for Hamburg and for the other Transform cities.

Recommendations for the further development of the Master Climate Action Plan

Considering the specific situation of the City of Hamburg with a “Climate Protection Concept” and a “Master Plan Climate Protection” (Masterplan “Klimaschutz”) the strategy for a sustainable development and the compliance with the climate targets until 2020 and 2050 is already developed. However, a more detailed analysis of the potentials of renewable energies and energy efficiency options is needed. Especially the knowledge of the spatial dispersion of diverse potentials and CO₂ reduction possibilities provides huge optimization options. Also synergies between different measures and activities will only arise when taking into account the spatial dimension.

³⁰ <http://hamburgenergie.de/privatkunden/energieerzeugung/solarenergie/>

³¹ More specifically: Landesbetrieb Geoinformation und Vermessung der Stadt Hamburg (LGV)

³² <http://hamburgenergie.de/privatkunden/energieerzeugung/solaratlas/>

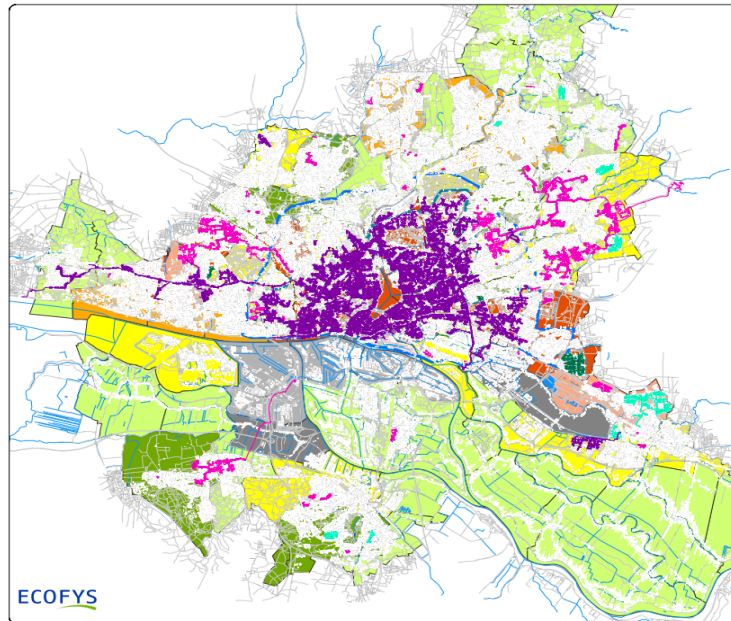


Figure D: Mapping of district heat networks and heating demand in Hamburg

Main focal points within Hamburg's Master Climate Action Plan strategy to further assess on spatial level are:

Energy Supply (Heat):

With the sub-topics of waste heat, renewable heat supply, district heat, heating systems on low temperature basis and combined heat and power generation. All these technical systems are very well suited for a detailed localization of their potentials, the place of heat generation and the connected consumption. This analysis will lead to a much better optimization of the systems since strategic planning for future demand will become possible. A detailed GIS based analysis of grid bound energy infrastructure and the heating demand of all buildings in Hamburg already exists within the BSU.

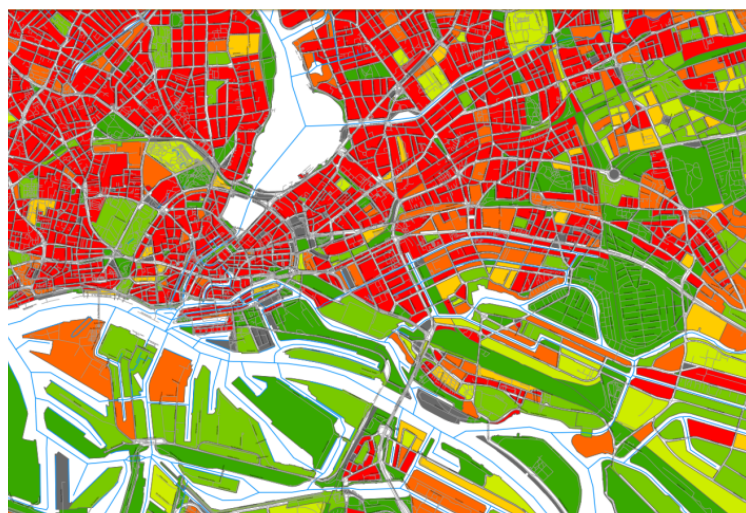


Figure E: Mapping of energy density in Hamburg

Energy Supply (Power):

The same goes for the supply of power in the city. Especially taking into account the feed-in of renewable power is leading to a more strategic planning including virtual power stations, networks of

many decentralized power producers. At the same time the demand side needs to be optimized accordingly. This can only happen when the information is available on a spatial level.

Industry, Trade & Harbour

Also the industrial areas of the city including the harbour are very well suited for a spatial analysis combining diverse sectors like urban development, energy supply and transport. Important is to gain an overview of the waste heat potential of the diverse producers and the options to consume this heat nearby. This applies also for the potential use of renewable energies in terms of e. g. installation areas on huge flat roofs of industrial buildings as well as the knowledge of certain industrial processes which are qualified for specific renewable energy systems.

Buildings:

Buildings are especially well suited for spatial surveys since they are very unhomogeneous in terms of their energy performance (building age, use of the building etc.) as well as renovation potential and therefore a localisation is highly recommendable. Together with additional information on renewable energy potentials and district heat connectivity concrete concepts can be developed on city district and quarter level. Hamburg already has a GIS based map of the energy demand, the specific building age and use of all residential buildings.



Figure F: Mapping of energy related parameters of residential buildings in Hamburg

Transport & Mobility:

The transport sector is of course one of the main field to localize the existing situation as well as the options for reduced traffic and alternative transport solutions. Combined with urban development strategies and also energy supply becomes more important when renewable energies will play a more important role also in transport. This is already in place e. g. with e-mobility concepts.

Consumption:

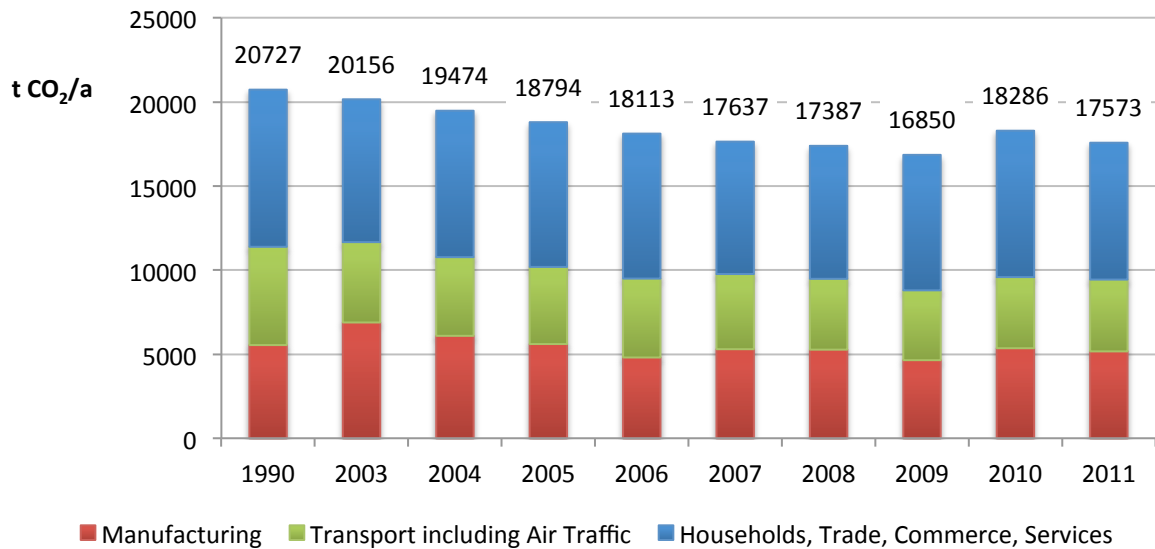
The provision with predominantly regional products and products with low live-cycle costs and low environmental impact could be supported via a localized strategy.

Education & Research:

These fields are not specifically suited for a spatial analysis.

Appendix

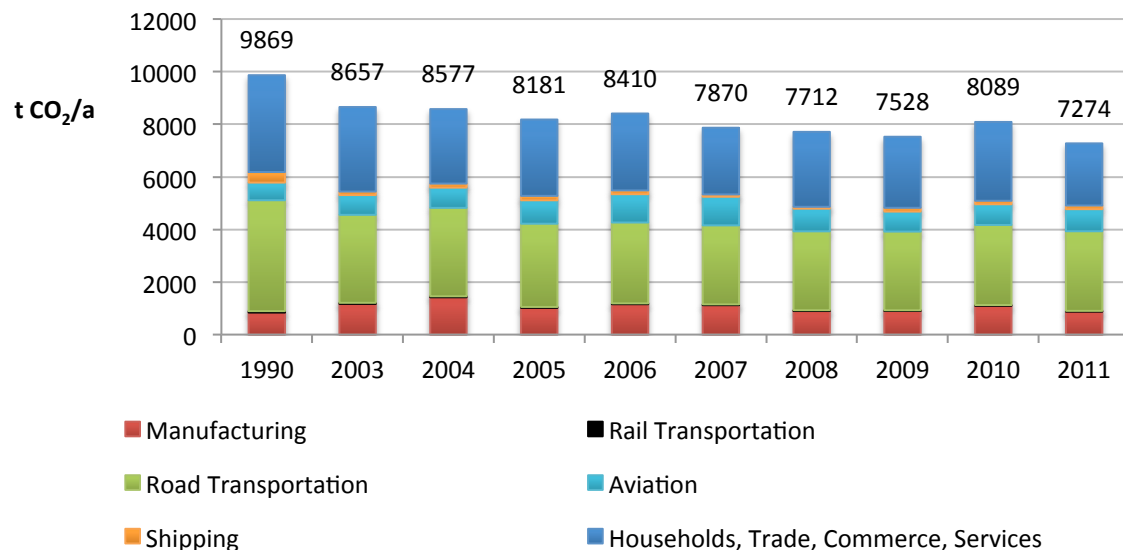
1. CO₂ Emissions from Final Energy Consumption (Polluter Balance)



CO₂ emissions from final energy consumption split into the groups “Manufacturing”, “Transport including Air Traffic”, “Households, Trade, Commerce, Services”

Source: “Länderarbeitskreis Energiebilanzen” 2013

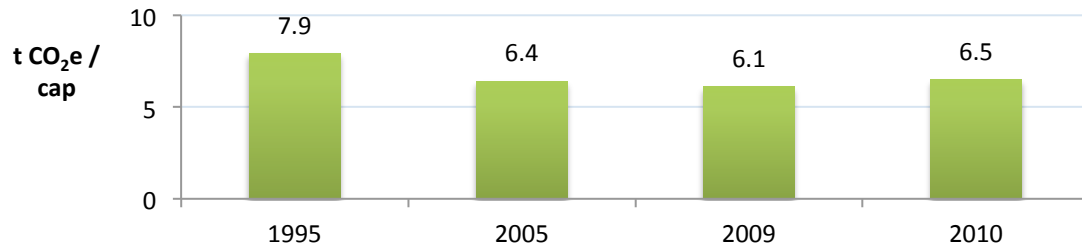
2. CO₂ Emissions from Primary Energy Consumption by Final Consumption (Sources Balance)



CO₂ emissions from primary energy consumption split into groups the “Manufacturing”, “Rail Transportation”, “Road Transportation”, “Aviation”, “Shipping” “Households, Trade, Commerce, Services”

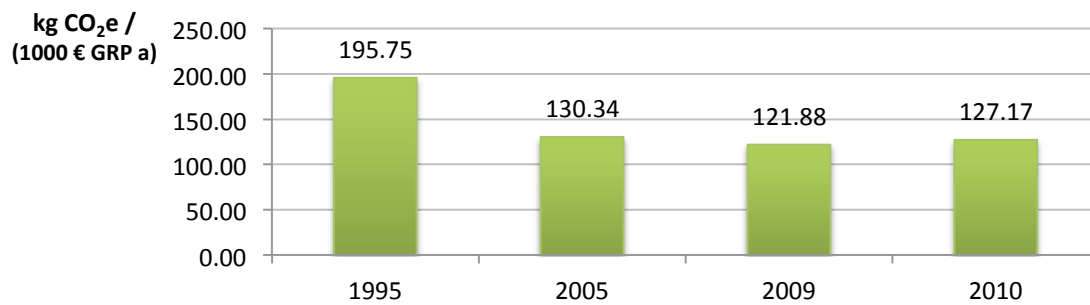
Source: “Länderarbeitskreis Energiebilanzen” 2013

3. CO₂e Emissions per Capita



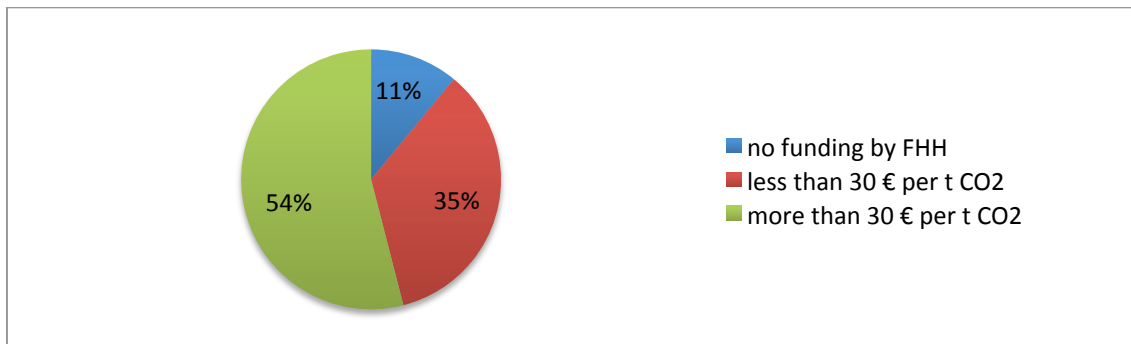
Source: Umweltökonomische Gesamtrechnungen der Länder (<http://www.ugrdl.de/tab31.htm>)

4. CO₂e Intensity: CO₂e Emissions per Gross Regional Product and annum



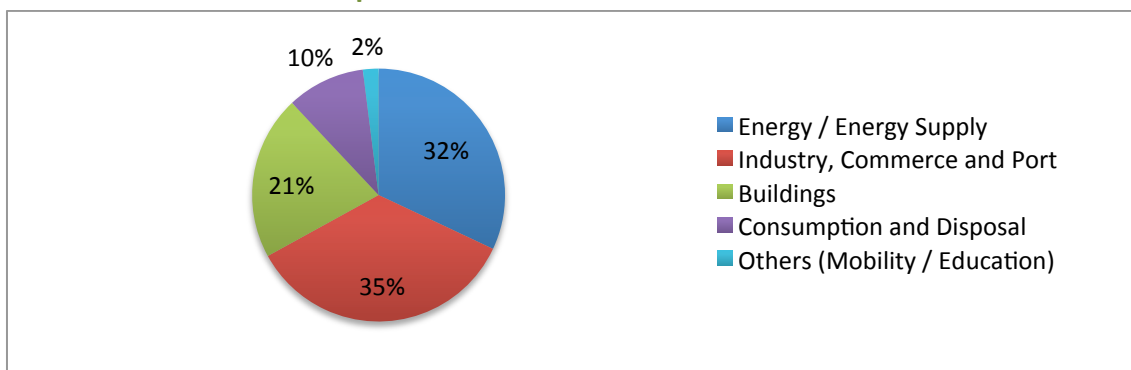
Source: Umweltökonomische Gesamtrechnungen der Länder (<http://www.ugrdl.de/tab31.htm>)

5. Distribution of Projects according to Cost Categories



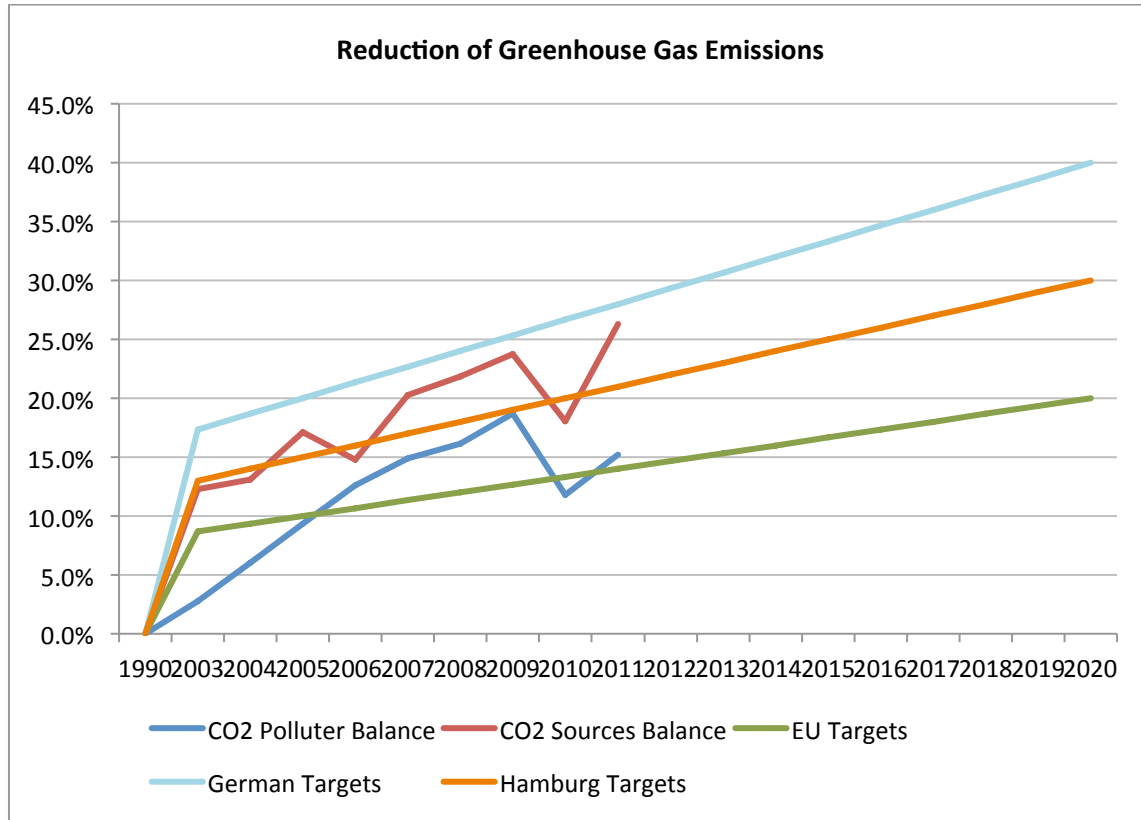
Source: Master Climate Action Plan

6. CO₂ Reductions with Respect to Fields of Action



Source: Master Climate Action Plan

7. Reduction of Greenhouse Gas Emissions – Targets EU, Germany & Hamburg



Source: "Länderarbeitskreis Energiebilanzen" 2013

Annex

1. Methodology of CO₂ Balancing

For the 2020 Action Plan, different balancing methods were weighed against each other.

On one hand, top-down approaches that determine the changes in a specific balance sheet framework for the whole of Hamburg between 1990 and 2020. Within this balance sheet framework, a particular goal is established, from which then the measures needed to achieve it are derived. Possible balance sheet frameworks are the Hamburg polluter balance or the modified polluter balance from the baseline report for the 2010 Master Plan. The Hamburg polluter balance cannot fully reflect quantitatively the climate protection measures covered by the Master Plan. It records as a sum total all measures or their impact that have an effect on the CO₂ balance created by the Bureau of Statistics Nord. In addition, important measures that are included in the Master Climate Action Plan are not part of the polluter balance. The polluter balance is also subject to a number of influences that can affect Hamburg only to a very limited extent (e.g. economy, federal policy). For the same reasons, the modified polluter balance from the baseline report for the 2010 Master Climate Action Plan cannot be considered as a balancing basis for the Master Plan: The starting point is the polluter balance, reduced by emissions trading investments and air traffic. In this framework, all federal and EU measures already decided for Hamburg were credited against a Hamburg reduction target of 40%. From this, a gap of 1.6 million tons was established that has to be bridged by additional measures.

Therefore, the balancing was chosen according to a bottom-up approach for the 2020 Action Plan of the Master Climate Action Plan, as it was already used in the Climate Action Plan 2007-2012. Here, the climate protection measures are added up to an overall goal. Bottom-up balancing: All climate effects (also outside Hamburg) are recognized that are achieved through measures implemented in Hamburg. For each measure, a so-called baseline is defined, showing how the emissions would have changed in this area without the measure. The reduction of a measure is calculated relative to the baseline. An example of this is the construction of new climate-friendly buildings. Here, it is respectively recognized how far they go beyond the legal standard. The legal standards of the ENEV thus form the baseline for new constructions.

Methodology chosen for the Action Plan 2020

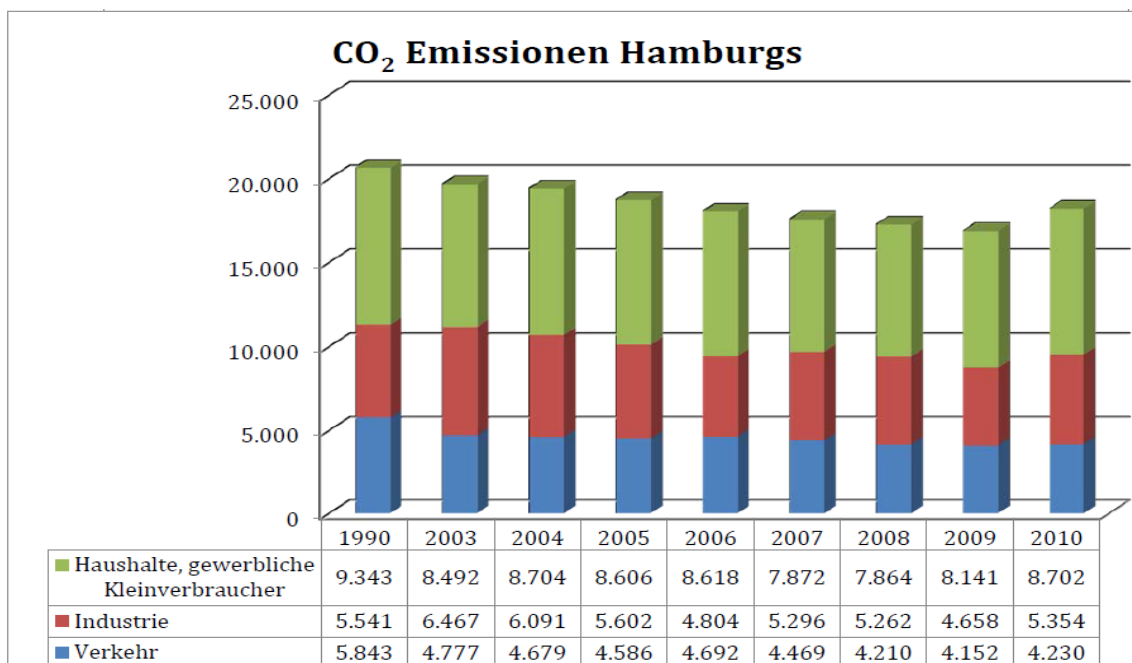
For the action plan, a bottom-up balancing was chosen. Various possibilities for action were weighed and the available climate protection funds planned in such a manner that the highest possible CO₂ reduction is achieved. The cumulative CO₂ reductions from 2013 to 2020 of close to 2 million tons are the target of this concept. The reduction capacity of all plants is accumulated, so that this concerns the annual CO₂ reduction to be achieved in 2020. The Senate takes up the challenge to achieve this goal with the full implementation of the climate protection measures specified in the master plan.

The chosen approach has the following advantages:

- It illustrates, (in contrast for example to the polluter balance), the CO₂ effects of the measures completely. For climate change, this is appropriate, since the factor of where harmful emissions are being avoided is basically negligible.
- The achievement of objectives can be truly influenced by the Senate, as opposed to the top-down approaches.
- Hamburg makes an appropriate contribution to climate protection, taking into account also the fact that Hamburg as a location for industry has high CO₂ emissions that sometimes are not influenceable and that emissions have still risen in the 90s, in Hamburg, in contrast to the federal government.

In the past, a reduction in CO₂ emissions in Hamburg is reported from 1990 to 2010 of 12% based on the polluter balance. A further reduction in CO₂ emissions by 28% by the year 2020, which is based

solely on the Hamburg polluter balance, cannot be achieved alone with a realistic Hamburg measures package. This is due last but not least also to the fact that in 2010, emissions have increased significantly in Hamburg because of exceptionally high economic growth.



With this Action Plan, the following target achievement in the context of top-down approaches can be estimated on the basis of the once more updated assumptions from the baseline report for the Master Plan. The measures were individually analyzed for their effect in the relevant balance context.

	Balancing framework			
	Baseline report for the Master plan		Polluter balance	
	in million t		in million t	
1990	17.9		20.7	
2006	16.2		18.1	
2008	15.1		17.3	
2009	14.7		17.0	
2010	16.1		18.3	
2020	13	- 27 %	15.2	- 27 %

Notwithstanding the above limitation, the polluter balance remains a further indicator staged alongside this total balance of the course of development of CO₂emissions in Hamburg.

Comparison of the objectives of the Climate Action Plan with the 2007-2012 Master Plan: The Climate Action Plan aims at a total reduction of CO₂emissions in Hamburg of nearly 2 million tons. External influences were logically recorded in this concept like the effects from federal actions. But since these cannot be ultimately influenced by Hamburg, this approach was not taken over for the Master Plan. Instead, the Master Plan is restricted to predictable reduction potentials that can be influenced.

Due to the longer duration of the Master Plan of 8 years compared to 5 years, and a consistent focus on measures with high reduction potential, an overall reduction can still be realized of almost 2 million tons.³³

³³ Source: Master Climate Action Plan

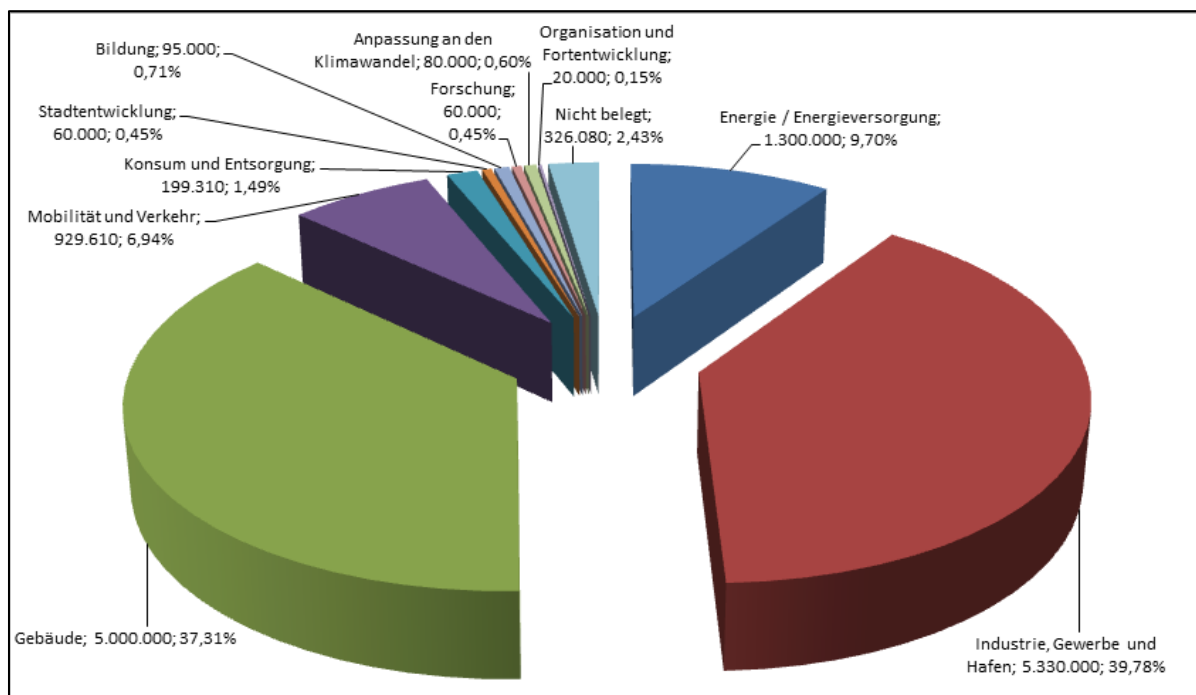
2. List of Measures defined in the Action Plan 2020

Explanation:

The table on the following page contains information contained in the Master Plan. In addition, the reduction of CO₂ emissions sought by the individual measures and the financing from climate protection funds of the budget titles 6800.893.19 and 6800.971.19 and the budget titles 6800.892.11 and 6800.899.10 of the Ministry of Urban Development and Environment are also shown.

The column CO₂ savings gives a breakdown to what extent the individual projects contribute to the goal of reducing CO₂ emissions by 2020 by nearly 2 million tons compared to the current state. The sorting is based on the CO₂ savings, starting with the measure with the highest savings.

The funds distribution of climate protection funds (budget titles 6800.893.19 and 6800.971.19) for the various fields of action of the Master Climate Action Plan are presented below (EUR /% proportion). Approx. 10% of the funds are used for projects to which no CO₂ can be directly attributed:



List of measures (including Reduction of CO₂ emissions and Climate protection financing from funds or specialist titles):

Information about the Project (The projects proposed for funding for 2013/2014 are key projects of the Master Plan and the result of inter-disciplinary Expert Workshops)			CO ₂ reduction by the end of 2020 (in t/a) (k. A. m. = no information possible)	Funding from climate protection funds of the budget titles 6800.971.19 and 6800.893.19 (in Euro)		Funding from the BSU budget titles 6800.892.10 and 6800.892.11
Field of action	Project number	Project	Period of time 2013-2020	2013	2014	per 2013/14
Energy / Energy supply	2013/001	Cooperation agreements of the FHH with the E.ON and the Vattenfall Group (60 individual measures), such as innovation power plant, additional 180 CHP, district heating expansion, intelligent load and consumption control	330,000			
Industry, trade and port	2008/031	CHP initiative - implementation of a program to enhance coupling of heat and electricity production with companies in Hamburg, from the production, service provider and housing sector (funding program)	230,400	1,200,000	1,200,000	
Industry, trade and port	2007/070	(Enterprises for resource conservation)	178,000	2,000,000	2,000,000	2,000,000
Industry, trade and port	2007/051	Opening up further energy efficiency potential in large industrial and commercial enterprises Implementing voluntary commitment of industrial companies (Letter of Intent - LOI)	150,000			
Consumerism and disposal	2007/117	Optimization of waste management in Hamburg under the aspect of climate protection ("Recycling Offensive")	134,000			
Buildings	2007/142	Energy-efficient modernization of rental housing (Förderprogramm)	111,000			
Energy / Energy supply	2013/002	Development of wind energy in Hamburg: creation of the framework conditions	110,000			
Energy / Energy supply	2013/003	Renewable heat Expansion of bioenergy large-scale systems	100,000			
Buildings	2013/008	Alliance for Housing (agreement FHH Associations)	100,000			
Buildings	2012/009	Replacement of electric night storage by pumped hot water heaters and funding of energy efficient domestic hot water systems (Funding program)	83,000	500,000	500,000	
Consumerism and disposal	2013/013	Implementing climate and energy concept Hamburg Water	50,000			
Buildings	2007/095	Climate protection program "Thermal insulation in existing buildings " (Funding program)	40,000	2,000,000	2,000,000	1,000,000
Industry, trade and port	2011/014	Heating network in the "Enterprises for resource conservation" program (Funding program)	40,000	800,000	800,000	
Buildings	2010/031	Funding of energy-efficient, non-residential buildings (Funding program)	24,000	1,500,000	1,500,000	
Industry, trade and port	2012/008	Energy-efficient optimization of air conditioning systems (Funding program)	22,000	500,000	500,000	

Information about the Project (The projects proposed for funding for 2013/2014 are key projects of the Master Plan and the result of inter-disciplinary Expert Workshops)			CO₂ reduction by the end of 2020 (in t/a) (k. A. m. = no information possible)	Funding from climate protection funds of the budget titles 6800.971.19 and 6800.893.19 (in Euro)		Funding from the BSU budget titles 6800.892.10 and 6800.892.11
Field of action	Project number	Project	Period of time 2013-2020	2013	2014	per 2013/14
Industry, trade and port	2010/019	Creating CO ₂ balances and opening up further energy efficiency potential in public enterprises	20,000			
Buildings	2007/140	New residential construction program (Funding program)	18,000			
Energy / Energy supply	2011/025	Renewable heat Biofuels - Biogas (Funding program)	14,000	200,000	200,000	
Education	2007/025	fifty-fifty	12,500			
Energy / Energy supply	2013/010	Heat supply concept and energy-efficient district planning	10,000			100,000
Energy / Energy supply	2011/025	Renewable heat Solar thermal energy and heating (Funding program)	8,000	500,000	500,000	
Mobility and Transportation	2013/014	Further Projects E-Mobility in the course Model region electromobility "The powered industry," Port-conversion of heavy goods traffic Project per 1,000 electric vehicles and Commercial of Commerce and Chamber of Trade	5,500			
Buildings	2007/159	Energy-efficient refurbishment of public buildings - Modernization of building services engineering	5,125	1,000,000	1,000,000	
Energy / Energy supply	2013/009	Renewable energy: concepts, solar center, monitoring, isolated cases, funding	5,000			650,000
Mobility and Transportation	2008/083	Implementation of the cycling strategy of the Bicycle Forum (from Master plan funds in 2013: individual measure Elbchaussee)	3,200	800,000	0	
Energy / Energy supply	2007/160	Energy savings in buildings with high base load	3,000	600,000	600,000	
Education	2008/082	Implementation of the measures from the climate protection plans of the schools in the context of climate protection in schools	3,000	70,000	70,000	
Education	2009/063	fifty-fifty junior	2,500			
Mobility and Transportation	2011/024	Expansion of the testing of battery-electric vehicles (Funding Master plan approved by VE)	300	50,000	48,500	

Information about the Project (The projects proposed for funding for 2013/2014 are key projects of the Master Plan and the result of inter-disciplinary Expert Workshops)			CO₂ reduction by the end of 2020 (in t/a) (k. A. m. = no information possible)	Funding from climate protection funds of the budget titles 6800.971.19 and 6800.893.19 (in Euro)		Funding from the BSU budget titles 6800.892.10 and 6800.892.11
Field of action	Project number	Project	Period of time 2013-2020	2013	2014	per 2013/14
Mobility and Transportation	2012/006	Example concepts for the systematic integration of electric mobility in residential neighborhoods	300			
Industry, trade and port	2010/058	Replacement of the lighting system in the Deichtorhallen (Funding Master plan approved by VE)	120	300,000	0	
Mobility and Transportation	2010/065	Pilot project electric mobility launch Smart ED (Funding Master plan approved by VE)	13	79,610	34,387	
Industry, trade and port	2012/001	Funding program for climate protection and resource efficiency in product development and process design	k. A. m.	300,000	600,000	
Consumerism and disposal	2007/080	Energy and Climate hotline in cooperation with the Consumer Advice Center Hamburg (Initial phone consultation) (Funding Master plan approved by VE)	k. A. m.	149,310	149,310	
Industry, trade and port	2007/068	Increase the reach of climate programs through active integration of enterprises not yet involved through economic institutions (HK energy controllers) (Funding Master plan approved by VE)	k. A. m.	135,000	135,000	
Industry, trade and port	2007/068	Increase the reach of climate programs through active integration of enterprises not yet involved through economic institutions (ZEWU mobile plus) (Funding Master plan approved by VE)	k. A. m.	95,000	95,000	
Urban development	2008/025	Climate protection and climate adaptation in Urban development - Climate model districts	k. A. m.	60,000	60,000	
Research and Science	2013/005	Minor measures in Field of Action Research and Science (to be specified)	k. A. m.	50,000	50,000	
Consumerism and disposal	2013/006	Minor measures in Field of Action Consumerism and disposal (to be specified)	k. A. m.	50,000	50,000	
Adaptation to climate change	2008/099	Modeling of urban climate	k. A. m.	50,000	0	
Adaptation to climate change	2008/080	Hamburg strategy for Adaptation to climate change (overall strategy)	k. A. m.	30,000	30,000	
Education	2013/007	Climate checkout Student competition for CO ₂ reduction everyday measures	k. A. m.	25,000	25,000	

Information about the Project (The projects proposed for funding for 2013/2014 are key projects of the Master Plan and the result of inter-disciplinary Expert Workshops)			CO₂ reduction by the end of 2020 (in t/a) (k. A. m. = no information possible)	Funding from climate protection funds of the budget titles 6800.971.19 and 6800.893.19 (in Euro)		Funding from the BSU budget titles 6800.892.10 and 6800.892.11
Field of action	Project number	Project	Period of time 2013-2020	2013	2014	per 2013/14
Organization and continued development	2010/025	Cost center for Climate protection	k. A. m.	20.000	20.000	
Research and Science	2011/032	Battery-Test-Labor (University of Applied Sciences)	k. A. m.	10.000	0	
Industry, trade and port	2013/015	Eco-profit	k. A. m.			150.000
Buildings	2007/083	ELBCAMPUS / Energy Construction Center	k. A. m.			104.720
Buildings	2007/082	Qualification for architects and tradesmen – IMPULSE Program	k. A. m.			100.000
Industry, trade and port	2013/011	Quality association enterprises with environmental awareness	k. A. m.			60.000
Energy / Energy supply	2007/084	Cluster Renewable Energy Hamburg	k. A. m.			
Industry, trade and port	2008/073	Climate protection in product development and technological innovations in the areas of Energy generation and conversion (Funding program)	k. A. m.			
Education	2008/081	School Construction Agency 2.0	k. A. m.			
Energy / Energy supply	2013/012	Energy cooperation Port of Hamburg (Funding (approximately 1 million Euro) from residual budget 2012)	k. A. m.			
Totals			1,812,958	13,073,920	12,167,197	4,164,720
			Quantifiable measures as things stand			
stated in the budget plan				13,400,000	13,400,000	4,235,000

3. Overview of the Vision 2050 for Hamburg

Field of Action	Aspects of the Vision 2050 for Hamburg
Energy / energy supply (Electricity and heat)	<ul style="list-style-type: none"> - energy requirements will be largely covered in a reliable, demand and competition driven manner through renewable energy sources achieved by <ul style="list-style-type: none"> o energy conservation o efficient energy generation, distribution and use o development and integration of renewable energy sources o exploitation of the potential in the buidings sector - (renewable energy) sources focused on <ul style="list-style-type: none"> o wind energy o solar energy o local biomass o biogenous waste o near surface geothermal energy o possibly deep geothermal energy o industrial waste energy - system integration of energy grids (electricity / gas / heating) - intelligent networking of <ul style="list-style-type: none"> o fluctuating generation capacities o storages o load management systems - virtual power plants - a widely expanded and condensed district heating grid - integration of heating systems on a low temperature to exploit heat from e.g. renewable sources - application of heat pumps and solar energy or combined heat and power plants in off-grid areas
Industry, Trade and Port	<ul style="list-style-type: none"> - extensive application of the most efficient technologies - active-ecological industry policy with strong environmental innovations - renewable energies: indispensable basis of an intelligent and modern port system - saving potentials are exploited especially in the cross-sectional applications of production and office buildings - minimized specific energy requirements for the areas of heat, cold and compressed air generation, illumination, driving mechanisms, ventilation and air conditioning, and computer systems by efficiency-enhancing technology leaps - improvement of the material and resources efficiency in the raw material industry - establishment of <ul style="list-style-type: none"> o energy management systems Across industries o a comprehensive raw material recycling, secondary raw materials are obtained from the metropolitan region to a significant degree - The Senate will act as a technology driver through assuming the intermediary function between enterprises and universities <ul style="list-style-type: none"> o energy supply companies and grid operators are also being integrated
Buildings	<p>The buildings sector plays a key role for the energy transition.</p> <p>Privately used Estate:</p> <ul style="list-style-type: none"> - almost all older buildings have been subject to energy modernisations at an ambitious but not unrealistic level of modernisation quality and depth <ul style="list-style-type: none"> o insulation of the outer shell with sustainable insulating materials o replacement of windows o installation of highly efficient heating systems - annual final energy needs (heating & hot water) for existing apartment buildings in stock at an average of 40-45 kWh/m² & for single-family dwellings at 45-55 kWh/m² - non-residential buildings require approximately 50% of their annual final energy needs for heating in 2013 - climate mitigation is coupled to a socially acceptable and economical implementation <ul style="list-style-type: none"> o investors achieve targeted yields at least in the long term

	<ul style="list-style-type: none"> ○ tenants find affordable rents ○ socially acceptable financing of modernisations - protection of historic buildings and monuments and the preservation of cityscape formative characteristics are taken into account - establishment of a Life Cycle Approach for buildings and components <ul style="list-style-type: none"> ○ Building materials and insulating materials will be sustainable, toxin-free ○ CO₂ minimisation during all product life phases ○ Long term preservation of buildings ○ Low demolition rates, flexibilisation of utilisation concepts Public Buildings: <ul style="list-style-type: none"> - The Free and Hanseatic City of Hamburg performs its role model function by means of the routine implementation of high energy standards <ul style="list-style-type: none"> ○ heating energy needs of existing public buildings are reduced to 50% of the level in 2013 ○ integral planning according to ambitious energy efficiency requirements for new buildings - deployment of sustainable materials and work methods for new buildings and modernisation efforts - establishment of a strong and intensive central energy management and controlling
<p>Mobility and Transport</p>	<ul style="list-style-type: none"> - noise and pollution mitigation besides climate mitigation will be well developed and integrated in a sustainable traffic - climate friendly air traffic according to international developments - Priority of environment-friendly mobility <ul style="list-style-type: none"> ○ Improvement and funding of non-motorized private transport and in public transport ○ Intelligent organisation of motorized private transport, which is predominantly operated with renewable energies ○ Dominant share of public transport, pedestrian traffic and bicycle traffic in modal split ○ the public bus fleet will be zero-emission - public and private loading infrastructure for eMobility will meet the requirements - establishment of the concept « use without ownership » for passenger traffic - Network of cycle paths deeply developed (cycling trails, strips, parking facilities) - Footpaths and cycle paths can be used free from obstructions and barriers - Comprehensive mobility management: means of transportation networked together both within the city and also to the surrounding areas enhancing multimodality - Integrated urban development and traffic development <ul style="list-style-type: none"> ○ compact city / city with short routes ○ sustainable city logistics ○ settlement development along the public transport track system ○ settlements and neighbourhoods with few cars ○ more space and sojourn quality for everybody in the public sphere - urban and environmentally sound management of the growing freight traffic <ul style="list-style-type: none"> ○ optimised seaport hinterland connectivity via rail ○ optimised last mile ○ Freight distribution takes place at night and is low-noise
<p>Consumption and Disposal</p>	<ul style="list-style-type: none"> - CO₂ emissions per capita and year amount to a value of 2t - comprehensive information about the CO₂ effects of consumer goods is available - production and trade provide transparency concerning the CO₂ effects during the entire product life cycle - Senate coordinates consumer advice & communication e.g. about reduction opportunities through organic food, regional agriculture, lower meat consumption - behavioral changes are motivated by education, structural changes (infrastructure, product offerings), product transparency and incentive systems <ul style="list-style-type: none"> ○ climate-friendly behavioral manners are recognizable for consumers and implementable in everyday life - optimized resource and recycling management

	<ul style="list-style-type: none"> - In all public institutions (administrative, educational institutions) the 2050 vision is implemented as a role model
<p>Integrated consideration of climate protection: Urban development</p>	<ul style="list-style-type: none"> - Hamburg is a regenerative city in spatial regard and adapted to climate change - climate policy requirements are integrated into the organisation of spatial planning through the inclusion of climate management - integrated management of (part) city development - establishment of the compact city concept <ul style="list-style-type: none"> o wide, small-scale usage mix o short routes o decentralised concentrations o settlement development along the public transport track system o settlements and neighbourhoods with few cars o more space and sojourn quality for everybody in the public sphere - Port is included as part of urban development oriented towards climate protection - Hamburg promotes sustainable and climate-friendly development of parts and neighborhoods of the city with its building policy - active municipal neighborhood management and funding for e.g., <ul style="list-style-type: none"> o communally-used gardens o solar roofs or rooftop greenhouses o projects of social coexistence, multi-generational housing - spatial development is coordinated with the environs despite existing competition - Hamburg: model of climate-neutral urban development in (inter)national context - Hamburg works on a federal level towards planning and incentive mechanisms which promote climate-friendly, spatial development - establishment of serious and regular monitoring of current strategies and concepts of urban development in terms of their energy-climatic effects and adverse social, geographical or economic side effects
Education	<ul style="list-style-type: none"> - Excellent location for climate-related training and further education with respect to <ul style="list-style-type: none"> o training in education (educators / teachers) o vocational training (crafts, technology, electronics, EDV/GIS, supply & disposal) o university degree programs - all state and many private educational institutions are CO₂ neutral and thus serve as role model learning centers and for demonstration purposes - all public events in Hamburg are carried out CO₂-neutrally - Annual awards for good examples of especially low CO₂ emissions per year
Research and Science	<ul style="list-style-type: none"> - research and science in the context of climatology have an inter-disciplinary and multi-disciplinary orientation <ul style="list-style-type: none"> o “integrative research approaches” are pursued - (inter)national cooperation for research facilities for climate, climate impact research - important contributions to the energy transition by climate-related research and science in Hamburg in cooperation with industry - transformation research for the transition to a CO₂ neutral society - science actively pursues a dialog with society and this dialog process itself with all societal groups must become the object of research
<p>Integrated consideration of climate protection: Adaptation to climate change</p>	<ul style="list-style-type: none"> - Hamburg is adapted through implementing inter-disciplinary measures at all levels of urban policy towards climate change to avoid damages as far as possible - the necessary green areas and open spaces are protected and developed for sufficient ventilation of the city, for quality of life and leisure in the city despite the densification process - an innovative strategy Hamburg’s green roofs is implemented to enhance urban climate and the city’s water household - water planning and inner city open space development consider and strengthen the retention capacity of areas (e.g. parks, parking places) - flood affected areas and the flood areas of moraine waters are excluded from development of new buildings, except flood control is guaranteed in another way, e.g. through an adapted construction method

4. Guiding Questions Hamburg

Please note: The yellow-marked questions seem to be key themes.

The Master Climate Action Plan Hamburg

2014-03-05

Guiding questions for assessment of your Energy/Climate City concept:

1. Definition of objective(s): How is the (main) objective/aim of the city plan defined?

- a) **Well defined components of the city plan (e.g. CO₂-reduction, energy demand reduction, increase of renewable energy production or energy efficiency), using a clear quantitative and qualitative set of categories?**
- b) Qualitative objectives only, which allow for different interpretations of how they can be reached best; or rather no explicit objectives – i.e. “the path is the way”.

Answer a):

The Hamburg climate action policy - integrated climate action under the sign of the energy transition and responsible fiscal policy: before this background, Hamburg will continue to make its contributions towards reaching the national climate action goals: to reduce CO₂ emissions by 40% by 2020 and by at least 80% by 2050. (p. 2) With the Master Climate Action Plan, the Free and Hanseatic City of Hamburg contributes its part to the objective that CO₂ emissions of central key fields of action for Hamburg are reduced to a minimum by 2050. The objective is a supply mainly from renewable resources by 2050. Hamburg is committed to advancing the energy transition. The areas are addressed that are the most important for climate protection and life in the city.

- Energy / energy supply (electricity and heat)
- Industry, Trade and Port
- Buildings
- Mobility and Transport
- Consumption and disposal
- Urban development
- Education
- Research and Science

2. What is the underlying “philosophy” of the plan?

- a) **Holistic and integrative approach, considering the interrelations between different components of the transformation agenda (e.g. the energy chain with respect to production, distribution and consumption).**
- b) Segregated, additive approach. (Accentuation of individual sectors without consideration for interdependencies.

Answer a):

According to answer 1 the plan follows a holistic and comprehensive approach:

The master plan is not limited to the energy sector. Rather, climate action should be even stronger than it is today and should be part of interdepartmental city policy at all levels, which is integrated into a canon with various objectives. With the master plan, this basic idea of so-called Mainstreaming, that has already formed the basis for the Climate Action Plan 2007-2012, will be further advanced. Then climate protection is not only operated by the Ministry of Urban Development and Environment, but is equally integrated into the sectoral policies of the other Departments of the Free and Hanseatic City of Hamburg. (p.2)

3. Does the plan provide a specific timeline?

- a) **Clearly defined milestones for short-term, mid-term and long-term targets as well as for the implementation of measures.**
- b) Flexible and open timeline.

The 2020 Action Plan, and the qualitative measures that are an action component of the Masterplan substantiate the long-term perspective for the next years (Part III.). Here the projects are named that the Senate is getting underway at short notice in order to get a bit closer to the objective in 2050. With these measures, Hamburg can reduce its CO₂ emissions from today until 2020 by just about 2 million tons. (p. 3)

4. Is the achievement of objectives monitored?

- a) **A system of monitoring is in place which observes the transformation process and provides regular progress reports – with possible adjustments**
- b) The process is designed to an open and flexible program. Specific objectives are negotiated on an ongoing basis.

Answer a):

Controlling, reporting and further development of the Master Plan: The Master Plan, as a long-term development plan for climate protection and the Climate change impact adaptation in Hamburg, has to be regularly adapted to the current developments and revised. To this end, the Senate updates it every two years. In the update, the monitoring results of individual projects, the achievement of objectives in individual fields of action and projects, project development (completed and newly created measures) as well as changes in the framework conditions are presented in different levels of detail. The criteria for project funding will be developed further. The responsible authority shall involve the other agencies and external partners in the climate action report. (p. 22)

Concerning Urban Development: The planning is flexible, constantly verifiable and is regularly adapted to developments. For this, the strategies and concepts of urban development are evaluated regularly in terms of their energy-climatic effects, and adverse social, geographical or economic side effects. Systematic monitoring has been developed on the basis of objectives that are also quantified to the greatest extent possible. (p. 9)

5. Is technical and social innovation (e.g. new energy producing technologies, changing consumer behavior) taken into consideration as an accelerator/catalyst for the city concept?

- a) **The plan outlines the significance and possible directions of innovation as well as the ability to influence it.**
- b) **The plan does not reflect the potential impact of innovation. It does not attempt to stimulate and govern innovation.**

Answer a) and b):

The economic potential of climate action (job creation and attractiveness of location, et al.), as well as the other advantages of a climate-friendly city (attractive living environment, et al.), are opened up with the conceptual approach of the Master Climate Action Plan. Climate protection hence becomes a model for success – innovation included. On the other hand the Master Climate Action Plan does not explicitly stimulate and govern innovation.

Climate action policy with the time horizon 2050 must be dynamic to meet the CO₂ reduction objectives. The technical developments will also often progress by leaps and bounds and are currently not foreseeable. Also concerning the political boundary conditions, changes are rather likely by 2050. (p. 3)

6. Does the plan reflect the spatial differentiation in terms of city scales (eg. building-, quarter-, district- or area-scale)?

- a) **High level of differentiation with an integrative view on different city scales.**
- b) **City considered as homogeneous space.**

Answer a) and b):

The City Plan is focused on the entire city space.

On the other hand within the action field 'Urban Planning' spatial differentiation is reflected (p. 18 and 19):

In the context of urban development planning, existing and advanced climate tools will be applied to B-plans, to calculate simply and quickly CO₂ emissions depending on specific plan content. Plan areas are subjected to climate protection and adaptation simulations, different scenarios are described, in order to achieve optimizations such as the one concerning innovative and efficient energy supply for neighborhoods and the entire city. A first overview is already provided by the application of the computational tool developed in the context of the Climate Action Plan for the detection of CO₂ savings. Urban Development & Planning visualizes the subject of climate protection and adaptation and makes a contribution to GIS-based spatial analysis on the subject of energy and climate protection. It identifies data, trends, and potential for climate action and adaptation to climate change. In total the spatial dimension has to be improved.

7. Does the city plan concern other themes of politics/governance?

- a) **Integrated in other political concepts (multilevel governance)**
- b) "Stand alone" plan

Answer a):

The master plan is not limited to the energy sector. Rather, climate action should be even stronger than it is today and should be part of interdepartmental city policy at all levels, which is integrated into a canon with various objectives. Especially the following concepts: "Energy Transition Hamburg" (Sustainable Transformation of energy supply), "Mobility Program 2013" and/or "2030: General Principles for Spatial Planning"

8. What is the role of Stakeholders?

- a) Systematical, continuous participation in developing and implementation of the city concept (e.g. theme and agenda setting, part of governance)
- b) Selective, isolated participation, mainly priority for administrative acting

Answer a):

During the development process of the city concept the overall objective was: the technical and strategic master plan process is to "map" the relevant bodies and organizations of the city as a whole - both within and outside the Ministry of Urban Development and Environment and the authorities.

As already begun in the context of the discussion of the "basic expert opinion report" (public events, website, environmental capital city dialogues), the development of the Hamburg Master Climate Action Plan was continued in dialogue with and participation of Hamburg stakeholders. The aim was to include both the scientific community as well as representatives from Hamburg's economy and society. In future, new, targeted participation formats will be designed to bring environmental and sustainability issues more close to the width of society. Here, beyond the scope of awareness, the focus in particular should be on the conveying of practical guidance and practical knowledge and incentives to participate and incentives for do-it-yourself. These formats should also be used for the implementation of the Master Plan. (p. 22)

9. Which other participative elements are included in the plan?

- a) A wide offer of options for participation, priority of action planning and experimental approaches;
- b) No explicit offer of options for participation

Answer a):

Hamburg can only achieve its climate protection goals if as many stakeholders in the city as possible get involved. Therefore the competent authority not only promotes the master plan, but also initiates projects with partners in the city. The Master Plan was discussed in advance with environmental organizations and chambers, which also corresponds to a recommendation from the evaluation. Furthermore, the established application process has been further developed, as proposed in the evaluation, and adapted to new conditions. The recommendations related to participation in networks and goal-oriented public relations will be fulfilled in the implementation of the plan. (p.23)

10. Does the plan ensure a coordinated action within the administration?

- a) Comprehensive tasks are explicitly named and considered in the organizational processes;
- b) No coordinated action between different administrative areas.

Answer a):

The master Plan concerns the entire Senate:

Climate action and energy policy is not only operated by the Ministry of Urban Development and Environment, but is equally integrated into the sectoral policies of the other Departments of the Free and Hanseatic City of Hamburg.(see answer 2.)

11. How well is the plan integrated in and secured by medium-term budget plans?

- a) The plan is secured, all measures are examined with regard to their financial dimensions and designed accordingly;
- b) Open financing depending on recurring negotiations

In Appendix 2, the proposed distribution of funds is shown. (p. 24 + appendix 2)

Title	Intended purpose	Budget 2013	Budget 2014
		- k Euro -	- k Euro -
6800.893.19	Master plan Climate protection (investment)	8,040 KM 8,040 VE	8,040 KM 4,800 VE
6800.971.19	Master plan Climate protection (consumptive)	5,360 KM 5,360 VE	5,360 KM 3,200 VE
Total		13,400 KM 13,400 VE	13,400 KM 8,000 VE

The financing of measures will be continued after 2014, the concrete budget will be decided later on

12. Which **energy themes** are included in the city concept? Please, specify and list the energy themes.

See answer 1.