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The connection between the characteristics of a municipal climate change mitigation program and the motivation of participating SMEs on the example of Hamburg's 'UmweltPartner'

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List of acronyms and abbreviations

°C	Degree Celsius
AR 5	Fifth Assessment Report
BSU	Behörde für Stadtentwicklung und Umwelt – Department for Urban Development and the Environment
CH ₄	Methane
cm	Centimetre
CO	Carbon monoxide
CO ₂	Carbon dioxide
CSR	Corporate Social Responsibility
e. V.	Eingetragener Verein – registered association
EMS	Environmental Management System
ENGOS	Environmental non-governmental groups
EU	European Union
EUR	Euro
GHG	Greenhouse gas
h	Hour
IPCC	Intergovernmental Panel on Climate Change
K	Kelvin
km	Kilometre
m ²	Square meter
m ³	Cubic meters
mg	Milligram
N ₂ O	Nitrous oxide
Nm ³	Normal meter cube
OECD	Organisation for Economic Co-operation and Development
SME	Small and medium sized enterprise
U.S.	United States of America
UN	United Nations
W	Watts
WGII	Working Group 2

Abstract

The city of Hamburg, as all other cities around the world, has to deal with the consequences of climate change. As cities are not just one of the main affected systems, but also one of the main causes, they developed approaches to mitigate their own effects. One political instrument is to promote or facilitate climate change mitigation of the own population. This includes also SMEs. This thesis investigates two aspects. On the one side, it investigates the characteristics of the programs of Hamburg's 'UmweltPartnerschaft'. On the other side, the motivation of participating SMEs of a group called 'UmweltPartner' has been determined. Furthermore, a connection between the motivations and the characteristics has been tested.

1 Introduction

The Free and Hanseatic City of Hamburg, as a city next to the sea always had paid attention to the climate. Hamburg has a long history in dealing with the affects of weather extremes. In 1908 a storm led to damage the property and people. In 1921 a storm hit the city with wind speed up to 11/12 on the Beaufort scale and led to damage the property of millions of Deutsche Mark. In 1957 a heat wave led to hundreds of death, water shortage and fish mortality (Bissolli, Göring, & Lefebvre, 2001). In 1962 a flood led to broken dykes with the consequence, that 100,000 inhabitants had been locked: over 15% of the city had been flooded and no gas, electricity or fresh water was available (Behörde für Stadtentwicklung und Umwelt, n.d.-a). But the vulnerability is not just an experience of the past. Most recently, in 2013, the hurricane 'Xaver' caused the collapse of several modes of transports, a stop of work of public and private organization and a numerous flooded areas within the city (Hamburg.de, n.d.-a). These examples show both, the variance of extreme conditions and the variance of the effects for the city and its inhabitants.

But it is not only these historical incidents that pressure Hamburg but also other climate change effects. For instance climate change already rose the sea level of the North Sea approximately 0.2 cm/year in the last century. And this might not the end. Whereas predictions for the future of the North Sea are barely possible due to the influence of changes of specific gravity and ocean currents, a prediction for the global sea level is possible. It can be assumed, that the average global sea level will rise between two and eight decimetre to the end of the century (Storch, Doerffer, & Meinke, 2009).

However, the rise of the sea level is not the only issue for the area of Hamburg. According to the North German climate atlas (Norddeutscher Klimaatlas), various other climate elements will be affected by climate change until 2071-2100 in comparison with 1961-1990. Table 1 shows that the average temperature and the amount of warm days will increase which might lead to more warm periods and heat waves. This is especially remarkable, because the amount of precipitation and rainy days will decrease during the summer (Gönnert, 2012). This combination would lead either to reduced local food production or an increased supply from groundwater wells. As a consequence of this, the groundwater level would decrease and food prices would rise.

Another effect of the climate change would be the increase of wind speed and storms in the winter. Storm surges in Hamburg are caused by water, which is pushed towards the coast next to the river mouth of the Elbe and transported upstream by tidal range (Gönnert, 2012). Whereas a rise of the sea level and an increase of extreme winds does not necessary lead to more or higher surges, it already increases the uncertainty of the situation (Storch et al., 2009). This uncertainty led to

investments of approximately EUR 200 millions in the flood adaption of Hamburg since 2010 (Sossidi et al., 2012).

Table 1: Possible climate changes in the Hamburg Metropolitan Region by 2071-2100 compared to 1961-1990¹

Climate element and derived variable	Annual average	Summer	Winter
Temperature			
Average temperature	2 to 4.7 °C	1.8 to 5.1 °C	1.8 to 4.6 °C
Summer days (days with a maximum temperature of at least 25 °C)	7.1 to 41.4 days	5.5 to 32.9 days	No change
Tropical nights (days with a minimum temperature not lower than 20 °C)	1.2 to 18.4 days	1.1 to 15.9 days	No change
Frost days (days with a minimum temperature lower than 0 °C)	-15.8 to -47.6 days	No change	10.5 to 31.6 days
Precipitation			
Amount of precipitation (incl. rain and snow)	0 to 9 %	-7 to -41 %	10 to 41 %
Rainy days (days with more than 1 mm precipitation)	-15 to 2,8 days	-3,2 to -20 days	2 to 8,5 days
Wind			
Mean wind speed	1 to 4 %	-11 to 1 %	0 to 15 %
Storm intensity (max. value of the wind vector in 10 meter heights)	0 to 3%	-8 to 1%	0 to 13%
Stormy days (days with a maximum wind speed of more than 62 km/h)	1,6 to 3,7 days	-0,6 to 0,4 days	0,7 to 2,8 days
Clouds			
Sunshine duration (hours with direct shortwave solar radiation of more than 120 W/m ²)	-4 to -7 %	-5 to 7 %	-12 to -29 %

However, this is not the only way the City of Hamburg faces the climate change. The city tries to reduce its own effects on climate change. As part of the application for the European Green Capital the city initiated various climate change mitigation projects. One of these projects is the establishment of hydrogen busses and a local bicycle system as a local mean of transports. Another project deals with the mitigation of CO₂ emissions by public schools. Various activities aimed the participation of Hamburg's' citizens and companies. For example the fair 'goodgoods' informed the citizens about resource-saving goods and the local harbour implemented several projects to reduce its resource consumption and CO₂ emission. Additionally, the city involves other local key players for climate change mitigation through the project 'UmweltPartnerschaft', established in 2003 (European Commission, 2010).

The institutionalised project 'UmweltPartnerschaft' tries to encourage companies of different sizes to be active in the mitigation of climate change. The project is located at Hamburg's Department for Urban Development and the Environment (BSU). It is supported by the Chamber of Crafts Hamburg, the Chamber of Trade Hamburg, the Federation of German Industry Hamburg and the 'Unternehmensverband Hafen Hamburg e.V.', which is a lobby group of harbour related companies. The aim of the project is to generate synergies between economic and ecologic developments in companies. Therefore, companies are asked to reduce their impacts on climate change, the environment and their resource consumption. 930 organizations have already been declared as partners of the

¹ (Meinke, Weiße, & von Storch, 2011, p. 4: translated by author)

project. Overall, 4,100 organizations had contact with the project (Behörde für Stadtentwicklung und Umwelt, 2013).

In general, the program of the city can be divided into six sub-aims

1. Improvement of energy efficiency
2. Improvement of resource efficiency and recycling
3. Integration of alternative energy sources
4. Eco-friendly mobility
5. Integrating environmental management systems
6. Adaption to climate change

To reach these aims, the government offers information, networking events, consultation and monetary support related to the sub-aims and climate change in general (Geschäftsstelle UmweltPartnerschaft Hamburg, n.d.).

1.1 Cities and climate change

So far, it has been described, that the City of Hamburg initiated various activities to mitigate climate change and to adapt to it. As Hamburg, other cities initiated such programs. The following paragraphs will show two sides; that cities have a notable input on climate change and that they're also notable affected by it. Following this they have an opportunity and a reason to be active on the issue of climate change.

1.1.1 The influence of cities on climate change

For a discussion about the effects of cities on climate change, three aspects have to be considered. At first, cities have a lower impact on climate change than rural areas. This is shown by estimation of CO₂ pollution per capita in comparison with the national average. Secondly, whereas the impact per capita might be lower, the total impact is still remarkable. In 2006 approximate calculations estimated a cities' share in energy related CO₂ emissions of 71% and a share of 40-70% on anthropogenic greenhouse gas (GHG) emissions. However, these data have to be considered as significantly uncertain, because another study allocated 30.5-40.8% of GHG emission to cities. Nevertheless, it becomes clear, that the impact is highly notable. The third and last aspect is, that cities themselves are not the polluter, but the activities of the dwellers or related activities are leading to pollution. These pollutions can be classified into different sectors; the most polluting sectors are energy supply, industry, transport and buildings (UN Human Settlements Programme, 2011).

City related energy supply is responsible for 8.6-13.0% of the global anthropogenic GHG emission (UN Human Settlements Programme, 2011). One of the reasons for this high value is that electricity is mainly converted from fossil energy sources, which have the most negative impact on climate change of all energy sources (Moomaw et al., 2011, p. 982). For example in 2001 41.3% of electricity was generated from coal and peat, 4.8% was generated from oil and 21.9% was generated from natural gas (International Energy Agency, 2013, p. 24). The global use of coal, which is the source with the highest GHG pollution (Moomaw et al., 2011, p. 982), will decline in the next decades (U.S. Energy Information Administration, 2013, p. 68). However, the coal consumption in not developed countries, namely Non-OECD-members, will increase (2013, p. 93). This is reasoned by an increased concentrated demand for energy as a consequence of urbanisation in an combination with the prohibition of using nuclear energy in these countries (UN Human Settlements Programme, 2011). This combination makes cities in developing countries a catalyst on climate change.

Industry in cities is responsible for 7.8-11.6% of anthropogenic GHG emission (UN Human Settlements Programme, 2011). This is based on energy consumption,

which is mainly satisfied with fossil energy sources (U.S. Energy Information Administration, 2013, p. 127). Especially in not-developed countries industry is the major polluter in cities. A reason for this is that a lot of heavy industry moved to these regions. This issue does not occur so often in developed countries because these kinds of industries moved out of the city-regions. The reason for this is stricter environmental protection (UN Human Settlements Programme, 2011).

The city related transport is responsible for 7.9-11.6% of anthropogenic GHG (UN Human Settlements Programme, 2011). Most of this is based on oil consumption: the total transport sector consumed 62.3% of the worlds' oil in 2011 (International Energy Agency, 2013, p. 33). Especially notable are three types of transport. Aviation is responsible for 2% of anthropogenic GHG emission. As a lot of airports are located in city-regions, this becomes an issue; for example London's aviation industry is responsible for 34% of its total emission. The next transport mode is shipping, which is used for long distance freight traffic. This mode of transport uses 10% of the global energy. The next transport mode is land vehicles. This mode transports passengers and goods within and towards cities. The emission of this mode is mainly dependent from four factors. Firstly, the density of passenger traffic, which is mainly influenced by the availability of public transport modes; secondly, the density of the city and its catching area; thirdly, the share of transport modes without combustion engine of the modal split; and lastly, the energy efficiency of the engine (UN Human Settlements Programme, 2011).

The last sector, buildings in cities, is responsible for 4.7-5.5 % of anthropogenic GHG emission (UN Human Settlements Programme, 2011). Commercial and residential buildings use mostly electricity and natural gas as energy sources (U.S. Energy Information Administration, 2013, p. 113), because most energy is used for light, electric driven machines, cooling (electricity) and heating (natural gas). The amount of pollution mainly depends on the climate and on the average income of a city. Cities in warm and cool regions tend to use more energy for cooling and heating than cities in milder climate zones. The income influences the amount of energy consuming technologies and the source of energy generation (UN Human Settlements Programme, 2011).

1.1.2 The influence of climate change on cities

Before the future influence of climate change will be discussed, it is useful to have a view on the location of cities and their current risk to be affected by natural hazards. Figure 1 shows that cities with more than one million inhabitant are often located in regions with a high risk of hazards (0=low risk: 10=high risk). The situation for the cities becomes even worse when frequency, intensity and duration of hazards increase as a consequence of climate change (Revi et al., 2014).

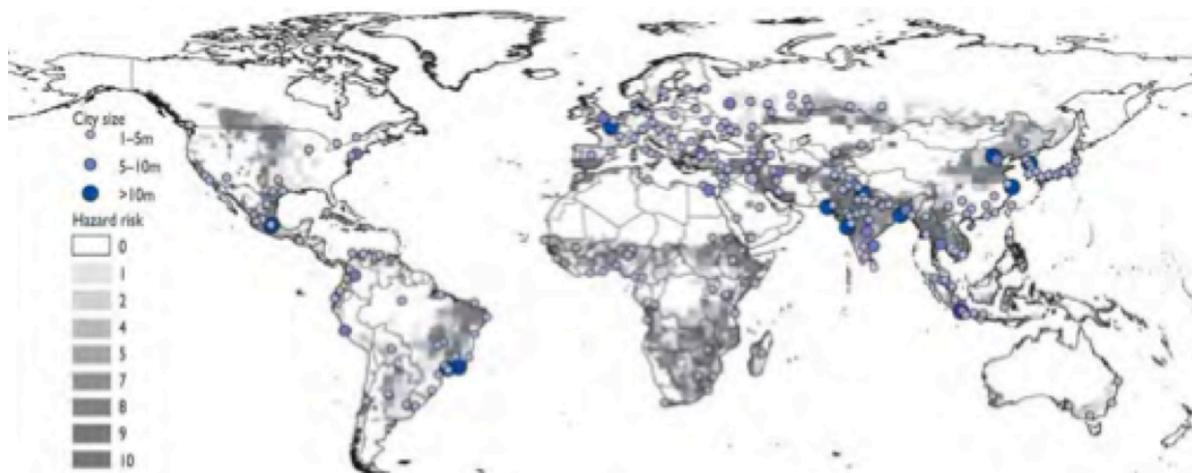


Figure 1: Cities in relation to current climate-related hazards²

According to the report IPCC WGII AR5 about urban areas (2014) the climate change will affect health, nature, social life, and the economy in the following ways:

1. Increased frequency and strength of heat waves will lead to related heat-problems and an increased mortality rates directly and in an indirect manner to more air pollution because of an increased use of cooling.
2. More droughts leading to water shortages, water-related diseases, electricity shortages, more expensive food and increased food insecurity.
3. Heavy rainfall will lead to water logging, water borne diseases, inland flooding and as a consequence of a collapse of drainage systems to pluvial flooding. The floods can lead to a destruction of property and infrastructure.
4. And finally, a rise of the sea level leads to erosion on the coast and on rivers, more storm surges, which affects the population, coastal vegetation, ecosystems and property. These storm surges are especially an issue for harbour cities, because the population can't be protected as in other coastal regions.

Apart from these impacts, which are notable in a direct cause-effect relationship, other long-term effects have to be faced as well.

Urban infrastructure is often not established to deal with extreme weather situations. An increase of them will lead to shorter life cycles and less operational capacities. As a consequence of this, additional capacities have to be generated and maintaining cost will increase in order to keep the actual productivity of cities (OECD, 2010).

Also the housing market will be influenced by climate change. An increase of wind and floods will cause inhabitability of houses. Lots of informal houses will already be destroyed by a little increase of the mean wind speed. But also proper buildings will be affected by increasing temperatures and precipitation, because their stone and metal structures will weather and oxidize (Revi et al., 2014). This will lead to more precarious living situations, e.g. homelessness, due to higher residential costs.

Another aspect is the occurrence of climate refugees and its consequences. People leave their home, when the benefit of staying at a place is lower than of leaving it. Climate change will decrease the economic perspectives of already poor people, especially in the agriculture sector, caused by droughts and flooding

² (UN Human Settlements Programme, 2011, p. 4)

(Reuveny, 2007). Moreover, their build environment is more vulnerable, which lowers their life expectancy (UN Human Settlements Programme, 2011). Both aspects lower the benefits of staying at their place and force them to migrate within or out of their home country. Following this, it can be expected, that people in regions with a vulnerable infrastructure and increasing effects of the climate change on flooding and droughts will leave their home and become a climate refugee. The rising sea level will cause 162 million climate refugees and more droughts will cause 50 million climate refugees till 2050 (Myers, 2002). Apart from aggravation of actual grievances, this migration stream can cause (or lead to) conflicts in the destination area. These conflicts might be based on contests about resources, ethnic conflicts or fast changes of the socio-demographic situation (Reuveny, 2007).

1.2 How to mobilize SMEs in climate adaption and mitigation?

The prior section has shown, that cities all over the world have an interest in climate change mitigation. A climate reasoned change in their social fabric and their infrastructure affects their productivity, which is one of the major purpose for their existence. The other, and even more important, point is that also human life is put at risk. Furthermore, it has been shown, that cities are not just affected by climate change, they are also responsible for it. The activities within a city make them a global hot spot of anthropogenic GHG pollution. Due to the fact that companies, among other parties in cities, are responsible for the pollution it makes sense to include them in mitigation activities.

A city, which already tries to do so, is the Free and Hanseatic City of Hamburg. It started the project 'UmweltPartnerschaft' in order to mobilize companies, including a lot of small and medium sized enterprises (SMEs), for their mitigation agenda. To do so, the government uses various sub-projects, which apply different governance mechanism and incentives.

The variation of governance practices offers not just great opportunities for the City of Hamburg; but for all other willing cities. However, often the cities design their practices based on easy accessible resources and the political will (Zuidema & de Roo, 2014). In order to enable them to overcome this situation and design their approaches more issue and target oriented, more knowledge is necessary.

Since there is no knowledge about the motivation of SMEs to react positive on specific mechanism and incentives, this thesis will identify this. The collected data will help other cities to implement or improve SME inclusion in their mitigation strategy, as they are able to advertise their programs more motivation oriented.

2 The municipal perspective

It has been already, explained, how cities affect and are affected by climate change. First, the approach of SME mobilization will be classified within the opportunities of municipal climate change mitigation. Afterwards, this chapter will discuss the variety of the approach.

2.1 Classification of SME mobilization

According to several researchers (Bulkeley & Kern, 2006; Corfee-Morlot et al., 2009; Kern & Alber, 2008; UN Human Settlements Programme, 2011) cities have four opportunities to mitigate climate change.

The first one, self-governing, identifies the municipality as a policy target of itself. Municipalities can reduce their own impact on climate change by reducing their energy consumption. This can be done by energy-saving projects for public real estates or equipment. Another opportunity is to purchase energy from energy

sources, which are environmental friendlier as fossil energy sources are. This can be considered as an easy method, because the city is barely dependent from other parties. However, the impact is limited as the municipal energy consumption is just responsible for 1-5% of local CO₂ emission.

The second approach addresses the municipality as an owner or shareholder of utility companies. A municipality as a provider of energy, transport, water and waste service can implement renewable energy sources or reduce the impact of waste disposals by cogeneration systems. Another opportunity is the provision of good established public transport systems. It has to be pointed, that this approach becomes less important in the future due to the global notable liberalization of these services.

The municipality as regulator and planner is the third approach. Municipalities often can set minimum energy-efficiency standards for buildings and industry. However, to do so, the municipalities often have to follow guidelines of higher authorities. Moreover, they can decrease the amount of travel by increasing the density via brownfield development and mixed-use development. Furthermore, improving infrastructure for other transport means can reduce individual motorized traffic. This opportunity is constrained by higher authorities, which often have an impact on the activities of municipalities within this field.

The last approach is the municipality as facilitator and promoter. This mode enables self-government of the citizens and the public sector. As a consequence, these parts of the society can mitigate climate change without the establishment of laws and rules. Nevertheless, the municipalities can trigger or steer the activities of other actors by using several governance mechanism. Municipalities can advertise low emission techniques or offering required infrastructure. Furthermore, they can enable activities via informational and monetary support. Information can be used to create a greater awareness or offer guidance for specific activities; monetary support can be provided via incentives and subsidies.

2.2 SMEs as target group

As mentioned above, mobilization can target a wide range of groups within the society. An often-addressed target group is companies, because they facilitate various activities within a society. For this reason, they are one of the main polluter of GHGs. Mobilization strategies try to decouple this economic activities from this emission. This shall guarantee further economic stability or growth without strengthening the effect of economic activities on climate change (Lemos & Agrawal, 2006).

2.2.1 SME definition

There is no explicit global definition of SMEs. Most countries and organizations are using the number of employees, the revenue, the asset, the organizational structures and the dominance in the sector as variables (Osteryoung & Newman, 1993). Some are even more complex. The United States (U.S.) distinguish between various business sectors (Hammer, 2010) and the OECD (2005) and the World Bank (Ayyagari, Demirgüç-Kunt, & Beck, 2003) use country and regional specific definitions. In African Countries every company with less than 200 employees is a SME, in Japan the limit is 300 employees (Ayyagari et al., 2003) and in the U.S. the limit is set by 500 employees (Hammer, 2010). The EU Commission (2003) gives an often applied and specific definition. The specificity is given by the fact that the definition distinguishes between three categories of SMEs (table two). According to this definition, SMEs in general are independent enterprises with less than 250

employees. Moreover their annual turnover is at most EUR 50 million or their balance sheet is at most EUR 43 million.

Table 2: SME categories of the EU

Enterprise category	Number of employees	and either	Annual turnover in EUR	or	Annual balance sheet in EUR
Microenterprise	<10		≤ 2 million		≤ 2 million
Small enterprise	<50		≤ 10 million		≤ 10 million
Medium-sized enterprise	<250		≤ 50 million		≤ 43 million

But these variables are not the only opportunity to categorize enterprises. According to Osteryoung and Newman (1993) SMEs are companies which are neither partly or completely owned by a public entity nor shares of them are traded at a stock market. A further distinction between small and medium sized enterprises is possible through the personal liability for debts obligations of the owners. In case of a small company personal liability is given, in case of a medium sized company this is not absolutely given.

The above-described definitions, including the one of the EU, are often used in official registers. Additionally, they are tailor-made for specific internal markets. The one by Osteryoung and Newman has the benefit that this definition goes beyond boundaries, which allows an easier comparison with further research. Another benefit is, that this definition allows a categorization of an enterprise on its legal form; barely accessible knowledge about the balance sheet is not required.

In this research SMEs are defined as companies with at most 500 employees. Furthermore, SMEs are neither partly or completely owned by a public entity nor are their shares traded at a stock market. This allows an international application of the research, as the highest amount of employees of the presented definitions will be applied. Additionally, this definition includes the responsibility of company-owners for the behaviour of the company.

2.2.2 The potential of SME mobilization

The amount of potential partners for mobilization for climate change mitigation seems to be endless. Between 95% and 99% of companies in each country of the world are SMEs (OECD, 2005). Within the member states of the OECD, the share of SMEs on all companies varies between 98.23% in Japan and 99.94% in Greece. The median of the OECD-members is 99.74% (OECD, 2012). And also within the EU, they play an important role. In total SMEs have a share of 99.8% of all company types (Gagliardi et al., 2013). The major share of SMEs can also be found in Hamburg. In 2009 99.58% of the companies in Hamburg have been SMEs (Günterberg, 2012). Table three gives a more detailed overview over the distribution of Hamburg's companies among their size.³

³ OECD's, EU's and Hamburg's data define SMEs as companies with less than 250 employees

Table 3: Distribution of Hamburg's companies among size⁴

Number of employees	Frequency	%
<10	93,586	91.10
<50	7,104	6.92
<250	1,598	1.56
>250	436	0.42
Total	102,724	100.0

However, SMEs do not only have a major share of the public economy, they are also one of the major employer. According to the World Bank SMEs median contribution in each global country is 66.89%. A view on the regional level (table 3) shows, that SME are especially important in the Sub-Saharan Region and in South Asia where the median is above 75%. Apart from the positive side of employment generation, this means that SMEs' employees are a main contributor for commuting related CO emission. An increased CO emission is noticeable in various cities all around the world in rush hours (Han & Naeher, 2006). Through various processes in the atmosphere these emissions can convert to the GHG CO₂ (Wiedmann & Minx, 2008).

Table 4: SME contribution to employment shares per region^{5 6}

Region	Median in %
Global	66.89
Sub-Saharan Africa	76.85
East Asia and Pacific	65.7
Europe and Central Asia	66.32
Latin America and Caribbean	67.77
Middle East and North Africa	57.31
North America	59.27
South Asia	80.26

The identification of SMEs as a global main employer becomes even more important if a correlation between number of employed people and GHG emission is assumed. It has been shown that, at least within the EU, various emissions correlate with the number of employees. For GHG it has been estimated, that CO₂ correlates with a value of 0.97, CH₄ correlates with a value of 0.94 and N₂O correlates with a value of 0.92 (Constantionos et al., 2010b). Following the share of SMEs on the employment market in combination with the correlation, SMEs are a main causer of GHGs. However, the values can't be applied one-to-one for other regions, because of individual correlation for different sectors of economy and an individual share of each sector in other regions.

More reliable data is barely possible, but the one that exists approves both, the remarkable share of SMEs on GHG emission and the regional dependence of this share. For example in the UK SMEs account for 60% of businesses CO₂

⁴ (based on Günterberg, 2012, p. 72)

⁵ (based on Demirguc-Kunt, Ayyagari, & Maksimovic, n.d.)

⁶ SMEs defined as companies with 250 employees and less, North America: 300 employees

emission (Comission of the European Communities, 2007) and in the Australian state Victoria they account for 39% (Rothberg, 2011). In the City of Rotterdam, SMEs have more CO₂ emissions per square meter (0.12 tonnes) than municipal buildings or citizens buildings (Sustainable 2010-2014 Programme Agency & City of Rotterdam/Rotterdam Climate Initiative, 2013).

Another aspect of the potential of SMEs is reasoned in their activities up to now. According to several researcher (Burch, Schroeder, Rayner, & Wilson, 2013; Revell, Stokes, & Chen, 2010; Spence, Jeurissen, & Rutherford, 2000), SMEs are often not active in the field of GHG mitigation, because they are not aware of their impact, don't have the money or the knowledge or don't know how to transfer their willingness into practice. Furthermore, regulations in the field of SMEs often fail, because their amount is too high (N. Gunningham, 2002). On the other side, they often think, that a greater environmental awareness would increases their success on the market (Revell et al., 2010; Spence et al., 2000). This combination makes them a potential target group for mobilization, because they see lowering their GHG emission as an economic benefit, but are missing a trigger in form of knowledge or money. Following this, SMEs often need an external trigger, such as the government, to be active in this field (Gadenne, Kennedy, & McKeiver, 2008). These combinations make them a hidden reserve of municipal climate change strategies.

Additionally, SMEs barely adapt to disasters caused by climate change such as extreme weather events. Even though their uninsured losses are highly notable (Ingirige, Jones, & Proverbs, 2008), they are often lacking adaption strategies or even awareness of this issue (Wedawatta & Ingirige, 2012). This makes them highly vulnerable for property damage and monetary losses.

2.3 Characteristics of mobilization strategies

So far, it has been shown, that the government includes external actors in their climate change mitigation strategies. It also has been shown, that SMEs are a valuable target group for mobilization.

In the following paragraphs, an analytical framework will be developed, which allows a distinction of different governmental mobilization strategies. Therefore, this section will explain five dimensions of SME mobilization with several characteristics. An overview of the dimensions and their characteristics is presented in figure two. Furthermore, to explain the dimensions, the characteristics of each dimension will be linked to an example.

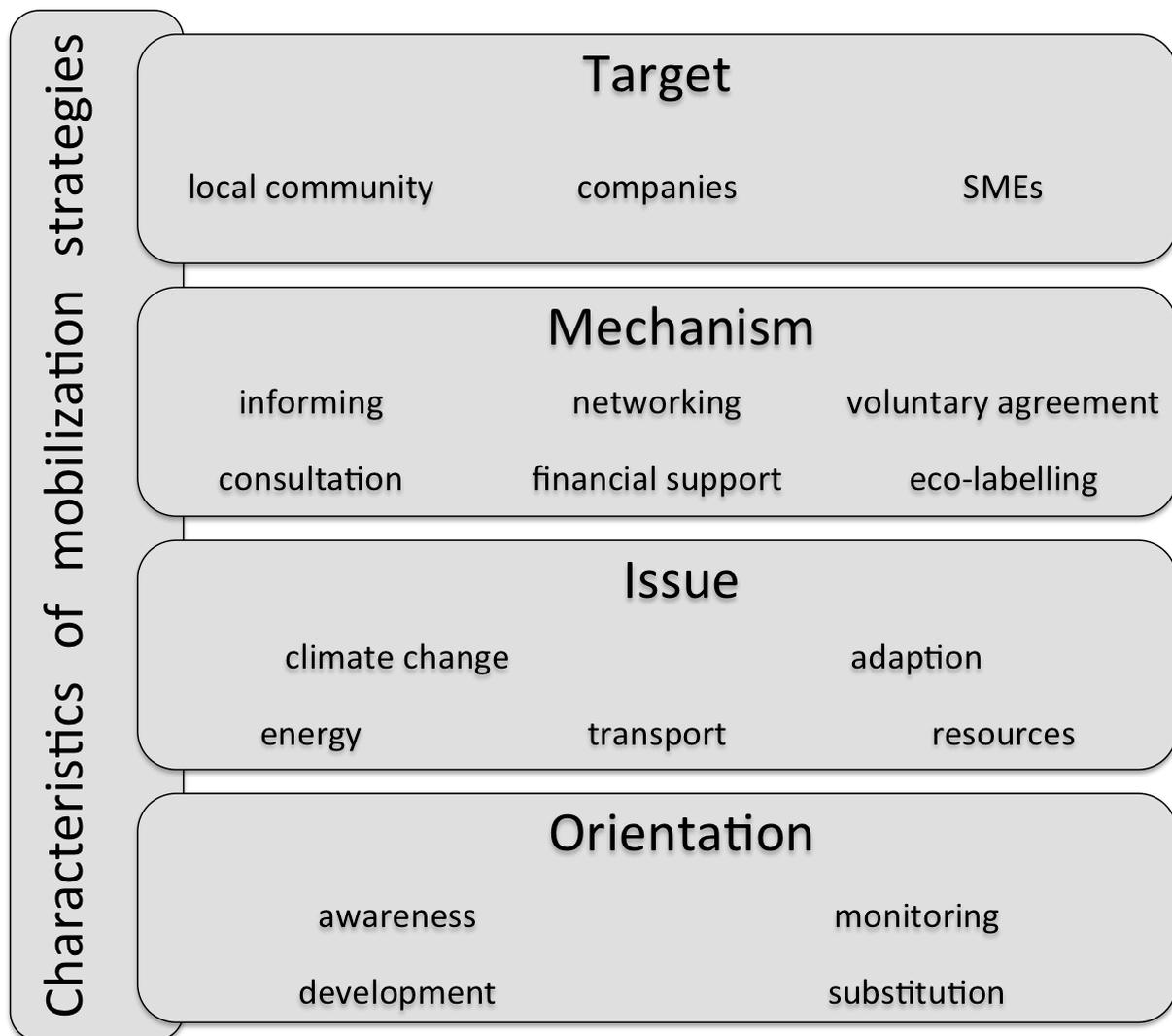


Figure 2: Characterization of mobilization strategies

2.3.1 Target of mobilization

The first dimension is the target of mobilization. SMEs can be mobilized by addressing different target groups. Promotion can address the local community in general. An example for this is the program 'Rationelle Energieverwendung' in Heidelberg, Germany. This project supports financially natural and legal persons that are starting an energetic renovation of their owned or rented real estate. Furthermore, it also supports the construction of passive houses and the installation of ventilator systems with waste heat recovery (Stadt Heidelberg, 2010).

Another opportunity is that companies are addressed more specifically. A project, which addresses explicitly companies, is the 'Benchmarkpool-Gebäudebetrieb' of the City of Frankfurt am Main, Germany. This project provides key performance indicators of energy use for developers of office buildings. They, in turn, can confront their construction companies, architects etc. with the localized target measures in order to reduce their future primary energy consumption (Energierferat, 2008). Following this, the program can be considered as company and developer specific.

The last opportunity in this dimension is to address SMEs explicitly. As in the last example companies have been addressed, it is also possible to limit their participation through the number of employees or the legal form of an enterprise.

2.3.2 Governance mechanism

The second dimension is the applied governance mechanisms. Within this dimension, informing is the only one with a one-way flow of information. To inform SMEs, various communication means, such as news media, posters or pamphlets, can be used (Arnstein, 1969). This becomes a strong approach, if a lack of knowledge exists. It might be a lack of general knowledge about climate change as shown by Harriet and Bulkeley (2000) or a lack of self-related knowledge as shown above for SMEs and their impact on climate change.

The second approach, which is commonly applied, is networking. Often, this buzzword is used not only to describe the potential of the multiplier effect of pooling resources (Healey, 2006), but also to create a commitment. Whereas this commitment is not necessarily formal, it can lead to an informal one. SMEs, which join a network, build a relationship to other actors and commit to be active informally. An example for this is the German 'Energie-Tische'. This is a meeting point of the government, companies and inhabitants. The program aims to be a platform for discussions about potential climate change mitigation projects (Fischer & Hänisch, n.d.).

During the 'Energie-Tische' program informal agreements can also shift to voluntary agreements, which is another approach. This approach gives companies the opportunity to reach the environmental targets their own way. This gives them more flexibility. Furthermore, a benefit for the government is, that no new regulations are required, which prevents a long-term bargaining process. Nevertheless, threatening with regulations etc. can influence the negotiating process with companies about the preferred targets (Price, 2005).

The fourth type is consultation and training. In this case the municipality offers knowledge to the SMEs (Kern & Alber, 2008). This can be done by their own employees or by external consultants. Whereas the own employees have their strength in traditional governmental tasks as hazard adaptation, the potential of external or especially hired consultants is unlimited. In contrast to informing, this approach includes tailor made and two-way communication (Arnstein, 1969). This approach has its strength in case that SMEs are lacking knowledge to transfer their willingness to act into practice. An example for this is the initiative 'Sustainability at Work' of the City of Portland. This initiative offers tailor-made advices in the field of energy efficiency for various company sizes and sectors (City of Portland, 2014).

The fourth governance technique is financial support. This, so called market-based instrument, includes subsidies or incentives, which aim to support activities of SMEs monetary. This approach lowers the boundaries of investments for companies (Jordan, Wurzel, & Zito, 2005). An example for this approach is the 'Münchener Förderprogramm Energieeinsparungen' of the City of Munich. The program supports buildings owners, developers and energy companies, except public entities, to improve their energy balance and reduce energy loss through, e.g. transformation loss or inefficient energy use (Die Landeshauptstadt, 2013).

Another approach is eco-labelling. Cities have the opportunity to establish either a single-issue label or a multi-issue label. Companies are allowed to use the eco-label to inform their potential costumers, that they meet the requirements of the label. The idea is, that responsible consumer considers this in their purchase decisions and the company will increase their market success (Jordan et al., 2005).

The last opportunity for municipalities is to link these governance mechanisms to approaches of other institutions. An example for this would be the information about Environmental Management Systems (EMSs) of other organizations. Among

others, this could be the environmental management and audit system of the EU or voluntary agreements of the industry with a national state.

2.3.3 Issue

The third dimension is the issue addressed. Municipalities can address the climate change in general or they can address it more explicit.

Environmental non-governmental organizations (ENGOS) performed several general climate change campaigns. Therefore, ENGOS as WWF, Ozone Action, Friends of Earth etc. used powerful pictures of habitats and animals to address the civil society and companies (Gough & Shackley, 2001). This general issue of climate change seems not to be addressed by municipalities in order to mobilize their inhabitants, but it is, nevertheless, an opportunity for them.

Within the more explicit issues, the municipalities can mobilize SMEs to mitigate the effects of climate change or mitigate their effect on climate change. The mobilization, which aims the effects of climate change, aims “[a]nticipatory adaption” (Downing, Ringius, Hulme, & Waughray, 1997, p. 28) of SMEs on expected future hazards. This adaption can be considered as a prevention of climate impacts on stock. In the case the city of Rotterdam, the municipality wants to cooperate with companies to mitigate flooding based damages. Therefore, it promotes the establishment of flood-proofed construction by information and hazard simulation (van Peijpe et al., 2013).

The other mobilization issues aim to mitigate the affects of SMEs on climate change. Suitable issues for this are energy, transport and resources.

An example for a city, which addresses energy is the City of Cape Town (“Energy Efficiency Forum for Commercial Buildings,” n.d.). Their forum for energy efficiency of commercial buildings is an information hub for several economic sectors to reduce their energy consumption. Governmental institutions and best practice examples enable other participants to save energy through practical information.

The example for the issue of transport can be found, again, in Cape Town. The initiative ‘travel SMART’ aims to reduce the use of single occupancy vehicles by giving employers the opportunity to provide information and options to their employees. To reduce the use of the single occupancy vehicle, the city promotes the establishment of public transport, non-motorized transport and the formation of car pools (The Sustainable Transport Unit & City of Cape Town, n.d.).

The last issue to address is resource consumption. The project ‘San Francisco Green Business’ (2009) offers knowledge and technical assistance to reduce the resource consumption, improve reuse of resources and reduce waste production. This will lower the GHG emission in various ways: (1) the transport to the company won’t take place, (2) the resources won’t have to be produced and (3) the landfills polluting less GHG as CH₄ (Boeckx, Cleemput, & Villaralvo, 1996).

2.3.4 Orientation

The last dimension is orientation. Mobilization strategies can increase awareness, monitor current situation, develop stock or substitute stock.

One awareness campaign can be found in Cape Town. The project ‘Climate Smart’ used various campaign elements as T-Shirts, button badges, outdoor advertising etc. to increase the awareness of residents, businesses and other members of the society (Ozinsky, 2012).

Another opportunity is to monitor the current statues. This is often done by EMSs as the ISO 14001 or other systems, which monitor key performance indicators. An example for this can be found in Ningbo. The municipality offers a subsidy to all companies, which apply the Cleaner Production Promotion Act. This act is passed, if

companies monitor their resource consumption and waste production during the production life cycle. The idea is, that companies apply reduction strategies afterwards (Hicks & Dietmar, 2007).

The last two orientations are focusing on stock and will be explained on two issues, energy and resources. When we think about stock, we have two options, we can improve the actual stock or substitute it with another one.

If stock development in the case of energy is considered, the approach is to reduce the energy consumption. This can be done, e.g. by better insulation as shown by the case in Heidelberg, the already mentioned program 'Rationelle Energieverwendung'. Legal entities, which want to reduce the rate of transfer of heat to maximal $0.20 \text{ W/m}^2\text{K}$, can apply for funding. This will reduce the CO_2 emission by reducing heating (Stadt Heidelberg, 2010). An easy example for resource reduction can be found in the example of San Francisco. Its green business initiative wants to reduce the paper consumption by promoting two-sided printing in offices (San Francisco Green Business, 2014).

Another opportunity is improvement via substitution. In the case of electric energy this would be a shift from conventional energy sources towards renewable or nuclear energy sources. Once again, this kind of mobilization strategy can be found in Cape Town. The City sells to companies purchasing certificates for electricity produced by wind. This allows companies to claim that they purchase renewable energy (City of Cape Town, 2014). For the case of resource use reduction by stock substitution the case of the 'Electric Transport Centre' in the City of Rotterdam is valuable. This institution offers information about electric vehicles for several target groups and offers test rides to companies. The aim is to motivate companies to substitute their petrol engine cars with hybrid cars, plug-in hybrids cars or electric cars. By doing so, the use of petrol shall be reduced, which reduces the CO_2 -emission of transport (Sustainable 2010-2014 Programme Agency & City of Rotterdam/Rotterdam Climate Initiative, 2013).

3 The SME perspective

In the last section an analytical framework for an analysis of SME mobilization strategies has been developed. Now, the motivation of SMEs to participate in such program will be examined in detail. This will allow the identification of match up later on. In general the reasons can be distinguished into objective and normative reasons. Whereas the objective reasons can also be considered as entrepreneurial, the normative reasons go beyond traditional entrepreneurial acting. However, before these reasons have been considered, the entrepreneurial environment of the decision in relation to SMEs will be described.

3.1 Particular entrepreneurial environment

The entrepreneurial environment for participation in mobilization strategies can be distinguished into an external environment and an internal one. The internal environment is characterized by the owner and management hierarchy of a company. The external one is shaped by stakeholders and institutions. All characteristics are important in order to understand the behaviour of SMEs in the field of environmental responsible behaviour.

At first, a view on the stakeholders of an SME is done. This helps to understand the multichannel influences on SMEs and their behaviour. An overview of the stakeholders is provided in figure three.

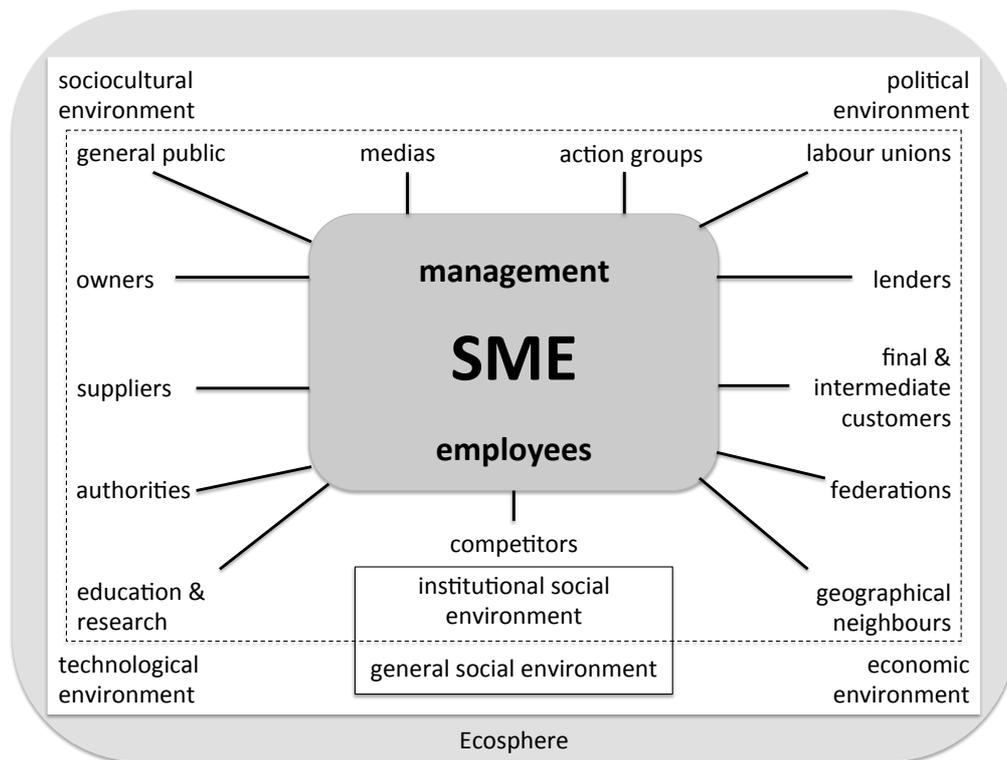


Figure 3: SMEs' stakeholders⁷

If the stakeholders of a company have to be considered, the shareholders have an important role. In the case of SMEs, the number of owners is often limited. Furthermore, the shareholders often have private relationship, e.g. they are members of the same family. However, often shareholders are not just the owner of a SME as they often also manage their company. This leads to a situation that the company is often considered as part of the personal life (Jamali, Zanhour, & Keshishian, 2009; Jenkins, 2004).

The next stakeholder group is authorities, also called state. This stakeholder can be distinguished into several institutions on several levels. The multi-level governance concept fragmented the contact institutions for SMEs. Nevertheless, the different authorities can affect the behaviour of SMEs through regulations, laws etc. (Hooghe & Marks, 2003). However, it seems to be difficult for the state to control the environmental performance in an effective manner due to by the high amount of SMEs (N. Gunningham, 2002).

Another stakeholder group is the one of lenders. In general the amount of potential investors is less for SMEs than for bigger companies. Nowadays, these investors also have an interest in the environmental performance of companies as it is seen as a responsible attitude. This responsible acting becomes even more important if socially responsible investors are considered as they do not invest in companies without social or environmental goals (Jenkins, 2004).

A fourth important stakeholder group is the employees. As SMEs often have troubles to acquire and keep high performer as employees, they have to pay a lot more attention to them (Jenkins, 2006). Often, their relationship with them is characterized as interpersonal with a 'care'-attitude (Jamali et al., 2009).

⁷ (based on Schaltegger & Sturm, 2000, p. 9; translated by author)

Customers are another main stakeholder group. SMEs' customer base is often characterized by the absence of end customers and by a small customer base. This makes them dependent from one strong big company in a supply chain (Jenkins, 2004).

The absence of SMEs on the retail market and their size reduces the importance of other stakeholders. Whereas, nowadays, the press or NGOs often monitor environmental activities of bigger companies, this is not so much the case for SMEs. Nevertheless, these institutions can trigger pressure by monitoring the activities of a main customer. Also the local community does not pressure SMEs as there is a lack of knowledge of their activities (Jenkins, 2004).

In order to gain insights into the internal structures, the importance of the owner, the strategic apex, has to be acknowledged. The apex is both, the decision-maker and driver of implementation. Nevertheless, the apex needs his employees to implement his decisions in order to guarantee a long-term success. The employees become even more important, if the limitation of resources of any kind in SMEs is considered. Often, SMEs have to focus on their survival and the implementation of environmental friendly technologies or behaviour ties up additional financial, humanly and/or material goods (Jenkins, 2004). At first, they have to pay attention to their economic performance indicators, second to their legal performance, than to their ethical and finally to the discretionary performance (Jamali et al., 2009). Following this, activities to mitigate greenhouse gas emission is often seen as an investment against the economic survival and legal performance, if there is no immediate pay off (Jenkins, 2006).

However, often environmental activities in SMEs are notable, but they are not considered and/or claimed as these. This happens because their origin is not a better public image (Jenkins, 2006). Often the reason is based on the 'care'-attitude towards their employees, which is based on the personal relationship with the decision-maker (Jamali et al., 2009).

3.2 Motivation to participate in climate change mitigation programs'

There can be several reasons for SMEs to participate in climate change mitigation programs. The following paragraphs introduce a broad variety of reasons; starting with business, or objective, motivations and ending with normative reasons. Table five gives an overview over the motivations.

Table 5: Motivation of SMEs to participate in climate change mitigation

Category	Reason
Selling market	Customer demands
	Positive image
	Strategy implementation
	Create new market opportunities
Employment	Better working conditions
	Employees' demands
	New employees
Regulations	Prevent regulation
	Access to subsidies
Internal management	Process optimization
	Safe costs
	Predictable costs
	Access to lenders
	Protection of possession
Normative reasons	Local climate change
	Local environment
	Local health
	Global environment
	Global climate change
	Religious reasons

3.2.1 Selling Market

As already mentioned, investments of SMEs in greenhouse gas mitigation have to pay off, preferable in a short term, because it reduces the resource capacities to guarantee the survival of the company. Consequently, it is not surprising that a consideration of the objective reasons for investments in this field starts with the market. As already described above, SMEs often do not operate on end customer markets and are members of a supply chain. Within this supply chain, they are often dependent on one key customer (Jenkins, 2004).

Following this situation Masurel (2007) identifies the demands of customers as one market driven reason to invest in greenhouse gas mitigation. Often the Corporate Social Responsibility (CSR)-strategy of a key client forces SMEs to be active as well. So, it can be considered that they are active to satisfy the demands of the market expectations (Jenkins, 2006). As the customer is focused on the products, this might not include activities of production conditions as insulation of the factory or low-energy technology for computers.

Another reason to invest in climate change mitigation might be the positive impact on the image of a company or a brand (Masurel, 2007). Whereas this is often a reason for bigger companies to pay attention to environmental issues and to advertise these activities, it can be assumed that this is not the case for SMEs. Reasons for this are that SMEs sell less to end customers and positive image is not as important on the supply chain market. Furthermore, SMEs often don't have a brand which they could protect (Jenkins, 2006).

It is also possible to express the values, visions or a strategic direction of a company by mitigation greenhouse gases (Masurel, 2007). In this case, the mitigation might be part of a CSR-strategy. CSR, according to the European Commission (2001, p. 4), is "a concept whereby companies decide voluntarily to

contribute to a better society and a cleaner environment". However, because of lacking resources and opportunities of long-term planning (Wieland & Schmiedeknecht, 2010), this is unlikely.

The last market driven reason for climate change mitigation is to create new market opportunities (Masurel, 2007). This can be done either by adding customers, who require low greenhouse gas emission, or fulfilling a market niche. Especially the market niche becomes likely through the potential of SMEs to step into unknown markets reasoned by their high flexibility (Jenkins, 2006). Another opportunity is to target an already known group and acquire them as customer. Finally, climate change mitigation can lead to publicity by media reports, it is also an useful advertising instrument (Weber, 2008).

3.2.2 Employment

Another reason for SMEs to invest in greener conditions of productions can be to create a better working environment for their employees. As greenhouse gasses often have a negative impact on the health of the employees, the 'care'-attitude of SMEs leads to mitigation of this impacts (Jamali et al., 2009).

As employees expect their companies to face environmental issues, this is another reason for SMEs to mitigate climate change (Masurel, 2007). Stakeholders, including employees, have expectations about companies' behaviour and their role in the society (Dubielzig & Schaltegger, 2005). This includes activities in climate change mitigation.

The next point is also related to these expectations. Companies' activities beyond 'just'-business improve the motivation of the management and the employees (Masurel, 2007). Both are based on an improved reputation of the company. Other reasons for improved motivation might be the better working environment based on health improvement or the perception of having an impact on companies' decisions. This is the case if the program is based on employee consultation (Weber, 2008).

The last employment reason is the attraction of employees. To 'green' a company or a job vacancy increases the likelihood of high skilled applicants (Renwick, Redman, & Maguire, 2013). As SMEs often struggle to attract high skilled employee (Holden, 2007), this is a valuable mean to attract them.

3.2.3 Regulations

Another motivation can be based on regulations. As other companies, SMEs have to face an increasing amount of environmental regulations, laws and commitments. For this reason, companies tend to perform better than the requirements. The idea behind this is that the over performance prevents more regulations (Masurel, 2007). However, SMEs barely caught the attention of governmental organizations (N. Gunningham, 2002) or have the attitude of long-term strategic thinking and acting (Wieland & Schmiedeknecht, 2010). Through this, it is unlikely, that they try to prevent long-term regulations this way.

Another kind of governmental market regulations is subsidies. These subsidies can be a motivation for SMEs to participate (Masurel, 2007). It becomes an important point, if the boundaries' of investment and the financial situation of SMEs' are considered (Jenkins, 2004).

3.2.4 Social responsibility

A SME can also be forced to act socially responsible by the public. In this case, a moral duty can be considered as business decision (Masurel, 2007) as inactivity would be synonymous to a loss of image, customers etc. In contrast to the above-

mentioned reason to improve the image, moral duty can be considered as re-activating and image protecting.

As another reason based in social responsibility the lead in this field can be considered. This lead can be based either on economic or technical innovation (Masurel, 2007).

3.2.5 Internal management

From an internal management perspective techniques, lowering the greenhouse gas emission, can lead to a cleaner workplace. Furthermore, process optimizing can also lead to a clearer and safer workplace structure, (Masurel, 2007).

Another opportunity is to save costs (Masurel, 2007), especially in a long term. This might particularly be the case, if resources as coal and oil are substituted with resources with lower greenhouse gas density such as gas or regenerative energy sources. In Germany, for example, the costs for heavy fuel oils increased by 409.1% from 1995 until 2012 whereas the costs for natural gas just increased by 184.7% in the same period (Bundesministerium für Wirtschaft und Technologie, 2013).

A third reason to mitigate greenhouse gasses might be the predictability of costs. As shown by Pindyck (2003) the volatility of natural gas is lower than the volatility of oil.

A fourth internal management reason is the access to additional funding opportunities by access to more lenders. As some investors require 'green' certificates or EMSs, this enables SMEs to generate investments from additional investors. However, these are not just requirements of some 'green' investors; also traditional investors require such information (Weber, 2008).

The last internal management reason is the protection of the company itself and its distribution means. The threats of climate change are especially important to SMEs because of a "lack of planning, vulnerability to cash flow interruptions, lack of capital for recovery, ineffectual interactions with national agencies, infra-structure problems, individual attitudes and organisational culture, access to expertise, business sector and perceived exposure to risk" (Ingirige et al., 2008, p. 584). Furthermore, they are often unable to insure their potential losses (Ingirige et al., 2008). This raises the importance for SMEs to adapt to climate change effects such as storm surges, droughts etc.

3.2.6 Local climate change

Another reason to reduce the greenhouse gas emission might be found apart from entrepreneurial thinking and acting. Normative reasons are based on the beliefs and values of the company, its staff, especially the managers, or its owner. The importance of this reason becomes clear if it is considered, that decisions in companies are based on subjective and intersubjective values. If the values go beyond business activities, the decisions go beyond as well (Schaltegger & Sturm, 2000, p. 18). However, as these values are not only subjective but also intersubjective, they can not be considered as totally detached from other stakeholders (Neil Gunningham, Kagan, & Thornton, 2004; Schaltegger & Sturm, 2000, p. 18).

As already described, climate change can lead to a locally increased frequency and strength of heat waves and droughts. Another aspect is the arise of heavy rainfall and a rise of the sea level (Revi et al., 2014). Following this, the prevention of local effects of climate change can be a reason for companies' activities.

3.2.7 Local environmental and health protection

Protecting the local environment can be one normative reason for companies to mitigate their greenhouse gas emission. Mostly, these reasons are based on own experiences and local media (Moser & Tribbia, 2006). Additionally, national media can also increase the awareness of local issues, if they report on national issues (Sampei & Aoyagi-Usui, 2009).

Anthropogenic emission of the greenhouse gas NO_x occurs through the combustion of fuel or biomass and production processes. Apart from the possible effects on climate change, this gas can also cause effect the environment. A high nutrient concentration can lead to damages of the local flora. Moreover, this emission can cause an acid rain, which can affect the environment beyond the local. This acid rain is also harmful for the human health as it leads to an acidification of lakes and rivers (Constantionos et al., 2010a, p. 47).

Non-methane Volatile Organic Compounds are one cause of ground-level ozone. Volatile Organic Compounds, as methane, are mainly emitted by the agriculture sector. Transportation, industrial processes and organic solvents cause non-methane, as benzene, xylene, propane and butane. The ground-level ozone is harmful for the vegetation, fauna and human beings (Constantionos et al., 2010a, p. 47).

Apart from these emission related issues, local climate change, as described in 3.3.1 can also lead to local environmental and health damages. The increased average temperature, arisen of heat waves and an increased, can lead to heat-related problems and higher mortality rates, because of infectious diseases and wide temperature ranges within a short space of time (Patz, Campbell-Lendrum, Holloway, & Foley, 2005). The droughts and the rainfalls can arise water-related diseases. And finally, the rise of the sea level leads to erosion on the coast and on rivers, more storm surges, which affect for population, coastal vegetation, ecosystems and property (Constantionos et al., 2010a, p. 47).

Furthermore, the climate change can have an impact on local animals and their habits. Some species adapt their behaviour; others disappear in their natural regions or appear in regions were their could not be found before (Parmesan, 2006).

3.2.8 Global environmental protection

Another normative motivation can be found in the global climate change discussion. NGOs and mass media run strong campaigns in the past in order to to strengthen the awareness of climate change related problems. Therefore, NGOs use strong pictures of protected species in order to transfer the scientific knowledge to the general public. The media also presents these pictures as the NGOs are well connected with them (Hall & Taplin, 2007). With this strategy, they are able to reach nearly every part of the society, and in line with that, all kinds of companies. Furthermore, they inform the majority of a country about climate change related issues in other parts in the world (Sampei & Aoyagi-Usui, 2009).

3.2.9 Religious and ethics reasons

The last reason to mitigate greenhouse gas emission can be found in religion. As shown by Vives (2006), this is an important reason for SMEs. The reason for the importance is that they can affect discussion through opinion-leaders and influence the broad majority through their directives (Posas, 2007). Nevertheless, it has to be acknowledged that these interpretations are mainly based on the opinions of environmentalists and are not representative for the entire religious community of each religion.

If we consider the Christian directives, it can be interpreted that an ecological side is added to the economy. The planet as kingdom of God introduces creatures as representatives of God. Following this, it is not allowed to treat them badly. Furthermore, every human is dependent on God's mercy and judgment. With this in mind, it follows, that the nature has to be treated sustainably (McFague, 2001).

The Jewish ideal of tikkun olam, which means repair the world, claims justice for everything on God-given land. This ideal also applies for the physical environment and other species. Furthermore, the land offers the basic needs to its' inhabitants, but just, if they are aware of justice toward this land, otherwise, the benefits will be removed (Tirosh-Samuels, 2001). Following this, the effects of greenhouse gas emission on the nature are not acceptable as it risks the re-movement of the God given benefits of land.

The Islamic religion describes the humans as the best of God's creatures. Nevertheless, they're not allowed to use this status to exercise power over it, it rather means that they are responsible for their acting in relation to each other and nature. Furthermore, nature is seen as something, which is required for human live and, following this, it has to be protected (Haq, 2001).

For Hindus their body has an organic connection to the earth, as it is a goddess. Due to this, the flora, the fauna and the earth itself are not allowed to be destroyed by humans (Narayanan, 2001).

Buddhist environmentalists have a special relationship to forests as Buddhas' enlightenment took place under a tree. Following this, they see nature as the basis of humans' flourishing. Furthermore, they see interdependence between nature, humans and enlightenment (Swearer, 2001).

4 Research Method

After the theoretical background of the research has been set, this chapter will provide a look into the research method. In general, the research requires two different kinds of data. The characteristics of the programs for climate change mitigation in the context of the 'UmweltPartnerschaft' are the first required data set. The second set investigates the motivation of the participants. To identify a potential connection between these two data, a statistical connection will be tested.

4.1 Research method characteristics' mobilization strategies

The data required to characterize the programs for climate change mitigation are qualitative. This qualitative data are developed through the employees of the city as they develop the mobilization strategies. The design of each program can be either provided through the people who developed the program, through people who deal with the program in their daily work or through documents describing the programs.

For this research, the data has been accessed through funding guidelines and brochures. The reason for this is, that a subjective interpretation of a professionally involved person can be ruled out. Additionally, the funding guidelines can be considered as 'hard' as they are standard procedure descriptions. Through their standardizing character, they are independent from individual applications as the investment bank is not able to generate a cash flow if the requirements in the description are not met.

The 'UmweltPartnerschaft' consists of 19 different mobilization strategies (see figure four). The high amount of different programs allows a broad variety of characteristics for programs in a geographically small area. The local limitation of the strategies on the area of the City of Hamburg lowers locally dependent influences on the programs, the companies and their motivation. Moreover, the impact of different cultural backgrounds on the perception of the characteristics by the companies is mitigated.

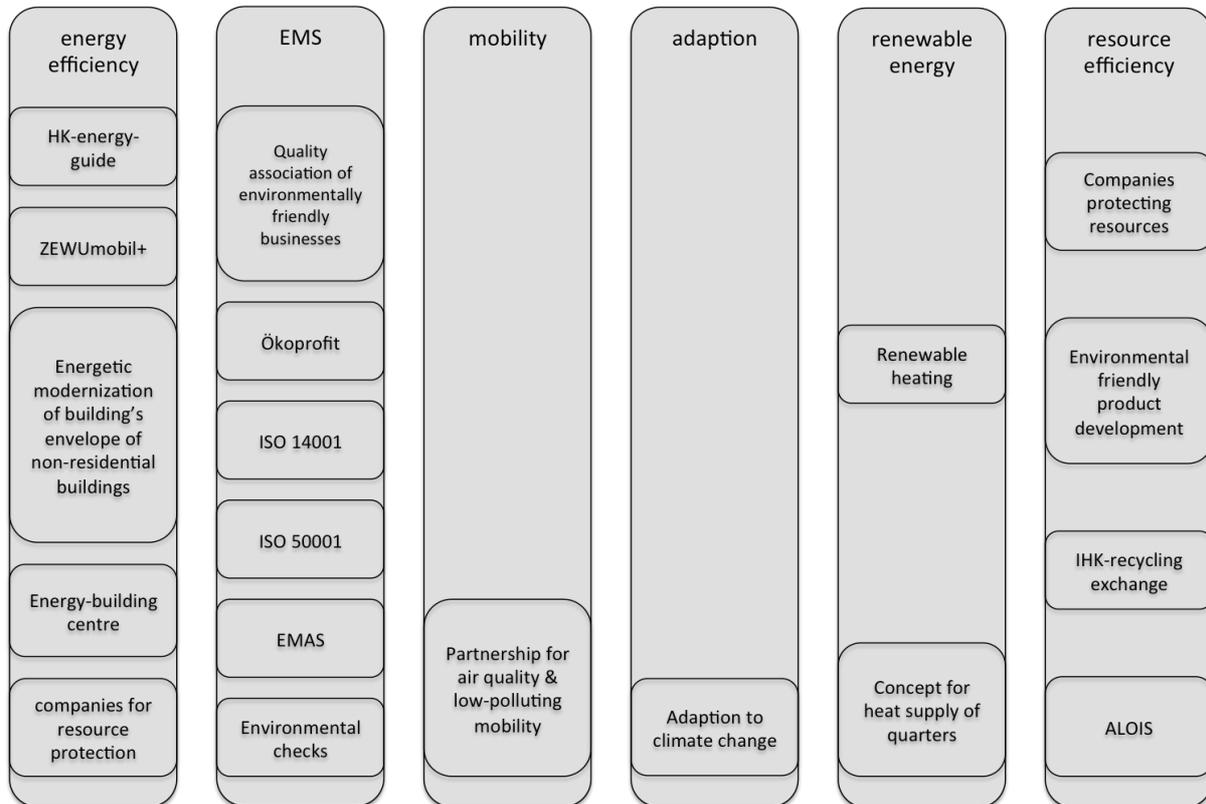


Figure 4: Programs for SME mobilization of 'UmweltPartnerschaft'

4.2 Research method for SMEs' motivation

The motivation of SMEs is represented by qualitative data. Internal stakeholders, e.g. owner or employees, can provide this information. In general, it can be assumed that an internal stakeholder with decision-making authority has a high significance. However, in case of SMEs also other members can provide such information as information flows easily from top to down (Jenkins, 2004).

To get access to their reasons to participate two approaches are possible. Option one is an interview and option two is a survey. Whereas the interview allows the researcher to get a broader understanding of the motivation of the investigated companies, the applied approach of questionnaires' allows asking more participants. Furthermore, standardized data can be created easily, which allows to transfer qualitative data into quantitative ones (Evans & Mathur, 2005).

It has to be acknowledged, that multiple reasons exist for a company to participate in a climate change mitigation program. For this reason, it is possible for the companies to name several motivations.

To identify the motivation of SMEs' to participate in climate change mitigation programs the 'UmweltPartner' of Hamburg has been chosen. 'UmweltPartner' are economic organizations, which participated in the project 'UmweltPartnerschaft' of the City of Hamburg. Furthermore, they have to be especially engaged in the programs. Following this, being an 'UmweltPartner' could be considered as an eco-

label. During the ten years of the program, 955 legal entities received this label (Hamburg.de, 2014). The legal entities are companies from various sizes, foundations and associations. From these 955 legal entities, 144 don't meet the criteria of a SME as presented in paragraph 2.2.1. Following this, the population of the research consists of 811 entities, which can be considered as pre-defined target group. The invitations to the survey have been sent via mail. Through these characteristics the survey can be considered as a probability-based mail survey (Andrews, Nonnecke, & Preece, 2003).

5 Data

In this chapter, the generated data will be presented and prepared for the final analysis. Therefore, the sample will be described, the programs will be analysed towards their characteristics and a statistical connection between the motivations of the participants and the characteristics of the programs will be proofed.

5.1 Description of the sample

In total 81 enterprises participated in the research. With the above-mentioned population of 811, the sample corresponds to a share of 9.99%. As shown in table five, 18 (22.2%) companies can be considered as small companies through their legal entity and 63 (77.8%) as medium sized. If the number of employees defines the size of a company according to the earlier mentioned definitions of the EU, 26 (32.1%) companies are micro enterprises, 37 (45.7%) are small sized and 14 (17.3%) are medium sized. If considered the definition of the USA, four additional companies (4.9%) meet the criteria of a SME.

Table 6: Distribution of size of company

Legal form	Frequency	%	Number of employees	Frequency	%
small enterprise	18	22.2	<10	26	32.1
			<50	37	45.7
medium enterprise	63	77.8	<250	14	17.3
			<500	4	4.9
Total	81	100.0	Total	81	100.0

Another opportunity is to describe the sample among the economic sector. As shown by table seven 0 participant can be aligned to the primary economic sector, 28.4% can be aligned to the secondary, 51.9% can be aligned to the tertiary sector and 19.8% can be aligned to the quaternary sector.

Table 7: Distribution of economic sector

Economic sector	Frequency	%
Primary	0	0
Secondary	23	28.4
Tertiary	42	51.9
Quaternary	16	19.8
Total	81	100.0

Table eight shows the distribution of the sample in relation to the question of the held position within the company. It has to be noticed, that this question has not been answered by all participants. Due to that, the sample size for this question is 80. However, most of the participants of the research are employees (30.9%). Nevertheless, the majority of the participants have decision-making authority (owner & CEO: 22.2%, CEO: 1.3%, share holder: 14.8%, share holder & CEO: 1.2% and upper management: 2.5% and with focus sustainability: 6.2%). 9.0% of the participants are especially assigned to sustainability (9.9%).

Table 8: Distribution of position held within the company

Position held within the company	Frequency	%
Owner & CEO	18	22.2
CEO	1	1.3
Employee with focus sustainability	8	9.9
Share holder	12	14.8
Owner	8	9.9
Upper management with focus sustainability	5	6.2
Employee	25	30.9
Share holder & CEO	1	1.2
Upper management	2	2.5
Total	80	100

The amount of participated programs per company is another way to distinguish the participants. The 81 companies participated in 170 programs as most companies participated in more than one program. The mean of the number of programs a company participated in is 2.099 and the median is two. The minimum amount of programs a company participated in is one and the maximum is eight. Furthermore table nine shows that most companies participated in one (40.7%), two (33.3%) or three (17.3%) programs. In the category of four, five and eight participated programs two (2.5%) companies can be identified in each program. One company (1.2%) participated in seven programs and none in six.

Table 9: Distribution of sum of participated programs

Sum of participated programs	Frequency	%
1	33	40.7
2	27	33.3
3	14	17.3
4	2	2.5
5	2	2.5
6	0	0
7	1	1.2
8	2	2.5
Total	81	100

A final description of the sample is given by the distribution of the companies among the programs. The mean of companies per program is 9.444 and the median is 7.5. The minimum is 0 in the case of ALOIS and the maximum is 29 in the case of environmental checks. Further distributions of companies per programs are presented in table ten.

Table 10: Distribution sum of participants per program

Program	Number of participants	%
Adaption to climate change	9	5.3
Energy-building centre	15	8.8
ALOIS	0	0
EMAS	2	1.2
Energetic modernization of building's envelope of non-residential buildings	4	2.4
Renewable heating	8	4.7
IHK-recycling exchange	2	1.2
ISO 14001	8	4.7
ISO 50001	2	1.2
Partnership for air quality & low-polluting mobility	16	9.4
Quality association of environmentally friendly businesses	6	3.5
Environmental checks	29	17.1
Environmental friendly product development	7	4.1
Companies protecting resources	28	16.5
Concept for heat supply of quarters	1	0.6
ZEWUmobil ⁺	3	1.8
Ökoprofit	19	11.2
HK-energy controller	11	6.5

5.2 Analysis of the programs

In this section each program will be analysed through the characteristics discussed in section 2.3. To identify the characters, a short description of the program will be given. It has to be acknowledged, that each dimension can have just one characterization through statistical reasons. The characterization can be found in the end of each description.

5.2.1 Energetic modernization of building's envelope of non-residential buildings

The program energetic modernization of building's envelope of non-residential buildings aims to improve the insulation of houses' facades. The aim is, to reduce the energy consumption for heating within the buildings. In line with this the production of CO₂ will be reduced. The program is designed for owners of buildings or natural and legal people with the decision-making authority. State owned or public companies buildings are excluded from the program. The monetary support is not just provided for the physical modernization, but also for energy consulting, the initiation of an energy review and the hiring of consultants in this sector. The subsidies themselves will be provided by the Hamburgische Investitions- und Förderbank (Hamburg's Bank for Investment and Development). The maximum amount is 150,000 EUR per building if they are used for the modernization. The subsidies are 10% of the total investment costs. If the subsidies are used for energy consulting or an energy review, 50% (maximum amount 5,000 EUR) will be paid. In case of a small (+ 20%) or medium sized (+ 10%) companies the rate of support is increased. If a company wants to get access to the subsidies for energy consultation, they can receive 50% of the costs (maximal 5,000 EUR). The last opportunity is to receive money for insulation

materials with the mark of quality RAL-ZU 132 respectively 140 or the natureplus-mark. In this case, 10 EUR per m² can be granted (Hamburgische Investitions- und Förderbank, 2014a).

Table 11: Characterization energetic modernization of building's envelope of non-residential buildings

Dimension	Characterization	Description
Target	Companies	For non-living houses
Mechanism	Financial support	Share of investment costs (e.g. subsidies for the modernization of the facade)
Issue	Resources	Energetic modernization of the façade, Energy report DIN V 18599 and independent expert for the above things is supported
Orientation	Development	Improving of existing houses

5.2.2 Energy-building centre

The energy-building centre is a first-contact information centre for energetic related improvements. It provides information for already established and planned buildings. Information about installation engineering, facade and energy supply is provided. Owners and professionals can also get access to information about related incentives etc. (EnergieBauZentrum Hamburg, n.d.-a, EnergieBauZentrum Hamburg, n.d.-b).

Table 12: Characterization energy-building centre

Dimension	Characterization	Description
Target	Local community	House owners and professionals as architects, planer etc.
Mechanism	Informing	Initial information provided
Issue	Resources	Facade, heating system information
Orientation	Development	Existing buildings or existing plans

5.2.3 Companies protecting resources

The program 'Companies protecting resources' is for manufacturing and service companies, craftsman's establishments and other organizations. The program consists of approaches to reduce greenhouse gasses directly or through resource consumption. The amount of the provided funding is calculated on the basis of saved tones CO₂, tones of material or m³ water per year. Companies can apply for the maximum amount of 100,000 EUR, which can be calculated based on the values of table thirteen. The basis for the calculation of t CO₂ are for electricity 0.556 kg CO₂/kWh, for natural gas 0.201 kg CO₂/kWh and for heating oil 0.268 CO₂/kWh (Hamburgische Investitions- und Förderbank, 2014d).

Table 13: Calculation subsidies for companies protecting resources⁸

Technic	Point of reference	Point of reference
Other electric drives	≤ 40 t 500 EUR pro t CO ₂	> 40 t 100 EUR pro t CO ₂ + 16,000 EUR
Compressed air	≤ 20 t 800 EUR pro t CO ₂	> 20 t 100 EUR pro t CO ₂ + 14,000 EUR
Cold	≤ 40 t 700 EUR pro t CO ₂	> 40 t 100 EUR pro t CO ₂ + 24,000 EUR
Combined heat and power unit > 20 KW (IT)	≤ 50 t 600 EUR pro t CO ₂	> 50 t 60 EUR pro t CO ₂ + 27,000 EUR
Heat generation	≤ 50 t 500 EUR pro t CO ₂	> 50 t 30 EUR pro t CO ₂ + 23,500 EUR
Heat recovery	≤ 50 t 500 EUR pro t CO ₂	> 50 t 60 EUR pro t CO ₂ + 22,000 EUR
Radiant heating	≤ 50 t 400 EUR pro t CO ₂	> 50 t 30 EUR pro t CO ₂ + 18,500 EUR
Ventilation	≤ 20 t 700 EUR pro t CO ₂	> 20 t 100 EUR pro t CO ₂ + 12,000 EUR
Saving of material	≤ 10 t 5,000 EUR pro t	> 10 t 50,000 EUR
Water	≤ 3,000 m ³ 10 EUR pro m ³	> 3,000 m ³ 0.4 EUR pro m ³ + 28,800 EUR
Integrated projects	120 EUR pro t CO ₂	

Table 14: Characterization companies protect resources

Dimension	Characterization	Description
Target	Companies	Manufacturing and service companies, craftsman's establishment and other organizations
Mechanism	Financial support	Technic specific support as shown in table 7
Issue	Resources	Protecting resources
Orientation	Development	Improvement of existing technic

5.2.4 Environmental friendly product development

'Environmental friendly product development' is a program that supports innovation in relation to end consumer consumption. It is developed for single companies or cooperation projects of multiple partners, e.g. companies and research institutes. It is

⁸ (Hamburgische Investitions- und Förderbank, n.d., p. 2; translated by author)

possible to get partial funding for projects, which aim to save resources and emissions through products, production processes or service improvements. Furthermore, the focus of the innovation project of the applying company should be resource efficiency of the production process, the use of recycled material or the degree of recyclability of used material. The funding can be provided for personnel and material costs, patents and external services. The maximum share of supported investment costs of a project is 80% and the sum is 500,000 EUR. For projects in the experimental development field, the share for enterprises with less than 50 employees is 45%; for companies with less than 250 employees it is 35% and for enterprises with more than 250 employees it is 25% (Hamburgische Investitions- und Förderbank, 2014c).

Apart from the monetary support also consultation is provided. Additionally, the City of Hamburg offers access to various external consultants. Therefore, the City pays the costs of the consultants (Freie und Hansestadt Hamburg Behörde für Stadtentwicklung und Umwelt, 2014).

Table 15: Characterization environmental friendly product development

Dimension	Characterization	Description
Target	Companies	Companies, not further specified
Mechanism	Financial support	Funding for personnel and material costs, patents and external services
Issue	Resources	Focus on resource efficiency within the production process, the use or the degree of reusable material
Orientation	Substitution	New products or production process

5.2.5 IHK-recycling exchange

Whereas the recycling exchange stock of the German Commercial and Industry Chamber is not provided by the City of Hamburg, it is still listed in the promotion documents about the program 'UmweltPartnerschaft'. This exchange informs companies about the possibility to purchase or sell recyclable material (Geschäftsstelle UmweltPartnerschaft Hamburg, 2013).

Table 16: Characterization IHK-recycling exchange

Dimension	Characterization	Description
Target	Companies	In general everybody; through the German Commercial and Industry Chamber as offering institution specifically for companies
Mechanism	Informing	Promotion of external offer
Issue	Resources	Establishment of recycling market
Orientation	Awareness	Use of recycled materials

5.2.6 Soil, rubble and component exchange ALOIS

'ALOIS' is comparable program to the 'IHK-recycling exchange' as it is also, a stock exchange. However, 'ALOIS' is an exchange for soil, rubble and components. The provinces Hamburg, Hessen, Rhineland-Palatinate and North Rhine-Westphalia host 'ALOIS', but it is run by the German Commercial and Industry Chamber. Whereas the

provinces offer the exchange for all natural and legal entities (Landesamt für Natur Umwelt und Verbraucherschutz Nordrhein-Westfalen, n.d.), the City of Hamburg addresses just companies (Geschäftsstelle UmweltPartnerschaft Hamburg, 2013).

Table 17: Characterization "ALOIS"

Dimension	Characterization	Description
Target	Companies	Companies are addressed
Mechanism	Informing	Promotion of external offer
Issue	Resources	Establishment of recycling market
Orientation	Awareness	Use of recycled materials

5.2.7 Renewable heating

The program 'Renewable heating' aims to reduce the consumption of non-renewable energy sources. Therefore, financial support is provided for the installation of solar thermal energy systems and the replacements of heating systems. Furthermore, the program supports the use of bioenergy and heat grids. The funding can be provided to landowners, companies and comparable organizations. In detail, funding is provided for following solar thermal and heating system related constellations:

- Existing residential buildings
 - o heat supporting systems of detached and semidetached houses
 - o hot water installations of buildings with at least three flats
 - o installations which feed into the heat grid, if their focus is a house
- Existing and new non-residential buildings
 - o installations for process heat and/or cold
 - o installations which feed the heat grid
- Existing non-residential buildings
 - o heating or warm water supporting installations which feed the heat grid, if their focus is an existing building
- Solar heating monitoring for new solar thermal systems

The subsidy for the solar thermal systems is 100 EUR/m² entry surfaces of the collectors. If the collectors' surface is more than 200 m², the level of the subsidies will be decided individually. The support for the monitoring is 1,750 EUR for installations with an aperture area between 20 and 100 m² and 2,600 EUR if the aperture area is between 100 and 200 m². For installations with a bigger aperture area the amount of subsidies will be decided individually. The replacement of the heating system with a wood pellet heating system can be supported with at least 1,500 EUR and at most 7,500 EUR. Therefore, 90 EUR/m² will be provided. If the system is replaced with a natural gas heating, an oil heating or a heat pump, the provided funding is between 1,000 and 5,000 EUR with a calculation basis of 60 EUR/m². In the case of bioenergy and the heating grid, automatic systems with at least 100 kW can be supported. Therefore, 45 EUR/kW for wood pellet or wood chip heating systems can be provided. If the installation has more than 500 kW, the subsidies can differ. Furthermore, following values (with 11% oxygen) are the allowed maxima:

- Dust: 40 mg/Nm³
- CO: 150 mg/Nm³
- All kinds of C: 10 mg/Nm³
- NO_x: 250 mg/Nm³

It is also possible to get subsidies for vegetable oil cogeneration power stations biogas plants with a direct connection between the biogas production and use. In this case, the level of the subsidies is decided individually but it is at least 600 EUR. This

minimum level is also applied for local heating grids' conversion units and distribution systems. The total amount is given by the length of the grid as 30 EUR/m will be provided (Hamburgische Investitions- und Förderbank, 2014b; Köhler, 2012).

Table 18: Characterization renewable heating

Dimension	Characterization	Description
Target	Local community	partly for residential, partly for non-residential and partly for all kind of houses
Mechanism	Financial support	Project dependent monetary support
Issue	Resources	Heating related resources
Orientation	Development	Replacement of heating system or parts of it

5.2.8 Concept for heat supply of quarters

The City of Hamburg uses also their concept of quarter development to motivate SMEs to participate in climate change mitigation. Among other aims, 'RISE', a framework for integrated district development, wants to integrate the dwellers in the process of infrastructure improvement through decentralization of the energy and heat production. In this case, dwellers include all kinds of natural and juristic persons. Financial support can be provided in case of unprofitable investment costs, investment preparation and supporting costs. Additional, support can be provided for non-investments over a period of seven years as long as they are considered as start-up furtherance. In general, the funding can cover up to 50% of the costs for a project. However, in some cases even up to 100% of the costs can be provided. The aim of the funding is to improve existing structures and infrastructures in order to increase the quality of life (Amt für Wohnen, Stadterneuerung und Bodenordnung, Abteilung Integrierte Stadteentwicklung, 2013).

Table 19: Characterization concept for heat supply of quarters

Dimension	Characterization	Description
Target	Local community	dwellers
Mechanism	Financial support	Subsidies for investment and non-investment costs
Issue	Resources	Heat production
Orientation	Development	Improving existing structure and infrastructure

5.2.9 Partnership for air quality & low-polluting mobility

Based on the mutual agreement between the Ministry of Urban Development and the Environment, the Ministry of Economy, Transport and Innovation, the Chamber of Commerce Hamburg and the Chamber of Crafts Hamburg the parties agree to increase the awareness for the subject of air quality within the local economy and population. Furthermore, they agree to increase the communication of the subject low-polluting mobility (Behörde für Stadtentwicklung und Umwelt, Behörde für Wirtschaft Verkehr und Innovation, Handelskammer Hamburg, & Handwerkskammer Hamburg, 2012). As part of this agreement the City of Hamburg provides advices for companies to reduce their traffic related air pollution. The advices are:

- providing information about the public transport
- offering the payment of passes for the local transport

- improving the facilities for bikes
- triggering carpooling and car sharing
- replacing company cars with low-emission cars
- installing particle filters
- applying a management system for the fleet (Behörde für Stadtentwicklung und Umwelt, 2012)

Table 20: Characterization partnership for air quality & low-polluting mobility

Dimension	Characterization	Description
Target	Companies	Agreement with chambers
Mechanism	Informing	Subsidies for investment and non-investment costs
Issue	Transport	Low-polluting mobility
Orientation	Awareness	Increase the awareness by providing advices

5.2.10 Quality association of environmentally conscious businesses

The program ‘Quality association of environmentally friendly businesses’ is an environmental and quality management system for small sized handcrafts and commercial companies. The aim is to reduce the waste, the wastewater production and the operation resources consumption. Furthermore, environmental law consultation can be provided. Therefore, experts visit the companies and provide a tailor-made strategy to improve the companies’ performance. The costs for the audit are dependent on the size of the company (Behörde für Stadtentwicklung und Umwelt, n.d.-b).

Table 21: Characterization quality association of environmentally conscious businesses

Dimension	Characterization	Description
Target	SME	Small sized handcrafts
Mechanism	Consultation	Experts provide tailor-made advices
Issue	Resources	Reduce of waste and wastewater and operation resources consumption
Orientation	Monitoring	Audit and management system

5.2.11 ‘Ökoprofit’

‘Ökoprofit’, an ecological program for integrated environmental technology, is a club managed by the City of Hamburg. The club provides management systems for ecological optimization of companies. Furthermore, the club offers a platform for knowledge exchange between companies. Therefore, the members themselves set the agendas for meetings and the City covers the costs. The aim is to reduce the impact of the companies on the environment by reducing waste and resource consumption. Apart from the ecological aspect, the companies try to reduce their operating costs (Geyer, 2011). The primary target of this program is medium sized companies (Behörde für Stadtentwicklung und Umwelt, 2013).

Table 22: Characterization 'Ökoprofit'

Dimension	Characterization	Description
Target	SMEs	Primary objective medium sized companies
Mechanism	Consultation	Management system
Issue	Resources	Reduce of waste and wastewater and operation resources consumption
Orientation	Monitoring	Audit and management system

5.2.12 ISO 14001

ISO 14001 is another EMS. However, whereas the target group of the prior one was small, mostly local acting companies, the ISO 14001 aims international acting companies. The reason for this difference is, that ISO 14001 is a certification with international standards. Following this, it offers a benefit to companies in all national markets as they can advertise with the certification everywhere. To increase the amount of companies, which implement a management system and apply the ISO 14001, the City of Hamburg provides information related to the implementation (Behörde für Stadtentwicklung und Umwelt, 2013). The specific aim of the ISO 14001 is that the applicant fulfils legal environmental requirements and monitors and improves their environmental performance ("ISO 14001:2004 - Environmental management systems -- Requirements with guidance for use," 2008).

Table 23: Characterization ISO 14001

Dimension	Characterization	Description
Target	Companies	International acting companies
Mechanism	Informing	Information about the implementation
Issue	Climate change	Improve general environmental performance
Orientation	Monitoring	Audit and management system

5.2.13 ISO 50001

The ISO 50001, or in Germany previously known as DIN EN 16001, is comparable to the ISO 14001 in one main aspect. As the ISO 14001, the ISO 50001 targets internationally acting organizations through a international standardization. However, whereas the ISO 14001 targets all sizes of companies, the ISO 50001 targets middle and large sized ones (Behörde für Stadtentwicklung und Umwelt, 2013). Additionally, the focus is more specific as the ISO 50001 focuses on the consumption of electric energy ("ISO 50001:2011 - Energy management systems -- Requirements with guidance for use," 2011). To trigger the participation of companies in this program, the city suggests the guideline of the Federal Ministry of the Environment, Nature Conversation and Nuclear Safety. Moreover, information about potential financing opportunities is provided (Behörde für Stadtentwicklung und Umwelt, 2013).

Table 24: Characterization ISO 50001

Dimension	Characterization	Description
Target	Companies	Medium and large sized companies
Mechanism	Informing	Providing of a guideline
Issue	Energy	Focus on consumption of electric energy
Orientation	Monitoring	Audit and management system

5.2.14 EMAS

'EMAS', the Eco-Management and Audit Scheme based on EU-Regulation 1221/2009, is another EMS. 'EMAS' aims to improve the environmental performance of organizations by on-going monitoring of relevant environmental performances. Furthermore, organizations have to publish their environmental key performing indicators and start a dialogue about them with their stakeholders. The member states of the EU are responsible for organizational aspects of 'EMAS' (European Parliament and the Council, 2009). In Germany, this responsibility is shifted from the federal state to the local level. Due to this responsibility, the City of Hamburg has to manage this EMS ("Umweltaudit - EMAS Hamburg," 2014). Whereas 'EMAS' in general offers small companies the opportunity to apply it (European Parliament and the Council, 2009), Hamburg indicates medium and large sized (Geschäftsstelle UmweltPartnerschaft Hamburg, n.d.), international oriented (Behörde für Stadtentwicklung und Umwelt, 2013) companies as its target group.

Table 25: Characterization EMAS

Dimension	Characterization	Description
Target	Companies	Medium and large sized companies with international orientation
Mechanism	Eco-labelling	Manages organizational aspects of an EMS
Issue	Climate change	General environmental performance
Orientation	Monitoring	Audit and management system

5.2.15 Adaption to climate change

To trigger adaption to climate change by companies the City of Hamburg informs them about possible developments and related consequences. Additionally, the City also provides information about potential subsidies of other organizations such as the federal state or the EU. This information is provided on events organized by science organizations like 'KLIMZUG-NORD' or the members of the Northern German Climate Office (Norddeutsches Klimabüro) (Behörde für Stadtentwicklung und Umwelt, 2013).

Table 26: Characterization adaption to climate change

Dimension	Characterization	Description
Target	Companies	Not further specified
Mechanism	Informing	Information about the consequences of climate change and funding opportunities
Issue	Adaption	Possible subsidies for adaption
Orientation	Awareness	General information and possible solutions

5.2.16 HK-Energy-Controllers

The program 'HK-Energy-Controllers' (HK-Energie-Lotsen) is run in cooperation with the Chamber of Commerce Hamburg. Whereas the Chamber offers the expertise, the City pays the costs. This program offers consultation for SMEs to reduce their electric energy consumption. Therefore, consultants develop a tailor-made advice for the company to improve their performance and lower the operating costs (Chamber of Commerce Hamburg, n.d.; "Energiekosten im Unternehmen senken - Handelskammer Hamburg," n.d.).

Table 27: Characterization HK-Energy-Controllers

Dimension	Characterization	Description
Target	SMEs	SME specifically named
Mechanism	Consultation	Consultants develop tailor-made plans
Issue	Energy	Electric energy consumption
Orientation	Development	Improvement of actual infrastructure

5.2.17 ZEWUmobil⁺

As the 'HK-Energy-Controllers', the 'ZEWUmobil⁺' is cooperation project with a chamber; in this case it's a cooperative project with the Chamber of Crafts Hamburg. However, it is not just the Chamber that is different. Whereas the focus of the 'HK-Energy-Controllers' is just electric energy, in this case the focus is resource and electricity efficiency. Additionally, consultants are also able to offer knowledge about mobility related issues. However, the focus of the program is resource consumption (ESF-Projekt ZEWUmobil⁺, n.d.). The target group of this project is SMEs (Geschäftsstelle UmweltPartnerschaft Hamburg, n.d.).

Table 28: Characterization ZEWUmobil⁺

Dimension	Characterization	Description
Target	SMEs	SME specifically named
Mechanism	Consultation	Consultants develop tailor-made plans
Issue	Resources	Resource consumption
Orientation	Development	Improvement of actual infrastructure

5.2.18 Environmental checks

The 'Environmental checks' can be considered as a start-up program for crafts with at most 50 employees. The participating companies get a checklist, which has been specified for each sector of economic activities. The checklist, which has been developed by the Centre for water and environmental technique of the Chamber of Crafts Hamburg, identifies the actual environmental performance of the company and serves as a base for further improvement. To enable the companies to improve, the checks suggest further programs of the 'UmweltPartnerschaft' and offer tailor-made ideas for improvement. The checks discuss subjects from the fields' waste, water, fleet, energy and environment-conscious management. However, the focus of the program is the consumption of resources (Hamburg.de, n.d.-b).

Table 29: Characterization environmental checks

Dimension	Characterization	Description
Target	SMEs	Crafts with at most 50 employees
Mechanism	Consultation	Tailor-made ideas for improvement
Issue	Resources	Resource as focus
Orientation	Development	Improvement of actual infrastructure

5.3 Preparation of the analysis

To enable a further analysis of the data, the questionnaires' data have to be aggregated first. Through the output of the motivation on a nominal scale (yes=1, no=0), the absolute frequencies of each reason for each program $n(y,j) = n_{.j}$ (x participant; y motivation) can be calculated. Therefore, the column totals for each reason in each program have to be calculated via the formula below. It also has to be acknowledged that the scale of the column totals is not nominal; it is rational. A visualization of the calculation is given by figure five.

$$\sum_{i=1}^k (n_{.j}) = n_{1j} + n_{2j} + n_{3j} + \dots + n_{kj}$$

	Reason ₁	Reason ₂	y ₃	...	y _j	...	y _m
Participant ₁	n_{11}	n_{12}	n_{13}	...	n_{1j}	...	n_{1m}
Participant ₂	n_{21}	n_{22}	n_{23}	...	n_{2j}	...	n_{2m}
X ₃	n_{31}	n_{32}	n_{33}	...	n_{3j}	...	n_{3m}
...
X _i	n_{i1}	n_{i2}	n_{i3}	...	n_{ij}	...	n_{im}
...
X _k	n_{k1}	n_{k2}	n_{k3}	...	n_{kj}	...	n_{km}
Column total	$n_{.1}$	$n_{.2}$	$n_{.3}$...	$n_{.j}$...	$n_{.m}$

Figure 5: Calculation column total for each reason and program

In the next step the characteristics of the programs are expressed in nominal values. Therefore, each characterization gets the value as presented in figure six. For example, the target characterization local community becomes the value one, companies the value two and SMEs the value three.

Characteristic	Value					
Target	1	2	3	4	5	6
Local community	X					
Companies		X				
SMEs			X			
Mechanism	1	2	3	4	5	6
Consultation	X					
Financial support		X				
Informing			X			
Eco-labelling				X		
Networking					X	
Voluntary agreement						X
Issue	1	2	3	4	5	6
Resources	X					
Transport		X				
Energy			X			
Climate change				X		
Adaption					X	
Orientation	1	2	3	4	5	6
Monitoring	X					
Development		X				
Substitution			X			
Awareness				x		

Figure 6: Nominal values for characterizations

In the next step, a new table is generated presenting information about the characteristics and the motivations. Therefore, the table includes the calculated column totals and the values for the characteristics of the programs. Here w is the program and y is the reason. The values in the table are the calculated column totals. Following this, the column totals of the program 'Ökoprofit' have to be added in the row of the program. For a better visualization n_j for the 'Ökoprofit' is \ddot{O}_j , for the 'Zewumobil+' it is Z_j and so on. Furthermore, targets are t_i , mechanisms m_i , issues i_i , and orientations o_i . The table with the joint information is presented in figure seven.

Program	Target	Mechanism	Issue	Orientation	Reason ₁	Reason ₂	y ₃	...	y _j	...	y _m
Okoprofit	3	1	1	1	Ö _{.1}	Ö _{.2}	Ö _{.3}	...	Ö _{.j}	...	Ö _{.m}
Zewumobil ⁺	3	1	1	2	Z _{.1}	Z _{.2}	Z _{.3}	...	Z _{.j}	...	Z _{.m}
W ₃	t ₃	m ₃	i ₃	o ₃	W _{3.1}	W _{3.2}	W _{3.3}	...	W _{3.j}	...	W _{3.m}
...
W _i	t _i	m _i	i _i	o _i	W _{i.1}	W _{i.2}	W _{i.3}	...	W _{i.j}	...	W _{i.m}
...
W _k	t _k	m _k	i _k	o _k	W _{k.1}	W _{k.2}	W _{k.3}	...	W _{k.j}	...	W _{k.m}

Figure 7: Joint information characteristic and motivation

5.4 Distribution among characteristics

In this section the connection between the characteristics of the programs and the motivation of the participants will be analysed in a descriptive manner. Tables 30 to 33 show the frequency of a motivation within a program with a specific characteristic. Furthermore, the tables provide the relative frequency in per cent in relation to the sum of participants in programs with a specific characteristic. Table 30 shows this for the characteristics of the target.

For the characteristic 'Local community' the minimum of the relative frequency is 0% for 'Access to additional investors', 'Access to subsidies' and 'Protects the distribution means and possesses'. The maximum is given for the motivation 'Expresses the values, visions or a strategic direction' with 37.5%. The median for the relative frequency is 16.7% and the mean is 14.9%. The standard deviation is 10.5%.

For the characteristic 'Companies' the minimum is 0% for 'Religious reasons'; the maximum is with 37.2% 'Protects local environment'. The mean is 18.3%; the median is 16.7% and the standard deviation is 11.4%.

In case of the characteristic 'SMEs' the minimum is again 'Religious reasons' with 0% and the maximum is with 39.7% 'Improves the image'. Here, the mean is 17.5%, the median 13.2% and the standard deviation is 13.0%

Table 30: Frequency and % of motivation per characteristics of target

	Characteristic					
	Local community	24	Companies	78	SMEs	68
Motivation	n	%	n	%	n	%
Expectation of current employees	3	12.5	9	11.5	6	8.8
Meeting the demands of the customer	2	8.3	6	7.7	7	10.3
Religious reasons	1	4.2	0	0	0	0
Access to additional investors	0	0	6	7.7	1	1.5
Healthier working environment	4	16.7	15	19.2	8	11.8
Safer workplace through cleaner workplace	5	20.8	12	15.4	17	25.0

	Characteristic					
	Local community	24	Local community	78	Local community	68
Motivation	n	%	n	%	n	%
Mitigate local consequences of climate change	6	25.0	22	28.2	23	33.8
Predictable costs	5	20.8	10	12.8	11	16.2
Expresses the values, visions or a strategic direction	9	37.5	29	37.2	25	36.8
Attracts future employees	2	8.3	9	11.5	5	7.4
Improves the image	8	33.3	28	35.9	27	39.7
Protects global health	4	16.7	13	16.7	18	26.5
Protects local health	4	16.7	21	26.9	17	25.0
Protects global nature	4	16.7	27	34.6	23	33.8
Protects local environment	4	16.7	29	37.2	27	39.7
Technical or social innovation leader	2	8.3	10	12.8	5	7.4
Protects the image	1	4.2	6	7.7	4	5.9
Creates new market opportunities	6	25.0	6	7.7	4	5.9
Prevents future regulations	2	8.3	13	16.7	6	8.8
Safe costs	3	12.5	22	28.2	19	27.9
Access to subsidies	0	0	17	21.8	9	13.2
Protects distribution means and possesses	0	0	1	1.3	1	1.5
Motivation of employees	7	29.2	18	23.1	11	16.2

Table 31 gives an overview about the absolute and relative frequencies of motivations per characteristics of mechanism. 'Religious reasons' is the minimum value for the characteristic 'Consultation' (0%); the maximum is given with 39.7% in the cases of 'Improves the image' and 'Protects local environment'. The standard deviation is 13.0%, the median is 13.2 and the mean is 17.5%

For 'Financial support' the minimum is 0% for 'Religious reasons' and 'Protects distribution means and possesses'; the maximum can be found for 'Expresses the values, visions or a strategic direction' with 41.7%. The standard deviation is 13.2% for a mean of 21.4%. The median is 20.8%.

The minimum of 'Informing' is with 1.9% ones more 'Religious reasons'; its maximum is 36.5% 'Improves the image'. The mean is 14.4%; the median is 13.5% and the standard deviation is 9.8%.

In case of 'Eco-labelling' the minimum is given for every value except the maxima ('Protects global nature', 'Protects local environment' and 'Technical or social innovation leader'). Here, the standard deviation is 17.2% from the mean 6.5%. The median is 0%.

Table 31: Frequency and % of motivation per characteristics mechanism

Motivation	Characteristic							
	Consul- tation n	68 %	Financial support n	48 %	Informing n	52 %	Eco- labelling n	2 %
Expectation of current employees	6	8.8	4	8.3	8	15.4	0	0
Meeting the demands of the customer	7	10.3	3	6.3	5	9.6	0	0
Religious reasons	0	0	0	0	1	1.9	0	0
Access to additional investors	1	1.5	4	8.3	2	3.8	0	0
Healthier working environment	8	11.8	12	25.0	7	13.5	0	0
Safer workplace through cleaner workplace	17	25.0	10	20.8	7	13.5	0	0
Mitigate local consequences of climate change	23	33.8	18	37.5	10	19.2	0	0
Predictable costs	11	16.2	10	20.8	5	9.6	0	0
Expresses the values, visions or a strategic direction	25	36.8	20	41.7	18	34.6	0	0
Attracts future employees	5	7.4	6	12.5	5	9.6	0	0
Improves the image	27	39.7	17	35.4	19	36.5	0	0
Protects global health	18	26.5	9	18.8	8	15.4	0	0
Protects local health	17	25.0	12	25.0	13	25.0	0	0
Protects global nature	23	33.8	19	39.6	11	21.2	1	50.0
Protects local environment	27	39.7	19	39.6	13	25.0	1	50.0
Technical or social innovation leader	5	7.4	6	12.5	5	9.6	1	50.0
Protects the image	4	5.9	5	10.4	2	3.8	0	0
Creates new market opportunities	4	5.9	8	16.7	4	7.7	0	0
Prevents future regulations	6	8.8	8	16.7	7	7.7	0	0
Safe costs	19	27.9	19	39.6	6	11.5	0	0
Access to subsidies	9	13.2	15	31.3	2	3.8	0	0
Protects distribution means and possesses	1	1.5	0	0	1	1.9	0	0
Motivation of employees	11	16.2	12	25.0	13	25.0	0	0

For the characteristics of the character issue the values are presented in table 32. For the category 'Resources' the standard deviation is 12.1% of the mean 19.1%; the median is 18.0%. The minimum is 0.8% in the cases of 'Religious reasons' and 'Protects distribution means and possesses'. The maximum is 39.3% and is given in the case of 'Expresses the values, visions or a strategic direction'.

The median of the characteristic transport is 12.5%; its mean 15.2% and its standard deviation is 14.9%. The minimum is 0%, which is given in eight cases. The maximum is 43.8% for 'Protects local environment'.

For the characteristic 'Energy' the minimum is 0% and can be found for four motivations. The maximum is 30.8% for 'Safe costs'. The mean of 'Energy' is 11.4% with a standard deviation of 8.3%. The median is 7.7%.

The fourth characteristic, the 'Climate change' has a maximum of 50.0% for 'Improves the image' and a minimum of 0%, which is given in seven cases. The mean is 12.2% with a standard deviation of 13.1%. The median is 10.0%.

The median of 'Adaption' is 11.1%; the mean is 14.5% with a standard deviation of 15.5%. The maximum of 'Adaption' is given in the case of 'Improves the image' with a relatively frequency of 55.6%. The minimum of 0% is met by eight motivations.

Table 32: Frequency and % of motivation per characteristics issue

Motivation	Characteristic									
	Resou-rces n	122 %	Trans- port n	16 %	Energy n	13 %	Climate change n	10 %	Adaption n	9 %
Expectation of current employees	11	9.0	4	25.0	2	15.4	0	0	1	11.1
Meeting the demands of the customer	11	9.0	1	6.3	1	7.7	2	20.0	0	0
Religious reasons	1	0.8	0	0	0	0	0	0	0	0
Access to additional investors	5	4.1	0	0	1	7.7	0	0	1	11.1
Healthier working environment	22	18.0	2	12.5	0	0	2	20.0	1	11.1
Safer workplace through cleaner workplace	30	24.6	0	0	1	7.7	3	30.0	0	0
Mitigate local consequences of climate change	41	33.6	3	18.8	3	23.1	0	0	4	44.4
Predictable costs	23	18.9	0	0	1	7.7	1	10.0	1	11.1
Expresses the values, visions or a strategic direction	48	39.3	6	37.5	3	23.1	3	30.0	3	33.3
Attracts future employees	13	10.7	2	12.5	1	7.7	0	0	0	0

	Characteristic									
	Resou-rces	122	Trans- port	16	Energy	13	Climate change	10	Adaption	9
Motivation	n	%	n	%	n	%	n	%	n	%
Improves the image	47	38.5	5	31.3	1	7.7	5	50.0	5	55.6
Protects global health	28	23.0	4	25.0	2	15.4	0	0	1	11.1
Protects local health	30	24.6	7	43.8	2	15.4	1	10.0	2	22.2
Protects global nature	42	34.4	5	31.3	3	23.1	1	10.0	3	33.3
Protects local environment	46	37.7	7	43.8	2	25.4	3	30.0	2	22.2
Technical or social innovation leader	12	9.8	2	12.5	1	7.7	1	10.0	1	11.1
Protects the image	10	8.2	0	0	1	7.7	0	0	0	0
Creates new market opportunities	15	12.3	0	0	0	0	1	10.0	0	0
Prevents future regulations	15	12.3	2	12.5	1	7.7	1	10.0	2	22.2
Safe costs	36	29.5	0	0	4	30.8	2	20.0	2	22.2
Access to subsidies	22	18.0	2	12.5	2	15.4	0	0	0	0
Protects distribution means and possesses	1	0.8	0	0	0	0	1	10.0	0	0
Motivation of employees	28	23.0	4	25.0	2	15.4	1	10.0	1	11.1

The absolute and relative frequencies of the characteristic 'Orientation' are presented in table 33. The median of the characteristic 'Monitoring' is 21.6% and the mean is 21.3% with a standard deviation of 14.7%. The minimum value is 0% for 'Religious reasons' and the maximum is 56.8% for 'Improves the image'.

For 'Development' the minimum is 1.0% in case of 'Religious reasons' and its' maximum is 38.4% for 'Expresses the values, visions or a strategic direction'. The mean is 16.4% with a standard deviation of 11.0%; the median is 14.1%.

In case of 'Substitution' the median is 28.6% and the mean is 24.2% with a standard deviation of 15.8%. The minimum is 0%, which is given in three cases, and the maximum is given in 'Improves the image' and 'Protects local environment' with a frequency of 57.1%.

The median of 'Awareness' is 11.1%; its' mean is 14.8% with a standard deviation of 37.0%. The minimum is 0% and given in three cases. The maximum is 37.0% for 'Protects local environment' and 'Protects local health'.

Table 33: Frequency and % of motivation per characteristics orientation

Motivation	Characteristic							
	Monitoring n	37 %	Development n	99 %	Substitution n	7 %	Awareness n	27 %
Expectation of current employees	2	5.4	8	8.1	2	28.6	6	22.2
Meeting the demands of the customer	7	18.9	6	6.1	1	14.3	1	3.7
Religious reasons	0	0	1	1.0	0	0	0	0
Access to additional investors	2	5.4	4	4.0	0	0	1	3.7
Healthier working environment	9	24.3	13	13.1	2	28.6	3	11.1
Safer workplace through cleaner workplace	18	48.6	14	14.1	2	28.6	0	0
Mitigate local consequences of climate change	10	27.0	32	32.3	2	28.6	7	25.9
Predictable costs	8	21.6	16	16.2	1	14.3	1	3.7
Expresses the values, visions or a strategic direction	14	37.8	38	38.4	2	28.6	9	33.3
Attracts future employees	4	10.8	9	9.1	1	14.3	2	7.4
Improves the image	21	56.8	28	28.3	4	57.1	10	37.0
Protects global health	10	27.0	18	18.2	2	28.6	5	18.5
Protects local health	10	27.0	20	20.2	2	28.6	10	37.0
Protects global nature	10	27.0	32	32.3	3	42.9	9	33.3
Protects local environment	15	40.5	31	31.3	4	57.1	10	37.0
Technical or social innovation leader	6	16.2	7	7.1	1	14.3	3	11.1
Protects the image	2	5.4	7	7.1	1	14.3	1	3.7
Creates new market opportunities	4	10.8	11	11.1	1	14.3	0	0
Prevents future regulations	5	13.5	11	11.1	1	14.3	4	14.8
Safe costs	10	27.0	29	29.3	3	42.9	2	7.4
Access to subsidies	5	13.5	17	17.2	2	28.6	2	7.4
Protects distribution means and possesses	1	2.7	1	1.0	0	0	0	0
Motivation of employees	8	21.6	20	20.2	2	28.6	6	22.2

5.5 Statistical connection of characteristics and motivation

So far, the data are prepared for analysis, but it is unknown, which test can be applied to test a statistical connection between the characterizations and the motivations. To identify the correct test, the nature and the distribution of the data has to be known. To categorize the nature of the data, it has to be identified if the data are paired or not. As the data are based on various participants, the sample can be described as an independent pairs sample. In the next step, the distribution of the data has to be proofed. Therefore, it has to be identified if the sample is normal distributed or not. To test the normal distribution, a Shapiro-Wilk-Test will be applied. The procedure is presented in figure eight. As 18 different motivations exist, the critical value is 0.897 (Lohninger, 2012).

Hypothesis	H ₀ : Data is normal distributed H ₁ : Data is not normal distributed	
Formula	$W = \frac{(\sum_{t=2}^n a_t y_t)^2}{\sum_{t=1}^n (x_t - \bar{y})^2}$	n number of objects y _t values of ordered sample a _t tabulated coefficient
Degrees of freedom	n	
Rejecting	H ₀ has to be rejected if $W < W_\alpha$	
Critical value	$W_\alpha = 0.897$	

Figure 8: Procedure Shapiro-Wilk-Test⁹

As identifiable in table 34 each W of all motivation is lower than W_α . Following this $W < W_\alpha$ and H₀ has to be rejected; or in other words: the data is not normal distributed. Furthermore, for each motivation the value of significant is lower than 0.05. This leads to the same conclusion.

Table 34: Values Shapiro-Wilk-Test

Motivation	W	df	Sig.
Expectation of current employees	.806	18	.002
Meeting the demands of the customer	.761	18	.000
Religious reasons	.253	18	.000
Access to additional investors	.460	18	.000
Healthier working environment	.678	18	.000
Safer workplace through cleaner workplace	.599	18	.000
Mitigate local consequences of climate change	.767	18	.001
Predictable costs	.679	18	.000
Expresses the values, visions or a strategic direction	.788	18	.001
Attracts future employees	.704	18	.000
Improves the image	.811	18	.002
Protects global health	.824	18	.003
Protects local health	.696	18	.000
Protects global nature	.758	18	.000
Protects local environment	.732	18	.000
Technical or social innovation leader	.712	18	.000
Protects the image	.726	18	.000
Creates new market opportunities	.733	18	.000
Prevents future regulations	.742	18	.000
Safe costs	.682	18	.000
Access to subsidies	.518	18	.000
Protects distribution means and possesses	.373	18	.000
Motivation of employees	.813	18	.002

⁹ (based on Lohninger, 2012)

Now, as it is known that the data is independent and not nominal distributed, the Kruskal-Wallis-Test can be used to test if a statistical connection between the motivations and the characterization of the programs is given. The Kruskal-Wallis-Test compares two or more rankings. The idea is, that the values within a ranking are equally distributed. The procedure is presented in figure nine.

Hypothesis	H ₀ : Statistical connection is given H ₁ : Statistical connection is not given
Formula	$H = \frac{12}{n * (n + 1)} \sum_{j=1}^k \frac{R_j^2}{n_j} - 3(n + 1)$
Size of the sample	n
Group j	J
Number of samples	K
Size of sample group j	n _j
Rank-sum of the group j	R _j
Rejection	H>H ₀

Figure 9: Procedure Kruskal-Wallis-Test¹⁰

Table 35 provides the results of the Kruskal-Wallis-Test for the different characterizations of the character target. The critical chi-square value for p=0.05 with two degrees of freedom is 5.991 (Schwarz, 2013, pp. 246–247). The likelihood of identify a value of H is above 0.05. This makes it likely and it can be concluded that there is no difference between the different target groups.

Table 35: Results Kruskal-Wallis-Test for target

Motivation	Chi-square	df	Asymp. Sig.
Expectation of current employees	0.620	2	.733
Meeting the demands of the customer	1.510	2	.470
Religious reasons	5.000	2	.082
Access to additional investors	1.205	2	.547
Healthier working environment	.570	2	.752
Safer workplace through cleaner workplace	1.097	2	.578
Mitigate local consequences of climate change	3.122	2	.210
Predictable costs	1.572	2	.456
Expresses the values, visions or a strategic direction	.901	2	.637
Attracts future employees	.508	2	.776
Improves the image	.608	2	.738
Protects global health	4.133	2	.127
Protects local health	.726	2	.696
Protects global nature	1.034	2	.354
Protects local environment	2.079	2	.354
Technical or social innovation leader	.249	2	.883
Protects the image	.787	2	.675
Creates new market opportunities	2.316	2	.314
Prevents future regulations	.230	2	.891
Safe costs	1.243	2	.537

¹⁰ (based on Hirsig, 2007)

Motivation	Chi-square	df	Asymp. Sig.
Access to subsidies	2.732	2	.255
Protects distribution means and possess	.744	2	.689
Motivation of employees	.427	2	.808

The results for the Kruskal-Wallis-Test for the characteristics of mechanism are presented in table 36. In this case, the critical value for $p=0.05$ with three degrees of freedom is 7.815 (Schwarz, 2013, pp. 246–247). The likelihood to identify a value of H is above 0.05. This makes it likely and it can be concluded that there is no difference between the different characteristics of the mechanism character.

Table 36: Results Kruskal-Wallis-Test for mechanism

Motivation	Chi-square	df	Asymp. Sig.
Expectation of current employees	1.386	3	.709
Meeting the demands of the customer	2.128	3	.549
Religious reasons	1.571	3	.666
Access to additional investors	.386	3	.943
Healthier working environment	2.546	3	.464
Safer workplace through cleaner workplace	3.221	3	.359
Mitigate local consequences of climate change	3.916	3	.271
Predictable costs	1.838	3	.607
Expresses the values, visions or a strategic direction	2.568	3	.463
Attracts future employees	1.075	3	.783
Improves the image	1.733	3	.630
Protects global health	5.090	3	.165
Protects local health	3.007	3	.391
Protects global nature	1.368	3	.713
Protects local environment	2.917	3	.405
Technical or social innovation leader	.503	3	.918
Protects the image	2.753	3	.431
Creates new market opportunities	2.349	3	.503
Prevents future regulations	1.299	3	.729
Safe costs	2.499	3	.476
Access to subsidies	3.215	3	.360
Protects distribution means and possess	1.154	3	.764
Motivation of employees	1.697	3	.638

For the character issue, the critical value for $p=0.05$ with four degrees of freedom is 9.488 (Schwarz, 2013, pp. 246–247). The likelihood to identify a value of H is above 0.05. This makes it likely and it can be concluded that there is no difference between the different mechanism groups.

Table 37: Results Kruskal-Wallis-Test for issue

Motivation	Chi-square	df	Asymp. Sig.
Expectation of current employees	3.957	4	.412
Meeting the demands of the customer	2.110	4	.716
Religious reasons	.417	4	.981
Access to additional investors	3.929	4	.416
Healthier working environment	3.898	4	.420
Safer workplace through cleaner workplace	3.830	4	.430
Mitigate local consequences of climate change	3.033	4	.552
Predictable costs	2.010	4	.734
Expresses the values, visions or a strategic direction	3.391	4	.495
Attracts future employees	3.094	4	.542
Improves the image	3.825	4	.430
Protects global health	3.195	4	.526
Protects local health	4.677	4	.322
Protects global nature	1.751	4	.782
Protects local environment	2.119	4	.714
Technical or social innovation leader	2.394	4	.664
Protects the image	2.960	4	.565
Creates new market opportunities	4.298	4	.367
Prevents future regulations	3.612	4	.461
Safe costs	1.862	4	.761
Access to subsidies	2.150	4	.708
Protects distribution means and possess	.417	4	.981
Motivation of employees	2.523	4	.641

For the character orientation the critical value for $p=0.05$ with three degrees of freedom is 7.815 (Schwarz, 2013, pp. 246–247). The likelihood to identify a value of H is above 0.05. This makes it likely and it can be concluded that there is no difference between the different mechanism groups.

Table 38: Results Kruskal-Wallis-Test for orientation

Motivation	Chi-square	df	Asymp. Sig.
Expectation of current employees	3.237	3	.357
Meeting the demands of the customer	2.100	3	.552
Religious reasons	1.250	3	.741
Access to additional investors	1.176	3	.759
Healthier working environment	1.142	3	.767
Safer workplace through cleaner workplace	5.456	3	.141
Mitigate local consequences of climate change	2.274	3	.517
Predictable costs	2.463	3	.482
Expresses the values, visions or a strategic direction	1.368	3	.713
Attracts future employees	.735	3	.865
Improves the image	.242	3	.971
Protects global health	1.177	3	.759

Motivation	Chi-square	df	Asymp. Sig.
Protects local health	.841	3	.840
Protects global nature	1.443	3	.695
Protects local environment	.913	3	.822
Technical or social innovation leader	.445	3	.931
Protects the image	2.917	3	.405
Creates new market opportunities	3.719	3	.293
Prevents future regulations	.058	3	.996
Safe costs	2.633	3	.452
Access to subsidies	1.747	3	.652
Protects distribution means and possess	.983	3	.805
Motivation of employees	.539	3	.910

6 Discussion and conclusion

This final chapter consists of three parts. Firstly, the determined data will be interpreted and discussed. Secondly, this interpretation will be used to draw a conclusion. Finally, consequences for further research will be suggested.

6.1 Discussion of findings

The aim of this thesis was to test a connection between the characteristics of a program for voluntary climate change mitigation and the motivation of the participants. Therefore, the programs of Hamburg's 'UmweltPartnerschaft' have been investigated in order to identify the characteristics of the sub-programs. Through this, the programs have been distinguished among their target-group, political mechanism, faced issues and intrinsic orientation. Furthermore, the motivations of the SMEs of the group of Hamburg's 'UmweltPartner' have been explored.

Through the nature and distribution of the data, the Kruskal-Wallis-Test has been applied to identify a statistical connection between the characteristics and the motivations. The test showed that there is no statistical connection for any combination of characteristic and motivation. Following this, the characteristic of a program has no influence on the participants that it attracts; at least not in relation to the motivation of a SME to mitigate climate change. In other words: SMEs with a specific motivation do not tend to join programs with specific characteristics.

This missing statistical connection between the different characteristics and the motivations can also be identified without the Kruskal-Wallis-Test. As shown in section 5.4, there are tendencies identifiable in the relative frequencies of motivations, no matter the characteristics. This means, that one motivation has a high relative frequency in all or various characteristics; often, even the maxima and minima of a motivation can be identified in different characteristics. An example for that is the motivation 'Religious reasons', which is the minimum in all characteristics of the dimension 'issue'. This observation would support the results of the Kruskal-Wallis-Test that there is no notable difference in the motivation of the participants among the different characteristics.

A consequence of the missing differences of the motivations between the different characteristics is, that municipalities cannot distinguish the motivations they address in their advertising campaigns for climate change mitigation among the differences in the characteristics of their programs.

However, the fact that there is no connection, not just statistically, between the characteristics and the motivation might not be a surprise as the characteristics have been defined from the municipal perspective. This leads to a situation where the SMEs might not be able to identify the characteristics. Following this, there cannot be a tendency among SMEs with a specific motivation to join a program with a specific characteristic, as the SMEs are not able to identify these characteristics. This argumentation is comprehensive for the different target groups. A company will not notice differences in the target group; it will just test, if it can apply for the program. In this case, there cannot be a connection, also not statistically, to the motivation as the target group has no impact on the decision of the SME.

Whereas this argument is comprehensible for the dimension target, it cannot be the reason for the absent statistical connection between the motivations and the other dimensions. For example, it is surprising, that there is no statistical connection between the different mechanisms and the motivation to gain access to subsidies. A company, which want to gain access to a subsidy, will rather choose a program with the mechanism 'Financial support' than a program with any other mechanism.

There can be two reasons why this obviously given connection could not be identified statistically. The first reason is, that the case specific distribution of participants per program with explicit definitions of characteristics did not allow it. A cause for this reason can be based on the case specific distribution of participants in programs with specific characteristics. Various characteristics of programs, which have been identified in section 2.3, have not been identified in a program of the 'UmweltPartnerschaft'. An example for that is the mechanism 'Networking'. Another case specific distribution is that some characteristics have been identified in a program of the 'UmweltPartnerschaft', but the amount of participants in a program with these characteristics is little. An example for this is given in table 31; there are just two SMEs, which participated in a program with the mechanism Eco-labelling. Here, the number of participants mitigates the validity of the calculated value.

Apart from the decreasing validity based on the amount of programs and the participants, another aspect has to be considered. As a population the SMEs of the group 'UmweltPartner' has been chosen. Companies receive this label through their remarkable engagement in the climate change mitigation programs of the City of Hamburg. It can be assumed, that the motivations to participate in climate change mitigating programs of SMEs committed to such a program differ from an SME without this passion. This could be a reason for the high frequency of the normative reasons 'Protects local environment' and 'Protects global nature'.

6.2 Conclusion

The thesis showed that the City of Hamburg would have to face a higher frequency and strength of extreme weather events at the end of the century. The reason for this is climate change. As shown in paragraph 1.1.2, Hamburg is not the only city; all over the world cities face increasing affects of extreme weather events on their infrastructure and social fabric. However, cities are not just affected by climate change, they are also a cause of it. Cities pollute GHGs through production of electric energy, industrial activities, transport and residential and commercial buildings. To face this crisis of climate change various cities try to mitigate their GHGs emission and adapt to the consequences of climate change.

To mitigate the GHGs emission various cities try to involve their citizens and companies through motivation and facilitation. The reason for this mobilization is that the impact on climate change of city owned facilities is limited. Similarly, new

legislation is also unlikely as the process of legislation is time consuming and the outcome could be limited through lobbying etc.

For their motivation and facilitation activities, cities have several target groups. SMEs are one of these target groups. This is a suitable target group as it is the most common company size. Furthermore, SMEs are also the major employer. This allows the assumption that they are also one of the main polluters of GHGs. To enable SMEs' participation in the climate change mitigation, cities trigger their activities through projects.

These climate change mitigation projects can be shaped differently. To distinguish their shape the characterisations of different dimensions have been investigated. The dimensions target, mechanism, issue and orientation have been identified. Each of them has between three and six characteristics.

However, not just the characteristics of the climate change mitigation projects vary; also the motivation of participating SMEs can be distinguished. 23 different potential reasons for SMEs to participate in such a project have been described. The reasons can be classified into five categories. SMEs might want to improve their position within the selling market, increase their attractiveness to actual or future employees, utilities the political regulation process, improve their internal management or participate for normative reasons.

The aim of this thesis was to test if there is a connection between the characteristics of a program and the motivation of participating SMEs. This would enable municipalities to advertise their projects more oriented towards the SMEs' motivation. This would lead to greater participation and more SMEs would mitigate their GHG emissions. Through the greater mitigation, the cities would mitigate their impact on climate change and the rising crisis would be less intense.

To proof such a connection the sub-programs of Hamburgs' climate change mobilization program 'UmweltPartnerschaft' have been chosen and the characteristics investigated. To determine the motivation, the reasons of SMEs of the group 'UmweltPartner' have been collected. The connection between the characteristics of the projects and the motivation of the SMEs has been tested statistically through the Kruskal-Wallis-Test. This test led to the result, that municipalities should not distinguish the motivation addressed in their advertising campaigns. Furthermore, they can address the same motivations regardless of the shape of the program.

This finding allows municipalities to address the same motivations in every participants raising campaign, no matter the characteristics of the programs. Based on this, the frequencies of table 39 help to indicate the motivations that municipalities can address in their campaigns. The table shows that 'Expresses the values, visions or a strategic direction' and 'Improves the image' are the most important motivations for SMEs to participate. The motivation with the lowest frequency is 'Religious reasons'.

Table 39: Overall frequency and % of motivation

Motivation	Frequency	%
Expresses the values, visions or a strategic direction	63	9.2
Improves the image	63	9.2
Protects local environment	60	8.8
Protects global nature	54	7.9
Mitigate local consequences of climate change	51	7.4

Motivation	Frequency	%
Safe costs	44	6.4
Protects local health	42	6.1
Motivation of employees	36	5.3
Protects global health	35	5.1
Safer workplace through cleaner workplace	34	5.0
Healthier working environment	27	3.9
Predictable costs	26	3.8
Access to subsidies	26	3.8
Prevents future regulations	21	3.1
Expectation of current employees	18	2.6
Technical or social innovation leader	17	2.5
Attracts future employees	16	2.3
Creates new market opportunities	16	2.3
Meeting the demands of the customer	15	2.2
Protects the image	11	1.6
Access to additional investors	7	1.0
Protects distribution means and possess	2	0.3
Religious reasons	1	0.1

However, the consideration of the descriptive values showed that the result of the statistical connection has to be questioned. An example for this lacking coherence is the missing statistical connection between the motivation to get access to subsidies and the characteristic 'Financial support'.

6.3 Future research

The previous two sections showed that there is no statistical connection between the characteristics of municipal motivating climate change mitigation strategies and the motivation of participating SMEs. However, it also has been discussed, that the descriptive data does both, supports and questions that finding. To overcome this lack of validity future research is necessary.

To increase the validity the test has to be applied in research with more programs. This would bring two benefits. On the one side, the diversity of characteristics of programs would increase. Through this, the missing characteristics could be included. On the other side, the number of participants would increase. This would lead to a higher significance for each statistical connection between the characteristics and the motivations.

Furthermore, the research should be applied in several locations. This would enable the researcher to introduce location as an additional dimension. As such programs are often, at least in some aspects, copied and used by other cities, the success of a comparative political approach could be tested.

Apart from the validity issue, the used approach is useful, but it needs an important extension. For this research a program could just be labelled with one characteristic per dimension. However, already the investigated programs showed, that programs often meet the description of several characteristics in the same dimension. A program, for example, can address energy and resources; or it can have a consultative character and provide financial support at the same time. In this case, it is necessary to use a multidimensional database. This kind of database would prevent same motivations from appearing more often in the dataset.

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