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**Matching Forerunner Cities:  
Assessing Turku's Climate Policy in Comparison  
with Malmö, Groningen and Rostock**

## Content

1. Introduction .....	3
2. Assessment of Turku’s climate change policy in comparative perspective .....	3
Ambitious climate mitigation target .....	3
Climate governance approaches .....	4
Transformation of the energy system and climate policy implementation .....	4
Local climate monitoring schemes .....	5
Engaging the civil society, businesses, and local research institutions .....	5
EU climate policy shaping international activities .....	7
3. Recommendations .....	7
Institutional changes .....	7
Integration of climate mitigation and adaptation .....	8
Participation .....	9
Local, national, and international leadership.....	11
4. Conclusions.....	12
References .....	14
Annex: City Profiles .....	15
Malmö.....	15
Groningen.....	18
Rostock .....	22

## 1. Introduction

Cities are at the forefront of combatting climate change (Dent et al, 2016; McPhearson et al, 2016). Cities are key in enabling a widespread societal transition towards a future fossil-free society, as the majority of the world's population lives in urban areas and consumes around 75 percent of the global energy supply (United Nations, 2016; 2018). They are also affected by climate hazards, such as intense precipitation and heat waves. As climate change progresses, cities need to adapt in order to remain livable and functional in the future (Haupt, 2020; Climate-Adapt, 2021).

The Matching Forerunner Cities research project provides an assessment of Turku's climate policy and compares its performance with three other forerunner cities with similar characteristics. Turku, Malmö, Rostock, and Groningen are mid-sized cities of roughly the same size located in advanced democracies in Northern and Continental Europe. They are old university cities, which share and value their Hanseatic heritage, relied historically on maritime trade, and have transformed into cities dominated by service industries. Moreover, all four cities have acquired the reputation of being a forerunner city in the area of sustainable development and climate policy, nationally and even internationally. By identifying Turku's climate policy strengths and weaknesses the project generates new insights and knowledge for Turku's climate policies and develops recommendations, which may help the city to continue its transformation into a recognized international forerunner in climate policy.

This study is of interest for both the scientific and the urban climate practitioner community. The study responds to the scholarly calls for providing a deeper understanding of urban climate trajectories (Frey and Calderon Ramirez, 2019; Bernardo and D'Alessandro 2019; Heijden, 2019). The study has a comparative approach and provides new knowledge of climate policy trajectories in different urban contexts. It offers novel insights of how forerunner climate cities have voluntarily engaged in developing and implementing climate policy activities. From a practitioners point of view, the study presents a contextually driven understanding that can reduce the gap between urban climate rhetoric and action. It informs climate practitioners across Europe and can guide them in expanding their voluntary climate work. Despite the importance of cities in combatting and adapting to climate change, climate activities on a local level are still a voluntary task in most EU member states (Kern, 2019).

The study relies on a mixed-methods data approach to provide a contextually driven understanding of urban climate policy trajectories in four different countries. It is based on extensive document analysis, spanning key policy areas affiliated with climate activities in each city. The document analysis for each city constitutes a point of departure for the study and has informed the interviews conducted with key local climate actors from all four cities. A total of 27 semi-structured interviews have been conducted over the course of this research project. Taken together, data from the documents analysis and from the interviews have been consolidated into a climate city profile for each city that can be found in the annex of this study. The city profiles provide a thorough overview of the biophysical, social, economic, and political context of the local organizational structures, city strategies and plans, governance approaches, and the choice of climate policy instruments.

## 2. Assessment of Turku's climate change policy in comparative perspective

### Ambitious climate mitigation target

The city of Turku has set an ambitious climate policy target by aspiring to reach climate neutrality by 2029. This target reflects Turku's aspirations to become a recognized international forerunner in developing local climate mitigation solutions. The situation of the four cities is characterized by different levels of institutional autonomy, which

allow the cities to engage in policy areas not mandated by national or federal law. All the cities have set voluntary GHG emission reduction targets, which generally exceed national targets. The cities engage in voluntary climate related actions, although climate mitigation and adaptation are not compulsory tasks of local authorities in Finland, Germany, and Sweden. Only the Netherlands have developed certain national agreements that require the cities to engage in climate related policies.

The initiative towards climate neutrality in Turku is supported by unanimous political support across political parties. The city council, the city government, and the mayor validate Turku's climate related ambitions. Malmö's climate ambitions are also endorsed by a broad political consensus, while in Groningen and Rostock there is a lower degree of politically shared urgency. In Rostock, the climate ambitions have been hampered by their voluntary nature and sometimes by local disagreement.

### **Climate governance approaches**

Turku's climate policy is steered and implemented by an overarching climate strategy, which is supported by an organizational structure that links the Central Administration and the Urban Environment Division with the Union of the Baltic Cities' Sustainable City Commission, located in Turku. Turku's organization of climate policy is geared towards the city's ambition to become a forerunner in climate mitigation. As Turku's strategy focuses on climate mitigation policies, climate adaptation policies have not received the same attention. Other cities such as Rostock have adopted a more balanced approach: Groningen has introduced a climate adaptation target to become climate adaptive by 2050, while Rostock views mitigation related efforts as preparing for the future, and adaptation activities as dealing with current impacts and issues.

Most of the cities have developed climate strategies and specific local climate policies as a basis for governing climate change at the local level. However, Malmö has opted for a different approach. The city has not developed an explicit climate strategy. Instead, mitigation and adaptation activities are integrated into existing policies. Malmö's logic originates in avoiding governing issues related to a lack of mainstreaming and integration of climate policies – both issues are present in the other three cities compared. The voluntary nature of local climate action often leads to inadequate policies to cope with the long-term challenges posed by climate change because they rely on external short-term and ad hoc funding. Dependence on such funding sources may hamper climate policy mainstreaming due to a lack of policy continuity, the institutionalization of misaligned policy routines, a desynchronization of actor orientations, and a decrease in transparency.

### **Transformation of the energy system and climate policy implementation**

The cities follow a similar implementation approach, though local contextual factors influence the functionality and viability of local climate action. Turku's ambitions are supported by a favorable contextual setting, in particular a relatively high degree of financial autonomy (compared to Groningen and Rostock) and a high capacity to steer the energy sector. Reaching ambitious climate mitigation goals and a fossil-free future requires a transformation of the energy system. This is key for achieving climate neutrality. Among the cities, Turku is (similar to Rostock) able to steer the regional energy company, Turku Energia, in accordance with measures that support carbon-free energy production. In contrast, Malmö and Groningen lack control of their energy production because the regional and local energy companies were privatized.

These governance structures, shaped by the Finnish model for intercity cooperation and welfare production, provide opportunities to develop regionally defined climate solutions, coordinated with city subsidiaries and regional cooperation partners. This constitutes an effective basis for developing administrative procedures suitable to reach

Turku's mitigation goals. Turku has the capability to govern city subsidiaries and cooperation partners by using regionally set climate targets, e.g. making South-West Finland carbon neutral, which are in line with Turku's ambition to become climate neutral by 2029.

All the cities face implementation challenges related to the need for mainstreaming local climate action. Besides, the need for a continuous flow of long-term financing of infrastructure projects leads to built-in challenges. Local climate activities are often carried out with the help of place-based demonstration projects, which function as symbols for benchmarking and good-practice cases and provide learning opportunities. Even if they are successful, they do not necessarily facilitate or encourage extensive local climate action in other parts of the city, as they often fail to mainstream climate activities beyond their own duration and narrow territorial scope.

### **Local climate monitoring schemes**

The cities have developed effective mitigation policies, which rely on interim goals, an effective monitoring system, and continuous reporting. Local monitoring systems are usually based on models endorsed by the EU Commission's regulations for the Covenant of Mayors (CoM). All four cities are signatories of the CoM, which is the world's largest initiative for stimulating local climate action. Turku has positioned itself according to the CoM framework for developing strategies, action plans, implementation practices, and progress reports.

However, Turku lacks systematic monitoring for measuring progress in climate adaptation. In Malmö, an annual national scheme serves as the basis for adaptation reporting, while Rostock is a signatory to the CoM initiative called Mayors Adapt which requires continuous assessments. Groningen, along Turku, lacks monitoring of climate adaptation progress. However, in Turku a risk and vulnerability assessment identified several risks in the area of water management by heavy rains, floods, and storm water. The assessment concluded that water bodies and sea areas in Turku are in poor or moderate condition at best. The assessment identified shortcomings in the sewer system and pinpointed that the human resources allocated to runoff water problems and water protection are still insufficient.

### **Engaging the civil society, businesses, and local research institutions**

Citizen engagement in local climate action is relatively low in Turku, particularly in comparison to Groningen and Rostock. This is partly due to different societal engagement norms, a broader practice of forms of direct democracy in Germany and the Netherlands, and a more systematic pro-active approach for setting up institutional arrangements, which facilitate local engagement. Although Turku's climate work is anchored in a societal perspective, the participatory mechanisms to enable citizen engagement are underdeveloped, especially with respect to the involvement of the general public in local decision-making. Turku would benefit from applying more extensive public participatory procedures as requested by the EU's guidebook on developing Sustainable Energy and Climate Action Plans. Furthermore, Turku can facilitate engagement with research institutions by using the 'Turku Urban Research Program' which is an institutionalized collaboration model. This is a unique policy feature that uses the local research capacity to inform city officials and politicians on various issues (including climate policy) and offer critical reflections on possible pathways for local action.

Some of the cities have set up collaboration platforms with local businesses. This interaction is either enabled by physical collaboration platforms, or via online platforms engaging with local business actors. The general logic of this collaboration is usually linked to an overarching aim of committing and integrating private companies and actors into a future vision of a carbon free society. The rationale for private actors to engage in combatting climate change is related to future business opportunities, recourse and energy efficiency reducing the overall societal costs for energy, as well as branding opportunities.

**Table 1.** Climate change policy features compared

	<b>Turku</b>	<b>Malmö</b>	<b>Groningen</b>	<b>Rostock</b>
Climate policy ambitions	Climate neutral by 2029	Climate neutral by 2030	Climate neutral by 2035 and climate adaptive by 2050	Climate neutral by 2050
Climate policy focus	Strong focus on climate mitigation Limited focus on climate adaptation	Climate mitigation prioritized Adaptation measures established and expanding	Main focus on climate mitigation Increasing adaptation focus	Balanced mitigation and adaptation approach
Strategic climate policy tools	Single climate strategy	No separate climate policy or strategy Mitigation and adaptation activities integrated in various existing policies	Separate climate mitigation and adaptation strategies	Separate climate mitigation and adaptation strategy
Institutional capacity of climate policy	Extensive local institutional and financial autonomy provides considerable steering capacity for developing voluntary climate activities	Local institutional and financial autonomy provides considerable steering capacity for developing voluntary climate activities	Local institutional autonomy but financially dependent on the state Voluntary as well as nationally determined local climate activities	Local institutional autonomy but financially dependent on the state Voluntary climate activities
Climate policy implementation	Implementation outsourced to city subsidiaries, regional cooperation entities via investment programs and demonstration projects	Implementation outsourced to city subsidiaries, regional cooperation entities and large-scale demonstration projects	Implementation in selected city units via demonstration projects	Implementation assigned to a city utility company and development projects in selected city districts
Climate policy monitoring	Mitigation monitoring system based on models developed by the CoM and the United Nations Adaptation progress rarely monitored	Mitigation monitoring system based on a Swedish monitoring model that adheres to EU standards Adaptation progress externally reported via an annual national scheme that is based on an EU methodology	Mitigation monitoring system based on models developed by the CoM Local energy monitoring platform involving the city, local industry, and larger businesses No adaptation monitoring	Mitigation monitoring system based on models developed by the CoM Adaptation monitored based on Mayors Adapt, another CoM initiative for climate adaptation
Climate policy and civil society, businesses, and local research institutions	Local citizen engagement relatively low Online collaboration platform engaging with local business actors. Highly institutionalized cooperation with local universities	Local citizen engagement relatively low Cooperation platforms for engaging with local business actors Urban sustainability cooperation platform with Malmö University	Local citizen engagement relatively high Supported by NGOs and a neighborhood approach. Cooperation with companies and the local university via an energy coalition	Local citizen engagement relatively high Institutionalized forms of citizen and NGO participation Alliance created for interaction with local businesses Formalized cooperation with research institutions
Climate policy and international activities	International policy (including participation in transnational city networks) are at the core of climate policy Facilitates and informs climate initiatives Generates external funding and supports capacity-building	International policy (including participation in transnational city networks) supports the goals of the city, including climate policy Facilitates and informs decision-making Generates external funding and supports capacity-building	Occasional engagement in Pan-European local city networks Climate policy influenced by EU facilitated local climate activity schemes and related projects	Climate policy informed and facilitated by the city's memberships in transnational city networks (such as the Climate Alliance) Little focus on generating external EU funding.

## EU climate policy shaping international activities

International activities are at the core of shaping climate engagement. The four cities have introduced EU developed and designed climate policy paradigms via a multi-level governance context. Therefore all four cities are directly or indirectly influenced by EU climate policy. The successful impact of the CoM at local levels across Europe proliferates EU endorsed models for climate policy development, implementation, and monitoring.

Among the cities, Turku and Malmö have institutionalized their international activities to support their broader ambitions. Both cities have developed systematic and broad internationalization approaches, which are supported by robust and efficient interlinkages within and across the city to inform and build capacity among civil servants and local politicians. In Malmö and Turku, international activities in the area of climate policy are imperative because they help to amass critical information and knowledge and generate external funding for voluntary climate actions.

## 3. Recommendations

### Institutional changes

Climate governance in Turku is based on voluntary efforts, which take place in a complex multi-level governance setting with built-in governing challenges. Turku's climate governance transpires in an organizational setting that has been shaped by traditional structures, based on sectoral divisions and hierarchically steered operational procedures. Turku's climate endeavors facilitate an already ongoing process of reorganization due to a demand for transformation, which is needed to meet climate goals. Hierarchically organized local government is now combined with multi-level climate governance arrangements, which strengthens local governing capacity. Key actors in navigating this transformation are pro-active politicians and dedicated city leadership.

Turku's organization of local climate action is steered by a consolidated climate strategy, which is implemented across sectors and areas and involves a range of different entities and actors. These operate on different governance levels in different sectors, often based on different timeframes determined by limited funding. Entities operating with different timeframes are steered by varying logics and do not automatically support the long-term climate ambitions of the city. Some entities follow traditional governing logics, others are influenced by ad-hoc and non-institutionalized multi-level governance arrangements. Collectively, this complicates mainstreaming and coordination efforts of climate activities in an organizational structure still characterized by sectoral divisions.

As Turku's climate policy is, at least in some areas, still based on initiatives limited to specific sectors and territories, a number of **possible institutional changes can be identified, which could improve local climate action** in Turku:

1. **A systematic and interactive oversight approach** could be pursued by setting up an advisory committee, coordinated by the city of Turku, consisting of external climate experts, representing the broad field of climate activities. Such a committee could oversee the operational and sectoral routines of the city and help to accentuate coherence and consistency of local climate policies.
2. More emphasis should be placed on **the internal coordination of policies and projects**, which have an impact on climate mitigation and adaptation and thus require new institutional arrangements. Building upon the experiences in Groningen, an internal interdepartmental committee consisting of representatives of all relevant departments could help to facilitate mainstreaming and integration of climate activities across sectors, for example by discussing policy proposals already in an early stage.

3. Additional **operating procedures to guarantee that all decisions taken by the city board and the city council take climate policy issues into account** could be set up. This can be accomplished by requiring assessments on the compatibility of all local decisions with Turku's climate policy goals.

### Integration of climate mitigation and adaptation

While being a mitigation champion, Turku has put less emphasis on climate change adaptation planning. There are three possible models: in the *full integration model* climate mitigation and adaptation tasks are concentrated in the same organizational unit or strategy, in the *pillarized model* they are allocated to several organizational units or strategies, and in the *project-based integration model* they are integrated at the operational level only.

Compared to other German cities, Rostock began relatively early with tackling climate change adaptation and is one of the very few mid-sized cities in Germany that succeeded in maintaining a balanced approach focusing on both, mitigation and adaptation. While the city has a profound adaptation strategy in place since 2012 (updated in 2015 and 2018), there is still considerable scope for improvement in the areas of implementation of measures and with respect to the integration of mitigation and adaptation. In Rostock, climate mitigation and adaptation were institutionally separated and coordinated by two different departments (mitigation: Climate Coordination Office, adaptation: Environmental Department), i.e. Rostock followed the *pillarized model*. However, this situation changed in 2020 because an administrative reorganization took place and led to the integration of climate mitigation and adaptation in the Environmental Department.

In Groningen, adaptation and mitigation are organizationally divided and are based on different policy goals. However, Groningen has started to integrate climate mitigation and adaptation at project level. For example, adaptation measures were integrated into a project on the construction of a heat grid in one of Groningen's neighborhoods (*project-based integration model*). Project-based integration offers the opportunity to get familiar with the challenges and opportunities of integrating mitigation and adaptation. Yet it represents a very "unstable" and usually only occasional form of integration that can hardly be put on the same footing with the full integration model.

Since examples for full institutional integration of mitigation and adaptation (*full integration model*) are rare, additional insights from the German city of Münster can be taken into account. Apart from the location – Münster is not a coastal city – the city shares several characteristics with Turku, Malmö and Groningen, such as a forerunner position in climate action, an international reputation as a bike city, a strong research environment, and a growing population. Already in 1995, the city established the Coordination Office for Climate and Energy that currently employs eight people, including two employees focusing on adaptation only. As in many cities in Europe, Münster became active in adaptation much later than in mitigation. Since an integrated approach (*full integration model*) has been chosen, the current responsible staff for adaptation has dealt with mitigation issues before. This has proven to be a practical advantage since there are many thematic overlaps between mitigation and adaptation and since there were already several established connections with other relevant and involved city departments and actors. The integration of adaptation and mitigation in one organizational unit enables direct and informal communication among actors working on adaptation and mitigation. This seems to be a key challenge because adaptation itself is already a very cross-sectoral task that requires good relationships and communication channels with various different city departments. This can not only help mitigate potential conflicts – e.g. mitigation measures that are put in place without taking their impact on adaptation into account and vice versa – but might also promote the identification of synergies, e.g. measures that integrate mitigation and adaptation from the outset and generate added value instead of creating conflicts between them.

Based on these experiences with the integration of climate mitigation and adaptation at the local level, we recommend that Turku should **strengthen and integrate the responsibilities for climate adaptation**:

1. This may require **an organizational integration of climate mitigation and adaptation within a single administrative unit**. The case studies in Rostock and Münster demonstrate that cities can be successful with both, the pillarized model and the full integration model. However, there are indications that cities in the early stages of adaptation planning, such as Turku, should give priority to the full integration model.
2. Developing a balanced approach to climate mitigation and adaptation requires **a revision of strategic documents**. Turku could strengthen climate adaptation in its existing climate strategy. The strategy needs to be broken down into appropriate action plans and measures in both areas, climate mitigation and adaptation.
3. This should be accompanied by a strong emphasis and **adequate administrative procedures that facilitate the integration of climate mitigation and adaptation at project level**, an approach pursued in Groningen. Combining the full integration model at the strategic level with project-based integration at the operational level seems to be most promising.
4. An adequate **monitoring system for climate adaptation measures** needs to be put in place. The best option to get this task accomplished would be to join the Climate-ADAPT initiative of the Covenant of Mayors. Participating in the Climate Adapt initiative has helped Rostock to implement its goals in the area of climate adaptation.

### Participation

The Turku Climate Plan 2029 includes a call for engaging local society in developing a carbon-neutral Turku. The annual Climate Forum is the most important event for involving civil society, businesses, and research institutions in climate policy. The existence of the annual Climate Forum demonstrates that the relationship between the city and the local society is viewed as an important feature and asset for urban development. However, Turku could improve its relationship with the local society by using policy tools that improve multi-actor collaboration and support citizen initiatives.

Two main structural factors need to be taken into consideration when it comes to citizen participation. First, for all activities organized by a municipality, citizen involvement needs to take place within an established framework that sets the rules for interaction and participation. Transparency with regard to information, perceived output, costs (both time-wise and financial) is important to assure citizen engagement. Second, a structural reflection on how climate policy connects to other urban characteristics and urban developments is key to successfully engage civil society. Citizen participation in climate-related affairs depends on the financial costs and time investments that citizens are able (and willing) to make. In the meanwhile, future adaptation and mitigation visions can also influence the social and material conditions of citizens. Enhancing participation is a way to start investigating how climate-related efforts and social topics are entangled within a city.

The following recommendations offer a basis for **a participatory approach that interlinks and engages the local society in the work on climate change**. The recommendations focus on participation of citizens rather than private parties and concentrate on options to stimulate behavioral changes at individual level, on neighborhood-oriented approaches, and citizen involvement in local decision-making.

1. Although the annual Climate Forum is a good way to communicate and enhance interfaces between the city and its citizens, this approach could be elaborated by setting up an energy and climate office, where citizens could get information and advice, for example on options to save energy. By **establishing one central point of communication**, citizens have the possibility for interaction on a frequent and continuous basis. For example, in Groningen a communication point was established by setting up a small department within the city, which mainly offers information on energy related questions. Turku could set up such an office that aligns with the vision, strategies, and plans of the city.
2. Turku could **organize more awareness projects**, both within the city and across the city in collaboration with non-governmental organizations. Projects can include educational activities, school and neighborhood allotments, and the organization of communal gardening. All these examples are inter-sectoral and offer low-key and accessible forms of participation. Key to implement such strategies is to create places for interaction and to actively approach citizens and inform them about these possibilities.
3. Citizen participation can be supported by **subsidy schemes to lower the threshold for individuals to engage in mitigation and adaptation activities**. For example, Groningen offers financial support for organizations and individuals that want to engage in such measurements, for example subsidies for heat pumps and bio mass boilers and plants.
4. Turku could **use a 'district-approach'**. This is a tool to translate an overall city vision into specific district projects. It refers to a long-term overall vision, which is broken up into strategies for smaller urban entities. By working on small-scale projects, the engagement and the input from citizens can be more easily integrated within governing processes and provides the city with information about citizens' needs and expectations. The neighborhood plans embed citizens in the process of policy planning, including formal decisions. Organizationally, a 'district manager' can be appointed to facilitate the participation of citizens and functions as a communication intermediary between local society and the city.
5. Besides creating specific neighborhood and district-oriented plans, it is also possible to create **institutionalized forms of citizen involvement** by formally setting up advisory citizen panels and committees within the organizational structure of the city. In this context, Turku should also build upon existing domestic experiences and lessons on citizen involvement (see Grönlund et al., 2020). In Rostock, several grassroots movements were formalized and institutionalized through the Local Agenda 21 Council that exists since the early 1990s. It is composed of active citizens and has been a visible player in Rostock's future development, climate and energy topics included.
6. Several of the four cities have a history of referenda to steer political action. As the legal possibilities exist to initiate referenda in Finland, both by elected representatives and citizens, Turku could consider to make and **encourage the use of direct democracy for long-term policy planning**. There are examples of path-dependent processes that started after referenda in the other cities. In Groningen, two referenda led to the development of a bike-friendly city. In addition, while still having a long way to become a bike-friendly city such as Groningen, also in Rostock a citizen-driven referendum in 2019 triggered major institutional changes in the city. More precisely, the establishment of an independent 'Department of Mobility' responsible for transformation into a bike-friendly city.

## Local, national, and international leadership

Leadership requires that a city increases its capacities and becomes recognized as a model for others. Cities like Malmö and Groningen show how cities can become nationally and internationally known leaders. In contrast to pioneering cities, which come up with innovative ideas but do not (yet) engage in promotional activities so that other cities follow their lead, forerunner cities succeed in promoting their innovative ideas to the outside world. Vice versa, forerunner cities have the capability to learn by matchmaking, i.e. by intentionally choosing other forerunner cities, nationally as well as internationally, with very similar characteristics and drawing lessons from their experiences.

This requires personal engagement by city leadership, either by a mayor or a leading administrator. The long-term mayor of Malmö, Ilmar Reepalu, was internationally known as a strong supporter of Malmö's sustainability and climate policy. There are similar cases in Germany such as Eckard Würzner, who has been in charge of climate change policy in the city of Heidelberg for a very long time, first in a leading position within the administration and since 2006 as mayor. Leading cities need a face, which represents local climate policy to the outside world.

Developing from a local pioneer into an acknowledged national and international leader implies to identify areas where Turku's performance is already outstanding and take additional steps to promote Turku's performance in these areas nationally and internationally. In Turku, this strategy is already pursued by the Union of the Baltic Cities (UBC) Sustainable Cities Commission, which is located in Turku. It has always been supported by the city, and has recently become more integrated into the city administration.

The following recommendations may help to boost these activities, lift them to the next level, and **develop a specific 'Turku model'**:

1. Leadership starts at the local level because **city administration can serve as a model** for citizens and local companies alike by setting own goals (such as becoming a climate neutral organization). This can be accomplished by making own buildings carbon-neutral and climate adaptive, invest in positive energy buildings and carbon-neutral vehicle fleets, set up mobility schemes to change the behavior of city employees, and develop new guidelines for procurement.
2. Turku should demonstrate its performance by **pointing to local pilot projects**. Forerunner cities have used their pilot and demonstration projects in a very strategic way for city-branding. This applies in particular to Malmö and its Western Harbour project, but also its follow-up project and new showcase Hyllie.
3. **Region-building by cooperation** seems to be a promising strategy to become better known as a climate policy champion internationally. Leading cities are often located in innovative regions, such as Malmö in the Öresund region or Groningen as an important player in the developing "Hydrogen Valley" in the North of the Netherlands. Such regional initiatives are often related to economic development strategies and the ambition to develop new regional clusters in economic sectors, which focus on the transformation of the energy and transport system.
4. Cities can gain recognition by **competing for awards and participating in certification schemes** which both seems to be less common in Finland. This may change – at least in Turku – because Turku's ambitious approach has most recently resulted even in global recognition. Nationally, Turku may learn from the city of Lahti, which is even smaller than Turku, but has nonetheless developed a very international reputation. Forerunner cities such as Malmö and Münster are very experienced in collecting awards and use them for

city branding. Rostock participated in a national competition and became one of 40 so-called 'Masterplan municipalities'. Winning awards and getting certificates require external performance assessments, which constitute an excellent tool for demonstrating that high ambitions are transferred into real actions.

5. Turku could become better known as a **Nordic city in the Eastern Baltic** by putting more emphasis on its close and long-standing cooperation with cities in the former Soviet Union, in particular with the city of St Petersburg. This is a very unique feature and advantage of the city of Turku.
6. Turku could benefit from promoting **the Turku Urban Research Program** internationally. This program is an outstanding initiative focusing on knowledge creation by establishing a close partnership between the city and its universities. From an international comparative perspective the 'Turku Urban Research Program' is not only a unique feature of the city but also an institutional innovation which has enough potential to become a model for other (forerunner) cities.

## 4. Conclusions

The city of Turku is in a relatively favorable position to develop and implement a successful climate policy. It shares many characteristics with the city of Malmö, but Malmö faces the challenge of limited influence on its privatized energy sector. In contrast to both Nordic cities, Groningen and Rostock need to cope with limited institutional and financial autonomy, which leads to a high degree of dependence on national funding schemes. In addition, they have to manage the repercussions of national decisions to phase-out nuclear energy (Germany) and fossil fuels (natural gas in the Netherlands and coal in Germany). Out of the four forerunner cities, Groningen is in the least favorable position with regard to these contextual factors because energy is (similar to Malmö) provided by private companies.

The assessment of Turku's climate change policy reveals various options for institutional and democratic innovations, which may help to fully utilize Turku's potential to further improve its climate policy and strengthen its national and international profile as a forerunner city.

First, we suggest institutional changes, which affect the organizational set-up of climate policy-making. This includes establishing an external advisory committee for climate policy, an internal interdepartmental coordination committee, and additional operating procedures for policy-making, which guarantee that the impact on climate change is regularly taken into account before taking decisions.

Second, the assessment showed that Turku is a climate mitigation champion. For improving its climate adaptation profile, we recommend strengthening and integrating the responsibilities and tasks in the area of climate adaptation. This could include administrative reorganizations (such as integrating climate mitigation and adaptation within a single administrative unit), changes of the strategic documents on climate adaptation (such as developing an own adaptation strategy), guidelines for the integration of climate mitigation and adaptation at project level, and setting up an adequate monitoring system for climate adaptation (for example by joining the Climate Adapt initiative of the CoM).

Third, we identified room for improvement in the area of citizen participation. New options in this area may focus on behavioral changes by setting up an information and communication office, run awareness campaigns in cooperation with local NGOs, and introduce subsidy schemes to create incentives for citizens to change their behavior. In addition, Turku could develop district and neighborhood-oriented plans and strategies and improve the formal access of citizens to decision-making by setting up advisory citizen panels and committees and make better use of elements of direct democracy in city planning.

Fourth, Turku is a pioneering city in many respects and has started to gain more international reputation. Developing a 'Turku model' could be supported by setting up internal schemes and measures to become a climate-neutral and climate-adaptive city administration. Moreover, existing and developing pilot and demonstration projects could be used in a more strategic way to gain local, national, and international reputation. This should be combined with a stronger focus on regional cooperation and strategies for region-building because leading cities are often located in innovative regions. Moreover, city branding requires a continuation of Turku's already existing efforts to compete for awards and participate in certification schemes. Furthermore, Turku should identify and promote its unique selling points, which are not specific to climate change policy but can be utilized to promote Turku's sustainability and climate policy. This refers in particular to its location as a Nordic city in the Eastern part of the Baltic Sea region with strong connections to cities in the former Soviet Union. Finally, the city could develop a strategy to make the Turku Urban Research Program better known to the outside world because this form of city-university partnership is a unique innovation and provides a model that has a high transfer potential and could attract considerable attention.

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## Annex: City Profiles

### Malmö

Malmö is a coastal city located in Sweden's southernmost province of Skåne and, with a population of around 316,000 inhabitants, the third largest city in Sweden. Malmö municipality is an administrative unit defined by geographical borders, consisting of the city of Malmö and its immediate surroundings. Malmö proper consists of the urban part of the municipality together with the small town of Arlöv in the Burlöv municipality. Malmö proper is to be distinguished from the city of Malmö, which is a semi-official name of Malmö municipality.

Malmö operates via locally defined city structures within a unitary national state. The city is independent with the legal authority to regulate local issues vis-à-vis the national state. Malmö's administrative independence originates in the general municipal mandate, which gives Malmö the right to take upon itself tasks that are not specifically defined in legislation. The national government can assign tasks or responsibilities only on the basis of legislation. Cities in Sweden have the right to levy taxes (including local income taxes) and are responsible for the majority of public services, e.g. education, planning, environmental protection, and social services. The Local Government Act of 1991 grants cities the autonomy to develop organizational structures suited to fulfil the assigned welfare production duties.

Malmö's local self-governance transpires through a local council (election every four years), which is the decision-making authority in local affairs. The city board, appointed by the council, is responsible for the practical management of local administration and its finances. The board prepares the issues discussed by the council, represents the local authority, and safeguards its interests. Politically, Malmö has been a social democrat stronghold. They have withheld the mayor position during most of the 21<sup>st</sup> Century and currently hold roughly a third of the council and city board seats.

In the late 1980s and early 1990s Malmö suffered an economic collapse. Global economic shifts resulted in bankruptcy of the dominating shipping industry in Malmö. This decreased the local tax revenue and caused significant economic deterioration of the city's finances. The economic crises provided an impetus and opportunity for the city leadership to reinvent Malmö's identity and policies. The new image of the city was underpinned by the attempt to transform the city from an industrial city into a knowledge-based, economically competitive, and sustainable city. Three decisions initiated Malmö's transition: the construction of Malmö University, the construction of the Öresund Bridge between Malmö and Copenhagen, and the development of Sweden's first renewable-energy and climate-adaptive district in its Western Harbour area.

The construction of Western Harbour enabled Malmö to position itself as a forerunner in the context of local sustainability and climate policy. Western Harbour addressed mitigation and adaptation by design, including energy efficiency, renewable energy, open storm-water management, and green roofs. The project received various sustainability and climate awards and helped Malmö to gain international reputation.

Along with Western Harbour, Ecocity Augustenborg and Hyllie are the most important pilot projects in Malmö. Drawing on the experiences made in the Western Harbour area, the Hyllie project started in 2010. Based on Malmö's Environmental Program and the city's long-term climate goals, a Climate Contract between the city and energy and water companies was signed in 2011. The project aims at making Hyllie the Öresund region's most climate-smart city district, and Malmö Sweden's most climate-smart city by 2020. Developers had to commit themselves to design buildings equipped with smart grids and smart home technologies.

Malmö has taken advantage of its high degree of autonomy to create a solid ground for climate change related activities. For instance, in Sweden most of the planning tasks are performed at the local level because urban planning is a formal city responsibility. As a result, Malmö has extensive jurisdiction over urban planning and housing devel-

opment. The city is also the largest land owner, developer, and employer. This offers Malmö considerable influence over GHG emissions within its jurisdiction and puts it in a favorable position to develop and implement climate mitigation and adaptation action plans and strategies.

Malmö’s environmental department is pivotal to the city’s mitigation and adaptation ambitions. Within city administration the role of the Environmental Department is emphasized because it is not only involved in regular environmental matters, but also functions as the development unit of the city. With respect to the number of employees, the department constitutes Sweden’s largest environmental department, employing in total about 180 persons. Other city departments and regional authorities are also involved in Malmö’s climate policy, e.g. the Department for Streets and Parks, the City Planning Office, the Real Estate Office, the Internal Services Department, and the regional entity of VA Syd (regional water company).

Malmö has decided not to set up a specific climate strategy. Instead, mitigation and adaptation activities are integrated into various existing policies to ensure mainstreaming of climate policy across sectors and departments. Strategically, climate change is addressed in the Environmental Program, the Master Plan, the Energy Strategy, the Urban Mobility Plan, and the Cloudburst Plan. Climate mitigation policies are prioritized, but climate adaptation policies have become more important. As a low-lying coastal city Malmö is vulnerable to sea-level rise and flooding. Thus, Malmö has developed an adaptation action plan, which includes guidelines for climate-adapted planning with references to EU-financed projects on local experiments in Malmö. Operationally, climate change is addressed in various policy documents on energy (Energy Strategy), buildings (Environmental Building Program for Southern Sweden), transportation (Traffic Environment Program, Bicycle Program, Walking Program), green and blue spaces (Green Plan, Nature Protection Plan, Rainwater Strategy); and consumption (Policy for Sustainable Development and Food).

**Table 2.** Malmö’s milestones for sustainable development and climate policy

1996	Vision Malmö 2015; strategy containing plans for the redevelopment of the Western Harbour area through a housing exhibition and a new university campus.
1998	Establishment of Malmö University College (received University status in 2018).
2001	Housing exhibition in the Western Harbour area as showcase for sustainable urban planning and development in Malmö (in the areas of energy, heating, and waste management).
2002	Program ‘Ecologically Sustainable Construction in Malmö’; includes sustainability recommendations for private and public developers and sets mandatory standards for energy efficiency and urban biodiversity.
2008	Institute for Sustainable Urban Development established; collaboration platform between the city and Malmö University for urban sustainable development.
2009	First Environment Program (updated several times); current program covers activities until 2020 and focuses on climate mitigation and adaptation targets and measures.
2009	Energy Strategy adopted (covering activities until 2020); focus on climate mitigation; main target: 100% renewable energy by 2030.
2010	Project in Hyllie starts; Hyllie Environmental Program requires that developers design buildings with smart grids and smart home technologies.
2011	Climate Contract signed between the city, energy and water companies.
2011	Action plan for climate and environmental policy; initially developed for 2011-2014 (updated several times); support the implementation of the Environmental Program across city departments in the areas of energy, transport, buildings, waste management, and environmental protection.
2016	Sustainable Urban Mobility Plan; holistic approach, which links urban development and sustainable transport.
2017	Cloudburst Plan for adapting the built environment to flooding caused by heavy cloudbursts; plan complemented by an action plan designed specifically for city-owned land; most actions focus on land-use planning, water management, green areas, and buildings.

In Malmö, climate ambitions are aligned with a smart city debate. Along with a new version of the Environmental Program the city introduced the smart city strategy (2009), which promoted the idea of Malmö's climate-smartness. Malmö as a city aspires that in 2030 the entire city will be provided with 100% renewable energy. Malmö's climate ambitions are conceptually and strategically institutionalized across city departments. The internal organization is operationally geared to serve the city's mitigation and adaptation targets. For mitigating emissions and adapting to climate change Malmö has various tools at its disposal. The most capable tool is the legal responsibility for local planning; in fact, the Swedish Law on Planning and Construction stipulates that cities must consider the effects of the changing climate in their land-use planning. For instance, when Malmö sells land for development, buyers must agree to stricter requirements than national building standards. The implementation of these standards transpires with the help of building passive housing, green roofs, and small-scale renewable energy installations.

Malmö's biggest challenge with respect to achieving its climate ambition targets is the lack of control over energy production. The privatization of Malmö Energi (the local energy company) in 1991 allowed Malmö to avoid bankruptcy, but it also meant that Malmö's factual ability to influence energy production disappeared. Today, the local energy company is owned by E.ON. Thus, Malmö's climate policy performance is strongly influenced by E.ON because it operates Malmö's electricity, district heating, and cooling networks. For example, E.ON's decision to open a natural gas plant was detrimental to Malmö's climate mitigation ambitions as the plant drastically increased per capita GHG emissions and derailed Malmö's mitigation policy. In the annual ranking of the climate adaptation performance of Swedish cities in 2019, commissioned by the Swedish Environmental Institute and Swedish Insurance, which assessed how cities have progressed in the area of climate adaptation, Malmö placed 28th out of the 208 Swedish cities that participated in the mapping. In the area of climate adaptation Malmö faces the challenge to secure funding for the implementation of inevitable measures. Malmö and other cities in Skåne have asked for governmental funding because Skåne's coastline is particularly vulnerable to climate change. However, the government has only a coordinator function, offering research data and new information. The financial burden for climate change adaptation is placed on the cities. Therefore, Malmö's international work is important because the city relies on externally generated financial support to implement climate actions.

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### Groningen

Groningen is the biggest city in the Northern part of the Netherlands, located close to the North Sea within the Province of Groningen. With around 202.000 inhabitants, it is the seventh biggest city in the Netherlands and still growing with around 3 percent per year (between 2013 and 2019). The founding of a university in 1614 contributed to the development of Groningen being an important 'knowledge hub'. It also contributed to Groningen having one of the youngest age-profiles of the Netherlands, due to the high number of students; around a fifth of the inhabitants of the city is enrolled at a university in town. It is an important economic center for the region and provides around 18 percent of employment in the North of the Netherlands. Groningen is also an internationally known bike city, as the bike is used for 60 percent of all urban traffic movements.

Groningen has a service economy. Public service activities, education, health and commercial services are the most important sectors and employers. The importance of these sectors has grown since the 1970's, a moment when the importance of the industrial sector declined. To anticipate on the decline of job opportunities and economic activity within the region, the state moved some public service organizations to these areas. The historical presence of a university and an academic hospital, contributed to the development of an education and health sector. Last, Groningen has the second biggest number of start-ups in the Netherlands (after the capital Amsterdam) and has recently seen the growth of the ICT sector through the settlement of several data centers.

Another characteristic of the region and contributor to the economy is the seaport 'Eemshaven', built in the 1960's. The harbor was built with the idea to support oil refinery and the chemical industry. However, it serves nowadays mainly as a transshipment port. In addition, Eemshaven is a key geographical point for energy and data provision. Besides the recent settlement of a data center in the harbor, it also is the location where the energy of several power plants, energy from windmill parks in the North Sea and power cables from Norway come ashore.

A key historical point for the development of the Netherlands and Groningen has been the discovery of 'Slochteren', the biggest natural gas field in Europe. After the discovery in 1959, the Dutch state rolled out a national gas grid which made the Netherlands highly dependent on this gas infrastructure. To exemplify: 90 percent of the total national housing stock was in 2018 connected to the national gas grid. Gas has also been an important export product and provided an important source of revenue for the Dutch state, up to a maximum of 15 percent of the national income in the 1980's. Yet for the Province of Groningen the consequences of the gas extraction were rather negative. The region has suffered several earthquakes of which the strongest took place in 2012 and 2018. The Dutch national government has decided in 2018 to phase out gas in 2030 the latest, with the possibility to bring forward the shutdown to 2022. The Dutch gas will, for the moment, be replaced with imported gas.

Municipalities are institutionally autonomous in the Netherlands. Local colleges are elected every four years through local elections. Mayors are appointed by the national cabinet (de jure by the king), based on recommendations from the local council for a period of 7 years. The state does oblige municipalities to carry out specific tasks (mainly when it comes to social welfare), which are all mandated through law. The Dutch national government has set a national climate policy framework which also involves new agreements between the national state and local governments in 2019 (called the 'Climate Accord', see more below). All actions that cities undertook before 2019 have been on a voluntary basis.

The city of Groningen works on climate change issues since 2006. Two historical moments that preceded are worth mentioning. First, an alderman (an elected member of the municipal council) decided in the 1970's - against the

policy trend to facilitate motorization within cities - to ban cars from the city center. The plan was controversial and caused conflicts within the city council. However, it laid the foundation for the current internationally praised concept of Groningen as a 'bike city'. Secondly, in the 1980's, when the Dutch state was (still) a frontrunner on national climate policy, Groningen responded to national schemes for environmental policies and funding. To implement the schemes, an environmental department within the municipality was founded.

As just mentioned, mitigation policy was for the first time implemented in 2006 after the elections of a green-red coalition. The election of the Green Left Party, that changed the composition of the historically dominant labor party councils, negotiated the institutionalization of energy neutrality by 2025. In the years that followed, the main focus was to find out how an alternative energy provision for the city could look like. Based on research, the municipality found out that only 30 percent of the local energy demand could be generated within the municipal borders and so the climate goal was changed into CO<sub>2</sub> neutrality in 2035. This key moment, in combination with the gas extraction industry within the region, led through the years to a strong focus on energy reduction and the replacement of natural gas as a source of energy and heating.

The strong focus on the energy transitions shifted attention away from adaptation policy. It is only since 2016 that the municipality has set the goal to be a climate adaptive city in 2050. A growing awareness of climate change brought adaptation on the political agenda.

In 2010, climate change policy became officially embedded within the Spatial Planning Department, but de facto it translated into a separated energy program, as climate policy was not perceived as the main priority of the department. Until today, the 'Program Energy', where around 25 employees are working, is the main responsible department for the implementation of mitigation policy. The strategies are primarily developed within a separate policy department. All current projects of the Program Energy are carried out under the overarching climate program 'Roadmap Groningen CO<sub>2</sub>-Neutral 2035'. The document gives a detailed overview of the energy use of five main priority themes (built environment, business sector, industry, mobility and the generation of renewable energy within the geographical boundaries of the municipality). The focus in the document is on the transition and the reduction of energy consumption to achieve climate neutrality.

The organizational structure of adaptation is organized differently. There is not an organizational equivalent of the 'Program Energy' for adaptation. Rather, it is an interdepartmental group of around 10 employees divided over 3 departments (among others the urban design department).

A challenge for the mitigation and adaptation policy employees is to work interdepartmental as there are no overarching institutional logics or standard procedures between the energy and adaptation programs and other departments. This means that the program Energy and the adaptation team actively need to reach out to other departments (mainly the City Planning Department) to achieve implementation of climate measurements at project level. In addition, mitigation and adaptation policy and projects are still divided. An opportunity for the municipality could be the integration of the sectoral policy divisions to create co-ownership of the energy transition. However, separate budget allocation, short-term finance cycles, and different political priorities inhibit this integration.

The national Climate Accord of 2019 created for the first time national guidelines for Dutch municipalities to follow. Among others a set goal is that a fifth of the total national number of households should be natural gas-free by 2030.

**Table 3.** Groningen’s milestones for sustainable development and climate policy

1976	‘Traffic circulation plan’ bans cars from the city center and is the first step to create a bike-friendly city.
1985	Environmental office established in Groningen.
2003	Regional network ‘Energy Valley’ is founded (on the initiative of the three Northern Provinces, several municipalities, the University of Groningen, the Dutch Oil Company and its sister-company Gasunie). It is an important platform for the expansion and concentration of energy related activities in the North of the Netherlands.
2006	Green left enters local council and articulates the climate ambition to become energy neutral in 2025.
2010	Cooperation with private partners starts after an important local conference.
	New coalition. New alderman decides to mainly focus on energy.
	Start of the ‘Program Energy’ (sub department of the Planning Department).
2014	Founding of the platform ‘Groningen CO2 Neutral 2035’, the main platform of contact between the municipality and businesses.
2016	Integration of adaptation policy within the city.
2018	Launch of the current Roadmap ‘Groningen CO2-neutral 2035’.
	(Re-) articulation of the ambition to become CO2 neutral in 2035 (i.e. changing the substance of the goal and the deadline). Public-private platform ‘New Energy Coalition’ is founded (merger of Energy Valley and a public research institute from universities in Groningen)
	Global Centre of Climate Adaptation settles in Groningen.
	Start of the European H2020 Lighthouse Project. Aims at realizing two PEDs (positive energy districts).
2019	National Climate Accord.
2020	Start of the European H2-region project, in cooperation with Energy Coalition and the Dutch Oil Company. ‘Hydrogen Valley’s’ aim is to develop a full-functioning green hydrogen chain in the North of the Netherlands.
Misc.	Earthquakes took place in (among others): 1986, 2012, 2018, and 2019.

Municipalities are commissioned with the task to translate this goal to the local level. Groningen is a frontrunner in the ‘neighborhood district approach’, being one of the first municipalities that have already identified alternative sources of energy for the city. However, implementation of the plans is difficult. The small number of projects that are running now are highly dependent on external funding and several national regulations are still hindering the pace of decoupling households of the gas grid. In addition, energy companies in the Netherlands are privatized, which means that the municipality is not able to control the energy provision for households. Hence, the main challenge for the municipality is to go beyond nationally supported pilot projects and scale up the energy transition within the built environment.

Because of these challenges, the municipality is strong in relation-building with educational institutions, companies, and citizens. Several pilot projects (both national and European) are undertaken in cooperation with the University of Groningen and the public-private platform New Energy Coalition. In addition, Groningen has welcomed the Global Centre of Climate Adaptation. This center has above all an important function to legitimize future action within the area of adaptation. Regular contact with businesses and industry has been institutionalized through the ‘Groningen CO2-Neutral’ platform. The partners involved in this network account for around 51 percent of the total CO<sub>2</sub> emissions in Groningen. Although the municipality cannot force these institutions to undertake action, it works with so-called ‘deals’ to encourage businesses to undertake action. In order to enhance citizen participation, the municipality works together with several NGOs and with citizens through officially integrating citizen’s input in the gas-free energy district approach (see above). The municipality is strongly aware of the necessity to avoid both energy poverty and civil reluctance towards the energy transition.

Groningen takes part in two major EU programs: Hydrogen Valley, and the MAKING-CITY project. The former is a project initiated by the public-private platform New Energy Coalition and a network of the three northern provinces (Groningen, Drenthe and Friesland) and the provincial capitals. The goal of the project is to develop an integrated and functioning green hydrogen chain (from production to local end-use). The project has started at the beginning of 2020. The MAKING-CITY project is the most important project for the municipality. The European project started in 2018 and aims at creating positive energy districts in two cities that can serve as a blueprint for four other participating cities. Groningen, being one of the leading cities and therefore called a 'Lighthouse City', is currently working on the realization of two energy positive buildings in two different areas of the city. As a Lighthouse City, Groningen uses this opportunity to work on its own future energy approach by combining the PED development with other ongoing energy transition projects.

To summarize, Groningen has an ambitious mitigation policy. The focus on energy has led to a strong 'Program Energy' team. The presence of a large fossil fuel infrastructure created a region in which much knowledge on energy is present. The focus on energy led to regular contacts with businesses and the 'energy sector' and public-private projects take regularly place. Attention and efforts for adaptation policy are growing. The municipality faces the challenge to integrate mitigation and adaptation programs within the whole organization and in wider city planning. In addition, the implementation trajectory of the plans is the biggest challenge for the municipality, partially because of its organizational structure but also due to national regulation and a lack of sustainable long-term cash flows. Groningen's main focus is now on the integration of the energy transition within the social sphere and built environment. Within the H2020 project, possibilities are researched how the city can align the energy transition within several municipal sectors and how the city can become less dependent on national (project) funding.

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### Rostock

Rostock is a coastal city located at the Baltic Sea in the northeast of Germany in the former German Democratic Republic (GDR). With around 208.000 inhabitants, Rostock is by far the largest city in the federal state (Land) of Mecklenburg-Western Pomerania. The city covers an area of 181.4 km<sup>2</sup> and extends about 16 kilometers along the river Warnow up to its mouth in the Baltic Sea between the districts Warnemünde and Hohe Düne. The old city center and port are located to the west of the river Warnow.

The historical city center and the city port are remnants of Rostock's cultural and economic significance within the Hanseatic League and the Baltic Sea region. In the process of industrialisation the population increased and reached 100.000 inhabitants for the first time in 1935. In the 20th century, Rostock gained importance through its function as a technological and maritime logistics hub within the German Reich and the GDR. After WW2 Rostock's population grew rapidly, with an all-time high of 254.000 inhabitants in 1988. After German reunification Rostock lost around 55.000 inhabitants, mainly due to a decline in the birth rate and because many citizens moved to the surrounding areas or to former West Germany. However, since 2007 the population has increased again by around 8.000 inhabitants.

Rostock's electricity and district heating grid is operated by a city utility company. The company contributed to the development of Rostock's mitigation strategy and is currently working on the organisation of a local heat plan together with the Climate Coordination Office. Moreover, several socialist large housing estates, a legacy from GDR times, are owned in large part by Rostock's municipal housing company WIRO. Thus, the city is in the position to influence electricity provision and the development of the housing stock.

Head of Rostock's city administration is the mayor who is directly elected for a term of 7 years. Rostock's city council, which consists of 53 members, is elected every 5 years. Ever since the German reunification the post-communist party The Left has been the strongest party within Rostock's city council. The Green Party that is represented in the council only since 2009, has become the second strongest party, holding one seat less than The Left. After the reunification, Rostock had social democratic, left and independent city mayors. In 2019, the Copenhagen-born Claus Ruhe Madsen was elected mayor of Rostock. While Madsen has no party affiliation, his campaign strongly focused on green topics such as an ecological traffic turn (electric mobility and above all bicycle traffic).

The city administration carries out the duties of both city and county following the principle of local self-government (kommunale Selbstverwaltung). This basic political principle ensures all German municipalities the constitutional right to manage their local affairs independently, climate action included. As part of the federal states (Länder), the municipalities remain subject both to legislation and legal or technical supervision by the federal states. It has the right to autonomously manage income and expenses (kommunale Finanzhoheit), to manage municipal assets and to levy local taxes. National allocations form a major part of the cities' income (kommunaler Finanzausgleich) and specific allocations. For most of the time since the German reunification the municipal finances were rather stretched. However, in recent years the situation could be stabilized giving Rostock a broader scope for action.

Rostock is an important regional economic hub, dominated by the harbor and its maritime economy, trade, and shipping companies. Other significant sectors are life sciences, aerospace, and wind power (Nordex, one of the world's largest wind turbine manufacturers, has its headquarters in Rostock). The service sector is growing particularly in the area of IT, creative, touristic, and online businesses. Tourism is an important economic pillar in the whole Baltic Sea region. The largest public employer of Rostock is the more than 600 year old university – one of the old-

est universities in Germany – where around 14,000 students are currently enrolled. Besides the university, Rostock hosts three additional institutions of higher education (focusing on music and theater, business and technology, and small and medium-sized businesses) and several public research institutes.

Rostock started to tackle the issue of climate change from the early 1990s onwards and was able to deliver several strategies and reports (adaptation and mitigation) and to set ambitious long-term climate goals. Table one gives an overview of Rostock’s key sustainable development and climate policy activities.

**Table 3.** Rostock’s milestones for sustainable development and climate policy

1993	Rostock joins the Climate Alliance.
1995	Rostock’s city council decides to initiate a Local Agenda 21 process.
	Rostock signs the European Sustainable Cities & Towns Campaign.
1998	Local Agenda 21 Office is created.
1999	Agenda 21 Council, which has informally existed since the early 1990s, is formally institutionalized as an advisory panel of Rostock’s citizens.
2005	Rostock publishes a climate mitigation strategy (updated in 2009).
2006	Rostock’s climate activities are certified through the European Energy Award.
2008	Climate Coordination Office created.
2009	Rostock joins the Covenant of Mayors.
2011	Rostock Energy Alliance, a network of various key actors in the area of renewable energies and energy efficiency, founded (since 2016 status of a non-profit organization).
	Rostock publishes a climate adaptation strategy.
2012	Rostock is awarded with the promotional prize Masterplan 100 % Klimaschutz (Masterplan 100 % climate protection) by the German Ministry for the Environment.
2013	Rostock publishes the mitigation masterplan.
2014	Rostock joins Mayors Adapt.
2019	A public petition demanding Rostock’s transformation into a bike-friendly city succeeds.
	Claus Ruhe Madsen wins the mayoral elections. He campaigned promoting the vision of a bike-friendly Rostock (role model: Copenhagen).
	Rostock’s city council declares the climate emergency (for 100 days).
2020	New Mobility Department created that should, amongst others, help to transform Rostock into a bike-friendly city.
	Climate Coordination Office integrated into the Environmental Department.

Rostock’s climate mitigation activities are coordinated by the Climate Coordination Office while the Environmental Department is responsible for adaptation. Both units support the city administration in climate action. The Climate Coordination Office has not been part of the city’s Environmental Department, but it has worked horizontally and cross-sectionally with different departments. Communication and collaboration among departments is very formal and hierarchical. Since not belonging to any of them, the Climate Coordination Office has been able to communicate directly and more informally with all departments on an equal footing. However, the drawback has been that the office being hardly included in the internal functioning of the departments and thus mostly cut off from their internal (also informal) communication. Therefore, in 2020 it was announced that the Climate Coordination Office will be integrated into the Environmental Department.

Among Rostock’s several climate reports and strategies, the masterplan of 2013 can be considered as the key climate strategy with a roadmap to 2050. Until then Rostock aims at reducing its greenhouse gas emissions by 95

percent and halving its energy consumption (base year 1990). The masterplan includes detailed measures that are suggested to reach these ambitious goals. However, many people in Rostock (citizens, representatives of businesses but also politicians and even activist groups like Fridays for Future) often do not know the masterplan, its goals, and its suggested measures. In addition, local politicians frequently need to be reminded of (the existence and content of) the masterplan. As climate action is not a compulsory task for municipalities in Germany, Rostock's local politicians often tend to delay or even prevent climate measures arguing that the financial means do not allow taking action in areas that do not represent a compulsory municipal field of action. Another significant challenge for implementing climate measures is the very hierarchical organization of the city administration, characterized by silo mentality and limited and very formal communication between different departments.

Over the years, the city was able to kick-off, develop, and implement relatively ambitious model projects, whereas the Climate Coordination Office was involved in the planning processes. Worth mentioning are *Petriviertel* and *Werftdreieck*. First of them is a residential, low-carbon, energy-efficient neighborhood east of the historic city center. In GDR times the area was an industrial district, but soon after the German reunification it became fallow land. Since around 90 percent of the area has been municipal property, its development could be proactively managed by the city. Each city mayor added new aspects and ideas on how to develop the area. The detailed planning of the project implementation started around 2009/2010 when – after discussions that had started in the early 1990s - a final political consensus on how to redevelop the area was achieved. Classified as part of a redevelopment area the planning and construction of the new residential neighborhood received significant subsidies from a variety of funding sources. Located in a landscape conservation area and a flood plain the aim was to develop the area applying ecologically compatible construction practices. Energy standards significantly higher than the legal minimum were set and respected and applied by the various developers. The northern part of the area is supplied with district heating while in the southern part the developers had to decide themselves how to comply with the high energy standards (e.g. by pellet heating or geothermal heat pumps). Moreover, significant parts of the area have recreational function. Today, *Petriviertel* has become a reference point for Rostock's sustainable urban development that various stakeholders frequently refer to during discussions about future city development.

After the German reunification the city underwent a difficult process of structural change, particularly the decline of the shipyard industry. As a consequence, former shipyard areas were made available for urban development projects. An example is the city's central brownfield area *Werftdreieck* (shipyard triangle neighborhood) that is currently being redeveloped as a sustainable residential area. The property was bought by Rostock's municipal housing company WIRO that manages the transformation process in collaboration with several involved city departments. The land use plan is mostly completed but not yet approved. Relatively ambitious climate and environment-related development goals were set by the architect's office managing the project. These include realizing traffic-calmed zones, the re-cultivation of a canalized creek, creation of green inner areas, and the installation of an adequate cycling infrastructure. Through these two urban redevelopment projects (*Petriviertel* and *Werftdreieck*) the city learned that it is generally attractive for investors and citizens and thus can be confident to set (building) standards above the legal requirements. Consequently, this approach is (partly) also being followed in current projects.

Citizen participation is relatively strong in general but also with regards to climate change related topics. Currently, local environmental activists are working on a petition aiming at the shutdown of a large coal-fired power plant located in the east of Rostock. Moreover, in 2019 a successful local referendum on expansion and improvement of the bikeway system has recently led to institutional changes within the city administration. In 2020, under the newly elected city mayor, who promised during the election campaign to transform Rostock into a bike city, a new Mobility

Department was established. The new department will be in charge of mobility management and first and foremost of the transformation into a bike city. The new mayor made funds available for several new positions within the new Mobility Department and facilitated contacts between Rostock's city administration and cycling route planners from Scandinavia.

Besides, citizen participation was also formalized and institutionalized. Since the early 1990s the Local Agenda 21 Council that is composed of several active citizens, has been a visible player in Rostock's city development, climate and energy topics included. The Agenda 21 Council is an advisory panel of Rostock's citizens managed by the Department of City Planning. The Council meets regularly to discuss topics related to sustainable urban development. Usually staff of the City Planning Department attends the meetings. While the communication channels between the citizens engaging in Agenda Council activities and the Department of City Planning are short and direct, this does not necessarily imply that the topics discussed during the meetings are manifested in the work agenda of the department. In 2008, within the Agenda Council a working group focusing on the local energy transition (*Arbeitskreis Energiewende*) was established. Prior to this the energy and climate topics were mostly not an integral part of the council discussions. In the beginning the council rather focused on urban development in general and the building/architectural development, traffic planning mostly following the vision of a compact city.

Taken together, Rostock is strong on a conceptual and strategic level as well as in citizen participation. Among German cities Rostock can be considered a climate policy champion succeeding in maintaining a balanced approach that puts emphasis on both pillars of climate action. The biggest challenges are around the actual implementation of (the existing and suggested measures) on the ground. Beyond these suggested and not implemented measures, however, quite extensive neighborhood development projects, in which climate change aspects were integrated, has been developed.

### Readings

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**The Turku Urban Research Programme** is a research collaboration and knowledge-brokerage initiative between the City of Turku, the University of Turku, and Åbo Akademi University, also involving co-operation with other universities and research institutes. The research programme focuses on urban development and urban governance topics, ranging thematically from economic development to social policy, and from urban planning to democratic innovations.

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