Climate action plans in Porto Atlantic Front municipalities: A comparison with the best municipal international practices

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Abstract

The purpose of this paper is to identify and discuss the main advances and shortcomings of the climate action plans of the Porto Atlantic Front municipalities - Matosinhos, Porto and Vila Nova de Gaia and compare them with the best international municipal practices, proposing recommendations for improving the plans and policy framework in which they were developed. We also analyse to what extent these municipal climate action plans and practices are influenced by horizontal and vertical relationships, within a multilevel territorial governance perspective. To answer the exploratory research questions, we used the case study research method. It involved the collection of documents and interviews with the main political actors in the three municipalities. Documents on best practices from European cities were also consulted through research of municipal reports and policies, as well as the official websites of the cities.

Keywords: climate change, mitigation, municipality, multilevel territorial governance

JEL codes: Q54, R11

1. Introduction

The purpose of this paper is to advance the assessment of the development of local/municipal climate planning in Portugal. Namely, we want to identify and discuss the main advances and shortcomings of the climate action plans of the Porto Atlantic Front municipalities - Matosinhos, Porto and Vila Nova de Gaia and compare them with the best international municipal practices, proposing recommendations for improving the plans and policy framework in which they were developed. The analysis addresses the following research questions:

- What is being done to address the vulnerabilities of climate change, regarding mitigation plans and adaptation actions, and how the municipal climate change action plans of the Port Atlantic Front municipalities compare with each other and with the best international municipal practices?

- To what extent are these municipal climate action plans and practices influenced by horizontal and vertical relationships, within a multilevel territorial governance perspective?

To answer the exploratory research questions, we used the case study research method (Yin, 2018), which is a qualitative method. It involved the collection of documents and interviews with the main political actors, to gather information on action plans and practices of the three municipalities and on the best international municipal practices. City administrative officials of the Porto Atlantic Front were contacted directly to confirm the existence of climate change action plans and/or provide the relevant documents. Documents on best practices from European cities were also consulted through research of municipal reports and policies, as well as the official

websites of the cities. Based on the information collected, in-depth interviews were prepared and conducted with the main political actors in the three municipalities.

Scientists are observing changes in the Earth's climate in every region and across the whole climate system. The most recent IPCC Working Group I report shows that emissions of greenhouse gases (GHG) from human activities are responsible for approximately 1.1°C of warming since the pre-industrial era and finds that, unless there are immediate, rapid, and large-scale reductions in GHG emissions, global temperature is expected to reach or exceed 1.5ºC of warming averaged over the next 20 years (IPCC, 2021). Robust strategies and action-plans are essential in tackling climate change. In the current scenario of escalating challenges related to climate change, it is urgent to adopt immediate mitigation measures, but also planning for adaptation, increasing the ability of human and ecological systems to respond to the impacts and effects of climate change, with a view to a carbon neutral and climate-resilient society. Notwithstanding the planetary scale of climate change, both GHG emissions and impacts of climate change are spatially highly differentiated (Romanello et al., 2021). Thus, there are strong incentives for mitigation and adaptation actions on a multi-scale basis: global, regional, and local governance levels (Hallegatte et al., 2011). A territorial multilevel place-based approach and governance (Barca et al., 2012) is therefore key for effective mitigation and adaptation solutions. With this perspective in mind, this paper addresses the local/municipal level of action.

Portugal is particularly vulnerable to the impacts of climate change resulting from extreme events associated like droughts or floods and heat waves. In addition, the rise in sea level is also a threat, since most of the resident population is concentrated along the

Atlantic coast, namely the population of the municipalities of the Porto Atlantic Front. According to the 2021 Census, the municipalities of Vila Nova de Gaia, Porto and Matosinhos are part of the top 10 of the most populous cities in Portugal and approximately half of Portugal's inhabitants live in just 31 municipalities (in a total of 308).

Worldwide, cities accommodate more than 50% of the world's population and are main centres of economic activities. Urban areas are responsible for 60% to 80% of global energy use in recent years and account for more than 70% of global GHG emissions (Araos et al, 2016).[1] Thus, on one hand, climate change and its inevitable consequences pose as one of the most prominent risks that cities are facing, and, on the other hand, they are a major source of the climate threat (Reckien et al., 2018). The way in which cities grow and operate matters for energy demand and, inevitably, for GHG emissions. Without deliberate policy interventions, the expected increase of urban areas would result in even higher emissions, clearly against the implementation of the Paris Agreement to limit global warming well below 2ºC or even below 1.5ºC as well as the broader development goals of the 2030 Agenda. Moreover, there is evidence that European cities are not on track to reach the Paris Agreement: they need to roughly double their ambitions and effort (Salvia et al., 2021). Thus, municipalities and local governments are in the front line regarding the climate emergency phase that is taking place. Fundamental changes in the urban environment are mandatory.

The EU has been at the forefront of international efforts to fight climate change. It was instrumental in brokering the Paris Agreement and continues to show global

[1] In Europe, this number rises to around 75% and this figure will likely rise to 80%, and even 90% in certain countries in the upcoming years (Carter, 2011).

leadership. The EU and its Member States, acting jointly, are committed to a binding target of a net domestic reduction of at least 55% in GHG emissions by 2030 compared to 1990 and have the binding obligation of climate neutrality by 2050 under the European Green Deal (European Climate Law) (EC, 2021). Having this in mind and given the high percentage of global emissions attributed to cities, this paper addresses with great emphasis the local/municipal level of action regarding mitigation. Municipalities are expected to contribute to climate mitigation by providing effective climate policy actions in a multilevel governance context, as stated by Neij and Heiskanen (2021). The municipal level can be considered as an ideal starting point to tackle climate change: resources on a large scale can be saved and it can become a modelling ground for aspects of sustainability, such as space-saving, compact and polycentric urban structures, low-emission transport, energy-efficient buildings and regulated waste and water management.

The paper unfolds as follows. After this introductory section, section 2 provides the literature review. Section 3 follows, where the method adopted in the research is explained. Results and discussion are presented in section 4. Section 5 concludes the paper.

2. Literature review

Several studies have been addressing climate action plans in cities worldwide. Reviews of climate planning documents carried out for cities worldwide (Araos et al., 2016; Mees, 2017), European cities (Biesbroek et al, 2010; Carter, 2011; Reckien, Flacke, Dawson, et al., 2014; Reckien, Flacke, Olazabal and Heidrich, 2015; Reckien,

Salvia, Heidrich, et al., 2018; Aguiar et al., 2018; Pietrapertosa, Khokhlov, et al., 2018; Reckien, Salvia, Pietrapertosa, et al., 2019), United Kingdom (Heidrich, Dawson, and Reckien, 2013), The Netherlands (den Exter, R., Lenhart, and Kern, 2015), Italy and Spain (De Gregorio Hurtado et al., 2015; Pietrapertosa et al., 2019) and USA (Deetjena et al., 2018), show that local municipal planning has increasingly been addressing more climate mitigation and adaptation issues.

The literature review was used to pinpoint the countries with the best performance as well as the most ambitious cities regarding climate issues, leaders in the implementation of climate measures in their countries. Thus, those, that we should look up to, to identify the best municipal international practices and measures adopted regarding mitigation, since this is our particular focus.

The studies suggest that Northern European cities and other high-income cities around the world are pioneers in local climate plans. In contrast, they are less common in Southern Europe. Cities in Northern Europe are leaders potentially because they had more experience with extreme climate events, like flooding (Reckien, Salvia, Pietrapertosa, et al., 2019). Moreover, in countries like The Netherlands, the United Kingdom and Germany, climate issues are high on the political agenda, and there are many motivating and facilitating factors, large research budgets are made available by governments and public organizations for regional and local research to enhance their commitment in fighting climate change (Biesbroek. et al., 2010).

The literature also highlights financial, political, and institutional barriers to the full realization of climate policies at the local level, like the lack of resources, leadership, and capacity; the lack of municipal decision-making; the lack of policy benchmarks

established by upper levels of government and the lack of coordination between national and subnational authorities are some of those barriers (Koop et al., 2017; Pietrapertosa et al., 2019; Soleki et al., 2015). Aguiar et al. (2018) add insufficient or deficient communication and information as well as deeply rooted values and beliefs that influence how people interpret and think about climate change and how to address it.

den Exter, Lenhart, and Kern (2015) identify three issues to address in local climate governance: (i) the decentralization of climate strategies within a city administration, where climate strategies are integrated across all relevant sectors and departments; (ii) the externalization of climate strategies, including broader methods to involve a wider group of non-public actors to guide local climate strategies; and (iii) the regionalization of climate strategies where municipalities in a wider region work together on joint strategies and learning, as well as with higher levels of government. Indeed, the integration of climate plans into all policies, conditions the guarantee of successful and effective emission reduction (Reckien, Salvia, Pietrapertosa, et al., 2019). Also, local public authorities need to actively involve different types of private actors: citizens, civil society, and business. That being said, there is the core of the responsibility sharing component, as cities cannot make a difference with the implementation of policies without the support of the private sector. Their active participation can help overcome problems of ineffectiveness, while also helping to increase the legitimacy of policies. It is stated and corroborated that public participation leads to higher quality plans, which are more likely to be implemented and maintained, to develop and succeed regarding climate change policies (Mees, 2017).

Very recently, Salvia et al. (2021) present a comparative analysis of the mitigation targets of 327 European cities, which covers over 25% of the European Union population, which includes cities of all sizes in all member states plus the United Kingdom. The results reveal that 78% of cities have a GHG emissions reduction target. 25% of the sample, which encompasses 81 cities, aim to achieve carbon neutrality, with 2020 being the earliest target date. 90% of these cities are members of the Climate Alliance and 75% of the Covenant of Mayors. They find that cities in Northern and Central Europe are much more likely to develop detailed plans compared to their counterparts in other countries. In some cases, this was linked to the national regulatory framework, because municipalities in some countries are legally required to produce climate plans (France and previously England). The authors give out several examples of cities that are ambitious in their climate targets, such as Uppsala in Sweden, which aims to reduce 90% of its emissions by 2040, more than 100% by 2050 and 110% by 2070. Other cities that aim to achieve carbon neutrality before 2050 include Aarhus and Copenhagen (Denmark), Turku and Oulu (Finland), Gottingen (Germany), Birmingham, Exter, Glasgow, Leicester and Newcastle (UK), Utrecht, Groningen, Den Haag, Breda, Tilburg and Nijmegen (Netherlands), Malmo, Linkoping, Stockholm and Orebro (Sweden).

The information provided by the literature review was relevant to compile a list of the cities with the best municipal international practices. Along the papers that were read and analysed, we were able to formulate a list of 48 cities that were mentioned at least once as having some of the best municipal international practices, as well as being an example of comparison. Moreover, we felt the need to add the cities that were part of

the European Green Capital list in the past decade, and not yet identified in the previous list, as to understand what had been implemented and what was the criteria used to differentiate the contestants.

The final list of cities analysed in detail was composed with 56 cities: 8 cities from the Netherlands, 7 from Spain, 8 from the United Kingdom, 2 from Denmark, 6 from Germany, 6 from Italy, 2 from the United States of America, 4 from Finland, 3 from France, 4 from Sweden, 1 from Switzerland, Slovenia, Norway, Portugal, South Africa and Uganda.[2]

Our main goal was to collect information on these cities based on what actions were already implemented, the results of those actions and environmental practices and recommendations on what can be done better by these municipalities, based on what was stated in municipal reports, the cities' websites, and the literature review. This made it possible to understand what the most used environmental municipal practices by those cities (known as being ambitious in their climate targets) are. Moreover, several key areas were identified: urban planning, buildings, mobility, energy, waste, water and sewage, crucial to address cities' climate mitigation. However, we must not neglect that comparison across different countries is a challenge due to institutional, legislative, political, and cultural differences (Biesbroek, 2010).

As several papers concluded, the Dutch cities are at the forefront of the fight against climate change, presenting numerous measures, some of them several decades old, to curb the effects felt by global warming. It is relevant to compare Dutch cities with those

[2] The Netherlands: Groningen, Rotterdam, Tilburg, Amsterdam, The Hague, Nijmegen, Utrecht, Breda; Spain: Madrid, Bilbao, Zaragoza, Vitoria/Gasteiz, Valladolid, Valencia, Barcelona; UK: Manchester, London, Birmingham, Glasgow, Leicester, Newcastle, Bristol, Exter; Denmark: Copenhagen, Aarhus; Germany: Stuttgart, Berlin, Freiburg, Hamburg, Göttingen, Essen; Italy: Naples, Rome, Venice, Milan, Firenze, Palermo; USA: Boise, New York; Finland: Helsinki Turku, Oulu, Lahti; France: Paris; Nantes, Grenoble; Sweden: Malmo, Linköping, Stockholm, Orebro; Switzerland: Basel; Slovenia: Ljubljana; Norway: Oslo; Portugal: Lisbon; South Africa: Durban and Uganda: Kampala.

of the Porto Atlantic Front since they have a very similar geography, due to their coastal characteristics, which makes the risk of floods and sea level rise much more pronounced and capable of intensely affecting local populations.

Campos et al. (2017) carry out the first national questionnaire survey of Portuguese municipalities about climate change to acquire knowledge about local policy strategies and actions in terms of mitigation and adaptation strategies and whether they are effectively involved in national and European climate strategies. Their findings show that climate change in municipal planning agendas is still little or not important and confirm that local policies are not adequately involved or guided by national and European strategies. The overwhelming majority of municipalities did not have a specific department to address responses to climate issues. Other studies addressed the municipalities of Íhavo and Vagos and the municipality of Cascais, and their climate plans (Campos, Alves et al., 2016; Campos, Vizinho, et al., 2016). Still in what concerns Portugal, the literature finds evidence of a low level of adaptive capacity in the country and little integration and coordination of policies across governance levels and scales (Carvalho et al., 2014; O'Riordan et al., 2014; Campos et al. al., 2017). As in most European countries, the coordination of climate change policies in Portugal has traditionally been carried out by ministries and government agencies, with little involvement of other stakeholders, leaving little room for the construction of social capital, and effective and fair strategies in the long term (Campos et al., 2017).

Our study focuses on the Portuguese context, where studies on the action of climate change are still marginal and it is a recent topic on the political agenda. It investigates the current climate action plans and practices in the Porto Atlantic Front municipalities

in what concerns mitigation, how they compare with each other and with the best international municipal practices identified in the cities previously referred. We give great emphasis to the local/municipal level of action regarding mitigation since cities are major contributors to climate change and climate neutrality is on the top of European Union political agenda.

This local municipal level, as discussed above, works within a broader multi-level governance perspective, including not only horizontal relationships such as those existing between the three neighboring cities, which arise from the need to coordinate actions and strengthen the sub-region and the region they represent (Maia and Costa, 2019), but also other interactions such as networks of (trans)national cities as well as vertical relationships. Indeed, there is evidence in Europe that transnational networks are an effective impetus for local climate change mitigation plans (Pietrapertosa et al., 2019), as many were developed under the Covenant of Mayors, which is a transnational network of governments launched by the European Union in 2008. Vertical relationships refer to interactions with higher levels of government such as national authorities and the European Union and how they can support local authorities in their climate struggle (den Exeter et al., 2015).

As previously referred, there are several key urban sectors to address cities' climate mitigation. Table 1 summarizes the best international practices in each of those sectors.

Table 1 – Key urban sectors and a summary of the best international practices

Key areas	**What cities are doing to reduce energy consumption and GHG emissions**
Urban planning	Reduction of land consumption through compact urban design (e.g. establi climate-friendly building codes, densification, designation of protected area restricted zones for settlements, prioritise landscape protection over bu development, restoring and increasing green spaces Balanced approach to housing, green spaces, and smooth mobility Promotion of urban food production centres
Buildings	Resource efficient (re-)construction and operation of buildings (e.g. sustainable

	building materials and design, strict green building standards, efficiency in cooling and heating, appliances and lighting) Green roofing and façades Financial support to the rehabilitation of privately owned buildings
Mobility	Reduction of traffic/Restrictions on the use of private transportation Balanced mobility redistribution between car, public transport, and smooth mobility: priority to public transport, pedestrians, and cyclists Provision and development of public transport. Its optimization intra-municipality and inter-municipalities (coordination and harmonisation at the metropolitan level) Tendency to free public transport Multimodal transport Provision of sharing systems Safe bicycle network Safe mobility of pedestrians. Creation of walkable, compact, and mixed-use neighbourhoods Citizen engagement with public transport and other ways of mobility Intelligent traffic management Promotion of efficient and electric vehicles. Provision of the infrastructure that supports them
Energy	Decentralised and renewable energy supply (e.g. distributed solar photovoltaics, self-sufficient buildings or even surplus producers, heating from renewable energy like solar panels or biomass heating systems) Financial support to households and firms to boost generation and use of renewable energy and improve energy efficiency
Waste	Improving solid waste management, 3R strategy (reduce, reuse and recycle), waste-to energy (electricity and heating), biological waste to compost Eradication of single use plastics Minimizing food waste. Donation of excess food
Water and sewage	Energy efficiency of treatment plants and the use of renewable energies Efficient water cycle management (circular economy)

If we look at the share of GHG emissions in cities by sector we find that the overwhelming majority comes from transport (about 28%), and buildings[3] energy use and efficiency (about 63%) (BMZ, 2021). Also, in the three municipalities of the Porto Atlantic Front, these same sectors are major consumers of final energy and major sources of GHG emissions. In 2018, both final energy consumption and GHG emissions range from 61% in Matosinhos to 90% in Porto. In Vila Nova de Gaia, both values are around 80% (AdE do Porto, Energaia). This explains why we give particular emphasis to urban mobility and buildings in the analysis we make.

[3] Residential, commercial, institutional, and industrial. These number refer to an average of sixty C40 cities.

3. The Method

To answer the exploratory research questions, we used the case study research method (Yin, 2018), which is a qualitative method.

Yin (2018) points out at least three reasons that justify the choice of this method: i) the question of investigation being a descriptive question – what is happening, or has it happened? - or explanatory - why or how did something happen?; ii) the method emphasizes the study of phenomena and the collection of data in real context, which is particularly relevant when the phenomenon under study is contemporary and not historical; (iii) the method is commonly used today in conducting evaluations. These three reasons hold in this investigation, which explains the choice of this method: (i) the research questions addressed in this study are descriptive and exploratory; (ii) they focus a recent and non-historical phenomenon, so that the analysis is necessarily exploratory and gains from being conducted in real context (rather than based so on secondary information); (iii) our goal is to carry out an evaluation of municipal climate change action in the three municipalities of the Port Atlantic Front and how they are influenced by horizontal and vertical relationships within a multilevel territorial governance perspective. There are three cases under analysis.

It involved the collection of documents and interviews with the main political actors of the Porto Atlantic Front. City administrative officials were contacted directly to confirm the existence of climate change action plans and/or provide the relevant documents. Documents on best practices from European cities were also consulted through research of municipal reports and policies, as well as the official websites of the cities. Based on the information collected, in-depth interviews (semi-structured) were

prepared and conducted with the main political actors in the three municipalities. The interview is, according to Yin (2018), one of the most important data sources for the case study, due to the interaction that allows between interviewer and interviewees. The information collected, obtained in documents and in the interviews, was then triangulated (see script of the interviews in the Appendix). Interviews focus with particular emphasis mobility and buildings because they are the major contributors to GHG emissions in the three municipalities.

4. Results and discussion

Work in progress

5. Conclusions

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Appendix

1. Climate Change: the view of the municipality

1.1. Porto signed the Covenant of Mayors in 2009 and in 2010 presented the corresponding Action Plan for Sustainable Energy of the city (PAES-P); signed the Global Covenant of Mayors for Climate and Energy in 2019 (when will be published the New Action Plan for Sustainable Energy and Climate?); published the Municipal Climate Change Adaptation Strategy in 2016 and the Metropolitan Plan for Adaptation to Climate Change in 2018; created the Porto Climate Pact in 2022. This range of initiatives shows a great concern of the municipality with climate change. What is the importance of each of the initiatives and how do they articulate themselves?

1.2. How was the implementation of PAES-P? Were the targets (final energy consumption, CO2 emissions reduction) for 2020 met? Which ones were close or far away from the goals? What lessons do you take for the future Plan?

1.3. What about the Adaptation Strategy: did it go better or worse than mitigation?

1.4. What is the role of planned investment in green spaces and afforestation of the city in reducing emissions? Is this strategy as important, more important or less important than the previous ones?

2. Mobility

At the international level, it seems to be a priority the reduction of cars in the city/promotion of public transport/promotion of smooth mobility (balanced distribution between the three). Is there any goal set for the distribution between the 3 mobility modes?

Thinking about reduction of cars in the city, does it make sense a new bridge for the subway? Why not install the subway on Arrábida Bridge?

2.1. Public transport

2.1.1. Who contributes more to the traffic in the city: residents or non-residents (house-work movements)?

2.1.1.1. Taking that into account, what strategies is the municipality adopting to promote access to the city and mobility within the city by public transport? (from the supply side and demand side)

2.1.2. Incentives for the use of public transport. Ex. Compensate citizens who leave their car at home and use public transport (discounts, free transportation). Free public transportation. Awareness raising and education of population.

2.1.3. Incentives/constraints to the renewal of the taxi fleet to electric taxis - Do they exist? Are there infrastructures for charging an electric taxi fleet?

2.2. Smooth mobility

2.2.1. We can clearly see some progress regarding the use of scooters and bicycles in a sharing regime, new bike lanes, new bicycle parking possibilities, pedestrian mobility. Do you have data regarding the number of users? How much has mobility increased on scooters and bicycles since the implementation of the sharing system (1 Jun 2020)? Are there goals and actions for the future to foster smooth mobility? (demand side (financial incentives, awareness campaigns, etc.), supply side (own lanes, parks, slope problem, etc.))

2.2.2. How is smooth mobility taken into account in the organisation of traffic plans and in the arrangement of public space?

2.3. Car traffic

2.3.1. Ongoing: (i) electrification of the fleet of light vehicles of the municipality; (ii) electrification of the bus fleet (or at least the use of natural gas); (iii) conversion of the fleet of heavy vehicles (e.g. garbage collection) to natural gas

How is this transformation going? What actions have there been? Are set goals being met?

When will the public transport system be carbon neutral (powered by electricity)?

There is a concern that municipal vehicles will be recharged for 100% renewable energy from the installation of photovoltaic panels in municipal buildings. Is that already a reality?

Can the city expected to meet the established carbon neutrality target in 2030 according to the Mission Cities "100 Climate-neutral and Smart Cities by 2030"?

2.3.2. Incentives to the use of electric vehicles

2.3.2.1. Are existing electric vehicle charging infrastructures sufficient for ongoing electrical conversion? Is it expected to expand this network? What is being done?

2.3.3. Does the municipality consider restrictions to the use of private transportation? (low emission zones, limit/close motorized traffic in certain parts of the city, limit/forbid car parking in the city centre, increase the

price of parking, congestion charges, parks to leave cars at the entrance of the city)

3. Buildings

3.1. Supply of renewable energy (autonomous and non-autonomous buildings (public and private))

3.1.1. Great concern with the conversion of energy sources of buildings (natural gas, photovoltaic solar energy, thermal collectors, etc.). What are the goals set (dates, total energy consumption, distribution by energy sources)?

3.1.2. How will you make civil society adopt these desired energy sources (technical solutions, incentives)?

3.1.3. What is the municipality doing in city districts and public buildings regarding this topic?

3.2. Conversion (energy efficiency) of existing buildings (municipal and non-municipal)/Strategies for new construction

3.2.1. What is the role of passive solar energy in the strategy of promoting the energy efficiency of buildings, both in rehabilitation of old buildings and in the construction of new buildings?

3.2.2. How is the city's strategy for green roofs going? Can these roofs be urban gardens?

3.2.3. How will you make civil society reconvert its buildings (technical solutions, financial support)? For example, promote the PortoEnergyHub? Other actions?

3.2.4. What is the municipality doing in city districts and public buildings regarding this topic?

4. Others

4.1. How does the war affect everything that we spoke about?

4.2. Other issues/comments you would like to make?