POCACITO

european post-carbon cities of tomorrow

D8.5 POCACITO PUBLICATIONS REPORT

SUBMISSION OF A SERIES OF ACADEMIC ARTICLES ON THE INDIVIDUAL CASE STUDIES AND COMPARING THE RESULTS ACROSS THE CASE STUDIES

ECOLOGIC INSTITUTE

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WP	Work Package

I POCACITO PUBLICATIONS

The project **Po**st-**Ca**rbon **Ci**ties of **To**morrow – foresight for sustainable pathways towards liveable, affordable and prospering cities in a world context **(POCACITO)** is a research project funded by the European Union's Seventh Framework Programme for Research, Technological Development. The objective of the project is to facilitate the transition of EU cities to a forecasted sustainable or "post-carbon" economic model, eventually leading to an evidence-based EU 2050 post-carbon city roadmap.

At the core of the project is a series of participatory stakeholder workshops in the case study cities of Barcelona, Copenhagen/Malmö, Istanbul, Lisbon, Litoměřice, Milan/Turin, Rostock and Zagreb. The purpose of these workshops is to bring together local stakeholders to construct a common post-carbon vision for 2050 and roadmap, or action plan, to reach the vision. The workshops will highlight the current successes and challenges facing the city and support a discussion of city-specific innovative measures based on lessons learned from local experience and best practices.

Other initiatives of the project include the development of a typology of post-carbon cities, which will be the basis of the EU 2050 post-carbon city roadmap. Additionally, the project will establish an online "market place of ideas" that supports an international knowledge exchange of urban best practices between cities in the EU and worldwide. The project also organises two study tours that enable city representatives to visit EU best practices in person as well as to connect and exchange experiences with representatives from other cities.

The project's research supports the sustainable development objective of the Europe 2020 strategy and the Innovation Union flagship initiative. POCACITO began in January 2014 and will end in December 2016.

Within the project, a number of publications have been produced which are collated in this report:

Table 1: Publications within the POCACITO project:

TITLE	AUTHOR(S)	YEAR
Leading mid-sized EU cities in post-carbon transitions: towards a preliminary typology	Beveridge et al.	2016
Towards a Post-Carbon Future: Benchmarking of 10 European Case Study Cities	Selada et al.	2016
İstanbul 2050 'Post-Carbon' Kent Gelişimi İçin Yol Haritasının Belirlenmesi (Determining of the Roadmap for Istanbul 2050 'Post-Carbon' Urban Development)	Baycan and Aygün	2016
Ökostadt zwischen Vision und Wirklichkeit	Döhler et al.	2014

II LEADING MID-SIZED EU CITIES IN POST-CARBON TRANSITIONS: TOWARDS A PRELIMINARY TYPOLOGY

Leading mid-sized EU cities in post-carbon transitions: towards a preliminary typology

Leading mid-sized EU cities in post-carbon transitions: towards a preliminary typology

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Abstract:

Adopting an explorative approach, this article seeks to advance understanding of how leading mid-sized cities are undergoing transitions towards post-carbon futures in the EU. The paper develops a preliminary typology of mid-sized cities in post-carbon transitions, profiling five exemplary city types according to a combination of their sustainability characteristics. The profiled cities have been pre-selected to provide reasonable geographic distribution within the EU, and show the influence of different contextual factors: population size, local political autonomy and economic wealth: (1) Malmö (Sweden); (2) Bristol (UK); (3) Freiburg (Germany); (4) Vitoria-Gasteiz (Spain); and Ljubljana (Slovenia). Conceptually, transitions are viewed as the outcome of the specificities of a place and broader (regional, national, transnational) dynamics in a range of dimensions (climate, economic, political-discursive) over a period of time. The progress of these cities in transition is evaluated qualitatively in environmental, social and economic terms. It is hoped that developing knowledge on generic urban types may aid in establishing which mid-sized cities are peers for the transfer of successful mitigation practices. This is especially important for disseminating and scaling up effective practices across European cities under different contextual conditions and with limited funding.

Keywords: urban sustainability; energy transitions; post-carbon city; Malmö; Bristol; Freiburg; Vitoria-Gasteiz; Ljubljana

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1. Introduction: Low-carbon transitions, contextual factors and mid-sized cities

Adopting a largely qualitative and explorative approach, this paper seeks to advance understanding of how leading mid-sized cities are undergoing transitions towards post-carbon futures in the EU. Information on practices and actual performance is combined with data on contextual factors to characterize profiles of five exemplary city types and develop a preliminary typology which helps identify commonalities and differences. The profiled leading cities have been pre-selected to provide reasonable geographic distribution within the EU and show how different contextual factors, such as socio-economic, developmental and biophysical factors, will influence performances of mid-sized cities. To meet these objectives, we have chosen mid-sized (100,000 – 500,000) European Green Capital Award finalists from the following cities: (1) Malmö (Sweden); (2) Bristol (UK); (3) Freiburg (Germany); (4) Vitoria-Gasteiz (Spain); and (5) Ljubljana (Slovenia).

Cities are vital to dealing with climate change both generally, in the sense that transformation, particularly decarbonization, must be achieved in urban areas[1], and in specific cases, in terms of certain cities developing innovative responses[2] and certain types of other cities being able to learn from them. The paper reports on ongoing results from the EU-Funded research project *POCACITO* (Post Carbon Cities of Tomorrow). Within the POCACITO project, the concept of "post-carbon cities" is used to signify "a rupture in the carbon-dependent urban system, which has led to high levels of anthropogenic greenhouse gases, and the establishment of new types of cities that are low carbon as well as environmentally, socially and economically sustainable. The term "post-carbon" emphasizes the process of transformation, a shift in paradigm, which is necessary to respond to the multiple challenges of climate change, ecosystem degradation, social equity and economic pressures" [3] (8). By developing a preliminary typology to structure the analysis across similar types of cities, this paper aims to help address a deficit in the literature regarding knowledge and indicative examples of urban sustainability transitions per city type.

Recent research on urban climate governance has devoted much attention to the importance of transnational and internal networks for learning and the transfer of expertise, policy and best practices [4-6]. Networks are an integral feature of urban sustainability [7], be they internal or external, local, regional, national or transnational in form. However, despite this proliferation of learning opportunities, overall achievements in low-carbon transitions and urban sustainability remain unclear [8] (p. 150).

This can be explained in a number of ways. First, it should never be forgotten – as it sometimes is in the literature – that transitions are contingent, political as well as technological and economic [9]. They are thus unpredictable. Second, transitions are fundamentally complex, defined by constraints and limitations, as well as opportunities and obligations. Urban climate governance is shaped by multiple and overlapping processes, by a range of actors, organizations and scales [5]. Cities can only do so much autonomously. Achieving urban post-carbon transitions requires dealing with a varying combination of constraints, as well as opportunities.

[1] Since the perceived failure of nation states to deal with climate change, e.g. at the 2009 United Nations Climate Change Conference in Copenhagen, there is a sense that change is more practicable at the urban level [1].
[2] In fact, many cities have adopted measures in advance of and of a more ambitious nature than the national level – and as such they influence national and even EU policy e.g. London, Rotterdam, Munich, and Stockholm [2].

Many constraints are generic, even if the particular ways in which they are combined vary from city to city. In a literature review and study of 38 cities' involvement in climate action worldwide, Martins and Ferriera [10] (46) conclude that the following general categories of constraints on action at the urban level are apparent: resources and capacity, knowledge and information, institutions and governance. Constraints are not always endogenous to a city, even if they are always locally observable. A lack of financial revenue at the urban level may result in part from the national context in which cities are embedded, e.g. wider national taxation frameworks in the UK, which result in a concentration of tax revenue at the center. Understanding transitions to post-carbon cities requires an analysis of the relationships between urban contexts themselves, internal dynamics, such as the actions undertaken and the overall performance of cities in moving to a post-carbon system, and the external dynamics from the EU to the national and the sub-national levels, e.g. EU-agreed and binding emission reduction goals (40% below the 1990 level by 2030).

To better identify the importance of contextual factors in influencing cities' performance in post-carbon transitions, this paper will focus on mid-sized cities which amount to between 100,000 and 500,000 cities across the world. Many existing studies focus on iconic cities or capitals above 500,000 inhabitants such as London, Paris, Stockholm, Copenhagen, Amsterdam, Hamburg, Berlin or Zürich. However, there are far more cities which have less than 500,000 inhabitants, and even in centrally-organized countries like France or Sweden, the majority of people still live in cities of less than 500,000 inhabitants. There is also more variety among cities between 100, 000 and 500,000 inhabitants. Further, although the vast majority of cities and towns have less than 100,000 inhabitants, only a very low percentage of these small cities (such as Växjö in Sweden) have become known as sustainability pioneers. Thus, a focus on mid-sized cities with more than 100,000 inhabitants is highly relevant to understanding the low-carbon transition in Europe, and developing a typology is important to capture the diversity of mid-sized cities (in terms of population size, wealth and economic structure, for instance).

A recent UN [11] (53) report also argues that the preponderance of mid-sized cities globally provides perhaps the best opportunity to make cities more sustainable; the implication being that change is more achievable financially, socially and materially at this urban scale of urban form than at that of smaller and larger cities. Within this context, means of improving 'matchmaking' between mid-sized cities, helping them find practices and general approaches attuned to their particular contexts of action is of paramount importance. Ultimately, cities have unique histories, but at the same time they share systemic and contextual features. Hence, very different cities can share very particular characteristics. For this reason, it could be "valuable to discern the particular drivers and mechanisms that contribute towards shifting evolutionary trajectories towards more sustainable ends" [12] (313). It is hoped that developing knowledge on generic urban types may aid in establishing which mid-sized cities are peers for the transfer of successful mitigation practices. Hence, the paper develops a preliminary non-comprehensive typology of mid-sized cities in post-carbon transitions, profiling five exemplary city types according to a combination of their sustainability (social, environmental and economic) characteristics. This may be especially important for disseminating and scaling up effective practices across European cities under different contextual conditions and with limited funding.

The paper has the following structure. Section two provides an overview of urban and sustainability typologies. Section three profiles and discusses the five types of mid-sized leading cities, outlining selection criteria, an introductory conceptual approach to urban post-carbon transitions and the preliminary typology. Section four reflects critically on the typology and offers ways forward for future research.

2. Urban and sustainability typologies

The term "typology" is still rather ambiguous and used in various ways. According Lang [13], typologies are the categorization of different types, or "construct[s] of a product or a process that serve as generic model[s] of way of thinking." Due to the diversity of European mid-sized cities, it is clear that many different types of cities and performance profiles are present. A typology, or categorization, of various city types can help identify commonalities and differences across urban contexts and lead to more meaningful benchmarking (see also Zoeteman, Zande, and Smeets [14]). The following therefore briefly summarizes the state of the art in international and European urban sustainability benchmarking and typologies that can serve as a baseline for further elaborating on the context, activities, and post-carbon performance of mid-sized EU cities.

In the field of urban sustainability, the benchmarking, or ranking[3], of cities according to various aspects (i.e., sustainability, liveability, innovativeness, etc.) has gained much popularity in Europe and worldwide. Some of the most notable rankings for European cities include the European Energy Award, European Green Capital Award, European Green City Index, European Soot-free City Ranking, RES Champions League, and the Urban Ecosystem Europe, all of which have their own methodological characteristics and limitations [16]. Although benchmarking is a potentially useful instrument to identify (and start a public debate about) a city's strengths, weaknesses, and strategies for future development, much attention has focused entirely on the ranks themselves rather than interpreting what they mean for urban policy [15]. Moreover, the methods and indicators used by city rankings often do not control for the diverse contextual conditions and are frequently non-transparent, which undermines the fairness and meaningfulness of comparisons. In fact, Venkatesh (2014) [17] notes that it may be necessary to tailor the indicators collected according to the city type.

The adequacy, normalization, aggregation, and weighting of indicators used by different benchmarks are, furthermore, subjects of much debate [16, 17]. Benchmarks also overlook the interrelatedness of indicators, meaning that an improvement/decline in one area could be offset or reinforced by an improvement/decline in another area, which is not immediately apparent after aggregation despite being highly relevant for policymaking [16, 17]. Although it is difficult to address all the methodological issues of benchmarking, using typologies to structure an analysis across similar types of cities would improve the usefulness of the instrument [14, 16, 17]. Nevertheless, none of the European city rankings mentioned above apply a city typology to benchmark performance [16]. Doing so would minimize differences within group comparisons and make it easier to identify structural (dis)similarities in sustainable city transitions [14, 16, 17] and thereby facilitate more targeted policy design and transferability of good practices [18-20].[4]

[3] According to Giffinger and Gudrun [15], city rankings comprise at least two cities, are structured in a hierarchical, ascending/descending order, which is based on a combination of at least two indicators.
[4] See also Giffinger, Haindlmaier, and Strohmayer [21], who develop a typology of European small and middle-sized cities to benchmark their performance according to "smart" city indicators

Although not yet included in prominent EU ranking methodologies, much research has focused on creating a typology of EU cities, which could aid in the analysis of post-carbon transitions across varying urban contexts. Of the assortment of European urban typologies reviewed, the typology developed in the State of European Cities Report is, as of yet, the most suitable in terms of providing a baseline categorization of a large selection of cities to assess the different types of post-carbon transitions. Many of the EU city typologies are based on limited factors, such as land cover,[5] population density,[6] and functional areas [24], which make them less relevant for benchmarking the sustainability of EU cities as they do not consider important socio-economic and environmental baseline conditions. A series of typologies established under the ESPON 2013 program are slightly more descriptive, including a typology of the sectoral structure of European cities (percentage share of agriculture, manufacturing, industry and energy, construction, trade and transport, finance and business services, and other services) as well as common types of metropolitan macroregions[7] based on demography, economic structure and labor market data [25, 26]. In order to provide a more balanced assessment of sustainability, Zoeteman, Zande, and Smeets [14] very recently published a preliminary typology of cities based on 87 indicators. However, these city types are based on 58 European Green Capital Award applicants and therefore not representative of EU cities as a whole. Recognizing the complexity of comparing diverse cities, the EEA's European Topic Centre on Urban, Land and Soil Systems is currently developing a new European city typology according to city socio-economic, environmental and geographic characteristics with the objective to improve the analysis of urban sustainability [27]. Information about these typologies, however, is not yet available.

Using data from the Urban Audit (2001 and 2004 datasets, respectively), the typologies developed for the First and Second State of European Cities Reports [28, 29] employ a broad set of indicators to cluster EU cities into different, mutually exclusive "city types." The first report develops thirteen city groupings based on 15 indicators, which cover aspects such as size, economic structure, economic performance and competitiveness. However, the categorization is mainly based on measures of economic criteria, thereby limiting the amount of context it could provide for analyzing post-carbon transitions. With a sample size of 329 cities (EU, Swiss and Norwegian), the subsequent State of European Cities Report [29] uses a set of 21 indicators to group EU cities into four basic "city types" and nine sub-types (see Table 1). The revised typology leads to a greater distinction between the core urban areas of the European economy and the outlying cities of Western Europe as well as the non-capital cities of Central Europe [29]. Due to the inclusion of demographic, economic, social, as well as environmental aspects, this appears to be the most relevant typology of EU cities for the purposes of this paper.[8]

[5] For example, the Urban Morphological Zones (UMZ) developed by the EEA [22]

[6] Degree of urbanisation (DEGURBA) developed by Eurostat[23]

[7] These types include: 1) Monocentric service centres surrounded by regional hinterland with labour market problems, 2) Central service centres surrounded by industrialised regional hinterlands, 3) Small service centres surrounded by mountain areas, 4) Polycentric metropolis in polycentric regions, 5) National growth poles surrounded by industrialised areas, 6) Restructuring cities in problem areas, 7) National growth poles surrounded by traditional rural areas, 8) Smaller cities in peripheral areas, 9) Other macroregions – capital cities, 10) Other macroregions – non-capital cities

[8] Nevertheless, significant limitations remain - the authors note that there is a considerable degree of simplification that comes with categorising the cities and therefore advocate caution when applying the city types. Furthermore, labels could be misleading for "borderline cases," which do not adhere to the group average values across all variables.

In the following, we use the city types developed by the State of European Cities Report as well as publicly available data to provide context for a qualitative profiling of the selected mid-sized cities. Through this approach, we aim to reflect on the usefulness of the city types, further inform city benchmarking, and propose a structure for comparatively analyzing cities in post-carbon transitions on which future research could expand. Following RWI et al. [29] the five types of mid-sized cities with populations between 100,000 and 500,000 are “Regional Service Centre”; “Regional Innovation Centre”; “Regional Centre with Growing Population”; “National Capital and Metropolis”; “Leading European Capital and Metropolis” (see Table 1).

Table 1. EU City Types and selected mid-sized cities.

EU CITY TYPE	DESCRIPTION OF EU CITY TYPE	LIST OF CITIES WITH SELECTED HIGH PERFORMING CITY IN BOLD
"Regional Service Centre"	• 76 ities providing highly specialised services, particularly from the financial and business service sector, public administration, health and education • Research centres for hi-tech industries and hubs of IT services • Overall economic output (GDP) per inhabitant, patent intensity and entrepreneurial activity are lower than in the highest-ranking urban centres, yet still above national averages	Aalborg , Aix-en-Provence, Amiens, Arnhem, Belfast, Bergen, Besançon, Birmingham, Bonn, Bordeaux, Bradford, Breda, Brescia, Caen, Cardiff, Charleroi, Clermont-Ferrand, Cork, Coventry, Dijon, Eindhoven, Enschede, Exeter, Funchal, Galway, Gent, Gravesham, Grenoble, Göteborg, Irakleio, Kingston-upon-Hull, Lausanne, Le Havre, Leeuwarden, Leicester, Lens - Liévin, Lille, Limerick, Limoges, Lincoln, Liverpool, Liège, **Malmö**, Manchester, Marseille, Metz, Montpellier, Nancy, Nantes, Napoli, Newcastle upon Tyne, Nice, Nottingham, Oporto, Orléans, Palermo, Poitiers, Portsmouth, Reims, Rennes, Rotterdam, Rouen, Saint-Etienne, Sheffield, Stevenage, Stoke-on-trent, Strasbourg, Tilburg, Toulon, Toulouse, Tours, Utrecht, Wirral, Wolverhampton, Worcester, s' Gravenhage
"Leading European Capital and Metropolis"	• 24 metropolises that represent the highest urban concentration of GDP per head • Account for the largest number of (national) patent applications per population and the largest share of new businesses • Centres of specialised service industries aimed at national or international markets • Ports of entry for international migrants	Amsterdam, Bremen, **Bristol**, Bruxelles/Brussel, Dublin, Düsseldorf, Edinburgh, Frankfurt am Main, Glasgow, Hamburg, Hannover, Helsinki, Köln, København, London, Luxembourg, Milano, München, Nürnberg, Oslo, Paris, Stockholm, Stuttgart, Wien
"Regional Innovation Centre"	• 51 cities, mainly from Germany and Italy, which are characterised by a particularly dynamic entrepreneurial and research activity • Ageing resident population • Overall economic output (GDP) per inhabitant, patent intensity and entrepreneurial activity are lower than in the highest-ranking urban centres, yet still above national averages	Aberdeen, Ancona, Augsburg, Bari, Bielefeld, Bochum, Bologna, Brugge, Cagliari, Cambridge, Cremona, Darmstadt, Dortmund, Erfurt, Firenze, **Freiburg im Breisgau**, Genova, Genève, Graz, Göttingen, Halle an der Saale, Heerlen, Karlsruhe, Kiel, Koblenz, Leipzig, Magdeburg, Mainz, Modena, Moers, Mönchengladbach, Mülheim a.d.Ruhr, Oulu, Padova, Pescara, Plzen, Regensburg, Saarbrücken, Schwerin, Torino, Trento, Trier, Trieste, Turku, Venezia, Verona, Vigo, Volos, Wiesbaden, Wuppertal, Zürich
"Regional Centre with Growing Population"	• 24 cities from Western (Austria, Germany, the Netherlands) and Southern Europe (Greece and Spain) • Among the Regional Centres, this is the most dynamic group in terms of city growth, particularly due to in-migration, but also because of birth surpluses. • Employment in public services, health and education combined accounts for a relatively high share (33% compared to 28% in all cities) of the total labour force • Overall economic output (GDP) per inhabitant, patent intensity and entrepreneurial activity are lower than in the highest-ranking urban centres, yet still above national averages	Alicante/Alacant, Bilbao, Dresden, Gijón, Groningen, Innsbruck, L'Hospitalet de Llobregat, Las Palmas, Linz, Logroño, Málaga, Nijmegen, Oviedo, Palma di Mallorca, Pamplona/Iruña, Potsdam, Salzburg, Santa Cruz de Tenerife, Santander, Sevilla, Thessaloniki, Valencia, Valladolid**, Vitoria/Gasteiz**
"National Capital and Metropolis"	• 28 cities, which are large economic centres of national importance and/or capital cities • Account for the largest number of (national) patent applications per population and the largest share of new businesses • Centres of specialised service industries aimed at national or international markets • Ports of entry for international migrants	Antwerpen, Athina, Barcelona, Berlin, Bern, Bratislava, Bucuresti, Budapest, Essen, Gdańsk, Kraków, Leeds, Lefkosia, Lisboa, **Ljubljana**, Lyon, Łódz, Madrid, Poznan, Praha, Riga, Roma, Sofia, Tallinn, Valletta, Vilnius,Warszawa, Wrocław

Source: Adapted from RWI et al. (2010)

3. Profiling major types of mid-sized cities in post-carbon transitions

3.1. Criteria for selection

The selection of mid-sized cities was based on the following criteria: The selected cities should (1) provide a geographic coverage of Europe and allow for preliminary insights on the importance of different city types and contextual factors generally; (2) be recognized as high performers, with particular reference to the European Green Capital Award; (3) have readily available and accessible data.

The leading green cities analyzed in this study represent different regions in Europe: Nordic countries, Britain and Ireland, Continental Europe, Southern Europe and Central and Eastern Europe. (1) Malmö: in the Nordic countries, the density of high performing cities is very high (see, for example, European Green City Index developed by Siemens); (2) Bristol: cities in the UK (and Ireland) where smaller and mid-sized cities, such as Leicester, have long been engaged sustainability initiatives despite the centralized political system; (3) Freiburg: cities in Continental Europe where the most prominent high performing green cities are located, from Nantes to Amsterdam, Freiburg, Zürich and Graz; (4) Vitoria-Gasteiz: in Southern Europe, cities started sustainability initiatives later than cities in the Nordic countries and in the UK (e.g. LA21 initiatives), although a few larger cities, such as Barcelona, have developed into European leaders; and (5) Ljubljana: cities in Central and Eastern Europe where high performing green cities are still an exception.

The selection of cities is based primarily on data from the European Green Capital Award, particularly the data on the award finalists. Since its introduction (2010), 20 cities have become finalists. Copenhagen and Oslo have been among the finalists twice and Bristol even three times. Among the 20 finalists for the award, six cities are located in Northern Europe (three Swedish, one Danish, one Norwegian, and one Icelandic city); two cities in the UK; nine cities in Continental Europe (six German, one French, one Dutch, and one Belgium city); two cities in Southern Europe (both located in Spain); and one city in Central and Eastern Europe (located in Slovenia). This means that 85% of the finalists can be found in Northwestern and Continental Europe, while only a few finalists are located in Southern Europe (Spain) (10%) or in Central and Eastern Europe (5%). All of the finalists are university cities, 60% are harbor cities, and 35% are capital cities (except Ljubljana all these capital cities are Nordic or Benelux cities).

15% of the finalists are cities with above 1,000,000 million inhabitants (Brussels, Hamburg, Barcelona), 25% have between 500,000 and 1,000,000 inhabitants (Copenhagen, Oslo, Stockholm, Glasgow, and Amsterdam), and 60% between 100,000 and 500,000 inhabitants (Malmö, Bristol, Nantes, Freiburg, Münster, Nuremberg, Frankfurt, Essen, Vitoria-Gasteiz, Ljublana, Reykjavik, Nijmegen, and Umeå). It can be concluded that the majority of cities which applied for the award and made it to the final round are mid-sized cities below 500,000 inhabitants. On this basis, we assessed the following five cities: (1) Malmö (Sweden); (2) Bristol (UK); (3) Freiburg (Germany); (4) Vitoria-Gasteiz (Spain); and (5) Ljubljana (Slovenia).

3.1. Malmö: from deindustrializing to knowledge-based sustainable city

Context: Malmö, a low-lying coastal city in Southwest Sweden, is, with more than 300,000 inhabitants, Sweden's third largest city [30]. Around 615,000 people live in the metro region of Greater Malmö, and the Öresund region is one of the most innovative regions in Europe. Malmö has become an important city for business because around 30 companies moved their headquarters to the city and generated around 2,300 jobs [31]. With 31% of its inhabitants born abroad and an average age of 36 years, Malmö is also a very international and young Swedish city [30]. The city has a considerable degree of autonomy due to the highly decentralized political system (see, for example, the Swedish Local Government Act), the financial capacities of Swedish municipalities [32] and other contextual factors, such as the percentage of homes owned by Swedish cities (in Malmö 32%) [30].

Strategy: Historically, Malmö identifies itself as an industrial city, home to Kockum's Shipyard. After the collapse of the industry, Malmö lost 27,000 jobs and the unemployment rate increased to 15% [33]. The city underwent drastic transitions in the late 1980s and early 1990s and started to reinvent itself based on the new vision of a knowledge and sustainable city. This transition included major infrastructure projects, in particular, the transformation of the Western Harbour area, the establishment of Malmö University (with around 12,000 students) in 1998, and the Öresund Bridge in 2000 [34]. Today, the dominant sectors in Malmö are business services, commerce, health care and social services, and education [31]. Malmö introduced its first Environmental Plan in 1990, followed by the Project 'Malmö 2000' and the 'Vision Malmö 2015' (1995). The new Masterplan (2012) is a long-term approach with the vision to develop Malmö into a sustainable and attractive city [34]. Malmö aims for a 40% reduction in CO_2 emissions by 2020 and by then the city administration will be climate neutral. By 2030 the entire city will run on 100% renewable energy [35]. In contrast to other comparable cities, Malmö addresses the challenges of climate change and sustainability simultaneously, i.e. Malmö's climate change policy is embedded in its sustainability strategy. This approach acknowledges social sustainability as an equal priority and also includes a communication strategy. This combination of climate change and sustainability seems to be one of the key factors for Malmö's development and relative success.

Main achievements: Malmö has become internationally renowned for its pilot project in the Western Harbour, which was transformed from a largely industrial shipyard into an area for sustainable living. Policy-makers, led by Malmö's ambitious mayor Ilmar Reepalu (1994-2013), opted for an ecological approach to planning and environmental sustainability, supported by many actors including the newly established Malmö University [33,34]. Malmö has won several awards, such as the European Commission's 2012 RegioStars Award for integrated sustainable development strategies, Idébanken's 2011 prize for long-term efforts to become a sustainable city, and WWF's 2011 Earth Hour Capital Award [34]. In 2012/13, Malmö became a finalist for the European Green Capital Award. The city has been active in urban transportation (expanding bike paths and increasing the number of people cycling in the city) and undertaken sustainable housing projects in disadvantaged districts (e.g. Augustenborg) [36].

	Country: Sweden		City: Malmo	
	Population [9] (2012)	9,482,855	Population (2011)[10]	302,835*(cities and greater cities) 615,721(larger urban zone)
	GDP €/capita (2011)[11]	40,800	GDP €/capita (2011)[13]	35,100 (NUTS 3 region)
	GDP per capita in PPS[12] (2013)	127		
	Region	Nordic Countries		
City's physical geography	Location	✓ A port town situated in the Skåne Region in South West Sweden and the wider Öresund Region incorporating southern Sweden and Eastern Denmark.		
	Climate[14]	✓ Oceanic climate, with 4.7 hours of sunshine per day ✓ Average temperate: warmest month is 18.2°C; coldest month is -1.7°C ✓ Annual rainfall: 697 litre/m²		
Political Autonomy[15]		✓ Decentralised unitary state with three recognised levels of governance: central, county and municipal. ✓ Municipalities have mandatory administrative powers in the fields of: ✓ Transport, Social Welfare, Economic Development, Education, Planning and Building, Health Protection, Environment (environmental protection, water and sewage, refuse and waste management) ✓ Voluntary responsibilities include: Energy and Housing		
CO_2 Reduction Targets		✓ 40% reduction CO_2 emissions by 2020 using 1990 as baseline year[16] ✓ GHG reduction of 92% in the Transport sector and 8% for Local Electricity by 2020[17]		

Table 2. Malmö Profile.

3.3. Bristol (UK): policy entrepreneurialism, local activism and green business

Context: Bristol was winner of the European Green Capital Award 2015, commended by the jury for its transport and energy investment plans in particular. Bristol is a growing city with a population of 430,300 and is the major city of South West England. It has experienced general economic prosperity in recent years, despite the economic and financial crisis. Its economic strengths are in advanced manufacturing, aerospace and, increasingly, in knowledge sectors and the green economy [44]. Bristol has recently gained political formal autonomy by way of an elected City Mayor (supported through public referendum in 2012) and the combining of local authorities. Although this has not resulted in a substantial decentralization of formal powers within the highly centralized UK political system, it has provided opportunities to stimulate the local economy and heighten focus on urban sustainability. The elected mayor can access a new economic fund supported by the local

[9] Eurostat [37]
[10] Eurostat [38]
[11] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[12] GDP in PPS: EU28 = 100; Eurostat [39]
[13] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[14] Figures for 2008, Eurostat [40]
[15] See European Union Committee of the Regions [41]
[16] Covenant of Mayors [42]
[17] Covenant of Mayors [43]

retention of business tax rates to fund, for example, transport improvements. Nonetheless, capacity to instigate change is low in comparison to Swedish cities and, in particular, German cities.

Strategy: The first elected mayor, George Ferguson (2012-), has acted as a “policy entrepreneur” [45] promoting sustainability and the city’s potential in the field, emphasizing the economic and social benefits of urban sustainability, such as addressing energy poverty [46]. However, this can be seen as a continuation of the city council’s proactive approach to environmental issues. Although Bristol has no statutory responsibility for controlling the energy mix of the city, it is attempting to increase renewable energy generation under its Sustainable Energy Action Plan (SEAP) (2012) through the construction of wind turbines in the Avonmouth area [47]. There is a strong sense of localism and the city is also home to many green organizations (Soil Association and Sustrans) and a growing green economy. There is, then, a bottom-up dimension to transition as well, with civil society and market actors promoting change.

Main achievements: The main foci have been on the areas of transport (especially promoting cycling), energy and the green economy. Bristol is a signatory to the Covenant of Mayors and has set ambitious targets to reduce energy use by 30% and CO_2 emissions by 40% by 2020 (from 2005 baseline). The city has undertaken a wide range of strategic initiatives, chief among them being the Bristol Climate Protection and Sustainable Energy Strategy, the Local Transport Plan to 2026 and initiatives centered on liveability and health, which have been recognized by the 2014 International Making Cities Liveable Lewis Mumford Award. At the center of the city’s financial commitment to sustainability is transport and energy. Bristol has committed €500m for transport improvements up to 2015 and €300m for energy efficiency and renewable energy up to 2020. In Bristol, domestic energy use has been reduced by 16% (2005 to 2010), and the energy efficiency of housing has been improved by 25 % (2000/2001 to 2011). The green and knowledge economy has been another major focus with plans to create 17,000 new jobs through the new Bristol Quarter Enterprise Zone in the areas of low carbon, creative and digital industries by 2030 [47]. Following in the footsteps of the original Transition Town, Totnes, in 2012 Bristol created the UK’s first city-wide local currency, the Bristol Pound, which promotes local sustainability as money generated from interest rates are reinvested in city initiatives.

	Country: United Kingdom		City: Bristol	
	Population[18] (2012)	63,495,303	Population (2012)[19]	430,300 (cities and greater cities) 898,800 (larger urban zone)
	GDP €/capita (2011)[20]	28,200	GDP €/capita (2011)[22]	29,400 (NUTS 3 region)
	GDP per capita in PPS[21] (2013)	109		
	Region	United Kingdom and Ireland		
City's physical geography	Location	✓ A port town situated on the river Avon and Severn Estuary in south-west England.		
	Climate[23]	✓ Oceanic climate, with 4 hours of sunshine per day (2004) ✓ Average temperate: warmest month is 17°C; coldest month is 4°C ✓ Annual rainfall: 852.60 litre/m²		
Political Autonomy[24]		✓ The UK is a unitary state with devolved powers to Scotland, Wales and Northern Ireland and relatively centralised local government financing system in England. ✓ There are two local levels of government in England: County Council and District Council. ✓ County Councils are responsible for providing schools, social services, and public transport services ✓ District Councils are responsible for local services, including council housing, gyms and leisure facilities, local planning, recycling and refuse collection.		
CO_2 Reduction Targets		✓ 29% reduction CO_2 emissions by 2020 using 1992 as baseline year[25] ✓ GHG reduction of 100% in the Transport sector[26]		

Table 3. Bristol Profile.

3.4. Freiburg (Continental Europe): from anti-nuclear roots to high-tech solar energy

Context: Freiburg has a population of 229,144 inhabitants and lies in the southwest corner of Germany, in the Black Forest region, near the borders with France (towards the West) and Switzerland (in the South). The city is an urban district ("Kreisfreie"), enjoying relative political autonomy at the intermediate level between the state ("Länder") and municipal ("Gemeinden") levels in the federal political of Germany. The elected Lord Mayor was the first mayor from the Green Party to be elected in a city larger than 100,000 inhabitants. Freiburg was one of the first cities in Germany to establish an Environmental Protection Office. The city was a European Green Capital Award Finalist in 2009 and named German Federal Capital for Climate Protection in 2010.

Strategy: Often called the solar capital of Germany because of its engaged solar policy, the city of Freiburg is also highly active in transport initiatives, sustainable housing districts (in particular the Vauban and Rieselfeld districts) and shows a comprehensive approach to sustainability. In 2014, the Municipal Council resolved to reduce CO_2 emissions by 29% by 2020 and at least 50% by 2030 (1992

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[18] Eurostat [37]
[19] Eurostat [38]
[20] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[21] GDP in PPS: EU28 = 100; Eurostat [39]
[22] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[23] Figures for 2008, Eurostat [40]
[24] See European Union Committee of the Regions [41]
[25] Covenant of Mayors [42]
[26] Covenant of Mayors [43]

baseline) and to set itself the long-term goal of climate neutrality by 2050. The city has also long been involved in transnational networks (e.g. Energy Cities, ICLEI, Climate Alliance). The story of sustainable policies in Freiburg starts in the mid-1970s [48]. At the time, there were plans to set up a new nuclear power station near Freiburg, in Whyl. This project was confronted with widespread resistance from the population including farmers, wine growers and students [49]. Protests prevented the nuclear power plant from being built and are seen as instrumental to the development of environmental politics and the strength of the Green Party in Germany [50]. Shortly after the nuclear power plant debate the institute of solar energy systems was set up in Freiburg. Today, the Fraunhofer-Institut for Solar Energy Systems (ISE) is one of the largest institutes of this kind. Dieter Salomon [51], the current mayor of Freiburg, states that the city was involved in local sustainable energy strategy much earlier than many other cities, with energy saving and renewable energy issues being prominent in the 1970s and laying the basis for the broader engagement with climate change which emerged in the decades afterwards. Overall, the transition can be seen as being bottom-up with a broad coalition of societal actors promoting environmental issues and the city government responding with ambitious policy measures centered on energy saving, new technology, and renewable energy sources [52].

Main achievements: Freiburg is an internationally recognized leader in post-carbon transitions. It became a member of the Covenant of Mayors as early as 2007 and has an approved and monitored Sustainable Energy Action Plan (SEAP). The city receives annually around 25,000 "business visitors" from around 45 nations on account of the environmental policy approach [53]. According to the city administration, the green economy and environment research sectors employ around 12,000 people in 2,000 business units and generates €650 million added value to the city. The solar economy provides 2,000 jobs in 100 business units (around 3-4 times as much as in the rest of Germany) [53]. Over 50% of the city's electricity is generated from combined heat and power plants. The CO_2 balance from 2012, monitored by the Institute for Energy and Environmental Research (IFEU), showed a global CO_2 reduction of 25.1 % between 1992 and 2012 [54]. In the transport and mobility sector, there has been an increase in the share of low-carbon transportation modes. The share of biking in the total volume of inner-city traffic rose from 15% to 27% between 1982 and 1999, while, in the same period the share of public transport rose from 11% to 18%, and the percentage of trips made by car fell from 38% to 32%. Freiburg currently has a low density of cars, with only 428 vehicles per 1,000 residents [53]. City-led campaigns targeting local stakeholders and citizens have been conducted in order to raise awareness of post-carbon opportunities and possibilities e.g. "Freiburg's CO_2 Diet", "200 Families Climate Project" and the "Climate Club" [53].

	Country: Germany		City: Freiburg	
	Population [27] (2012)	81,843,743	Population (2012)[28]	229,144 (cities and greater cities) 640,226 (larger urban zone)
	GDP €/capita (2011)[29]	31,900	GDP €/capita (2011)[31]	31, 300 (NUTS 3 region)
	GDP per capita in PPS[30] (2013)	122		
	Region	Continental Europe		
City's physical geography	Location	✓ A University town in the south west of Germany, within the Black Forest region, close to the borders with France and Switzerland.		
	Climate[32]	✓ 4.68 hours of sunshine per day ✓ Average temperate: warmest month is 19.6°C; coldest month is 1.8°C ✓ Annual rainfall: 847 litre/m²		
Political Autonomy[33]		✓ Germany is a federal state, with power relatively decentralized across the federal, state (Land), intermediary (cities with over 100,000 population) (Kreis) and municipality levels. ✓ Intermediary level mandatory responsibilities include: district spatial planning, nature and landscape protection, social welfare, household waste collection and disposal. ✓ Municipalities mandatory responsibilities include: town planning, construction affairs, green areas, urban development and regeneration.		
CO_2 Reduction Targets		✓ 29% reduction CO_2 emissions by 2020 using 1992 as baseline year[34] ✓ GHG reduction of 100% in the Transport sector[35]		

Table 4. Freiburg Profile.

3.5. Vitoria-Gasteiz (Southern Europe): environmentally-sensitive spatial planning, citizen involvement and green growth

Context: The city of Vitoria-Gasteiz, located in the north of Spain and capital of the Autonomous Community of the Basque Country, was the first medium-sized and Southern European city awarded the European Green Capital Award for its long-established commitment to promoting sustainability. Since 2003, the city has seen a population increase of 8.4%, with the total population of the urban area reaching 242,223 in 2012 [38]. Although still negatively affected by the economic downturn, the city's unemployment rate is much less than the national average. In Spain, a large amount of power resides with the Autonomous Communities, who determine the responsibilities of municipalities [41]Relative to their EU counterparts, local authorities in Spain have a high degree of fiscal autonomy, yet the Autonomous Communities are responsible for the majority of expenditures. Larger municipalities (>50,000 inhabitants), as in the case of Vitoria-Gasteiz, are responsible for environmental protection and public transport [55].

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[27] Eurostat [37]
[28] Eurostat [38]
[29] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[30] GDP in PPS: EU28 = 100; Eurostat [39]
[31] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[32] Figures for 2008, Eurostat [40]
[33] See European Union Committee of the Regions [41]
[34] Covenant of Mayors [42]
[35] Covenant of Mayors [43]

Strategy: As the first Spanish city to sign the Aalborg Charter and design a local Agenda 21 [56Vitoria-Gasteiz is renowned for its long-term commitment to the environment and well-planned growth, which has become part of its cultural identity [57]. Already in the 1980s, Mayor José Ángel Cuerda – together with the support of all political parties – established the Environmental Studies Center (CEA), an interdisciplinary public organization that helped lay the groundwork for sustainable initiatives in Vitoria-Gasteiz [56]. By involving civic organizations (schools, community and professional associations), citizens, and the industry in initiatives, the city also supports a bottom-up approach to environmental protection, which has led to a high level of public commitment to sustainability. Furthermore, with the aim to foster a sense of 'belonging' in a green community, Vitoria-Gasteiz takes a citizen-centric approach to its post-carbon transition.

The flagship project of the city is the Green Belt, which is a semi-natural area surrounding the city that evolved over the last 20 years with considerable effort to reclaim and partially recover degraded areas (gravel pits, drained wetlands and burnt ground) and transform them into green and blue areas. As set out in its long term vision, "Climate Change Prevention Strategy 2006-2012," Vitoria-Gasteiz aims to become a carbon neutral emission zone. The city signed the "Covenant of Mayors" in 2009, committing to a 25.7% reduction in total CO_2 equivalent emissions by 2020 (56% of emissions associated with the activity of the City Council) and a 90% reduction by 2050 using 2006 as the baseline year [58] (33). The CO_2 emissions reduction strategy is primarily based on energy efficiency (buildings, mobility and municipal services) and renewable energy. In 2010, GHG emissions were equivalent to 3.26 t CO_2eq/inhabitant, a 10.4% decrease from 2008 [59].

Main achievements: Despite this growth and an expansion of the urban territory, planners have increased the density of the built environment, successfully minimizing spread in the environmentally sensitive areas to the south of the city. Some 81% of the population live within 1,500m of the city center, and 95% have access to basic services such as education, health and cultural facilities within 500 m, everything thus being within easy reach [58]. The abundance of green space and the compact city model has helped walking being the most used choice of transportation (53.6% in 2011) and a steady increase in other sustainable modes [60]. Shops revenues have increased over the years, owing to the 25% of the streets reserved for pedestrian use [61]. Although still the second most used mode of transportation (28.3%), private vehicle usage decreased considerably (29.3%) from 2006-2011 [62]. Furthermore, Vitoria-Gasteiz has successfully involved the business sector in the drive towards a sustainable environment, which enabled the city to remain prosperous in the crisis-torn economic situation. With an unemployment of 10.9% (2011) – half the national average – the high standard of living and the reputation as a green city has attracted big business and residents alike. Firms occupy more than 9.5 million m^2 of the municipality, and the Jundiz business park is one of the largest industrial areas in the north of Spain [58] (15). It is also a major innovation center, attracting a wide range of companies to its technology park and research centers, some of which focus on alternative energy research and electric vehicle development [58] (19-20).

	Country: Spain		City: Vitoria-Gasteiz	
	Population (2012)[36]	2,055,496	Population (2012)[37]	242,223 (cities and greater cities) 268,950 (larger urban zone)
	GDP €/capita (2011)[38]	22,700	GDP €/capita (2011)[40]	35,200 (NUTS 3 region)
	GDP per capita in PPS[39] (2013)	94		
	Region	Southern Europe		
City's physical geography	Location	✓ Located in the north of Spain and is the capital of the Autonomous Community of the Basque Country		
	Climate[41]	✓ The urban territory lies in a region that encounters intense climate variations due to its placement in a transition zone between the Atlantic and Mediterranean climates[42] ✓ 5.21 hours of sunshine per day ✓ Average temperate: warmest month is 18.9°C; coldest month is 4.6°C ✓ Annual rainfall: 885.5 litre/m²		
Political Autonomy[43]		✓ In Spain, local powers largely depend on State or autonomic law and may differ largely across Autonomous Communities. ✓ Local authorities also have a high degree of fiscal autonomy. Autonomous Communities, however, are responsible for the majority of expenditures ✓ Responsibilities devolved to municipalities include: public safety, traffic management, management of parks and garden, urban policies, cultural heritage, protection of public health, social services, promotion of social reinsertion, cultural activities, participation in the design of education programs and facilities. ✓ Municipalities >50.000 inhabitants are also responsible for: environmental protection, urban public transport, markets and public parks, waste treatment, civil protection, social service allowances.		
CO_2 Reduction Targets		✓ 25.7% reduction in total CO_2 equivalent emissions by 2020 using 2006 as baseline year (90% by 2050)[44] ✓ Strategy primarily based on energy efficiency (buildings, mobility and municipal services) and renewable energy		

Table 5. Vitoria-Gasteiz Profile.

3.6. Ljubljana (Central and Eastern Europe): city center renewal, sustainable transportation and living standards

Context: Named the capital of Slovenia in 1991, Ljubljana is the country's most important economic, political, administrative, and cultural center. The 280,607 inhabitants (in 2012) make up 13.7 % of the country's population. Economically speaking, it is by far the most developed region in the country with a GDP per capita of 24,660 € [63] (9), 42.3% higher than the Slovenian average (in 2009). The economic and urban restructuring that occurred in the 1990's helped Ljubljana become one

36 Eurostat [37]
37 Eurostat [38]
38 GDP at current market prices by NUTS 3 regions; Eurostat [39]
39 GDP in PPS: EU28 = 100; Eurostat[39]
40 GDP at current market prices by NUTS 3 regions; Eurostat [39]
41 Figures for 2008, Eurostat [40]
42 European Green Capital 2012 Report, p. 16 European Green Capital 2012 Report, p. 16
43 See European Union Committee of the Regions [41]
44 Covenant of Mayors [42]

of the most competitive urban areas in Central Europe [64]. Municipalities in Slovenia have a moderate level of fiscal autonomy controlling only 14% of total local tax revenues and are dependent on revenues from personal income tax redistributed by the central government [65].

Strategy: Over the last 15 years, Ljubljana has taken measures towards a post-carbon transformation, particularly in areas such as public transport and the pedestrianization of the city center [66]. The basis for the city's development is the Vision 2025, adopted in 2007, through which eco-innovation and sustainable development is ensured and ambitious goals are put forth by the city authorities. Between 2007 and 2013, more than 650 projects were implemented to improve the quality of life in the city [67] (13). As a signatory of the Covenant of Mayors, Ljubljana commits to achieving an overall CO_2 emissions reduction target of 21% using 2008 as the baseline year, an equivalent of 1.9 tonnes CO_2/capita. This translates into an estimated emission reduction of 24% in the transport sector, 65% for local heating/cooling and 4% for local electricity by 2020 [63]. The long-term targets are more ambitious, reaching for a 50-80% reduction of emissions by 2050 compared to 2008.

The most important sustainable-oriented strategic projects in Ljubljana are the Urban Master Plan, Environmental Protection Program, Sustainable Mobility Plan, Sustainable Energy Action Plan (SEAP) and the Electromobility Strategy. 83% of all city development is directed towards renewal of existing developed areas and brownfields, which helps increase city density. Furthermore, in cooperation with the state, Ljubljana plans to invest 50 million euro to increase flood safety [68].

Main achievements: Ljubljana has undertaken ambitious steps to support the transition away from heavy car traffic to pedestrian and cycling networks, which is one of the biggest problems in the city and surrounding region due to the gap between the distribution of jobs and places of residence [63](13). These include closing a section of the main transport artery – the Slovenska Street – and renovating the city center as well as encouraging public participation in initiatives, such as the Civitas Elan project, which aim to reduce car use and make public transport, walking, and cycling more attractive [69]. An analysis of traffic patterns between 1994 and 2013 showed a reduction of private car usage in favor of pedestrian and bicycle usage.

Ljubljana also created an extensive urban ecological zone – almost three quarters of Ljubljana's surface area now consists of green spaces, with 16.5% designated as Natura 2000 areas. Between 2008 and 2012, the city created 40 ha of new parks on formerly degraded areas. The city has also made progress in decreasing waste and increasing its share of renewable energy sources. Although still higher than the national average, municipal waste generated (domestic and commercial) has decreased by 8.9% (a total of 115,737,000t) since 2010. Moreover, the total power from renewable sources, particularly solar power plants, increased by more than 50% each year from 2008-2012 – the share of renewable energy in the final energy consumption amounted to 13.5% in 2012 [67] (35).

	Country: Slovenia		City: Ljubljana	
	Population (2012) [45]	2,055,496	Population (2012)[46]	280,607 (cities and greater cities) 536,484 (larger urban zone)
	GDP €/capita (2011)[47]	17,600	GDP €/capita (2011)[49]	24,600 (NUTS 3 region)
	GDP per capita in PPS[48] (2013)	82		
	Region	Central & Eastern Europe		
City's physical geography	Location	✓ Situated on a natural crossroad from Central Europe to the Mediterranean, to the Balkan Peninsula, and to the Pannonian Basin [50]		
	Climate[51]	✓ Central continental climate ✓ 5 hours of sunshine per day ✓ Average temperate: warmest month is 21.4°C; coldest month is 2,5°C ✓ Annual rainfall: 1,490 litre/m²		
Political Autonomy[52]		✓ State authorities supervise the legality of the work of local community authorities ✓ Local authorities have a moderate level of fiscal autonomy controlling only 14% of total local tax revenues and are dependent on transfers from the central government. ✓ Responsibilities devolved to municipalities include: education, primary health care, family and youth assistance, social welfare, housing, urban planning, spatial planning, water and sewage, environmental protection, culture (libraries), sport and leisure, promotion of agriculture, economic development of the municipality. ✓ In some cases, urban municipalities have additional responsibilities of urban transport and urban development		
CO_2 Reduction Targets		✓ 21% reduction CO_2 emissions by 2020 using 2008 as baseline year (50-80% by 2050)[53] ✓ GHG reduction of 24% in the Transport sector, 65% for Local Heating/Cooling and 4% for Local Electricity by 2020[54]		

Table 6. Ljubljana Profile.

3.7. Discussion: constraints and resources in city types

This section reflects on the city types, tracing out what is distinctive about their post-carbon transitions and what similarities are apparent between the cities. In doing so, the section asks what the profiles tell us about the emerging types of post-carbon cities, and the constraints and opportunities shaping them. In particular, we return to the insights of Martins and Ferriera [10] who conclude that the main constraints on action at the urban level are: resources and capacity, knowledge and information, institutions and governance. The city types are roughly considered in relation to these categories. Given the preliminary nature of our profiles, the discussion is exploratory and preliminary, intended to provide inspiration for future research in the area. In the case of each city, the section

[45]Eurostat [37]
[46] Eurostat [38]
[47] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[48] GDP in PPS: EU28 = 100; Eurostat[39]
[49] GDP at current market prices by NUTS 3 regions; Eurostat [39]
[50] City of Ljubljana – - Profile, Development Projects and Investments Office, 2011, p. 6
[51] Figures for 2008, Eurostat [40]
[52] See European Union Committee of the Regions [41]
[53] Covenant of Mayors [42]
[54] Municipality of Ljubljana [70]

considers what is distinctive about each of these cities, why they might be of interest to other cities and which types of city in particular.

Malmö: A ‘Regional Service Centre’, Malmö has transformed its economy from industry to service and knowledge sectors. The key question that arises when we consider Malmö is how did the city embark on such an ambitious and high profile move to sustainability in the context of economic crisis, social problems and deindustrialization? The city is not what might be termed a typical Nordic sustainability leader – it has neither the economic wealth nor the long tradition of environmental activity of Copenhagen, for instance. Hence, it is overcoming deficits in resources and capacity, as well as knowledge and information. In very general terms, it is achieving this through developments in the sphere of governance. Within the Swedish national context, Malmö has benefited greatly from national sustainability and regeneration funding programs. Thus, the national context has been pivotal in the city’s attempts to reinvent itself, assisting it in overcoming its own economic constraints. It might also be added that the regional context (the economically strong Öresund region) and the proximity to the economic and environmental leader, Copenhagen, has also been beneficial. Within the city, the leadership role played by the municipality has been also been crucial in making sustainability a central component of socio-economic restructuring towards the knowledge society. Furthermore, the city has successfully presented itself internationally as an urban sustainability leader, embedding itself in regional, national and international networks. This is why Malmö is (already) of interest to a wide range of city types, e.g. other deindustrializing cities in other parts of Europe/ the World.

Bristol: A ‘Leading European Capital and Metropolis’, Bristol has a strong economic base, a growing population and a broad coalition of actors promoting sustainability. In general terms, the city is not constrained by resources and capacity, knowledge and information. Rather, it is a strong example of how cities can be entrepreneurial in sustainability despite the restricted autonomy afforded by the UK political system. The relative alignment of “green” business and citizen groups and the city’s administration appears crucial to the transition. The city’s transition is instructive to other cities in centralized political contexts and in terms of its city administration reacting to and incorporating societal pressure for increased action on sustainability. As in Freiburg, the city administration has responded to societal actors pressing for more sustainability, with a distinctive emphasis on localness. The ongoing transition has been accompanied by general economic growth and a particular growth in the so-called green economy. Bristol does not have a long-established record in sustainability like Freiburg nor quite the level of performance, but like the other cities assessed here, it combines high level of city administration activity/ intervention and strenuous publicity work to place sustainability on the urban agenda and city on the European sustainability agenda.

Freiburg: A ‘Regional Innovation Centre’, the city is something of an archetype of a prosperous, ‘green’ high performing mid-sized Continental European city. Freiburg has long been seen as an example of how economic development can be combined with environmental ambitions. The city might be considered to enjoy a very favorable context of action in that it is a relatively wealthy city in a relatively wealthy nation. Hence, it has resources and capacity. It also has relative knowledge and information, given the strength of the high-tech knowledge economy. The institutional and governance context is also comparatively favorable in that Freiburg enjoys a fair degree of political autonomy. Perhaps a difference between Freiburg and other, wealthy, but less environmentally-concerned cities is the broad coalition of actors involved in the post-carbon transition – from green activists, (even) conservative politicians and high-tech businesses. While undeniably being a model for other wealthy mid-sized cities (and cities of other sizes generally), its inherent wealth casts doubt on the usefulness of poorer cities seeing it as a *Leitbild* in terms of its overall transition narrative. It is a city defined by an unusually 'green' political constellation, not found in many other parts of the world. Nevertheless, its harnessing of solar energy makes it of interest to southern European countries.

Vitoria-Gasteiz: A 'Regional Centre with Growing Population', Vitoria-Gasteiz is a good example of how cities are attempting to align social, environmental, and economic objectives to enhance their regional standing despite having less financial resources at the national and local level compared to its counterparts in wealthier countries. As the first Spanish city to sign the Aalborg Charter and design a Local Agenda 21[56], Vitoria-Gasteiz demonstrates the importance of strong political leadership. By emphasizing a high amount of public participation in initiatives (including education programs for children), the city is able to mold a cultural identity based on sustainability, which further supports its post-carbon transition. This is complemented by the relatively high municipal fiscal autonomy and capacity in areas such as spatial planning, environmental protection, and urban transport. By curtailing unsustainable sprawl and increasing density, the city is able to protect the natural environment, encourage the use of sustainable modes of transport (demonstrated by the majority of trips now being undertaken by foot), and increase street revenues and therefore the local economy. The population density also allows the city to provide citizens better access to amenities in a relatively more efficient manner, which also increases quality of life and attracts new residents and companies. Vitoria-Gasteiz capitalizes on its strong history of mechanical and metallurgy industries (still the city's main industries) [71], and is now attracting green innovation to its technology park and research centers; which help build a more diverse economy. This enabled the city to be more economically resilient compared to other Spanish cities during the economic crisis.

Ljubljana: A 'National Capital and Metropolis', Ljubljana is an example of a capital that has yet to become a 'Leading European Capital and Metropolis' in terms of economic influence, but has nevertheless made recent strides to improve its sustainability. With the lowest national and local GDP per capita out of the selected high performing cities, Ljubljana provides an example of a city that has embarked on a post-carbon transition despite significant economic and structural constraints (e.g., aging infrastructure and population) as well as a moderate level of fiscal autonomy. As in several other Central and Eastern European cities in this category of city type (Berlin, Bratislava, Bucharest, Budapest, Kraków, Gdańsk, Łódz, Poznan, Prague, Riga, Sofia, Tallinn, Vilnius, Warsaw, Wrocław), Ljubljana underwent significant economic and urban restructuring in the 1990's [64] and only began tackling issues of sustainability within the last 15 years. Although the city does not have a deep-seated history of sustainability as in the case of many of the other high performing cities, substantial progress has been made over a short period of time to pedestrianize the city center, provide convenient and accessible public transportation, and revitalize deteriorated brownfields into useful public and private spaces. These initiatives encourage the use of more sustainable modes of transport, support the quality of life for elderly inhabitants, attract younger residents to the city center, and revitalize the economy of underdeveloped areas. Moreover, faced with high levels of annual rainfall, the city also demonstrates resilience in terms of flood management. Ljubljana can therefore serve as an example as to how to include social and environmental goals in economic restructuring plans as well as innovative measures in terms of climate adaptation.

Cities may be constrained in some categories, but the leading types outlined above have utilized or developed strengths in the other areas to overcome them. Malmö has taken advantage of economic funding opportunities in Sweden, a country with generally strong economic performance, to overcome its own economic weaknesses and political decentralization to re-define itself. Bristol is attempting to overcome a lack of political autonomy through the city administration building on economic strengths and societal coalition engaged in sustainability. Through political leadership and the involvement of the public, Vitoria-Gasteiz has created a cultural identity of being “green”, which supports its transformation despite economic constraints and attracts new residents and business. After a decade of economic restructuring, Ljubljana is rapidly transforming and revitalizing its spaces to be more sustainable, inclusive, and accessible, as well as economically prosperous. Freiburg is, in a sense, an exception as it appears not to be overtly constrained in the categories identified as crucial by Martins and Ferriera [10]: resources and capacity, knowledge and information, institutions and governance. Of course, this is not to say that the city is not constrained in these areas. Rather, Freiburg appears to have relatively large capacity for action in sustainability due to generally favorable contextual factors.

4. Conclusions

The aim of this article was to profile five leading mid-sized cities in different EU regions. By providing a basic structure for assessing sustainability in cities, this preliminary research is intended to be used to compare other mid-sized cities of similar types (i.e. with similar contextual characteristics). The analysis has been based on readily available data sources, and hence the analytical structure adopted here could be utilized to conduct research on other examples or other city types in the EU. Given the explorative approach and preliminary results in this article, much work remains. Researchers may want to develop and test the approach adopted here by comparing data and transition narratives within the same EU city type, as identified in Table 1, e.g. comparing Malmö with Newcastle upon Tyne, or Vitoria-Gasteiz with Potsdam. The aim in doing so would be to further develop and refine city profiles as well as trace out commonalities and differences between city types.

Going further, research may seek to focus on the geographical patterns within the groups and their explanatory significance for transitions, transfer and learning. A quick glance over these economic types reveals a number of puzzles in sustainability terms. For instance, within the “Leading European capital & Metropolis” group we find most of the acknowledged sustainability leaders and most of these are in Northern and Western Europe (Bristol, Copenhagen, Stockholm, Amsterdam). But what of cities such as Milan – can it be seen as an exception or a potential leader in its own geographic context? And what of the cluster of Italian cities (Triest, Firenze, Torino, Trento) in the ‘Regional Innovation Center’ group – what links can be drawn between them and those cities in other parts of Europe (Freiburg, Graz, Turku, Heerlen)? Similarly, there is a cluster of Spanish cities in the group ‘Regional Center with Growing Population’ (Victoria-Gasteiz, Alicante, Bilbao, Las Palmas, Valencia, Malaga), which might suggest that Victoria-Gasteiz may provide some kind of solid basis for further comparison. There may be very few grounds for comparing Ljubljana with some of the other ‘National Capital & Metropolises’, such Berlin and Rome, but comparison to other central and Eastern cities in the group may be fruitful (e.g. Bratislava, Warschawa, Talinn, Krakow, Gdansk). Finally, researchers might probe the similarities and difference between high performing 'Regional Service Centers' in different geographical areas, such as and Nantes.

Ultimately, the article has attempted to advance knowledge of how post-carbon transitions are occurring in mid-sized cities. It has evaluated indicative examples of five particular types of high performing city. The justification for this has been that a more nuanced, context-concerned approach is needed when assessing transitions, and that a typology or grouping of cities with similar attributes is one way in which this can be better achieved. Ultimately, comparisons are fairer within, and not across, city types due to great variation in contextual factors, such as wealth, climate, and population size. Hence, future research in the field should seek to account for contextual factors as a first step. Research on post-carbon transitions could focus on the progress or maturity of transitions within city types. This would also give insight into whether the city types chosen are useful or if further modification is necessary (as factors are dynamic and cities will move from different city types as they develop).

The aim here has not been to develop a comprehensive typology, though this study provides pointers as to how this might be done. For instance, in order to be more representative, the approach taken by Zoeteman, Zande, and Smeets [14] should be expanded to include a larger set of cities in the EU and not just applicants to the European Green Capital Award. As Zoeteman, Zande, and Smeets' [14] preliminary typology focuses on sustainability, it might be interesting to compare the groupings of cities with the city types developed by the Second State of European Cities Report. An analysis of this manner could shed light on key factors that influence the sustainability of a city as well as how typologies can change over time. In general, to achieve this comparable data, particularly on performance (e.g. on GHG emissions) in sustainability would be needed, more detailed research on the conditions of transitions in individual cities would have to be conducted, perhaps in the form of case studies, which might better delineate how transitions have (or have not) emerged in particular cities, what is driving and constraining them and what similar types of cities might learn from them. The following questions might guide the development of typologies: What types of urban context exist? What do cities do to achieve the post-carbon transition? What kind of strategies in what types of cities? What combination of context variables promote or constrain actions and performance in these types? Which sets of actions in which contexts are the most effective? By addressing such questions, researchers will ensure that the typology elucidates the complex inter-relationships between context, action and performance, which shape urban post-carbon transitions.

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III TOWARDS A POST-CARBON FUTURE: BENCHMARKING OF 10 EUROPEAN CASE STUDY CITIES

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Research Article

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Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities

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Abstract

Considering the urgency of global climate change and other environmental, social and economic pressures, it is presumed that a new system is needed–the post-carbon city. Through their adaptive capacity, post-carbon cities use the threat of climate change as an opportunity to reduce vulnerability as they restructure human-ecological and human-human relationships toward ecosystem health and a clean energy economy.

This article intends to analyse this transition process towards a post-carbon city model in 10 European case study cities (Barcelona, Copenhagen, Malmö, Istanbul, Lisbon, Litoměřice, Milan, Turin, Rostock and Zagreb) based on a set of environmental, economic and social Key Performance Indicators (KPI).

Through the analysis of the KPI, namely reference indicators such as energy efficiency and GHG emissions indicators, it is possible to identify groups of cities with different stages of development in the transition towards a post-carbon city, namely: Group 1 (Copenhagen, Malmö and Rostock), Group 2 (Milan, Turin and Barcelona), Group 3 (Istanbul and Zagreb) and Group 4 (Lisbon and Litoměřice).

Copenhagen and Malmö are at the forefront of this sustainable trajectory. These cities have clear strategic visions in the area of urban sustainability, and are implementing several projects on mobility, energy and climate with positive impacts.

This work has been developed under the framework of the POCACITO–"Post-carbon Cities of Tomorrow" project, supported by FP7 of the European Commission (EC).

Keywords: Sustainability; Clean energy; Key Performance Indicators (KPI); Post-carbon; Global climate

Introduction

Cities are complex, adaptive, social-ecological systems [1-5] "characterised by a particular human settlement pattern that associates with its functional or administrative region, a critical mass and density of people, man-made structures and activities" [6].

A significant proportion of global greenhouse gas emissions and world's resources massive consumption are attributed to urban areas, with figures ranging from 31 to 80% of global emissions [7,8] and 75% consumption of the world's resources. It is therefore of pivotal importance that cities, while being the centre of economic and social activities, become crucial players of promoting carbon reduction and sustainable development strategies worldwide.

Since the World Commission on Environment and Development (the "Brundtland Commission") sought to address the problem of conflicts between environment and development goals by formulating a definition of sustainable development in 1987–"development which meets the needs of the present without compromising the ability of future generations to meet their own needs", many attempts have been made to narrow down the concept to make it applicable to different contexts or to reconcile the three classical pillars–environment, society, and economy.

Mainly based on undertake a convincing attempt for framing urban sustainable development [9-11]. They define a diagram for sustainable urban development, which is made up of six blocks.

The social perspective includes urban social inequalities, low income, poverty, crime and social exclusion, which can lead to socially deprived problem areas in urban centres or suburbs. In sequence, the economic development integrates not only the economy, but also municipal finance in order to ensure provision of essential city services as well as social support activities. The environmental aspects are two-fold: on the one hand, cities are the largest contributors of GHG emissions; on the other hand, cities and their citizens suffer from climate instability, floods, heat waves or hurricanes. The fourth component refers to the viewpoint of access to utilities and infrastructure, which determines, among others, the degree to which a city can become active in transition processes towards sustainable development since a city has more influence on utilities if they belong to the city or if the municipality is at least a shareholder. Moreover, the connections derived from urban form and spatial developments have consequences for all the pillars of sustainable development and are therefore crucial in the urban context. Ultimately, the inclusion of multi-level governance and institutional development pillar refers to the fact that a city is part of a larger system, e.g., the political system of the nation state.

When ecological, social, or economic structures make the existing cities unsustainable, it may be necessary to fundamentally change the nature of the system–to transform it. Considering the urgency of global climate change and other environmental, social and economic pressures, it is presumed that the current urban system is close to

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crossing several thresholds of sustainability and that a new system – the post-carbon city – is necessary to prevent the movement into an undesirable state from which it is difficult, if not impossible, to recover.

The concept of 'post-carbon cities' signifies a rupture in the carbon-dependent urban system, which has led to high levels of anthropogenic greenhouse gases, and the establishment of new types of cities that are low-carbon as well as environmentally, socially and economically sustainable [12]. The term post-carbon emphasizes the process of transformation, a shift in paradigm, which is necessary to respond to the multiple challenges of climate change, ecosystem degradation, social equity and economic pressures. Through their adaptive capacity, post-carbon cities use the threat of climate change "as an opportunity to reduce vulnerability as they restructure human-ecological and human-human relationships toward ecosystem health and a clean energy economy [5,13,14].

In this context, a transition process can be defined as "a gradual, continuous process of change where the structural character of a society (or a complex sub-system of society) transforms (…) [15]. Consequently, transitions are "complex and long-term processes comprising multiple actors" [16].

Transitions with regard to sustainability have three characteristics that distinguish them from other transitions [16]. First, sustainability transitions are goal-oriented. However, since the goal is a collective good, there are hardly any incentives for private actors to engage in sustainability transitions. Sustainable solutions usually do not offer obvious user benefits. Therefore, economic framework conditions need to be changed so that innovations can replace existing systems. This requires changes in policies beforehand to address politics and power struggles, which are likely to emerge since vested interests will probably try to resist these changes. The third characteristic is based on the assumption that it is not incumbent firms, but pioneers who develop innovations and thus help start or implement transitions. Moreover, incumbent firms will probably stick to the old regime. Therefore, innovation and innovative businesses are seen as a driver of transition.

The transition of cities to become more sustainable through the three pillars – environment, society and economy – requires dramatic improvements in energy and water-use efficiency; alternative transportation modes such as walking, bicycling, and mass transit; investments in green infrastructure; waste minimisation (reduced packaging and increased use of composting, waste-to-energy, and recycling); promotion of regional food systems; sustainable housing; as well as other measures in governance or education structures. Along with environmental concerns, policies and planning must also confront key socio-economic issues, such as aging populations, migration, health, poverty and exclusion of the urban poor.

The knowledge of constituent elements, actors and interactions within a city system, will enable an active steering of the system's transition towards a post-carbon cities model.

This article intends to analyze the transition process of 10 European cities-Barcelona, Copenhagen, Malmö, Istanbul, Lisbon, Litoměřice, Milan, Turin, Rostock and Zagreb towards a post-carbon model, based on a set of environmental, economic and social Key Performance Indicators (KPI). The identification of groups of cities with different stages of development in the achievement of a sustainable future is also an objective of the research, taking in account the diverse territorial specificities.

This work has been developed under the framework of the POCACITO–"Post-carbon Cities of Tomorrow–Foresight for sustainable pathways towards livable, affordable and prospering cities in a world context" project, supported by FP7 of the European Commission (EC). This initiative aims to produce a 2050 roadmap to support the transition of cities to a more sustainable or post-carbon future, through a collaborative research and participatory scenario building. An important step to achieve project's goal is the production of an integrated assessment of case study cities in order to evaluate and make a comparison of their current situation as an input into the scenario development.

The novelty of this approach is related to the extensive empirical work developed by the selected cities in collaboration with well-known European research organisations, under a bottom-up approach. Moreover, different city profiles are identified based on their transition process towards a post-carbon future.

The article is divided in the following parts, besides the introduction: Conceptual and methodological framework, overview of the case study cities, case study cities performance, findings and key challenges, and conclusions.

Conceptual and Methodological Framework

Conceptual model

The conceptual model was conceived to have the quality of life as the main driver since every step towards a post-carbon city has to guarantee the welfare of both inhabitants and future generations.

To achieve this objective, a theoretical model was developed based on the concepts of 'urban sustainability' and 'post-carbon cities' comprising the environmental, social and economic dimensions. Instead of analysing these three components as silos, a comprehensive and holistic approach that assesses the relationships among factors and feedback loops of the entire system was adopted. A systems thinking approach was used in order to analyse the dynamics of urban systems and to identify key features of post-carbon city transitions (Figure 1).

Dimensions and sub-dimensions

The environment dimension investigates the sustainable profile of the cities and assesses not only the current impacts on the environment, but also during the transition processes, evaluating the environmental resilience of the cities. It is important to continuously adapt the strategies to follow in order to mitigate the negative impacts on the environment during the transition process. The environmental

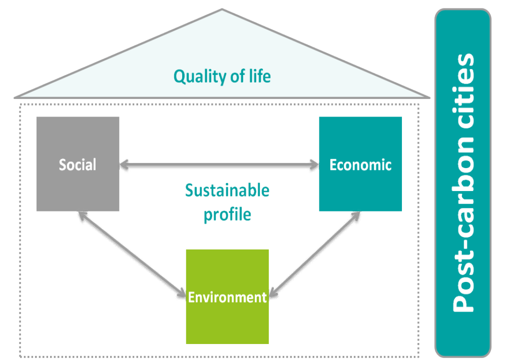


Figure 1: Conceptual model.

dimension covers the energy sector in general in order to promote not only the final energy efficiency but also the resources depletion associated with energy consumption. Post-carbon cities pay special attention to GHG emission and its contribution to climate change. Some energy intensive sectors are emphasised, such as transportation/mobility and the buildings stock. Biodiversity and air quality are critical themes that are integrated in this dimension. The concerns regarding waste and water are also evaluated.

The economic dimension emphasises the sustainable economic growth based on the wealth of the cities and their inhabitants. It recognises that investments are crucial to promoting post-carbon cities, in particular the ones related to sustainable facilities. The labour market and the life of the companies are taken into account to demonstrate the dynamics of a post-carbon economy in a green economy paradigm. Public finances are also analysed because the cities with a lower level of indebtedness are more prepared to face the challenges during the transition process towards a post-carbon city. This dimension also includes the R&D expenditure because no city can become a post-carbon city without innovation.

The social dimension is concerned about equity both in the current generation and between generations during the transition process to post-carbon cities, which is expected to be smooth for all citizens. The benefits for inhabitants that come out of living in a reduced carbon city are highlighted, showing that these cities are places where it is pleasant to live in and the values of equity and social inclusion are present. Special attention has been given to standards of living related to essential aspects such as education and health (for example, life expectancy and wellbeing). Unemployment rates and poverty are also issues addressed in the context of post-carbon cities. Public services and infrastructures that are available for citizens are analysed, as well as aspects of governance and civic society, promoting the positive sense of culture and community (Figure 2).

For each dimension and sub-dimension, a set of indicators has been selected which allows a uniform collection of data, improves the comparison and supports the identification of good practices.

Key Performance Indicators (KPI) selection

The Key Performance Indicators aim to evaluate the performance of cities during the transition process towards a post-carbon city. Through the literature review carried out, it was possible to produce an innovative mix of indicators.

The initial phase of the KPI design and development process was supported by an in-depth analysis of several existing index systems related to the three dimensions (social, economic and environmental), as observed on the following (Table 1):

In general, the indexes consulted include a long list of indicators that was not possible to manage in the scope of POCACITO project. Moreover, these indexes are essentially based on specific perspectives and objectives. Indeed, some of the indexes include environmental,

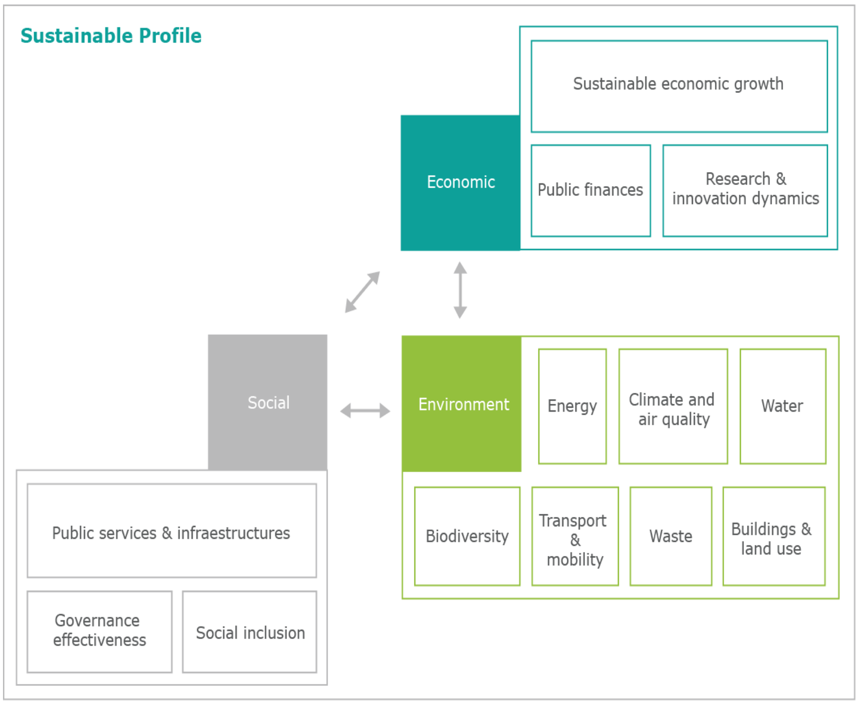


Figure 2: Dimensions and sub-dimensions.

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.

Topic	Document Title	Main features
Carbon Index	[17]	It measures the current capacity of each country to be competitive and to generate material prosperity for its residents in a low carbon world, based upon each country's current policies and indicators.
	[18]	Based on the OECD Green Growth strategy, it monitors how the Benelux region is performing in the transition towards the pursuit of green economic growth and development, while preventing costly environmental degradation, climate change, biodiversity loss, and unsustainable natural resource use.
Sustainability Index Smart Cities and Social Index	[19]	It undertakes a city environmental diagnosis and performance benchmark on the most critical issues (pressures on energy and water resources, waste management, sewer systems, and transport networks, among others) of the urban environmental sustainability.
	Columbia University, Joint Research Centre European Commission, World Economic Forum (2005), Environmental Sustainability Index, Benchmarking National Environmental Stewardship Yale University	It is a composite index tracking a diverse set of socioeconomic, environmental, and institutional indicators that characterize and influence environmental sustainability at the national scale, out-coming trend analysis and performance targets.
	[20]	It is a quantifying and numerically ranking of how countries perform on high-priority environmental issues in two broad policy areas: Environmental health, which measures environmental stresses to human health, and ecosystem vitality, which measures ecosystem health and natural resource management.
	[21]	It assesses the country's progress in sustainability, enabling the connection with the main levels of strategic decision–policies, plans and programs–national, regional and sectoral level, based on the OECD framework model Pressure-State-Response (PSR).
	Selada et al. (2012), Smart Cities Index	A composite indicator ranking resultant of the simple average of 5 dimensions' scores to strategically position cities in terms of urban intelligence. A database of municipal information and knowledge to support the decision-making process of public authorities and economic and social actors was also developed.
	Department for Communities and Local Government (2011), The English Indices of Deprivation 2010	A national statistical release to identify national and sub-national patterns of multiple deprivation, made up of several distinct dimensions or domains.
Europe 2020 Strategy	Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth, 2010	European Union's ten year growth and jobs strategy composed by a set of EU headline targets that cover the following priorities: employment, research and development, climate/energy, education, social inclusion and poverty reduction.

Table 1: Main features of the index systems consulted.

social and economic indicators, but not in the perspective of POCACITO targets, and not on an integrated approach for assessing the social, environmental and economic resilience of citizens and city's economy to face the transition process towards post-carbon cities. Moreover the cities should have a deep role in the transition process and consequently the capacity to influence all indicators.

Additionally, a set of screening criteria-clear message, relevance, data availability and data quality–(described on the box below) was established for the Key Performance Indicators selection through an interactive process comprising discussions with stakeholders, as most relationships are not straightforward and dynamic in nature.

Relevance

- Is the indicator linked to the definition of an innovative post-carbon city?
- Is the city able to influence the indicator on its own? (i.e., is the city level the right level?)
- Is the indicator relevant for small cities as well as for megacities, does it respect the diversity of case study cities?
- Are there indicators included that enable to measure development/transition scenarios impacts?

Clear message

- Is the message of the indicator clear?
- Is the meaning of the indicator substantial?
- Is the name and the data of the indicator easy understandable?
- Is the direction of the indicator clear?

Data availability

- Is the data available at the city level?
- Is the data already collected?
- What is the location/source of the data?
- Is there free access?
- For how long has the data been collected? (Years)
- How often is the data collected? (Year)
- Are the city officials able to provide us with the data?

Data quality

- Reliability

How consistent is the data?

- Validity

Does it measure what it is intended to measure?

- Completeness

Is the database complete or is data missing?

- Comparability e.g., is the data standardised?
- Transparency e.g., is it possible for other people to verify the data?
- Uncertainty

How does the indicator deal with uncertainty?

Data collection

In order to quantify the KPI in each case study city, the selected methods for data gathering and collection have comprised the following approaches:

- Top-down approach – Completion of the indicators list according to a review of main statistical findings, existing relevant strategic and planning documents, and legislation to assure an accurate quantitative data collection;
- Bottom-up approach – Discussions with local authorities and other selected stakeholders to complement the collection of quantitative data and enrich the contents of the case study analysis.

In general, most of the required data can be retrieved by national/regional statistical offices, government departments, environment and energy agencies, research institutes and non-governmental organisations. The data collection process depends on the availability of high quality and relevant data.

Moreover, all the indicators should be collected for both years 2003 and 2012 in order to compare their evolution throughout this period (sometimes, mainly for some economic and social indicators, time series were required). Whenever data are not available for those years, one should collect the earliest and the most recent years between 2003 and 2012.

The geographical boundaries of the assessment should be defined according to the limitations of data availability. All indicators should be collected for one geographical level, being privileged the municipality level. If an indicator is not available at this geographical level, then it could be collected for NUT III or NUT II. If the data are only available at the national level, it is considered that it is not representative of the city, so it should be discarded.

Data collection limitations were centred in the following issues:

- Some data were collected for different time periods due to unavailability of data;
- Some data were collected for different geographical scales due to unavailability of data;
- Different data sources used for different years, which can cause comparison problems;
- Absence of data for the quantification of some indicators.

Because of the referred limitations, the integration of data was difficult. However, all the methodological problems are indicated in the analysis.

Overview of the Case Study Cities

Selection of case study cities

The POCACITO project has analysed a set of case study cities in order to enhance mutual learning and the open-ended exchange of knowledge on issues of common concern in order to improve coordination and decision making, both within and among cities [22-26].

Aligned with the project objectives, the selection of case studies was then developed according to a matrix crossing the following criteria:

- Economic, social and ecological flows under the following themes: Water, waste, energy, transport, food, green

Dimension	Sub-Dimension	Indicator	Unit
Social	Social Inclusion	Unemployment level	Percentage
		Poverty level	Percentage
		Tertiary education level	Percentage
		Average life expectancy	Nº
	Public services and Infrastructures	Green space availability	Percentage
	Governance effectiveness	Existence of monitoring system for emissions reductions	Yes/No Description
Environment	Biodiversity	Ecosystem protected areas	Percentage
	Energy	Energy intensity	Toe/euro
		Energy consumption by sectors	Percentage
	Climate and Air Quality	Carbon emissions intensity	Ton CO_2/euro
		Carbon emissions by sectors	Percentage
		Exceedance rate of air quality limit values	Nº
	Transport and mobility	Share of sustainable transportation	Percentage
	Waste	Urban waste generation	Kg/person/year
		Urban waste recovery	Percentage
	Water	Water losses	m^3/person/year
	Buildings and Land Use	Energy-efficient buildings	Percentage
		Urban building density	Nº/ km^2
Economy	Sustainable economic growth	Wealth per capita	Eur/person
		GDP by sectors	Percentage
		Employment by sectors	Percentage
		Business survival	Percentage
	Public Finances	Budget deficit	Percentage of city's GDP
		Indebtedness level	Percentage of city's GDP
	Research & Innovation dynamics	R&D intensity	Percentage

Table 2: List of Key Performance Indicators (KPI).

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.

infrastructure and adaptation to climate change;

- Territorial (cross border, mountain areas, inland, central and coastal regions) and geographical (Northern, Southern, East and Central Europe, and Nordic Countries) location according to the ESPON regional typology database 2013.

Thus, for analysing the transition process towards a post-carbon future, 10 case study cities were selected, namely: Barcelona, Spain; Copenhagen, Denmark; Malmö, Sweden; Istanbul, Turkey; Lisbon, Portugal; Litoměřice, Check Republic; Milan and Turin, Italy; Rostock, Germany; and Zagreb, Croatia, as displayed on Figure 3.

The characteristics of the case study cities differ widely according to size, density, wealth, climate as well as governance and economic structures. Although this complicates the standardisation of the case study activities within the project, it also strengthens the project's ability to transfer lessons learned and best practices to a wider range of EU and global cities.

Case study cities' profile

A short analysis of the case study cities basic indicators and geopolitical elements (Tables 3 and 4) reveal some important features of the territories.

Istanbul has the biggest territorial area, followed by Zagreb and Malmö. The smallest municipalities are Lisbon, Copenhagen and Litoměřice. However, Barcelona is the municipality with higher urban density, followed by Milan and Turin. Less dense municipalities are Rostock and Malmö.

The number of inhabitants of the case study cities is very diverse: from around 14 million inhabitants of Istanbul to 24,000 of Litoměřice. It is worth of notice that Istanbul is a mega city, ranking 8 out of 78 OECD metropolitan regions in terms of population size and first for population growth since the mid-1990.

Case Study Cities Performance

Environmental performance

Environmental performance of case study cities will be analysed based on selected KPI.

Ecosystem protected areas: Litoměřice reports 92.1% of ecosystem protected areas as a percentage of total surface area, followed by Barcelona (28%) (Figure 4).

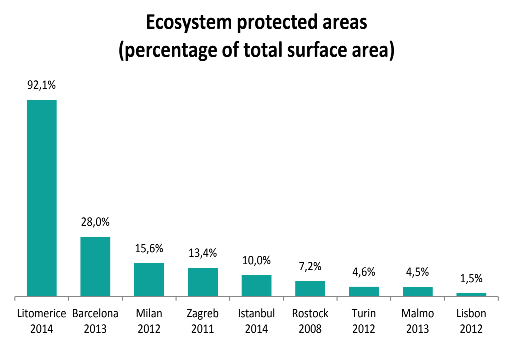
Green space availability: Malmö and Rostock present a high percentage of green space over total urban area, compared with the other case study cities (Figure 5).

Energy intensity: Energy intensity is represented by the ratio of gross energy consumption by GDP. Cities with more energy intensity per GDP consume more energy to produce the same amount of goods. It is a proxy of energy efficiency.

Energy intensity is higher in Barcelona, followed by Zagreb and Turin. The general decrease in energy intensity is a trend in all case study cities (Figure 6).

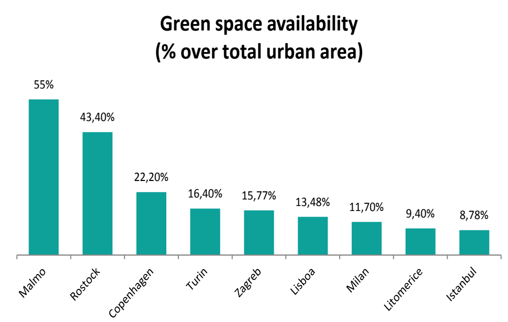
Energy consumption by sector: This indicator measures the sum of primary energy consumption in industry, agriculture, services, transports, residential and others, and allows us to identify the sectors that are more energy intensive and therefore need more action towards

Figure 3: Case study cities.



Note: Milan–NUT II; Barcelona–Barcelona metropolitan area.

Figure 4: Ecosystem protected area, Municipality (% total surface area).



Note: Rostock–2012; Litoměřice–2013; Lisbon–2014; Non comparable data for Barcelona.

Figure 5: Percentage of green space over total urban area, Municipality, 2009.

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.

Case Study Cities	Area (km²) Municipality, 2013	Density (inhab/km²) Municipality, 2013	Population Municipality, 2013
Barcelona	101,40	15.779,09	1.600.000,00
Copenhagen	89,00	6.285,84	559.440,00
Istanbul	5.196,82	2.666,0	13.854.720,00
Lisbon	100,05	5.474,59	547.733,00
Litoměřice	17,99	1.341,63	24.136,00
Malmö	332,64	940,94	312.994,00
Milan	182,00	7.275,65	1.324.169,00
Turin	130,00	6.939,52	902.137,00
Rostock	181,00	1.125,27	203.673,00
Zagreb	641,00	1.236,93	792.875,00

Note: Zagreb and Lisbon-2011; Istanbul-2012.

Table 3: Case study cities statistical figures.

Case Study Cities	Geopolitical Elements
Barcelona	2nd largest city in Spain, capital of Catalonia 2nd economic centre in Spain, after Madrid Relevant port city Important cultural centre in Europe Touristic destination
Copenhagen	Capital city (Denmark) Located by the coast of Oresund, it is situated on the island of Zealand and the small island of Amager in the south western part of Denmark Oresund bridge connects Copenhagen to Malmö Important harbour area
Istanbul	Capital city (Turkey), mega city Strategic location: Istanbul extends over 2 continents–Asia and Europe; 4th Pan European Corridor ends in Istanbul Two important ports Cultural, economic and demographic dynamics
Lisbon	Capital city and the largest city in Portugal Westernmost city in Europe, along the Atlantic coast Coastal city and touristic destination Strategic location: Relation with Latin America, Africa and Asia, allowing access to 750 million consumers from Europe and Portuguese-speaking countries
Litoměřice	Small city Northern part of Czech Republic 60 km North of the capital Prague
Malmö	3rd largest city in Sweden Southwest coast of Sweden Direct connection to Denmark via the Öresund bridge
Milan	2nd largest city in Italy, after Rome Administrative centre of the Lombardy region Northern part of Italy, midway between Po river and the foothills of the Alps Main industrial and commercial city in Italy Artistic and cultural centre
Turin	4th largest city in Italy Administrative centre of the Piedmont region Western part of the Po river, at the foothills of the Alps 3rd area in Italy in terms of GDP
Rostock	Medium-sized city North-east of Germany by the Baltic sea Geographical region Northern Lowland Can be accessed by highway from Hamburg and Berlin in around 2 hours
Zagreb	Capital city and the largest city in Croatia Northwest of the country, along the Sava river Excellent traffic connection between Central Europe and Adriatic Sea

Table 4: Geopolitical elements.

being more efficient.

As observed in the graphics below, the higher energy consumers are Milan and Barcelona. However, the profile of case study cities in terms of energy consumption by sectors is very diverse. In Milan, services present higher energy consumption in comparison with the other sectors. In Lisbon and Barcelona the higher energy consumer is the transport sector. In Turin and Malmö the residential sector dominates (Figure 7).

Carbon emissions intensity: This indicator assesses the carbon emissions due to energy consumption. It is the ratio between CO_2 emissions and GDP. The carbon emissions intensity of the economy identifies the cities where more CO_2 are emitted to produce wealth.

Carbon emissions intensity is higher in Barcelona, being

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Copenhagen the best performer. The general decrease in carbon emission intensity is a trend in all case study cities (Figure 8).

Carbon emissions by sector: This indicator assesses the measurement of CO_2 emissions per sector: industry, agriculture, services, transports, residential, and others.

Turin leads the case study cities group in terms of carbon emissions intensity by sector. However, the cities profile in terms of carbon emissions by sectors is very diverse. In Milan and Turin, services and residential sectors present higher carbon emissions in comparison with the other sectors. In Malmö, industry and energy sectors are the higher producers of carbon emissions (Figure 9).

Transports and mobility: The share of sustainable transportation (public transports, walk, and bike) in total modal share is higher in Istanbul, followed by Litoměřice, Barcelona and Copenhagen. Copenhagen, Malmö and Rostock residents use intensively bicycle as an alternative transportation mode. It is worth of notice that Copenhagen wants to become the best cycling city in the world (Figure 10).

Urban waste: Urban waste production is calculated by the total amount of city urban solid waste generated per capita in kilogram.

Urban waste production was higher in Copenhagen, Turin and Milan in 2007. In 2011, Copenhagen and Lisbon reported the highest urban waste generation. However, the decrease in the amount of this indicator is the general trend, with exception of Lisbon and Istanbul (Figure 11).

Urban waste recovery corresponds to the percentage of recovered/treated waste. The information on waste recovering/treatment system is broken down into five categories of final destination: material recycling; total incineration, including energy recovery; deposit onto or into land; composting; and digestion.

This indicator is higher in Copenhagen, Rostock, Turin, Milan and Barcelona, being Lisbon, Zagreb and Istanbul the worst performers. The trend is towards the increase of urban waste recovery, with the exception of Lisbon (Figure 12).

Water losses: This indicator determines the percentage of water losses registered in public supply networks.

Water losses are bigger in Istanbul and Turin, being Lisbon and Rostock the best performers (Figure 13).

Social Performance

Social performance of case study cities will be analysed based on selected KPI.

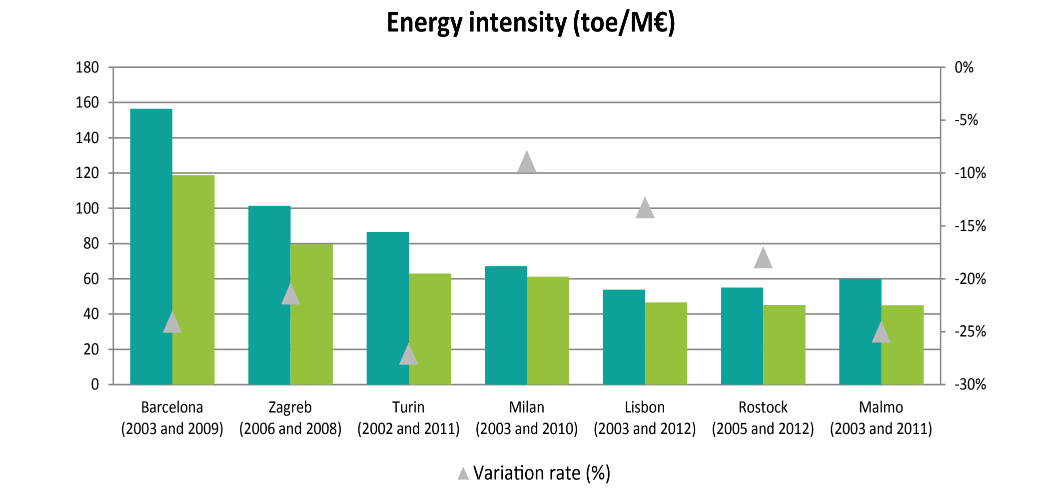
Unemployment level: In general, from 2006 to 2012 unemployment rate has increased mostly because of the adverse effects of the economic and financial crisis. Higher rates are reported in Barcelona. In this period, in Barcelona the variation of male's unemployment rate was +239% and the variation of women unemployment rate was +158%. Exceptions are Istanbul, Rostock and Zagreb (Figure 14).

Tertiary education level: Tertiary education rate is higher in Zagreb and Copenhagen, followed by Malmö, Barcelona and Lisbon. Istanbul reports the lowest tertiary education level. It is interesting to note that female have generally higher education rates than men (Figure 15).

Poverty level: In 2009, Litoměřice and Zagreb (Croatia) presented the highest poverty rates, followed by Rostock and Barcelona. Istanbul reported a poverty rate of 14.9%.

A sharp increase in the poverty rate happened between 2008 and 2011 while a reversion of this trend can be appreciated from 2011 onwards, being Milan the exception. It is worth of notice that Copenhagen reported a continuous decrease in poverty levels since 2008 (Figures 16 and 17).

Economic Performance



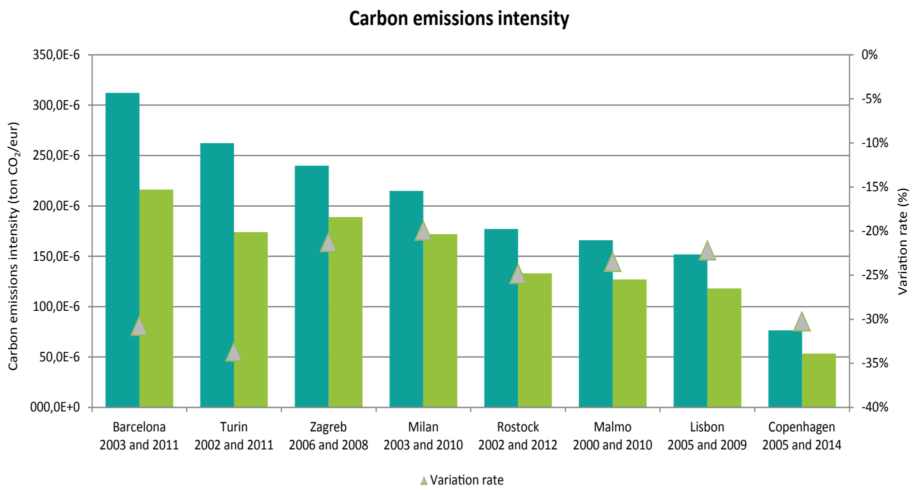
Note: Barcelona–NUT II; Lisbon, Milan, Turin–NUT III; Malmö, Rostock, Zagreb–Municipality; No information available for Copenhagen, Litoměřice and Istanbul.

Figure 6: Energy intensity (toe/M€).

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.

Figure 7: Energy consumption by sector.

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.



Note: Lisbon, Milan, Turin–NUT III; Barcelona–NUT II; Malmö, Rostock, Zagreb–Municipality; No comparable data available for Istanbul and Litoměřice.

Figure 8: Carbon emissions intensity.

Economic performance of case study cities will be analysed based on selected KPI.

Wealth: Copenhagen, Milan and Malmö have the highest level of GDP per capita among the case study cities. This position is followed by Rostock, Turin and Barcelona. Turin and Barcelona presents a decrease in the level of wealth between 2007 and 2010 (Figure 18).

R&D intensity: Malmö (3.2%) and Lisbon (2.48%) are the best performers in term of R&D expenditure as a percentage of GDP, followed by Rostock and Turin. The worst performer is Litoměřice (0.28%) (Figure 19).

Key Findings and Conclusions

The evaluation of the pre-defined Key Performance Indicators in the case study cities suggests that there is a global trend towards a post-carbon paradigm. However, cities were generally affected by the economic and financial crisis, with negative consequences on unemployment and poverty. Case study cities present different development stages towards sustainability.

Barcelona is at the forefront of the smart cities movement, with an intensive use of smart technologies. Several strategies towards a post-carbon city are being implemented by the Metropolitan Area; but energy and carbon emissions intensity are still high. Unemployment and poverty are weaknesses that have been enhanced by the economic and financial crisis. One of the biggest challenges of the city is to find a balance between the need to maintain it as a tourist centre, while keeping its local character.

Copenhagen is a leading city in terms of urban sustainability, being climate change one of the prominent urban policy issues. The ambition for Copenhagen is to become the first CO_2 neutral capital in the world by 2025. Several strategies and plans are being implemented in the areas of climate change, green buildings and mobility. Moreover, the city developed an integrated monitoring system of a large quantity of environmental indicators. It is a young, qualified and diverse city with good economic performance. High level of low-income citizens and widening income gap are the main challenges faced by the city.

Istanbul is in an initial stage of development towards a post-carbon city. Environmental performance is the weakest dimension and most underestimated by the city. However, some investments were made in the area of transportation. The main problems are population increase and growing urbanisation, urban sprawl towards peripheries, air and environmental pollution, and stress on natural protection areas and forests. However, Istanbul is improving in economic and social terms, being a dynamic and vibrant city.

Lisbon is in an intermediate stage of development in the transition towards a post-carbon city. Several strategies and projects have been launched in the areas of energy, mobility, and biodiversity but with limited impacts. The car is still the privileged transport mode, being mobility one of the main urban challenges. However, the reduction of water losses was expressive. Due to economic and financial crisis, unemployment and risk of poverty are increasing. Reduced population and aging people in the city centre are also a problem. There is a need to invest in buildings renovation.

Litoměřice is in an initial stage of development in the transition towards a post-carbon city. It is a small city that is influenced by the development of higher territorial units. However, it is one of pioneer cities in Czech Republic aiming at energy efficiency and renewable energy production. To become an energy self-sufficient city is the ambition, mostly based on the geothermal power plant future project. The dependence on the availability of external financial sources is a reality.

Malmö is also a frontrunner in the transition towards a post-carbon city. An ambitious energy strategy is being implemented with

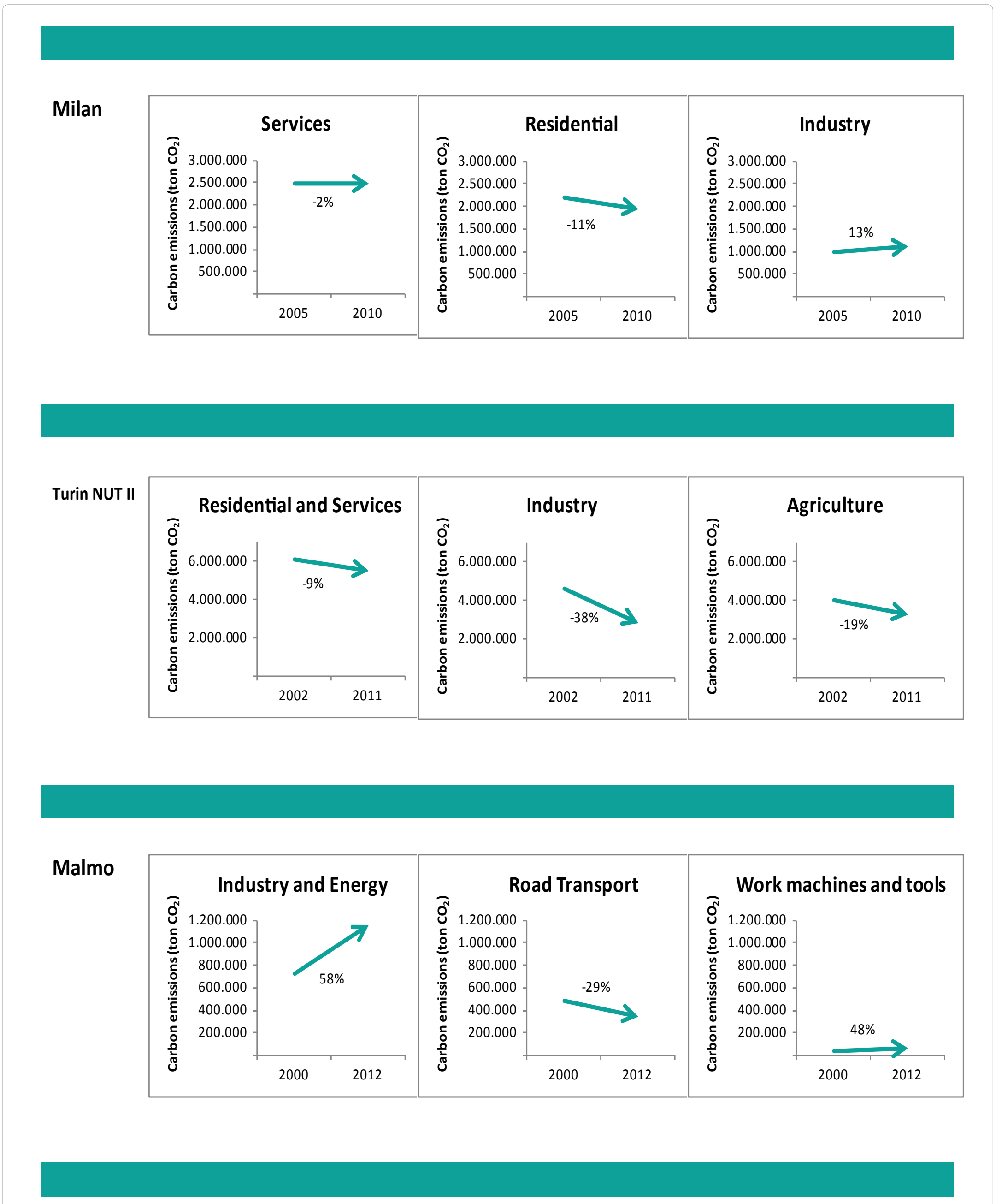


Figure 9: Carbon emissions by sector.

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.

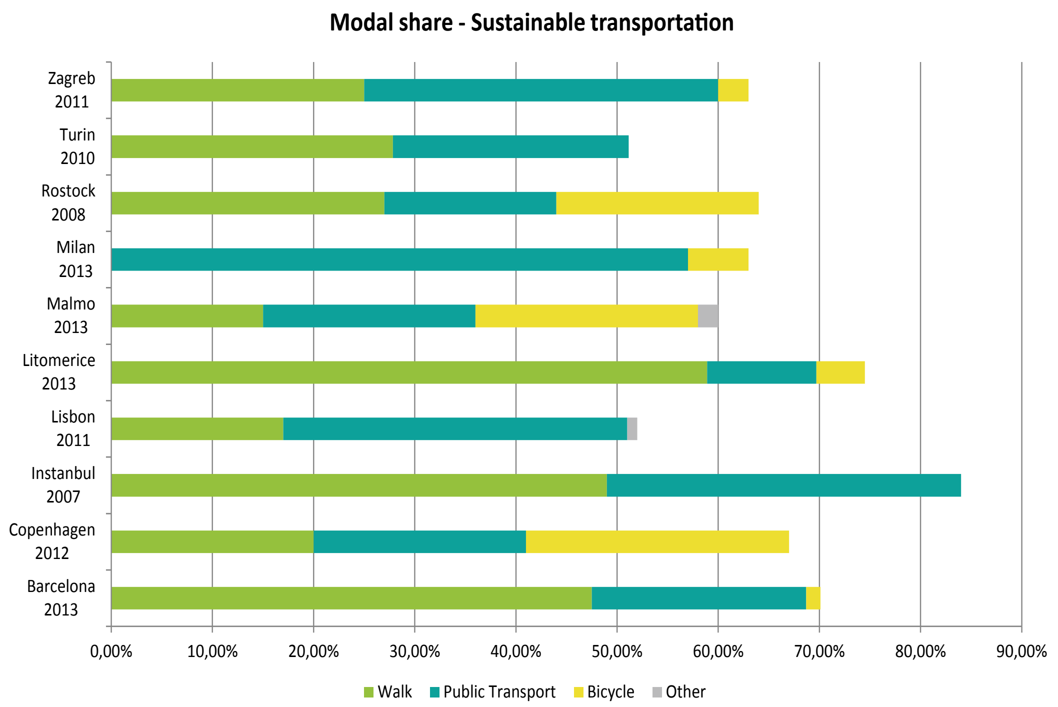
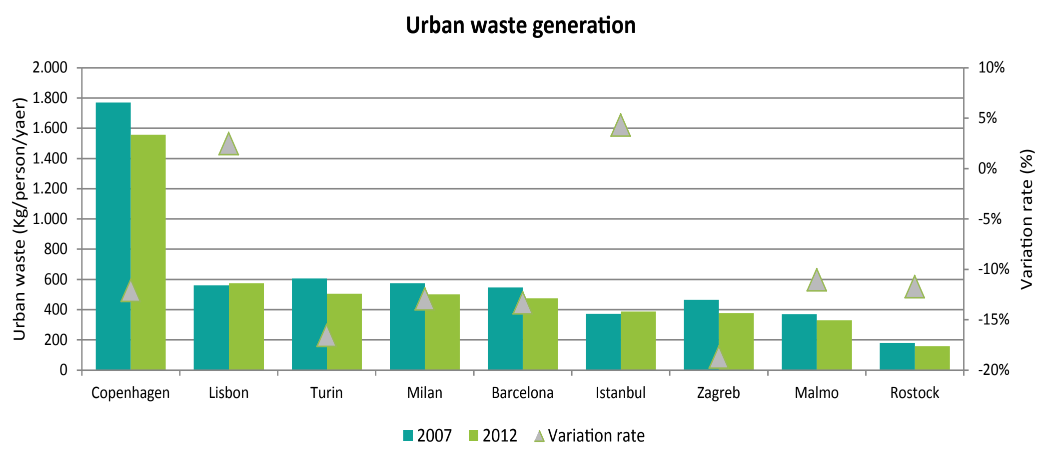
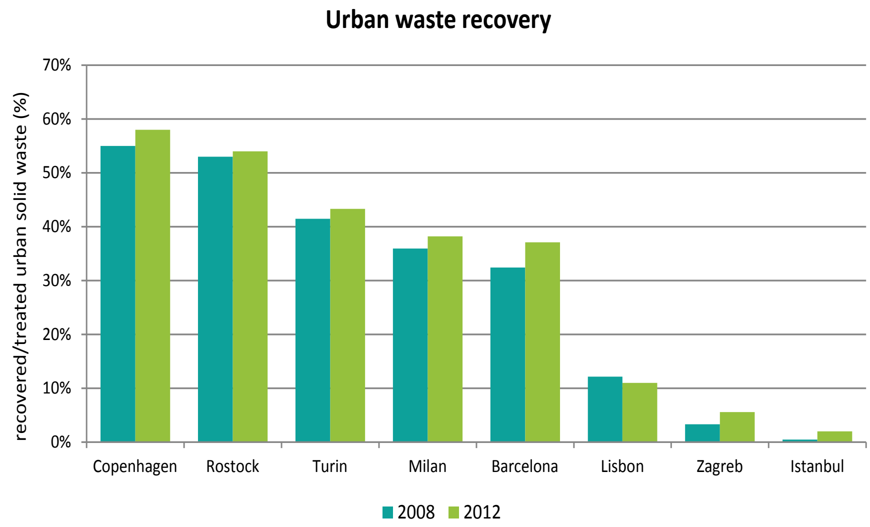


Figure 10: Sustainable transportation.



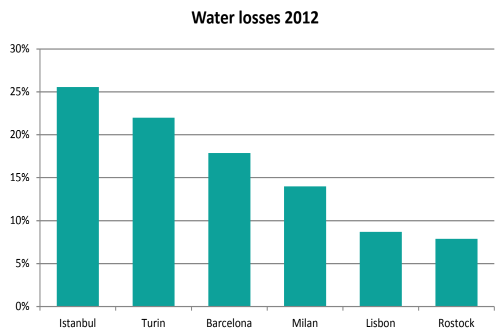
Note: Zagreb–2008-2011; Rostock–2006-2012.

Figure 11: Urban waste generation, 2007 and 2012



Note: Zagreb–2009-2011; Rostock–2009-2013; Copenhagen–2006 and 2012.

Figure 12: Urban waste recovery, 2008 and 2012.



Note: Barcelona–2013; No information available for Copenhagen, Litoměřice, Malmö, Zagreb.

Figure 13: Water losses, 2012.

positive impacts in carbon emissions and energy consumption. Several improvements were made in the area of sustainable transportation. It is a young, qualified and multicultural city with reasonable economic and social performance. Economic inequity and social segregation (due to high immigration numbers) are the main urban challenges.

Milan is in an intermediate stage of development in the transition towards a post-carbon city. It is a leading city in economic terms but the investment in environmental policy issues is comparatively lower. However, it has an advantage compared to other Italian cities in terms of environmental standards, but behind European average standards. There is a need to invest in the shift towards a zero-carbon paradigm and to increase civil awareness. Major urban problems are pollution, poor air quality and aged building stock.

Rostock is in an advanced-intermediate stage of development in the transition towards a post-carbon paradigm. Important measures were adopted to reduce the environmental footprint of the city, namely in the areas of air quality, waste and water management and sustainable mobility with positive impacts. The main urban challenges are linked to poverty, unemployment and weak infrastructures.

Turin is in an intermediate stage of development in the transition towards a post-carbon city. It is an innovative city, but it is being affected by unemployment and poverty due to strong specialisation. Major urban problems are pollution and poor air quality.

Zagreb is in an initial stage of development in the transition towards a post-carbon city. Some grassroots movements are in place, but strategic planning is weak. Critical success factors are unemployment and poverty (social), public transportation and municipal waste management (environment), and GDP per capita, business survival and social entrepreneurship (economic). It is worth of notice the high qualification of the population, in comparison with other case study cities.

Based on the previous analysis and through the cross analysis of GDP per capita and carbon emissions intensity, we can identify tentatively groups of cities with different stages of development in the transition towards a post-carbon city (Figure 20):

Group 1: Copenhagen, Malmö and Rostock: Higher GDP per capita, and lower carbon emissions intensity.

Group 2: Milan, Turin and Barcelona: Higher GDP per capita, and higher carbon emissions intensity.

Group 3: Istanbul and Zagreb: Lower GDP per capita, and higher carbon emissions intensity.

Group 4: Lisbon and Litoměřice: Lower GDP per capita, and lower

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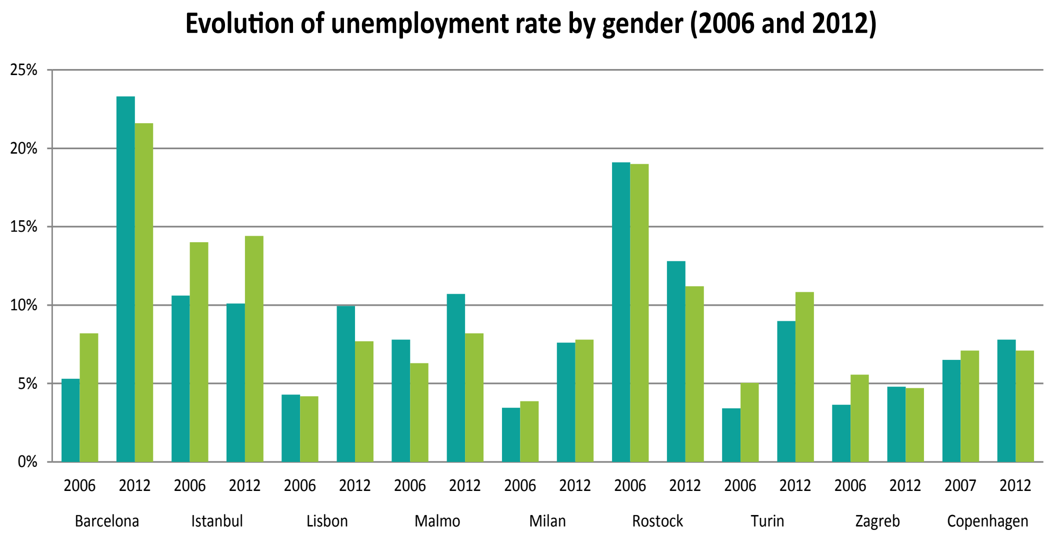
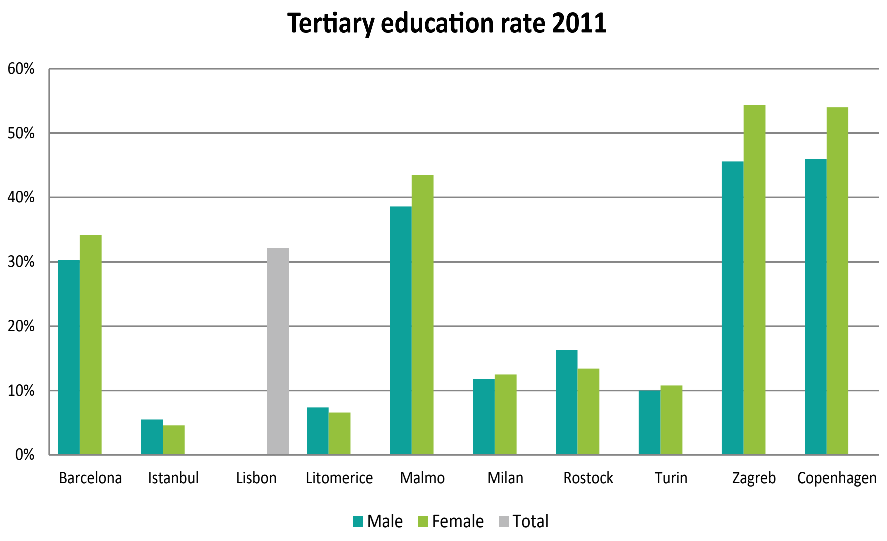


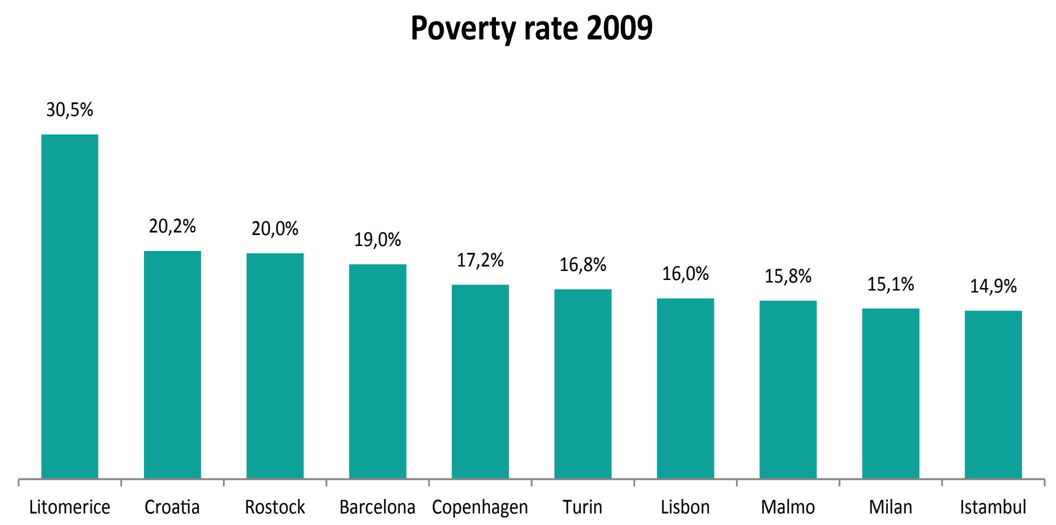
Note: Barcelona, Milan, Turin-NUT III; Istanbul, Lisbon, Rostock-NUT II; Malmö, Zagreb-Municipality; Information for Litoměřice not available.

Figure 14: Evolution of unemployment rate by gender, 2006 and 2012.



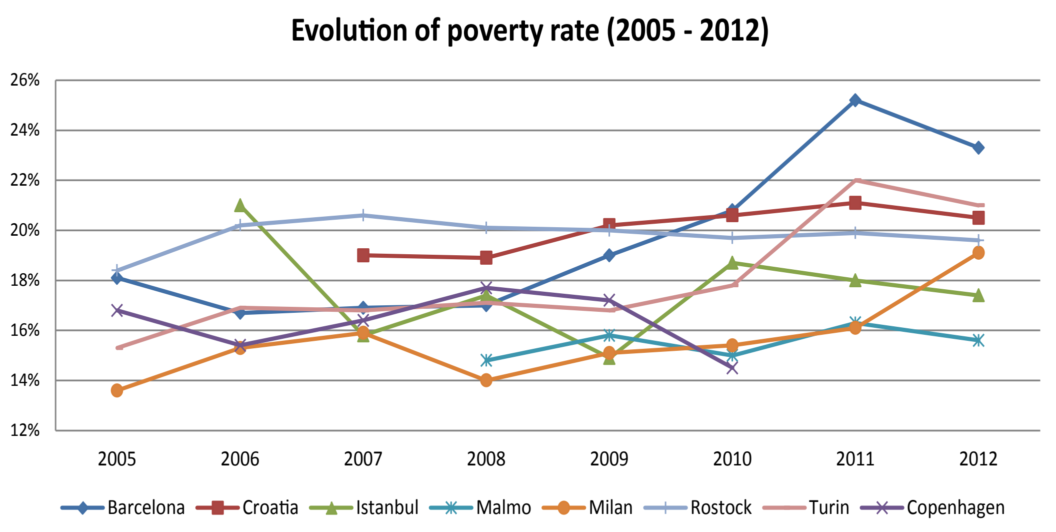
Note: Malmö–Municipality; Copenhagen–2012.

Figure 15: Tertiary education rate by gender, NUT II, 2011.



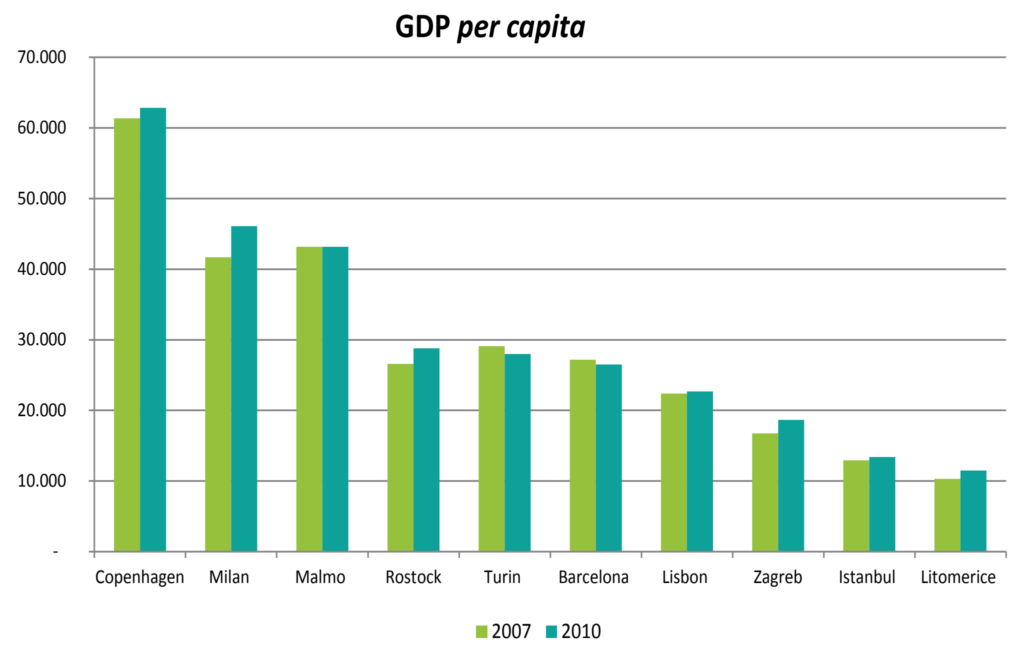
Note: Litoměřice-2010; Zagreb–Croatia–NUT I.

Figure 16: Poverty rate, NUT II, 2009.



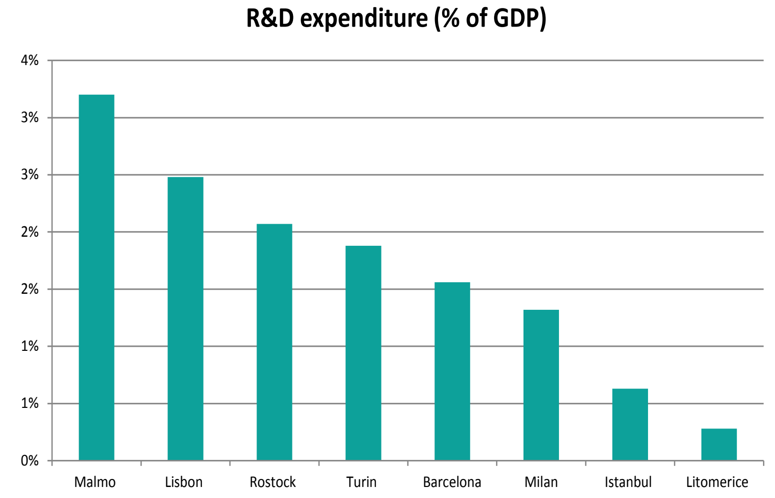
Note: Litoměřice-2010; Zagreb–Croatia: NUT I; Non comparable data for Lisbon and Zagreb.

Figure 17: Evolution of poverty rate, NUT II, 2005-2012.



Note: Istanbul, Lisbon–NUT II; Rostock, Zagreb–Municipality; Copenhagen–2005 and 2012.

Figure 18: Evolution of GDP per capita, NUT III, 2007 and 2010.



Note: Malmö, Lisbon–NUT III; Lisbon–2010; No available data for Copenhagen.

Figure 19: R&D expenditure as % of GDP, NUT II, 2011.

Citation: Selada C, Silva C, Almeida AL, Guerreiro D (2016) Towards a Post-carbon Future: Benchmarking of 10 European Case Study Cities. Innov Ener Res 5: 140.

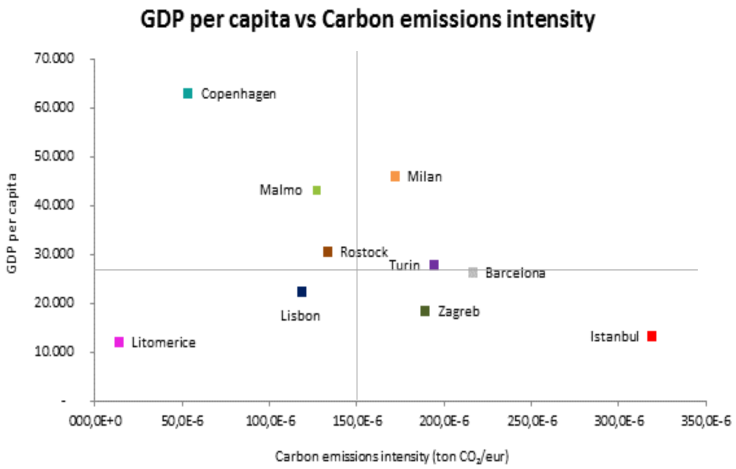


Figure 20: GDP per capita vs. carbon emissions intensity.

carbon emissions intensity.

Thus, Copenhagen and Malmö are at the forefront of the transition towards a post-carbon city. They are young, qualified and multicultural cities and present a good economic performance in terms of GDP per capita. These cities have clear strategic visions in the area of urban sustainability, and are implementing several projects on mobility, energy and climate with positive impacts.

However, case study cities are very different in terms of population size and economic, social and cultural dynamics, which makes the comparison difficult. Moreover, the majority of cities had problems on data collection; thus, the development of urban information systems is a recommendation for all case study cities.

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IV İSTANBUL 2050 ‘POST-CARBON’ KENT GELIŞIMI İÇIN YOL HARITASININ BELIRLENMESI (DETERMINING OF THE ROADMAP FOR ISTANBUL 2050 ‘POST-CARBON’ URBAN DEVELOPMENT)

15. Ulusal Bölge Bilimi / Bölge Planlama Kongresi
Bölge Bilimi Türk Milli Komitesi & KTÜ Şehir ve Bölge Planlama Bölümü
Trabzon, 3-4 Aralık 2015

İSTANBUL 2050 'POST-CARBON' KENT GELİŞİMİ İÇİN YOL HARİTASININ BELİRLENMESİ

Tüzin BAYCAN [1]
Aysun AYGÜN [2]

ÖZET

Dünya kentleşme dinamikleri incelendiğinde, dünya nüfusunun %50'sinin kentlerde yaşadığı görülmekte ve 2030 yılında bu oranın %75'e çıkması beklenmektedir. Bugün kentler enerji kullanımına bağlı sera gazı salınımının yaklaşık %70'inden sorumludur. Kentsel nüfusun artışı, kentler üzerinde ekonomik, sosyal ve çevresel baskılara sebep olmaktadır. Kentler üzerindeki bu baskılarla mücadele edebilmek adına kent sistemine yeni yaklaşımlar getirilmektedir. Son dönemlerde ortaya konan yaklaşımlarda; kendine yetebilen, halkın katılımının sağlandığı, kademeli olarak sürdürülebilir bir yapıya evrilen kentler ön plana çıkmaktadır. Bu kapsamda birçok ulusal ve yerel platform oluşturulmakta, büyüyen bir küresel ağ ile yaygınlaştırılmaktadır. 'Post-Carbon' kentler, benimsenen yeni yaklaşımlar doğrultusunda kentlerin ve bölgelerin bugün ve gelecekte karşılaşacakları çevresel, sosyal ve ekonomik baskılara karşı dayanıklılığını geliştirmek üzere ortaya çıkmış bir kavramdır.

'Post-Carbon' kentler karbona bağımlı kentsel sistem döngüsünün kırılmasını, düşük karbon salınımlı, çevresel, sosyal ve ekonomik olarak sürdürülebilir yeni tip gelişmelerin sağlanmasını amaçlamaktadır. Bu yaklaşım iklim değişikliği, ekosistem bozulması, sosyal eşitsizlik, ekonomik baskılar gibi birçok probleme çözüm getirirken, kentlerin adapte olma kapasitesini güçlendirerek iklim değişikliğine karşı kentlerin kırılganlığını azaltan bir fırsat olarak kullanılabilmektedir.

Bu çalışma, Avrupa Birliği 7. Çerçeve Programı tarafından desteklenen 'POCACITO – Post-CarbonCities of Tomorrow' Projesi kapsamında, İstanbul kentinin mevcut durumunun analiz edilmesine ve kentin geleceği için vizyon ve senaryo geliştirme çalışmalarına dayanmaktadır. POCACITO Projesi, Avrupa 'Post-Carbon' kentleri için katılımcı örnek kent yaklaşımı ile bulguya dayalı 2050 yol haritası geliştirmeyi, yerel paydaşlarla geleceği şekillendiren bir platform oluşturmayı amaçlamaktadır. Bu bağlamda, İstanbul kent dinamiklerini anlamak ve geçmişten günümüze değişimini gözlemlemek için sosyal, çevresel ve ekonomik göstergeler, POCACITO Projesi kapsamında belirlenen 'Temel Performans İndeksi' çerçevesinde incelenmiştir. İstanbul gelişme dinamiklerini ortaya koyan bu çalışmanın ardından 'İstanbul 2050 Post-Carbon Vizyon ve Senaryo Çalıştayı' düzenlenmiştir. Çeşitli kurumlardan 18 temsilcinin katıldığı çalıştayda İstanbul için 2050 Post-Carbon vizyonu belirlenmiş, senaryo çalışmasında ise bu vizyona ulaşmak için yol haritası çizilmiştir. Vizyon çerçevesinde İstanbul için kritik olan temel sektörler belirlenmiş, her bir sektör için ilgili aktörler, fırsatlar, engeller tanımlanmış, 2050 yılı için hedefler ortaya konmuştur. Katılımcılar ile yapılan tartışmalar sonucunda belirlenen hedeflere ulaşmak için yapılması gereken eylemler ve politikalar belirlenmiştir.

Çalışmanın sonuçları, İstanbul'un Post-Carbon bir kent gelişimi için başlangıç aşamasında olduğunu ortaya koymaktadır. Post-Carbon geleceğe ulaşmak için önünde birçok zorluk olmasına karşın, İstanbul coğrafi konumu, ekonomik dinamizmi, doğal değerleri, kültürel ve tarihi varlıkları, turizm potansiyeli gibi bir çok temel avantaja da sahiptir. Bu çalışma, İstanbul için Post-Carbon kent gelişiminin yol haritasının farklı aktör ve paydaşların katılımı ile belirlenmesi açısından önemlidir. Çalışma, gelecek gelişmeleri şekillendiren faktörleri ve trendleri inceleyerek öğrenme sürecine katkıda bulunmaktadır.

Anahtar Kelimeler: *İstanbul, Post-Carbon Kentler, Kentsel Vizyon, Katılım, POCACITO*

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1. GİRİŞ

Kentler, nüfusun, sosyal ve ekonomik faaliyetlerin merkezi olmaları sebebiyle 21. yüzyılın en kritik konularından biri haline gelmiştir. Dünya üzerinde kapladıkları alan %2 [1] olmasına rağmen kentler, dünya nüfusunun yarısından fazlasını barındırmakta, enerji kullanımı, atık yönetimi ve arazi kullanımı yoluyla sera gazı salınımının %75 ini oluşturmaktadır[2]. Tüm bunlar göz önüne alındığında iklim değişikliği ve beklenen etkileri açısından kentler küresel anlamda kritik bir konumdadır. Sürekli artan kent nüfusu, su kaynakları, altyapı, çevre, sosyal yapı, ekonomik yapı, halk sağlığı üzerinde büyük baskılar oluşturmaktadır [3].Oluşan bu baskıların üstesinden gelebilmek için fiziksel gelişimin yanında kentin sosyal, ekonomik ve çevresel değerlerini de göz önüne alan sürdürülebilir kentsel stratejiler ve politikalar belirlenmelidir. Sanayileşmiş ülkelerin sosyal, ekonomik, ekolojik sürdürülebilir dönüşümünde enerji ve su tüketimi, ulaşım, yeşil alanların korunması, yeşil altyapı, atık yönetimi, gıda yönetimi, verimli konut, eğitim ve yönetişim konularında önemli gelişmeler gösterme yolunda ilerlediği görülmektedir [3].Üretilen sürdürülebilir çözümler iklim değişikliği ile mücadele etmede ve beklenen iklim değişikliği etkilerine adapte olmada büyük bir avantaj oluşturmaktadır. Sürdürülebilir altyapı, enerji sistemleri ve teşvikler küresel sera gazı emisyonunda ciddi bir düşüş sağlarken, kentlerde yoğunlaşan nüfus daha verimli kullanımlara öncülük edebilmektedir. Ekonomik gelişmeye çevresel ve sosyal sürdürülebilirliğin sağlanması ile katkıda bulunma hedefi, OECD (Green Growth) [4], UNEP (Green Economy) [1], EU (Sustainable Growth) [5] tarafından ortaya atılmıştır. Çerçevesi çizilen bu sisteme Avrupa ülkeleri 2020 stratejilerinde yer verilerek, eğitim, akıllı büyüme, AR-GE, düşük karbon kent gelişimi, yoksulluğun azaltılması konuları ele alınmaya başlanmıştır[6].

Fosil yakıt kullanımı yerel etkilerin yanında küresel olarak da bir çok olumsuzluklar yaratmakta ve iklim değişikliği etkilerini şiddetlendirmektedir. Bu nedenle, yenilenebilir enerji kullanımı, emisyonların azaltılması, verimliliğin arttırılması ekosistem üzerindeki olumsuz etkileri yok ederken, yerel ekonomiye ve refah seviyesinin arttırılmasına katkıda bulunmaktadır. Bu açıdan bakıldığında post-carbon kentler hem yerel hem de küresel ölçekte bir çok fırsat sunan bir yaklaşım olarak öne çıkmaktadır.

Post-carbon kentler küresel ısınmanın da temel sebebi olan karbona bağımlı kentsel sistem döngüsünün kırılmasını, düşük karbon salınımı ile çevresel, sosyal, ekonomik olarak sürdürülebilir yeni tip kentsel sistemin kurulmasını hedeflemektedir. Bu yaklaşım kentsel model değişiminde, karbon bağımlı kentlerden sürdürülebilir, post-carbon kentlere geçişte dönüşüm sürecine odaklanmakta, geçiş sürecini yönetmektedir. Bu yaklaşım ile iklim değişikliği, ekosistem bozulması, sosyal eşitsizlik, ekonomik krizler gibi birçok probleme çözüm geliştirilirken kentlerin adapte olma kapasitesi arttırılarak, kırılganlıkları azaltılarak bir çok tehdide karşı önlemler geliştirilmektedir [7].

2. POST-CARBON CITIES OF TOMORROW (POCACITO)

Avrupa Birliği 7. Çerçeve Programı tarafından desteklenen 'POCACITO – Post-Carbon Cities of Tomorrow' Projesi yaşanabilir, refah seviyesi yüksek kentlere giden sürdürülebilir yolu dünya çapında öngörmeyi amaçlamaktadır. Proje, 2050 Avrupa post-carbon kentleri için kanıta dayalı yol haritası geliştirmeyi hedeflemektedir. Avrupa kentlerinin gelecek için öngörülen sürdürülebilir veya post-carbon ekonomik modele dönüşümünün yolu ortaya konmaya çalışılmaktadır. Proje, küçük ölçekli kentlerden, nüfusu 1 milyonun üzerine çıkan metropoliten alanlara kadar çeşitli ölçeklerde yerleşimleri kapsamaktadır. Proje, katılımcı senaryo geliştirme, birlikte öğrenme ve yaşayan laboratuvar yaklaşımları ile çalışmaktadır. Post-carbon dönüşüm ile değişken çevresel ve sosyo-ekonomik baskılara karşı kentsel dayanıklılığın arttırılması, kentlerin uzun dönemli demografik, sosyal değişimlere hazırlıklı olması, kent sağlığının korunması beklenmektedir. Proje, kentlerin ve bölgelerin bugün ve gelecekte karşılaşacakları çevresel, sosyal ve ekonomik baskılara karşı dayanıklılığını nasıl geliştirebiliriz sorusuna cevap aramaktadır[8].

POCACITO, Avrupa post-carbon kentleri için iklim değişikliğini ve çevresel metabolizmayı dikkate alan, örnek kentler üzerinden katılımcı bir yaklaşım kullanan ve uzun dönemli yenilikçi bir bakış açısı geliştiren bir projedir. Proje kapsamında 10 örnek kent seçilmiştir: Barselona, Kopenhag/Malmö, İstanbul, Lizbon, Litomerice, Milano/Torino, Rostock ve Zagreb. Belirlenen bu örnek kentler üzerinden, katılımcı bir yaklaşımla 2050 Avrupa post-carbon kentleri için yol haritası çizilmesi amaçlanmaktadır. POCACITO, geleceği tahmin etmek yerine yerel paydaşlarla oluşturduğu platformlarda düşünen, tartışan ve geleceği şekillendiren bir çalışma ortaya koymakta, paydaşlarla birlikte öğrenme sürecini desteklemekte, senaryo çalışmaları ile geleceği şekillendirecek faktörleri ve trendleri incelemektedir.

İstanbul, proje kapsamında örnek bir kent olarak ele alınmakta ve 2050 İstanbul post-carbon yol haritasının çizilmesi hedeflenmektedir. Bu bağlamda, proje 3 temel aşamada yürütülmüştür. İlk aşamada, İstanbul kent dinamiklerini anlamak, sürdürülebilirlik anlamında performansını değerlendirmek üzere proje kapsamında belirlenen sosyal, ekonomik ve ekolojik göstergelerin geçmişten bugüne değişimi incelenmiş, her bir gösterge için trendler ortaya konmuştur. İkinci aşama, uzmanlar toplantısı şeklinde, kent sisteminde aktif rol oynayan farklı kurum, kuruluş, özel sektör ve akademiden katılımcılarla düzenlenen çalışta yoluyla gerçekleştirilmiştir. Projede tanımlanan metodolojiye uygun olarak uzmanlar toplantısında İstanbul'un göstergeleri tartışılmış, İstanbul'un 2050 post-carbon geleceği için vizyon oluşturulmuş, son aşamada ise belirlenen vizyona ulaşmak için günümüzden 2050 yılına kadar sürecin nasıl yönetilmesi gerektiği tanımlanmış, senaryolar ortaya konmuş, aktörler, fırsatlar, engeller belirlenmiştir.

3. İSTANBUL'UN GELİŞME TRENDLERİ VE PERFORMANS GÖSTERGELERİ

POCACITO Projesi kapsamında İstanbul 2050 post-carbon yol haritası 3 aşamalı bir çalışma ile belirlenmiştir. İlk aşamada projede belirlenen sosyal, ekonomik ve çevresel göstergeler üzerinden İstanbul değerlendirilmiş, 10 yıllık süreç içerisinde bu göstergelerdeki değişim incelenmiş, trendler ortaya konmuştur.

İkinci aşamada çeşitli sektörlerden katılımcılar ile çalıştay düzenlenmiş, özel sektör, kamu sektörü, STK ve akademiden katılımcıların oluşturduğu uzman grup toplantısında İstanbul 2050 post-carbon vizyonu belirlenmiştir.

Son aşamada ise yine uzman grubu ile belirlenen vizyona ulaşmak için sürecin nasıl yönetileceği ele alınmış, temel gelişme sektörleri belirlenmiş ve 2050 yılına uzanan süreç tanımlanmıştır. Bu aşamada senaryolar tartışılmış, yol haritasında dönüm noktaları, her bir sektör için aktörler, fırsatlar ve engeller belirlenmiştir.

Performans göstergeleri daha önce European Green City Index [9], INTELI Smart City Index [10], Innovation Index [11] çalışmalarında kullanılan veri setlerinden referans alınarak oluşturulmuştur. POCACITO projesinin bir örnek kenti olan İstanbul için performans göstergeleri kullanılarak İstanbul'un dinamikleri belirlenmiştir. Bu göstergeler 3 temel başlık altında toplanmıştır; sosyal göstergeler, ekonomik göstergeler ve çevresel göstergeler. Proje kapsamında her bir başlık altında alt göstergeler belirlenmiş, farklı örnek kentlerin göstergeler bazında karşılaştırılması amaçlanmıştır. Geçmişten günümüze göstergelerdeki değişimi incelemek ve karşılaştırma yapmak için 10 yıllık dilimler halinde veriler toplanmıştır. Ancak çalışma süresince karşılaşılan en büyük sıkıntı verilere ulaşma konusunda yaşanmıştır. Kimi göstergeler için veri bulunamazken, kimileri için 10 yıllık dönemde sürekli ve düzenli depolanmış veri bulmakta sorun yaşanmıştır. Türkiye İstatistik Kurumu veri tabanı, İstanbul Büyükşehir Belediyesi birimleri, İstanbul Kalkınma Ajansı veri tabanları ve raporları ile çeşitli akademik çalışmalar temel kaynak olarak kullanılmıştır.

3.1. Sosyal Göstergeler

Sosyal göstergeler demografik yapı, kamu servisleri, etkin yönetişim alt başlıkları ile değerlendirilmiştir. Tablo 1 bu alt başlıkların ele alındığı göstergeleri sunmaktadır.

Tablo 1: Sosyal Göstergeler ve Zaman İçindeki Trendleri

Gösterge	Zaman Aralığı	Değerler	Trend
Cinsiyete göre işsizlik oranı (TUİK)	2004 - 2012	**2004**: K:%14,9 E: %11,7 **2012**: K: %14,4 E: %10,1	AZALAN
Yoksulluk oranı (TUİK)	2006 - 2012	**2006**: %21 **2012**: %17,4	AZALAN
Cinsiyete göre yükseköğretim oranı (TUİK)	2008 - 2012	**2008**: K: %3,14 E: %3,92 **2012**: K: %4,98 E: %5,71	ARTAN
Ortalama yaşam süresi (TUİK)	2012,2013	**2012**: 77,8 **2013**: 77,2	AZALAN
Aktif yeşil alan büyüklüğü (İBB)	2004 - 2012	**2004**: 308,64 km2 %5,65 **2012**: 496,93 km2 %9,09	ARTAN

Demografik yapıyı ortaya koyacak ilk değerlendirme işsizlik oranı ile yapılmıştır. 2004-2012 yılları arasında incelenen işsizlik oranında kadınlarda işsizliğin tüm yıllarda daha yüksek olduğu, 8 yıllık dönem içerisinde işsizlik oranında iniş çıkışlar yaşandığı, 2009 yılında işsizliğin %5-6 oranında artıp sonra tekrar düşüşe geçtiği görülmüştür. 2004 yılı ile 2012 yılı karşılaştırıldığında işsizlik oranının neredeyse aynı olduğu, 2012 yılında küçük bir farkla daha düşük olduğu görülmüştür [12]. Bu konuda İstanbul düşük performans göstermektedir. Ancak diğer bir etken olan yoksulluk oranında 2006 yılından 2012 yılına %4'lük bir düşüş yaşanmıştır. Eğitim seviyesinde yıllar içerisinde performansı olumlu etkileyen bir artış olmuştur [12].

Kamusal servisler ulaşılabilir yeşil alan oranı üzerinden değerlendirilmiş, 2004-2012 yılları arasında yeşil alan büyüklüğünde %60 artış ile pozitif bir trend yakalanmıştır [13].

Etkin yönetişim göstergesi ise emisyonları düzenli olarak takip eden monitör sistemi olup olmadığı ile ilgilidir. Hava kirliliğini kontrol eden sistem vardır ancak karbon salınımının düzenli olarak takip edildiği bir sistem bulunmamaktadır.

3.2. Ekonomik Göstergeler

Ekonomik göstergeler sürdürülebilir ekonomik gelişme ile kamusal ekonomik göstergeler alt başlıklarında incelenmiştir. Tablo 2 bu alt başlıkların ele alındığı göstergeleri sunmaktadır.

Tablo 2: Ekonomik Göstergeler ve Zaman İçindeki Trendleri

Gösterge	Zaman Aralığı	Değerler	Trend
Kişi başına düşen GSKD (TUİK)	2004 - 2011	**2004**: 7.943 $/kişi **2011**: 13.865 $/kişi	ARTAN
Sektörlere göre GSYİH (TUİK)	2007 - 2011	**2007** **2011** Servis: %72,3 %72,5 Sanayi: %27,5 %27,4 Tarım: %0,2 %0,2	SABİT
Sektörel işgücü (TUİK)	2004 – 2009	**2004** **2009** Servis: %56,7 %61,8 Sanayi: %42,6 %37,9 Tarım: %0,8 %0,3	SERVİS ARTIŞ SANAYİ AZAL. TARIM AZAL.
Borçlanma oranı (İBB)	2006 - 2012	**2006**: % 7,8 **2012**: % 9,5	ARTAN
AR-GE için ayrılan bütçe	2010, 2011	**2010**: % 0,6286 **2011**: % 0,6857	ARTAN

Sürdürülebilir ekonomik gelişme başlığında kişi başına düşen milli gelir 2004 yılından 2011 yılına kadar incelenmiş, 8 yıllık dönemde %74 artış gözlemlenmiştir. Bu dönemde sektörel olarak GSMH değişimi sanayide azalma, servislerde artış şeklinde gerçekleşirken değişim yüzdelerinin çok az olduğu görülmüştür. Aynı zamanda sektörel işgücü dağılımına göre tarımda azalma (%0.5), sanayide azalma (%5), servislerde artış (%5) görülmektedir [12]. Bu başlık altındaki göstergelerde olumlu bir değişim olduğu söylenebilir.

Kamusal ekonomik göstergeler kapsamında kamusal borç oranı incelenmiştir. 2006 ile 2012 yılları arasında 2009 ve 2010 yıllarında ciddi bir borçlanma varken, borç oranının giderek azalıp olumlu bir trend yakaladığı görülmüştür. Bu başlık altındaki bir diğer gösterge ise AR-GE yatırımlarına ayrılan bütçe üzerinden değerlendirilmiştir. İstanbul yerel bütçesinde AR-GE yatırımlarına ayrılan pay %0,6 gibi düşük bir orandır ve zaman içerisinde ciddi bir artış trendi görülmemektedir [12]. Bu konuda İstanbul performansının düşük olduğu söylenebilir.

3.3. Çevresel Göstergeler

Çevresel göstergeler biyoçeşitlilik, enerji, hava kalitesi ve karbon salınımı, ulaşım, atık yönetimi, su yönetimi ve yapılaşmış çevre kalitesi alt başlıkları ile değerlendirmeye alınmıştır. Tablo 3 bu alt başlıkların ele alındığı göstergeleri sunmaktadır.

Biyoçeşitlilik, İstanbul ilinde koruma altına alınan ekosistem alanları üzerinden - doğal sit alanları - değerlendirilmiş, 2004 yılından 2014 yılına koruma alanlarının %32 oranında arttığı görülmüştür [14].

Enerji, verimlilik ve sektörel enerji tüketimi dağılımı üzerinden değerlendirilmiş, enerji verimliliğinde (yoğunluğu) son yıllarda bir artış gözlemlenmiştir. Sektörel enerji tüketimi incelendiğinde ulaşım, konut ve servis sektöründe kullanılan enerjide artış görülürken sanayide azalma görülmüştür [15].

Karbon salınımında 2006 yılı ile 2010 yılı karşılaştırıldığında bir miktar artış görülmekte [16] ancak nüfus artışı ve kişi başına yurtiçi milli hâsıla dikkate alınarak hesaplandığında karbon salınım yoğunluğunda azalış görülmekte ve olumlu bir performans olarak yansımaktadır. Hava kalitesi ise havada bulunan partikül madde ve zararlı gazların miktarı üzerinden 2010, 2011, 2012 yılları için incelenmiş, değişken bir performans gösterdiği gözlemlenmiştir [14]. Bu kategoride herhangi bir sürekli artış veya azalıştan söz edilememektedir.

Tablo 3: Çevresel Göstergeler ve Zaman İçindeki Trendleri

Gösterge	Zaman Aralığı	Değerler	Trend
Ekosistem koruma alanları (Doğal Sit Alanları) (İBB)	2004, 2014	**2004**: 39.497 ha **2012**: 52.212 ha	ARTAN
Enerji yoğunluğu (Enj. Tüketimi/GSKD) (TUİK)	2008 - 2012	**2008**: 0,023 toe/euro **2012**: 0,020 toe/euro	AZALAN
Sektörlere göre enerji tüketimi (ETKB)	2003, 2008	**20032008** Konut: %24 %36 Ulaşım: %16 %20 Sanayi: %33 %32 Tarım: %4 %7	ARTAN (SANAYİ AZALAN)
Karbon emisyonu (İstanbul SGE Envanteri, Green City Index)	2006, 2010	**2006**: 3,25 tCO_2e **2010**: 3,31 tCO_2e	ARTAN
Toplu taşımanın payı (İBB, Green City Index)	2006 - 2008	**2006**: %84 **2008**: %55	AZALAN
Atık üretim miktarı (İSTAÇ)	2005 - 2012	**2005**: 4.668.350 ton/yıl **2012**: 5.685.605 ton/yıl	ARTAN
Geri kazanım (İSTAÇ)	2006 - 2011	**2006**: % 0,48 **2011**: % 2,62	ARTAN
Su kayıpları oranı (İSKİ)	2001 – 2012	**2001**: % 35,33 **2012**: % 24,11	AZALAN
Enerji verimli binalar (LEED sertifikalı binalar) (www.usgbc.org/leed)	2009 - 2014	**2009**: 2 **2014**: 40	ARTAN
Bina yoğunluğu (İBB)	2009, 2011	**2009:** 637,93 no/km^2 **2011**: 677,51 no/km^2	ARTAN

Ulaşım performansı incelendiğinde ise toplu taşıma yüzdesinde azalma görülürken araba sahipliği ve özel araç kullanımında artış olduğu görülmektedir [17]. Toplu taşımanın oranındaki azalma olumsuz bir trend olarak yansımaktadır.

İstanbul'da üretilen atık miktarında 2005 yılından 2012 yılına %22'lik bir artış gözlemlenmiştir [18]. Bu artış nüfus artışı ile de doğrudan ilişkilidir. Ancak atık geri dönüşümü ve geri kazanımı konusunda ilerleme çok düşük seviyededir ve İstanbul bu konuda düşük bir performans sergilemektedir.

Su yönetimi, su kayıp oranı üzerinden değerlendirilmiştir. İSKİ tarafından geliştirilen projeler ile su kayıpları 2001 yılında %35 iken 2012 yılında %24'e düşürülerek yüksek bir performans göstermiştir [19].

Çevre kalitesi başlığı altında enerji verimli binalar ele alınmış, LEED sertifikalı binaların sayısı bu kategoride gösterge olarak kullanılmıştır. 2009 yılında LEED sertifikalı verimli bina sayısı 2 iken 2014 yılında 40'a yükselmiştir [20]. İstanbul için verimli binalarda bir artış trendinden söz edilebilir ancak tüm kent içindeki oranına bakıldığında çok düşük kalmaktadır. Bir diğer gösterge ise konut yoğunluğu olarak belirlenmiştir. İstanbul'da hızlı nüfus artışı konut alanlarının genişlemesine, aynı zamanda konut sayısının artışıyla yoğunluğun da artmasına sebep olmaktadır.

Performans göstergeleri toplu olarak değerlendirildiğinde, İstanbul'un sosyal göstergeler bakımından olumlu bir gelişme gösterdiği gözlenmektedir. Son yıllarda durağan bir yapıya evrilmiş olsa da 10 yıllık süreç içerisinde başlangıç ve gelinen nokta arasında büyük farklar vardır. Aynı zamanda İstanbul'un sosyal göstergeleri Türkiye ortalamasının da üstünde bir gelişim grafiği vermektedir.

Türkiye'nin ekonomik merkezi olma avantajı ile İstanbul ekonomik yönden gelişen ve dinamik bir performans göstermektedir. İşgücünün sektörel dağılımı ve GSMH bakımından servis sektörü kentte öne çıkmaktadır.

Çevresel göstergeler veri bulma bakımından ve yıllar içindeki değişimi gözlemlemek açısından en problemli veri grubunu oluşturmaktadır. Genel anlamda olumlu bir performans göstermiştir ancak çevre konuları son yıllarda dikkate alınmaya başlanmıştır. Artan nüfus, yayılma eğilimi gösteren kentsel yapılaşmalar doğal alanları tehdit eden birer unsur olduğu için çevre performansı hassas yaklaşılması gereken bir konudur.

İstanbul kenti sosyal, ekonomik ve çevresel performansları karşılaştırıldığında en zayıf performansı gösteren kategori çevresel göstergeler olmuştur. Sosyal ve ekonomik veriler ise yıllar içerisinde artan bir performans ortaya koymuşlardır. Bu dönemde çevre göstergelerini oluşturan konular göz ardı edilmiş, gereken önem verilmemiş, ilgili verilerin bile düzenli toplanması ve bu konuda veri tabanı oluşturulması sağlanamamıştır. Kentsel ve ekonomik gelişmeye öncelik verilerek, bu gelişme faktörünün çevre ve doğal alanlar üzerindeki etkisi gözardı edilmiştir.

4. İSTANBUL 2050 POST-CARBON GELİŞME VİZYONU VE YOL HARİTASININ BELİRLENMESİ

4.1. İstanbul 2050 Post-Carbon Gelişme Vizyonu

POCACITO Projesi kapsamında, İstanbul 2050 Post-Carbon vizyonu ve bu vizyona ulaşmak için izlenmesi gereken yol, çeşitli kurum ve kuruluşlardan gelen uzmanlarla düzenlenen çalıştayda tartışılarak belirlenmiştir. Projenin ön hazırlığı olarak tamamlanan İstanbul kent dinamikleri göstergeleri çalıştayda önem verilecek konulara ışık tutar nitelikte kullanılmıştır.

Katılımcılar, kentsel kararlarda etkisi olan kurum, kuruluş, STK, akademi ve özel sektörden yetkili kişiler ve uzmanlar olarak davet edilmişlerdir. Çalıştaya, İTÜ, İBB ÇEVRE KORUMA MÜDÜRLÜĞÜ, KENTSEL DÖNÜŞÜM MÜDÜRLÜĞÜ, ULAŞIM MÜDÜRLÜĞÜ, İSKİ, İSTKA, BİMTAŞ, TOKİ, İTO, EY TURKEY gibi farklı kurum ve kuruluşlardan toplam 18 temsilci katılmıştır.

Yapılan çalıştayda uzmanlar tarafından, İstanbul dinamikleri, kurumlar ve özel sektör faaliyetleri tartışılmış, İstanbul'un bulunduğu nokta ile sürdürülebilir bir gelecek için olması gereken nokta değerlendirilmiştir. Sonuç olarak, İstanbul 2050 Post-Carbon Vizyonu "*Küresel düzeyde rekabet etme gücüne sahip, dinamik, yenilikçi, kendine yetebilen, yaşam kalitesi yüksek, iyi yönetişim gücüne sahip, sürdürülebilir bir İstanbul*" olarak belirlenmiştir. Belirlenen vizyonun temel alt bileşenleri ise *enerji, yaşam kalitesi, yönetişim, çevre ve doğal kaynaklar, küresel rekabet edebilirlik* şeklinde tanımlanmıştır. Alt bileşenler 2050 vizyonuna ulaşmak için odaklanılacak eksenleri göstermektedir.

Çalıştayın bir sonraki aşamasında belirlenen vizyon ve alt bileşenler ekseninde 2050'ye uzanan yol haritası belirlenmiştir. Bu aşamada, yapılması gerekenler, politikalar ve zaman yönetimi üzerinde tartışılmıştır.

4.2. İstanbul 2050 Post-Carbon Kentsel Gelişme Senaryoları ve Yol Haritasının Belirlenmesi

Vizyon çalıştayının bir sonraki aşaması olan senaryo çalışması aynı uzman grubu ile devam etmiştir. Çalıştayın ikinci aşamasını oluşturan senaryo çalışmasında belirlenen vizyon ve vizyonun alt bileşenleri kapsayıcı bir biçimde ele alınmış, yol haritası detaylı bir biçimde tartışılmıştır. Çalışmada her bir alt bileşen için ilgili aktörler tanımlanmıştır. İkinci olarak her bir alt bileşen için vizyona ulaşmadaki fırsatlar ve engeller ortaya konmuştur. Son olarak 2015 yılından başlayarak 2050 yılına kadar olan süreçte yapılması gerekenler, dönüm noktaları, hedefler ve politikalar belirlenmiştir. Bu sayede, İstanbul 2050 Post-Carbon gelişimi için oluşturulan vizyonun adım adım geleceğe taşınması hedeflenmiştir. Her bir alt bileşen için ilk olarak 2050 hedefleri tanımlanmıştır. Çalışmanın sonraki aşamasında belirlenen hedeflere giden yolda yapılması gereken eylemler, uygulanması gereken politikalar belirlenmiştir. Uzun erimli bu süreçte dönüm noktası olabilecek temel eylemler ve yapılması gerekenlerin zaman takvimi belirlenmiştir. Son aşamada ise her bir alt bileşen için ilgili aktörler ve uzman grubun tartışmasında ortaya konan fırsatlar ve engeller ortaya konmuştur. Tablo 4 çalıştayda tartışılan konular doğrultusunda ortaya çıkan sonuçları göstermektedir.

Uzmanlar grubu ile yapılan çalışmada İstanbul için üzerinde durulması belirlenen 5 bileşen -enerji, yaşam kalitesi, yönetişim, çevre ve doğal alanlar, küresel rekabet edebilirlik- detaylıca incelenmiş, her biri için 2050 hedefi belirlenmiş, bu hedefe ulaşmada aktif olacak aktörler, hedefin önündeki engeller, fırsatlar tanımlanmış, bu uzun erimli süreç yönetilmeye çalışılmıştır. Yapılan tartışmalarda her bir bileşenin ihtiyacı olan eylem ve politikalar, temel dönüm noktası olacak eylemler belirlenerek sürecin nasıl olması gerektiği tanımlanmıştır. Tüm bu detaylı çalışmaların sonucunda 2050 İstanbul post-carbon vizyonuna ulaşmak için gerekli adımlar tek tek ortaya konmuştur.

5. SONUÇ VE DEĞERLENDİRME

POCACITO projesi kapsamında ele alınan İstanbul post-carbon geleceğine yönelik çalışmada geçmişten bugüne sosyal, ekonomik ve çevresel göstergeler bazında olumlu bir trend ortaya çıkmıştır. Ancak çevresel göstergelere daha çok önem verilmesi gerektiği, bugüne kadar geri planda bırakıldığı gözlemlenmiştir. İstanbul gelişme trendleri göz önüne alınarak yapılan çalıştayda 2050 İstanbul Post-Carbon gelecek vizyonu "*Küresel düzeyde rekabet etme gücüne sahip, dinamik, yenilikçi, kendine yetebilen, yaşam kalitesi yüksek, iyi yönetişim gücüne sahip, sürdürülebilir bir İstanbu*l" olarak ortaya konmuştur. Bu vizyona ulaşmak için ele alınması gereken beş bileşen "*enerji, yaşam kalitesi, yönetişim, çevre ve doğal kaynaklar, küresel rekabet edebilirlik"* olarak tanımlanmıştır. Her bir bileşen için aktörler, fırsatlar, engeller, dönüm noktaları, 2050 hedefleri belirlenerek bu vizyona ulaşmak için yol haritası çizilmiştir. Vizyona ulaşmak için işbirliği yapacak olan aktörler kamu kurumları, özel sektör, yabancı yatırımcılar, vatandaşlar ve STK'lar olarak tanımlanmıştır. İstanbul metropoliten kentinin fırsatları olarak Türkiye'nin AB uyum sürecinde olması, kentte yükselen kentlilik bilinci, sahip olduğu nüfus potansiyeli, sahip olduğu doğal kaynak potansiyeli ve içinde bulunduğu kentsel dönüşüm süreci tanımlanırken, engel olarak gerekli hassasiyetten uzak kentsel dönüşüm uygulamaları, kentlilik bilincinin henüz yetersiz oluşu, yoğun göç baskısı, çarpık kentleşme, sosyal, ekonomik ve çevresel verilerin toplanması ve izlenmesindeki yetersizlik, kurumlar arası işbirliği eksikliği, uygulamalarda denetim eksikliği, ekonomi-ekoloji dengesini bozan uygulama kararları tanımlanmıştır. 2050 yılı için ortaya konulan vizyona ulaşmak için yapılması gerekenler sıralanmıştır. 2020 yılı için hedefler; "enerji master planının oluşturulması; ulaşımın yeniden düzenlenmesi ve toplu taşıma ağının genişletilmesi; sürdürülebilir kentsel envanterin (sosyal, ekonomik, fiziksel, çevresel) oluşturulması ve kamuoyu ile paylaşılması; kent bilgi sistemlerinin oluşturulması; ekonomik vizyon planının hazırlanması" olarak belirlenmiştir. 2025 yılı hedefleri; "yasal-yönetsel çerçevenin oluşturulması; mutlak korunması gereken doğal kaynakların belirlenmesi" şeklindedir. 2040 yılı hedefi "erişilebilir kent için planlama ve uygulamanın yapılması" olarak belirlenmiştir. Vizyon çerçevesinde her bir bileşen için 2050 hedefleri "CO_2 salınımını azaltan, doğal kaynaklardan enerji üreten, verimli topluma geçişin sağlanması; planlı, güvenli, herkes için

Tablo 4: İstanbul 2050 Post-Carbon Yol Haritası: Hedefler, Dönüm Noktaları, Aktörler, Fırsatlar ve Engeller

ALT BİLEŞEN	2050 HEDEF	DÖNÜM NOKTASI	AKTÖRLER	FIRSATLAR	ENGELLER
ENERJİ	• Doğal kaynaklardan enerji sağlayan, verimli toplum • CO_2 salınımının azalması	**2020 -** Enerji master planının oluşturulması, yenilenebilir enerji kaynaklarının geliştirilmesi ve hayata entegre edilmesi **2025 -** Master plan çalışması sonuç ve eylem araçlarının belirlenmesi, yasal - yönetsel çerçevenin oluşturulması	Kamu-Özel işbirliği	• Kurumsal kapasitenin yeterliliği • Enerji teşvikleri • Yeni yasal düzenlemeler • Mevcut örnek uygulamalar • AB süreci (AB enerji politikaları) • Kentsel dönüşüm	Geçmişe ait veri eksikliği Denetim yetersizliği Enerji verimliliğinde halk bilincinin yetersiz olması Kamu kaynaklarının etkin ve zamanında kullanılamaması İlk yatırım maliyetlerinin yüksek olması Kurumlar arası koordinasyonun yetersizliği Mevzuatın uygulanmasındaki eksiklikler Standartların tam oluşturulmamış olması Kalifiye eleman eksikliği
YAŞAM KALİTESİ	• Günün her saati sokaklarda güvenle dolaşabilmek • Çocuk, yaşlı ve kadınlar için kaliteli yaşam mekânları oluşturmak • Planlı kentleşme • Sosyal ve teknik altyapısı düzenlenmiş fiziksel mekânlar • Özellikle engelliler için erişilebilirliğin arttırılması	**2020 -** Ulaşımın yeniden düzenlenmesi ve yönetilmesi **2020 -** Toplu taşıma ağının genişletilmesi, raylı sistem ağının tam olarak hayata geçmesi **2040 -** Erişilebilir kent için planlama, uygulama	Kamu - Özel İşbirliği Yabancı Yatırımcı	• Kentsel dönüşüm • Yaşam kalitesi kavramının her platformda tartışılmaya başlanması • Yaşam kalitesi ile ilgili araştırmaların çoğalması	Denetimsiz fiziksel mekan uygulamaları Ulaşım sistemlerinin yatırım ve işletme maliyetlerinin yüksek olması Kentlilik bilinci ve aidiyetin az olması Gelir dağılımındaki uçurum Çarpık kentleşme Göç Mevzuatın yetersizliği Mevcut yapılaşma
YÖNETİŞİM	• Ölçülebilirlik, şeffaflık, hesap verebilirlik, katılımcılık • Kendi kendine yeten ve yöneten toplumlar	**2020 -** Sürdürülebilir kentsel envanterin (sosyal, ekonomik, fiziksel veri) oluşturulması ve paylaşılması **2020 -** Kent bilgi sistemi oluşturulması	Kamu kurumları Özel sektör STK Vatandaş	• AB uyum süreci • STK'ların aktif olarak halkı bilinçlendirmesi, şeffaflığa yönelim • Teknolojik gelişim (destek sistemleri, simulasyonlar, oyunlar)	Mevcut durum İş tanımlarının eksikliği, yetki karmaşası Kurumlar arası iletişim eksikliği Farkındalığın ve bilincin olmaması Bilgi paylaşımındaki eksiklik

Tablo 4'ün devamı

ÇEVRE VE DOĞAL KAYNAKLAR	• Verimli su ve atık yönetimi • Mevcut yeşil alanların korunması • Su kaynaklarının korunması • Yeraltı su kaynaklarının korunması	**2025 -** Paydaşların vazgeçilmemesi gereken doğal kaynaklar üzerinde konsensüs oluşturması	Kamu kurumları Özel sektör STK Vatandaş	• Kentsel dönüşüm • AB çevre politikaları • Çeşitli doğal kaynakların varlığı • İlgili aktif STK'ların varlığı	Ekonomi - ekoloji dengesinde ekonominin daima ağır basması Mevcut uygulamaların doğal kaynaklara zarar verici nitelikte olması 2B kararları ve uygulamaları Nüfus - göç - yapılaşma baskısı Kentsel dönüşüm Doğal değerler üzerinde baskı oluşturacak yapılaşma kararları (Kanal İstanbul vb) Araştırmalara dayanan yenilikçi çalışmaların yapılmaması, desteklenmemesi
KÜRESEL REKABET EDEBİLİRLİK	• Model / örnek kent • Küresel odak kent	**2020 -** Ekonomik vizyon planının hazırlanması	Kamu-Özel İşbirliği Yabancı Yatırımcı	• Kentsel dönüşüm • Bölgesinde demokrasiye ve ekonomik potansiyele sahip ülke • AB süreci • Genç nüfus ve kalifiye işgücü	Ara eleman yetişmemesi Bölgede yaşanan ve yaşanma potansiyeli olan çatışmalar İstikrarsızlık Küresel intiba (Impression) Tasarrufların ve ulusal sermayenin yetersiz olması (kırılgan ekonomi)

kaliteli, erişilebilir, engelli dostu kentsel mekânların yaratılması; katılımcı, şeffaf ve kendi kendine yeter bir yönetim sisteminin oluşturulması; verimli su ve atık yönetiminin sağlanması; doğal kaynakların koruma altına alınması; İstanbul'un küresel odak bir kent haline getirilmesi" olarak belirlenmiştir.

İstanbul metropoliten kenti için oluşturulan vizyon ve yol haritası ile yerel ve küresel çevre sorunlarını azaltmak amaçlanırken, iklim değişikliğine karşı kentin dayanıklılığını arttırmak, verimli kentleşmeyi sağlamak, İstanbul'un potansiyelini en etkin şekilde kullanmak, çevresel, sosyal ve ekonomik olarak sürdürülebilir yeni tip kentleşme sistemini oluşturmak hedeflenmiştir.

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V ÖKOSTADT ZWISCHEN VISION UND WIRKLICHKEIT

Felix Döhler, Max Grünig, Susanne Langsdorf

Ökostadt zwischen Vision und Wirklichkeit

Eine ökologische Transformation von Städten wird heute nahezu universal gefordert. Als Antwort auf eskalierende Umweltprobleme in Ballungsräumen entstand vor über 30 Jahren das Konzept der „Ökostadt“, deren vollständige Verwirklichung ein bisher unerreichtes Ideal darstellt. Die Ökostadt als Leitkonzept wurde bald von anderen Modellen verdrängt. Dennoch besitzen die von „Stadtökologen“ herausgearbeiteten Prinzipien für die Praxis der ökologischen Stadterneuerung nach wie vor hohe Aktualität.

Einleitung

Global nimmt der Anteil der Stadtbewohner an der Weltbevölkerung zu. Heute lebt über die Hälfte der Menschheit in Städten. Bis zum Jahr 2030 wird dieser Anteil auf über 75% ansteigen. Vor allem in Schwellenländern schreitet die Urbanisierung rasant voran (Hornweg und Freire 2013). Für Europa rechnen die Vereinten Nationen bis 2030 mit einem Anteil von fast 80% Stadtbewohnern an der Gesamtbevölkerung (DESA 2012). Städte verursachen schon heute ca. 70% der energiebedingten Kohlenstoffemissionen, bei steigender Tendenz. Gleichzeitig liegt in Städten großes Potential für den Umweltschutz: Dichte und Kompaktheit können zur Reduzierung des Energie-, Wasser- und Materialverbrauchs sowie des Verkehrs beitragen (Jabareen 2006). Die Nähe zwischen den Akteuren eröffnet Handlungsmöglichkeiten und seit jeher stehen Städte für ein hohes Innovationspotential.

Die Urbanisierung stellt vorhandene Stadtinfrastrukturen vor große Herausforderungen, da sich der Druck auf die ökonomischen, sozialen und ökologischen Systeme deutlich erhöht. Als frühe Antwort auf die Verschlechterung der Lebensqualität im urbanen Raum entstand in den siebziger und frühen achtziger Jahren das Konzept der Ökostadt. Kann dieser Ansatz auch mehr als 30 Jahre später noch als wegweisend betrachtet werden?

In der Folge werden wir zunächst das Konzept Ökostadt genauer darstellen, um dann die aktuelle Relevanz der ursprünglichen Ideen und Vorschläge zu untersuchen. Schließlich prüfen wir, ob die Ökostadt auch in Hinblick auf die potenzierten Herausforderungen der nächsten 40 Jahre noch Bestand haben kann.

„Stadtökologen“ als Vordenker der Ökostadt

Ausgehend von den Debatten der siebziger Jahre um die Grenzen des Wachstums wurde neben bestehenden Produktions- und Konsummustern auch das dominierende Stadtplanungsmodell der Nachkriegszeit in Frage gestellt. Die in der *Charta von Athen* postulierte funktionale Trennung in Arbeits-, Wohn-, Freizeit- und Bewegungsräume hatte zu einer „De-Naturierung“ der Bewohner von ihrer Lebenswelt geführt. Mitte der siebziger Jahre entstanden Forschergruppen von „Stadtökologen“, die sich dieses Phänomens annahmen, es benannten und unter dem Begriff „Ökostadt“ Lösungsansätze entwickelten. Die Diskussion wurde zunächst vor allem in den USA geführt. Vordenker wie Richard Register, der 1975 mit Freunden in Berkeley die Gruppe *Urban Ecology* gründete, prägten die Debatte jenseits des Atlantik. Im deutschsprachigen Raum vollzog sich eine Parallelentwicklung, die hier näher beleuchtet werden soll.

Stadtsysteme in der Krise

Im Zuge der Debatten um Atomkraft, Ölkrise und Waldsterben entstanden in Deutschland Bürgerinitiativen, die auch neue Forschungsansätze hervorbrachten. Im Jahr 1976 führte Frederic Vester in seiner gleichnamigen Studie im Auftrag des Umweltbundesamts den

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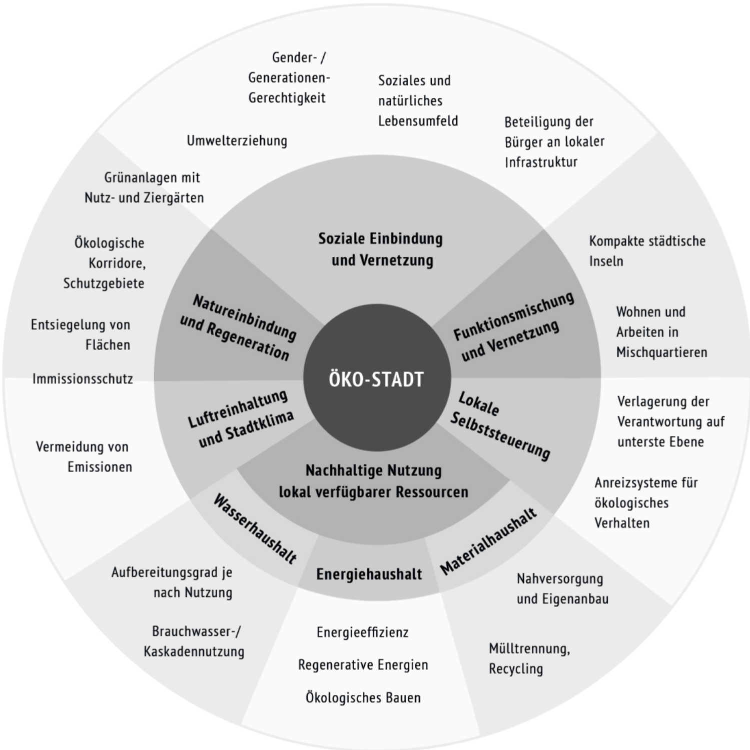
Begriff von „Ballungsgebieten in der Krise“ ein. Ausgangspunkt war eine „biokybernetische“ Perspektive, in der Ökologie als Haushaltslehre und die Stadt - analog zu natürlichen Systemen - als vernetztes System verstanden wurde. Stadtökologen wie Vester erklärten die ökologischen und sozialen Herausforderungen der siebziger Jahre als Rückkopplungen negativer Entwicklungstrends, die sich gegenseitig verstärken: Anstieg des Flächen- und Ressourcenverbrauchs; des Automobilverkehrs; Abnahme der Luft-, Wasser- und Bodenqualität; Zunahme umweltbedingter Krankheiten wie Lungenkrebs; „Stadtflucht“ und Verwahrlosung der Innenstädte; und nicht zuletzt die Entfremdung des Stadtbewohners von seinem unmittelbaren Lebensraum.

Ansatzpunkte für die Ökostadt

Als Antwort forderten die Stadtökologen eine neue Betrachtungsweise. Die Analyse der Wechselwirkungen zwischen vernetzten natürlichen, sozialen und künstlichen Teilsystemen, sollte es möglich machen, dem Kollaps städtischer Systeme entgegenzuwirken und die Regeneration der Stadt zu ermöglichen. Dies bildete die theoretische und praktische Grundlage der „Ökostadt“, wie später in den Materialien zur Bauausstellung 1984 dokumentiert. Ihr gemeinsames Bestreben ist das Erreichen eines funktionierenden, miteinander vernetzten und – in heutigem Sprachgebrauch – nachhaltigen Stadtsystems, bestehend aus unzähligen Teilsystemen.

Obgleich es damals wie heute keine allgemein gültige Ökostadt-Definition gab (Roseland 1997), weisen die Prinzipien zur Umsetzung der Ökostadt eine starke Kohärenz auf. Es wird ein schrittweiser Umbauprozess angestrebt, der von bestehenden Strukturen ausgeht und sich über viele Jahrzehnte erstreckt. Der Prozess wird von den Stadtbewohnern aktiv mitgestaltet, um diesen eine höhere Lebensqualität zu ermöglichen. Das Stadtplanungsmodell ist polyzentrisch, mit einem Netz „kompakter städtischer Inseln“, die jeweils einen möglichst hohen Grad an Selbstversorgung erreichen. Angepasste technologische Lösungen zielen auf die größtmögliche Nutzung örtlicher Potenziale (Baustoffe, passive Solarnutzung) und Vermeidung von Ressourcenverbrauch ab. Einige der wichtigsten Prinzipien der ökologischen Stadterneuerung sind im nachstehenden Schaubild zusammengefasst (vgl. auch Krusche *in*: Kennedy, 1984, 83ff).

Abbildung 1: Ökostadt: Prinzipien und ausgewählte Handlungsansätze



Integration und Weiterentwicklung ökologischer Stadtkonzepte
Im Laufe der achtziger Jahre haben Akteure auf verschiedensten Ebenen in Deutschland die von den Stadtökologen vorgebrachten Anliegen und Ansätze in der Praxis aufgegriffen. Eine zunehmende Institutionalisierung der Umweltpolitik und des Umweltrechts auch in der Stadtplanung, trug wirksam zu einer Entschärfung der Umweltprobleme bei. Einzelne Kommunalregierungen verfolgten über die geltenden Verordnungen hinaus ökologische Zielsetzungen in ihrer Planung und erarbeiteten sich einen Ruf als „grüne“ Modellstädte, so beispielsweise Freiburg. Infolge der VN-Umweltkonferenz in Rio 1992 begannen viele Städte partizipative Strategieprozesse zur lokalen Umsetzung der Agenda 21, die auf eine integrierte Lösung sozialer, ökologischer und ökonomischer Probleme abzielten. In die gleiche Richtung wiesen Initiativen der integrierten Stadtentwicklungsplanung, die in den neunziger Jahren in Deutschland vor allem zur Lösung komplexer Probleme auf Stadtteilebene eine Renaissance erlebten.
Seit der Jahrtausendwende steigt weltweit die Zahl strategischer Nachhaltigkeitsinitiativen, die sich auf unterschiedliche Konzepte berufen. Anstelle von Umweltschutz stellt nun oft der Klimawandel den Bezugsrahmen dar. In armen Entwicklungsländern verbergen sich hinter lokalen Klimastrategien häufig Initiativen für eine bessere Infrastrukturversorgung („urban resilience“); in Industrieländern liegt der Fokus stärker auf Ressourceneffizienz und Treibhausgasminderung. Einige der neueren Ansätze für Städte mit Attributen wie „low

carbon“, „CO2-free“ oder „smart“ zeichnen sich durch ehrgeizige Zielsetzungen und einen hohen Technologieeinsatz aus. Diese kommen in Sektoren wie Energie, Verkehr und Gebäudetechnik, aber auch bei der Nutzung moderner Kommunikationstechnologien für eine bessere Prozessgestaltung und Beteiligung zum Einsatz.

Rückenwind für die ökologische Stadtentwicklung: Kampagnen, Initiativen, Akteure
Aktuelle Initiativen verdeutlichen, wie sehr städtische Nachhaltigkeit im politischen Mainstream angekommen ist:

- Auf europäischer Ebene vereint der Konvent der Bürgermeister fast 5.500 Städte, die bislang fast 3.500 Aktionspläne für nachhaltige Energie eingereicht haben. Der Schwerpunkt liegt auf dem Thema Energie. Im Bereich Verkehr existieren die Pläne für nachhaltige Urbane Mobilität, die im Rahmen des *Intelligent Energy for Europe* Programms entstehen. Parallel hierzu entstand das private Gütesiegel *European Energy Award*.
- Im Rahmen der Nationalen Klimaschutzinitiative entwickeln derzeit Tausende deutsche Kommunen Klimaschutzkonzepte und Masterpläne für „100% Klimaschutz“.
- Einen umfassenderen Zugang zum Thema Nachhaltigkeit vertritt das Netzwerk ICLEI (Local Governments for Sustainability), dem weltweit rund 1.200 und europaweit rund 200 lokale Regierungen angehören. ICLEI unterstützt seine Mitglieder mit einem breiten Beratungsspektrum und durch globale Lobbyarbeit.
- Ein prominentes Beispiel für rein zivilgesellschaftliche Initiativen stellen die „Transition Towns“ dar. Unter diesem Begriff sammeln sich Nachhaltigkeitsinitiativen in hunderten Gemeinden in Europa und weltweit, in denen Bürger den Wandel hin zu einer kooperativen lokalen, nachhaltigen Wirtschaft gestalten möchten.
- Auch Unternehmen treten verschiedentlich als Förderer nachhaltiger Stadtentwicklung auf. Der Technologiekonzern Siemens beispielsweise durch seine Studien zu grüner städtischer Infrastruktur und den Green City Index.

Was ist dran an der Ökostadt?

Über die genannten Beispiele hinaus existieren etliche weitere lokale, regionale und globale Initiativen zur Förderung nachhaltiger Stadtentwicklung. Doch gibt es heute Ökostädte? Ist das Konzept noch umsetzbar und zeitgemäß? Wer in einer Internetsuchmaschine „Ökostadt“ oder „Eco City“ eingibt, stößt auf eine unübersichtliche Projektlandschaft von sektoralen Initiativen und Demonstrationsprojekten auf Stadtteilebene bis hin zu äußerst kostspieligen High-Tech-Planstädten wie Dongtan in China oder Masdar in den Vereinigten Arabischen Emiraten. Letztere versprechen in punkto Nachhaltigkeit nur Superlative. Probleme in der Umsetzung und Finanzierungslücken haben die Projekte mittlerweile erheblich ausgebremst – doch auch im Falle des Erfolgs bleibt der Mehrwert für die Realisierung anderer Öko-Städte begrenzt: ihrer Grundidee nach muss die Öko-Stadt im Bestand und in bestehenden Strukturen gelingen, nicht am Reißbrett.

„Echte“ Städte, die ökologische Ansätze im Bestand verfolgen, backen kleinere Brötchen. Kaum eine Stadt beansprucht für sich, Ökostadt zu werden. Die Online-Datenbank *oekosiedlungen.de* listet 183 Siedlungen mit zusammen etwa 26.000 Wohneinheiten auf, die in den letzten 30 Jahren in Deutschland mit ökologischen Zielsetzungen entstanden. Neben

Modellprojekten auf Gebäude- oder Stadtteilebene verfolgen kommunale Akteure ökologisch orientierte Strategien und Infrastrukturprogramme in einzelnen Sektoren. Inhaltlich-konzeptionell weisen auch diese verblüffend viele Schnittmengen mit Ökostadt-Prinzipien auf. Von der Gestaltung einer polyzentrischen Stadt mit gemischten Quartieren, der Einrichtung ökologischer Korridore, über passive Solarnutzung und Kraft-Wärme-Kopplungs-Anlagen bis hin zu öffentlichen Nutzgärten („urban gardening“) findet sich die gesamte Bandbreite der oben genannten Prinzipien für ökologische Stadterneuerung auch in neueren Initiativen wieder. Waren die Vertreter dieser Ideen früher Exoten, werden die Konzepte heute von Bürgermeistern genauso vorangetrieben wie durch die Weltbank, die Vereinten Nationen oder europäische Institutionen. Vor allem gehören sie inzwischen zum Bildungskanon der Stadtplaner und Kommunalpolitiker.

Die Ansätze der Ökostadt sind heute lebendiger als je zuvor, allerdings wurde *die* „Ökostadt“ als zentraler Begriff bis auf wenige Ausnahmen von Spielarten der „nachhaltigen“ und „klimagerechten“ Stadt abgelöst. Die Stadtforschung sieht den Wert des eher präskriptiv-normativ denn analytischen Ökostadt-Ansatzes vor allem darin, dass er einen Rahmen für verschiedene Unterkonzepte bietet. Einerseits wird die Unschärfe kritisiert, da sie wissenschaftliche Abgrenzungen zu anderen Ansätzen und zur städtischen Realität erschwert. Andererseits stellt gerade diese Flexibilität in der Praxis eine Stärke dar (vgl. Roseland 1997; Rapoport 2014) und ist die logische Konsequenz einer Perspektive, in der jede Stadt als einzigartiges, komplexes und lebendiges System begriffen wird.
Im Gegensatz zu staatlichen Konzepten tendieren zivilgesellschaftliche Transitionsinitiativen zu einem holistischen Anspruch. Oftmals stehen sie für einen grundlegenden gesellschaftlichen Wandel, selbst wenn sie sich mit partikularen Themen befassen. Unterstützt durch soziale Medien erfahren solche Initiativen derzeit einen enormen Zuwachs. Ob diese Entwicklung zukünftig prägend sein wird, ist unklar. Staatliche Akteure hingegen stecken ihren Gestaltungsrahmen entlang festgelegter Budgets, Zeitrahmen und Zuständigkeiten ab. Innerhalb dieses Rahmens ist viel bewegt worden: Städte werden heute anders geplant als in den achtziger Jahren.
Thematische Fokussierungen können als Einschränkung, aber auch als Chance für den Wandel wahrgenommen werden: Mit einem konkreten Thema wie Energie, Verkehr oder Klimaschutz lassen sich lokale Akteure direkter aktivieren als über ein abstraktes Thema wie Ökologie. Dies ist umso wichtiger, als individuelle Entscheidungen und Handlungen große Potenziale für eine ökologische städtische Ressourcennutzung bergen.
Verhaltensänderungen lassen sich nicht von oben herab verordnen, sondern müssen sich als Prozess entwickeln, der auf die Lebensqualität und Nachhaltigkeit abzielt. Staatliche und zivilgesellschaftliche Initiativen können hier gemeinsam eine größere Wirkung entfalten, indem sie einerseits Menschen überzeugen, Verantwortung zu übernehmen, und andererseits Handlungs- und Gestaltungsmöglichkeiten bieten. Auch in der Privatwirtschaft finden sich zunehmend Partner, die sich als verantwortungsbewusste Produzenten, Projektförderer und Anbieter auf dem wachsenden „Nachhaltigkeitsmarkt“ positionieren. Die Basis für staatlich-zivilgesellschaftlich-privatwirtschaftliche Allianzen für lokale Nachhaltigkeit schien niemals günstiger als heute.
Auf dem Weg zur Ökostadt erscheinen Koalitionen dieser Art auch notwendig. Denn Stadtpolitik wird immer so komplex und „unordentlich“ bleiben, dass sie ihre Akteure zu Kompromissen zwischen handfesten Interessen, Prioritäten und Leitwerten zwingt. Daher lohnt es auch heute, sich das Konzept der Ökostadt und seine Entstehungsgeschichte ins

Bewusstsein zu rufen. Erstens bietet es dank seiner Flexibilität einen Rahmen für unterschiedlichste Ansätze. Zweitens bieten sich die Stadtökologen als Vorbild an, in ihrer Mischung aus politischem Aktivismus, Forschung und Praxis für die Gestaltung einer lebenswerten Welt einzutreten.

Dass Konzepte nachhaltiger Stadtentwicklung von Zeit zu Zeit neue Namen tragen, ist nebensächlich. Denn für den Stadtbewohner ist der Name des Entwicklungsplanes nicht wichtig – solange es sich um einen ganzheitlichen Ansatz handelt, der seine Lebensqualität und auch die der kommenden Generationen verbessert.

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