



european post-carbon
cities of tomorrow

CASE STUDY ASSESSMENT REPORT

ROSTOCK

ECOLOGIC INSTITUTE



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I INTRODUCTION

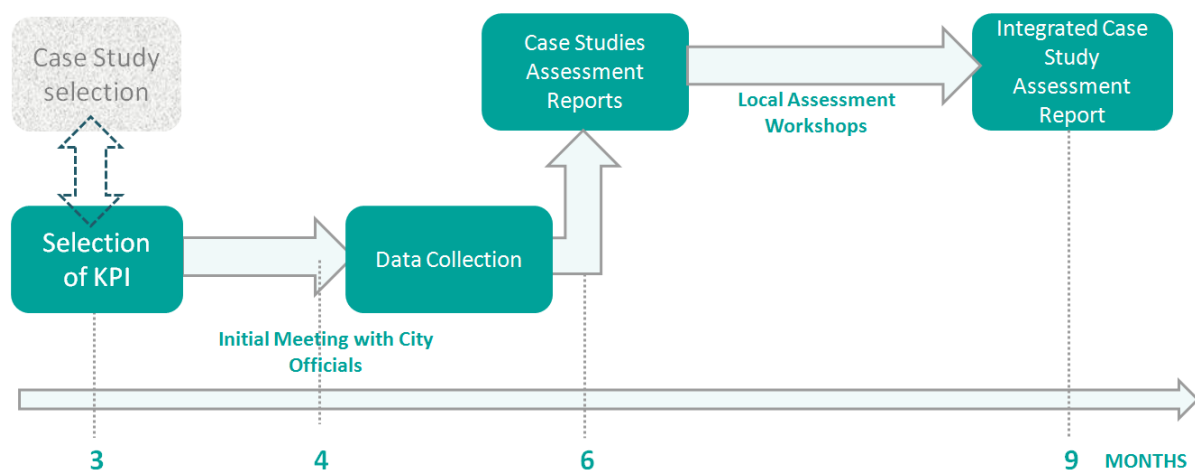
This document gives an overview of the key indicators for the POCACITO case study of Rostock. This mid-sized city is located in Central Europe on the north-east coast of Germany. Rostock is a regional centre and coastal city. The following assessment provides an outline of some of its main challenges and opportunities.

II APPROACH AND METHODOLOGY

II.I MODEL AND CONCEPT

The initial assessment of the case study cities includes the following interrelated stages:

Figure 1: Methodological approach of the initial assessment



The following key performance indicators are used to describe some of Rostock's main challenges and opportunities. Sometimes the data was not available for all years or, for a few indicators, not available at all. Regional data was used if city-level data was unavailable.

Table 1: List of key performance indicators

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
SOCIAL	Social Inclusion	Variation rate of unemployment level by gender	Percentage	2003-2012
		Variation rate of poverty level	Percentage	2003-2012
		Variation rate of tertiary education level by gender	Percentage	2003-2012
		Variation rate of average life expectancy	Average N°	2003-2012

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR		
	Public services and Infrastructures	Variation rate of green space availability	Percentage	2003		
				2012		
	Governance effectiveness	Existence of monitoring system for emissions reductions	Yes/No Description	2013		
ENVIRONMENT	Biodiversity	Variation rate of ecosystem protected areas	Percentage	2012		
	Energy	Energy intensity variation rate		Toe/euro	2003	
				Toe	2012	
				Percentage	2003 2012	
	Climate and Air Quality	Variation rate of carbon emissions intensity		Ton CO₂/euro	2003	
				Ton CO₂	2012	
				Ton CO₂	2003 2012	
				Nº	2010 2012	
	Transport and mobility	Variation share of sustainable transportation		Percentage	2001	
					2011	
	Waste	Variation rate of urban waste generation		Kg/person/year	2007	
					2012	
	Water	Variation rate of urban waste recovery		Percentage	2007	
2012						
Buildings and Land Use	Water losses variation rate		m³/person/year	2003		
				2012		
ECONOMY	Sustainable economic growth	Energy-efficient buildings variation rate	Percentage	2007		
				2012		
				Urban building density variation rate	Nº/ km²	2003
						2012
		Level of wealth variation rate	eur/person	2003-2012		
				Variation rate of GDP by sectors	Percentage	2003-2012
						Employment by sectors variation rate
				Business survival variation rate	Percentage	

DIMENSION	SUB-DIMENSION	INDICATOR	UNIT	YEAR
				2010
	Public Finances	Budget deficit variation rate	Percentage of city's GDP	2003-2012
		Indebtedness level variation rate	Percentage of city's GDP	2003-2012
	Research & Innovation dynamics	R&D intensity variation rate	Percentage	2003-2012

II.II DATA COLLECTION PROCESS

The data was collected in a bottom-up approach through the local authorities, mainly the environmental agency of Rostock, and a top-down approach through statistical data and other relevant documents. One major data source was the town hall website¹ and the yearbook “Statistisches Jahrbuch Hansestadt Rostock 2013”. As Rostock is a master plan commune for 100% climate protection, it has already gathered much relevant data.

III OVERVIEW OF THE CASE STUDY CITY

III.I TERRITORY

Rostock is a medium-sized city on the north-east coast of Germany by the Baltic Sea. The city is located in the state Mecklenburg Western-Pomerania (Eurostat NUTS2 region) within the geographical region Northern Lowland. The climate is temperate with significant rainfall throughout the year. Rostock is situated on the river Warnow, which flows into the Baltic Sea in the northern quarter Warnemünde. Rostock is composed of 31 quarters, although for statistical reasons they are summed up to 21. Rostock can be accessed by highway from Hamburg and Berlin in around 2 hours. Ferry traffic is conducted between Rostock and Gedser (Denmark), Trelleborg (Sweden), Ventspils (Latvia), Helsinki (Finland) and Gdynia (Poland). The military and civil airport Rostock-Laage is situated around 40km from the city. The maps below indicate its location within Europe and its geographical boundaries.

¹ <http://rathaus.rostock.de>

Figure 2: Map of Rostock in Central Europe, in Germany and close-up



Source: © OpenStreetMap contributors

III.II POPULATION

Rostock is the largest city in the region with a population of 203,673 inhabitants. With a size of 181 km², there are on average 1,123 inhabitants per km². While 23% of the population is more than 65 years old, 11% is younger than 15 years. 3.9% of the population are foreigners. Around 1/3 of the inhabitants completed a higher/tertiary education. Rostock's employment rate is at 49.7% and its unemployment rate at 11.5%.

III.III ECONOMY

GDP per capita in Rostock is at 30,628 EUR with the main economic sectors being Tourism, Services and Technologies. Major employers are the cruise line AIDA, which has its German headquarters in Rostock, several shipping companies and call centres. The University of Rostock is the main public employer. Being located on the Baltic Sea, the beach, harbour and several maritime events are key tourist attractions. Rostock boasts Germany's largest cruise liner harbour as well as a ferry harbour and an international seaport for the maritime transport of goods. Rostock is further allying with the region as a "Regiopole", a major regional city².

IV KEY STRATEGIES AND PROJECTS

IV.I STRATEGIES AND ACTION PLANS

STRATEGY/ACTION PLAN FACTSHEET	
Title	<i>Climate Protection Concept (Klimaschutzkonzept)</i>
Dimension of KPIs	Environmental dimension
Period	Publication 2005, data 2004
Strategy/Action Plan description	
Objective	A framework concept for climate protection.
Targets	50% reduction of CO ₂ emissions by 2010 compared to 1987.
Links and Contacts	
Promoter	Environmental Agency Rostock
Document/web site	http://rathaus.rostock.de/sixcms/media.php/144/Klimaschutz%20Rahmenkonzept%20kl%20Kopie.pdf

² <http://www.regiopolregion-rostock.de>.

STRATEGY/ACTION PLAN FACTSHEET	
Title	Communal Master Plan
Dimension of KPIs	Environmental dimension
Period	May 2012 – April 2016
Strategy/Action Plan description	
Objective	Reduction of energy demand by 50% by 2050 and CO ₂ emissions reduction by 95% compared to 1990 levels.
Measures	Measures in the public, private and household domain, e.g., energy concepts for swimming hall, scholar education, and inclusion of businesses to the energy alliance (see Master Plan for more details).
Targets	Various, e.g., 53% of total heating thorough long-distance heating; saving of 30,000l fuel oil per year by the public waste disposal company (see Master Plan for more details).
Links and Contacts	
Promoter	<i>Environmental Agency Rostock</i>
Document/website	http://rathaus.rostock.de

IV.II KEY PROJECTS

Key projects in Rostock include:

- Master Plan for 100% climate protection/Masterplan 100% Klimaschutz³;
- Agenda21-Counsel⁴;
- Working Group Energiewende;
- Fair-Trade-City⁵;
- Bürgerenergie (citizen energy);
- Future Mobility Plan (Mobilitätsplan Zukunft, work in progress)⁶;

³ <http://rathaus.rostock.de/sixcms/media.php/144/Vortrag%20KSL%20HRO.pdf>

⁴ http://dotcomdesign.de/pdf/hro/struktur_agenda.pdf

⁵ <http://rostock.fairtrade-towns.de/das-projekt/>

⁶ <https://rostock-bewegen.de/mitreden>

- Energy alliance (pre-association launch)⁷.

V CASE STUDY CITY ASSESSMENT

V.I ENVIROMENTAL PERFORMANCE

V.I.I VARIATION RATE OF ECOSYSTEM PROTECTED AREAS

The data available for 2008 are 13 km² of protected area in Rostock⁸. For further information also see social performance indicator V.II.5 Variation Rate of Green Space.

V.I.II ENERGY INTENSITY VARIATION RATE

Table 2: Energy variation 2005 & 2012

year	GDP/ per person	toe ⁹ / per Person	inhabitants	toe	GDP (Mio €)	toe/GDP	energy demand per Person in MWh ¹⁰
2005	25,288	1.394	199,300	277,100	5,033	0,0000551	16,17
2012	30,628	1.389	203,104	282,040	6,238	0,0000452	16,15
year	toe/EUR		variation				
2005	0,0000551		-				
2012	0,0000452		-18%				

The energy intensity (tonne of oil equivalent - toe) per GDP (EUR) decreased by 18%, comparing 2005 and 2012 data. (The numbers are based on the available years 2005 and 2012.)

Level: city

Source: Rathaus Rostock¹¹, Statistisches Amt Mecklenburg-Vorpommern SIS-Online¹²

⁷ http://rathaus.rostock.de/sixcms/detail.php?template=seite_umweltamt_energiewende_de

⁸ http://rathaus.rostock.de/sixcms/media.php/1074/GV_Flaechenstatistik.pdf

⁹ The IEA/OECD define one toe to be equal to 11.63 MWh.

¹⁰ Final energy demand adjusted by weather data

¹¹ http://rathaus.rostock.de/sixcms/detail.php?id=194&_sid1=rostock_01.c.263.de&_sid2=rostock_01.c.538.de&_sid3=&_sid4=&_sid5=, "Rostock_Bilanztafel"

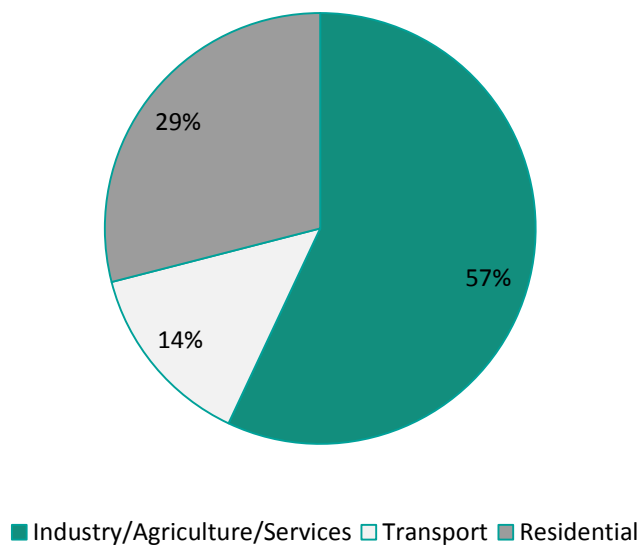
¹² http://sisonline.statistik.m-v.de/sachgebiete/P242601K_Bruttoinlandsprodukt_zu_Marktpreisen

V.I.III VARIATION RATE OF ENERGY CONSUMPTION BY SECTORS

The total energy consumption dropped between 2002 and 2012 by 9.1%. The sectors Industry, Agriculture and Services consumed an aggregate of 57% of the total energy consumed in Rostock in 2012 (Total 4,135 GWh). There is no data on the variation rate on city-level by sectors for 2002 available.

Figure 3: Energy consumption by sector, 2012 (%)

Energy consumption by sectors (%)



Level: city

Source: Hansestadt Rostock, Amt für Umweltschutz

V.I.IV VARIATION RATE OF CARBON EMISSIONS INTENSITY

Carbon emission intensity per GDP (EUR) decreased by 25% between 2002 and 2012 in Rostock.

Table 3: Variation rate of carbon emissions intensity (%)

year	kt CO ₂	GDP	tCO ₂ /EUR	kgCO ₂ /EUR	variation
2002	890	5.033.000.000 €	0.000177	0.176833	-
2012	830	6.238.000.000 €	0.000133	0.133055	-25%

Level: city

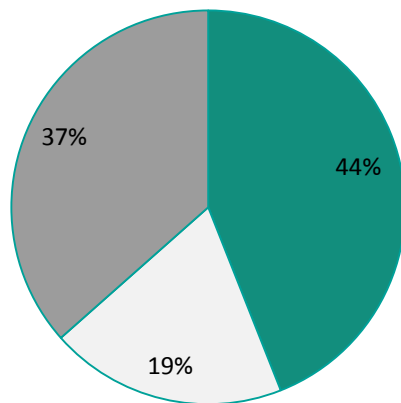
Source: <http://rathaus.rostock.de>

V.I.V VARIATION RATE OF CARBON EMISSIONS BY SECTOR

A total of 791kt CO₂ were emitted in 2012 (based solely on energy consumption). The sectors Agriculture, Industry and Services contributed 44%, Residents 37% and Transport 19%.

Figure 4: Carbon emission (based on energy consumption) by sector (%)

Carbon emissions (based on energy consumption) by sector (%)



■ industry/agriculture/services □ transport ■ residential

Level: city

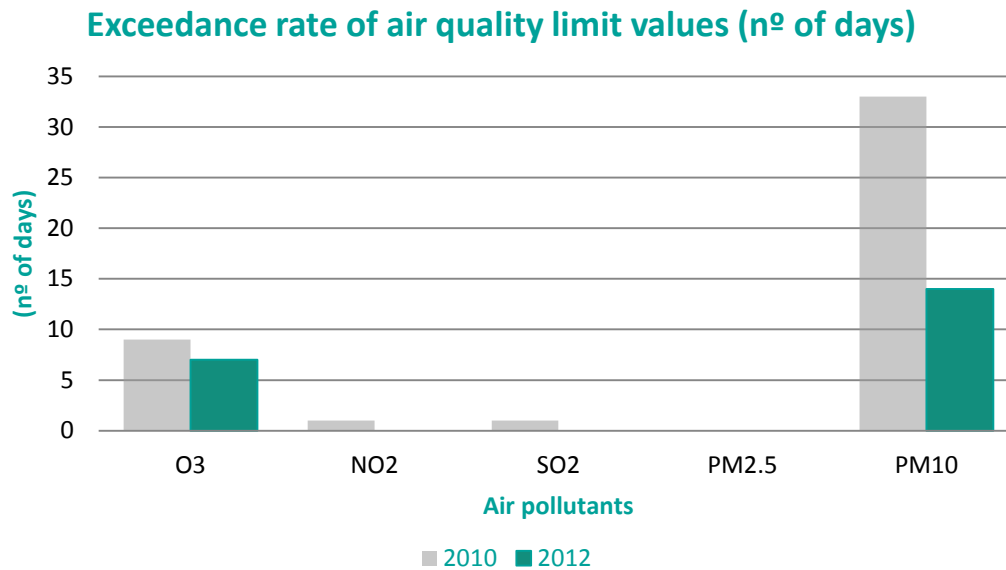
Source: Rathaus Rostock Ergebnisbericht¹³, p. 51 (data only for CO₂ (Energy) available)

¹³ http://rathaus.rostock.de/sixcms/media.php/144/Ergebnisbericht_AP1_20130823.pdf

V.I.VI EXCEEDANCE RATE OF AIR QUALITY LIMIT VALUES

In Rostock, the air quality limits were mainly exceeded for the larger particulate matter PM₁₀. The air quality improved with PM₁₀ levels being exceeded in 2010 on 33 days and in 2012 on 14 days. In 2010, the limit value for SO₂ threshold was at least 1 time higher than the limit value. Data for the O₂-values are based on > 100µg/m³.

Figure 5: Air quality limit exceedance (days)



Level: city

Source: Lung¹⁴, Umweltbundesamt¹⁵

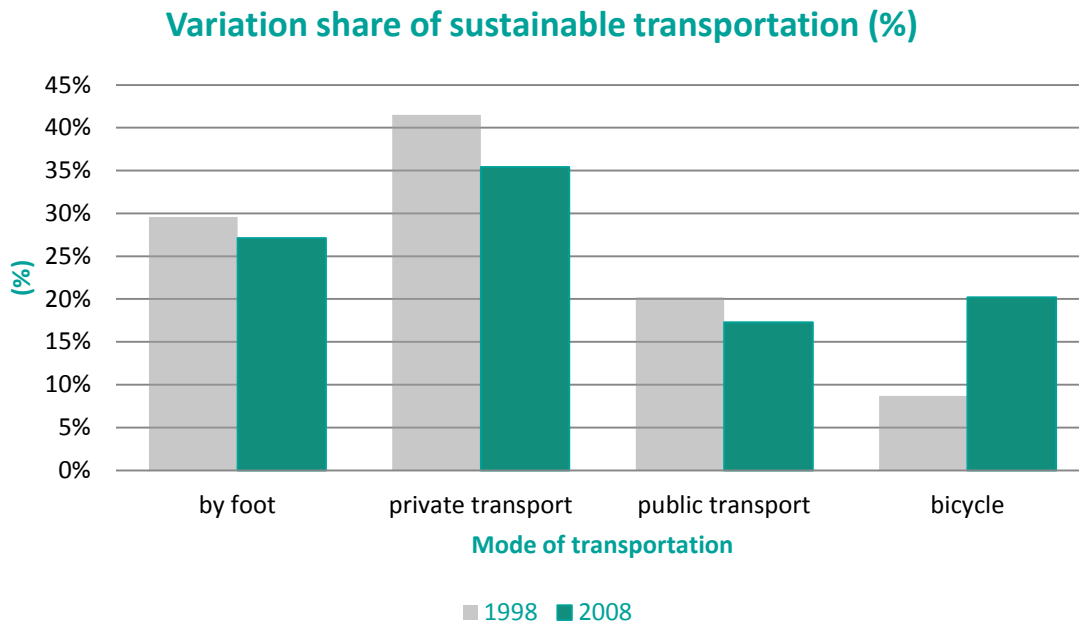
¹⁴ http://www.lung.mv-regierung.de/umwelt/luft/http://www.umweltbundesamt.de/sites/default/files/medien/358/dokumente/no2_2012.pdf

¹⁵ https://www.umweltbundesamt.de/sites/default/files/medien/370/dokumente/no2_2010.pdf

V.I.VII VARIATION SHARE OF SUSTAINABLE TRANSPORTATION

In 2008, 65% of people in Rostock use sustainable transport, which is an increase of 6% compared to 1998. Private transport, which includes car-driving, car-passenger and motorcycles, are used by 35% - a 15% decrease compared to 1998. Public transport, such as bus and train usage as well as walking by foot, slightly decreased. The major increase is seen with the total use of bicycles from 9% to 20%.

Figure 6: Share of mode of transportation (%)



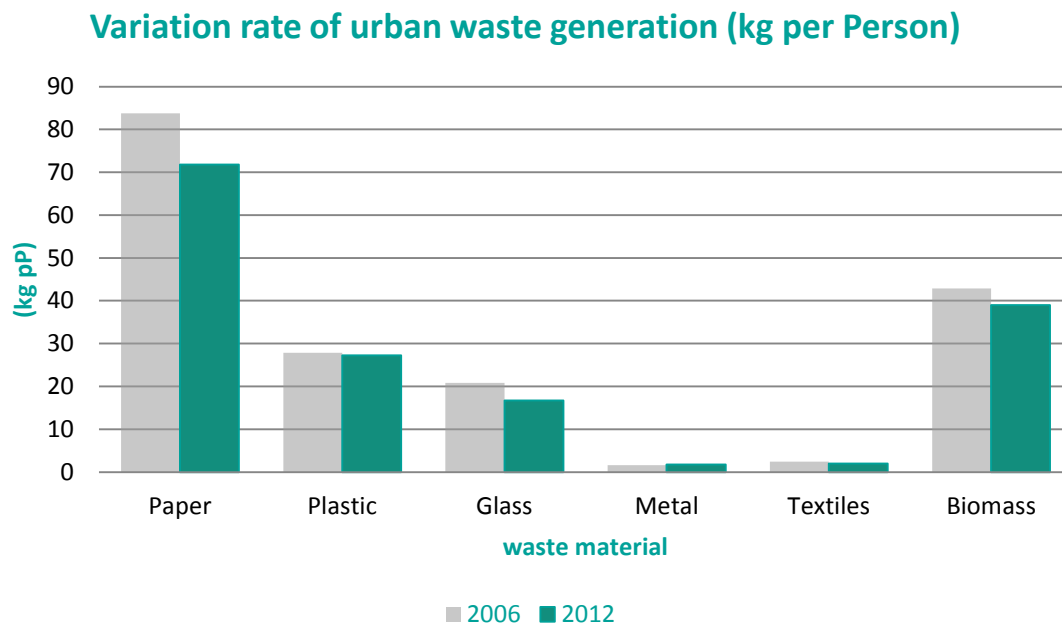
Level: city
Source: Modal Split¹⁶

¹⁶ <http://www.radregion-rostock.de/fileadmin/downloads/abc-Radverkehrskonferenz2014/P08-140516-HolgerMatthaeus.pdf>

V.I.VIII VARIATION RATE OF URBAN WASTE GENERATION

Waste generation saw an overall reduction – on average by 9% from 2006 to 2012. The only increase of waste during that time was seen with metal from 1.6 to 1.7 kg per person (8%). Data of the category plastic is substituted by light packaging (no data of plastic available).

Figure 7: Variation of urban waste generation (kg per Person)



Level: city

Source: Jahrbuch HRO 2013, p. 177

V.I.IX VARIATION RATE OF URBAN WASTE RECOVERY

Material for recycling increased in Rostock from 53% in 2009 to 54% in 2013. No data for the categories of total incineration (%), deposit onto or into land (%), composting (%) and digestion (%) were available.

Level: city

Sources: Genesis (Statistik der öffentl.-rechtl. Abfallentsorgung)¹⁷, Jahrbuch HRO 2013, p. 177

¹⁷<https://www.regionalstatistik.de/genesis/online/data;jsessionid=1D658C9907433A4F6E6FA8BD6BEE4EA9?operation=abrufabelleBearbeiten&levelindex=2&levelid=1416567021626&auswahloperation=abrufabelleAuspraegungAuswaehlen&auswahlverzeichnis=ordnungsstruktur&auswahlziel=werteabruf&selectionname=503-41-4&auswahltext=%23SHKRLB-13003&werteabruf=Werteabruf>

V.I.X VARIATION RATE OF WATER LOSSES

Water losses were reduced in Rostock by 44% between 2003 and 2012 levels.

Table 4: Variation of water losses (m³/person/year)

year	m ³ /person/ year	variation
2003	14.10	-
2012	7.90	-44%

Level: city

Source: Hansestadt Rostock, Amt für Umweltschutz

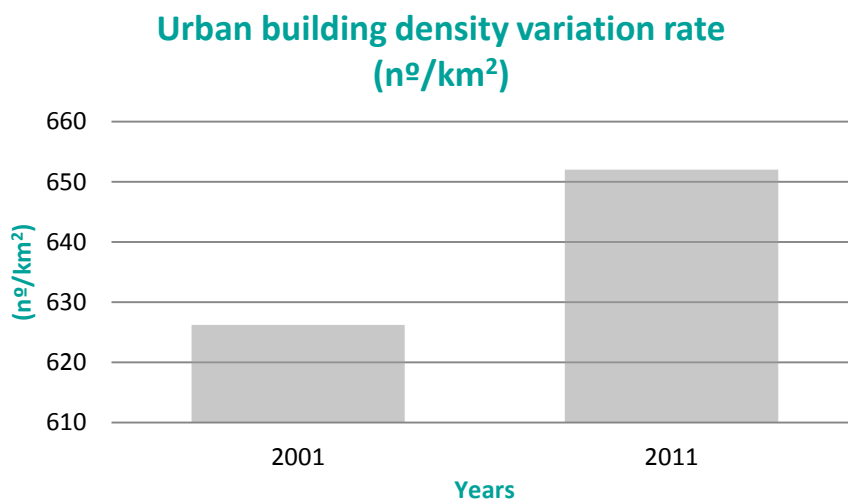
V.I.XI ENERGY - EFFICIENT BUILDINGS VARIATION RATE

No data available.

V.I.XII URBAN BUILDING DENSITY VARIATION RATE

The total area in Rostock is 181.3 km². Urban building density increased in Rostock from 626 buildings per km² in 2001 to 652 buildings in 2011 (increase of 4.1%).

Figure 8: Urban building density variation rate (n^o/km²)



Level: city

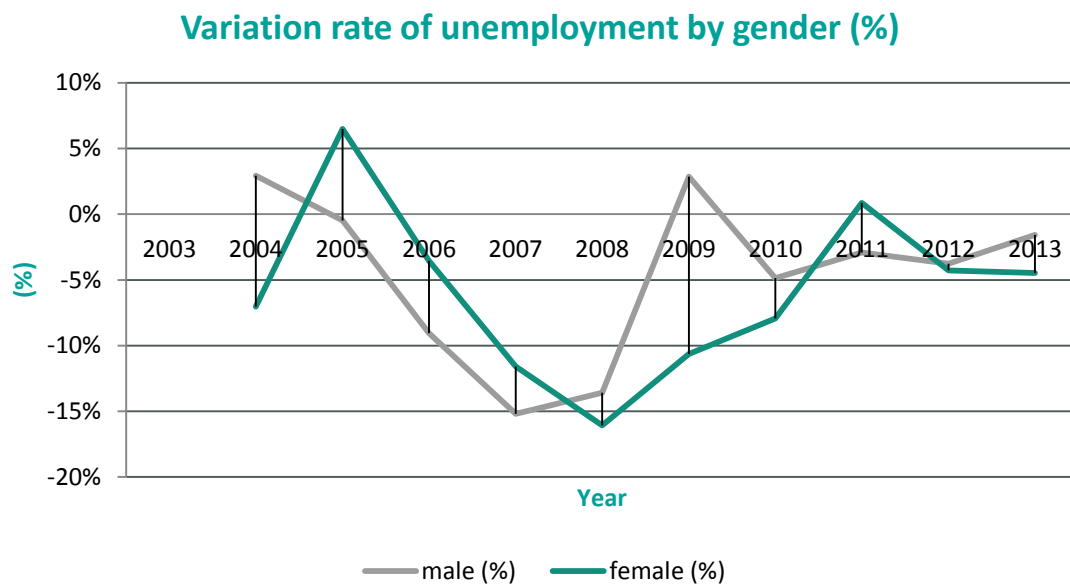
Source: Jahrbuch HRO 2013, p. 153

V.II SOCIAL PERFORMANCE

V.II.I VARIATION RATE OF UNEMPLOYMENT LEVEL BY GENDER

In the state Mecklenburg Western-Pomerania, the average unemployment rate between 2003 and 2013 was 15% for females and 16% for males.

Figure 9: Variation rate of unemployment by gender (%)

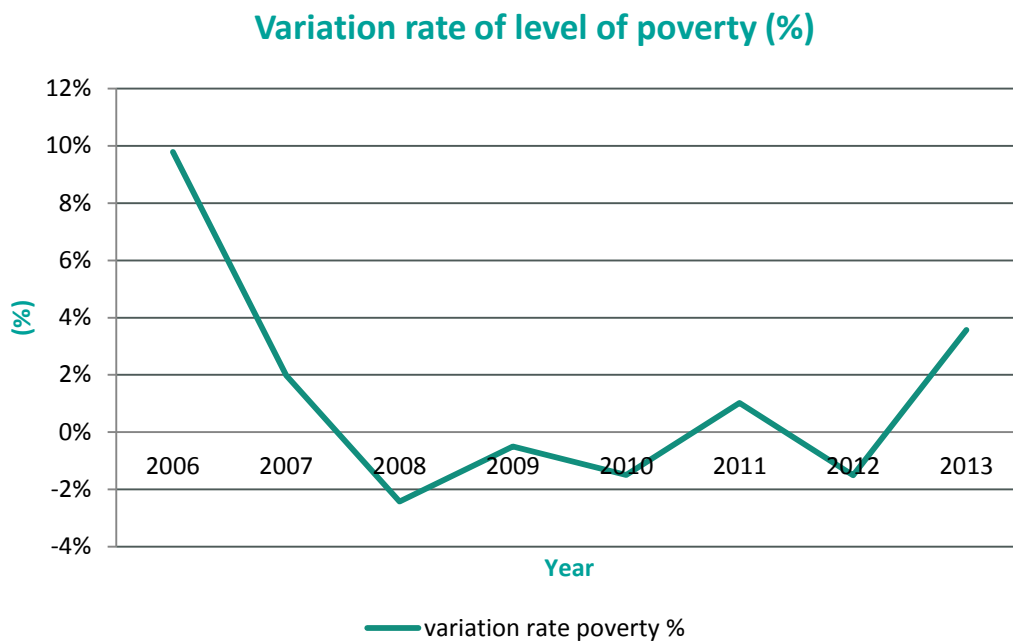


Level: NUTS2 (is the state Mecklenburg-Western Pomerania)
 Source: <https://www-genesis.destatis.de>

V.II.II VARIATION RATE OF POVERTY LEVEL

Poverty levels in Mecklenburg-Western Pomerania range from 18.4% in 2005 to 20.3% in 2013 and are increasing again in 2013.

Figure 10: Variation rate of level of poverty (%)



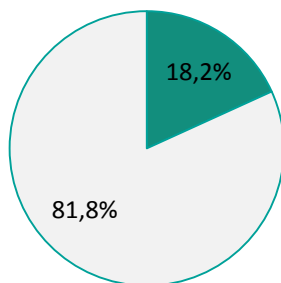
Level: NUTS2 (Mecklenburg-Western Pomerania)
Source: Eurostat

V.II.III RATE OF TERTIARY EDUCATION LEVEL BY GENDER

The total percentage of the population with higher education in Rostock is 18.2% for women and 17.5% for men in 2011 (Zensus 2011). (Only data for people with higher education working in the city for the other years are available.)

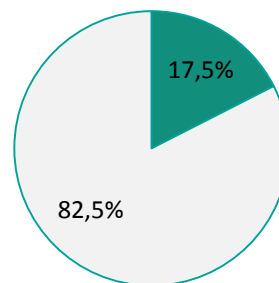
Figure 11: Rate and variation rate of tertiary education level by gender (%)

Rate of tertiary education level by gender (%), 2011 female



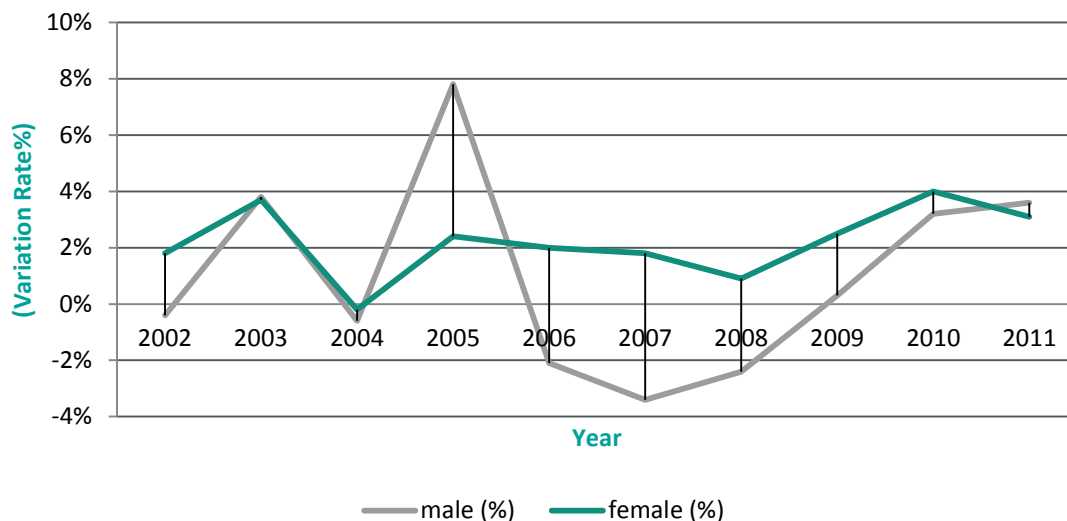
■ tertiary education □ lower

Rate of tertiary education level by gender (%), 2011 male



■ tertiary education □ lower

Variation rate of tertiary education level by gender (%)



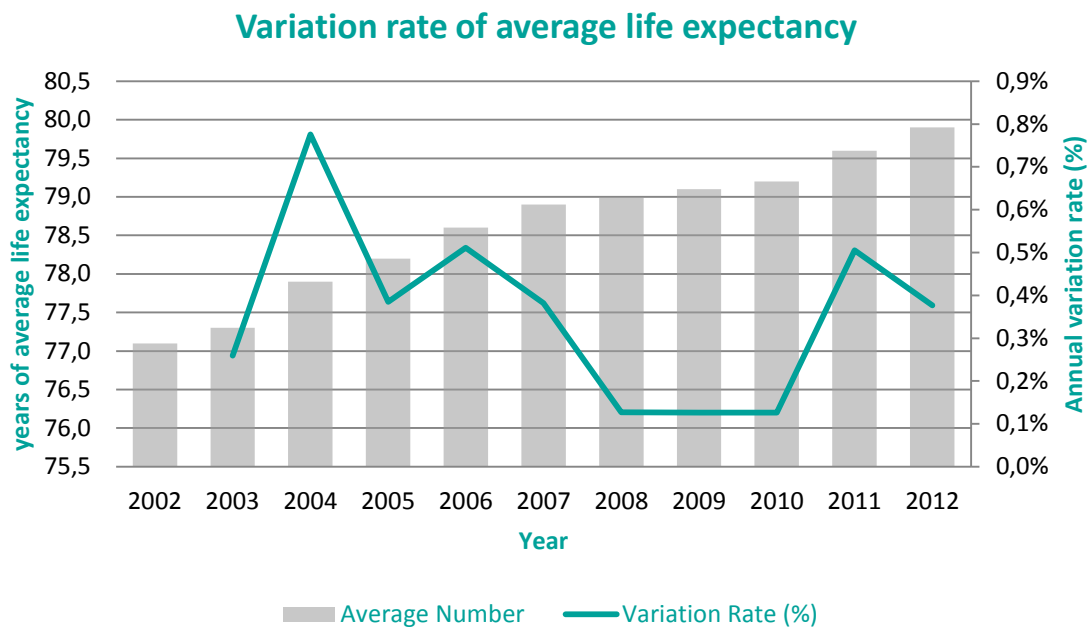
Level: city

Source: Zensus 2011 - www.regionalstatistik.de

V.II.IV VARIATION RATE OF AVERAGE LIFE EXPECTANCY

Life expectancy increased in Rostock from 77 years in 2003 to 80 years in 2012.

Figure 12: Variation rate of average life expectancy (%)



Level: NUTS2 (Mecklenburg-Western Pomerania)
Source: Eurostat

V.II.V VARIATION RATE OF GREEN SPACE AVAILABILITY

Green space increased in Rostock by 4.6% from 75.2 km² in 2003 to 78.66 km² in 2012. While garden land decreased by around 70%, recreational land increased by around 34% during this time period.

Table 5: Variation rate of green space availability (%)

YEAR	TOTAL AREA HA	RECREATION-AL AREA HA	FOREST HA	GRASSLAND HA	GARDEN LAND HA	CEMETERY HA	TOTAL GREEN SPACE HA	SHARE
2003	18103	1097	4924	1143	270	83	7517	41.5%
2012	18127	1469	5034	1203	78	82	7866	43.4%
variation	-	33.9%	2.2%	5.2%	-71.1%	-1.2%	4.6%	1.9%

Level: city
Source: Jahrbuch HRO 2013, p. 23 (Hansestadt Rostock, Kataster-, Vermessungs- und Liegenschaftsamt)

V.II.VI EXISTENCE OF MONITORING SYSTEM FOR EMISSIONS REDUCTIONS

Rostock has developed and concluded a carbon neutrality plan “Masterplan 100% Climate Protection” at city level, with the goals to reduce CO₂ emissions by 95% and energy consumption by 50% by 2050. This programme is co-funded by the Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Germany.

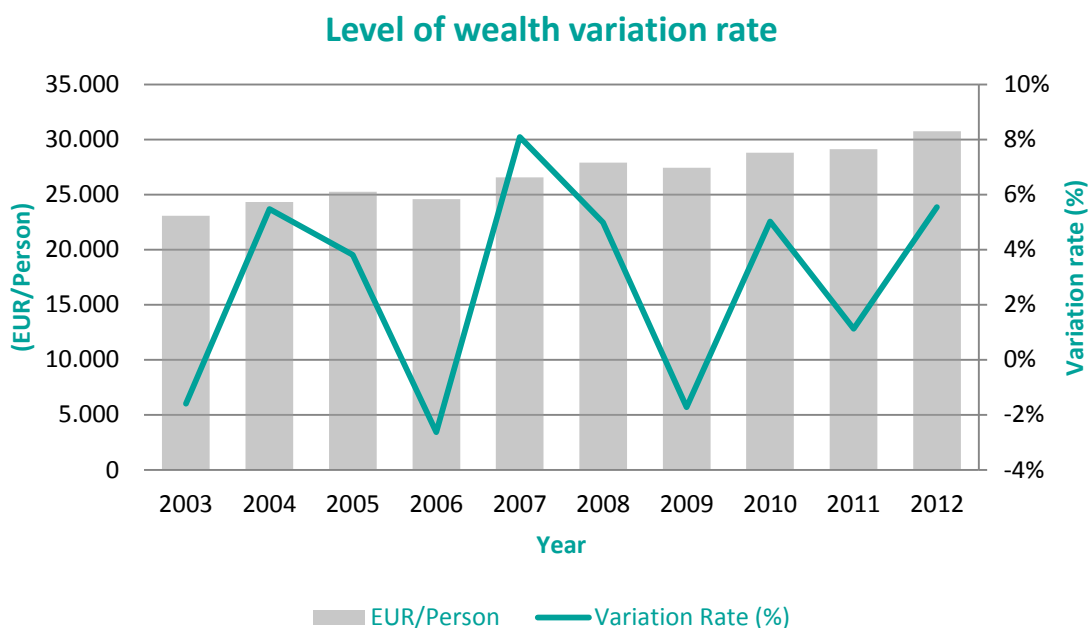
Based on the carbon neutrality plan for Rostock, the climate department of the city (Klimaschutzleitstelle des Umweltamtes) is responsible for monitoring and providing the indicators and data structure for data collection of CO₂ and energy consumption in the future.

V.III ECONOMIC PERFORMANCE

V.III.I LEVEL OF WEALTH VARIATION RATE

The GDP per person increased in Rostock from 23,066 EUR in 2003 to 30,746 EUR in 2012.

Figure 13: Level of wealth variation rate (%)



Level: city

Source: Statistisches Amt Mecklenburg-Vorpommern SIS-Online¹⁸, Jahrbuch HRO 2013, p. 33

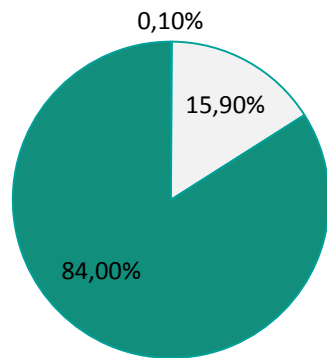
V.III.II VARIATION RATE OF GDP BY SECTORS

Services is the main sector of GDP generation in Rostock with 84% in 2003 and around 81% in 2012. The very small amount of agriculture dropped even further by 50% GDP decrease. Industry increased during this period by 16%.

¹⁸ http://sisonline.statistik.m-v.de/sachgebiete/P242601K_Bruttoinlandsprodukt_zu_Marktpreisen

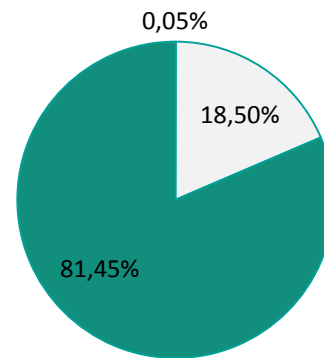
Figure 14: Variation rate of GDP by sector (%)

GDP by sectors (%), 2003



■ Agriculture □ Industry ■ Services

GDP by sectors (%), 2012



■ Agriculture □ Industry ■ Services

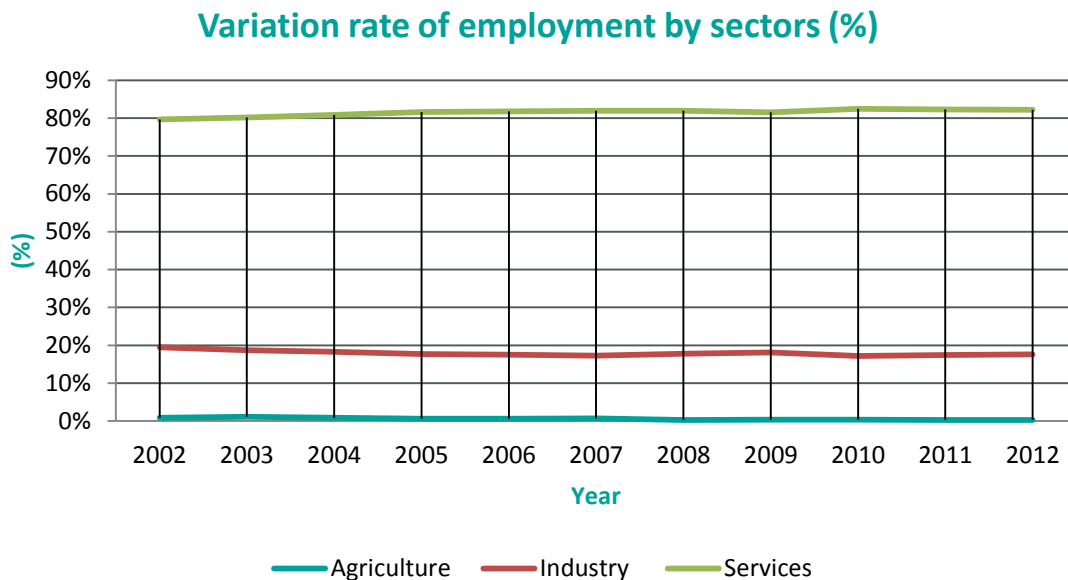
Level: city

Source: Hansestadt Rostock, Amt für Umweltschutz

V.III.III VARIATION RATE OF EMPLOYMENT BY SECTORS

The highest rate of employment in Rostock is in the Services sector ranging from 79.6% in 2002 to 82.2% in 2012.

Figure 15: Variation rate of employment by sector (%)



Level: city

Source: Statistisches Amt Mecklenburg-Vorpommern SIS-Online¹⁹

V.III.IV VARIATION RATE OF BUSINESS SURVIVAL

The number of businesses increased in 2008 by 10% compared to the year before. From 2009 to 2010 there was, each year, around 1-2% more businesses in total established in Rostock.

Level: city

Source: Statistisches Amt Mecklenburg-Vorpommern SIS-Online²⁰

¹⁹http://sisonline.statistik.m-v.de/sachgebiete/A625407K_Sozialversicherungspflichtig_Beschaefigte_Wohnort_nach_Wirtschaftsabschnitten_WZ2008

http://sisonline.statistik.m-v.de/sachgebiete/A625405K_Sozialversicherungspflichtig_Beschaefigte_Wohnort_nach_Wirtschaftsabschnitten

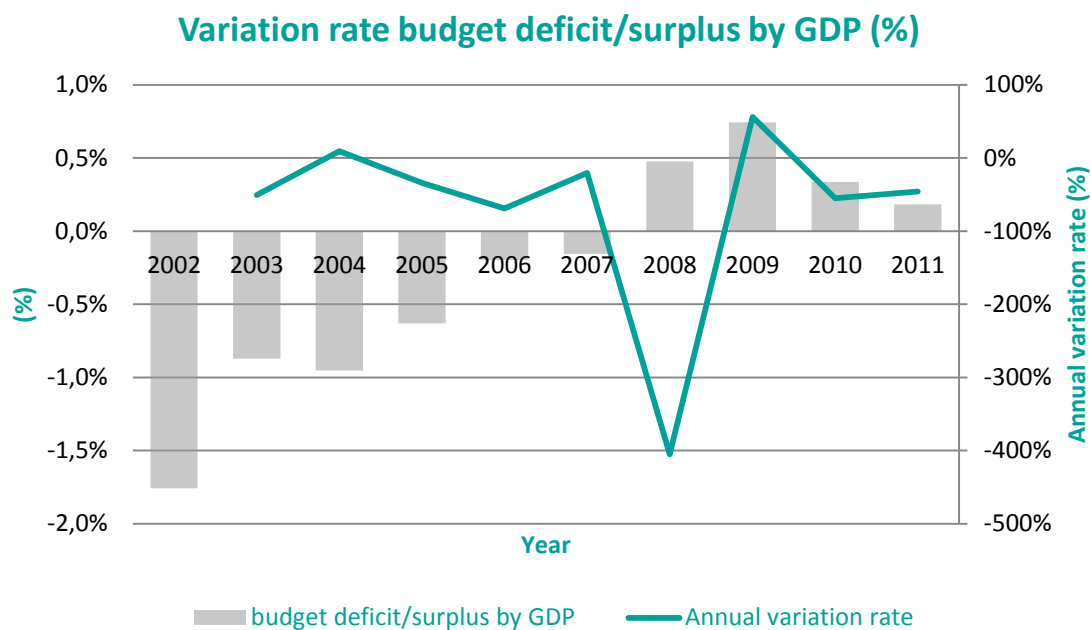
²⁰ http://sisonline.statistik.m-v.de/sachgebiete/D152106K_Betriebe_nach_Kreisen_und_Wirtschaftsabschnitten

http://sisonline.statistik.m-v.de/sachgebiete/C441101K_Landwirtschaftliche_Betriebe_nach_Groessenklassen_der_landwirtschaftlich_genutzte_n_Flaeche_Betriebe

V.III.V VARIATION RATE OF BUDGET DEFICIT

The share of the annual budget deficit/surplus of Rostock by GDP is shown in the grey histogram. It indicates that until 2007 Rostock did not generate the necessary annual revenues to finance all their activities. Between 2007 and 2011, the city ceased adding new annual deficits and generated slight annual surpluses, although with a downwards trend. The annual surplus of Rostock in 2011 by GDP was 0.2%. The variation rate highlights the high fluctuation in 2008.

Figure 16: Variation rate of budget deficit by GDP (%)



Level: city

Sources: Statistisches Amt Mecklenburg-Vorpommern SIS-Online²¹

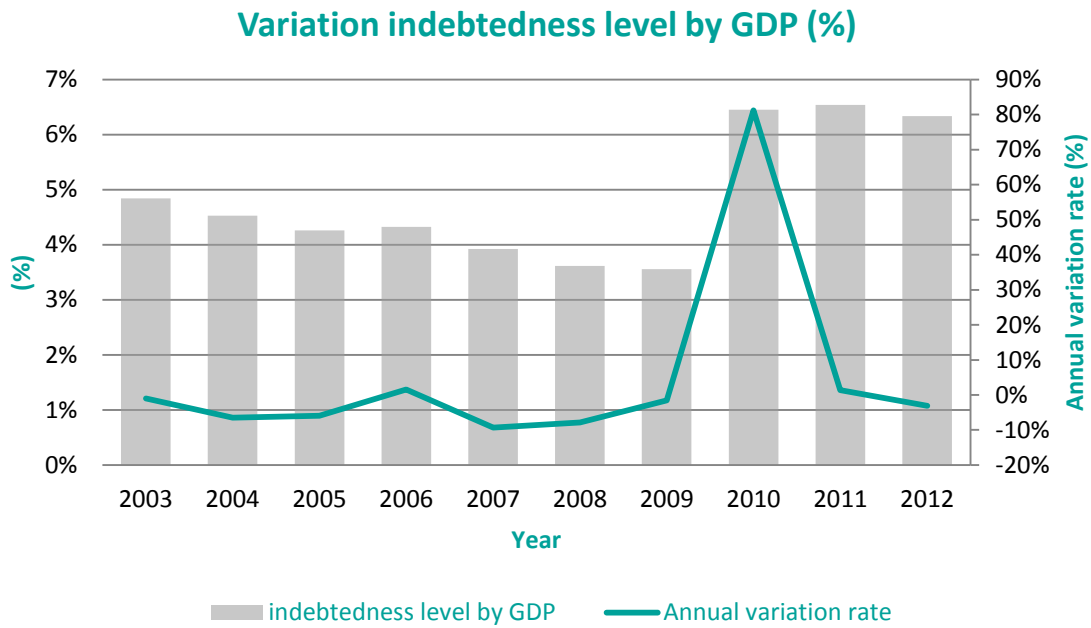
²¹ http://sisonline.statistik.mv.de/sachgebiete/L271101K_Kassenmaessige_Ausgaben_und_Einnahmen_der_Gemeinden_und_Gemeindeverbaende

http://rathaus.rostock.de/sixcms/detail.php?id=194&_sid1=rostock_01.c.261.de&_sid2=rostock_01.c.388.de&_sid3=rostock_01.c.200178.de&_sid4=rostock_01.c.409.de&_sid5=

V.III.VI VARIATION RATE INDEBTEDNESS LEVEL

The indebtedness level indicates that Rostock needed to seek external financial sources to finance its activities. Indebtedness levels in relation to (an increasing) GDP have declined until 2009. The variation indebtedness level jumped by +81% in 2010 and decreased from 2011 to 2012 by 3% again. The indebtedness in relation to GDP in Rostock was 6.3% in 2012.

Figure 17: Variation rate of indebtedness level (%)

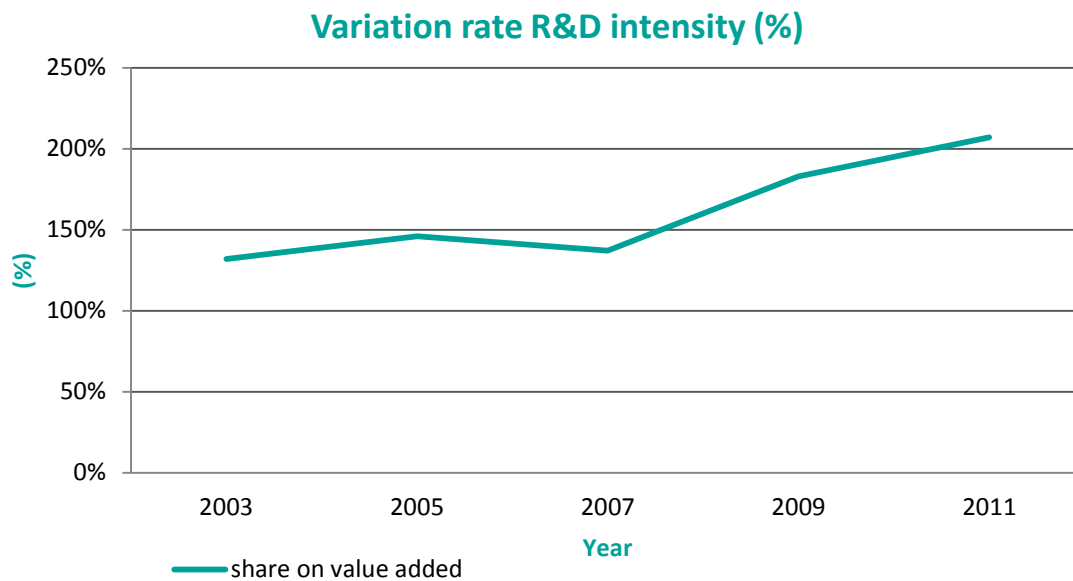


Level: city
 Source: Jahrbuch HRO 2013, p. 331

V.III.VII VARIATION RATE R&D INTENSITY

Research and development increased in Mecklenburg-Western Pomerania from 1.32% of value added in 2003 to 2.07% of value added in 2011. The only exception is for 2006 (-6%). The largest increase of 34% was in 2009. Data was available for bi-annual variation.

Figure 18: Variation rate R&D intensity (%)



Level: NUTS2 (Mecklenburg-Western Pomerania)
Source: Eurostat²²

²² http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/dataset?p_product_code=TGS00042

VI FINDINGS AND KEY CHALLENGES

The workshop in Rostock on the 4 December 2014 helped to develop a vision for a post-fossil Rostock in 2050 and receive feedback on the initial assessment indicators. Some indicators were criticised for being redundant, as many stakeholders had already gone through similar data and time-intensive discussions during the “Masterplan 100% Klimaschutz” creation. Various datasets were updated with input from stakeholders. The vision-building proved difficult, since stakeholders were already thinking about concrete measures and felt past this process. Hence, some indicators were updated afterwards and other indicators were neglected due to insufficient data.

The environmental indicators show that Rostock has already started important measures to reduce its environmental footprint. Energy intensity and energy consumption by sector decreased from 2002 to 2012. Air quality improved and public transportation as well as cycling increased while private transport decreased. Waste generation decreased slightly and water losses were significantly reduced while urban building density increased.

The social indicators only partly show a picture of Rostock. The data of Mecklenburg-Western Pomerania indicates a weak infrastructure of the region and social challenges regarding unemployment and poverty. However, in Rostock, tertiary education is high, which can be associated to the locally influential university. Life expectancy increased and green spaces grew slightly. Rostock has a large area of green space of more than 7,800 ha. A large share of green space derives from the circa 6,000ha forest of Rostocker Heide (see territory map), which is located on the eastern, less-populated and accessible side of the river. This can be seen in favour of biodiversity, but also decreases the actual urban green area. Furthermore, the indicator for building density does not reflect the high amount of multi-level buildings that are common for the East German region.

Regarding economic indicators, it stands out that services are the main factors for employment and GDP-generation. Financial resilience (budget deficit, indebtedness level) can be further improved. Another positive note is the increased research and development intensity, indicating a focus on Rostock being a location of knowledge generation and innovation. This can be an indicator for high competitiveness of the economic area.

VII RECOMMENDATIONS

Based on the indicators in this report, the following recommendations can be given for Rostock:

- A variation of sectors in Rostock can lead to a more flexible and vibrant economy, especially with a focus on social entrepreneurship and green economy.
- Financial resilience could be improved by local authorities in order for Rostock to be financially sustainable.
- Further environmental measures in the energy sectors can improve energy intensity and efficiency.

- Incentives or nudges could boost the public transport use and walking by foot to increase sustainable transport.
- Improved green space availability and efficient waste management could also be on the agenda.
- The green space availability indicator could be more insightful when seen in relation to the quarters of high multi-level building density or inhabitants per km².
- Furthermore, present experience with renovation, re-design and revaluation of multi-level-housing areas can be combined with eco-technologies and -design for more sustainable housing.
- Strengthening the region around Rostock, e.g., through strengthening regional food networks, should further improve the city's socio-economic challenges.
- Lastly, positive examples, e.g., on large water savings, should be valued and their factors of success better understood.

VIII CONCLUSIONS

Rostock is already on the way to a post-carbon economy with its master plan programme; however, key challenges remain. Being located in an infrastructurally weak region, the city has established itself as a “Regiopole” with connections to Hamburg-Berlin-Scandinavia-Poland and should further expand this strategy. The focus on high quality research, education through the university, and various tourist attractions are major advantages of the location that can be built upon further. Stricter financial planning could improve the city's financial situation while a variation in sectors could further improve the city's economic resilience.

Based on the key performance indicators, the vision-building workshop defined the following areas as essential for the future vision of Rostock 2050:

- Economy/employment,
- Mobility (alternative drives, model split/environmental associations),
- Consumption and waste management,
- Quality of life for everyone,
- Working with demographic change/old-age poverty,
- (Affordable) living space (vs. increased density/green spaces),
- Energy sources/energy efficiency/using the potentials and networking with the region.