

OECD Territorial Reviews

HAMBURG METROPOLITAN REGION, GERMANY

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OECD Territorial Reviews: Hamburg Metropolitan Region, Germany

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Foreword

Many metropolitan regions around the world have grown beyond their core city. By growing bigger, they often improve their capacity to attract investment, upgrade their skills base and move up the global value chain. Large metropolitan regions are better equipped than smaller cities to reap “agglomeration economies”, which typically arise when firms and workers in close proximity share knowledge and become more productive together.

Administrative fragmentation can get in the way of agglomeration economies. OECD research shows that the more fragmented a metropolitan region is, the less productive it is. When a metropolitan region encompasses a large number of municipalities and even regions, as in the case of the Hamburg Metropolitan Region that spans more than 1,100 municipalities across four different federal states in Germany, the search for agglomeration economies is all the more complex.

Despite the presence of a dynamic port, a diversified range of economic clusters, top-class research facilities, a wealth of cultural, natural and recreational assets, and a generally high level of quality of life, the Hamburg Metropolitan Region (HMR) is losing ground to other comparable OECD metropolitan regions, including within Germany. Although HMR enjoys a relatively high level of GDP per capita and labour productivity, it falls behind other high-productivity OECD metropolitan regions such as Boston (US), Copenhagen (Denmark), or Gothenburg (Sweden).

The *OECD Territorial Review of the Hamburg Metropolitan Region* calls for “thinking big” beyond local, state, and even national boundaries to leverage the benefits of more effective regional integration. Joining forces to achieve a critical mass is particularly relevant in view of the construction of the Fehmarn Belt Fixed Link, an immersed tunnel that will directly connect Germany and Denmark and open further economic opportunities with Scandinavia. The review offers targeted policy recommendations to strengthen the capacity of the Hamburg Metropolitan Region to innovate, improve transport and housing planning, and develop an attractive branding strategy to maximise benefits for the entire region in the long term.

This review is part of a series of OECD Territorial Reviews created in 2001 to support regional development at the multi-country, country, regional and metropolitan scale through peer-to-peer learning and the dissemination of best practices. The analysis follows a standard methodology. It draws on the responses from the stakeholders of the Hamburg Metropolitan Region to a detailed OECD questionnaire, in-depth desk research, two study missions conducted in September and November 2018, insights from three international peer reviewers (from Chicago (US), Rotterdam-The Hague (The Netherlands), and Västra-Götaland (Sweden), respectively), phone interviews, and detailed consultations with the Hamburg Metropolitan Region. The review was approved by the Working Party on Urban Policy of the Regional Development Policy Committee at its 25th session on 15 May 2019.

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Table of contents

Foreword	3
Acknowledgements	5
Abbreviations and acronyms	11
Executive summary	13
Key messages	13
Key recommendations	14
Assessment and recommendations	17
Assessment	17
Recommendations	21
Chapter 1. Trends, challenges and opportunities in the Hamburg Metropolitan Region	25
Overview of the Metropolitan Region of Hamburg in Germany	26
Economic performance, innovation and digitalisation	36
Quality of life, infrastructure and environmental sustainability	58
Institutional framework	71
Notes	82
References	85
Annex 1.A. Additional tables on comparator regions	88
Chapter 2. Strengthening economic development, innovation and digitalisation in the Hamburg Metropolitan Region	91
Introduction	93
Strengthening innovation in the Hamburg Metropolitan Region	94
Boosting education and human capital	104
Promoting a more dynamic business environment and entrepreneurship	115
Making the most of digitalisation	125
Notes	129
References	130
Annex 2.A. Comparison with international and German metropolitan regions	135
Chapter 3. Fostering sustainable and balanced development in the Hamburg Metropolitan Region	137
Introduction	138
Improving housing affordability and making spatial planning more effective	139
Improving mobility management and harnessing new technologies to improve accessibility	157
Leveraging the HMR's potential to advance environmental sustainability	165
Enhancing quality of life and attractiveness of the HMR	170
Conclusion: A holistic strategy to promoting sustainable development for all in the HMR	177
References	177

Tables

Table 1.1. Administrative structure of metropolitan regions in Germany.....	32
Table 1.2. Geographical area, structure and population of metropolitan regions in Germany.....	33
Table 1.3. Economic development of metropolitan regions in Germany.....	34
Table 1.4. Comparison of economic development with metropolitan regions across the OECD.....	36
Table 1.5. Excerpt from Educational Monitoring 2018 on selected benchmarks.....	43
Table 1.6. Firm size and research and development infrastructure in metropolitan regions in Germany.....	47
Table 1.7. Tourism in metropolitan regions in Germany.....	69
Table 1.8. Organisation and competencies of metropolitan regions in Germany.....	74
Table 2.1. Key instruments in regional innovation strategies in the HMR, by federal state.....	96
Table 2.2. Educational attainment of the workforce, 2015.....	105
Table 2.3. Research and development expenditure by the state in the HMR, 2014-16.....	108
Table 2.4. High-profile public research institutes in the HMR.....	109
Table 2.5. Research and innovation parks for technology transfers.....	110
Table 2.6. Graduates of general education schools in the HMR, 2016.....	114
Table 2.7. Cluster policies in the HMR, by federal state.....	118
Table 3.1. Spatial planning competencies and guidelines in the HMR.....	150
Table 3.2. State housing policies and strategies in the HMR.....	151
Table 3.3. Climate and energy policy of the four <i>Länder</i>	168
Annex Table 1.A.1. Comparison of economic development with other metropolitan regions across the OECD – Extended set.....	88
Annex Table 1.A.2. Labour markets and education in metropolitan regions in Germany.....	89
Annex Table 2.A.1. Comparison of economic development with other metropolitan regions across the OECD – Extended set.....	135
Annex Table 2.A.2. Labour markets and education in metropolitan regions in Germany.....	136

Figures

Figure 1.1. The metropolitan region of Hamburg with constituent federal states.....	27
Figure 1.2. The metropolitan region of Hamburg with constituent districts.....	27
Figure 1.3. Metropolitan regions in Germany as of April 2018.....	28
Figure 1.4. Labour productivity: The HMR vs. other metropolitan regions in Germany.....	37
Figure 1.5. Labour productivity: The HMR vs. metropolitan regions in Southern Germany.....	38
Figure 1.6. Difference in labour productivity between the HMR and metropolitan regions in Southern Germany.....	39
Figure 1.7. Labour productivity: Hamburg City vs. First ring vs. Second ring.....	40
Figure 1.8. Labour productivity: The HMR vs. metropolitan regions across the OECD.....	41
Figure 1.9. High-tech employment and share of employed with a tertiary degree in 2015.....	42
Figure 1.10. Ratio vacancies-unemployed (professional qualification): The HMR vs. metropolitan regions in Southern Germany.....	46
Figure 1.11. R&D personnel: The HMR vs. metropolitan regions in Germany.....	48
Figure 1.12. Regional Innovation Scoreboard 2017: The HMR vs. other metropolitan regions in Germany.....	49
Figure 1.13. Regional Innovation Scoreboard 2017: The HMR vs. metropolitan regions in Southern Germany.....	50

Figure 1.14. Regional Innovation Scoreboard 2017: The HMR vs. metropolitan regions across the OECD	51
Figure 1.15. Regional Innovation Index: The HMR vs. metropolitan regions in Southern Germany...	52
Figure 1.16. Regional Innovation Index: The HMR vs. principal comparators across the OECD	53
Figure 1.17. Local wind power adequacy in Germany.....	54
Figure 1.18. Installed electrical capacity of wind power in Germany at the district level (megawatts) as of December 2017	55
Figure 1.19. Mean coverage of broadband access over all technologies ≥ 50 Mbit/s in the HMR at the district level (%)	58
Figure 1.20. Well-being 2018: The HMR vs. metropolitan regions across the OECD	59
Figure 1.21. Mean life satisfaction: The HMR at the district level (0 to 10 scale)	60
Figure 1.22. Average driving time to the nearest access point in metropolitan regions in Germany (minutes).....	61
Figure 1.23. Average driving time to the nearest access point in the HMR at the district level (minutes).....	62
Figure 1.24. Average distance to the nearest public transport stop in the HMR at the district level (metres).....	63
Figure 1.25. Travel time to the city of Hamburg (centroid) from districts (centroids) in minutes per kilometre.....	64
Figure 1.26. Mean housing satisfaction in the HMR at the district level (0 to 10 scale)	65
Figure 1.27. Change in floor space in square metres per resident 2011-15 (%).....	66
Figure 1.28. Forecasted change in demand for floor space in square metres per resident 2015-30 (%).....	67
Figure 1.29. Change in beds in tourist establishments in the HMR at the district level 2011-15 (%) ..	71
Figure 2.1. Regional Innovation Scoreboard 2017, EU	98
Figure 2.2. Private sector R&D expenditure as percentage of GDP in metropolitan regions	100
Figure 2.3. Regional innovation ecosystems	101
Figure 2.4. Product and service portfolio of the Hamburg aviation cluster	120
Figure 2.5. Entrepreneurship ranking of German federal states.....	121
Figure 2.6. Ranking of German districts by enterprise creations per 10 000 inhabitants, 2017.....	122
Figure 2.7. Access to optical fibre broadband, 2018	125
Figure 3.1. Real housing prices have increased more rapidly in Germany than on average in the OECD and the Euro area in the last decade.....	140
Figure 3.2. Rental prices in Hamburg and its surrounding districts are among the most expensive in Germany	141
Figure 3.3. The core city of Hamburg has among the highest housing prices for apartments	143
Figure 3.4. Germany's directly subsidised social housing stock is low compared to other OECD countries	145
Figure 3.5. The city of Hamburg's stock of social housing has decreased despite an increase in new social housing units	146
Figure 3.6. From 2000 to 2015, the consumption of land for built-up areas has grown faster than the population in all cities and districts in the HMR except the city of Hamburg	147
Figure 3.7. From 2000 to 2016, land consumption of buildings increased faster than the population everywhere except in the district of Stormarn.....	148
Figure 3.8. The number of building permits issued in the city of Hamburg has increased since the implementation of the <i>Vertrag für Hamburg</i> in 2011	152
Figure 3.9. MR Rhein-Neckar	153
Figure 3.10. Accessibility of the next medium-level centre by car in the HMR	159
Figure 3.11. Accessibility of the next medium-level centres by public transport in the HMR	160
Figure 3.12. Guests to the HMR are mainly concentrated in the city of Hamburg	173

Figure 3.13. Change in tourism trends in the HMR, 2013-17 175

Boxes

Box 1.1. History of metropolitan regions in Germany	29
Box 1.2. Germany's federal structure.....	30
Box 1.3. Implications of administrative fragmentation	31
Box 1.4. International comparison of the HMR's economic performance.....	35
Box 1.5. Challenges for the HMR due to the German energy transition.....	56
Box 2.1. Summary of key findings and recommendations.....	92
Box 2.2. OECD definitions of innovation	95
Box 2.3. NEW 4.0 – A joint innovation strategy	101
Box 2.4. Rotterdam-The Hague – A regional triple helix strategy.....	103
Box 2.5. The case of the Lüneburg Innovation Incubator	111
Box 2.6. The science park system in Västra Götaland, Sweden.....	112
Box 2.7. Hamburg Youth Employment Agency (YEA)	113
Box 2.8. Scaling up of SMEs	117
Box 2.9. Hamburg aviation cluster: An example of successful region-wide cluster co-operation.....	119
Box 2.10. Overview of selected business parks and incubators in the HMR.....	123
Box 2.11. Regional determinants of business dynamism	124
Box 2.12. ITS World Congress	128
Box 3.1. Summary of key findings and recommendations.....	138
Box 3.2. The ten goals of the federal initiative <i>Bündnis für bezahlbares Wohnen und Bauen</i>	145
Box 3.3. Spatial planning in the Metropolitan Region of Rhein-Neckar	152
Box 3.4. Chicago Metropolitan Agency for Planning (CMAP).....	157
Box 3.5. Selected applications of CNT's H+T index.....	163
Box 3.6. UNESCO biosphere reserves in the HMR.....	166
Box 3.7. <i>Tage der Industriekultur am Wasser</i> : Highlighting industrial heritage whilst uniting the HMR.....	172
Box 3.8. HollandCity.....	173

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Abbreviations and acronyms

Abbreviation	English	German original (if applicable)
BKSK	commission for a decrease in building costs	<i>Baukostensenkungskommission</i>
BMWi	Federal Ministry for Economic Affairs and Energy	Bundesministerium für Wirtschaft und Energie
CMAP	Chicago Metropolitan Agency for Planning	
CNT	Center for Neighborhood Technology	
DESY	German Electron Synchrotron	
DGB	Federation of German Trade Unions	Deutscher Gewerkschaftsbund
FUA	Functional Urban Area	
GDP	Gross Domestic Product	
GEFEK	Industrial space concept of the HMR	<i>Konzept zur Gewerbeflächenentwicklung</i>
GEFIS	Commercial space information system of the HMR	<i>Gewerbeflächeninformationssystem</i>
HEIs	higher education institutes	
HMR	Hamburg Metropolitan Region	
HVV	Hamburg Public Transport Association	Hamburger Verkehrsverbund
IAB	Institute for Employment Research	Institut für Arbeitsmarkt- und Berufsforschung
IC/ ICE	Intercity/ Intercity-Express	
ICT	Information and Communications Technology	
IHK	Chamber for Commerce and Industry	Industrie- und Handelskammer
ITS	Intelligent Transport System	
METREX	Network of European Metropolitan Regions and Areas	
MR	Metropolitan region	
NUTS	Nomenclature of Territorial Units for Statistics	
PRIs	public research institutions	
R&D	Research and development	Forschung und Entwicklung
REK	Regional development plan	Regionaler Entwicklungsplan
SME	Small and medium-sized enterprise	
SOEP	German Socio-Economic Panel	
UNESCO	United Nations Educational, Scientific and Cultural Organization	
UVNord	United Business Associations of Hamburg and Schleswig-Holstein	
VET	Vocational education and training	
WoMo	Housing and mobility calculator	Wohn- und Mobilitätskostenrechner
XFEL	European X-Ray Free-Electron Laser Facility	
YEA	Hamburg Youth Employment Agency	Jugendberufsagentur Hamburg

Executive summary

Key messages

- With almost 5.4 million inhabitants, the Hamburg Metropolitan Region (HMR) covers a heterogeneous mix of urban and rural areas fragmented across four federal states (the Free and Hanseatic City of Hamburg and parts of three states surrounding it: Schleswig-Holstein, Mecklenburg-Western Pomerania, and Lower Saxony). Although a co-ordination body is in place (HMR Office) to promote dialogue, it has no dedicated competency.
- With Germany's largest port, HMR has developed strong clusters, ranging from its traditionally leading maritime, logistics, and port-related industries to aviation, renewable energy, and life sciences. While HMR enjoys a strong economy overall, it fell behind *all* other metropolitan regions in Germany in terms of GDP per capita growth between 2005 and 2015, and it is quickly losing ground to regions in the South of Germany.
- Labour productivity in HMR remains low relative to the average of comparable metropolitan regions across the OECD (similar to the level of Vancouver (Canada) and lower than that of Milan (Italy)), including due to the relatively lower level of skilled human capital and weak innovation capacity. Firms struggle with a shortage of skilled workers and scattered efforts to develop clusters undermine the region's growth potential.
- HMR is well-positioned to make the most of digitalisation in Germany, but a digital divide remains between urban and rural areas, including in terms of connectivity and broadband access coverage. HMR is investing in Intelligent Transport Systems (ITS) to reduce congestion in urban areas and improve mobility for residents of remote areas.
- Despite successful regional collaboration in transport, notably through the Hamburg Traffic Association (HVV), large differences remain in terms of public transport accessibility within HMR, particularly between urban and rural areas, which raises challenges for further economic integration and territorial cohesion.
- The fragmented spatial planning framework contributes to a persistent mismatch between supply and demand on the housing market. Housing prices and rents in Hamburg were among the highest in Germany in 2016 and are still on the rise, including in its immediate surroundings, whereas some municipalities in the second ring of HMR are losing population and face higher vacancies.
- With its coastal location, strong capacity to generate wind power and the presence of competitive firms in the renewable energy sector, HMR could better use its potential to become a global leader in renewable energy, including through the North German Energy Transition (NEW 4.0) initiative, particularly with further national investment in energy transmission infrastructure.

- The region offers a diverse range of cultural, natural and recreational assets, but these remain underexploited due to separate branding approaches and there is no co-ordinated tourism offer for the region.

Key recommendations

- **Strengthen collaboration across local, state, and national boundaries – notably with Scandinavia – to raise HMR’s international profile.** An overarching recommendation is to “think big” beyond local, state, and even national boundaries to achieve a critical mass in the international context and maximise benefits for the entire region in the long term.
- **Develop an integrated regional innovation strategy.** A joint focus on clusters in sectors such as energy, aviation, life and health sciences, food industry, and maritime industry will help create and diffuse knowledge more efficiently, tap into synergies across sectors and across different parts of the HMR, create new jobs, and achieve greater international visibility and competitiveness. A regional innovation agency could be established for this purpose, with adequate capacities and resources.
- **Invest in strengthening education and human capital.** Policy-makers need to increase the low level of R&D while strengthening science-industry linkages. Exploiting the full potential of new research facilities, such as the European X-Ray Free-Electron Laser Facility (XFEL), should be a joint priority for policy-makers in HMR.
- **Seize the opportunities of digitalisation to nurture new sources of growth and improve public service delivery.** Public, private, education and research sectors across the four states need to join forces to provide workers, students and apprentices with the necessary training. The HMR economic fabric is largely made up of SMEs, which typically face more difficulties in adopting digital technologies. Targeted support to help SMEs transition into digital technologies and solutions is particularly required.
- **Improve regional planning for housing and transport.** Establishing a regional planning association in charge of developing an integrated regional plan covering all or a significant part of HMR would help better match housing supply and demand, promote more sustainable transit-oriented development, and integrate housing and transport planning. Bottlenecks in and around the city of Hamburg need to be alleviated. A shift from road to rail for freight transport should also be encouraged. Accessibility in rural areas needs to be improved, for example by implementing a single tariff scheme across HMR and harnessing the potential of digital mobility solutions.
- **Leverage the region’s biodiversity and leadership in renewable energy production.** Greater co-operation should take place across administrative boundaries on Biosphere Reserves, for example. To encourage energy efficiency throughout HMR, urban and regional development plans should include energy concepts for production and consumption.
- **Join forces around a common cultural and tourism brand as a driver of balanced regional growth.** A joint marketing and branding strategy could help raise the visibility and attractiveness of HMR to skilled workers, firms and visitors.

- In sum, a more coherent and integrated approach to innovation, planning, and branding will offer a powerful tool to boost productivity, reconcile competing objectives for land, respond more effectively to demographic pressure, improve quality of life both for residents and for visitors, and raise the national and international profile of HMR.

Assessment and recommendations

Assessment

Hamburg Metropolitan Region spans four federal states and a heterogeneous mix of urban and rural areas

With about 8% of the national territory, the Hamburg Metropolitan Region (HMR) is the second largest in Germany, just behind the metropolitan region of Berlin-Brandenburg. Home to almost 5.4 million inhabitants, it encompasses the Free and Hanseatic City of Hamburg (which is also a federal state) and parts of 3 states surrounding it: Schleswig-Holstein (51% of its territory lies within the HMR), Mecklenburg-Western Pomerania (30%), and Lower Saxony (26%). The metropolitan region brings together 20 districts and more than 1 100 municipalities.

Among the 11 metropolitan regions in Germany, the HMR registers the second lowest population density, with only 186 inhabitants per square kilometre and 12.5% of its territory used for settlement or transport. This reflects the heterogeneous combination of a densely populated urban core and a relatively wide periphery. The core area, composed of the city of Hamburg and its immediate surroundings, is economically stronger but also struggling to maintain affordable housing, attract skilled workers and preserve its high quality of life. Some rural areas have capitalised on economic sectors such as tourism and renewable energy, but many are also losing population and have poorer access to public services and employment opportunities.

With 4 federal states, the HMR spans the highest number of states among the 11 metropolitan regions in Germany and includes 2 of the 4 state capitals. Regional co-operation in the area dates back as far as the 1920s and was progressively institutionalised through an inter-state agreement in 1991, the recognition at the federal level by the Standing Conference of Ministers Responsible for Spatial Planning (*Ministerkonferenz für Raumordnung*) in 1995, and further regional expansion up until 2017. The HMR Office does not constitute a tier of government and has no dedicated competencies. It serves as a co-ordination body and promotes dialogue to help build consensus among its 36 stakeholders, who are frequently driven apart due to differences in their legal frameworks, policy objectives and political interests.

While the HMR enjoys a strong economy overall, it is quickly losing ground to regions in the south of Germany and its labour productivity remains low in the OECD context

Among the 11 metropolitan regions in Germany, the HMR is the fifth largest contributor to national GDP (6.2%) and enjoys the fourth highest level of GDP per capita (EUR 39 604). Its unemployment rate dropped from about 12% in 2005 to about 7% in 2015. With Germany's largest and Europe's third busiest port in Europe (behind Rotterdam and Antwerp), the HMR has developed strong clusters in various sectors, ranging from its traditionally leading maritime, logistics and port-related industries to aviation, renewable

energy and life sciences. Compared to other parts of Germany, entrepreneurial activity is high in the urban areas of the HMR. The region is home to a number of major research institutes, including the world-class XFEL (European X-ray Free-Electron Laser) research facility, in operation since 2017, and the German Electron Synchrotron (DESY), Europe's leading centre for particle accelerators. Hamburg hosts the offices of social media/information technology (IT) multinational firms and has a vibrant fabric of tech start-ups. The HMR also stands at a unique strategic location along the transport and trade corridor linking Germany, Denmark, Sweden, and Norway, with promising new opportunities from the upcoming construction of the Fehmarn Belt Fixed Link. Quality of life is relatively high in the region and in many dimensions exceeds that in other regions across the OECD.

However, the HMR's growth potential remains underexploited. The HMR fell behind *all* other metropolitan regions in Germany in terms of GDP per capita growth between 2005 and 2015 (19% in the HMR vs. 42% in Central Germany; 39% in Metropolitan Region (MR) Berlin-Brandenburg, MR Nuremberg, and MR Stuttgart; 30% in MR Munich). A major explanation of this poor performance is comparatively low growth in labour productivity (measured in terms of GDP per employed) during the same period. In particular, metropolitan regions in Southern Germany performed considerably better. MR Munich, which was already at a higher level than the HMR in 2005, almost doubled its advantage by 2015; MR Stuttgart, which was initially at a lower level, leapt ahead comfortably; and MR Rhein-Neckar, also initially at a lower level, is now at about the same level as the HMR. The gap in labour productivity between the HMR and regions in the South rose from less than EUR 4 000 in 2005 to more than EUR 6 000 in 2015. If this trend continued, every 4 years the HMR would be missing out about EUR 1 000 in GDP per employed relative to metropolitan regions in the south of Germany.

Labour productivity in the HMR also remains low relative to the average of comparable metropolitan regions across the OECD. Although labour productivity grew faster in the HMR during the 2005-15 period, it remains well below the level of Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands), for example.

Human capital is lower in the HMR than in other metropolitan regions in Germany

One reason behind sluggish labour productivity growth in the HMR is the relatively lower level of human capital. Only 14.4% of the labour force hold a tertiary degree, placing the HMR 8th out of the 11 metropolitan regions in Germany and 4 percentage points below Munich and the Capital Region of Berlin-Brandenburg. More than 6% of high school graduates in the HMR left school without a degree in 2016. The high-tech sector employs a meagre 4.8% of the labour force, the second lowest share among the 11 regions in Germany and almost 3 times less than in MR Stuttgart.

Firms across the HMR struggle with a shortage of skilled workers, especially in the sectors of health and social care, information and communication, engineering and crafts. The skills shortage is most severe in jobs requiring a vocational qualification, in the sectors of crafts or social care. However, it also affects occupations that require tertiary education, in the areas of medicine, engineering, software development and STEM (science, technology, engineering and mathematics). On the *supply* side, schools and universities in the HMR score, on average, only midfield to lower midfield when it comes to standardised achievement. On the *demand* side, other metropolitan regions in Germany are registering higher job creations than the HMR (as evidenced by higher vacancies-unemployed ratios),

which is likely to drain the HMR of qualified candidates and increase existing skill shortages even further.

Limited capacity to invest in innovation and scattered efforts to develop clusters undermine the region's growth potential

The lack of large companies is another reason for the HMR's sluggish growth in labour productivity. Compared to other metropolitan regions in Germany, the HMR has a higher share of smaller firms and a lower share of larger firms, especially compared to the regions in the south of Germany. There is only one DAX (the German national stock market index listing the 30 largest firms by market capitalisation) company headquartered in the HMR. The lack of large firms at least partly explains the low level of R&D expenditure, which only accounts for 0.8% of GDP – the second lowest share out of 11 regions and strikingly far below the EU target of 3% of GDP for 2020. Compared with other economic hubs in Germany, such as the cities of Berlin, Frankfurt or Munich, the lack of alternative sources of funding for private sector innovation (such as venture capital) constrains small businesses and inhibits entrepreneurship in the HMR.

Co-operation between higher education research and the economy remains underdeveloped. Over the past decade, several science and technology parks were established in the HMR with the explicit aim of fostering further interaction between firms and higher education institutions. Such measures have contributed to improving science-industry linkages, but research and business needs are not always aligned.

While all four federal states that compose the HMR have followed the EU approach of smart regional specialisation, they have developed independent cluster strategies. Hamburg identifies eight business clusters as crucial for economic development and innovation, Lower Saxony seven, Mecklenburg-Western Pomerania five and Schleswig-Holstein five. Several of these clusters overlap across the four states (e.g. maritime industries, logistics, health and life sciences, aviation, and renewable energy) and collaboration sometimes occurs across state boundaries, with excellent outcomes (e.g. in aviation and renewable energy). However, there is no overall, shared vision to exploit synergies across the region and no mechanism to pool resources and capacities.

The HMR is well-positioned to make the most of digitalisation but a digital divide remains between urban and rural areas

More than 35% of households have access to optical fibre in the HMR compared to around 15% in MR Munich, the second-best equipped region, and less than 5% in 6 out of 11 German metropolitan regions. Likewise, internationally, the HMR offers higher levels of basic broadband connectivity than regions such as Barcelona (Spain), Boston (US) or Gothenburg (Sweden). With the relatively rapid roll-out of high-speed broadband, businesses in the HMR are in a better position to design, test and implement new digital technologies into their production processes and methods. Digital innovation also offers new solutions to simplify and accelerate public service delivery while reducing barriers for entrepreneurs and small firms. In particular, the HMR is making significant strides forward to reduce congestion in urban areas and improve the supply of buses and taxis for residents of remote areas through intelligent transport systems (ITS). Hamburg will host the next ITS World Congress in 2021, which has boosted the digital agenda and stimulated closer co-operation between government, businesses and universities to position the region as a global player in smart transport solutions.

However, substantial disparities remain between urban and rural areas. While the urban core and the districts in the north of the HMR report nearly full coverage of high-speed broadband access, more remote areas (particularly in the east of the HMR) report much lower coverages, sometimes below 60%. Differences in broadband access coverage may be a result of different priorities of federal states involved in the HMR, all of which follow an independent digitalisation strategy.

Despite successful regional collaboration in transport, large differences in accessibility within the HMR are hampering economic integration and territorial cohesion

While the creation of the Hamburg Traffic Association (HVV) and its integrated transport network offer a major example of successful regional collaboration, it only covers part of the HMR territory and wide disparities exist in terms of transport accessibility across the region. In some districts, the average driving time to the closest train station is close to 60 minutes, more than twice the HMR average (26 minutes). The average linear distance to the nearest public transport stop with at least 10 departures per day is only 429 metres in the HMR but varies substantially by district, ranging from 191 metres in Neumünster (a district-free city in the north of the HMR) to 895 metres in Ludwigslust-Parchim (a district to the east). Even though efforts have been made at all levels of the HMR to improve transport services, the multimodal and extensive public transport network in the urban core stands in stark contrast with less extensive and less accessible transport options in rural parts in the periphery.

The fragmented spatial planning framework contributes to a persistent mismatch between supply and demand in the housing market

Housing prices and rents in Hamburg were among the highest in Germany in 2016 and are still on the rise. The urban core of the HMR is increasingly struggling to provide affordable housing. For example, according to the 2016 European Urban Audit, only about 7% of citizens in the city-state of Hamburg stated that it was easy or somewhat easy to find affordable housing in Hamburg, compared to 31% in Barcelona (Spain) and 34% in Rotterdam (Netherlands). While federal, regional and local policies have aimed to increase the supply of affordable housing, the lack of land made available for development, a shrinking social housing stock and an increase in planning and building costs related to quality and regulatory requirements (including lengthy planning processes) have driven housing costs up in the urban core. In contrast, some municipalities in the second ring of the HMR face higher vacancies and a housing stock ill-adapted to the changing needs of the population (such as large single-family houses located far from public transport, which are no longer suited to an ageing population).

Co-ordination of housing policy in the HMR is further complicated by the fact that the four participating states organise spatial planning at different levels and with different timelines. While Hamburg and Schleswig-Holstein have one spatial planning body each at the state level, Mecklenburg-Western Pomerania has several regional planning associations; Lower Saxony, on the contrary, leaves regional planning entirely to the discretion of districts, which form the smallest planning units within the HMR.

The HMR has the potential to become a global leader in renewable energy

The HMR is in a unique position to take advantage of the energy transition in Germany. It could benefit from its high volume of onshore wind power and the potential of offshore

wind energy, the connection of Scandinavia’s hydropower generation with the Central European grid, and the intersections of the supra-regional gas transmission pipelines with future LNG (liquid natural gas) terminals. The North German Energy Transition (NEW 4.0) initiative connects 60 public, private, and research partners across the 2 federal states of Hamburg and Schleswig-Holstein in 2016-20 with the aim to supply these 2 states with 100% renewable energy by 2035. The federal states have been taking steps to integrate renewable energy production into land use and spatial planning, and some states have introduced legislation around citizen participation in production (e.g. *Bürger- und Gemeindenbeteiligungsgesetz* in Mecklenburg-Western Pomerania).

However, the HMR needs to address several challenges for renewable energy generation, especially wind power, in the near future. These include addressing local resistance more comprehensively and consistently when it comes to replacing old wind turbines with larger, new ones at existing sites; how to most effectively use green energy by jointly optimising electricity, heating and transport sectors; and how to control electricity consumption and shift demand in times of underproduction towards times of overproduction. Given also the lack of high-power transmission lines from the north of Germany to its industrial hubs in Rhein-Neckar and Rhein-Ruhr, renewable energy generation in the HMR is not reaching its full potential.

The region offers a diverse range of cultural and natural assets but these remain underexploited

World-renowned cultural assets, such as the Elbphilharmonie and the United Nations Educational, Scientific and Cultural Organization (UNESCO) world heritage site Speicherstadt, act as magnets to Hamburg and the HMR as a whole. Historic towns, including Lübeck (Schleswig-Holstein), Lüneburg (Lower Saxony) and Wismar (Mecklenburg-Western Pomerania), offer a rich cultural history. The HMR is also endowed with numerous natural assets and recreational amenities, including five UNESCO Biosphere Reserves. The latter can help combat climate change and preserve biodiversity, sustain recreational and green areas, and promote research and education. In an effort to encourage a broader understanding of the region’s cultural heritage, the HMR has aimed to promote lesser-known sites as well.

However, the tourism sector is fragmented across the HMR. There is no co-ordinated tourism offer between urban and rural areas, with several different brands advertising different parts of the region. The potential to capitalise on the name value and international visibility of Hamburg remains largely underexploited due to the lack of a joint tourism strategy, resulting from the dominance of strong local identities and concerns about serving not only the HMR territory but also the remaining territory of each state.

Recommendations

Strengthen collaboration across local, state and national boundaries to raise the HMR’s international profile

An overarching recommendation is to “think big” beyond local, state and even national boundaries to achieve a critical mass in the international context and maximise benefits for the entire region in the long term. In a rapidly changing world where powerful megatrends such as globalisation, digitalisation, demographic shifts and climate change are reshaping economies and societies, maintaining a status quo of fragmented, small-scale initiatives means missing opportunities for growth and well-being. Despite valuable economic,

environmental and cultural assets, and an unprecedented opportunity to step up its role in the economic corridor running from Hamburg to Oslo, HMR is already falling behind regions in the south of Germany and often busy competing locally (within itself) instead of globally. As a result, the HMR is not delivering at a level that a region of its size could do, as evidenced by its low labour productivity. An urgent shift is required to jointly re-focus energy and funding across the four federal states on shared core strengths that can put the HMR on the world map and generate benefits for all residents in the region. Such strengths include: innovation, education and human capital; digitalisation; planning; renewable energy; cultural and tourism branding.

Develop an integrated regional innovation strategy

A joint focus on clusters in sectors such as energy, life and health sciences, food industry, and maritime industry will tap into synergies, create new jobs and achieve greater international visibility and competitiveness. In particular, HMR holds a unique competitive advantage in the renewable energy sector (especially wind power), both in Germany and in Europe. There are high hopes to benefit from technological advances in research on hydrogen fuel cells. Stronger collaboration to develop a clear, integrated regional innovation strategy will generate benefits for all of HMR, including the city of Hamburg. Building on the successful experience of NEW 4.0 and the aviation cluster, the four states are strongly encouraged to develop an integrated regional innovation strategy that consolidates overlapping initiatives and promotes a more efficient approach to knowledge creation and diffusion. A regional innovation agency could be established for this purpose, with adequate capacities and resources.

Intensify national and European co-operation on innovation

Stronger co-operation between the HMR and German and European functional regions will help enhance the HMR's own capacity for innovation and complement its existing strengths. Given their geographic proximity and already existing economic linkages with the HMR, the Copenhagen-Malmö-Gothenburg-Oslo corridor is a natural partner for collaboration. In particular, supporting further research co-operation between XFEL and the European Spallation Source (ESS) research facility located in Lund (Sweden) would yield significant mutual benefits to the HMR and international partners.

Invest in strengthening education and human capital

Boosting education and human capital is a key component of enhancing economic development in the HMR. Policymakers need to increase the low level of R&D while also strengthening science-industry linkages that are currently undermined by a mismatch between research and business needs of enterprises. Facilitating collaboration across research institutes and firms from all parts of the HMR will yield additional benefits for technology transfer and knowledge creation. A co-ordinated approach will also raise the national and international profile of the HMR, which, in turn, will boost its capacity to alleviate the widespread skills shortage by attracting skilled workers.

Exploiting the full potential of new research facilities should be a joint priority for policymakers in the HMR. The European X-Ray Free-Electron Laser Facility (XFEL), in conjunction with the German Electron Synchrotron (DESY), opens up unprecedented research opportunities and manifold possibilities for combining research with private sector development. If managed successfully, they can attract further world-class researchers and highly skilled workers, establishing the HMR as a globally leading location for research in

the sectors using X-ray technology and particle accelerators. The four federal states of the HMR need to strengthen their co-operation to take advantage of the economic and social benefits that XFEL and associated applied research in sectors such as material or life sciences generate.

Seize the opportunities of digitalisation to nurture new sources of growth and improve public service delivery

Considering that digitalisation will have a significant impact on production and work processes and change the skills demanded by the labour market, public, private, education and research sectors across the four states need to join forces to provide workers with the necessary training. For example, life-long learning and up-skilling opportunities should be further expanded to ensure that older employees are not left behind in the change that digitalisation will bring. Education in secondary and tertiary education and during vocational training should also equip young adults with the best possible digital skills and tools. Given the lack of large firms in the HMR economy, targeted support to help SMEs transition into digital technologies and solutions is particularly required.

Opportunities to raise the daily well-being of residents through the digitalisation of public service delivery should also be pursued further across the HMR, particularly in remote areas. The expansion of broadband infrastructure needs to continue, especially in rural areas. Efforts should also be made to achieve the widest possible geographic expansion of new generations of cellular mobile communications such as 5G. Intelligent transport systems (ITS) could make the HMR an international leader in the mobility sector, thus further strengthening the regional economy. The upcoming ITS World Congress in 2021 provides a unique opportunity to enhance mobility and transport solutions in the HMR to raise international visibility as well as create jobs. Digital services such as ride-hailing and vehicle-sharing applications have great potential to improve mobility in rural areas and should be further developed.

Improve regional planning for housing and transport

Quantitative and qualitative assessments need to be carried out to ensure that the housing stock keeps pace with the needs of the population and development patterns, which vary across the HMR. While demand for single-family houses seems to be rising across the HMR in the future, demand for apartment buildings appears to be increasing in and around its urban core but decreasing at its fringes. Between 2015 and 2030, demand for floor space available per resident overall is forecasted to increase between 12% and 15% in the first ring around the urban core (more so than in the urban core itself). Considering that land consumption increased faster than the population in all parts of the HMR (except in Hamburg) between 2000 and 2015, there is a need to encourage more compact development of towns and cities. The housing stock for low- and medium-income groups in the HMR should be expanded, particularly as the stock of social housing in Hamburg decreased between 2006 and 2017. Conferring spatial planning competencies to a regional planning association, which could establish a regional plan covering all or a significant part of the HMR, would help overcome the fragmentation on the housing market, better match housing supply and demand, and curb the rise of house prices and rents.

Bottlenecks in rail and road transport in and around the city of Hamburg need to be alleviated. A shift from road to rail for freight transport should also be encouraged. Accessibility in rural areas needs to be improved, for example by implementing a single tariff scheme across the HMR and harnessing the potential of digital mobility solutions and

public-private partnerships, which can help reduce spatial disparities in mobility and meet environmental goals. Municipalities and districts could further leverage digital solutions and public-private partnerships to ensure mobility in rural areas. On-demand mobility services integrated with the public transport network, for example, have the potential to reach HMR residents throughout the region and improve accessibility in peripheral areas. The common regional plan for the HMR mentioned above should integrate housing and transport planning and promote more sustainable, transit-oriented development.

Leverage the region's biodiversity and leadership in renewable energy production

The protection of natural areas to improve environmental sustainability and preserve their recreational value plays an important role in building a cohesive region. Greater co-operation should take place across administrative boundaries on Biosphere Reserves, for example. Energy efficiency in buildings should also be encouraged. Tax incentives may also be needed in the case of new buildings, as applying energy standards is sometimes considered as being at odds with the imperative to increase the construction of housing. Retrofitting existing buildings can also be costly for low-income households that would, however, greatly benefit from lower energy costs. To encourage energy efficiency throughout the HMR, urban and regional development plans should include energy concepts for production and consumption.

Measures need to be taken to retain and improve the acceptance of renewable energy production through citizen participation. Municipalities taking part in renewable energy production should invest in informing households and engaging them in co-planning of renewable energy production sites, wherever possible. Districts and federal states also need to include adequate modalities to inform and engage residents in strategic and regional plans.

Join forces around a common cultural and tourism brand as a driver of balanced regional growth

Leveraging the HMR's cultural assets will help raise the visibility of the whole region to the outside world and strengthen the attractiveness of the HMR to visitors, firms and skilled workers. The HMR should build on the strengths of being a heterogeneous region in the area of tourism by offering a diversified range of activities and attracting visitors that will spread throughout the region. The interplay between urban and rural areas should be used as a key selling point. A joint marketing campaign promoting attractions in and around Hamburg, from coastal areas and cities of the Hanseatic league to the urban core, could convince tourists to discover new places and stay in the region longer than they would have otherwise. A joint strategy could integrate tourism with sustainable mobility planning to broaden the focus from the city of Hamburg and put the infrastructure in place to develop joint offers promoting different areas within the HMR.

The way forward

A more coherent and integrated approach to innovation, planning and branding will offer a powerful tool to boost productivity, reconcile competing objectives for land, respond more effectively to demographic pressure, improve quality of life both for residents and visitors, and raise the national and international competitiveness of the HMR.

Chapter 1. Trends, challenges and opportunities in the Hamburg Metropolitan Region

Abstract

This chapter analyses the main trends, challenges and opportunities in the Hamburg Metropolitan Region (referred to as HMR for short), with a particular focus on three dimensions: i) economic performance, innovation and digitalisation; ii) quality of life, transport, housing, environmental sustainability and tourism; and iii) the institutional framework. In doing so, the chapter benchmarks the HMR with all other metropolitan regions in Germany and with carefully selected, comparable metropolitan regions across OECD countries.

Overview of the Metropolitan Region of Hamburg in Germany

The HMR has almost 5.4 million inhabitants (about 6% of the total population in Germany). It is comprised of the Free and Hanseatic City of Hamburg (referred to as Hamburg for short) – the second largest city in Germany, with a population of more than 1.8 million – and parts of 3 surrounding federal states: Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein (Statistikamt Nord, 2017^[1]; Destatis, n.d.^[2]).

The HMR is 1 of 11 metropolitan regions in Germany, together with the Capital Region of Berlin-Brandenburg, Bremen-Oldenburg in the Northwest, FrankfurtRheinMain, Hannover-Braunschweig-Göttingen-Wolfsburg, Central Germany, Munich, Nuremberg, Rhein-Neckar, Rhein-Ruhr and Stuttgart.¹ Metropolitan regions make up more than half (almost 55%) of the total area of Germany and are home to about two-thirds of its entire population. They do not necessarily constitute a distinct tier of government in the German federal system: only Metropolitan Region (MR) Frankfurt, MR Rhein-Neckar, MR Ruhr and MR Stuttgart, which are organised as associations (*Verbände*), are distinct tiers according to German basic law. MR Berlin-Brandenburg – with its joint planning authority comprising the two constituent federal states Berlin and Brandenburg – can be seen as a distinct tier of government as well. Metropolitan regions were defined by the Standing Conference of Ministers responsible for Spatial Planning (*Ministerkonferenz für Raumordnung*), a joint committee comprising the Federal Minister of the Interior, Building and Community and ministers from individual federal states who are responsible for spatial planning.

The HMR is politically defined, and its definition has changed over time. Co-operation within THE HMR dates back to the 1950s: between 1955 and 1962, joint regional planning between the federal states of Hamburg and Schleswig-Holstein, as well as between Hamburg and Lower Saxony was established, including bilateral promotional funds as a common financial instrument to grant funding to projects put forward by municipalities in the region. In 1991, an intergovernmental agreement was signed between Hamburg, Lower Saxony and Schleswig-Holstein about trilateral co-operation within the metropolitan region of Hamburg. From 1992 onwards, the first Regional Development Concept (*Regionales Entwicklungskonzept*) was developed, and in 1995, the formal recognition as a metropolitan region by the Standing Conference of Ministers responsible for Spatial Planning followed. In 1997, the trilateral Joint Regional Planning “Metropolregion Hamburg” was established, including the installation of political and executive bodies, in particular, the Planning Council (from 2006 onwards Regional Council), Steering Committee and thematic working groups. A first regional expansion followed in the same year, and the ensuing years saw a first operative programme and a first administrative agreement about co-operation within the metropolitan region. While the region followed initially a decentralised approach, with a joint secretariat at three decentralised locations (Hamburg, Bad Segeberg, and Lüneburg), the secretariat was centralised in Hamburg from 2009 onwards.

Figure 1.1. The metropolitan region of Hamburg with constituent federal states



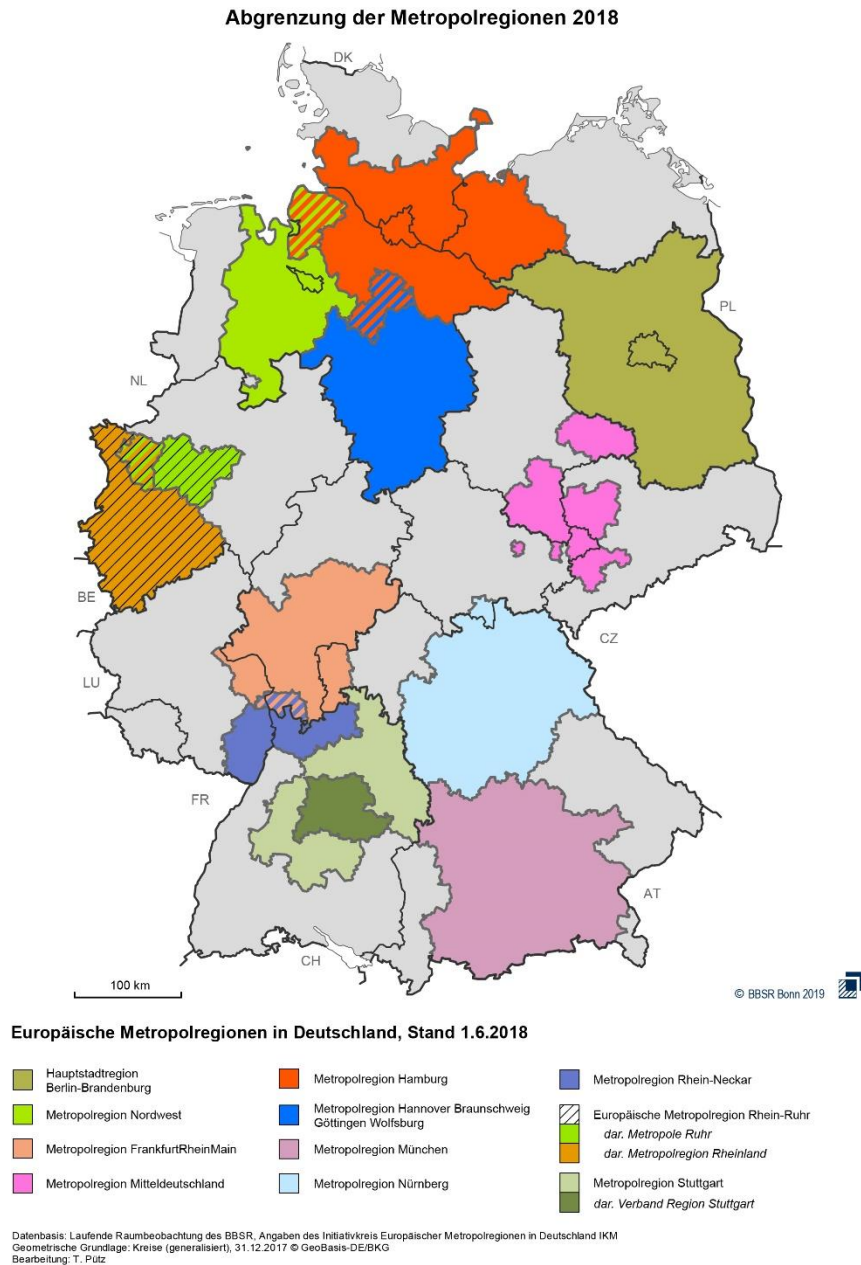
Source: Provided by the [Metropolitan Region of Hamburg](#).

Figure 1.2. The metropolitan region of Hamburg with constituent districts



Source: Provided by the [Metropolitan Region of Hamburg](#).

Figure 1.3. Metropolitan regions in Germany as of April 2018



Source: Provided by the Federal Institute for Research on Building, Urban Affairs and Spatial Development.

From 2006 onwards, the metropolitan region saw several geographical expansions as well as an inclusion of a larger group of stakeholders. In 2006, the remainder of the district of Dithmarschen was included, and in the same year, districts became stakeholders. In 2012, with the involvement of the federal state of Mecklenburg-Western Pomerania, the districts Ludwigslust and Nordwestmecklenburg were included. Likewise, the district Ostholstein and the unitary cities Lübeck and Neumünster, part of the already constituent federal state of Schleswig-Holstein, were included. The latest regional expansion followed in 2017, with the inclusion of Mecklenburg-Western Pomerania's state capital of Schwerin and the district of Parchim (Ludwigslust and Parchim have merged to form a single district

Ludwigslust-Parchim). At the same time, several stakeholders joined, including the Chamber for Commerce Hamburg, Chambers for Commerce and Industry Flensburg (IHK Flensburg), Lübeck (IHK Lübeck), Lüneburg-Wolfsburg (IHK Lüneburg-Wolfsburg), Kiel (IHK Kiel), Schwerin (IHK Schwerin), Stade (IHK Stade); the Chambers of Crafts Hamburg, Lübeck and Schwerin; the United Business Associations of Hamburg and Schleswig-Holstein (UV Nord); and the Federation of German Trade Unions, District North (DGB Nord). A Second Strategical Framework was adopted in 2017, covering the years 2017-2020, as a successor to the First Strategical Framework (2011-2013).

Box 1.1. History of metropolitan regions in Germany

The notion of urban regions and agglomerations with international standing as drivers of economic growth in Germany dates back to the Spatial Policy Orientation Framework (*Raumordnungspolitischer Orientierungsrahmen*) and the Spatial Policy Report (*Raumordnungsbericht*) by the federal government in 1993. The HMR was first mentioned in the Regional Development Concept for the Metropolitan Region of Hamburg in 1991.

In 1995, the first six European metropolitan regions, including the HMR, Berlin-Brandenburg, Frankfurt, Munich, Rhein-Ruhr and Stuttgart, were recognised by the Standing Conference of Ministers responsible for Spatial Planning. In 1997, the Metropolitan Region Sachsendreieck (the predecessor of today's Central Germany) followed. The federal government recognised metropolitan regions as “engine[s] of societal, economic, social and cultural success, which enhance the European integration process” (Federal Ministry for Regional Planning, Building and Urban Development, 1995^[3]). They were seen as to increase participation in globalisation processes beyond urban centres, born out of a tension between exploiting spatial agglomeration benefits on the one hand and avoiding negative externalities associated with increasing populations in urban centres on the other.

In 2005, after a decision by the Standing Conference of Ministers responsible for Spatial Planning, four additional metropolitan regions were recognised, including Northwest, Hanover, Nuremberg and Rhein-Neckar. The metropolitan region Rhein-Ruhr consists of two parts: Rheinland (which was established in 2017 and has taken over the part that had hitherto been played by the Köln/Bonn Region) and Ruhr. There are 11 metropolitan regions in Germany today.

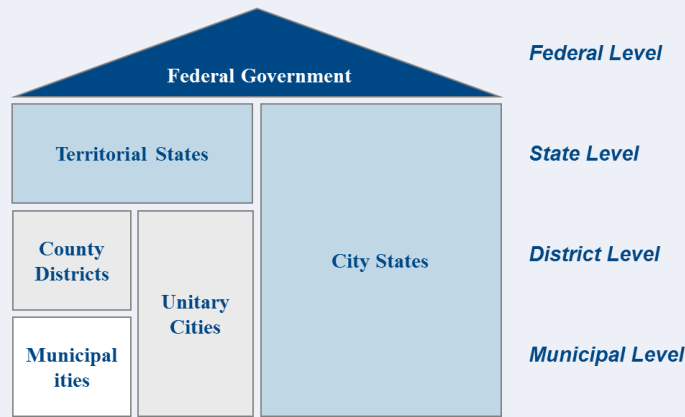
In Germany, metropolitan regions are organised within the Association of European Metropolitan Regions in Germany (*Initiativkreis Europäische Metropolregionen in Deutschland*). At the European level, the HMR and the metropolitan regions Berlin-Brandenburg, Central Germany, Frankfurt, Nuremberg, Rhein-Neckar, Rheinland and Stuttgart are part of the Network of European Metropolitan Regions and Areas (METREX).

Source: Federal Ministry for Regional Planning, Building and Urban Development (1995^[3]), *Raumordnungspolitischer Handlungsrahmen: Beschluss der Ministerkonferenz für Raumordnung in Düsseldorf am 8. März 1995*.

Box 1.2. Germany’s federal structure

Germany is a federal republic comprised of 16 federal states (*Bundesländer*). Besides the federal government (*Bundesregierung*) in Berlin (where the Federal Ministry of the Interior, Building and Community is located), there exists 16 individual state governments (*Landesregierungen*) – located in 16 state capitals – which enjoy large autonomy when it comes to, for example, education, energy or spatial policy. Two types of federal states can be distinguished: city-states (*Stadtstaaten*), which are states that are geographically limited to a single city, and territorial states (*Flächenstaaten*), which span a wider geographical area.² There are three city-states in Germany: Berlin, which also hosts the federal government, Bremen and Hamburg; with the remaining states being territorial states. Federal states are, in turn, subdivided into unitary cities (*Kreisfreie Städte*) and county districts (*Landkreise*), with a (largely formal) distinction similar to city and territorial states. There are 107 unitary cities and 294 county districts in Germany, yielding 401 districts in total, with numbers and size varying by federal state. For example, there are 37 districts in Lower Saxony but only 6 in Mecklenburg-Western Pomerania. While executive, legislative and judicial powers lie with the federal and respective state governments, government at the district level is limited to executive powers. Below county districts and unitary cities, there are municipalities (*Gemeinden*). Note that in some federal states, there is an additional layer between county districts and unitary cities on the one hand and municipalities on the other such as, for example, bureaus (*Ämter*) in Mecklenburg-Western Pomerania.

The German federal system



A relatively fragmented administrative structure

The HMR has a relatively fragmented administrative structure (Table 1.1). It spans across 4 federal states: 1 city-state (Hamburg, with 100% of its territory lying within the HMR) and 3 territorial states (Lower Saxony, 26%; Mecklenburg-Western Pomerania, 30%; and Schleswig-Holstein, 51%). No other metropolitan region in Germany spans more federal states – the mean number of federal states is two. The HMR is also one of the few metropolitan regions in Germany (besides Berlin-Brandenburg and Northwest) that includes a city-state. At the same time, the HMR consists of only 20 districts, less than the average number of districts that metropolitan regions in Germany typically contain, which

is 22. Two of these districts are located in other metropolitan regions *at the same time*: Cuxhaven (Northwest) and Heidekreis (Hanover). To the extent that federal states differ in the way and level at which administrative processes are implemented at the regional and local levels, a relatively more fragmented administrative structure may require more co-ordination and co-operation amongst its stakeholders.

Box 1.3. Implications of administrative fragmentation

Administrative fragmentation can be measured by the number of local governments (in total or per capita) within a specific geographical area (including across different regions/states or across different countries). Administrative fragmentation can have two, potentially opposing, effects on economic performance: on the one hand, more fragmentation may enhance economic performance as it may give greater choice over public service provision and put competitive pressure on local governments to align public goods and services with residents' preferences. On the other hand, however, it may lead to duplication of efforts and reduced economies of scale. In a context of tight public finances, administrative fragmentation further complicates the efficient delivery of transport, housing, schools, hospitals and other public services that are central to residents' well-being.

A growing body of evidence suggests that administrative fragmentation has, indeed, adverse effects on economic performance on average (see Martinez-Vasquez et al. (2017^[4]), for example). Ahrend et al. (2014^[5]) study the impact of administrative fragmentation on labour productivity in 5 OECD countries (Germany, Mexico, Spain, the United Kingdom and the United States), exploiting observations on wages of more than 2 million residents across 430 OECD functional urban areas (i.e. geographical areas that are defined by commuting behaviour rather than administrative boundaries and, therefore, vary in the number of local governments). The authors show that doubling the number of local governments within a metropolitan area reduces labour productivity by about 6%, potentially outweighing spatial agglomeration benefits. This holds true even when controlling for a wide range of other, productivity-driving differences such as city size, average human capital, the presence of a port or capital city status.

The OECD (2015^[6]) finds that, during the period 2000 to 2010, metropolitan areas with low administrative fragmentation experienced growth in gross domestic product (GDP) per capita that was more than twice as strong as those with high fragmentation. Bartolini (2015^[7]) shows that fragmentation harms growth in GDP per capita most in and around urban areas (where people are more likely to commute across administrative boundaries). In fact, the suboptimal provision of public transport infrastructure (where, for example, transport modes such as subways end at administrative borders for no apparent economic reason) is an often-cited symptom of fragmentation.

Besides amalgamation of municipalities, one way to overcome adverse effects of administrative fragmentation is to create an overarching entity dedicated to policy co-ordination between local governments (often referred to as a *metropolitan governance body*). About two-thirds of 275 OECD metropolitan areas studied in the *OECD Metropolitan Governance Survey* have such entities in place (most operating on a voluntary basis), although with varying competencies (most co-operate in regional development, transportation and spatial planning) (Ahrend, Gamper and Schumann, 2014^[8]; OECD, 2015^[9]). Ahrend et al. (2014^[5]) show that the presence of metropolitan government bodies

can reduce the penalty associated with administrative fragmentation, on average, by half. Several transmission channels can explain this positive relationship. Metropolitan co-ordination can help exploit synergies across different policy sectors (transport, spatial planning and housing, for example). It can also help reduce costs, reap economies of scale and improve the quality of public service delivery, thereby contributing to higher productivity.

Source: Martinez-Vazquez, J., S. Lago-Peñas and A. Sacchi (2017^[4]), “The impact of fiscal decentralization: A survey”, *Journal of Economic Surveys*, Vol. 31/4, pp. 1095-1129; Ahrend, R. et al. (2014^[5]), “What Makes Cities More Productive? Evidence on the Role of Urban Governance from Five OECD Countries”, <https://dx.doi.org/10.1787/5jz432cf2d8p-en>; Bartolini, D. (2015^[7]), “Municipal Fragmentation and Economic Performance of OECD TL2 Regions”, <https://dx.doi.org/10.1787/5jrxqs60st5h-en>; Ahrend, R., C. Gamper and A. Schumann (2014^[8]), “The OECD Metropolitan Governance Survey: A Quantitative Description of Governance Structures in large Urban Agglomerations”, <https://dx.doi.org/10.1787/5jz43zldh08p-en>; OECD (2015^[9]), *Governing the City*, <https://dx.doi.org/10.1787/9789264226500-en>; Ahrend and Lembcke (2015).

Table 1.1. Administrative structure of metropolitan regions in Germany

	Founded	Number of federal states	of which city-states	of which territorial states	Number of districts	of which unitary cities	of which county districts	Number of districts belonging to other regions
HMR	1995	4	1	3	20	3	17	2
Berlin-Brandenburg	1995	2	1	1	19	5	14	0
Northwest	2005	2	1	1	16	5	11	1
Frankfurt	1995	3	0	3	25	7	18	1
Hanover	2005	1	0	1	18	3	15	1
Central Germany	1997	3	0	3	12	6	6	0
Munich	1995	1	0	1	33	6	27	0
Nuremberg	2005	2	0	2	34	11	23	0
Rhein-Neckar	2005	3	0	3	15	8	7	1
Rhein-Ruhr	1995	1	0	1	31	20	11	0
Stuttgart	1995	1	0	1	20	3	17	0

Note: Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Source: Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018).

A monocentric region with a wide periphery

Table 1.2 shows the descriptive statistics on the geographical area, structure and population of the HMR relative to the average of all other metropolitan regions in Germany.³ Amongst the 11 metropolitan regions in Germany, the HMR is the second largest (about 8% of the total area of Germany), with the largest being MR Berlin-Brandenburg (about 8.5%) and the smallest MR Rhein-Neckar (about 1.6%). Despite its large total area, however, the share of area used for settlement – residential, commercial and industrial – or transport in the HMR is relatively small, at about 12.5%. In this respect, the region ranks 8th out of 11, with the largest share being in MR Rhein-Ruhr (about 34%) and the smallest in MR Berlin-Brandenburg (about 11.2%). For the HMR, the low ratio of area used for settlement or transport to total area is also reflected in its low population density; with 186 inhabitants per square kilometre, the region ranks 10th out of 11 (MR Rhein-Ruhr, with 991 inhabitants

per square kilometre, and MR Nuremberg, with 161 inhabitants per square kilometre, are the most and least densely populated metropolitan regions respectively). Given its relatively large total area, low share of area used for settlement and transport, and low overall population density with a densely populated urban core, the HMR can be characterised as a monocentric region with a wide second ring. This second ring includes all districts that are *not* immediately adjacent to the urban core (which are, in turn, referred to as first ring).

Table 1.2. Geographical area, structure and population of metropolitan regions in Germany

	Total area (km ²)	Share of total area in Germany (%)	Area for settlement, transport (km ²)	Share of area for settlement, transport in region (%)	Total population (million)	Share of total population in Germany (%)	Inhabitants per km ²
HMR	28 469	8	3 562	12.5	5.3	6.4	186
Berlin-Brandenburg	30 546	8.5	3 426	11.2	6	7.3	197
Northwest	13 751	3.8	2 207	16	2.8	3.3	200
Frankfurt	14 755	4.1	2 592	17.6	5.7	6.9	385
Hanover	18 580	5.2	2 669	14.4	3.8	4.7	206
Central Germany	9 114	2.6	1 475	16.2	2.5	3	275
Munich	25 548	7.1	3 131	12.3	6	7.3	235
Nuremberg	21 783	6.1	2 608	12	3.5	4.3	161
Rhein-Neckar	5 637	1.6	1 091	19.4	2.4	2.9	422
Rhein-Ruhr	11 744	3.3	3 988	34	11.6	14.2	991
Stuttgart	15 427	4.3	2 415	15.7	5.4	6.5	347

Notes: Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hanover Braunschweig Göttingen Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

The HMR ranks upper midfield for economic development in Germany

The HMR generates about 6.2% of German GDP, with MR Rhein-Ruhr (13.1%) being the largest and MR Central Germany (2.2%) the smallest regional economies amongst the German metropolitan regions (Table 1.3). Regarding aggregate labour market performance, the HMR ranks 6th out of 11 for unemployment, regardless of whether the unemployment rate is measured as the share of the unemployed within the total population, which is 3.2%, or as the share of the unemployed within the labour force, which is 6.6%. MR Munich performs best, with the lowest unemployment rate (1.9%, 3.1%), whereas MR Berlin-Brandenburg (5.1%, 9.3%) and MR Central Germany (4.7%, 9.4%) perform worst with highest levels of unemployment. In terms of employment rates, the HMR ranks 6th for the share of the employed within the labour force, but 10th out of 11 for the share of the employed within the total population. Most other metropolitan regions in Germany, however, are not vastly different in this respect. In terms of GDP per capita (as a measure of overall economic activity), the HMR is placed in the upper middle field, ranking 4th out of 11 (Munich ranks first, Central Germany last).

Table 1.3. Economic development of metropolitan regions in Germany

	GDP (EUR billion)	Share of GDP in Germany (%)	GDP per capita (EUR)	Change 2005-15 (%)	Employed (million)	Employment rate (% total population)	Employment rate (% labour force)	Unemployed (thousand)
HMR	209.7	6.2	39 604	19	2.6	48.2	81	172
Berlin-Brandenburg	190.6	5.6	31 669	39	2.9	48.7	83.1	309.7
Northwest	92.2	2.7	33 517	32	1.4	51.3	81.4	97.8
Frankfurt	255.2	7.6	44 930	21	2.9	51.6	80.4	150.5
Hanover	133.5	4	34 881	28	1.8	46.8	80.6	137.9
Central Germany	73.5	2.2	29 345	42	1.3	50.3	82.2	118.1
Munich	299	8.9	49 797	30	3.4	56.9	82.5	112.5
Nuremberg	128.7	3.8	36 696	39	1.9	55.5	84	81.7
Rhein-Neckar	92.6	2.7	38 914	29	1.2	52.4	79.9	63.2
Rhein-Ruhr	440.8	13.1	37 879	28	6	51.3	78.8	543.4
Stuttgart	239.5	7.1	44 738	39	3	55.6	82.5	112.9

Notes: Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest;

Frankfurt = FrankfurtRheinMain; Hanover = Hanover Braunschweig Göttingen Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015

The HMR shows lower labour productivity than directly comparable metropolitan regions across the OECD

The HMR is at the lower end of labour productivity of directly comparable metropolitan regions across the OECD, showing labour productivity like that of Barcelona (Spain). Table 1.4 shows descriptive statistics on population and economic development in the HMR alongside selected comparator regions across the OECD. Comparator regions are divided into *principal comparators*, which follow strict comparison rules, and *other comparators*, which follow more lenient rules. Principal comparators include Barcelona (Spain), Boston (US), Copenhagen (Denmark), Gothenburg (Sweden), and Rotterdam (Netherlands), while other comparators include Athens (Greece), Birmingham (UK), Busan (Korea), Dublin (Ireland), Lisbon (Portugal), Manchester (UK), Marseille (France), Milan (Italy), Montreal (Canada), Naples (Italy), Oslo (Norway), Rome (Italy), Stockholm (Sweden), Vancouver (Canada).

Barcelona (Spain) and Boston (US) have slightly larger populations (about 7.5 million and 6.8 million respectively) than the HMR (almost 5.4 million), whereas Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands) have relatively smaller populations (about 2.5 million, 1.9 million and 3.6 million respectively). Boston (US) and Rotterdam (Netherlands) have larger average incomes (about EUR 59 000 and EUR 41 000 respectively) than the HMR (about EUR 40 000), whereas Barcelona (Spain) has a smaller average income (about EUR 34 000). In Copenhagen (Denmark) and Gothenburg (Sweden), income levels (about EUR 39 000) are very similar to the HMR. Finally, all regions have slightly different levels of labour productivity, measured in terms of GDP per employed, with the HMR being at the lower end, performing only slightly better than Barcelona (Spain). The other comparator regions are broadly in line with the HMR and principal comparators, with slightly larger populations and lower average income levels (Annex Table 1.A.1).

Box 1.4. International comparison of the HMR's economic performance

While it is natural to compare the HMR with other metropolitan regions in Germany as these are set within a similar institutional context, comparing the HMR with other regions across the OECD faces the challenge of balancing comparability with heterogeneity, i.e. choosing regions that are comparable but not too comparable in order to allow for learning from differences. The HMR's economic performance has, therefore, been benchmarked against the performance of other metropolitan regions across the OECD in two steps:

- A set of *primarily comparable regions* was selected based on three criteria. First, primarily comparable regions should have about the same population as the HMR. Second, they should have a comparable level of development. Finally, candidates should, ideally, have a (major) port, although this is used as a weaker criterion. Based on these criteria, Barcelona (Spain), Boston (US), Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands) were selected as primarily comparable regions.⁴
- As an *extended set of comparable regions*, Athens (Greece), Birmingham (UK), Busan (Korea), Dublin (Ireland), Lisbon (Portugal), Manchester (UK), Marseille (France), Milan (Italy), Montreal (Canada), Naples (Italy), Oslo (Norway), Rome (Italy), Stockholm (Sweden) and Vancouver (Canada) were chosen. Here, the selection criteria were less stringent: the population in each region should be below 10 million and the ratio of population in the core functional urban area to that in the surrounding administrative area should be between 40% and 80% (given that this ratio is about 60% for the HMR).⁵

To compare regions across OECD countries, the OECD defines regions as administrative tiers of subnational government. Two categories of relevance to this review are distinguished: larger regions (OECD TL2 level), which, in case of Germany, correspond to the 16 federal states (*Bundesländer*) and smaller regions (OECD TL3 level), which correspond to the 401 districts (*Kreise*), including both county districts and unitary cities.

Note that these categorisations may differ by country as administrative tiers of subnational government may differ. In France, for example, regions at the OECD TL2 level correspond to the 13 *Régions de France métropolitaine*, whereas regions at the OECD TL3 level correspond to the 96 *Départements de France métropolitaine*.

When conducting comparisons with other metropolitan regions across the OECD, wherever possible, the HMR is constructed from smaller regions (OECD TL3 level), taking into account exact geographical boundaries of the HMR. The majority of the other regions are constructed from larger regions (OECD TL2 level). In some instances, several OECD TL2 or TL3 regions are combined to provide a more accurate picture of the respective region.

Source: Based on OECD (2018^[11]), *Territorial Grids*, OECD, Paris, <http://www.oecd.org/cfe/regional-policy/territorial-grid-2018.pdf>.

Table 1.4. Comparison of economic development with metropolitan regions across the OECD

	Total population (million)	Share of total population in country (%)	Inhabitants per km ²	GDP (EUR billion)	Share of GDP in country (%)	GDP per capita (EUR)	Change 2000-16 (%)
HMR	5.3	6.4	186	209.7	6.2	39 604	18.9
Barcelona (Spain)	7.5	16.1	233	254.2	19.1	34 233	9.4
Boston (US)	6.8	2.1	336	400.5	2.7	58 793	20.1
Copenhagen (Denmark)	2.5	43.1	359	112	50.3	38 710	10.9
Gothenburg (Sweden)	1.9	19	68	76.8	19.8	38 823	29.4
Rotterdam (Netherlands)	3.6	21.1	1 301	148	21.4	40 707	10.4
Average principal comparators	4.5	20	459	198.3	23	42 253	16
Median principal comparators	3.6	19	336	148	20	38 823	11
Average other	5.4	24	316	173.9	27	33 579	13
Median other	5.2	16	376	167.7	18	31 387	9

Notes: Metropolitan regions are composed of OECD TL2 or TL3 regions.

Principal comparators = Barcelona (Spain), Boston (US), Copenhagen (Denmark), Gothenburg (Sweden), Rotterdam (Netherlands). See Footnote 4 for exact compositions.

Other comparators = Athens (Greece), Birmingham (UK), Busan (Korea), Dublin (Ireland), Lisbon (Portugal), Manchester (UK), Marseille (France), Milan (Italy), Montreal (Canada), Naples (Italy), Oslo (Norway), Rome (Italy), Stockholm (Sweden), Vancouver (Canada). See Footnote 5 for exact compositions.

USD converted into EUR as of 4 February 2019.

Source: Own calculations based on OECD Regional Statistics (n.d.^[12]), *Regional Social and Environmental Indicators: Internet Broadband Access*, <http://stats.oecd.org> (accessed on 18 December 2018), latest available data from 2016 except for Marseille (France), which are from 2015.

In sum, the HMR has a more fragmented administrative structure than other metropolitan regions in Germany. As a monocentric region with a densely populated urban core and a wide second ring, the region takes a midfield to upper midfield position compared with other metropolitan regions in Germany when it comes to the level of economic development, measured in terms of unemployment, employment and GDP. The HMR has about the same average income as principal comparators across the OECD but ranks relatively low for labour productivity.

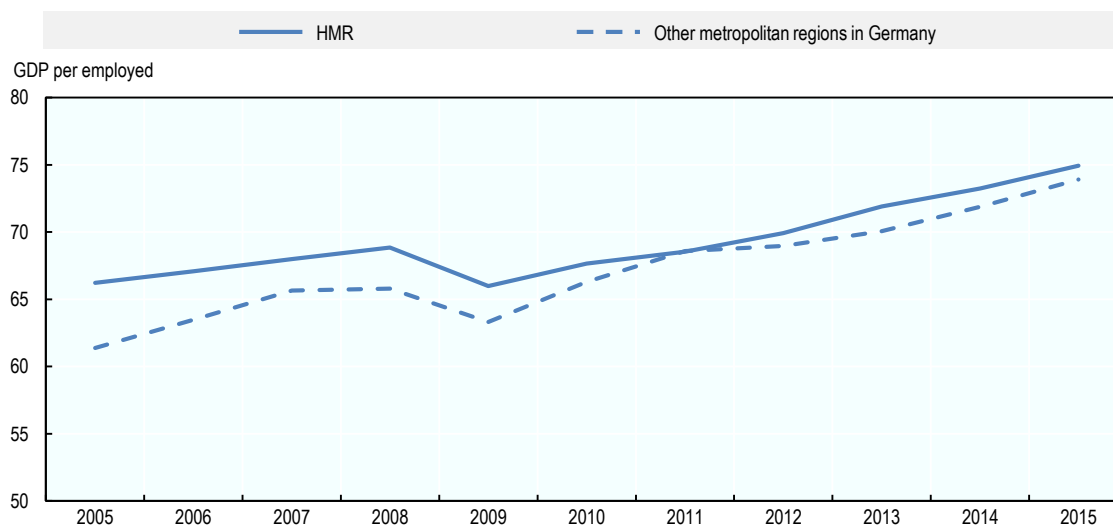
Economic performance, innovation and digitalisation

Labour productivity lags behind regions in Southern Germany

Although the HMR started at a slightly higher level of labour productivity compared to all other metropolitan regions in Germany in 2005, this gap has almost closed in 2015. Figure 1.4 plots the evolution of labour productivity, measured as GDP per employed (i.e. output divided by the number of individuals generating it) in the HMR compared to all other metropolitan regions in Germany, pooled together, during the period 2005 to 2015, the latest year for which comparable data at the district level are currently available. Other regions, which had, on average, labour productivity slightly below that of the HMR in 2005, grew faster and, by 2015, had reached almost the same level as the HMR.⁶ A similar picture arises for GDP per capita (as opposed to employed) as a measure of overall economic

activity: the HMR grew from a level of EUR 33 246 in 2005 to a level of EUR 39 549 in 2015 (+19%); other regions grew from a level of EUR 29 740 to a level of EUR 39 105 (+31%).

Figure 1.4. Labour productivity: The HMR vs. other metropolitan regions in Germany



Notes: GDP per employed in EUR 1 000.

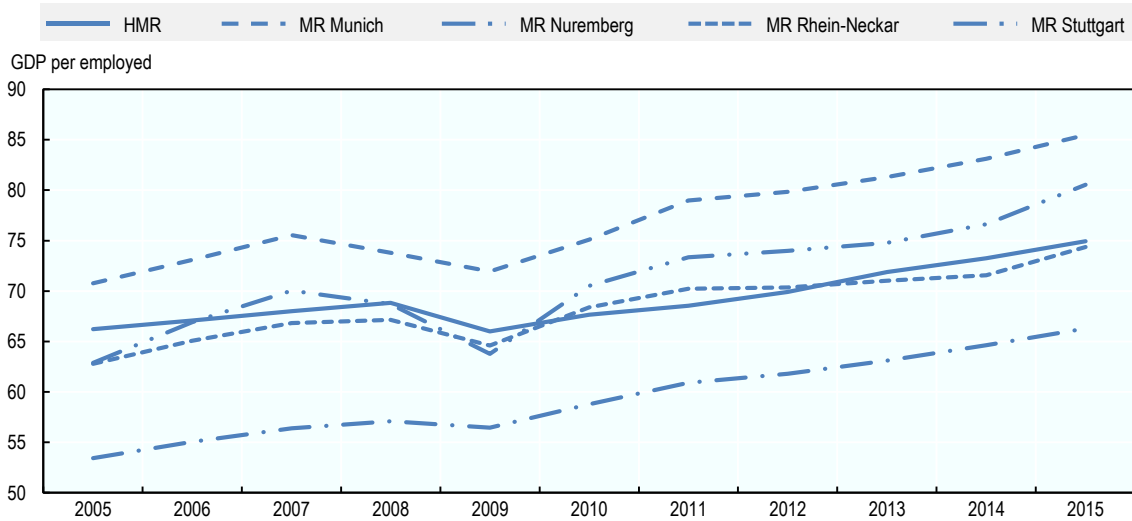
The figure takes into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Other metropolitan regions in Germany = MR Berlin-Brandenburg, Northwest, MR Frankfurt, MR Hanover, Central Germany, MR Munich, MR Nuremberg, MR Rhein-Neckar, MR Rhein-Ruhr, MR Stuttgart.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015; weighted by district employment level.

Note that as the structure and composition of metropolitan regions have changed over time (for example, because districts have entered or left a region), it is difficult to compare regions over time. To minimise bias, regions are compared based on their most recent structure and composition and then projected back in time. That is, the structure and composition of the HMR in 2018, including the city of Schwerin (which entered the HMR in 2017) is taken to be the same as in 2005. The same logic applies to all other regions in Germany.

In particular, compared to metropolitan regions in Southern Germany, the HMR experienced relatively sluggish growth in labour productivity during the period 2005 to 2015. Figure 1.5 shows that MR Munich, which was already at a higher level in 2005, has almost doubled its initial gap in GDP per employed by 2015; MR Stuttgart, which was initially at a lower level, has leaped ahead comfortably; and MR Rhein-Neckar, which was also initially at a lower level, is now at about the same level as the HMR. Again, a similar picture arises for GDP per capita: while GDP per capita increased by about 19% in the HMR between 2005 and 2015, it increased by about 30% in MR Munich, 39% in MR Stuttgart, 29% in MR Rhein-Neckar and 39% in MR Nuremberg.

Figure 1.5. Labour productivity: The HMR vs. metropolitan regions in Southern Germany

Notes: GDP per employed in EUR 1 000.

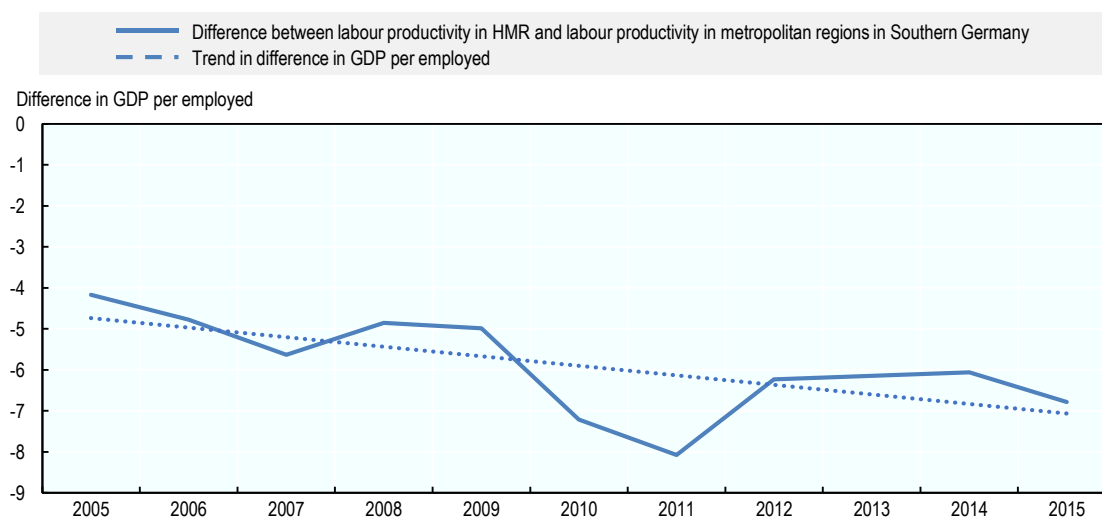
The figure takes into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d._[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015; weighted by district employment level.

The initial gap in labour productivity between the HMR and metropolitan regions in Southern Germany amounted to slightly less than EUR 4 000 in 2005 but has risen over time by about 50%. By 2015, it amounted to more than EUR 6 000. Figure 1.6 plots the annual difference in GDP per employed between the HMR and metropolitan regions in Southern Germany, pooled together, showing the divergence in productivity over time in terms of this difference. This figure can be interpreted as the amount that the HMR is missing out by *not* growing as fast as metropolitan regions in Southern Germany, and the size of this amount is growing over time, as shown by the downward-sloping (dotted) trend line. The slope of this trend line indicates that, if this downward trend continues, the HMR will be missing out about EUR 1 000 in GDP per employed relative to metropolitan regions in Southern Germany every 4 years.

It is unlikely that relative sluggishness in GDP per capita and GDP per employed is driven by a demographic factor alone (i.e. a relative increase in the population in the HMR which then, mechanically, reduces *GDP per capita* or *GDP per employed*): for example, MR Munich, which clearly outperformed the HMR, experienced a constant and strong population growth of about 6.3% between 1997 and 2010, increasing to about 8.5% until 2015. the HMR, on the contrary, experienced a lower and more volatile population growth, of about 4.1% between 1997 and 2006, about 2.1% if the years 2000 to 2010 are considered, and about 4.3% between 2010 and 2015 (Federal Institute for Research on Building, Urban Affairs and Spatial Development, 2008_[13]; 2012_[14]; n.d._[10]). One key factor for explaining sluggish relative growth in the HMR is the low level of productivity gains compared to other metropolitan regions in Germany, which may arise due to differences (both stock and flow) in human capital and research and development.

Figure 1.6. Difference in labour productivity between the HMR and metropolitan regions in Southern Germany



Notes: Difference in GDP per employed in EUR 1 000.

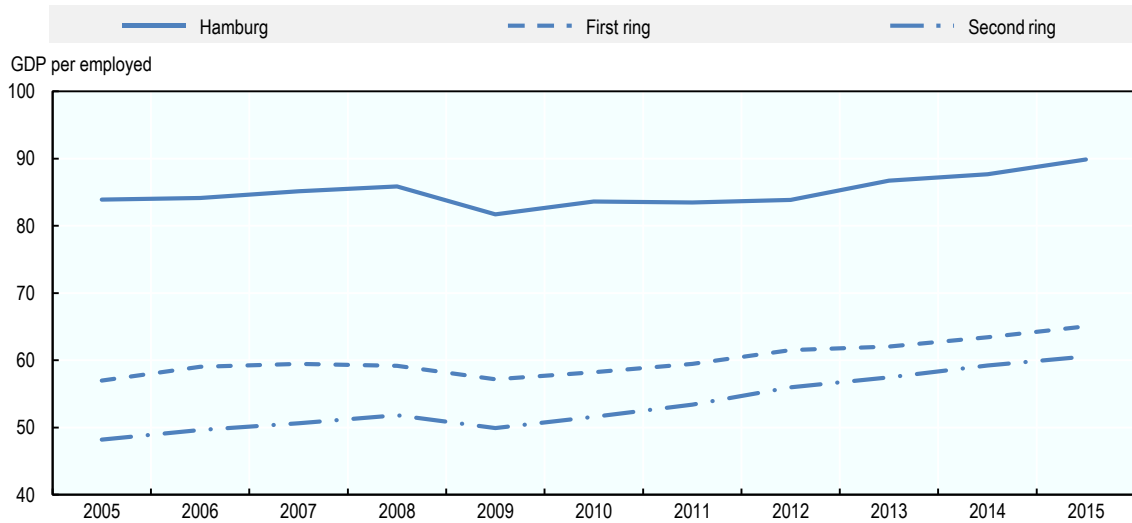
Solid line = Difference between labour productivity in the HMR and labour productivity in metropolitan regions in Southern Germany (MR Munich, MR Nuremberg, MR Rhein-Neckar, MR Stuttgart), pooled together. Dashed line = Trend in difference in GDP per employed.

The figure takes into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015; weighted by district employment level.

Large differences in labour productivity within the HMR persist

The HMR is not a homogeneous entity when it comes to labour productivity. Figure 1.7 plots GDP per employed in the Free and Hanseatic City of Hamburg vs. the first ring (including, for brevity, all districts directly bordering the city, which are Harburg, Herzogtum Lauenburg, Pinneberg, Segeberg, Stade and Stormarn) vs. the second ring (including, for brevity, all districts and unitary cities *not* directly bordering the city, which are Cuxhaven, Dithmarschen, Heidekreis, Lübeck, Lüchow-Dannenberg, Lüneburg, Ludwigslust-Parchim, Neumünster, Nordwestmecklenburg, Ostholstein, Rotenburg [Wümme], Schwerin, Steinburg and Uelzen). There is a discrepancy in labour productivity between the city of Hamburg and the rest of the region and little convergence over time: the productivity difference that prevailed in 2015 was almost the same as in 2005. Yet, districts in the second ring have caught up with districts in the first ring, which might be explained by changes in the spatial economic structure brought by, for example, the expansion of wind power in the second ring and the closure of conventional power plants in the core region; infrastructure pertaining to connectivity has changed little during that period.

Figure 1.7. Labour productivity: Hamburg City vs. First ring vs. Second ring

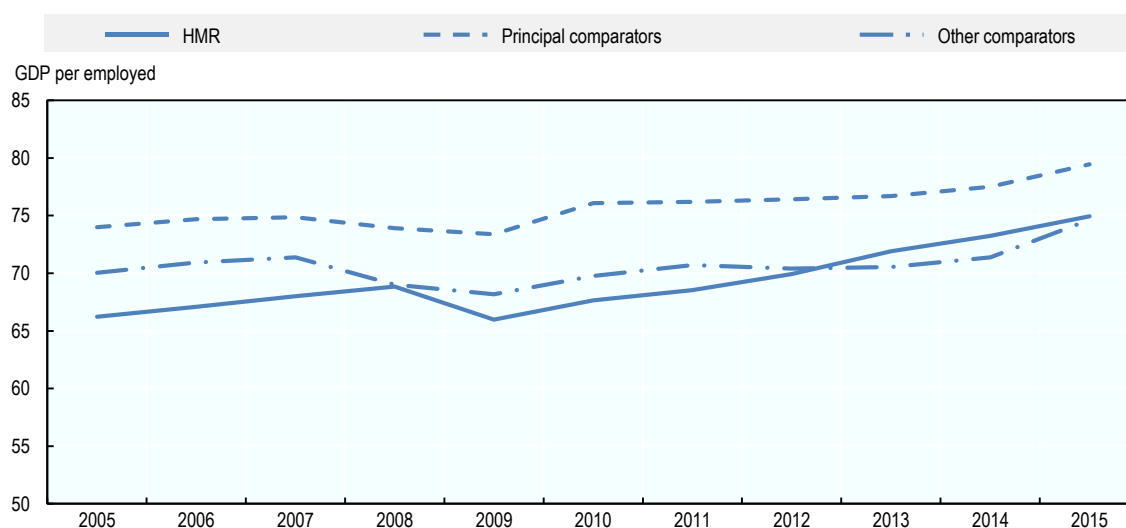
Notes: Difference in GDP per employed in EUR 1 000.

Hamburg = Free and Hanseatic City of Hamburg; First ring = Harburg, Herzogtum Lauenburg, Pinneberg, Segeberg, Stade, Stormarn; Second ring = Cuxhaven, Dithmarschen, Heidekreis, Lübeck, Lüchow-Dannenberg, Lüneburg, Ludwigslust-Parchim, Neumünster, Nordwestmecklenburg, Ostholstein, Rotenburg (Wümme), Schwerin, Steinburg, Uelzen.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raubeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015; weighted by district employment level.

The HMR's economic performance is improving relative to other metropolitan regions across the OECD

Although the HMR started at lower labour productivity compared to both principal and other comparators across the OECD in 2005, it has shown relatively strong growth, and by 2015, has substantially reduced its initial gap to other comparators. A large gap, however, still exists in 2015 between the HMR and principal comparators (although smaller than in 2005). Figure 1.8 plots the evolution of GDP per employed for the HMR alongside the principal comparators of Barcelona (Spain), Boston (US), Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands) as well as other comparators across the OECD, pooled together, during the period 2005 to 2015. The HMR did, therefore, perform relatively well internationally. There is some evidence that other regions show stronger uptake in growth from 2013 onwards. GDP per capita in principal comparators grew by 6% between 2005 and 2015, and only by 5% in other comparators. Growth in the HMR, as well as other regions, was stronger than in their countries, on average: in Germany, for example, growth in labour productivity during 2005 to 2015 was about 8%, while it was about 13% in the HMR. For principal comparators, average country-level growth in labour productivity was about 6%, while for metropolitan regions within countries it was about 7%.

Figure 1.8. Labour productivity: The HMR vs. metropolitan regions across the OECD

Notes: GDP per employed in EUR 1 000.

Principal comparators = Barcelona (Spain), Boston (US), Copenhagen (Denmark), Gothenburg (Sweden), Rotterdam (Netherlands).

Other comparators = Athens (Greece), Birmingham (UK), Busan (Korea), Dublin (Ireland), Lisbon (Portugal), Manchester (UK), Marseille (France), Milan (Italy), Montreal (Canada), Naples (Italy), Oslo (Norway), Rome (Italy), Stockholm (Sweden), Vancouver (Canada).

USD converted into EUR as of 4 February 2019.

Source: Own calculations based on OECD Regional Statistics (n.d.^[12]), *Regional Social and Environmental Indicators: Internet Broadband Access*, <http://stats.oecd.org> (accessed on 18 December 2018), latest available data from 2016 except for Marseille (France), which are from 2015.

The HMR scores lower for human capital than other regions in Germany

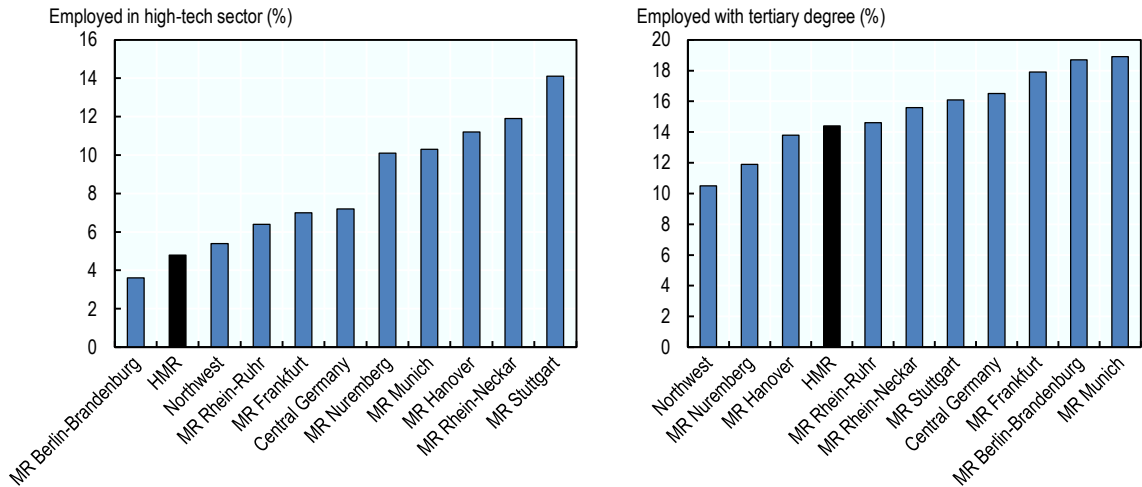
The HMR performs less well when it comes to the educational profile of its workforce compared to other metropolitan regions in Germany, in particular, those in the south. Differences in human capital may be an important factor driving differences in productivity across regions over time. Annex Table 1.A.2 shows, amongst others, shares of employed by degree, shares of employed in two human capital-intensive sectors (the high-tech and creative sectors, which also include crafts, service companies and freelancers) and shares of students enrolled in university as a percentage of the overall population with recent rates of change, by metropolitan region in Germany. With about 14.4%, the HMR is ranked 8th out of 11 for the share of employed with a tertiary degree (defined as a master school, college or university degree), clearly being outperformed by MR Munich, which is the frontrunner at about 18.9%. The bottom-placed is Northwest with a share of only 10.5%. However, the HMR ranks fourth in terms of growth, suggesting moderate catch-up.

The HMR has relatively low shares of high-tech employment and employed with a tertiary degree

The picture is even less favourable for the share of employed in the high-tech sector (Figure 1.9, left panel): with about 4.8%, the HMR ranks only 10th out of 11, the frontrunner being MR Stuttgart in the south (about 14.1%) and the bottom-placed MR Berlin-Brandenburg (about 3.6%). Almost three times as many employees in the labour force work in the knowledge-intensive high-tech sector in MR Stuttgart than in the HMR. While there are positive growth rates in MR Munich (about 3.1%) and MR Stuttgart (about

1.5%), both of which are in the south, the share of the employed in this sector has stagnated, even showing a slight drop in the HMR (about -0.2%). With about 2.4%, the HMR ranks 9th when it comes to the share of employed with a tertiary degree (Figure 1.9, right panel), with MR Munich in the south being first (about 18.9%) and Northwest being last (about 10.5%). The HMR performs fairly well when it comes to employment in the creative sector, in third place (about 3.3%) with a positive growth trend (about 3%) (Annex Table 1.A.2).

Figure 1.9. High-tech employment and share of employed with a tertiary degree in 2015



*Note:*s Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = Frankfurt/RheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d._[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

The HMR ranks midfield to lower midfield for quality of education

Indicators of human capital presented so far have been related to the *quantity* of education. *Quality* of education, however, is just as important. It is difficult to measure the quality of education, and even more so to compare it between metropolitan regions in Germany, considering differences in their education systems. Due to the federal structure of Germany, education policy is the responsibility of federal states. To some extent, federal states co-ordinate education policy in the Standing Conference of the Ministers of Education and Cultural Affairs of the Federal States (*Kultusministerkonferenz*), a voluntary body without legislative power comprising the ministers responsible for education policy from the federal states. Differences in education policy between federal states, however, still remain. It is even more difficult to compare quality of education between metropolitan regions in Germany when these regions are composed of different federal states. Each of the four federal states of which the HMR is composed has their own education policy. MR Munich and MR Stuttgart, on the contrary, are comprised of (parts of) only one federal state (Bavaria and Baden-Württemberg respectively), making it a homogeneous educational space.

The Educational Monitoring 2018 (*Bildungsmonitor 2018*) by the Initiative New Social Market Economy (*Initiative für Neue Soziale Marktwirtschaft*), an organisation related to the German Employers' Association, benchmarks the 16 federal states in Germany against each other based on 93 indicators (collected from various sources), covering the entirety of the educational system from primary schooling to tertiary education in each federal state (Institut der deutschen Wirtschaft Köln, 2018_[15]). An excerpt from the latest edition of the report is shown in Table 1.5.

Table 1.5. Excerpt from Educational Monitoring 2018 on selected benchmarks

Federal state	Overall ranking	Quality of schools	Vocational training and labour market orientation	Tertiary education and "STEM"	Research orientation
Baden-Württemberg	4	8	2	3	8
Bavaria	3	2	1	9	5
Berlin	13	15	15	5	2
Brandenburg	14	5	14	15	16
Bremen	16	16	7	1	7
Hamburg	5	14	4	12	6
Hesse	10	12	12	10	12
Mecklenburg-Western Pomerania	7	7	8	13	3
Lower Saxony	8	11	9	14	9
North-Rhine Westphalia	15	13	16	7	11
Rhineland Palatinate	9	10	5	8	15
Saarland	6	9	10	6	3
Saxony	1	1	6	2	1
Saxony-Anhalt	12	4	11	11	13
Schleswig-Holstein	10	6	13	16	14
Thuringia	2	3	3	4	10

STEM = Science, Technology, Engineering and Mathematics.

Source: Initiative für Neue Soziale Marktwirtschaft (2018_[16]) *Der INSM-Bildungsmonitor 2018*, <http://www.insm-bildungsmonitor.de> (accessed on 18 December 2018), selected benchmarks.

Hamburg, Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein – the four federal states, parts of which constitute the HMR – ranked in the middle of federal states in 2018, at positions five, eight, seven and ten respectively. Bavaria and Baden-Württemberg (which can be used as proxies for the metropolitan regions Munich and Stuttgart respectively) ranked third and fourth. Quality of schools, which is measured by indicators for reading in fourth and ninth grade as well as for mathematics in grade four, is particularly low in Hamburg: it ranks 14th out of 16 federal states – Lower Saxony ranks 11th, Mecklenburg-Western Pomerania 7th and Schleswig-Holstein 6th. On the other hand, Munich ranks second and Baden-Württemberg eighth for quality of education. It should be noted, however, that the demographic background of students differs substantially between federal states: for example, in Hamburg, the share of students who are not German citizens and who have a migration background is 10.5% and 29.1% respectively. Corresponding figures for Baden-Württemberg are 9.8% and 19.5%, those for Bavaria 7.3% and 13.8% respectively (Kemper, 2017_[17]).

The constituent federal states that make up the HMR are placed eighth and below (with the exception of Hamburg itself, which comes out fourth) for vocational training and labour market orientation of education, measured by the number of graduates from vocational training schools, the vocational training ratio and the number of “NEET” (Not in Education, Employment or Training). Bavaria and Baden-Württemberg lead the table, being first and second respectively. Related to the concept of vocational training and labour market orientation of education is tertiary education and its relation to natural science or “STEM” (Science, Technology, Engineering and Mathematics) subjects (which can be considered as catering more to economic needs): based on the number of graduates from tertiary education, in particular from subjects such as engineering, the federal states that constitute the HMR perform poorly: Schleswig-Holstein is ranks last and all other constituent federal states of the HMR rank 12th or lower, whereas Baden-Württemberg and Bavaria are placed 3rd and 9th respectively out of 16.

Research orientation of education draws a similar picture in terms of relative ranking (which may be one reason for the low rate of technology transfers between universities and the private sector), suggesting differences in quality of education between the HMR and other regions in Germany, in particular, those in the south. It is conceivable that initiatives at the federal level such as, for example, the implementation of the Digital Pact (*Digitalpakt*), which aims to ensure basic training in digital skills in high schools, have the potential to reduce, to some extent, inequalities in quality of education between federal states.

The fragmented educational space in the HMR may have implications going well beyond between-region comparability of quality of education: to the extent that frictions in education policy can lead to a decrease in labour mobility (for example, parents may not move for new jobs across federal state borders within the metropolitan region because their children would be subject to a different school system), aggregate labour productivity may be further reduced as labour does not flow to where it could be most productive.

It should be noted that the Educational Monitoring 2018 is just one source of comparable data on quality of education in Germany, its advantage being that it covers education from primary to tertiary schooling. Other sources include, for example, the Institute for Quality Development in the Educational System (*Institut zur Qualitätsentwicklung im Bildungswesen*), which, in its regularly published educational trend reports, benchmarks primary-school students in subjects German and mathematics at the end of grade four. In its latest edition for 2016, in mathematics (global), the share of students who did not reach the minimum requirements at the end of grade four is 21.2% in Hamburg, 16.3% in Lower Saxony, 14.8% in Mecklenburg-Western Pomerania and 13.2% in Schleswig-Holstein. In Bavaria and Baden-Württemberg, these shares are 8.3% and 15.5% respectively; the German average is 15.4% (Stanat et al., 2017^[18]).

More dynamic labour markets elsewhere may increase skills shortages in the HMR

Differences in human capital between metropolitan regions in Germany affect labour market dynamics and can further widen already existing differences in aggregate labour productivity between regions.

The unemployment rate in the HMR followed closely that of all other metropolitan regions in Germany, pooled together, during the period 2005 to 2015: unemployment decreased from about 12% in 2005 to about 7% in 2015, as Germany was heading towards full employment. Although the HMR has a higher unemployment rate (by about two percentage

points) than metropolitan regions in the south, there is little evidence that regions in the south do much better when it comes to reducing unemployment. During the period 2005 to 2015, the HMR and metropolitan regions in the south reduced unemployment by approximately equal amounts, from about 12% unemployment in the HMR and 10% in the south in 2005 to about 7% in the HMR and 5% in the south in 2015 (Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), weighted by district employment level, own calculations).⁷

As the unemployment rate continues to decrease, the demand for workers requiring a professional qualification (*Fachkraft*) is rising. This is evidenced by the ratio of the number of vacancies requiring a professional qualification to the number of unemployed having a professional qualification, multiplied by 100. This ratio is rising across all metropolitan regions in Germany. In the HMR, it was about 21 in 2005 and about 35 in 2015 (+ 67%); in other metropolitan regions in Germany, it was about 16 in 2005 and 34 in 2015 (+113%) (Federal Institute for Research on Building, Urban Affairs and Spatial Development, n.d.^[10]). According to the generic statistical definition of the Federal Employment Agency (*Bundesagentur für Arbeit*), a candidate with a professional qualification has completed at least two years of vocational training or a comparable qualification and has sound knowledge and skills that enable the candidate to engage in specialist activities. As of 2015, the majority (more than two-thirds) of all job vacancies matched this candidate profile, with little differences between metropolitan regions in Germany or even within the HMR.

However, the rise in the ratio of vacancies to unemployed is much more pronounced in regions in the south, especially in MR Stuttgart and MR Munich, pointing towards a higher rate of job creation, in particular of jobs demanding this type of labour, in the regions. Figure 1.10 shows this development.

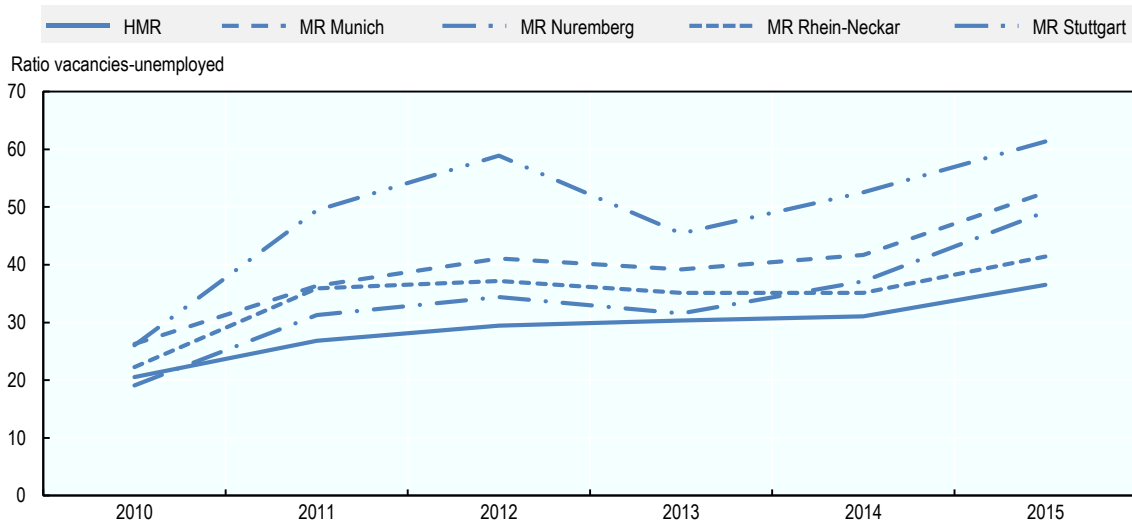
A relatively tighter labour market in regions in the south, in particular in case of jobs requiring a professional qualification (*Fachkraft*), has three implications for HMR:

1. Higher demand for candidates with a professional qualification in the south may increase (discretionary) wages, attracting such individuals, which may increase skill shortages (*Fachkräftemangel*) in HMR. In part, this is already reflected in a higher average monthly disposable household income in regions in the south, which is indicative of higher labour productivity more generally (Table 1.3).
2. A higher rate of job creation in regions in the south may point towards systematic differences in business and industry structure, including differences in capital productivity arising from a different research and development environment.
3. Greater job creation in regions in the south may perpetuate and enhance existing differences in labour productivity between regions if coinciding with labour productivity growth (e.g. by attracting skilled workers).

In sum, although HMR has experienced (average) growth in aggregate labour productivity (measured in terms of GDP per employed) over the past decade, other metropolitan regions in Germany, especially those in the south, have experienced stronger growth, having either increased an initial advantage or decreased an initial disadvantage over HMR. These regions are further widening the gap in aggregate labour productivity with HMR. One of the reasons for differences in aggregate labour productivity between metropolitan regions in Germany over time may be differences in the stock and flow of human capital, as evidenced by shares of employees with different educational endowments and shares of employees working in sectors with different educational prerequisites. The HMR does not score highest in either of them relative to regions in the south, and most recent rates of

change suggest that differences may continue to persist or even widen. This development is exacerbated by a fragmented educational structure, with schools and universities that – when it comes to standardised achievement – score, on average, only midfield to lower midfield (a supply-side issue of skilled labour), as well as by higher rates of job creation in other regions that may attract qualified candidates and thereby lead to skill shortages (a demand-side issue of skilled labour).

Figure 1.10. Ratio vacancies-unemployed (professional qualification): The HMR vs. metropolitan regions in Southern Germany



Notes: Ratio of vacancies to unemployed for job profile “professional qualification”, multiplied by 100.

The figure takes into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015; weighted by district unemployment level.

The HMR ranks midfield for research, development and innovation (RDI) but is improving

Besides differences in labour productivity, differences in capital productivity may be another reason why the HMR experienced sluggish growth in GDP per capita compared to other metropolitan regions in Germany. Such differences may arise due to systematic differences in business and industry structure: to the extent that firms in regions in the south invest more into research and development and are more innovative (e.g. when it comes to novel production processes and methods), capital in these regions is put to more productive use and relative output increases.

The HMR tends to have smaller firms

The HMR tends to have a higher share of smaller firms and a lower share of larger firms than other metropolitan regions in Germany, especially those in the south. Table 1.6 shows the distribution of firms by firm size, the number of DAX firms,⁸ the share of research and development personnel as a percentage of overall employees, firm investment into research

and development (including the rate of change between 2003 and 2009) and the number of public research institutes – defined as major public research institutes (i.e. institutes by the four major research associations Fraunhofer Gesellschaft, Helmholtz Association, Leibnitz Association and Max Planck Society in Germany plus federal research institutes) – by metropolitan regions in Germany. There is a clear gradient in the share of firms by size in the HMR compared to other metropolitan regions in Germany: while the HMR ranks 5th and 6th out of 11 for the share of very small and small firms respectively, it ranks only 9th for the share of medium-sized and even 10th for the share of large firms, which typically engage more in research and development.

Table 1.6. Firm size and research and development infrastructure in metropolitan regions in Germany

	Share of very small firms (‰ total firms)	Share of small firms (‰ total firms)	Share of medium-sized firms (‰ total firms)	Share of large firms (‰ total firms)	Number of DAX firms	Firm investment into R&D (EUR million)	Change 2003-09
HMR	892.2	85.2	19.2	3.3	1	1 575	39
Berlin-Brandenburg	901	77.9	17.9	3.2	1	1 551	-10
Northwest	869.6	102.6	23.8	4	0	457	-3
Frankfurt	894.7	81.3	19.9	4.2	3	5 201	26
Hanover	868.4	103.3	24	4.2	2	3 183	-10
Central Germany	871.7	99.4	24.7	4.2	0	1 489	33
Munich	904.6	75.2	16.8	3.4	7	6 624	6
Nuremberg	880.7	93.2	22	4.1	1	1 951	20
Rhein-Neckar	890.2	85.6	20.3	3.9	4	2 438	16
Rhein-Ruhr	892.2	82.4	21	4.3	10	4 453	23
Stuttgart	891.6	83.6	20.8	4	1	8 492	46

Notes: Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Sources: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (2012^[14]), *Regionales Monitoring 2012*; Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level on shares of firms by firm size from 2014, on research and development investments from 2009, on public research institutes from 2010, and on broadband access from 2010.

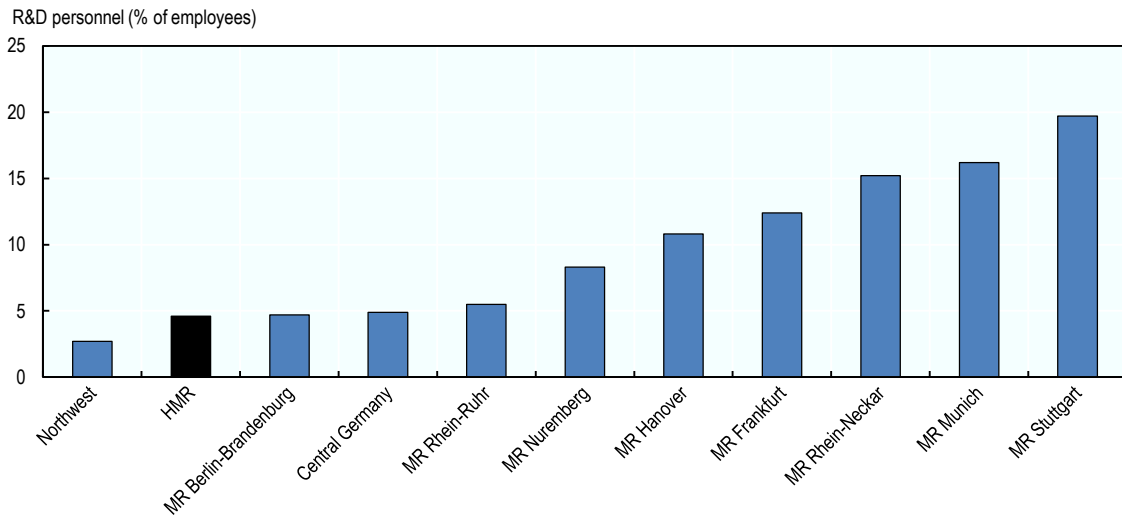
A similar picture arises when it comes to the presence of DAX firms' headquarters, which, with relatively large research and development budgets, are more likely to engage in research and development activities. The HMR hosts one DAX firm (Beiersdorf), ranking 7th out of 11, together with MR Berlin-Brandenburg and MR Stuttgart. MR Rhein-Ruhr, the largest metropolitan region in Germany in terms of GDP, hosts ten DAX firms, the largest number amongst all metropolitan regions. MR Munich, MR Rhein-Neckar and MR Nuremberg, which recorded high GDP per capita growth over the past decade, are home to seven, four and two DAX firms respectively.

The HMR ranks lower midfield for research and development in Germany

The HMR ranks only 10th out of 11 when it comes to the share of research and development personnel as a percentage of overall employees (about 4.6%) (Figure 1.11). More than 4 times as many employees work in research and development in MR Stuttgart (the

frontrunner, about 19.7%) and slightly fewer in MR Munich (in second place with about 16.2%) and MR Rhein-Neckar (third place, about 15.2%). Northwest ranks last, with only about 2.7%. The share of research and development personnel is also reflected in firm investment into research and development as a percentage of regional GDP. The HMR ranks 9th out of 11 (about 0.8%), MR Stuttgart (about 3.5%) raking first again and Northwest (about 0.5%) last again. However, the HMR experienced the second largest growth in the share of research and development personnel (about 39.0%) between 2003 and 2009, outranked only by MR Stuttgart (about 45.7%). Finally, with the presence of 13 institutes, the HMR ranks midfield for the number of public research institutes in the region. Note, however, that this indicator accounts only for major research institutes by the main research associations in Germany plus the federal government; if smaller institutes are also accounted for, the number for HMR increases to 30, making the HMR upper midfield in this category.

Figure 1.11. R&D personnel: The HMR vs. metropolitan regions in Germany



Notes: Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (2012^[14]), *Regionales Monitoring 2012*; Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level on research and development personnel and investments from 2009; own calculations.

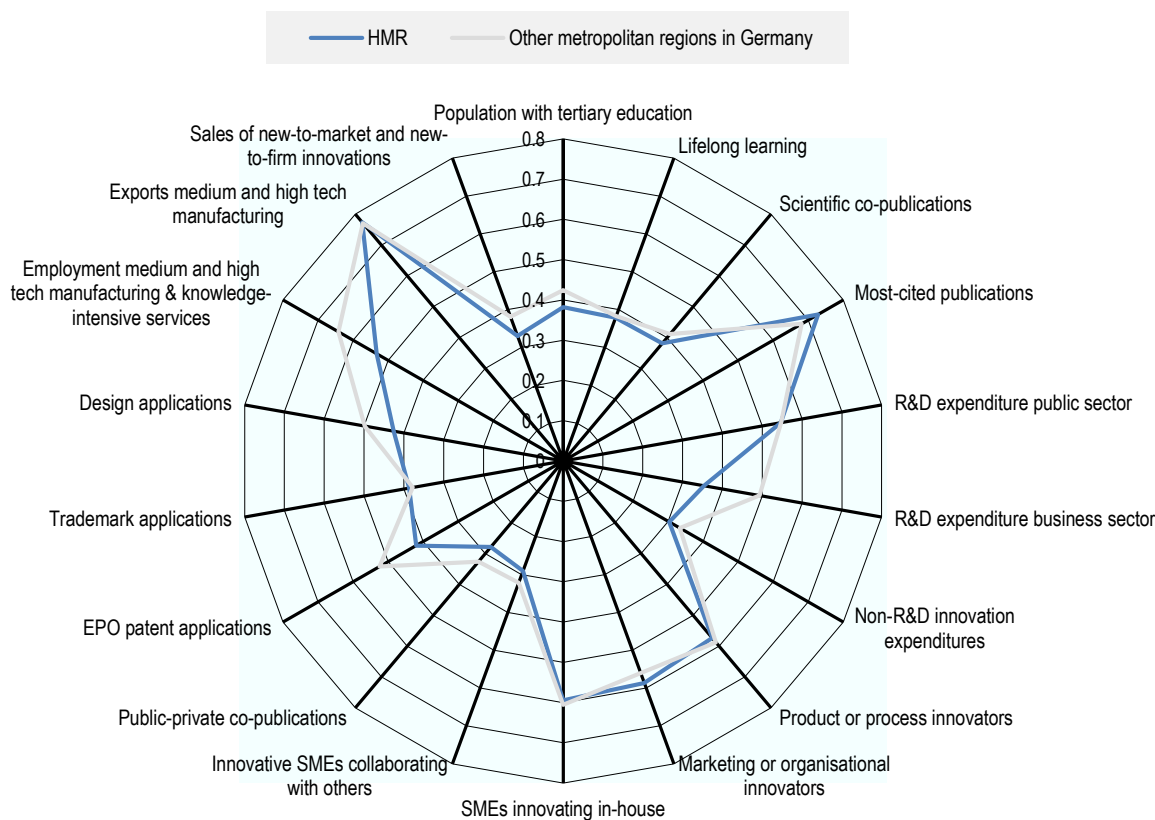
The HMR scores lower for innovation performance than regions in Southern Germany

The HMR performs similarly, or worse than, other metropolitan regions in Germany with respect to innovation indicators. Figure 1.12 illustrates the performance of the HMR on different indicators relative to other metropolitan regions in Germany, pooled together, using the latest edition of the Regional Innovation Scoreboard.⁹ The HMR only rarely scores higher than average, and if so, only slightly, as in case of most-cited publications and marketing or organisational innovators. It scores considerably lower than average when

it comes to research and development expenditure by the business sector, innovative small- and medium-sized enterprises collaborating with others, public-private co-publications, patent and design applications, and employment in medium and high-tech manufacturing and knowledge-intensive services.¹⁰

The largest differences in innovation performance between the HMR and other regions in Germany can be found with regions in the south. Figure 1.13 replicates Figure 1.12 for metropolitan regions in Southern Germany. All regions in the south (with the exception of MR Munich when it comes to research and development expenditure by the public sector, publications and lifelong learning) clearly outperform the HMR, some by a very large margin. MR Stuttgart, and to a lesser extent MR Rhein-Neckar, MR Munich and MR Nuremberg perform considerably better than the HMR when it comes to research and development expenditure by the business sector, patent and design applications, employment in medium- and high-tech manufacturing and knowledge-intensive services, and exports of medium- and high-tech manufacturing.

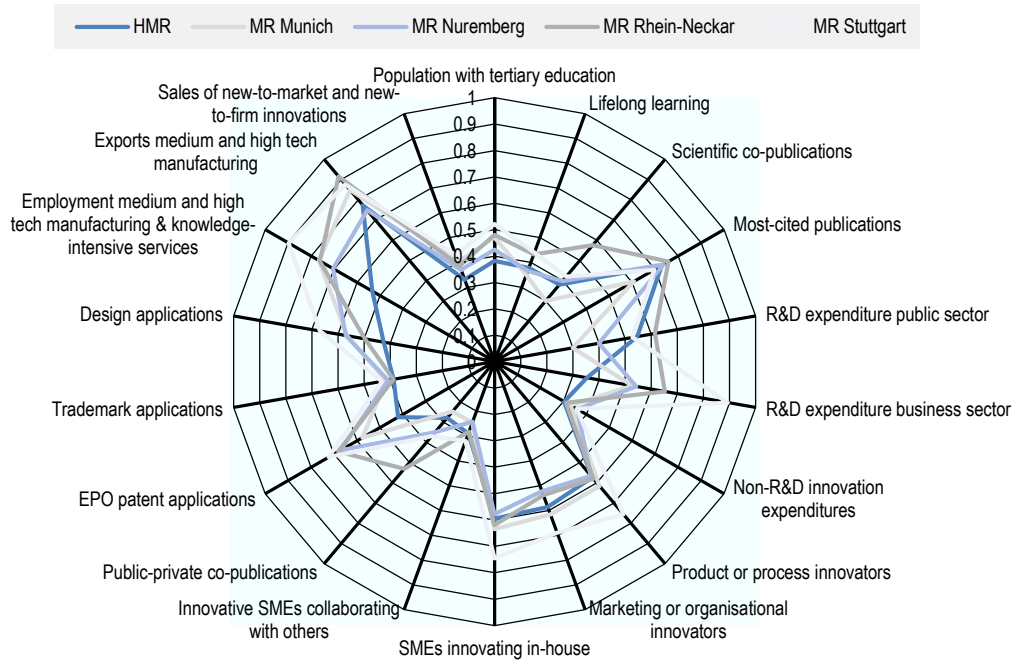
Figure 1.12. Regional Innovation Scoreboard 2017: The HMR vs. other metropolitan regions in Germany



Notes: Metropolitan regions are composed of NUTS2 regions. See Footnote 11 for the exact composition. Other metropolitan regions in Germany = MR Berlin-Brandenburg, Northwest, MR Frankfurt, MR Hanover, Central Germany, MR Munich, MR Nuremberg, MR Rhein-Neckar, MR Rhein-Ruhr and MR Stuttgart.

Source: Own calculations based on European Commission (2017^[19]), *Regional Innovation Scoreboard 2017*, https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en (accessed on 15 December 2019), latest available data from 2017.

Figure 1.13. Regional Innovation Scoreboard 2017: The HMR vs. metropolitan regions in Southern Germany



Note: Metropolitan regions are composed of NUTS2 regions. See Footnote 11 for the exact composition.

Source: Own calculations based on European Commission (2017^[19]), *Regional Innovation Scoreboard 2017*, https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en (accessed on 15 December 2019), latest available data from 2017.

Differences between the HMR and other regions in Germany are not as systematic as those between the HMR and regions in the south. For example, the HMR scores lower than MR Hanover when it comes to research and development expenditure (regardless of whether public or private), employment in medium- and high-tech manufacturing and knowledge-intensive services, and exports of medium- and high-tech manufacturing – the latter items are most likely driven by the strong presence of the automobile sector in MR Hanover. The HMR also scores lower than MR Hanover when it comes to lifelong learning, patent applications and innovative small- and medium-sized enterprises (SMEs) collaborating with others, which is a recurring theme, possibly made worse by the fragmented administrative structure in the HMR that makes public-private or private-private collaboration across state boundaries more difficult. Note that some SMEs may deliberately not apply for patents so as not to lose industrial knowledge to competitors, while others may spontaneously engage in (non-formal) collaborations (for example, production networks) to fulfil orders too large for one firm to handle.

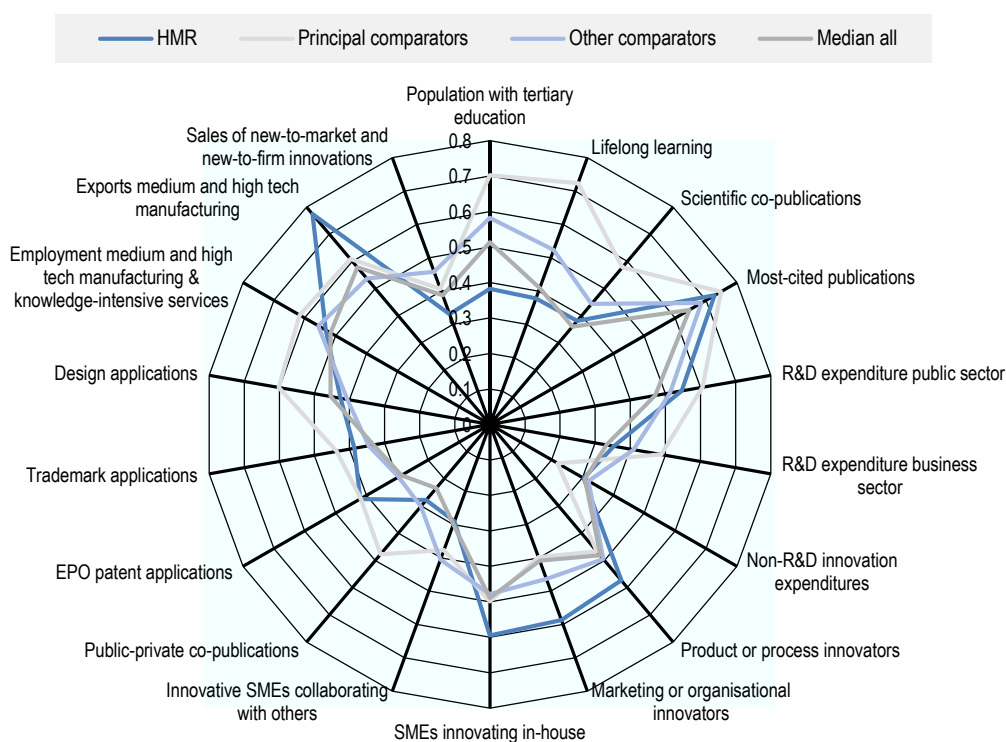
The more systematic differences between the HMR and metropolitan regions in Southern Germany are somewhat expected: although differences in overall firm size between the HMR and regions in the south are not large, regions in the south concentrate more human capital within their boundaries, with the potential of more research and development being undertaken. They also concentrate several large and dominant firms that operate in certain research-intensive industries and that tend to invest more into research and development activities than others, with regional supply chains potentially profiting.¹¹ This is a mutually

reinforcing process: as firms invest more into research and development, and thereby become more productive, they are able to pay higher wages, which, in turn, attracts more human capital that can be used to raise productivity.

The HMR ranks midfield for innovation performance compared to principal comparators across the OECD

Principal comparators across the OECD are as good as or better than the HMR on most indicators of innovation performance, with the exception of marketing or organisational innovators as well as exports of medium- and high-tech manufacturing, where the HMR seems to have a competitive edge. Figure 1.14 replicates Figure 1.12, illustrating the relative performance of the HMR for each indicator of innovation performance relative to principal comparators, including Barcelona (Spain), Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands) as well as other comparators across the OECD.¹² *Average All* denotes the median innovation performance of all regions participating in this round of the European Commission's Regional Innovation Index, which are EU28 regions and regions in neighbouring accession countries.

Figure 1.14. Regional Innovation Scoreboard 2017: The HMR vs. metropolitan regions across the OECD



Notes: Metropolitan regions are composed of NUTS2 regions. See Footnote 13 for the exact composition. Principal comparators = Barcelona (Spain), Copenhagen (Denmark), Gothenburg (Sweden), Rotterdam (Netherlands).

Other comparators = Athens (Greece), Birmingham (UK), Dublin (Ireland), Lisbon (Portugal), Manchester (UK), Marseille (France), Milan (Italy), Naples (Italy), Oslo (Norway), Rome (Italy), Stockholm (Sweden).

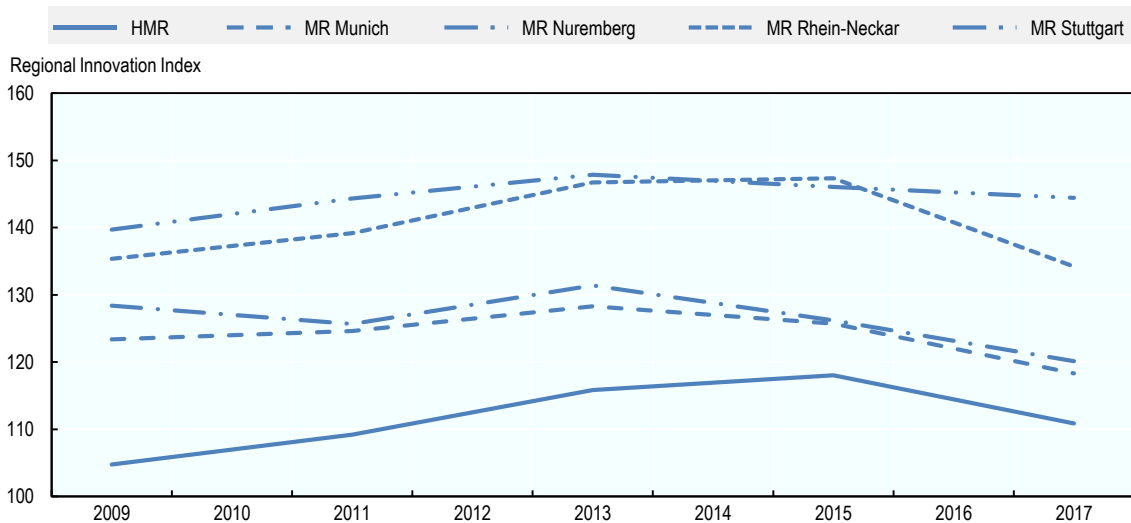
Source: Own calculations based on European Commission (2017^[19]), *Regional Innovation Scoreboard 2017*, https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en (accessed on 15 December 2019), latest available data from 2017.

The picture is more diverse for other comparators across the OECD: although other regions fare better when it comes to education performance (i.e. population with tertiary education, lifelong learning or scientific co-publications), the HMR seems to be better in putting innovation into practice, as evidenced by higher scores for European Patent Office (EPO) patent applications, trademark applications and, to a lesser extent, design applications. Overall, the HMR can be located between the principal and other comparators across the OECD when it comes to innovation performance. It fares better (except for population with a tertiary degree) than the median of all other participating countries.

The HMR's relative innovation performance has improved over time

The HMR has slightly improved its overall index of innovation performance relative to metropolitan regions in Southern Germany, in particular, MR Munich and MR Nuremberg, during the period 2009 to 2017. The European Commission's Regional Innovation Scoreboard includes, besides composite indicators for specific aspects of innovation performance, an overall index that combines all aspects. It is standardised, with values greater than 100 implying that the respective region is above the EU27 average in terms of overall innovation performance. Figure 1.15 shows that the improvement of the HMR relative to MR Munich and MR Nuremberg during the period 2009 to 2017 was, in equal parts, due to a rise in the HMR (from about 105 to about 111) and a reduction in both MR Munich and MR Nuremberg (from about 123 and 128 to about 118 and 120 respectively).

Figure 1.15. Regional Innovation Index: The HMR vs. metropolitan regions in Southern Germany

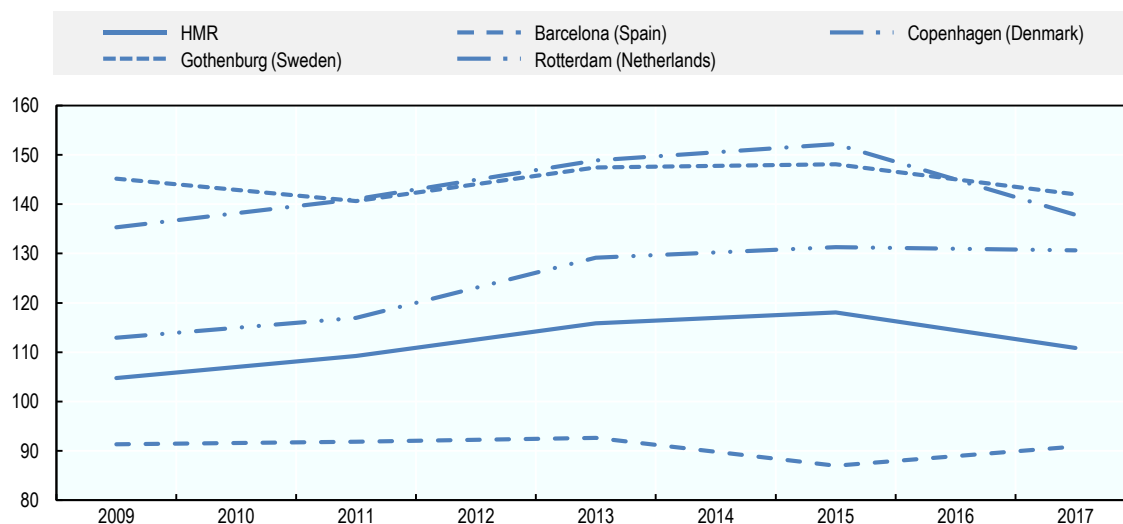


Note: Metropolitan regions are composed of NUTS2 regions. See Footnote 11 for the exact composition.

Source: Own calculations based on European Commission (2017^[19]), *Regional Innovation Scoreboard 2017*, https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en (accessed on 15 December 2019), latest available data from 2017.

The HMR ranked only midfield for overall innovation performance relative to principal comparators across the OECD. However, Figure 1.16 shows that, in 2017, the HMR had a score of 111, whereas Barcelona (Spain) had a score of 91. Yet, the HMR was outperformed, by a considerable margin, by Rotterdam (Netherlands), which scored 131, and even more so by Copenhagen (Denmark), which scored 159. The innovation performance of Copenhagen (Denmark) is closely shadowed by that of Gothenburg (Sweden).

Figure 1.16. Regional Innovation Index: The HMR vs. principal comparators across the OECD

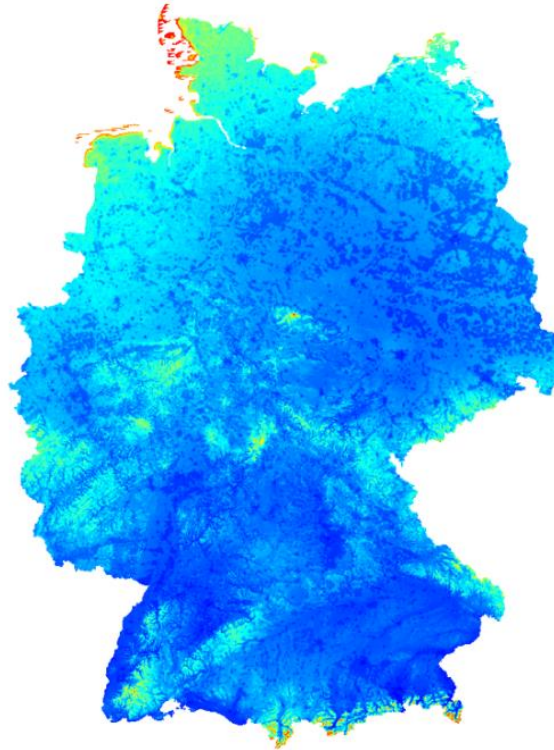


Note: Metropolitan regions are composed of NUTS2 regions. See Footnote 13 for the exact composition.

Source: Own calculations based on European Commission (2017^[19]), *Regional Innovation Scoreboard 2017*, https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en (accessed on 15 December 2019), latest available data from 2017.

The HMR's comparative advantage in innovation potential: The case of renewable energy generation and storage

The HMR plays a leading role in electricity generation from renewable energy, especially wind power. Figure 1.17 is a heatmap plotting the so-called *local wind power adequacy*, obtained from the German Meteorological Service (*Deutscher Wetterdienst*) for Germany in 2014. It is defined as the average annual energy yield of a wind turbine in kilowatt hours per square metre of rotor area.¹³ Federal states in the north of Germany, in particular those located at or close to the coast of the North and Baltic Seas – including Hamburg, Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein, large parts of which constitute the HMR – have a higher local wind power adequacy than other regions in Germany, as indicated by brighter spots on the heatmap. A wind turbine of a given generation capacity can, within a given time frame, produce more energy in the northern parts of the country than in its southern parts. In other words, generating energy from wind is relatively more efficient in the north than in the south. Even larger wind power adequacy is considered to be offshore Lower Saxony and Schleswig-Holstein, in the North Sea, further elevating the potential for electricity generation from wind power in the region.

Figure 1.17. Local wind power adequacy in Germany

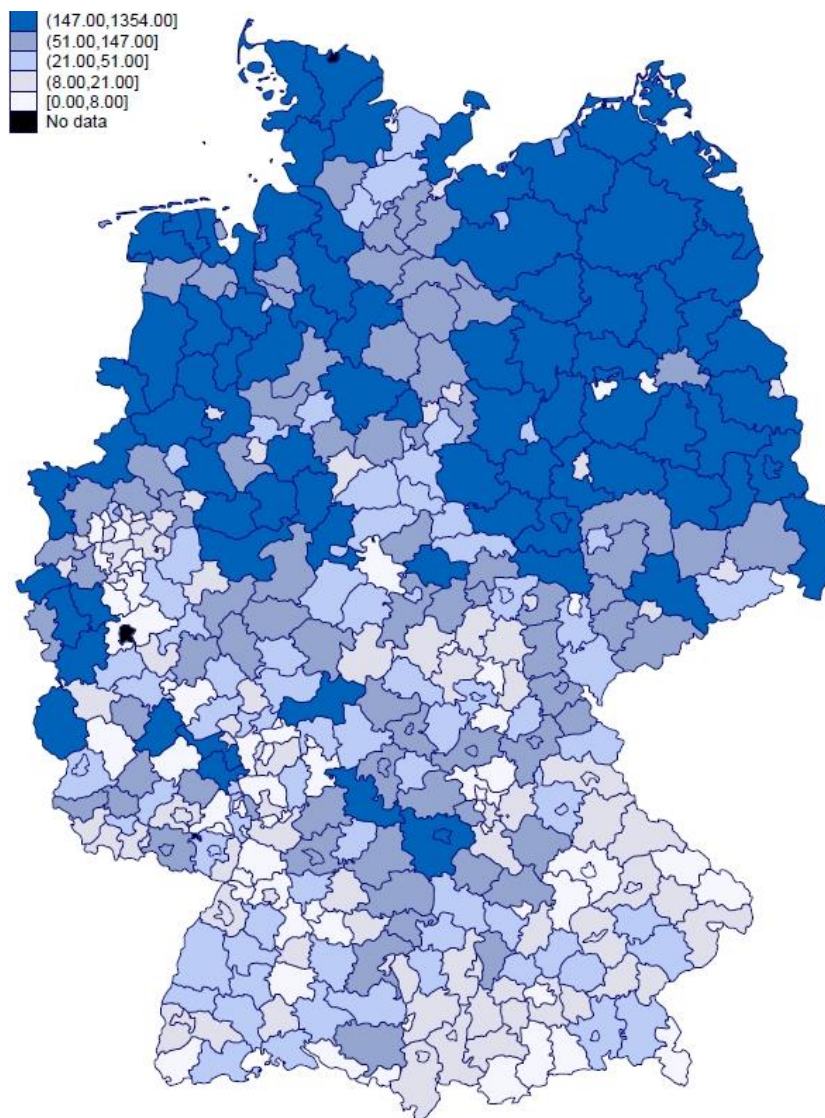
Note: The local wind power adequacy is the average annual energy yield of a wind turbine in kilowatt hours per square metre of rotor area. Brighter spots on the heatmap imply a higher average annual energy yield, making investments into wind power generation capacities more worthwhile, whereas darker colours imply a lower yield.

Sources: Own calculations based on German Meteorological Service (2018^[20]), *Karten zur Windkraftnutzungseignung in 80 Meter über Grund*, https://www.dwd.de/DE/klimaumwelt/ku_beratung/energie_bau/windenergie/windenergie_node.html (accessed on 24 December 2018); Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

This potential has already been (partially) exploited over the past two decades. Figure 1.18 shows installed electrical capacity from wind power, measured in megawatts, at the district level in Germany in 2017. As can be seen, there is a clear gradient in the amount of installed electrical capacity in Germany, with districts in northern parts of the country having more megawatts installed than those in southern parts. The correlation between local wind power adequacy and installed electrical capacity, however, is not perfect (for example, there are regions in Bavaria that have a low wind power adequacy but a high installed electrical capacity), which is, in part, due to energy policy in Germany over the past two decades. Starting in 2000, the passing of the first Renewable Energies Act (*Erneuerbare-Energien-Gesetz* – there have been six revisions since, the most recent being in 2018) guaranteed favourable, fixed feed-in-tariffs when producing electricity from renewables. This led to a massive expansion in installed electrical capacity from wind, biomass and solar photovoltaic: gross electricity consumption from renewables was about 6.3% in 2000; by the end of 2017, it had reached 36%, about half of which was from wind power (Federal Ministry for Economic Affairs and Energy, n.d.^[22]; n.d.^[23]). The trend towards renewables in electricity generation has been fuelled further by the decision of the federal government in 2011 to completely phase out nuclear power by 2022 (which affects three nuclear power

plants in the HMR, namely Brunsbüttel and Krümmel, which are already being decommissioned, and Brokdorf, which goes off grid by the end of 2021).

Figure 1.18. Installed electrical capacity of wind power in Germany at the district level (megawatts) as of December 2017



Sources: Open Power System Data (2018^[24]), *Data Package Renewable Power Plants*, https://doi.org/10.25832/renewable_power_plants/2018-03-08; Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

The German energy transition (*Energiewende*) yields significant opportunities for the HMR. With its already dominant position in electricity generation from renewables and the potential of storage using innovative technologies such as hydrogen, the HMR may take a leading position for renewables (especially wind power) and become a knowledge provider for the transition towards renewables in general, having learned from the phasing-out and decommissioning of conventional technologies. Renewables could also play a key role in reducing urban-rural disparities in economic development, with urban areas as consumers

and rural areas (where renewable power plants are sited) as producers of *locally* generated renewable energy (contrary to, for example, conventional energy generated outside the HMR). At the same time, however, the German energy transition, as a dynamic and ongoing process, poses several challenges for the region.

Box 1.5. Challenges for the HMR due to the German energy transition

The revision of the Renewable Energies Act in 2017 sees a change in paradigm from a system of fixed feed-in-tariffs towards a system of auctioning (Federal Ministry for Economic Affairs and Energy, n.d.^[25]). This implies that, instead of paying a fixed feed-in-tariff to everybody, volumes of renewable energy generation capacities are now being auctioned to those bidders that can produce these volumes most cost-effectively. While this is generally a favourable development for the HMR (which has a competitive advantage and can produce renewable energy very cost-effectively due to its location), at the same time, many early-generation installations in the HMR (as an early adopter of the technology) are about to drop out of the *original* Renewable Energies Act and thus fixed feed-in-tariffs within the next two years (the law was passed in 2000 and has a lifetime of 20 years).

Note that wind turbines have high maintenance costs (see Vitina et al. (2015^[26]), for example), which industry estimates to require a minimum price of between EUR 25 and EUR 35 per megawatt hour to be realised at the stock exchange (the average price in 2017 was EUR 33 per megawatt hour, which has recently increased to more than EUR 40 due to higher CO₂ prices). It is not clear as to whether early-generation installations, which have relatively high maintenance costs, would still be profitable when transitioning from a system of fixed feed-in-tariffs to a more competitive system of auctioning. When it comes to repowering (that is, replacing old installations with new ones at existing locations), it should be noted that the siting process and locational decision-making are stricter today than 20 years ago. It is, therefore, questionable whether old installations can simply be replaced with new ones at *existing* locations.

In general, the transition towards renewable energy generation poses the challenges of how to most *efficiently* use green energy, for example, by jointly optimising electricity, heating and transport sectors (so-called *sector coupling*); how to effectively store green energy (so-called Power-to-X), for example, by using modern hydrogen technologies; and how to control electricity consumption and shift demand in times of underproduction towards times of overproduction (so-called *demand-side integration*) (Stötzer et al., 2015^[27]).

Finally, the German energy transition implies that, in the medium to longer term, energy will be produced in the and consumed in the south, especially by industrial hubs in the Rhein-Ruhr and Rhein-Neckar regions. To transport energy from the north to the south, however, new high-tension power lines have to be built. Network expansion from the north to the south of Germany is progressing slowly, partly due to long planning requirements in Germany. This means that network interventions will increasingly become necessary and power generation from renewable energy will have to be temporarily reduced. In other words, the region is currently producing less renewable energy than would normally be required for more developed networks.¹⁴

Source: Own elaborations based on expert interviews.

The HMR takes a leadership position for digital infrastructure

Besides differences in labour and capital productivity arising from differences in human capital endowments and the overall research and development environment, differences in infrastructure – physical or digital – may be another reason why the HMR experienced sluggish growth in GDP per capita compared to other metropolitan regions in Germany, especially those in the south. Infrastructure is an important component of overall (total factor) productivity, which, in turn, determines how productive labour and capital as input factors are when generating output. Digital infrastructure, in particular, has the potential to raise total factor productivity by increasing the efficiency of production processes and methods. It also has the potential to allow for savings in production costs, which can then be reinvested into productive capital. To the extent that relative changes (over time) in digital infrastructure between metropolitan regions increase the advantage of certain regions over others, such differences may explain some of the divergences in GDP per capita between regions.

Digitalisation, as a transformation process, is more than just digital infrastructure, but digital infrastructure is the prerequisite for digitalisation to occur. According to the latest data available from the Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), most households in metropolitan regions in Germany already had access to basic broadband (i.e. two megabits) in 2010, with coverages ranging between 89% to 98% approximately. In the past decade, the extension and improvement of broadband infrastructure was relatively successful in the HMR compared to other metropolitan regions in Germany: in 2010, Table 1.6's year of reference, the share of households with 2 Mbit and 50 Mbit broadband access in the HMR was 93.7% and 31.1% respectively; in 2017, the HMR reached shares of 99.6% (nearly universal broadband coverage) and 36.2% respectively, putting the HMR into a leading position amongst German metropolitan regions for high-speed Internet access (i.e. households with optic fibre connections).¹⁵

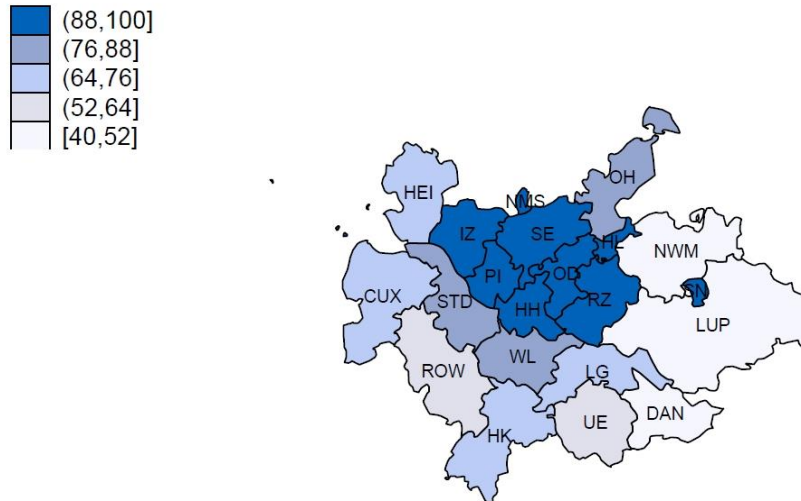
In comparison with principal comparators across the OECD, the HMR performs very favourably when it comes to basic broadband access: in 2016, Rotterdam (Netherlands) reported a share of about 95%, Copenhagen (Denmark) of about 92%, Gothenburg (Sweden) of about 89%, Boston (US) of about 83%, and Barcelona (Spain) of about 82% (OECD Regional Statistics, n.d.^[12]).¹⁶

However, this should not hide the fact that there are disparities within the HMR. Figure 1.19 shows the share of households with high-speed broadband access in 2017, using district-level data from the Federal Ministry of Transport and Digital Infrastructure, within the HMR, by constituent district.

While the urban core and the districts to the north report nearly full coverage of high-speed broadband access, more remote areas (particularly in the east) report much lower coverages, some below 60% (Nordwestmecklenburg, Lüchow-Dannenberg, and Ludwigslust-Parchim report the lowest coverages with only 52%, 51% and 45% respectively, whereas Neumünster, Hamburg and Lübeck report the highest coverages with 98%, 97% and 95% respectively). Differences in broadband access coverage may be a result of different priorities of federal states involved in the HMR, all of which follow an independent digitalisation strategy: with its *Digitale Stadt* strategy, Hamburg focuses on digital public services, whereas Lower Saxony (*Masterplan Digitalisierung*), Mecklenburg-Western Pomerania and Schleswig-Holstein focus on broadband expansion and individual digital public services. Note that undersupply of high-speed broadband

Internet access in rural areas is not a phenomenon which is exclusively observable in the HMR but, instead, a German-wide phenomenon (Wernick and Bender, 2016^[28]).

Figure 1.19. Mean coverage of broadband access over all technologies ≥ 50 Mbit/s in the HMR at the district level (%)



CUX = Cuxhaven, DAN = Lüchow-Dannenberg, HEI = Dithmarschen, HH = Hamburg, HK = Heidekreis, HL = Lübeck, IZ = Steinburg, LG = Lüneburg, LUP = Ludwigslust-Parchim, NMS = Neumünster, NWM = Nordwestmecklenburg, OD = Stormarn, OH = Ostholstein, PI = Pinneberg, ROW = Rotenburg (Wümme), RZ = Herzogtum Lauenburg, SE = Segeberg, SN = Schwerin, STD = Stade, UE = Uelzen, WL = Harburg.

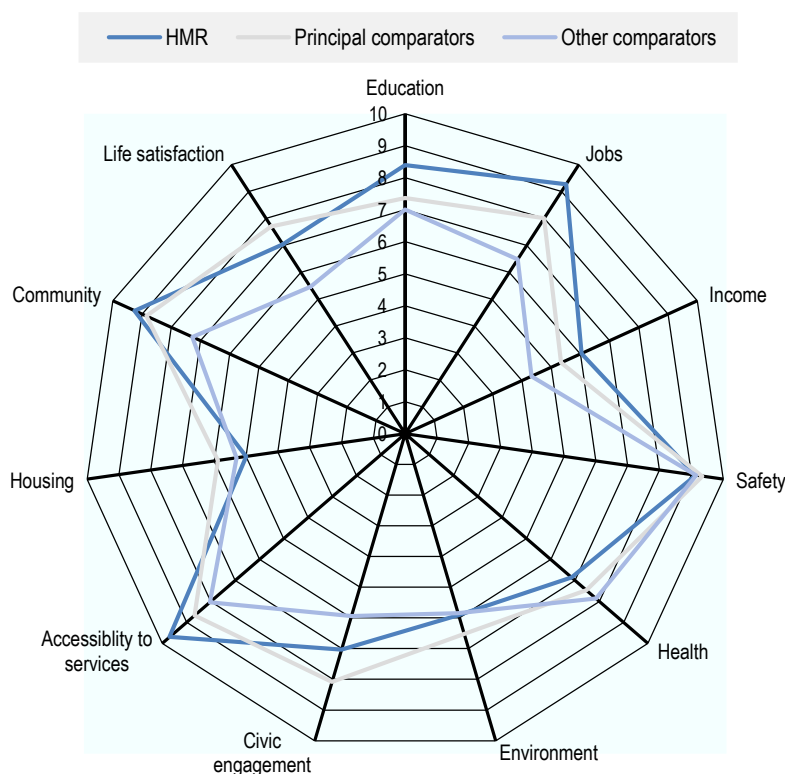
Sources: Own calculations based on Federal Ministry of Transport and Digital Infrastructure (2017^[29]), *Broadband, Glassfiber, 3G, 4G Metropolregion Hamburg*, latest available data on from 2017; Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

Digitalisation is more than just digital infrastructure: it is part of an innovation cycle in which firms design, test and implement new digital technologies into their production processes and methods. There exists no comparable data on the absorptive capacity of firms in metropolitan regions in Germany. However, lessons learned from secondary data analyses on research and development as well as innovation performance more generally can also be applied to the case of digitalisation (as a specific case of innovation): a higher share of smaller firms (with a smaller scale, and hence incentive, to fully take advantage and reap benefits of digitalisation) in a diversified (yet fragmented) economy may put the HMR at a relative disadvantage for absorptive capacity of new digital technologies, for example, relative to metropolitan regions in Southern Germany. These regions are characterised by a few large, dominant firms in research-intensive industries, which can serve as incubators (and examples) for the streamlining of new digital technologies into operations and facilitators for knowledge exchange along supply chains.

Quality of life, infrastructure and environmental sustainability

Quality of life is high

Quality of life is relatively high in the HMR and in many dimensions exceeds that in other regions across the OECD.¹⁷ Figure 1.20 plots quality-of-life data in the HMR relative to principal and other comparators across the OECD, pooled together.¹⁸

Figure 1.20. Well-being 2018: The HMR vs. metropolitan regions across the OECD

Notes: Metropolitan regions are composed of OECD TL2 regions.

Principal comparators = Barcelona (Spain), Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands). See Footnote 4 for exact compositions.

Other comparators = Athens (Greece), Birmingham (UK), Dublin (Ireland), Lisbon (Portugal), Manchester (UK), Marseille (France), Milan (Italy), Naples (Italy), Oslo (Norway), Rome (Italy), and Stockholm (Sweden). See Footnote 5 for exact compositions.

Summary scores are normalised for ease of comparison, with values ranging between zero and ten.

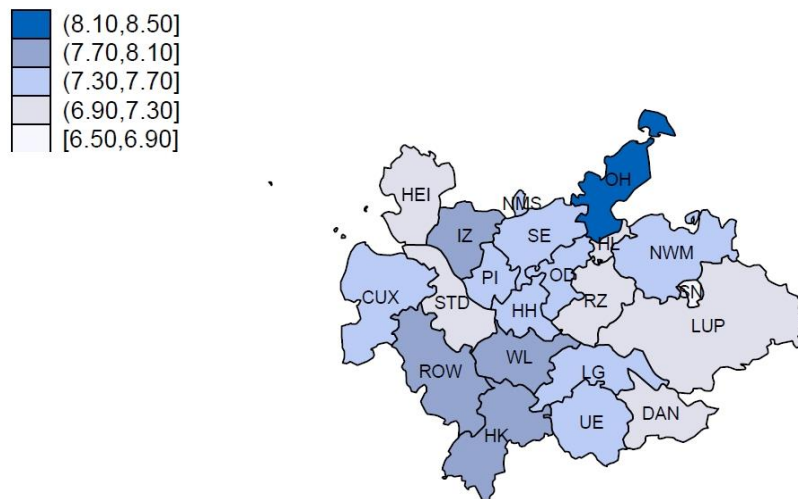
Source: Own calculations based on OECD Regional Well-Being Statistics (2018^[30]), *Regional Well-Being in Hamburg, Catalonia, Massachusetts, Copenhagen (Denmark) District, Lombardy, South Holland*, <http://www.oecdregionalwellbeing.org> (accessed on 19 December 2018), unweighted.

The HMR performs equally well or better than other comparators across the OECD when it comes to well-being. However, comparing the HMR with principal comparators, including Barcelona (Spain), Boston (US), Copenhagen (Denmark), Gothenburg (Sweden) and Rotterdam (Netherlands), a more diverse picture emerges: while the HMR does perform better on some indicators such as education, jobs, income and accessibility to services, it performs worse on others, notably the environment, housing and overall satisfaction with life. Note again that, in this analysis, the HMR is represented by the federal state of Hamburg alone, whereas other OECD TL2 regions refer to the first administrative tier of subnational governments. Thus, there seems to be room for improvement for the HMR, especially when it comes to the natural and built environment as well as, to a certain extent, overall subjective well-being of residents.

The happiest people in the region do not necessarily live in the city of Hamburg but instead live in the districts to the south of the core or in the most northern district. Figure 1.21 plots average life satisfaction in 2016 (the latest year for which comparable data at the individual

level are currently available), taken from the German Socio-Economic Panel Study (SOEP), within the HMR by constituent district. Respondents in districts in the east tend to be, on average, less satisfied with their lives than respondents in districts in the west, with some exceptions (they are below the average life satisfaction in Germany in 2016, which was about 7.4).¹⁹ Even when adjusting life satisfaction for differences in economic conditions between districts, differences in life satisfaction between constituent districts in the region remain, pointing towards other important aspects of quality of life that matter for liveability in the region. In line with the international benchmarking, three are discussed in more detail: transport, housing and environmental sustainability with its potential for tourism.

Figure 1.21. Mean life satisfaction: The HMR at the district level (0 to 10 scale)



Notes: The item on life satisfaction asks respondents: “How satisfied are you with your life, all things considered?”. Answer possibilities range from zero (“completely dissatisfied”) to ten (“completely satisfied”). CUX = Cuxhaven, DAN = Lüchow-Dannenberg, HEI = Dithmarschen, HH = Hamburg, HK = Heidekreis, HL = Lübeck, IZ = Steinburg, LG = Lüneburg, LUP = Ludwigslust-Parchim, NMS = Neumünster, NWM = Nordwestmecklenburg, OD = Stormarn, OH = Ostholstein, PI = Pinneberg, ROW = Rotenburg (Wümme), RZ = Herzogtum Lauenburg, SE = Segeberg, SN = Schwerin, STD = Stade, UE = Uelzen, WL = Harburg.

Sources: Own calculations based on SOEP (2016^[31]), *Data for Years 1984-2016, Version 32*, German Socio-Economic Panel Study, German Institute for Economic Research, Berlin, latest available data from 2016; Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

Large differences in transport and mobility within the region

There is a large number of daily commuters in the HMR (about 761 000 daily commuters, whereby 350 000 alone enter the city of Hamburg every day) and a general perception that the growth of daily commuters in recent years has not been met by growth in transport infrastructure, leading to congestion. Transport relates to productivity in the sense that transport infrastructure enables labour and capital to flow, more or less quickly, to where they are most productive. But there is also a quality-of-life aspect to transport, especially public transport: long commuting times from home to work (and back) have been shown to have a very detrimental effect on life satisfaction (Stutzer and Frey, 2008^[32]; Dickerson, Hole and Munford, 2014^[33]).

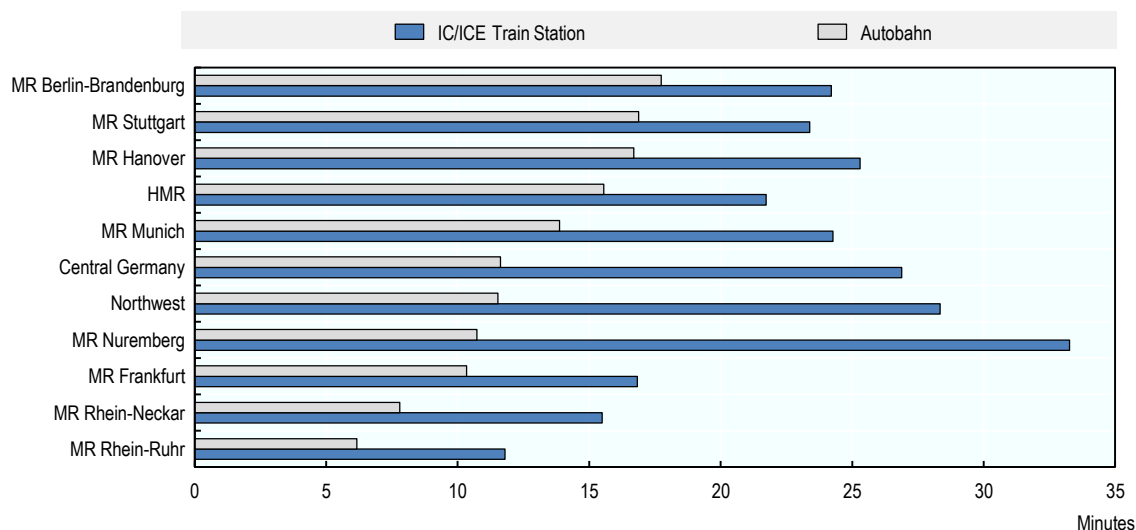
Bottlenecks may be further exacerbated by several factors such as fragmented tariff zones and structures across the region – the regional transport association, Hamburger

Verkehrsverbund (HVV), serves only part of the region, covering seven districts spread across three federal states; and competition between passenger and freight on both road and rail, especially inbound towards the harbour in the city of Hamburg. There is also a demographic component to public transport, pertaining to the difficulty of maintaining public transport services in rural areas with demographic change. Three dimensions of transport are examined in further detail below: connectivity, accessibility of public transport and congestion.

The HMR's level of connectivity resembles that of other metropolitan regions in Germany

Although there is some heterogeneity when it comes to average driving time to the nearest connection point, differences between metropolitan regions in Germany are, in general, not large. Figure 1.22 illustrates connectivity in the HMR relative to other metropolitan regions in Germany, by plotting the average driving time by car in minutes to the nearest connection point of a motorway (*Autobahn*) and an intercity or intercity express train station (IC/ICE Train Station) in 2015, the latest year for which comparable data are currently available. Some regions, especially those with higher population densities and smaller geographical areas such as MR Rhein-Neckar or MR Rhein-Ruhr, have lower average driving times than the HMR, but the HMR shows a similar overall pattern as, for example, MR Munich or MR Stuttgart. It seems that, across metropolitan regions in Germany, connectivity to train stations is worse than to motorways. Differences in connectivity, however, are not large, despite the fact that the size of geographical areas is quite different between regions.

Figure 1.22. Average driving time to the nearest access point in metropolitan regions in Germany (minutes)



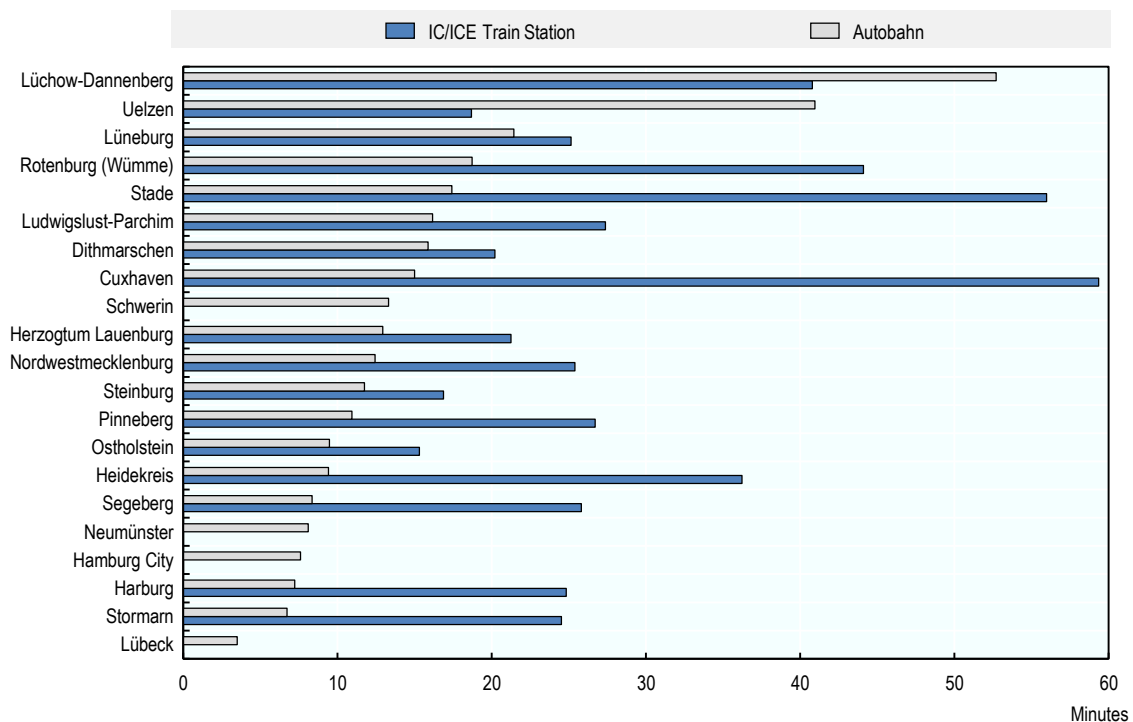
Note: Values are average driving times by car to the nearest access point in minutes. Reachability calculations of motorised individual traffic are based on route searches in a road network model. Calculations of car speeds used for different road types depends on the state of completion as well as settlement-structural and topographic conditions.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

Large differences exist within the HMR in terms of connectivity, accessibility of public transport and congestion

More pronounced, however, are differences in connectivity between districts within the HMR. Figure 1.23 plots the average driving time by car in minutes to the same connection points by district. Note that, unfortunately, no calculations are available for unitary cities. The general pattern – train stations being less well connected than motorways – that is observable between metropolitan regions in Germany, is also observable within the HMR itself, with few exceptions. There are large discrepancies in connectivity to train stations between districts, with districts such as Cuxhaven, Stade or Rotenburg (Wümme) showing long average driving times of more than 40 minutes (59, 56 and 44 minutes respectively), almost or more than twice as much as average (26 minutes). Lüchow-Dannenberg, one of the most eastern districts in the region, also shows a long average driving time to the nearest motorway connection point (53 minutes, with an average of 13 minutes).

Figure 1.23. Average driving time to the nearest access point in the HMR at the district level (minutes)



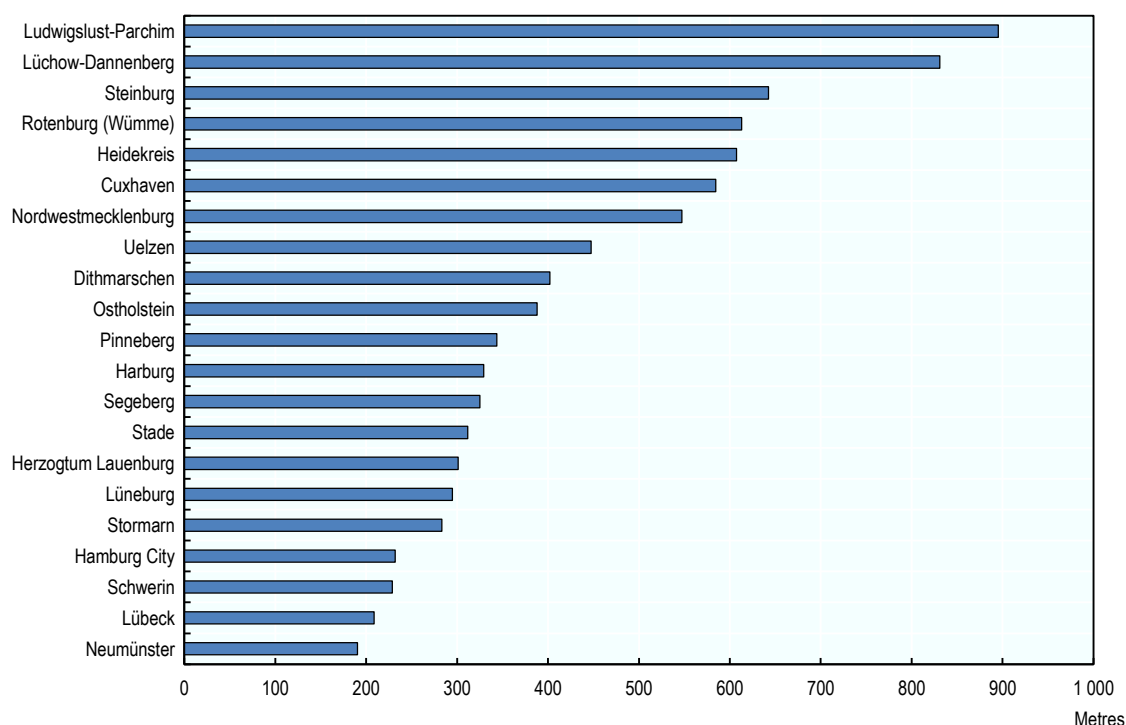
Note: Values are average driving times by car to the nearest access point in minutes. Reachability calculations of motorised individual traffic are based on route searches in a road network model. Calculations of car speeds used for different road types depends on the state of completion as well as settlement-structural and topographic conditions. No driving-time calculations are available for unitary cities.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

So far, average driving time to the nearest connection point of a motorway and intercity or intercity express train station was measured by driving time in a *personal* vehicle. Large differences within the HMR, however, also exist when looking at average distances to the

nearest public transport stop. Figure 1.24 plots the population-weighted average linear distance (which implies that the actual, non-linear distance is slightly longer) to the nearest public transport stop with at least ten departures per day at the district level within the HMR. Districts can be broadly categorised into those having a public transport stop in less than 400 metres, between 400 and 600 metres, and in more than 600 metres of distance to places of residence. The largest distance can be found in Ludwigslust-Parchim, a district in the eastern part of the region (about 895 metres), the smallest in Neumünster, a district in the northern part (about 191 metres). The average distance is approximately 429 metres. For wider, rural areas where regular public transport services may prove difficult to sustain, novel concepts in the area of on-demand public transport (for example, ride-sharing or call bus systems, which are already operating in the districts of Ludwigslust-Parchim and Nordwestmecklenburg) may be an alternative to uphold services.

Figure 1.24. Average distance to the nearest public transport stop in the HMR at the district level (metres)



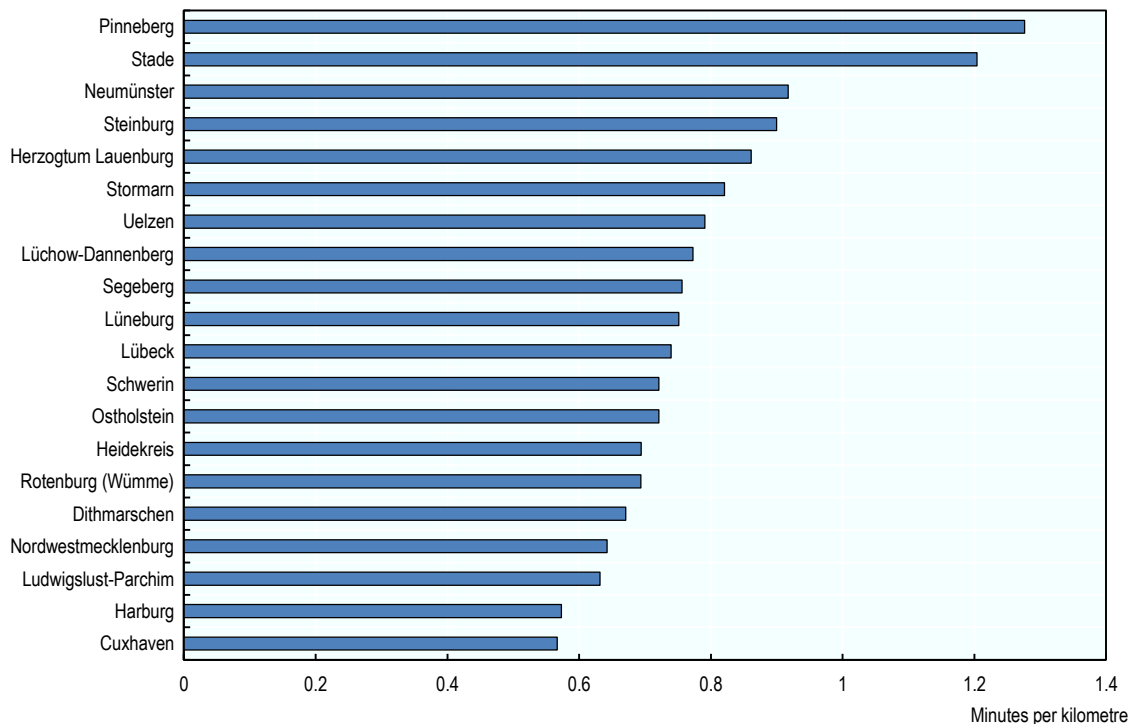
Note: Population-weighted Euclidean distance in metres to the nearest public transport stop according to publicly available timetable query. Only stops with at least ten departures per day are considered.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

A final way to look at transport in the region is congestion. There seems to be a tendency for relative travel time to increase in proximity to the urban core. This tendency, however, is unevenly distributed: districts in the west of the urban core show relatively higher congestion than others. Figure 1.25 plots coefficients for relative travel time by car under respective, normal traffic conditions (as of December 2018) from the centroids (i.e. geographical midpoints) of the different constituent districts of the HMR to the city of Hamburg, reflecting average commuting behaviour in a monocentric region from the

second and first ring towards the urban core. Coefficients for relative travel time are measured in minutes per kilometre, i.e. dividing travel time in minutes by travel distance in kilometres. Districts are then ranked from highest to lowest coefficient. There is a discrete jump in relative travel time from Neumünster, a district in the northern part of the region, to Pinneberg and Stade, which are two districts to the west of the urban core. As distance to the urban core (the denominator) is low for adjacent districts, a higher travel time (the nominator) under normal traffic conditions from close-by districts to the urban core must be driving the coefficients of relative travel time to the city of Hamburg. This is especially true for Pinneberg and Stade; other districts adjacent to the urban core such as, for example, Harburg or Lüneburg, show lower relative travel time.²⁰ Congestion, therefore, is affecting some districts adjacent to the urban core more strongly than others.

Figure 1.25. Travel time to the city of Hamburg (centroid) from districts (centroids) in minutes per kilometre



Note: Values are relative travel times from geographical centroids (midpoints) of districts to geographical centroids (midpoints) of the city of Hamburg in minutes (travel time) per kilometre (travel distance, i.e. not Euclidean distance) under respective, normal traffic conditions. Calculations are based on “HERE” API.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d._[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

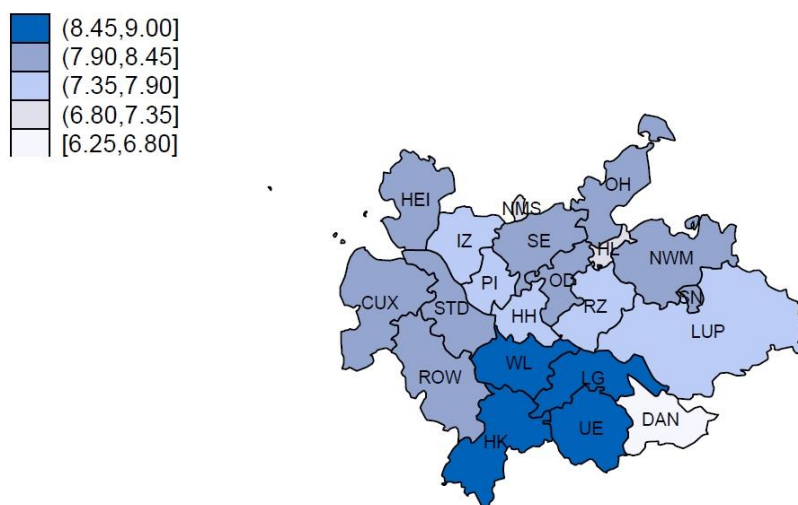
This congestion analysis highlights the importance of co-ordinating traffic management around the core with close-by districts and, potentially, of developing joint steering and infrastructure concepts (as is being done in other metropolitan regions in Germany such as MR Central Germany, MR Rhein-Neckar or MR Rhein-Ruhr). Integrating transport infrastructure into (ideally joint) city and urban planning – possibly developed in parallel with novel, digital technologies for traffic and mobility management where infrastructure already exists – becomes even more important as large infrastructure projects, such as the

Fehmarn-Belt (which connects regions), have traffic externalities that affect several stakeholders simultaneously and require co-ordination across administrative boundaries. Finally, the circumventions of the city of Hamburg is promising to reduce bottlenecks in passenger transportation and freight around the urban core of the region in the longer term but is unlikely to be realised quickly because of relatively long planning processes in Germany.

A rising demand for housing remains partly unmet

Where people settle and how they live is a major determinant of overall quality of life in a region. Over the last decade, affordable housing and floor space more generally, has become an important issue in urban regions in Germany, including the HMR. There is a fair amount of heterogeneity when it comes to satisfaction with housing within the HMR, with residents living in southern districts reporting, on average, higher satisfaction with housing than those living in other districts, including the urban core.²¹ Figure 1.26 plots average satisfaction with housing in 2016, obtained from the German Socio-Economic Panel Study (SOEP), within the HMR at the district level. Residents report to be most satisfied in Heidekreis (about 8.8 out of 10), the most southern district in the region; and least satisfied in Lüchow-Dannenberg (about 6.6). With a score of 7.8, residents in the city of Hamburg are as satisfied with their housing as people in Germany on average.

Figure 1.26. Mean housing satisfaction in the HMR at the district level (0 to 10 scale)



Notes: The item asks respondents: “How satisfied are you with your place of dwelling?”, with response options ranging from zero (“totally unhappy”) to ten (“totally happy”).

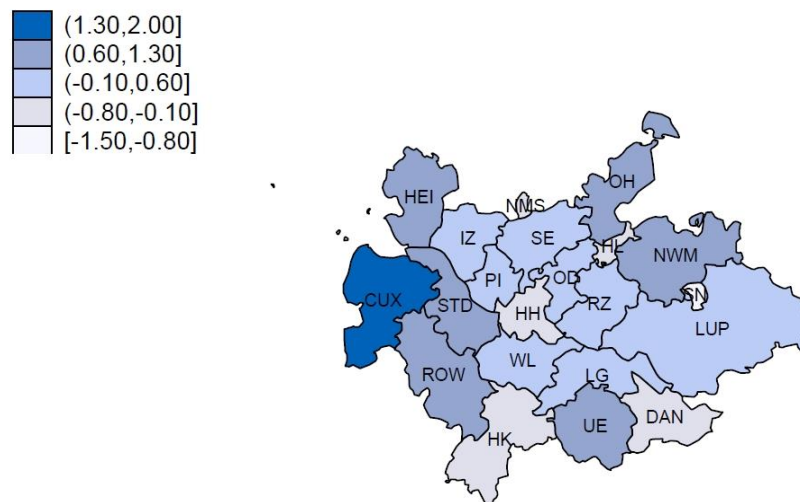
CUX = Cuxhaven, DAN = Lüchow-Dannenberg, HEI = Dithmarschen, HH = Hamburg, HK = Heidekreis, HL = Lübeck, IZ = Steinburg, LG = Lüneburg, LUP = Ludwigslust-Parchim, NMS = Neumünster, NWM = Nordwestmecklenburg, OD = Stormarn, OH = Ostholstein, PI = Pinneberg, ROW = Rotenburg (Wümme), RZ = Herzogtum Lauenburg, SE = Segeberg, SN = Schwerin, STD = Stade, UE = Uelzen, WL = Harburg.

Source: Own calculations based on SOEP (2016^[31]), *Data for Years 1984-2016, Version 32*, German Socio-Economic Panel Study, German Institute for Economic Research, Berlin, latest available data from 2016; Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

An increasing demand for floor space remains partly unmet

During the years 2011 to 2015, there has been quite some change in the amount of floor space, defined as the total developed area in both residential and non-residential dwellings in square metres, available per resident. Figure 1.27 shows that, while districts in the wider second ring of the HMR, especially those in the west and northeast, have increased the amount of floor space available per resident, districts in or around its urban core have seen either only a small increase or, as with the city of Hamburg and some districts in the south, even a decline. The largest increase in floor space was in Cuxhaven (about 1.5%), the largest decrease in Schwerin (-1.4%). This is interesting against the fact that the housing market forecast for 2015 to 2030 – based on population growth as well as patterns of demographic change and migration – by the Federal Institute for Research on Building, Urban Affairs and Spatial Development identifies districts in and around the urban core as those with the highest future increase in demand for floor space. Figure 1.28 shows this prognosis for the percentage change in demand for floor space available per resident overall.

Figure 1.27. Change in floor space in square metres per resident 2011-15 (%)

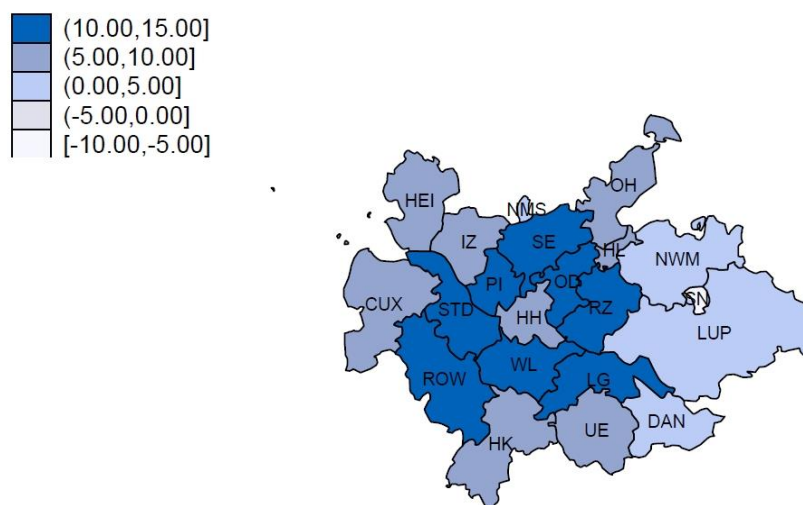


Notes: Percentage change in floor space between 2011 and 2015 in both residential and non-residential dwellings available per resident in square metres.

CUX = Cuxhaven, DAN = Lüchow-Dannenberg, HEI = Dithmarschen, HH = Hamburg, HK = Heidekreis, HL = Lübeck, IZ = Steinburg, LG = Lüneburg, LUP = Ludwigslust-Parchim, NMS = Neumünster, NWM = Nordwestmecklenburg, OD = Stormarn, OH = Ostholstein, PI = Pinneberg, ROW = Rotenburg (Wümme), RZ = Herzogtum Lauenburg, SE = Segeberg, SN = Schwerin, STD = Stade, UE = Uelzen, WL = Harburg.

Sources: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), latest available data at the district level from 2015; Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

Figure 1.28. Forecasted change in demand for floor space in square metres per resident 2015-30 (%)



Notes: Forecasted percentage change in floor space between 2015 and 2030 in both residential and non-residential dwellings available per resident in square metres.

CUX = Cuxhaven, DAN = Lüchow-Dannenberg, HEI = Dithmarschen, HH = Hamburg, HK = Heidekreis, HL = Lübeck, IZ = Steinburg, LG = Lüneburg, LUP = Ludwigslust-Parchim, NMS = Neumünster, NWM = Nordwestmecklenburg, OD = Stormarn, OH = Ostholstein, PI = Pinneberg, ROW = Rotenburg (Wümme), RZ = Herzogtum Lauenburg, SE = Segeberg, SN = Schwerin, STD = Stade, UE = Uelzen, WL = Harburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015; Institute for Cartography and Geodesy (2016^[21]), *Verwaltungsgebiete 1:250,000*.

As can be seen, during the period 2015 to 2030, demand for floor space available per resident overall is forecasted to increase between 12% and 15% in the first ring around the urban core (more so than in the urban core itself), which is where floor space increased only modestly during the period 2011 to 2015. While demand for single-family houses seems to be rising across the HMR in the future, demand for apartment buildings seems to be increasing in and around its urban core but decreasing at its fringes. Districts in the north of the city of Hamburg are forecasted to show the strongest percentage increase in the demand for single-family houses, whereas districts in its south (including the city of Hamburg itself) are forecasted to have the strongest percentage increase in the demand for apartment buildings.

Spatial demand mismatches and management

If the planning system does not respond to changing patterns of demand, unmet future demand for space and housing in the HMR can have three implications:

1. It is likely to increase competition between different types of land use (such as housing, commercial, industrial or public open space) for the same space, thereby increasing its price.

2. Lack of space for industrial real estate and for commercial developments, or a prohibitive price for each of them (resulting from increased competition), is likely to put the HMR at a disadvantage relative to other regions in Germany and across the OECD.
3. A lack of affordable housing is likely to increase the number of commuters towards the urban core. Pertaining to this final point, besides highlighting the importance of joint planning of housing and transport infrastructure, it advocates for adequate long-term planning to ensure availability of affordable housing in the urban core of the region and its adjacent districts; residential floor space needs to be provided where long-term demand will be. Finally, competition over space may be reduced by developing novel residential housing concepts (for example, building more densely) or changing the nature of existing residential housing in and around the urban core.

Spatial planning needs to adapt to increasing demand for floor space and enable additional housing supply and greenfield development in areas where long-term demand will be. Issues of spatial demand mismatches and management are exacerbated by spatial planning occurring at different administrative levels and with different regulations in the four constituent federal states of the HMR, which, despite a spatial planning framework in the HMR as a whole, have different spatial planning strategies. While Hamburg and Schleswig-Holstein have one spatial planning body each at the state level, Mecklenburg-Western Pomerania has several regional planning associations (*Regionale Planungsverbände*); Lower Saxony, on the contrary, leaves regional planning entirely to the discretion of districts (8 of the 20 constituent districts of the HMR are part of Lower Saxony). Moreover, each federal state has a separate spatial planning strategy and follows a different concept. Joint spatial planning of transport and housing infrastructure that goes beyond voluntary participation – for example, as has been implemented in MR Rhein-Neckar with its joint planning association – or the arbitration of spatial planning via the HMR, is promising to reduce spatial demand mismatches in the future.

A diverse natural environment

The natural environment is an important capital endowment for the HMR. Being one of the largest metropolitan regions in Germany but also one of the least populated, the natural environment in the wider second ring beyond its urban core is likely to play an important role for the everyday quality of life of people living in the region.

The HMR has a diverse natural environment: it ranks second after MR Berlin-Brandenburg (which is the largest metropolitan region in Germany by total area size) when it comes to open space per resident in square metres, defined as non-developed area including, for example, agricultural, recreational, forest and water areas (Federal Institute for Research on Building, Urban Affairs and Spatial Development, n.d.^[10]). When it comes to these different subtypes of land use, a diverse picture emerges: except for water areas per resident in square metres, where the HMR again ranks second after MR Berlin-Brandenburg, the region takes a midfield position when it comes to the other types – recreational, close-to-nature, forest and water areas – suggesting that not a single type of land use dominates the region but a diversity of types prevail. Such landscape diversity has been shown to be positively related to life satisfaction of residents in their surroundings (Kopmann and Rehdanz, 2013^[34]). Note, however, that metropolitan regions in Germany differ quite substantially in size and location (including surrounding areas), rendering comparisons of natural endowments between regions difficult.

The HMR takes a midfield position for recreational areas per resident in square metres, including green spaces, parks, sports and leisure areas; for close-to-nature areas, including moors, heathers, and areas covered by rocks and dunes; and for forests. When it comes to water, the HMR also ranks second after MR Berlin-Brandenburg, which has the most water areas within its boundaries. The diversity of the HMR's natural environment is also reflected in the fact that five UNESCO Biosphere Reserves are located within the HMR: Flusslandschaft Elbe, Hamburgisches Wattenmeer, Niedersächsisches Wattenmeer, Schaalsee and Schleswig-Holsteinisches Wattenmeer und Halligen, with two (Hamburgisches Wattenmeer and Schaalsee) being located entirely within the HMR and the remainder in part (UNESCO, n.d.^[35]). Such biosphere reserves do not only play an important role in preserving biodiversity but can also provide an example for sustainable living in the region and be economically-relevant, natural capital endowments as they provide recreational green areas and areas for research and education. Hamburgisches Wattenmeer, Niedersächsisches Wattenmeer and Schleswig-Holsteinisches Wattenmeer und Halligen are already top tourist destinations; Flusslandschaft Elbe and Schaalsee, which are situated in the wider second ring of the HMR, have the potential to become so in the future, both qualitatively and quantitatively in terms of number of tourists (for example, for sustainable environmental tourism).

Highly attractive for tourism but differences within region persist

Holding several UNESCO World Heritage Sites (Altstadt Wismar, Hansestadt Lübeck, Wattenmeer and Hamburg's Speicherstadt and Kontorhausviertel with Chilehaus), the HMR is a very attractive tourist destination. With about 43.9 beds per 1 000 residents, the HMR leads the table of metropolitan regions, followed closely by Northwest (about 42.3), MR Hanover (about 40.6), MR Munich (about 39.4) and MR Berlin-Brandenburg (about 36.8). Table 1.7 shows the performance of the HMR relative to other metropolitan regions in Germany when it comes to tourism, measured in terms of beds in tourism establishments per 1 000 residents (as a supply-side component of tourism) and overnight stays in tourism establishments per resident (as a demand-side component) in 2015, including rates of change during the period 2011 to 2015. It also shows the shares of foreigners in overnight stays in percentage (as an item measuring the international reputation of a tourism destination and recognisability of a brand) and the average number of overnight stays *per trip* in tourism establishments (as an item measuring the intensive margin of tourism). Although MR Berlin-Brandenburg and Northwest have grown the fastest when it comes to beds in tourism establishments during the period 2011 to 2015 (about 5.7% and 5.6% respectively), the HMR – which comes from a higher baseline level – has also experienced moderate growth in this supply-side measure (about 3.4%) during that time.

Table 1.7. Tourism in metropolitan regions in Germany

	Beds per 1 000 residents	Change 2011-15 (%)	Overnight stays per resident	Change 2011-15 (%)	Share of foreigners in overnight stays (%)	Average number of overnight stays per trip
HMR	43.9	3.40	6.4	12	14.8	2.6
Berlin-Brandenburg	36.8	5.60	7.1	17	29.7	2.6
Northwest	42.3	5.70	4.6	9.00	11.4	2.8
Frankfurt	34.2	-0.40	4.8	8.00	21.1	2.3

	Beds per 1 000 residents	Change 2011-15 (%)	Overnight stays per resident	Change 2011-15 (%)	Share of foreigners in overnight stays (%)	Average number of overnight stays per trip
Hanover	40.6	3	4.4	7.60	15.3	2.4
Central Germany	22	3.60	3.1	13	11.6	2.2
Munich	39.4	0.50	6.8	11	25.7	2.3
Nuremberg	30	-2.80	4.2	4.10	17.3	2.3
Rhein-Neckar	27.8	0.10	3.8	13	19.2	2.2
Rhein-Ruhr	14.9	2.90	2.4	8.70	19.6	2
Stuttgart	26	3.10	3.4	13	19.6	2.3

Notes: Beds and overnight stays refer to tourism establishments with at least ten beds. Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), latest available data at the district level from 2015.

However, not all parts of the HMR are benefitting equally from tourism: its urban core and adjacent districts, as well as more urban areas, are profiting particularly. While the city of Hamburg and districts adjacent to the urban core as well as more urban areas experienced growth in the supply of beds in tourism establishments, defined as establishments with at least ten beds, more rural regions actually experienced a decline, as show in Figure 1.29.

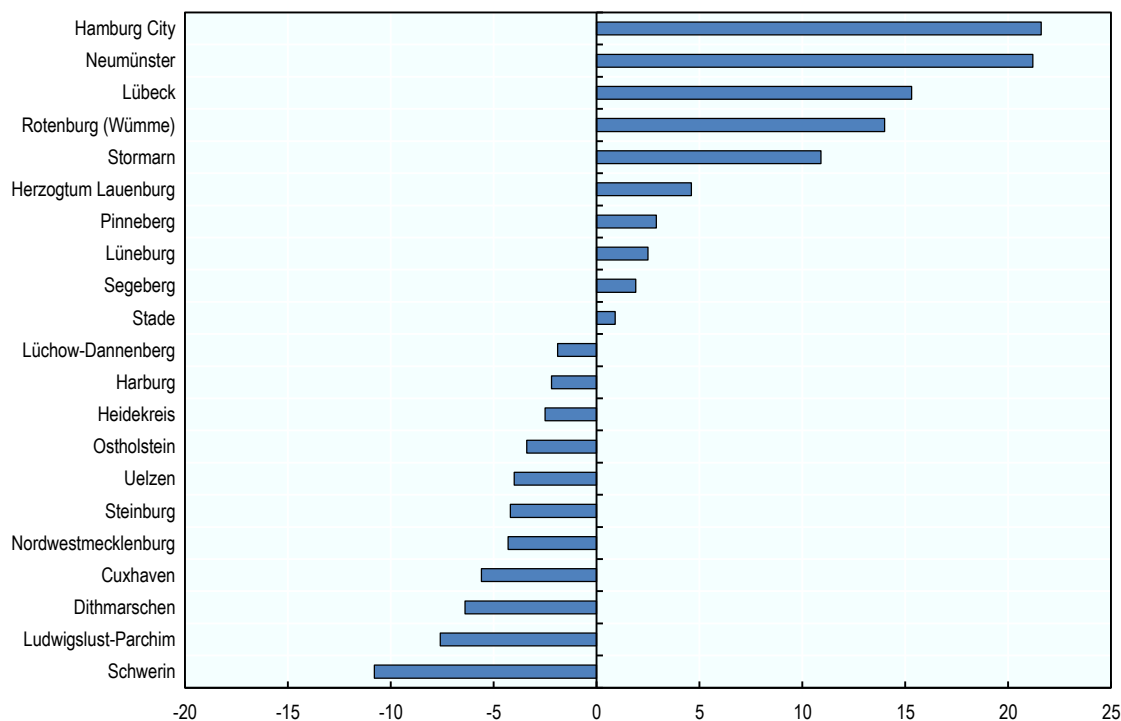
This divergence may be further exacerbated by different tourism strategies in each of the four federal states which constitute the HMR, including the lack of a coherent joint marketing strategy for the HMR as a whole and the lack of a joint tourism strategy that connects the urban core to the remainder of the region.

It should be noted that the official statistics on tourism may conceal tourist hotspots within the HMR: first, some of the region's most successful tourist destinations are located at the coasts of the North and Baltic Seas and thus in more peripheral, rural regions; although these hotspots attract a considerable number of tourists every year, the official statistics on tourism conceal this fact as the districts in which these tourist hotspots are located are much larger and the remaining parts of these districts less successful in attracting tourists. Second, the official statistics on tourism only count tourists in establishments with at least ten beds; there is a considerable number of smaller establishments in the region and these smaller establishments are often located in more rural areas. Finally, the official statistics exclude campsites, which are similarly more often located in rural areas, for example, close to the North and Baltic Seas. Figures presented here, therefore, likely underestimate the tourism potential in rural areas of the region.

Despite having the highest supply of beds, the HMR does not appear to realise the highest demand for overnight stays, although it is not too far off matching supply with demand in tourism. Table 1.7 shows that MR Berlin-Brandenburg clearly outperforms all other metropolitan regions in Germany when it comes to the number of overnight stays in tourism establishments as a demand-side measure: it leads the table for level (about 7.1 overnight stays per resident in 2015) and for growth (about 16.6% increase during the period 2011 to 2015). With about 6.4 overnight stays per resident in 2015, the HMR ranks third and is not too far behind MR Munich in second place (about 6.8%). The HMR and MR Munich also

experienced similar growth rates during the period between 2011 and 2015 (about 11.7% and 10.5% respectively).

Figure 1.29. Change in beds in tourist establishments in the HMR at the district level 2011-15 (%)



Note: Changes in beds in tourist establishments that can host at least ten guests temporarily, excluding campsites.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

The HMR performs worse in terms of international guests: with a share of foreigners in overnight stays of only about 14.8% in 2015, the HMR ranks 9th out of 11 metropolitan regions in Germany, being outperformed by all other regions except Central Germany (about 11.6%) and Northwest (about 11.4%). The top-performer is clearly MR Berlin-Brandenburg where almost every third overnight guest in 2015 came from abroad. However, the new concert hall in Hamburg (*Elbphilharmonie*) has given the HMR a lot of international exposure and can help significantly enhance the metropolitan region's attractiveness as an international tourist destination. The enhanced international recognition of Hamburg can also generate future positive trickle-down effects for international tourism in the neighbouring federal states, both within and outside of the HMR.

Institutional framework

Besides differences in the administrative structure between metropolitan regions, differences in terms of organisation and competencies are also important. In collaboration

with the HMR office, a survey was, therefore, sent to the offices of the remaining ten metropolitan regions in Germany, asking about their legal status, organisation and budget, and strategic co-operation between participating bodies and stakeholders in various policy domains. Table 1.8 shows the findings of this survey as of April 2019. Metropolitan regions in Germany vary when it comes to legal status and, in particular, organisation and budget as well as the extent of strategic co-operation between participating bodies and stakeholders.

- Seven out of 12 metropolitan regions (for this exercise, we count MR Rheinland and MR Ruhr, both of which are part of MR Rhein-Ruhr, separately), including the HMR, have a legal mandate, which is given to them in all cases by state treaty. A legal mandate enshrined into state law, however, is not exclusive to those metropolitan regions that span more than one federal state: MR Ruhr and MR Stuttgart are nested respectively within a single federal state but are given its legal mandate by state treaty. When it comes to legal form, many metropolitan regions in Germany are organised as registered associations. There are, however, some exceptions: while the HMR does not have any legal form, MR Central Germany and MR Rhein-Neckar are organised as limited companies; MR Stuttgart is a corporation under public law.
- Eleven out of 12 metropolitan regions, including the HMR, have a central governing body (only MR Rheinland has none): in most cases, it is composed of representatives of stakeholders and determined by a general assembly. MR Stuttgart is a notable exception: the central governing body is composed of regional deputies who are directly elected by the citizens within the region. In MR Frankfurt, the central governing body is composed of municipal representatives. Not every central governing body, however, is able to set its own rules.

The organisational capacities, measured in terms of full-time, part-time and voluntary staff differ substantially between regions. While MR Rheinland has only 5 (full-time) staff, MR Ruhr has about 451 (327 full-time and 124 part-time); MR Frankfurt, the second largest region in terms of the overall number of staff, has 116 full-time and 32 part-time staff; the HMR has 7 full-time and 6 part-time. The median number of paid staff is 19. Not all staff are paid by own resources, which is especially the case for the HMR (where almost all staff are paid by external sources) and, to a lesser extent, MR Nuremberg.

Stark differences in staffing are also reflected in differences in budgeting. While all metropolitan regions in Germany do have their own budget, with a budget cycle of one year in most cases (exceptions are MR Berlin-Brandenburg and MR Frankfurt, where budget is set for two years), budget amounts vary substantially. While MR Stuttgart and MR Ruhr have a budget of about EUR 350 million and EUR 90 million respectively, most other regions have budgets below EUR 10 million (with the exception of MR Frankfurt, which has a budget of about EUR 15 million). The HMR has a budget of about EUR 0.4 million. The mean budget is about EUR 43 million, the median about EUR 4.7 million. All regions state that they are able to obtain additional funding, mostly from the EU (Interreg, Horizon 2020, European Regional Development Fund [ERDF], European Social Fund [ESF], and Connecting Europe Facility [CEF]) and from the private sector or federal states.

Differences in organisational capacities, staffing and budgets can be explained by the fact that some regions have sovereign competencies, including planning and operating public services (such as public transport in case of Stuttgart). When it comes to budget, differences

can be explained by the financial involvement of the federal states or stakeholders from the private sector (for example, enterprises).

Joint strategies between participating bodies and stakeholders in metropolitan regions can be in place in various policy domains and at different levels. The survey asked, in particular, about joint strategies in 15 key domains, namely economic development, urban and spatial planning, housing and infrastructure, transportation, education, health services, social services and welfare, demographic change, environment, innovation, digitalisation, tourism, culture, marketing and budget and finance.

Most metropolitan regions in Germany have joint strategies in place in various policy domains. Most strategies can be found in MR Rhein-Neckar, which has them in place in all key domains above, followed by MR Ruhr (12 out of 15 domains) and MR Stuttgart (11). On the other hand, no joint strategies at all can be found in the HMR, MR Central Germany and MR Northwest. Note that the absence of a joint strategy does not necessarily mean that there is no co-operation: in fact, in the HMR, there is co-operation on various topical issues and at various levels, although it is not officially mandated in a legally binding joint strategy document. In the HMR, business development, tourism and transportation are mixed competencies (federal states, county districts and unitary districts); marketing is a shared competency between the federal state of Hamburg and surrounding districts. Ultimately, mandated joint strategies within a region may enhance co-operation between neighbouring metropolitan regions, which may be beneficial to enhance each other's innovativeness, competitiveness and global visibility.

The average number of joint strategies across metropolitan regions in Germany is in 6 out of 15 possible policy domains. Most joint strategies can be found when it comes to transportation, the environment, culture and marketing (7 out of 12 regions have joint strategies in place in these domains), followed by economic development and urban/spatial planning (6 regions). On the other hand, only a small number of regions show joint strategies in the areas of health (two regions) and social services/welfare (only one region has a joint strategy in place). Finally, it is important to note that not all joint strategies are legally mandated: for example, in MR Rhein-Neckar, which has most joint strategies in place, only about half of them are mandated by state treaty; the remainder is voluntary.

Table 1.8. Organisation and competencies of metropolitan regions in Germany

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
Legal mandate (yes/no)	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No	Yes
if yes, legal basis for co-operation (e.g. state treaty)	State treaty	State treaty	State treaty	State law					State treaty	Legal basis		State treaty
Legal form (e.g. limited company)	No	Public admin./joint department (?)	Registered association	Public body	Limited company (various company partners; private, public)	Association /limited company	Registered association	Registered association	Limited company (various company partners; private, public)	Public admin.	Registered association	Corporation under public law
Central governing body (yes/no)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
if yes, determined/elected by (e.g. federal state)		State treaty	General assembly		Shareholders' meeting/ Supervisory board/Parliamentary advisory board	General assembly	General assembly		General assembly	Regional assembly		Elected by citizens
if yes, composed of (e.g. municipality representatives)	Reps. of stakeholders	Reps. of federal states	State reps., district reps., reps. of the economic sector	Municipal reps.	Reps. of stakeholders	Reps. of stakeholders	Reps. of stakeholders	Municipal reps.	Reps. of general assembly	Municipal reps.		Directly elected regional deputies
Ability to set own governing rules (yes/no)	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	No	Yes

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
if no, governing rules set by (e.g. federal state)			Federal states			Federal states	Federal state				Stakeholders	
Number of full-time staff	7	70	4	116	14	11	4	17	73	327	5	98
of which paid by own resources (= from own budget)	0	70	3.00	113	4	5	4	10	0	313	5	97
of which paid by other resources (by stakeholders, incl. "Entsendeprinzip")	7	0	1	3	10	6	0	7	0	14	0	1
Number of part-time staff	6	0	4	32	2	3	3	12	0	124	0	42
of which paid by own resources (= from own budget)	1	0	4	32	0	3	3	2	0	122	0	40
of which paid by other resources (=by stakeholders, incl. "Entsendeprinzip")	5	0	0	0	4	0	0	8	0	2	0	2
Number of voluntary staff	0	0	0	25	0	0	0	0	0	2	0	8
Total number of paid staff	13	70	6	132	15	12.5	5.5	23	73	453	5	119

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
Own budget (yes/no)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
if yes, budget amount (EUR million)	0.44	(?)	0.65	15.0	2.2	0.7	0.7	2.2	9.0 (VRRN + MRN GmbH)	90.0	1.0	349.4
if yes, budget cycle (years)	1	2	1	2	1	1	1	1	1	1	1	1
if yes, determined by (e.g. federal state)	Stakeholders	Federal states	Steering Committee	Parliamentary chamber	Shareholders' meeting/ Supervisory board Parliamentary advisory board	Association fees	Regional management	Membership fees, project funding (state and federal)	General assembly, company meeting	Regional assembly	Members	Regional assembly
Other financial resources (EUR million)	2.7	> 0	0	> 0	0	0.9	0.6	0.7	0	10.0	0	> 0
if > 0, by whom (e.g. private sector)	Federal States	EU Interreg, others		EU Interreg, Horizon 2020	EU, federal states, private sector	Private sector, federal states	Private sector	Private sector	Private sector, EFRD, EU Interreg, ESF, CEF	EU funds, federal gvt., federal states		EU, federal state, private sector
Joint strategy for...												
... economic development (yes/no)	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
if yes, mandated or voluntary					Voluntary		Voluntary	Voluntary	Mandated	Mandated (legal task)		Mandated
if no, which administrative level	Federal states	Federal states	Districts, district-free cities	Federal states, districts, cities		Federal states, districts, cities						
... (urban/spatial) planning (yes/no)	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	No	Yes
if yes, mandated or voluntary		Mandated		Mandated				Voluntary		Mandated		Mandated
if no, which administrative level	Federal state, districts, wards		Federal states, districts, district-free cities		Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				
... housing/ infrastructure (yes/no)	No	No	No	Yes	No	No	No	No	Yes	Yes	No	Yes
if yes, mandated or voluntary					Voluntary				Mandated	Mandated (legal task)		Mandated
if no, which administrative level	Federal states	Federal states	Federal states, districts, district-free cities		Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				
... transportation (yes/no)	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
if yes, mandated or voluntary		Mandated		Voluntary				Voluntary	Mandated	Mandated (legal task)	Voluntary	Mandated

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
if no, which administrative level	Federal states, districts, district-free cities		Federal states, districts, district-free cities		Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				
... education (yes/no)	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No
if yes, mandated or voluntary								Voluntary	Voluntary	Mandated (legal task)	Voluntary	
if no, which administrative level	Federal states	Federal states	Federal states	Federal states	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				Federal state
... health services (yes/no)	No	Yes	No	No	No	No	No	No	Yes	No	No	No
if yes, mandated or voluntary		Federal states							Voluntary			
if no, which administrative level	Federal states	Federal states	Federal states	Federal states, districts, cities	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities		Federal states, districts, cities		Districts
... social services/welfare (yes/no)	No	No	No	No	No	No	No	No	Yes	No	No	No
if yes, mandated or voluntary									Voluntary			
if no, which administrative level	Federal states	Federal states	Federal states, districts, district-free cities	Federal states, districts, cities	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities		Federal states, districts, cities		Districts, municipalities

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
... demographic change (yes/no)	No	Yes	No	No	No	No	No	No	Yes	Yes	No	No
if yes, mandated or voluntary		Mandated							Voluntary	Mandated		
if no, which administrative level	Federal states, districts, district-free cities		Federal states, districts, district-free cities	Federal states, districts, cities	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				Federal state
... environment (yes/no)	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
if yes, mandated or voluntary				Mandated	Voluntary		Voluntary	Voluntary	Mandated	Mandated (legal task)		Mandated
if no, which administrative level	Federal states	Federal states, regions, municipalities	Federal states			Federal states, districts, cities						
... innovation (yes/no)	No	Yes	No	No	No	No	No	Yes	Yes	Yes	No	Yes
if yes, mandated or voluntary		Voluntary						Voluntary	Voluntary	Mandated		Mandatory
if no, which administrative level	Federal states		Federal states	Federal states	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities					
... digitalisation (yes/no)	No	No	No	Yes	No	No	No	No	Yes	Yes	Yes	Yes
if yes, mandated or voluntary				Voluntary					Voluntary	Mandated	Voluntary	Voluntary

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
if no, which administrative level	Federal states	Federal States	Federal states		Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				
... tourism (yes/no)	No	No	No	No	No	No	No	Yes	Yes	Yes	No	Yes
if yes, mandated or voluntary								Voluntary	Mandated	Mandated (legal task)		Mandated
if no, which administrative level	Federal states	Regions, counties, municipalities	Federal states	Federal states, districts, cities	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				
... culture (yes/no)	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
if yes, mandated or voluntary					Voluntary		Voluntary	Voluntary	Mandated	Mandated (legal task)	Voluntary	Voluntary
if no, which administrative level	Federal states	Federal states, counties, municipalities	Federal states	Federal states, districts, cities		Federal states, districts, cities						
... marketing (yes/no)	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
if yes, mandated or voluntary					Voluntary		Voluntary	Voluntary	Mandated	Mandated (legal task)	Voluntary	Mandated
if no, which administrative level	Federal states		Federal states	Federal states, districts, counties		Federal states, districts, counties						
... budget/finance (yes/no)	No	Yes	No	No	No	No	No	No	Yes	No		Yes

	HMR	Berlin-Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Ruhr (Part of Rhein-Ruhr)	Rheinland (Part of Rhein-Ruhr)	Stuttgart
if yes, mandated or voluntary		Mandated for Joint Spatial Planning, diverse other State Contracts for Joint Boards							Mandated			
if no, which administrative level	Federal states	Diverse by Federal states	Federal states	Federal states, districts, cities	Federal state, districts, cities	Federal states, districts, cities	Federal state, districts, cities	Federal state, districts, cities				
Column Total	0	6		5		0	4	4	15	9	5	11

Notes: Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Source: Author's own elaborations based on responses from metropolitan regions to survey.

Notes

¹ For brevity, the Capital Region of Berlin-Brandenburg is referred to as Berlin-Brandenburg, Bremen-Oldenburg in the Northwest as Northwest, FrankfurtRheinMain as Frankfurt, and Hannover-Braunschweig-Göttingen-Wolfsburg as Hanover. Where necessary, the prefix MR (short for metropolitan region) is used to refer to the respective metropolitan region rather than the city of the same name.

² Other international examples of city-states include Brussels (Belgium), Moscow (Russia) and Vienna (Austria).

³ When computing descriptive statistics on metropolitan regions in Germany, the exact geographical borders of metropolitan regions are always taken into account, by aggregating (and, when necessary, weighting) observations over the districts they contain.

⁴ The composition of principal comparators is as follows: Barcelona (Spain) includes *Catalonia (ES51)*; Boston (US) includes *Massachusetts (US25)*; Copenhagen (Denmark) includes *Capital (DK01)* and *Zealand (DK02)*; Gothenburg (Sweden) includes *West Sweden (SE23)*; and Rotterdam (Netherlands) includes *South Holland (NL33)*.

⁵ The composition of other comparators is as follows: Athens (Greece) includes *Attica (EL30)*, *Central Greece (EL64)*, and *Peloponnese (EL65)*; Birmingham (UK) includes *West Midlands (UKG)*; Busan (Korea) includes *Gyeongnam (KR02)*; Dublin (Ireland) includes *Southern and Eastern (IE02)*; Lisbon (Portugal) includes *Lisbon (PT17)* and *Alentejo (PT18)*; Manchester (UK) includes *North West England (UKD)*; Milan (Italy) includes *Lombardy (ITC4)*; Montreal (Canada) includes *Quebec (CA24)*; Naples (Italy) includes *Campania (ITF3)*; Oslo (Norway) includes *Oslo (NO01)* and *South-Eastern Norway (NO03)*; Rome (Italy) includes *Lazio (ITI4)*; Stockholm (Sweden) includes *Stockholm (SE11)* and *East Middle Sweden (SE12)*; and Vancouver (Canada) includes *British Columbia (CA59)*. While all of the aforementioned comparators were constructed from (one or more) OECD TL2 regions, Marseille (France) was constructed from OECD TL3 regions, including *Bouches-du-Rhône (FR824)* and *Var (FR825)*.

⁶ A similar picture arises when looking at gross value added (GVA) instead of gross domestic product (GDP) per employed, with GVA taking into account regional differences in taxes and subsidies.

⁷ Note that regions in the south may already be at the point at which their unemployment rate is near the natural rate – this is the frictional rate that is always present due to normal job separation and finding – implying that no further decrease in unemployment is possible.

⁸ The DAX (*Deutscher Aktienindex*) is the German national stock market index listing the 30 largest German firms by market capitalisation.

⁹ The European Commission's Regional Innovation Scoreboard provides comparable data on the innovation performance of EU member states' and other European countries' regions in various categories. These include framework conditions for innovation (human resources, attractive research systems and innovation-friendly environment), investments into innovation (finance and support as well as firm investments), innovation activities (innovators, linkages and intellectual assets) and impacts (both employment and sales impacts). The data set provides 18 composite indicators on regional innovation performance – one indicator per category – which are available at the EU NUTS2 level (similar to the OECD T2 level). NUTS2 regions are chosen such that they most accurately reflect metropolitan regions in terms of actual geographical coverage, i.e. NUTS2 regions with large parts of their geographical areas in the respective metropolitan region are chosen. Nevertheless, a caveat with this analysis is that, as composite indicators are only available at the NUTS2 level, metropolitan regions are not exactly equal to the actual metropolitan regions in Germany or across the OECD, and this divergence in geographical coverage limits the validity of the analysis to some extent.

¹⁰ For this analysis, the metropolitan regions are composed of the following NUTS2 regions: HMR includes *Hamburg (DE60)*, *Lüneburg (DE93)*, *Mecklenburg-Vorpommern (DE80)*, and *Schleswig-Holstein (DEF0)*. Berlin-Brandenburg includes *Berlin (DE30)* and *Brandenburg (DE40)*. Northwest includes *Northwest (DE50)* and *Weser-Ems (DE94)*. Frankfurt includes *Darmstadt (DE71)*, *Giessen (DE72)*, and *Kassel (DE73)*. Hanover includes *Braunschweig (DE91)* and *Hannover (DE92)*. Central Germany includes *Chemnitz (DED1)*, *Leipzig (DED3)*, *Sachsen-Anhalt (DEE0)*, and *Thüringen (DEG0)*. Munich includes *Niederbayern (DE22)*, *Oberbayern (DE21)*, and *Schwaben (DE27)*. Nuremberg includes *Mittelfranken (DE25)*, *Oberfranken (DE24)*, *Oberpfalz (DE23)*, and *Unterfranken (DE26)*. Rhein-Neckar includes *Karlsruhe (DE12)* and *Rheinhessen-Pfalz (DEB3)*. Rhein-Ruhr includes *Arnsberg (DEA5)*, *Duesseldorf (DEA1)*, *Köln (DEA2)*, and *Muenster (DEA3)*. Stuttgart includes *Stuttgart (DE11)* and *Tübingen (DE14)*.

¹¹ In terms of large, dominant firms that serve as incubators of innovation through relatively higher research and development intensities, MR Stuttgart hosts the headquarters of Daimler (car manufacturing), MR Rhein-Neckar the headquarters of BASF (chemicals) and SAP (software), and MR Munich the headquarters of BMW (car manufacturing) and Siemens (industrial, electronics), jointly with MR Berlin-Brandenburg.

¹² For this analysis, the metropolitan regions are composed of the following NUTS2 regions: HMR includes *Hamburg (DE60)*, *Lüneburg (DE93)*, *Mecklenburg-Vorpommern (DE80)*, and *Schleswig-Holstein (DEF0)*. Principal Comparators: Barcelona (Spain) includes *Cataluña (ES51)*; Copenhagen (Denmark) includes *Hovedstaden (DK01)* and *Sjælland (DK02)*; Gothenburg includes *Vaestsverige (SE23)*; and Rotterdam (Netherlands) includes *Zuid-Holland (NL33)*. Other Comparators: Athens includes *Attiki (EL30)*, *Stereia Ellada (EL64)*, and *Peloponnisos (EL65)*; Birmingham includes *West Midlands (UKG)*; Dublin includes *Southern and Eastern (IE02)*; Lisbon includes *Lisboa (PT17)* and *Alentejo (PT18)*; Manchester includes *North West (UKG)*; Marseille includes *Méditerranée (FR8)*; Milan (Italy) includes *Lombardia (ITC4)*; Naples includes *Campania (ITF3)*; Oslo includes *Oslo og Akershus (NO01)* and *Sør-Østlandet (NO03)*; Rome includes *Lazio (ITI4)*; and Stockholm includes *Stockholm (SE11)* and *Oestra Mellansverige (SE12)*.

¹³ The local wind power adequacy is calculated based on average weather data from 1981 to 2000 and encompasses a multitude of exogenous climatic and geographical factors related to electricity generation from wind power. Specifically, it is based on wind velocity and aptitude, taking into account between-region factors, such as coasts, and within-region factors, such as cities, forests, and local topographies. The variable is typically considered by project developers during cost-benefit analyses and siting decisions of new build projects and is thus a suitable predictor for locations where electricity generation from wind power is likely to take place in the future.

¹⁴ The slow grid expansion should be somewhat mitigated by the new Action Plan Power Grid (*Aktionsplan Stromnetz*) by the Federal Ministry for Economic Affairs and Energy (*Bundesministerium für Wirtschaft und Energie*), which is scheduled to pass cabinet by early 2019 and which foresees the north-south transmission line to be completed by early 2024 (Federal Ministry for Economic Affairs and Energy, n.d.^[36]).

¹⁵ Unfortunately, the time-series on basic and high-speed broadband access from the Federal Institute for Research on Building, Urban Affairs and Spatial Development in Germany have been discontinued since 2010.

¹⁶ For this tabulation, OECD T2 regions were taken. Barcelona (Spain) was represented by *Catalonia (ES51)*, Boston (US) by *Massachusetts (US25)*, Copenhagen (Denmark) by *Capital (DK01)*, Gothenburg (Sweden) by *West Sweden (SE23)*, and Rotterdam (Netherlands) by *South Holland (NL33)*. Unfortunately, data on basic broadband access in the US are only available at the state level. Thus, Massachusetts is taken to represent Boston.

¹⁷ For this analysis, OECD TL2 regions were taken. Unfortunately, the summary scores used are not available for smaller regions, which makes comparisons between HMR and other metropolitan regions in Germany, which are partly nested in one or more TL2 regions, difficult. In any case, indicators similar to some of these summary scores have already been looked at in previous sections. HMR is represented by *Hamburg (DE6A)* because quality-of-life data are not available for smaller OECD TL3 regions.

¹⁸ Each dimension of quality of life includes one or more regional well-being indicators. Education includes the share of the labour force with at least secondary education, jobs includes both the employment and the unemployment rate, income includes the household disposable income per capita, safety includes the homicide rate, health includes life expectancy at birth and the age-adjusted mortality rate, environment includes the estimated average exposure to air pollution based on satellite imagery, civic engagement includes voter turnout, accessibility to services includes the share of households with broadband access, housing includes the number of rooms per person, and community includes the share of people who have friends or relatives to rely on in case of need. Overall satisfaction with life is obtained from a single-item 11-point Likert scale that asks respondents in each region: “Overall, how satisfied are you with your life as a whole these days?” Answer possibilities range from zero (“not at all satisfied”) to ten (“completely satisfied”). For all indicators, the latest available data are taken, which implies that some indicators are more recent and some are slightly older. For example, in case of HMR, data on voter turnout are from 2017, whereas data on overall satisfaction with life are from 2010.

¹⁹ Average life satisfaction in HMR in 2016 was 7.5 (out of 10). The ranking of constituent districts, in terms of average life satisfaction, was, in descending order: *Ostholstein* (8.3), *Harburg* (8.0), *Heidekreis* (7.9), *Rotenburg (Wümme)* (7.9), *Steinburg* (7.8), *Uelzen* (7.7), *Stormarn* (7.6), *Cuxhaven* (7.6), *Hamburg* (7.6), *Nordwestmecklenburg* (7.5), *Segeberg* (7.5), *Lüneburg* (7.4), *Pinneberg* (7.4), *Neumünster* (7.3), *Dithmarschen* (7.3), *Stade* (7.2), *Ludwigslust-Parchim* (7.2), *Lüchow-Dannenberg* (7.2), *Herzogtum Lauenburg* (7.1), *Lübeck* (7.1), and *Schwerin* (6.7).

²⁰ Note that there is a district called “Harburg” and a borough within the Free and Hanseatic City of Hamburg which has the same name. If not stated otherwise, the text refers to the district.

²¹ Average housing satisfaction in HMR in 2016 was 7.9 (out of 10). The ranking of constituent districts, in terms of average housing satisfaction, was, in descending order: *Heidekreis* (8.8), *Lüneburg* (8.8), *Uelzen* (8.7), *Harburg* (8.5), *Rotenburg (Wümme)* (8.3), *Nordwestmecklenburg* (8.3), *Stade* (8.1), *Segeberg* (8.1), *Ostholstein* (8.1), *Stormarn* (8.1), *Dithmarschen* (8.0), *Schwerin* (8.0), *Cuxhaven* (7.9), *Hamburg* (7.8), *Ludwigslust-Parchim* (7.8), *Steinburg* (7.7), *Pinneberg* (7.7), *Herzogtum-Lauenburg* (7.5), *Neumünster* (7.1), *Lübeck* (6.9), and *Lüchow-Dannenberg* (6.6).

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Annex 1.A. Additional tables on comparator regions

Annex Table 1.A.1. Comparison of economic development with other metropolitan regions across the OECD – Extended set

	Total population	Share of total population in country (%)	Inhabitants per km ²	GDP (EUR million)	Share of GDP in country (%)	GDP per capita (EUR)	GDP per employed (EUR)
Athens (Greece)	4 889 101	45.4	402	127 278	56.9	17 570	55 526
Birmingham (UK)	5 638 865	8.5	447	160 917	7.2	27 796	60 871
Busan (Korea)	7 946 209	15.3	635	248 470	15.9	31 207	62 947
Dublin (Ireland)	3 365 126	70.8	97	226 423	87.3	65 314	144 836
Milan (Italy)	9 744 596	16	439	386 033	21.7	38 549	82 433
Lisbon (Portugal)	3 597 784	35	478	103 285	43	26 534	61 204
Manchester (UK)	7 078 612	10.8	512	64 417	2.9	24 440	58 293
Marseille (France)	3 065 274	4.6	286	91 455	4.3	28 080	63 235
Montreal (Canada)	8 254 912	22.6	6	262 698	19.5	31 567	63 556
Naples (Italy)	5 771 239	9.6	436	112 429	6.3	19 235	59 483
Oslo (Norway)	2 084 157	39.6	138	105 467	39	46 006	85 525

Notes: Metropolitan regions are composed of OECD TL2 or TL3 regions. See Footnote 5 for exact composition. USD converted into EUR as of 4 February 2019.

Source: Own calculations based on OECD Regional Statistics (n.d.^[12]), *Regional Social and Environmental Indicators: Internet Broadband Access*, <http://stats.oecd.org> (accessed on 18 December 2018), latest available data from 2016.

Annex Table 1.A.2. Labour markets and education in metropolitan regions in Germany

	Share of employed without vocational degree (%)	Change 2014-15 (%)	Share of employed with vocational degree (%)	Change 2014-15 (%)	Share of employed with tertiary degree (%)	Change 2014-15 (%)	Share of employed in high-tech sector (%)	Change 2014-15 (%)	Share of employed in creative sector (%)	Change 2014-15 (%)
HMR	11.1	7.70	60.4	2.20	14.4	6.80	4.8	-0.20	3.3	3.00
Berlin-Brandenburg	8.9	9.70	57.6	2.10	18.7	8.50	3.6	-1.00	3.4	5.30
Northwest	12.5	7.60	63.4	2.80	10.5	6.20	5.4	-0.20	1.7	2.20
Frankfurt	12.5	5.70	56.4	1.80	17.9	6.40	7	0.20	3.2	3.30
Hanover	11.1	8.00	64.7	2.20	13.8	5.90	11.2	0.30	2.7	2.40
Central Germany	5.9	17.40	69.3	1.80	16.5	3.10	7.2	2.40	2.5	2.00
Munich	11.1	4.60	58.5	2.50	18.9	8.20	10.3	3.10	4.1	6.80
Nuremberg	12.2	4.50	67.1	2.10	11.9	6.50	10.1	-4.30	2	3.30
Rhein-Neckar	13.2	5.70	60.8	2.10	15.6	5.90	11.9	-1.20	3.1	4.10
Rhein-Ruhr	13.5	5.80	58	2.00	14.6	5.80	6.4	-0.80	2.6	1.70
Stuttgart	13.8	4.80	61.7	2.20	16.1	7.40	14.1	1.50	3.1	4.70

Notes: Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover-Braunschweig-Göttingen-Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[10]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

Chapter 2. Strengthening economic development, innovation and digitalisation in the Hamburg Metropolitan Region

Abstract

Despite its strong clusters and high level of entrepreneurial activity in urban centres, the Hamburg Metropolitan Region (HMR) faces important policy challenges to economic development, including low labour productivity and human capital. This chapter examines how innovation can enhance economic growth and productivity in the HMR, by looking at key drivers of innovation: (i) education and human capital; (ii) entrepreneurship and dynamic small- and medium-sized enterprises (SMEs); and (iii) digitalisation.

Box 2.1. Summary of key findings and recommendations

The Hamburg Metropolitan Region (HMR) has a strong economy with highly developed clusters in a number of economic sectors. However, the region faces important policy challenges to enhance the dynamics of the economy and raise productivity growth. To increase the future competitiveness and resilience of the metropolitan region, policymakers, in close co-operation and consultation with representatives of the regional economy, need to increase efforts to foster innovation as part of a structural shift away from historically dominant sectors towards new emerging technologies and sectors, which will enable the region to thrive in the digital era.

- Political fragmentation hampers economic development in the metropolitan region. Each of the four federal states that cover the territory of the HMR pursues independent innovation and digitalisation strategies. Strengthened collaboration can generate new benefit for all of the HMR. While the city of Hamburg is the dominating economic centre of the HMR, it can equally profit from strong surrounding areas. It is in Hamburg's own interest to assume responsibility for ensuring that the joint economic zone and labour market outside of Hamburg city proper benefit economically from any initiatives that might be taken in order to enhance the city's competitiveness and ability to innovate.
- Overcoming political fragmentation in innovation strategies is a formidable opportunity to drive sustainable economic growth in the entire metropolitan region. A shared focus on clusters as regional development tools and commonalities in the identified economic clusters in sectors such as energy (especially renewable energy), life and health sciences, food industry and maritime industry, give rise to considerable synergies that could benefit the entire HMR in terms of new jobs, greater international competitiveness and well-being.
- Boosting human capital and education is a key component of enhancing economic development in the HMR. Policy makers need to support an increase in the low level of research and development (R&D) while also strengthening science-industry linkages that are currently undermined by a mismatch of research and enterprises business needs. Facilitating exchange and collaboration of research institutes and firms from all part of the metropolitan region would yield additional benefits for technology transfer and knowledge creation. A co-ordinated approach could also raise the national and international profile of the HMR, which would boost its capacity to alleviate the widespread skills shortage by attracting skilled workers.
- Seizing the full potential of new research facilities should be a priority for policymakers in the HMR. The European X-Ray Free-Electron Laser Facility (XFEL), in conjunction with the German Electron Synchrotron (DESY), opens up unprecedented research opportunities and manifold possibilities for combining research with private sector development. Policy makers from the different federal states that cover the territory of the HMR need to strengthen their co-operation, especially in improving accessibility by public transport, to take advantage of the economic and social benefits that XFEL and associated applied research in sectors such as material or life sciences can generate.

- Broadband infrastructure is more developed in the HMR than in other German metropolitan regions. With the right policies, this advantage can enable the region to seize the opportunities that will arise in the digital era. Access to high-speed Internet needs to be sufficiently good in all parts of the HMR. Currently, many rural areas do not have fast broadband Internet access. To ensure inclusive growth in the HMR, policymakers should also strive to provide the widest geographic expansion possible of new generations of cellular mobile communications such as 5G. Embracing digitalisation for public service provision can raise well-being across the entire territory, especially in more remote areas.
- Using digitalisation for ongoing projects on intelligent transport solutions has the potential to make the HMR an international leader in the mobility sector, thus further strengthening the regional economy. The ITS (Intelligent Transport System) World Congress in 2021 provides a unique opportunity to enhance mobility and transport solutions in the HMR to increase the welfare of residents and to generate new jobs and growth in a promising economic sector.

Introduction

The Hamburg Metropolitan Region (HMR) is a prosperous region relative to European and OECD standards. Centred around the economy of its largest city, Hamburg, the HMR records high levels of productivity with a gross domestic product (GDP) per employee of more than EUR 75 000 and its citizens enjoy a high quality of life. Over the past decade and especially in recent years, however, economic growth in the HMR has been sluggish. As a consequence, the HMR is falling behind other metropolitan areas in Germany. Between 2005 and 2015, all other ten German metropolitan regions recorded faster growth in GDP per employee than the HMR (Chapter 1).

Historically, the economy of the HMR relied largely on logistics and trade, with Hamburg harbour as one of the major economic pillars of the region that still remains one of the largest employers in the HMR. This puts the region in a comfortable position in order to benefit from rapidly increasing international trade. However, in a globalised world with a gravitational shift of economic activity towards Asia, the HMR now faces fierce international competition in the sectors of port industries, logistics and trade with the rise of Asian mega-ports. Furthermore, there are natural, geographic and environmental limitations to growth for Hamburg harbour and to scaling up maritime trade.

In light of changing patterns of international trade flows, growing international competition in the area of logistics, and rapid technological as well as digital progress that challenges established production and service delivery processes, the Hamburg Metropolitan Region finds itself at a crossroads. The decisions that policymakers implement now and over the coming years will largely determine its development and the future prosperity of its residents.

To fully exploit the opportunities that will arise due to trends such as digitalisation, economic policymaking in the HMR will need to pursue a structural shift. While capitalising on the historically dominant sectors of maritime industries, trade and logistics, a rapid and strong move towards a more innovative economy can provide the conditions for the HMR to thrive in the digitalisation era. Although those sectors will remain major

assets for the economy of the HMR, a fundamental reorientation of economic policies is needed.

Strengthening existing clusters in innovative sectors such as renewable energies, life sciences or aviation could help secure the competitive advantage of the HMR in the global economy. Nascent sectors that offer great innovation potential, for example, smart mobility or material sciences, need targeted and holistic development strategies. A re-shaped focus on those industries must not supersede traditional strength but can offer a valuable complement to already existing strong sectors. Boosting these innovative sectors will not only help raise productivity in the metropolitan region. It is also a necessary step to ensure the economic sustainability of the regional economy in light of the relative decline of the harbour of Hamburg on the global arena and the gradual recession of the maritime industry.

A reorientation of its economic development strategy can position the HMR to reach its full potential in a rapidly changing economic environment. The objective of economic development can serve as a lever for territorial co-operation in innovation and industrial policies, energy and digitalisation across the HMR. In particular, infrastructure investments across federal state borders and joint projects that exploit the region's leadership in the sustainable energy sector, most prominently wind energy, could yield major benefits for the entire territory. If the different parts of the HMR join forces, they can use digitalisation as a powerful tool to drive innovation, create new jobs and improve quality of life in the region.

Working together across levels of government and across federal state borders to foster stronger economic development in the HMR can be a catalyst for a forward-looking strategy for the entire region. Aligning initiatives in areas such as digitalisation, smart transport or cluster policies across the constituting parts of the HMR can generate economic returns for the region and help overcome political fragmentation as an impediment to collaborative strategies. Exploiting the mutual benefits of a co-ordinated approach to enhancing economic development through innovation can prove to be a catalyst for designing future joint initiatives across the HMR on topics beyond innovation.

This chapter is organised in four main parts. First, it examines the innovation strategies in the HMR and identifies the major challenges of the metropolitan region in terms of innovation. Second, it analyses existing policies and practices in education and discusses possibilities to enhance human capital in the metropolitan region. Third, the chapter assesses policies to promote entrepreneurship and growth of small- and medium-sized enterprises (SMEs) in the region. Finally, the chapter evaluates the opportunities that digitalisation might create and how policies can help the HMR to make the most of digitalisation.

Strengthening innovation in the Hamburg Metropolitan Region

The economic case for innovation

Empirical evidence highlights the importance of innovation for economic growth and productivity. Over the past 20 years, innovation-driven productivity gains accounted for large shares of economic growth in OECD countries (OECD, 2018^[1]). Consequently, innovation-driven growth has become a major objective for policymakers (OECD, 2013^[2]) as cities and regions are increasingly competing for innovative firms and individuals. Innovation can consist of fundamental changes such as the development of new

technologies as well as the implementation of gradual changes, e.g. a new design (Box 2.2).¹

Innovation increases the future viability and sustainability of a regional economy by boosting productivity growth, firm creations and new employment opportunities. But innovation is not only important to enhance economic development; it can also be used as a tool to address social, demographic and environmental challenges, such as ageing, climate change or resource scarcity. Efficiency gains through innovative solutions minimise costs for solving such challenges. Pursuing a concerted innovation strategy raises the competitiveness as well as the resilience of a region as it facilitates adjusting to structural economic or technological changes.

Box 2.2. OECD definitions of innovation

Innovation is multifaceted. The Oslo Manual identifies four types of innovation:

- **Product innovation:** The introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses, including significant improvements in technical specifications, components and materials, software, user-friendliness or other functional characteristics.
- **Process innovation:** The implementation of a new or significantly improved production or delivery method, including significant changes in techniques, equipment or software.
- **Marketing innovation:** The implementation of a new marketing method involving significant changes in product design, packaging, product placement, promotion or pricing.
- **Organisational innovation:** The implementation of a new organisational method in the firm's business practices, workplace organisation or external relations.

Source: OECD-Eurostat (2005^[3]), *Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data, 3rd Edition*, OECD Publishing, Paris.

The innovation ecosystem and strategies in the HMR

The Hamburg Metropolitan Region currently does not have a consolidated innovation strategy. Instead, an independent innovation strategy exists in each of the four federal states that constitute the HMR. This fragmentation might explain, or even aggravate, some of the pressing challenges in the region. The region lacks a joint vision and master plan for modernising the economy towards innovative sectors and industries.

Each of the four federal states that compose the HMR has developed a regional innovation strategy following the European Union (EU) approach of smart regional specialisation. All four regional strategies identify policies that support and further build economic clusters as crucial elements for enhancing innovation (Table 2.1). In fact, cluster policies are a key instrument according to the existing regional innovation strategies both in Hamburg and in Schleswig-Holstein (see the section on cluster policies for more details). For example, Hamburg's innovation strategy "is mainly realised through clusters as *strategic initiatives* in the relevant key sectors" (BWVI Hamburg, 2014^[4]), which clearly define areas of priority on which the bulk of resources for research and innovation is supposed to be

concentrated. Similarly, the innovation strategy of Schleswig-Holstein aims to build on “the region’s existing strengths in medical technology, the food industry and (renewable) energy technologies” (Ministerium für Wirtschaft, Arbeit, Verkehr und Technologie Schleswig-Holstein, 2014^[5]).

Actively capturing synergies across the federal state innovation strategies in the HMR could yield benefits for the entire HMR in terms of new jobs, greater international competitiveness and well-being. Besides the strong emphasis on sectoral specialisation, all four states emphasise the significance of science-industry linkages and intend to enhance knowledge and technology transfer between higher education institutes (HEIs) and private sector firms (Table 2.1). Furthermore, several of the prioritised economic sectors are common across the different states. For instance, all parts of the HMR highlight renewable energies as a key area for growth. Health and life sciences and maritime industries are other common clusters where the different federal states of the HMR could align development policies to achieve greater critical mass, which is necessary to succeed in competitive economic sectors.² Finally, all four regional strategies consider the creation of innovation parks and provision of digital infrastructure as key elements.

Table 2.1. Key instruments in regional innovation strategies in the HMR, by federal state

Hamburg	Lower Saxony	Schleswig-Holstein	Mecklenburg-Western Pomerania
Cluster strategies and politics	Cluster policies	Cluster strategies and politics	Identification of future key economic sectors
Boosting R&D expenditure of public and private sector	Activation of innovation potential of SMEs and crafts	Focus on key technologies	Applied research and advancement of technology transfer
Technology transfer between research institutes and the economy	World-class research with direct knowledge and technology transfer	Expanding the research infrastructure	Enhancing innovation, research and development in firms, especially SMEs
	Cross-sectoral topics: societal challenges such as climate change and equality of opportunities	Private sector: firm innovation and entrepreneurship	

Note: Key instruments as identified based on the delineated innovation strategy papers. The list does not make any claims of completion but presents instruments that appear to stand out the most in the respective strategy. *Sources:* BWVI Hamburg (2014^[4]), *Regionale Innovationsstrategie 2020 der Freien und Hansestadt Hamburg*, https://www.hamburg.de/contentblob/4483086/c1e24c0eeb1ef963a9244e7848f3057d/data/exanted_oku-innovationsstrategie-fhh-final.pdf;jsessionid=1D51AF941E9E8633DB744389488E987D.liveWorker2; Mecklenburg-Western Pomerania (2014^[6]), *Regionale Innovationsstrategie 2020 Mecklenburg-Vorpommern*; Ministerium für Wirtschaft, Arbeit, Verkehr und Technologie Schleswig-Holstein (2014^[5]), *Innovationsstrategie des Landes Schleswig-Holstein*, http://www.schleswig-holstein.de/DE/Fachinhalte/F/foerderprogramme/MWAVT/Downloads/regionale_innovationsstrategieNEU.pdf?blob=publicationFile&v=3; Niedersachsen (2014^[7]), *Niedersächsische regionale Innovationsstrategie für intelligente Spezialisierung*.

The regional innovation strategies in the HMR lack a clearly defined plan with respect to some pressing social and economic issues or only address them in a rudimentary manner. Geographic discrepancies within federal states are barely addressed. In particular, the divide between rural and urban areas in terms of innovation activities and innovation infrastructure is not considered explicitly. Furthermore, a holistic innovation vision for the metropolitan region is missing, even though it could connect different economic sectors and provide solutions to societal challenges such as the transition to a low-carbon economy. Leveraging the geographic conditions of a coastal location for building a strong renewable energy sector that helps to manage the German energy transition could provide the foundation for a broad innovation vision for the HMR. Targeting investment in innovation capability and infrastructure in rural areas can help alleviate the strong economic divide between rural and urban areas in the HMR documented in Chapter 1.

The four innovation approaches differ in a number of areas. While all four federal states recognise the importance of the private sector for increasing innovation, the regional innovation strategies in Lower Saxony and Mecklenburg-Western Pomerania particularly underline the need to promote research, development and the uptake of new technologies and production processes in SMEs. The differences in the four innovation strategies also arise because the HMR only covers part of Lower Saxony, Schleswig-Holstein and Mecklenburg-Western Pomerania. The fact that the HMR does not include the state capitals of Lower Saxony and Schleswig-Holstein can also explain differences in the innovation strategies. Nonetheless, common economic and social interests would justify a closer alignment of innovation policies in the different regions of the HMR.

Key challenges to innovation in the HMR

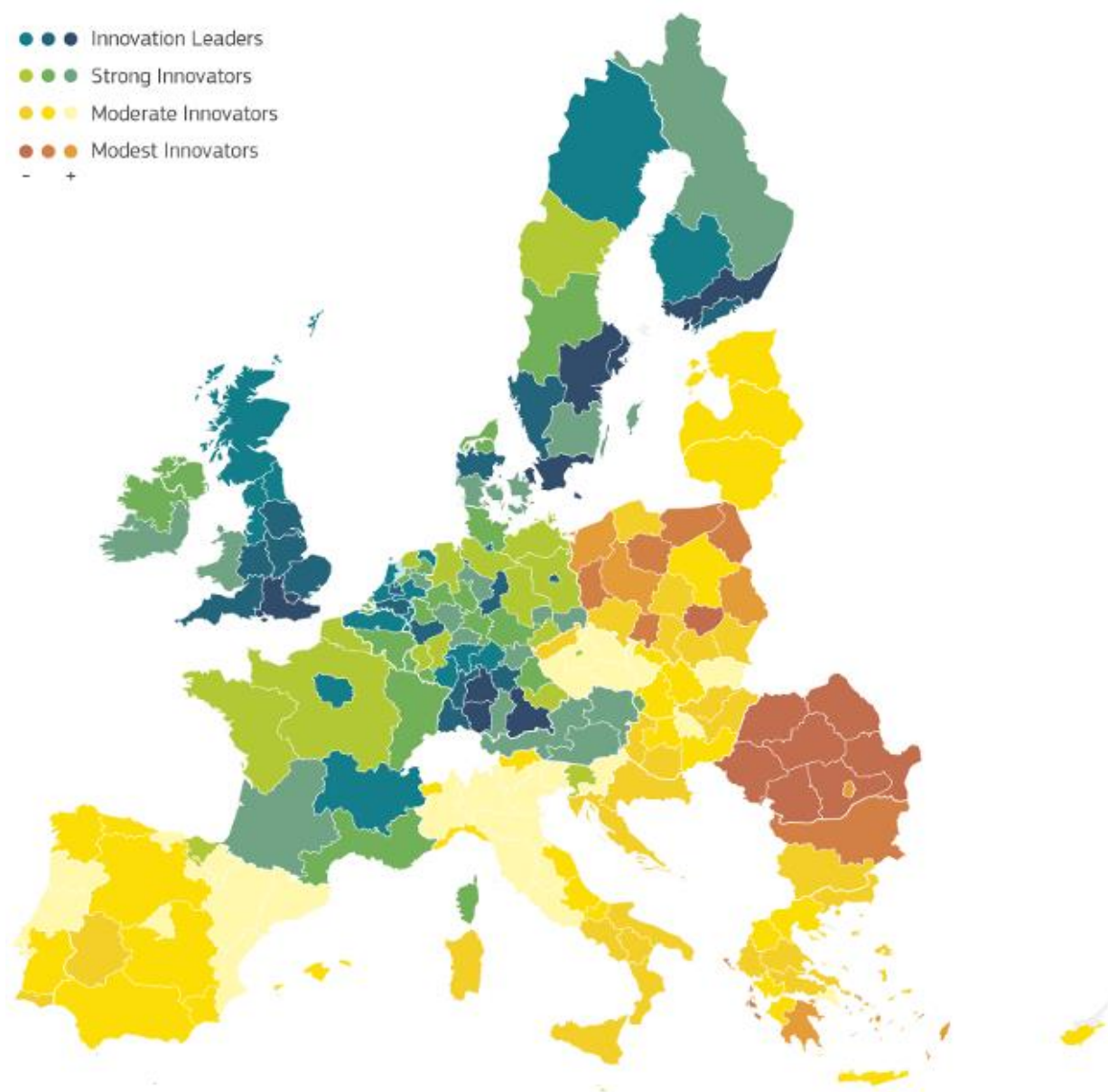
The fragmentation into the four regional innovation strategies leaves significant scope for improvement in enhancing innovation in the HMR. Only the state of Hamburg is among the 25% most innovative European regions as ranked by the European Regional Innovation Scoreboard (Figure 2.1). The other 3 states are among regions with innovation scores between 90% and 120% of the EU average. These relatively favourable international rankings of the different states that make up the HMR mask their actual innovation performance. Compared to other German states (or regions in Scandinavia and the Benelux countries), the HMR lags behind the national innovation leaders as many areas of West and South Germany record higher innovation scores (European Commission, 2017^[8]). Within Germany, there is a significant difference between the HMR and southern German metropolitan regions in terms of innovation performance, notably in patent applications, public-private co-publications and innovation in SMEs (see Chapter 1). In comparison with international regions of similar size, the HMR falls behind innovation leaders such as Copenhagen, Gothenburg or Rotterdam (see Chapter 1).

The current regional innovation strategies and policy practices reveal a number of significant shortfalls concerning both the private as well as the public sector:

- Technology and innovation transfer are a major problem in the HMR. The majority of enterprises in the HMR are small and lack the resources and capacity to invest in R&D. Additionally, public research and the needs of the local economy in the HMR are not aligned with each other as most research activities do not match the specific demands (e.g. in terms of technologies or production processes) of local enterprises, as confirmed by numerous stakeholders from the private sector and Chambers for Commerce and Industry.³ The lack of research targeted to the needs of SMEs hampers technology transfer and thus a widespread diffusion of

innovation in the metropolitan region. Co-operation between higher education research and the regional economy across the entire territory of the HMR needs to be intensified.

Figure 2.1. Regional Innovation Scoreboard 2017, EU



Note: The innovation score is a composite indicator consisting of indicators on framework conditions, investments, innovation activities and impacts.

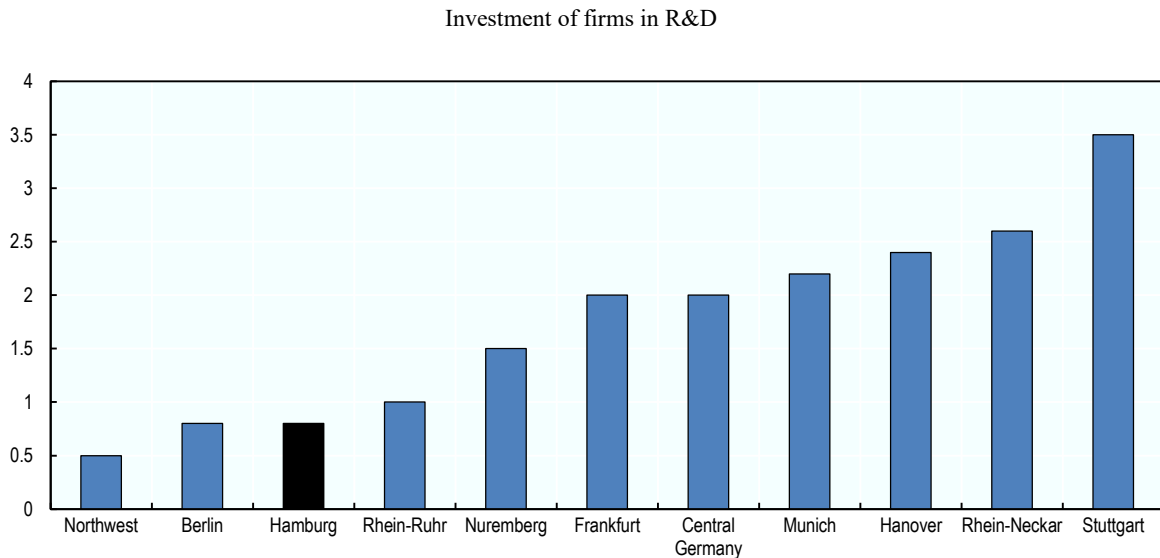
Source: European Commission (2017^[8]), *Regional Innovation Scoreboard 2017*, <http://dx.doi.org/10.2873/469382>.

- Digitalisation poses imminent challenges to firms and workers across the HMR. Three out of the four federal states that cover the HMR experienced an increase in the share of jobs at high risk of automation between 2011 and 2016 (OECD, 2018_[9]). Given the rapid rise of new forms of technology, the increasing automation of work processes and the changing nature of work, policymakers in the HMR need to equip their labour force with the adequate skills (see Section *Ensuring social mobility and inclusion through education* for more detail). So far, representatives of labour unions and smaller enterprises lament the fact that there are few initiatives exist to ensure that no employee is left behind. Training and upskilling opportunities for experienced employees are limited. Furthermore, a lack of access to high-speed Internet hampers innovation in rural areas of the HMR and constrains the provision of digital services in remote areas further away from Hamburg.
- Regional fragmentation undermines the effectiveness of existing innovation strategies. For example, the objective of boosting science-industry linkages is defined within federal state boundaries of Hamburg, Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein respectively. There are no established networks between higher education institutions (HEIs) and public research institutions (PRIs) from all parts of the HMR with private sector firms. While several cross-regional cluster initiatives exist, more could be done to realise the economies of scale by region-wide collaboration in areas of mutual interest, as documented by the overlap between regional clusters.

Another factor holding back the private sector's contribution to innovation and thus economic growth is R&D investments:

- Expenditure on research and development by private sector firms is low in the HMR compared to other metropolitan regions in Germany. There is only one DAX market index company headquartered in the HMR. The lack of headquarters of large enterprises in the Hamburg Metropolitan Region partially explains the low level of R&D expenditure in the region, which falls strikingly short of the EU target of 3% of GDP (Figure 2.2). With R&D expenditure equivalent to only 0.8% of GDP, the research intensity in the HMR is the second lowest among the 11 German metropolitan regions. Firms point out a scarcity of funding for private sector research and development that holds back investment in innovation. Compared to other economic centres in Germany such as Berlin, Frankfurt or Munich, according to local stakeholders, there is a lack of alternative sources of funding for private sector innovation such as venture capital, which constrains small businesses and inhibits entrepreneurship.

In order to address these challenges, the HMR needs to enhance its innovation ecosystem by attracting more R&D investments, fostering knowledge dissemination, and strengthening the interaction of firms, universities and policymakers. Regional innovation environments, so-called innovation ecosystems, need to ensure a close interaction among a variety of actors (Figure 2.3). Innovation is a product of linkages and co-operation between numerous public and private actors, ranging from individuals such as entrepreneurs to institutions (government, universities, research centres, start-ups, big firms) (OECD, 2018_[10]). Rather than being geographically constrained, regional innovation networks sustain and extend such linkages beyond the regional borders.

Figure 2.2. Private sector R&D expenditure as percentage of GDP in metropolitan regions

Notes: Figures take into account the exact geographical borders of regions, by aggregating observations over districts they are composed of.

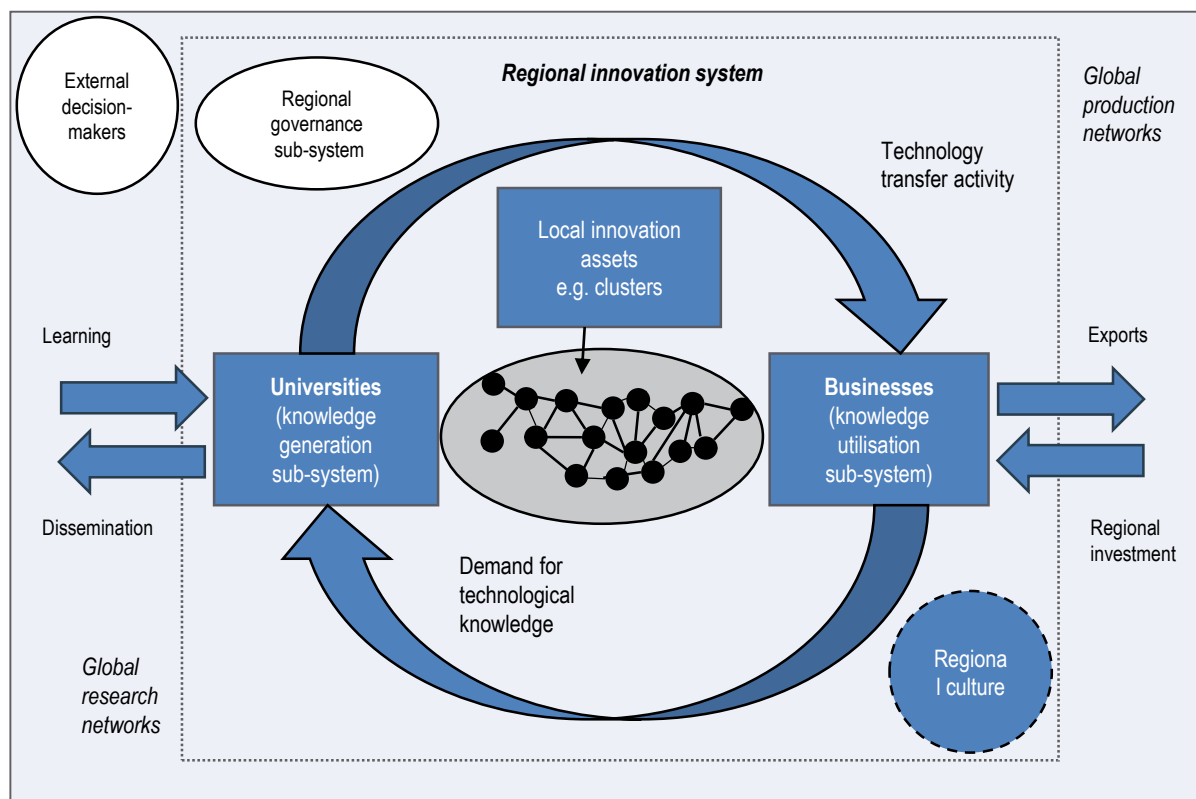
Berlin = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover Braunschweig Göttingen Wolfsburg.

Source: Own calculation based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[11]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumb Beobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level on shares of firms by firm size from 2014 and on research and development personnel and investments from 2009.

Better co-ordination of innovation policy across federal state borders could alleviate some of the existing challenges in the HMR and yield significant economies of scale. By collaborating, the stakeholders from the four federal states that cover the territory of the HMR can reach a wider territory, better pool their assets and achieve greater critical mass. This critical mass is particularly important as the Hamburg Metropolitan Region is facing competition from more populous metropolitan areas, or international metropolitan areas that have high R&D spending and region-wide innovation co-operation, such as Boston or Rotterdam-The Hague (OECD, 2013^[2]). HMR-wide collaboration can establish larger business and knowledge networks, helping in particular SMEs overcome their size-related impediments to innovate and become more productive.

Project-based collaboration such as the North German Energy Transition (NEW 4.0) could provide a starting point for more integrated innovation policies in the metropolitan region. By aligning innovation policies and addressing existing challenges to innovation, policymakers in the region could generate considerable returns to scale. For example, the project NEW 4.0 illustrates how co-operation across federal state borders can provide a more holistic approach to innovation in the region (see Box 2.3). Jointly, the different stakeholders of the HMR could also better boost essential drivers of innovation (Section *Drivers of innovation*).

Figure 2.3. Regional innovation ecosystems



Sources: Benneworth, P. and A. Dassen (2011^[12]), “Strengthening Global-Local Connectivity in Regional Innovation Strategies: Implications for Regional Innovation Policy”, <https://doi.org/10.1787/5kgc6d80nns4-cn>, based on Cooke, P. (2005^[13]), “Regionally asymmetric knowledge capabilities and open innovation: Exploring „Globalisation 2” – A new model of industry organisation”, *Research Policy*, Vol. 34.

Box 2.3. NEW 4.0 – A joint innovation strategy

The initiative North German Energy Transition (NEW 4.0) provides a good example of an innovation strategy across administrative federal state borders in the HMR. Aiming to proactively address the German energy transition and decarbonisation, NEW 4.0 brings together actors from the private sector, research and the public sector in the states of Hamburg and Schleswig-Holstein. As part of this project, these different actors join forces to demonstrate how the entire region can be supplied with 100% renewable energy by 2035 in a safe, reliable and socially acceptable manner.

By realising significant reductions in CO₂ emissions, the project aims to contribute to making the regional economy more sustainable. It places particular emphasis on technological solutions for reaching this objective. As part of the Fourth Industrial Revolution, it intends to boost and utilise the digitalisation of the industry and a more intelligent integration and cross-linking of systems. The project connects 60 partners in the region and runs from 2016 to 2020. The Federal Ministry for Economic Affairs and Energy (BMWi) supports it with approximately EUR 46 million in the framework of the funding

programme “Showcase Intelligent Energy – Digital Agenda for Energy Transition”. The total investment volume of partners of the initiative amounts to around EUR 130 million.

Multiple projects illustrate how NEW 4.0 works on finding new energy solutions while also supporting the creation of an integrated cross-regional network. For example, different types of firms collaborate on a project that aims to better link wind energy facilities with energy storage technology in order to increase the stability and reliability of the energy grid. An inter-regional alliance of higher education institutions (HEIs), Chambers of Crafts and Chambers for Commerce and Industry focuses on offering new or better education or training programmes for workers in the energy sector in Hamburg and Schleswig-Holstein.

NEW 4.0 offers great innovation potential for the entire north German economy. Especially the Hamburg Metropolitan Region, as one of the leaders in the renewable energy industry in Europe, stands to benefit from investing and further strengthening this economic cluster. NEW 4.0 might offer a promising approach for increasing the future economic competitiveness of the metropolitan region.

Source: Norddeutsche EnergieWende (n.d._[14]), *NEW 4.0*, <http://www.new4-0.de/>.

The case of the metropolitan area of Rotterdam-The Hague offers an interesting example of how regional co-operation can yield a holistic approach to innovation supported by regional innovation funds (OECD, 2016_[15]). Rotterdam-The Hague pursues a triple helix framework for enhancing innovation and economic development in the region (see Box 2.4). The triple helix framework in Rotterdam-The Hague ensures a close interaction of firms, universities and the public sector in promoting a strong regional innovation system. A politically autonomous corporation manages the regional development strategy, which facilitates pursuing development projects in a region that consists of a multitude of different entities (e.g. municipalities, districts, etc.). A dedicated regional development corporation, similar to the *InnovationQuarter* in Rotterdam-The Hague, combined with a joint regional innovation fund could alleviate the existing of cross-border collaboration and co-ordination that impedes innovation in the HMR. Following such a focused approach on enhancing the innovative capabilities of SMEs would also contribute to raising productivity in the HMR, allowing it to catch up with leading metropolitan regions in Germany and the OECD.

To initiate closer region-wide economic and innovation collaboration, the office of the HMR could aim to establish a platform for exchange on innovation-related issues and projects. A key issue that harms the HMR’s competitiveness is the lack of co-operation and information sharing across federal state borders. In contrast, the office of the metropolitan region Rhein-Neckar, which also consists of districts (*Landkreise*) from several federal states, has created a new job position of an innovation manager who works for the entire metropolitan region. Adopting a similar initiative would benefit the HMR as an innovation manager would facilitate the exchange between the different innovation actors from all parts of the region and help stimulate new collaborative projects. The innovation manager could thus support streamlining innovation initiatives in the metropolitan regions and provide a platform that connects private sector activities with research projects at research institutes in the HMR. Local enterprises would play a key role in ensuring that the introduction of an innovation manager would be a success. In Rhein-Neckar, stakeholders from the regional economy drove the process of establishing the position as they recognised the potential for their own line of business.

Box 2.4. Rotterdam-The Hague – A regional triple helix strategy

The metropolitan area of Rotterdam-The Hague has set up a formal mechanism to foster innovation through regional collaboration. *InnovationQuarter*, a regional development corporation, works in close co-operation with all major corporations, educational and research institutions and government in West Holland. The regional development corporation works for the entire region. Its mission is to strengthen the regional economy by supporting and stimulating the innovation potential of the region.

InnovationQuarter has far-reaching autonomy. The company is publicly owned but the various municipal governments share power and are not involved in daily operations. This autonomy allows the corporation to pursue strategies that generate the greatest benefit to the regional economy without strong political interference. Additionally, *InnovationQuarter* manages funds for investments into innovation-enhancing projects and enterprises. In total, the investment capital amounts to EUR 140 million.

The development corporation works to actively promote the region, attract foreign companies and investors and support them in finding the right locations and facilities for setting up or expanding business. It encourages entrepreneurship, invests in fast-growing companies and supports technological initiatives with social impact. On a daily basis, *InnovationQuarter* offers: i) detailed information on regional and national regulation; ii) extensive networks; iii) site selection support; iv) R&D matchmaking services; and v) investor relation and funding advice.

Source: InnovationQuarter (n.d.^[16]), Homepage, <https://www.innovationquarter.nl/en/>.

Drivers of innovation

To make the regional economy more innovative, policymakers in the HMR should pursue action in three key areas that are associated with innovation and that need to be strengthened in the HMR (OECD, 2015^[17]):

1. The HMR scores low in comparison to other German metropolitan regions with respect to human capital (Chapter 1). Although education and human capital are a requirement to build a skilled workforce, university student enrolment and the share of tertiary-educated employees are relatively low in the HMR (Section *Boosting education and human capital*). Skilled workers can help develop new ideas, conceive new technologies, implement those ideas and make them commercially available. Policy makers in the HMR need to revise established education policies to: i) address skills shortages and labour market skills mismatching that are key concerns for enterprises in the region; and ii) enable the workforce to adapt to technological and structural changes, given the high risk of automation of jobs in the HMR.
2. Innovation requires a strong business environment that incentivises investment in technology and knowledge-based capital, especially since firm investment in R&D in the HMR is critically low. Policymakers in the HMR should also encourage entrepreneurship and support growth and scaling up of new firms, especially in rural and remote areas of the HMR. Promising clusters and industries in the HMR, such as renewable energies or material sciences, should receive further support to strengthen the business environment in the HMR. Examples such as

Kompetenzzentrum neue Materialien und Produktion, competency centre on material sciences, illustrate the potential of inter-regional co-operation in clusters in the HMR.

3. Fostering innovation in the HMR calls for a more efficient approach to knowledge creation and diffusion based on work on fundamental knowledge and science and delivered through a widespread transfer of such knowledge to different parts of society. In the HMR, stronger science-industry linkages should be a key policy priority in order to ensure that innovation delivers benefits to the private sector. Making better use of existing research facilities and fully seizing the potential of XFEL will help spur innovation in the metropolitan region.
4. Pursuing clear internationalisation strategies of public and private R&D activities as well as business clusters can augment the innovation capacity of the HMR. Across the OECD, international co-operation has become extremely important for science and innovation both in terms of the internationalisation of business R&D and innovation and the globalisation of public research systems, including higher education R&D (OECD, 2017^[18]). For example, international co-authorship in science and innovation research and international co-patenting account for large parts of innovation output in OECD countries (OECD, 2015^[19]; 2016^[20]). The relevant actors in the HMR should, therefore, strengthen their ability to stimulate innovation by expanding interaction and joint initiatives with external partners. With this aim, actors in the HMR are advised to seek long-term co-operation with external partners like German and European metro regions on a win-win basis. The close scientific relations and geographic proximity make Greater Copenhagen and the Malmö-Gothenburg-Oslo region ideal partners for a future internationalisation strategy for innovation in the HMR.⁴

In the following sections, this chapter will assess the status quo of existing policies, pressing bottlenecks, and major challenges in the areas of education and vocational training, business environment and entrepreneurship, digitalisation and smart transport in the HMR. For each of these areas, the key components delineated in the OECD Innovation Strategy (human capital, business environment, research institutions and innovation policies that link innovation and entrepreneurial activities) will be evaluated. These drivers of innovation cannot be viewed in isolation but are interdependent. For example, the rapid digitalisation of the economy constitutes both opportunities and potential challenges for the HMR in terms of the required skills of the workforce, the demands on businesses to remain successful, technological innovation or the links between research and development on one hand and entrepreneurship on the other. Since effective innovation policies need to take into account such complementarities between different pillars of innovation, the analysis presented in this chapter will emphasise potential overlap and complementarities of policies in the various areas of innovation in the HMR.

Boosting education and human capital

Key challenges in education and human capital in the HMR

In terms of education, human capital and research, the regional economy of the HMR needs to address four major challenges to increase its economic and innovation capacity: i) a widespread skills shortage; ii) low R&D intensity; iii) weakly developed science-industry linkages; and iv) ensuring social mobility through education in light of digitalisation and resulting changes to the nature of work. The heterogeneous nature of the

HMR gives rise to considerable geographic variation in the extent of these challenges. In particular, the larger urban centres such as Hamburg or Lübeck (but also some medium-sized *Kreisstädte*, i.e. district capitals) stand in contrast to more rural and remote areas.

Across the metropolitan region, firms increasingly encounter a shortage of skilled workers in the labour market especially in the sectors of health and social care, information and communication, engineering and crafts (Christensen, 2013^[21]; Bundesagentur für Arbeit, 2018^[22]). The skills shortage is most severe for professions with a vocational qualification in the sectors of crafts or social care but also strongly affects occupations that require tertiary education in the areas of medicine, informatics, software development and STEM (science, technology, engineering and mathematics) (Kompetenzzentrum Fachkräftesicherung, 2017^[23]). The relatively low share of tertiary-educated individuals among the labour force in the HMR further exacerbates this issue (Table 2.2). Only 14.4% of the workforce has a higher education degree, placing the HMR 4 percentage points below Munich and the Capital Region of Berlin-Brandenburg, the two leading metropolitan regions in Germany. The labour shortage is not limited to high-skilled workers; firms across the region also struggle to fill vacancies for mid- and low-skilled positions. The relatively low level of human capital poses significant challenges for the HMR, as the skills and knowledge of workers are a fundamental driver of economic growth (Barro, 1992^[24]) and a primary determinant of regional differences in economic development as it is essential for firms' productivity (Gennaioli et al., 2013^[25]).

Table 2.2. Educational attainment of the workforce, 2015

Comparison with other metropolitan regions in Germany

Region	Share with a higher education degree	Share without formal vocational qualification or tertiary degree
Munich	18.9	11.2
Berlin-Brandenburg	18.7	8.9
FrankfurtRheinMain	17.9	12.5
Central Germany	16.5	5.9
Stuttgart	16.1	13.8
Rhein-Neckar	15.6	13.2
Rhein-Ruhr	14.6	13.5
Hamburg	14.4 (8th highest)	11.1 (3rd lowest)
Hannover Braunschweig Göttingen Wolfsburg	13.8	11.2
Nuremberg	11.9	12.2
Northwest	10.5	12.5

Source: Data are provided by the data monitoring portal of the initiative of German metropolitan regions, <http://www.deutsche-metropolregionen.org/>.

However, the labour and skills shortage varies widely across the different parts of the region. While Hamburg and its surrounding municipalities, where wages are higher and access to services is generally better, attract workers from all over the HMR, other areas further away from Hamburg struggle to find adequate labour. The availability of a wide local pool of adequately skilled workers may be a crucial source of agglomeration in Hamburg, as it reduces search costs in the labour market (Overman and Puga, 2010^[26]), however, the geographic divide has created a sense of competition for labour within the region.

The lack of a consistent, region-wide approach to attract, train and retain workers with the necessary skills undermines joint initiatives to fight the skills shortage across the HMR. No coherent strategy to promote the attractiveness of the entire HMR on the international stage exists so far. Vocational training and higher education are in the domain of federal states.⁵ Despite bilateral agreements between federal states, region-wide cross-border collaboration remains limited. Initiatives to address the skills shortage only focus on parts of the metropolitan region, which might be explained by the perceived competition for workers in the region. To counter the skills shortage, Hamburg has established a database for firms and job seekers that facilitates the matching of firms with individuals with the right skills, providing a good example of projects that extend to other parts of the region.⁶ Using the brand of Hamburg and its high quality of life (Chapter 3) under the umbrella of HMR could help attract skilled workers and would thus strengthen human capital, which in turn stimulates technological progress and facilitates the adoption of new production processes.

In an economic context that is increasingly based on services and rapidly adjusting to new emerging technological opportunities, a skilled workforce has become one of the most important assets of regional economies. The HMR experiences a shift towards larger reliance on knowledge-intensive tasks that require labour supply of tertiary-educated or vocationally trained individuals. These skilled workers are necessary to help firms and industries in the HMR move up global value chains and succeed in competition with international peers.

Stronger regional co-operation and a joint strategy in the HMR could help address the skills and labour shortage more effectively. Policymakers should seek to enhance educational mobility by creating more flexible entry options into education, both for tertiary education and VET programmes. Among other possible priorities, the different stakeholders in the HMR, ranging from the public sector to the private sector, could work together to increase the share of women in the labour market. While the gender gap in the employment rate in the HMR falls at 2 percentage points significantly below the national gender gap of 6 percentage points, policymakers should aim to increase women's participation in the labour market to not leave a considerable source of talent and skills untapped. Against this backdrop of a lack of region-wide co-ordination, the office of the metropolitan region organised a regional conference in December 2014 on the topic of skilled workers, bringing together actors from all parts of the region. With the same purpose, representatives from Hamburg and Schleswig-Holstein regularly convene to discuss VET-related issues. Such initiatives and meetings could be a starting point to find more counter the labour shortage in the HMR more effectively.⁷

The dual education system is of great importance for the regional economy. Postsecondary vocational education and training programmes (VET) are a key asset of the German education system. They do not only provide young adults with the technical skills that firms seek by meeting labour market demand but the schooling part also equips students with transferable skills. VET programmes also contribute to a smooth transition of apprentices from fixed-term contracts to permanent positions, help to reduce youth unemployment and offer students avenues of progression (Fazekas and Field, 2013^[27]).

Falling popularity of vocational training will pose new challenges to find the right employees for the majority of firms in the HMR. The vast majority of firms in the HMR consists of SMEs that heavily rely on the German education system of both tertiary education and dual vocational training schemes (*Ausbildung*). However, over the past two decades, the share of teenagers that start vocational training schemes has substantially fallen due to a significant increase in the share of young adults that pursue tertiary

education. This structural shift, often referred to as *academisation* in Germany, poses a skills match problem for most SMEs that need the skills provided by vocational training to run their operations. For example, in the city-state of Hamburg, the number of unfilled apprenticeships increased by 14% in 2018 (Federal Employment Agency). Enhancing the prestige of vocational education through pilot projects could raise the attractiveness of vocational training and apprenticeships. For example, co-operation between universities for applied sciences and larger firms in the region, comparable to IBM in the Stuttgart Metropolitan Region, or increasing international mobility during VET by making better use of opportunities such as VET-Erasmus could contribute to this objective.

Administrative fragmentation of the training system negatively affects the conditions for apprenticeships in the metropolitan region. Vocational training schemes are organised in each federal state, with the contents of the training being specified by national regulations. The federal states decide where the schools for different professions are located and adapt the topics of the lessons in school to the national schemes. As part of their training, apprentices attend a vocational school several days a week in the state where their enterprise is located.⁸ This fragmentation can have adverse implications for apprentices. For example, someone living in and working for a firm in a municipality in Schleswig-Holstein that borders Hamburg would be required to travel up to 100 km to Kiel, instead of enlisting in a vocational school in nearby Hamburg. Closer co-ordination to attract young adults could significantly raise the attractiveness of vocational training schemes and thus alleviate the shortage of skilled labour in the HMR. Alternatively, apprentices should receive travel allowances to cover the transport costs to their vocational school.

Research and universities in the HMR

Research and development expenditure in the HMR is significantly below the German average and fails to meet the European R&D target for 2020 of 3% of GDP (Table 2.3). In Hamburg, R&D expenditure only amounted to 2.2% in 2016, compared to 2.9% nationally. Mecklenburg-Western Pomerania and Schleswig-Holstein fall even further below the national average R&D expenditure with R&D expenditure corresponding to less than 1.9% and 1.5% of GDP respectively. While Lower Saxony spends the equivalent of 3.3% of its GDP on R&D, the main universities (Göttingen, Hannover) and largest enterprises (e.g. Volkswagen), which account for the largest part of R&D activities, are located outside the HMR.

The low level of R&D expenditure in the HMR can, at least partly, be explained by a lack of large headquarters of multinational firms in the region, which is particularly striking compared to the south of Germany (see section *Promoting a more dynamic business environment and entrepreneurship*). Nevertheless, the R&D intensity has substantially improved in various parts of the HMR. For example, R&D expenditure in Hamburg has increased by almost 50% since 2000 (*Statistisches Bundesamt*). To further improve the R&D environment in the HMR, policymakers could encourage smaller firms to co-operate by pooling research and development resources. For example, enabling firms to apply for joint research funding, including applications across federal state boundaries, would help SMEs from the HMR overcome their competitive disadvantage due to smaller firm size and could yield higher innovation performance of the private sector.

Table 2.3. Research and development expenditure by the state in the HMR, 2014-16

Expenditure by federal state

	Internal expenditure for research and development in EUR million			Share of the GDP in %		
	2014	2015	2016	2014	2015	2016
Hamburg	2 453	2 423	2 513	2.34	2.20	2.22
Mecklenburg-Western Pomerania	732	753	759	1.87	1.87	1.85
Lower Saxony	7 363	8 867	9 156	2.90	3.43	3.31
Schleswig-Holstein	1 287	1 277	1 342	1.53	1.47	1.49
Germany	84 247	88 782	92 174	2.87	2.92	2.93

Note: No further geographic breakdown is available. The numbers for Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein contain expenditure in areas outside of the HMR.

Source: BMBF (2018^[28]), *Datenband Bundesbericht Forschung und Innovation 2018*, https://www.bmbf.de/upload_filestore/pub/BuFi_2018_Datenband.pdf.

While the metropolitan region lacks world-class higher education institutions (HEIs), recent efforts to strengthen the universities in the HMR have been successful. With its dominant city Hamburg having historically been a trading and business city without a strong tradition in higher education, there is a lack of internationally renowned universities in the metropolitan region. However, in 2018, the University of Hamburg and its partner institutions were very successful at the new “Excellence Strategy” of the German Federal Government and the German States. Four Clusters of Excellence (research clusters) from Hamburg were successful, namely in climate research, photonics and nanoscience, as well as mathematics and particle physics. Such status will offer significant amounts of additional funding to the universities over a period of seven years and will help to foster cutting-edge research in the region. Thus, 4 out of the 57 clusters that will be nationally funded are located in the HMR raising the profile of the region for cutting-edge research.

The void in top-class university and private sector research is partly filled by the presence of public research institutions (PRIs) but research activities need to better align with the needs of local firms. Across the HMR, PRIs contribute significantly to research and development, thus they help to spur innovation. In total, there are three Max Planck Society institutes, three institutes of the Fraunhofer Society and four Leibniz Association institutes in the HMR with research strengths in numerous disciplines (Table 2.4). The HMR is home to two Helmholtz Association research centres with the German Electron Synchrotron (DESY) and the Centre for Materials and Coastal Research jointly funded by the national government and the federal states. In addition, there are four public non-university research institutes, completely funded by the federal state of Hamburg, including the Hamburg Academy of Science. Despite the breadth of the research disciplines of these PRIs, exchange and co-operation with local firms needs to improve. In order to foster innovation, research of both HEIs and PRIs needs to better match the needs of the firm environment in the HMR (see Section *Strengthening science-industry linkages* for further discussion).

The new XFEL research facility can be a powerful catalyst for innovation and economic development in the metropolitan region. Located at the border between the federal states of Hamburg and Schleswig-Holstein, XFEL has the potential to elevate scientific research in the HMR to a completely new level. Based on the world’s largest X-ray laser, the research facility will open up completely new research opportunities for scientists and industrial users. XFEL will raise the attractiveness of the metropolitan region for new

businesses and international researchers alike. The scope for manifold, new applied research can also boost the creation of new enterprises in the region.

Table 2.4. High-profile public research institutes in the HMR

PRI	Location	Key strengths
Max Planck Society – 3 institutes	Hamburg	Structure and Dynamics of Matter, Meteorology, Comparative and International Private Law
Fraunhofer Society – 3 institutes	1 Hamburg, 2 Schleswig-Holstein	Additive production technologies, silicon technology, cell technology
Helmholtz Association – 2 research centres	1 Hamburg, 1 Schleswig-Holstein	Centre for Materials and Coastal Research, DESY – German Electron Synchrotron
XFEL – European X-Ray Free-Electron Laser Facility GmbH	Hamburg and Schleswig-Holstein	Material science, life sciences, physics and chemistry research
Leibniz Association – 4 institutes	Hamburg and Schleswig-Holstein	Global and area studies, experimental virology, tropical medicine, pneumology

Note: The list is non-exhaustive. It is limited to research centres of the Max Planck Society, Helmholtz and Fraunhofer Societies, and other PRIs of significant international reputation and critical size.

Source: Fraunhofer (n.d.^[29]), *Standortkarte*, <https://maps.fraunhofer.de/fsk/>; Helmholtz (Helmholtz, n.d.^[30]) (n.d.^[30]), *Unsere Forschungszentren im Überblick*, https://www.helmholtz.de/ueber_uns/helmholtz_zentren/; Max-Planck-Gesellschaft (n.d.^[31]), *Liste aller MPG-Institute und -Experten mit Suchfunktion*, https://www.mpg.de/institute_karte; Leibniz Association (2019^[32]), *The Leibniz Association - About Us*, <https://www.leibniz-gemeinschaft.de/en/about-us/>.

Supporting the development and growth of XFEL should be a priority for policymakers in the HMR. Large world-class research infrastructure does not only generate economic and financial returns to the local economy; it also contributes to human capital formation through learning, new education and training opportunities, and knowledge spillovers. As the case of CERN (European Organisation for Nuclear Research) demonstrates, the presence of globally leading research facility can also raise the international prestige and recognition of the HMR as an innovation hub (OECD, 2014^[33]).

In fully utilising the potential of large research facilities such as XFEL, a region-wide co-operation across administrative borders is of paramount importance. XFEL provides an example of policymakers from different federal states working together for regional development. The development of XFEL was not only supported by the states Hamburg and Schleswig-Holstein but the research facility is also physically located in both states. By attracting new firms and linking up with existing ones, XFEL can support the cluster formation in life and material sciences in the metropolitan region. However, a lack of transport co-ordination between the two involved federal states currently undermines the potential impact of XFEL. For example, no direct public transport connections exist so far from Hamburg city centre or the international airport to the XFEL facility in Schenefeld (Schleswig-Holstein), reducing its accessibility for international guests significantly. This calls for a better alignment of public transport policies across federal states.

A new research and business hub in Hamburg is a promising development that can tighten the links between scientific research, university education and application for business ideas. The city of Hamburg is planning to construct an international science park in Bahrenfeld, together with the University of Hamburg and DESY (German Electron Synchrotron), to exploit the industrial application potential of DESY and XFEL. The

science park will pursue interdisciplinary research and education in physics, chemistry, biology and scientific computing. To make this project a success and to maximise the positive effects for the regional economy, close co-ordination between and integration of stakeholders from different parts of the HMR is a must.

Strengthening science-industry linkages

Universities are becoming more entrepreneurial in many OECD countries. Consequently, the presence of universities and PRIs, and the level as well as the quality of their research activities, contribute to the creation of new enterprises (Audretsch, Lehmann and Warning, 2005^[34]; Hausman, 2012^[35]). Furthermore, research activities and investments can provide the necessary innovation spillovers that stimulate entrepreneurship. Initiatives such as on-campus business incubators, technology accelerators or spin-offs, can all contribute to the consolidation of existing economic clusters and the development of new innovation-reliant business sectors (OECD, 2018^[36]).

While science-industry linkages have become an important policy focus in the HMR, co-operation between higher education research and the economy remains underdeveloped. Over the past decade, policymakers and business representatives across the HMR have supported the creation of various science and technology parks, which were established with the explicit aim of fostering interaction between firms and HEIs (Table 2.5). These actions have improved science-industry linkages in the metropolitan region but their effectiveness is hampered by a mismatch between research and business needs.⁹ Closer alignment of research and the requirements of local firms in the HMR would facilitate the transfer and uptake of new technologies and production processes, generating positive innovation spillovers and boost local entrepreneurship.

Table 2.5. Research and innovation parks for technology transfers

Park	Location	Business sectors
Zentrum für Angewandte Luftfahrtforschung (ZAL)	Hamburg - Finkenwerder	Aviation
Energie Campus	Hamburg - Bergedorf	Energy research and new technologies
Innovation Campus Green Technologies	Hamburg-Harburg	Green technologies
Innovation Centre Bahrenfeld	Hamburg - Bahrenfeld	Material science, life sciences, physics, chemistry, biology and scientific computing
CFK-Nord Research Centre	Lower Saxony - Stade	Lightweight construction, carbon fibre reinforced plastics
Technikzentrum Lübeck	Schleswig-Holstein - Lübeck	Photonics, biotechnology, life sciences, 3d printing

Despite the creation of innovation parks, science-industry linkages face two important challenges. The vast majority of firms in the HMR consists of SMEs that are specialised in specific sectors or niche products. Their needs in terms of applied research are often misaligned with the research at HEIs and PRIs in the region. Therefore, many local enterprises struggle to take advantage of the facilities and research at their disposal and fail to benefit from technology and innovation transfer. Furthermore, the fragmented nature of the business environment hinders the exchange between local firms, especially SMEs and HEIs. Better matching research and business needs could raise the effectiveness of research

and innovation parks considerably. The Lüneburg Innovation Incubator associated with Leuphana University provided a positive example of how such difficulties can be overcome (OECD, 2015^[37]). The incubator successfully fostered fruitful co-operation with local SMEs, embedding its research agenda in the local economy (Box 2.5).

Box 2.5. The case of the Lüneburg Innovation Incubator

Lüneburg Innovation Incubator was set out to trigger transformational economic change in its region by providing a platform to attract and develop innovative people, firms, research projects, social capital and infrastructures. Key features were:

- A substantial group of regionally engaged scientists, start-up companies and research-intensive inward investors were attracted and embedded into a globally connected and open research and learning environment.
- In defining a strategic roadmap for the Incubator, Leuphana looked to its own strengths, notably in the area of sustainability studies, and responded to the region's aims to grow its digital and creative industries, to provide cleaner and more sustainable energy, and to meet the demands of an ageing population.
- Co-financed by Lower Saxony and EU, the incubator was based on a portfolio of five measures: i) expansion of regional research capacity through attracting international scientists; ii) growth of employment opportunities in skilled services; iii) development of advanced education and training; iv) project management; and iv) investment in infrastructure.
- Regional networking was a key concept of the incubator: it connected Leuphana scientists with a network and co-operation partners, primarily local SMEs. It helped to build knowledge networks through co-operative and knowledge transfer projects with SMEs.
- Impact: 12 start-ups, 1 000 jobs created.

Source: OECD (2015^[37]), *Lessons Learned from the Lüneburg Innovation Incubator*, https://www.oecd.org/cfe/leed/FINAL_OECD%20Luneburg_report.pdf (accessed on 19 December 2018).

The positive impact of intensified science-industry linkage is highly concentrated around Hamburg and a few other locations in the metropolitan region. Firms in remote areas of the HMR, i.e. further away from Hamburg and other main locations of technology transfer and research centres, struggle to gain from the knowledge and technological progress created in the region. Greater regional diffusion of science and innovation parks could alleviate such urban-rural differences. The region Västra Götaland in Sweden, for example, has set up an innovation system of science parks that are distributed across the region (OECD, 2018^[38]). Locally, each of the six sites has spurred innovation and driven R&D-infused job creation in manufacturing (Box 2.6). A similar approach, which strengthens innovation by creating or enhancing existing science parks across the territory of the HMR, could help boost economic growth in large parts of the metropolitan region.

Box 2.6. The science park system in Västra Götaland, Sweden

Distributing science parks across a region

The Science Park system (innovation system) in Region Västra Götaland is successfully contributing to economic growth in all parts of the region. The system consists of six different sites, spread throughout the region. All six have different specialities linked to the part of the region or location.

The six science parks work together and meet frequently but do not compete. They are owned and supported by actors from the private sector, academia and the public sector. Universities in the region are co-located with the six science parks, i.e. distributed across the territory of the region. While the science parks have far-reaching autonomy, the region invests in the science parks as part of its regional strategy for growth within the objective “A leading knowledge region”.

Jointly, the parks contribute to the regional smart specialisation strategy with their respective focus. They also help address societal challenges in the region such as climate strategy. The science park system in Västra Götaland ensures localised investment and innovation output. Job creation in business services and R&D-driven manufacturing is predominantly located directly in or close to the six sites.

Source: OECD (2018^[38]), *OECD Territorial Reviews: The Megaregion of Western Scandinavia*, <https://dx.doi.org/10.1787/9789264290679-en>.

Ensuring social mobility and inclusion through education

Education does not only fulfil an important role in providing individuals with the skills to participate economically. It also serves as an essential vehicle for social mobility and inclusion. Policymakers in the HMR need to address two challenges to maintain the social mobility function of education and to safeguard a socially inclusive economic development. First, disparities in educational opportunities by socio-economic background need to be reduced. Second, targeted action is required in light of the demands and risks that digitalisation and automation pose for low-skilled workers and economically disadvantaged households.

More than 6% of all high school graduates left school without any qualification or degree in 2016. Out of 58 000 students, almost 4 000 dropped out of school in the metropolitan region (Table 2.6). Even though the school dropout rate is below that of many OECD regions, where early school leavers can make up around 10% of students each year, the associated social and economic costs with such a number of school dropouts remain too high to be ignored (OECD, 2018^[39]). It is extremely difficult for young people without qualifications or with low skills to find a job, especially a permanent one, in the post-crisis workplace environment (OECD, 2016^[40]). In the HMR, the issue is particularly pressing in Mecklenburg-Western Pomerania, where 9.4% of high school students leave without a formal qualification.

To combat the dependency of educational attainment on households’ levels of education and income, authorities in parts of the HMR are pursuing a number of measures. For example, in Hamburg, a dedicated youth employment agency offers students and young adults guidance and support in their career plans (see Box 2.7). The scheme also supports students in their search for the right training place, the choice of the suitable course of study

and aims to offer advice in addressing problems at school or personal difficulties. Hamburg also employs another initiative that aims to close the attainment gap based on socio-economic background. By offering free full-day care at school, the state aims to improve learning conditions for students from disadvantaged families. Similar youth employment agencies also exist in other parts of the HMR such as the districts Dithmarschen and Pinneberg, the district-free city Neumünster (all Schleswig-Holstein), and the districts Cuxhaven, Lüchow-Dannenberg and Lüneburg (all Lower Saxony).

Digitalisation raises new challenges for education's role in safeguarding social mobility and inclusion in the HMR. The advance of digital technologies in work processes requires more targeted education and training programmes for employees in the HMR. So far, opportunities for continuous training and lifelong learning are not extensive enough and do not reach large segments of the employees in the HMR.¹⁰ Currently, too few companies in the HMR offer lifelong learning and training opportunities to their employees that would equip them with the necessary skills to succeed in the labour market. Due to rapid changes to operational processes in businesses and quick, technological progress, the skill sets demanded by companies are changing and as a result, 4% to 40% of jobs in OECD regions are at risk of automation (OECD, 2018^[9]).¹¹ In the HMR, policymakers should support Chambers of Crafts, Chambers for Commerce and Industry, vocational schools and universities in jointly devising such training opportunities.¹² As digitalisation also facilitates remote access to training opportunities, it should also be exploited to increase lifelong learning provisions in parts of the region where the offer of training is so far limited.

Box 2.7. Hamburg Youth Employment Agency (YEA)

The Youth Employment Agency of Hamburg is directed at adolescents and young adults up to the age of 25, offering advice and support on the choice and preparation of a professional career. The agency supports young adults in looking for the right vocational training place, helps them determine suitable courses of, and helps to address school and personal problems.

The initiative also keeps track of adolescents who are not in an apprenticeship or high school, offers them direct support. Pupils still in a compulsory schooling age register with the vocational school (vocational preparation school) responsible for them after each summer holiday, where they are individually advised by teachers and, if necessary, by the YEA and receive suitable support. Young people no longer subject to compulsory schooling are advised, guided and placed in an apprenticeship by the YEA until they have found a professional perspective.

Since the introduction of the YEA, the retention rates in apprenticeships, as well as other measures, have been regularly surveyed for all school graduates after Year 9 or 10. The number of school graduates immediately starting an apprenticeship has increased significantly since 2012 and remains stable at a high level. Thus, the YEA helped to increase the direct transition to an apprenticeship after Year 10 from approximately 25% in 2012 to 36% to 39% in 2017.

Source: Youth Employment Agency (Jugendberufsagentur) Hamburg (n.d.^[41]), *Infoportal : What can the JBA Can Do for You*, <https://www.jba-hamburg.de/English-71>.

Table 2.6. Graduates of general education schools in the HMR, 2016

Number of graduates by district and type of degree

	Total number of graduates of general education schools	among which							
		without <i>Hauptschulabschluss</i> (lowest secondary qualification)		with <i>Hauptschulabschluss</i> (lowest secondary qualification)		with <i>Mittlerem Abschluss</i> (middle secondary qualification)		with <i>Allgemeiner Hochschulreife</i> (general matriculation standard)	
		total	female	total	female	total	female	total	female
Hamburg Metropolitan Region (HMR)	57 705	3 626	1 413	8 066	3 309	20 097	9 714	25 916	13 923
Hamburg	16 944	992	401	2 588	1 117	3 944	1 802	9 420	5 053
Kreisfreie Stadt Lübeck	2 395	180	77	347	147	711	342	1 157	639
Kreisfreie Stadt Neumünster	1 494	91	42	198	90	419	202	786	435
Kreis Dithmarschen	1 919	159	57	267	104	657	310	836	472
Kreis Herzogtum Lauenburg	2 236	157	67	340	118	786	398	953	502
Kreis Ostholstein	2 600	234	90	411	151	943	466	1 012	555
Kreis Pinneberg	4 239	254	106	535	243	1 412	727	2 038	1 062
Kreis Segeberg	3 629	226	74	588	230	1 246	627	1 569	851
Kreis Steinburg	1 765	127	35	288	128	602	307	748	390
Kreis Stormarn	2 939	132	55	292	108	795	378	1 720	891
Schleswig-Holstein (area within HMR)	23 216	1 560	603	3 266	1 319	7 571	3 757	10 819	5 797
Landkreis Cuxhaven	2 121	142	57	338	129	1 153	555	488	265
Landkreis Harburg	2 547	70	29	305	101	1 168	573	1 004	519
Landkreis Lüchow-Dannenberg	535	34	11	82	41	285	142	134	74
Landkreis Lüneburg	1 956	72	33	185	85	946	429	753	375
Landkreis Rotenburg (Wümme)	1 960	109	32	203	80	1 039	506	609	323
Landkreis Heidekreis	1 548	111	40	193	70	809	407	435	253
Landkreis Stade	2 216	148	59	275	109	1 201	603	592	353
Landkreis Uelzen	1 019	45	11	138	53	542	243	294	162
Lower Saxony (area within HMR)	13 902	731	272	1 719	668	7 143	3 458	4 309	2 324
Kreisfreie Stadt Schwerin	851	101	38	76	35	266	124	408	202
Landkreis Nordwestmecklenburg	1 225	120	51	199	85	479	234	427	240
Landkreis Ludwigslust-Parchim	1 567	122	48	218	85	694	339	533	307
Mecklenburg-Western Pomerania (area within HMR)	3 643	343	137	493	205	1 439	697	1 368	749
HMR without Hamburg	40 761	2 634	1 012	5 478	2 192	16 153	7 912	16 496	8 870

Note: Graduates of general education schools 2016.

Source: Statistik Nord (2018^[42]), *Statistik der Allgemeinbildenden Schule*, <https://www.statistik-nord.de/zahlen-fakten/regionalstatistik-datenbanken-und-karten/metropolregion-hamburg/>.

In order to leave nobody behind, policymakers need to provide upskilling opportunities for low-educated and low-skilled employees widely and quickly. According to the Institute for Employment Research (IAB), the exposure to automation risk in the HMR is highest in Lower Saxony (25% of employees in high-risk occupations) and most strongly affect jobs in manufacturing (Dengler, Matthes and Wydra-Somaggio, 2018^[43]). By granting the right training opportunities, policymakers can achieve the widest possible participation of the labour force in an economy changed by digitalisation. Policies to address the social impact of digitalisation in the metropolitan region have to place older and less-skilled workers at their centre, groups that appear particularly vulnerable to digitalisation-driven structural changes.

Furthermore, increased upskilling and training opportunities in the HMR could produce positive spillover effects through knowledge sharing (Fritsch and Aamoucke, 2013^[44]). These spillover effects are especially pronounced in high-tech sectors that rely relatively more on workers with tertiary education. Therefore, regional differences in the supply of highly skilled workers can give rise to differences in productivity (Moretti, 2004^[45]).

Promoting a more dynamic business environment and entrepreneurship

Supporting SMEs to scale up, enhancing and expanding business clusters, and incentivising entrepreneurship are key priorities for private sector development in the HMR. In the metropolitan region, SMEs strongly dominate the business environment. The vast majority of firms consists of small- or medium-sized firms that are financially constrained. These firms only have a low or slow take-up of new technology and face various obstacles to growth. The regional focus on selected business clusters can create a comparative advantage in key sectors for the HMR and help spur and spread innovation more widely throughout the metropolitan region. Finally, the region needs to do more to expand entrepreneurial activity beyond its economic centre of Hamburg.

Supporting SMEs to scale up and innovate

A lack of SMEs that grow in terms of revenue, employment or product portfolio inhibits the growth of the local economy in the HMR. As documented in Chapter 1, the HMR tends to have a higher share of smaller firms and a lower share of larger firms than other German metropolitan regions. Empirical evidence has demonstrated that there is a persistent productivity gap between SMEs and large firms. Large firms benefit from increasing returns to scale and consequently, productivity often increases with firm size. Since the economic crisis, the gap between SMEs and larger firms has further widened (OECD, 2017^[46]). To raise MRHs relatively low level of productivity compared to national and international peers (see Chapter 1), scaling up of SMEs plays an important role.

By enabling SMEs to scale up, the regional economy of the HMR could reap multiple benefits. Scaling up raises productivity, it generates new jobs and contributes to innovation as larger firms are better positioned to take up new technologies or production processes. This is particularly pertinent for the HMR with only one DAX enterprise headquartered in the region. The economies of metropolitan regions of Rhein-Ruhr, Munich, Rhein-Neckar or FrankfurtRheinMain enjoy considerably larger R&D capacity in the private sector because of the presence of 10, 7, 4 and 3 DAX companies respectively (Chapter 1).

The most common obstacles to scaling up of SMEs in the HMR seem to be a lack of skilled workers (Section *Key challenges in education and human capital in the HMR*), difficulties of implementing new technologies and access to finance. As documented earlier in this

chapter, SMEs struggle to take up new technologies and apply new production processes because they face difficulties in linking up with innovation and science parks in the region. Recent progress has been made in this regard with the creation of various new innovation parks and incubators such as the Innovation Park Bergedorf with a focus on wind energy and 3D laser technology (Table 2.5). However, more targeted research could help further mitigate the challenge of technology take-up of SMEs, as illustrated by the close collaboration between local research institutes and SMEs at Leuphana University. ARTIE, the regional network of districts in northern and eastern Lower Saxony, is another good example of an initiative that aims to spur innovation-oriented economic development of SMEs based on demand-oriented knowledge and technology transfer targeted at the specific needs of SMEs.

Research and development investments by private sector firms are relatively low in the HMR. As a result of a low number of headquarters of large multinational enterprises within the metropolitan region, R&D activities are low given the size of the regional economy. Since SMEs with both limited financial resources and low research capacity dominate the business environment in the HMR, achieving more effective co-operation between research and innovation centres and SMEs across all areas of the metropolitan region is of pivotal importance. The fragmented and diversified business structure in the HMR may, on the other hand, enhance the economic resilience of the region compared to regions dominated by a few large firms.

SMEs in the HMR have access to a smaller number of non-institutional company financiers than enterprises in other parts of Germany such as Berlin, Dusseldorf and Munich. Private equity or business angels are particularly important sources for capital-intensive formations and expansions of businesses. While SMEs typically rely on bank debt for their external financing, policies that encourage non-institutional financing could help firms access the funds they need to pursue investments and upscale their operations. Locally initiatives could set up business angel networks to ensure better access to these sources of financing, especially in remote areas of the metropolitan region.¹³ A lack of access to finance is not the only challenge that SMEs face in their efforts to scale up their operations (Box 2.8).

SMEs in the HMR need to strive to increase their management capacity and the skills of their employees. Managerial skills and expertise often limit SME growth. Policymakers in the HMR could target this challenge by supporting the introduction of peer learning networks and by offering specific training jointly with universities and other educational institutions. Furthermore, establishing a platform for exchange between entrepreneurs and the management of established firms could yield mutual benefits and knowledge dissemination. Currently, there are few initiatives in the HMR that aim to nurture aspirations and growth ambitions among SME management. Given the lack of available workers and the changing nature of work due to digitalisation, SMEs need to provide more and better training opportunities for their employees, enabling them to upskill and satisfy changing business needs.

Box 2.8. Scaling up of SMEs

Only a small proportion of SMEs manages to grow significantly over time. Consequently, only a small fraction of young SMEs manages to scale up their operations significantly. Across the OECD, less than 8% of start-ups are able to grow beyond the number of 10 employees within 5 years. The majority stagnates at a small business size. However, those start-ups that do manage to grow – though relatively few in numbers – drive job creation (Calvino, Criscuolo and Menon, 2016^[47]). Among the most relevant factors that affect scaling up are:

- bankruptcy regulation (complexity of regulatory and insolvency procedures)
- the burden of tax compliance
- contract enforcement and civil justice efficiency
- limited access to finance: subdued lending, unavailability of venture capital, crowdsourcing and other alternative sources of funding
- management skills
- research incentives (R&D tax incentives) and technology diffusion.

Sources: OECD (2018^[48]), “Enabling SMEs to scale up”, SME Ministerial Conference, OECD, Paris; Calvino, F., C. Criscuolo and C. Menon (2016^[47]), “No Country for Young Firms?: Start-up Dynamics and National Policies”, <http://dx.doi.org/10.1787/5jm22p40c8mw-en>.

Strengthening business links with Scandinavia would offer new economic opportunities for the HMR that could help its companies, especially SMEs, expand their operations and grow. The geographic proximity of Denmark and southern Sweden, as well as commonalities in business sectors, give rise to natural mutual interests with the HMR. In areas such as renewable energies, 3D-printing or logistics, firms from the HMR could benefit from a closer economic integration of the HMR and southern Scandinavia. Cluster policies offer a promising approach to overcome the difficulties that SMEs face in their quest to grow and become more productive (see Section *Cluster policies for smart specialisation*) and a closer relationship with southern Scandinavia could help extend the scope of these clusters. The crossing of the Fehmarn Belt is of essential importance to realise the economic potential of intensified co-operation between the HMR and southern Scandinavia (see Chapter 3 for further discussion).

Cluster policies for smart specialisation

The metropolitan region places a strong focus on cluster policies as a tool for economic development. Each federal state views economic clusters as vital for regional innovation, as demonstrated by the prominent role of smart specialisation in the respective regional innovation strategy. The clusters provide institutional arrangements and support for actors along different stages of the value chain of a specific industry. Clusters in the HMR usually consist of different types of companies (producers of a final product, intermediaries and suppliers), public affairs agencies, Chambers of Crafts, Chambers for Commerce and Industry, public authorities and scientific institutions with research related to the industry.

Across the OECD, governments aim to use smart specialisation approaches to raise productivity and innovation in regions. Cluster policies can enhance competitive advantage in specific industries and help firms and entrepreneurs organised in clusters to move up in

the value chain by increased specialisation (OECD, 2014^[49]). Furthermore, clusters yield significant agglomeration benefits of connecting the know-how and skills of a larger number of firms working in the same field. By bundling resources and expertise, smaller- and medium-sized firms in the HMR can improve their access to innovation centres in the region. Furthermore, resource sharing can ease the financial capacity constraints that in many cases inhibits private sector firms in the HMR from pursuing research and development activities themselves.

Currently, the four federal states that compose the HMR have developed independent cluster strategies. Hamburg identifies eight business clusters as crucial for economic development and innovation (Table 2.7). Schleswig-Holstein's cluster strategy rests on five business sectors (life sciences, renewable energies, maritime industries, ICT and food industry). Lower Saxony puts the focus on seven sectors, areas in which the state already has a comparative advantage, which it aims to extend. Finally, Mecklenburg-Western Pomerania deviates from the other three states by gearing its choice of five clusters more on future importance than on existing strengths and established networks.

Table 2.7. Cluster policies in the HMR, by federal state

Sectors			
Lower Saxony	Hamburg	Schleswig-Holstein	Mecklenburg-Western Pomerania
Renewable energies	Renewable energies	Energy	Energy and climate
Health sciences	Health sciences	Health sciences	Health and life sciences
Food industry		Food industry	Food industry
Maritime industries	Maritime industries	Maritime industries	
	Life sciences	Life sciences	
(New) Material science			New and sustainable materials
Mobility economy			Mobility
		Information, communication and media	Information and communication
Digital and creative economy	Creative economy		
	Logistics	Logistics	
	Media		
	Aviation		

Note: Clusters that are common across several states are in bold.

Source: BWVI Hamburg (2014^[4]), *Regionale Innovationsstrategie 2020 der Freien und Hansestadt Hamburg*, https://www.hamburg.de/contentblob/4483086/c1e24c0eeb1ef963a9244e7848f3057d/data/exanted_oku-innovationsstrategie-fhh-final.pdf;jsessionid=1D51AF941E9E8633DB744389488E987D.liveWorker2; Mecklenburg-Western Pomerania (2014^[6]), *Regionale Innovationsstrategie 2020 Mecklenburg-Vorpommern*; Regionale Innovationsstrategie Schleswig-Holstein (2014^[50]); Niedersachsen (2014^[7]), *Niedersächsische regionale Innovationsstrategie für intelligente Spezialisierung*.

There are significant commonalities between the main business clusters in the different regions in the HMR. Energy (including renewable energy) and health sciences feature prominently in the cluster policies in all four areas (Table 2.7). Similarly, three out of the four federal states consider the food industry and the maritime industry as sectors of priority. Finally, at least two of the four federal states list material sciences, mobility,

logistics, information and communication, life sciences and the creative economy as vital clusters. These shared priorities in terms of economic sectors give rise to large economies of scale through integrated approaches and cross-border administration in the metropolitan region.

Extending clusters to the entire metropolitan region would raise their effectiveness. The thematic overlap and shared interest between clusters of the different areas in the HMR give rise to enormous collaboration potential. Enlarging the clusters, where possible, to all parts of the HMR would create large agglomeration benefits that arise with larger clusters. The networking platforms that clusters usually provide would benefit from additional input and knowledge, creating a value-added for everyone involved. Furthermore, larger clusters could also facilitate science-industry interactions, one of the main bottlenecks for technology and knowledge transfer in the metropolitan region (OECD, 2016^[51]).

Successful cluster initiatives such as Hamburg aviation demonstrate the benefits of region-wide co-operation. Bringing together actors from the entire regions, spanning large international players, SMEs, research institutions and technology centres, the cluster has established Hamburg as the third largest centre for civil aviation in the world (Box 2.9). The cluster enables all actors to contribute to the advancement of Hamburg as an aviation centre with their respective know-how and expertise. It also facilitates targeted applied research that raises the innovativeness and competitiveness of the participating enterprises.

Box 2.9. Hamburg aviation cluster: An example of successful region-wide cluster co-operation

The Hamburg Metropolitan Region is one of the world's most important centres for the civil aviation industry. The Hamburg aviation cluster brings together more than 40 000 high-skilled specialists, 300 SMEs, large international players in the aviation industry and institutions in the metropolitan region.

Led by two major international companies, Airbus and Lufthansa Technik and Hamburg Airport, the cluster is dedicated to advancing the region's importance in the aviation industry. The cluster connects companies, universities, associations, the economic authorities and other partners, bringing together different actors to form a powerful coalition with shared objectives.

These partners pursue a common goal: “to network research and development, thereby bringing to market high-quality products and services for the aviation of the future – products that are good for passengers and set the standards in terms of resource protection”.

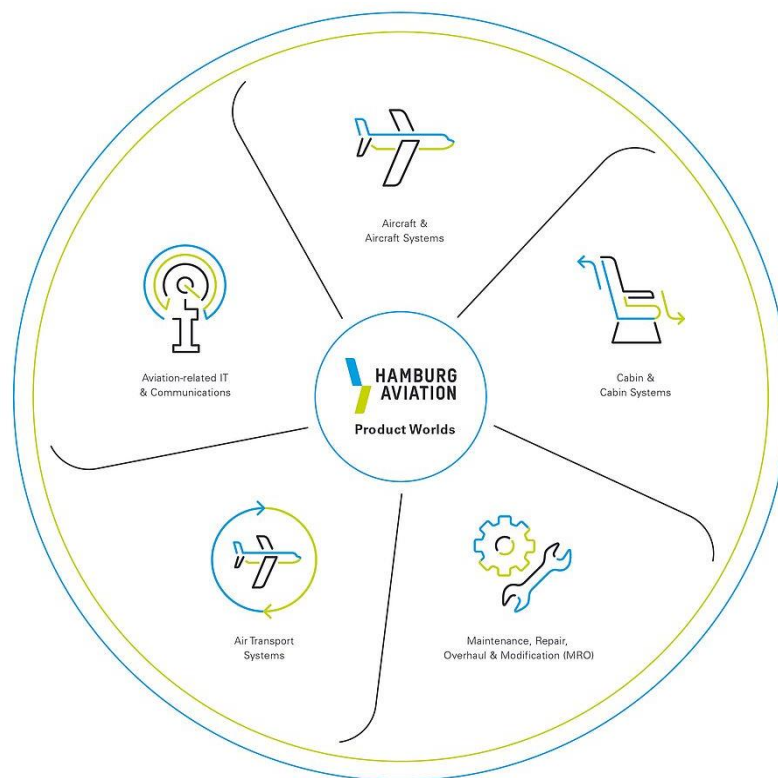
The broad range of stakeholders with different competencies allows the cluster to offer services and products that cover the complete life cycle of an aircraft (Figure 2.4). The services and products range from the design, manufacture and fitting out of aircraft, to the maintenance, repair and overhaul, as well as the recycling of planes. By joining forces, the cluster constitutes the third largest location in the civil aviation industry worldwide.

Source: Hamburg Aviation (n.d.^[52]), *Homepage*, <https://www.hamburg-aviation.de/>.

Notwithstanding existing co-operation, there remains significant potential for scaling up clusters to wider areas of the metropolitan region. Sectors such as renewable energy, mobility or life sciences are not only common cluster priorities of large areas of the HMR.

They also offer non-negligible returns to a closer alignment of interests and territorial co-operation. While for some of these sectors regional cluster policy co-operations, such as the initiative *Süderelbe AG*, already exist, these collaborations do not yet make use of the full potential of bringing together all relevant actors from the metropolitan region.¹⁴ For example, the co-operation on renewable energy in the project NEW 4.0 is only limited to Hamburg and Schleswig-Holstein. The project offers a promising example of working together across administrative borders but its expansion to the other areas of the HMR could be a logical next step, given the shared natural conditions and the strategic importance of renewable energy for the future competitiveness of the entire metropolitan region. Finally, yet importantly, intensified territorial co-operation in these vital clusters can support an innovation- and entrepreneurship-friendly business environment that is a prerequisite for stimulating the growth of a regional start-up scene in these sectors.

Figure 2.4. Product and service portfolio of the Hamburg aviation cluster



Source: Hamburg Aviation (n.d.^[52]), *Homepage*, <https://www.hamburg-aviation.de/>.

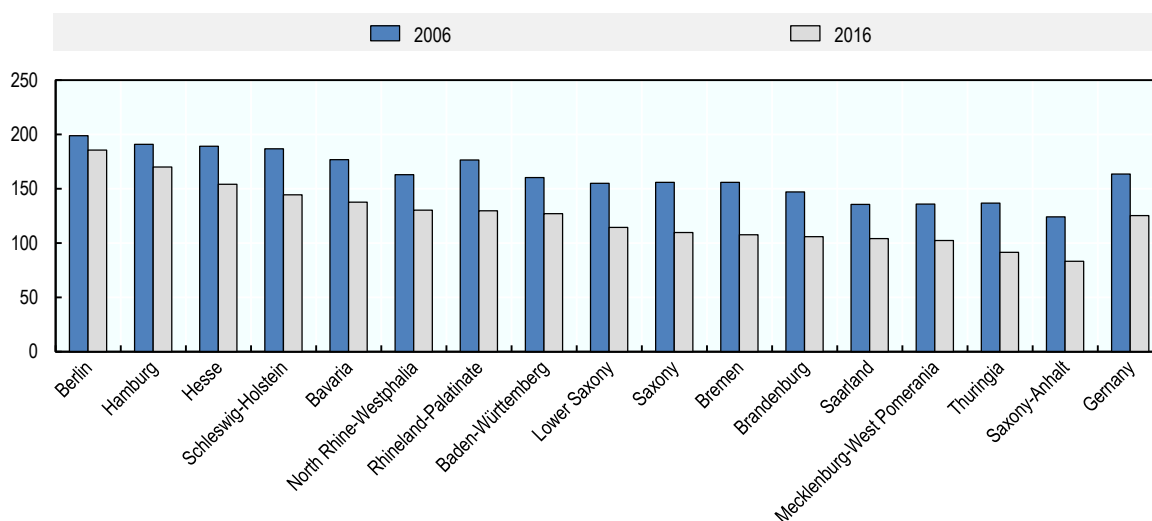
Encouraging entrepreneurship in the HMR

The Hamburg Metropolitan Region is increasingly investing effort into creating the right conditions for business developments. Across the four federal states, various business parks and incubators have been set up or are in planning with the explicit aim of improving entrepreneurship. Realising the contribution new firms can generate for the local economy, the policy discourse in the HMR is placing a lot of weight on attracting entrepreneurs and highly skilled workers to form a vibrant start-up ecosystem. The recognition of the economic importance of new firms puts the HMR in a good position to benefit from the innovation and employment that local entrepreneurship yields (OECD, 2017^[53]; 2018^[54]).

Compared to other parts of Germany, entrepreneurial activity is high in most parts of the HMR. In a ranking of Germany federal states according to the number of firm creations per 10 000 inhabitants, Hamburg and Schleswig-Holstein record the 2nd and 4th highest score respectively (Figure 2.5). With more than 170 new firms per 10 000 inhabitants in 2016, Hamburg ranks 2nd nationally, only falling below Berlin. The vibrant business dynamism in Hamburg also drives entrepreneurship in the metropolitan region and explains the fact that the HMR fares relatively well in terms of indicators of firm creations. In contrast, firm creation rates are below the German average both in Lower Saxony and in Mecklenburg-Western Pomerania, where the number of business creations per 10 000 employees also declined more between 2006 and 2016 than for Germany as a whole, with a reduction of 26% and 25% respectively.

Figure 2.5. Entrepreneurship ranking of German federal states

Ranking of German regions based on business creations per 10 000 inhabitants

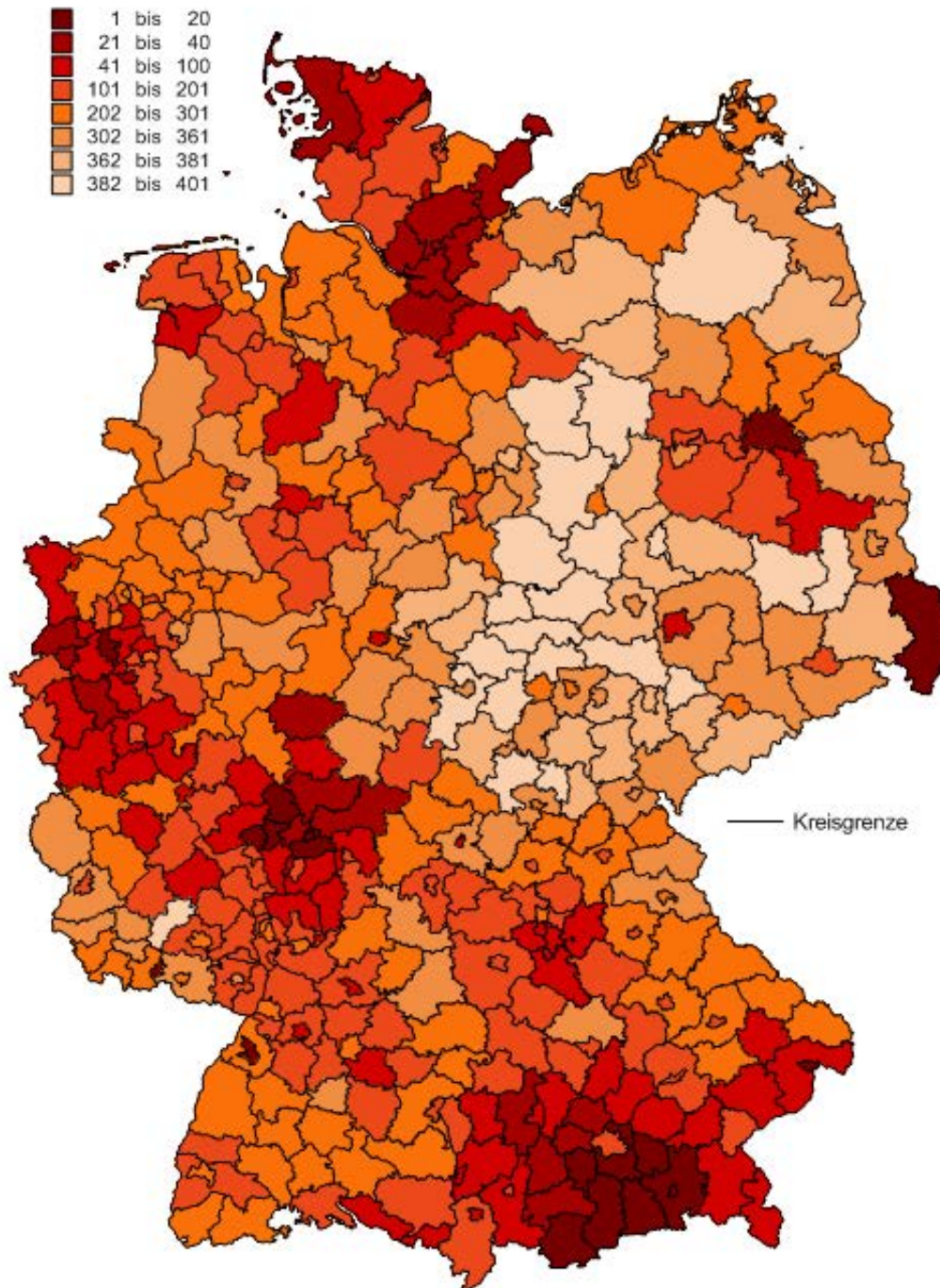


Note: Mean number of firm creations per 10 000 inhabitants of the sample of districts of each federal state.

Source: Institut für Mittelstandsforschung (IFM) Bonn, (IFM, 2017^[55]).

Geographic differences in entrepreneurship and firm creations are substantial across the HMR and reveal a significant urban-rural divide. The overall size and performance of the start-up scene masks large variation in entrepreneurship in the metropolitan region, in particular when one examines districts (Figure 2.6). The city of Hamburg and several directly neighbouring districts (*Landkreise*) such as Harburg, Pinneberg, Segeberg or Stormarn rank among the best 40 districts (top 5% to 10%) across Germany in enterprise creations. They record between 160 and 175 new enterprises per 10 000 inhabitants. In contrast, the districts Nordwestmecklenburg and Ludwigslust-Parchim are among the 15% and 10% of German districts with the lowest enterprise creation rate respectively. The greater business dynamism in the central parts of the HMR illustrates that entrepreneurship in the HMR can be characterised by large rural-urban differences.

Figure 2.6. Ranking of German districts by enterprise creations per 10 000 inhabitants, 2017



Note: The map depicts the ranks by colour, as specified in the legend.

Source: Neue Unternehmerische Initiative – NUI; Institut für Mittelstandsforschung (IFM) Bonn, IFM (2017^[55]), *Das NUI-Regionenranking 2017 nach Bundesländern*, https://www.ifm-bonn.org/fileadmin/data/re_daktion/statistik/gruendungen-und-unternehmensschliessungen/dokumente/NUI-Regionenranking_BL_2006-2017.pdf.

Throughout the region, newly created business parks and incubators support potential founders and boost the start-up environment (Box 2.10). The business parks and incubators facilitate the exchange between R&D actors and entrepreneurs and provide a physical home for new start-ups. By offering institutional support for entrepreneurship, these places advance the metropolitan region as one of the foremost locations in Germany for aspiring entrepreneurs. The fact that additional innovation parks and technology transfer centres are in planning demonstrates that policymakers in the HMR have recognised the significance of creating a vibrant start-up ecosystem.

Box 2.10. Overview of selected business parks and incubators in the HMR

Hamburg:

- Innovation Campus Green Technologies: provides knowledge-based start-ups infrastructure and assists business start-ups in green technologies from the Hamburg University of Technology.
- Health Innovation Port: incubator/accelerator that connects entrepreneurs and establishes firms in health sciences.
- Next Media Accelerator: hub for media innovation, start-up support.
- Airbus BizLab: global aerospace accelerator, hosts start-ups for six months.
- Next Logistics Accelerator: supports start-ups working on the digitisation of logistics.
- Digital Hub Logistics: brings together market leaders, SMEs and start-ups, science, research and advanced training at the leading logistics centre in Northern Europe.
- Next Commerce Accelerator: offers a six months programme to help companies focused on commerce achieve product-market fit and growth via mentorship, network and funding.
- Music WorX Accelerator: offers programmes specifically aimed at start-ups and entrepreneurs from the music industry.

Lower Saxony:

- ARTIE: regional network of (county) districts for innovation-oriented economic development for SME in northern and eastern Lower Saxony.
- TZEW Transfer Centre Elbe-Weser: transfer and knowledge transfer centre for SMEs supported by ten districts in order to enhance communal economic development.

Schleswig-Holstein:

- BioMedTec Wissenschaftscampus: centre of a regional cluster on life science that supports entrepreneurs through its incubator *GründerCube*.
- IZET Innovation Centre Itzehoe: helps entrepreneurs as well as technology-oriented start-ups by providing office, laboratory and workshop facilities, etc.

While these business parks are generating positive returns to the regional economy, more needs to be done to address the spatial disparities in entrepreneurship. Most of the

innovation parks, incubators or technology transfer centres are in Hamburg or surrounding locations. To the contrary, firms in Mecklenburg-Western Pomerania or remote parts of Lower Saxony have little access to such services. Following the example of the Swedish region Västtra Götaland by distributing science parks across space could yield more inclusive access to entrepreneurship-related knowledge and technology (Box 2.6.). Alternatively, incubators or innovation parks could establish regional offices, even if only a few days a month, granting firms in remote places the opportunity to benefit from their services and knowledge exchange platform. To create the effectiveness of business parks, policymakers in the HMR should accompany them with business-friendly regulation and improved access to finance (Box 2.11).

Box 2.11. Regional determinants of business dynamism

Measures policymakers in the HMR can take to create beneficial conditions for entrepreneurship include:

- **Business regulation:** Higher product market regulation is associated with lower net business creation and reduced survival probability of new firms. Business regulation, such as burdensome administrative procedures or slow legal conflict resolution, discourages entrepreneurship significantly.
- **R&D spending:** Firm creation rates are significantly and positively correlated with research and development by the higher education sector, highlighting the role of human capital and innovation. R&D offers new business opportunities and generates positive spillovers to the private sector, both of which provide incentives for entrepreneurs to start a new business.
- **Education:** The education of the regional labour force contributes to business creation (Chatterji, Glaeser and Kerr, 2013^[56]). A 1% increase in the share of the regional workforce that is tertiary-educated is associated with an increase in the net firm creation rate by 0.5%.
- **Access to finance:** Financing constraints of firms increase business deaths and reduce new business creation. In European regions, additional resources via EU Cohesion Funds can enhance regional firm dynamics and this effect is greater where there is a higher quality of governance, i.e. efficient rule of law, dispute settlement and low corruption.

Source: OECD (2017^[53]), *The Geography of Firm Dynamics: Measuring Business Demography for Regional Development*, <http://dx.doi.org/10.1787/9789264286764-en>.

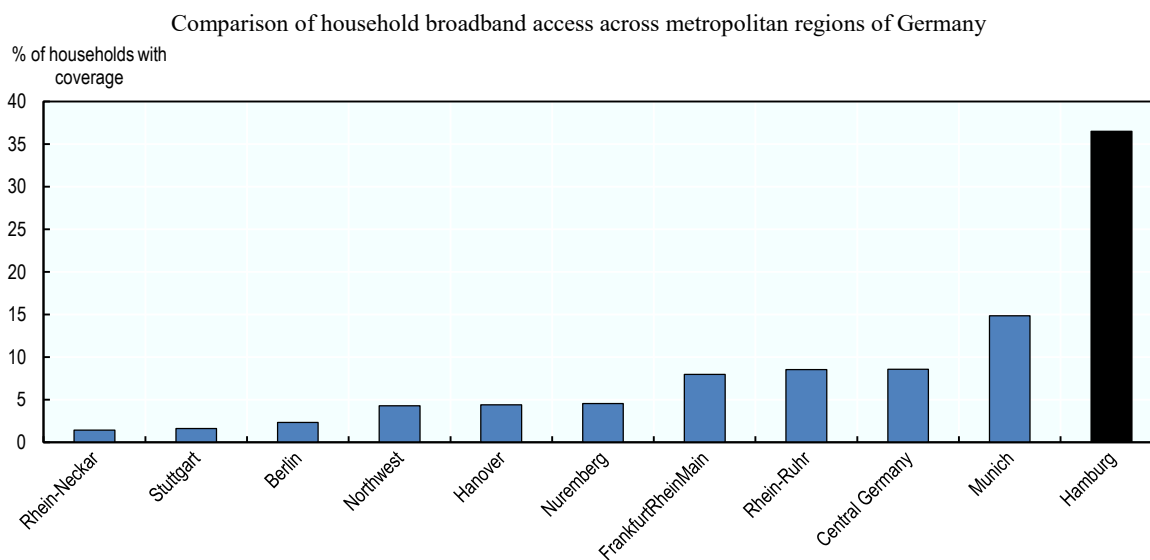
The example of entrepreneurship demonstrates that the metropolitan region could reap considerable economic benefits from a joint, holistic approach to economic development. Start-ups benefit from strong science-industry linkage, developed and broad cluster policies, efficient systems of knowledge sharing, and forward-looking strategies towards digitalisation. As discussed in the preceding sections, there are some promising initiatives in all of these areas in the HMR. However, region-wide co-operation could generate significant returns to scale that could be decisive in successfully establishing the HMR as a hub for entrepreneurship.

Making the most of digitalisation

High-quality access to high-speed Internet

The Hamburg Metropolitan Region is the digitalisation leader in Germany. Coverage of optical fibre, which guarantees very fast broadband connections of more than 50 megabytes per second, is much more common among households in the HMR than in any other metropolitan region of Germany (Figure 2.7). More than 35% of households have access to optical fibre in the HMR compared to around 15% in Munich, the metropolitan region that has the second highest level of optical fibre access. In 6 out of 11 German metropolitan regions, less than 5% of households have access to fast optical fibre connections.

Figure 2.7. Access to optical fibre broadband, 2018



Note: The metropolitan region Hannover Braunschweig Göttingen Wolfsburg is abbreviated as Hanover, the Capital Region of Berlin-Brandenburg is abbreviated as Berlin.

Source: Own calculations based on municipal data from Broadband Atlas, Federal Ministry of Transport and Digital Infrastructure, BMVI (n.d.^[57]), BMVI (2018), *Broadband Atlas*, <https://breitbandbuero.de/english/broadband-atlas/>.

The relatively rapid rollout of high-speed broadband puts businesses in the HMR in a better position to embrace digitalisation than enterprises in Germany's other metropolitan regions. High-speed Internet is a prerequisite for using computationally intense online services and facilitates the digitalisation of production processes. However, access to optical fibre is only a necessary condition, not a sufficient condition for making digitalisation a success in the region. It requires further effort to catch up with the internationally leading regions and countries such as Estonia or Korea to put businesses in the metropolitan region in a position where they can compete globally.

Despite the HMR's "pole position" in terms of broadband infrastructure, significant challenges remain in establishing widespread high-speed access in the region. The broadband expansion plans, detailed in the four state-level digitalisation strategies, have so far not managed to provide high-speed broadband access to many rural areas of the region. Whereas optical fibre virtually covers complete neighbourhoods and towns in some parts of the metropolitan region, in more remote areas the share of households with optical fibre

broadband access in 2016 still fell below 5% (OECD, 2018^[39]). This large spatial divide between central and remote areas is highly problematic as digitalisation offers a revitalisation opportunity for rural areas as it could give rise to better compatibility of certain professions with living outside of urban centres. Without a high-speed Internet connection, remote areas risk being left behind in the implementation of new production technologies and miss out on potential productivity gains due to digitalisation.

In line with the latest broadband strategies and development measures, fibre optic upgrades are currently being strongly promoted, particularly in rural areas. Mecklenburg-Western Pomerania has started broadband expansion projects that plan to increase the share of households with connections with a download speed of more than 50Mbit/sec from 60.5% to 84.9%, especially improving the situation in rural areas where the plans predict an increase from 22.8% to 94.1%. Similarly, Schleswig-Holstein plans to significantly increase the rollout of optical fibre as part of its 2025 broadband strategy. Action also takes place at the district level. For example, Lüchow-Dannenberg in Lower Saxony decided in 2017 to invest in broadband expansion. These initiatives might help to alleviate the rural-urban discrepancies in high-speed Internet access.

To ensure inclusive growth in the HMR, policymakers should, however, not stop there but also strive to provide the widest geographic expansion possible of new generations of cellular mobile communications such as 5G. A wide coverage of 5G will provide the basis for the settlement and development of new production processes. With sufficient high-speed Internet connections and opportunities to apply it for industrial or service processes, rural-urban linkages in the HMR can be strengthened, which would alleviate the economic gap between the urban centres of the HMR and its more remote districts.

To make digitalisation a success in the metropolitan region, policies that take on board and support SMEs in embracing digital processes and services need to be expanded. In the HMR, some good approaches are already in place to smooth the transition of firms into the digital era. As part of the federal initiative, competency centre *Mittelstand 4.0 – Digitale Produktions- und Arbeitsprozesse*¹⁵ was established in Hamburg. This centre promotes SMEs and handicraft firms in using digitalisation for Industry 4.0 applications. To help small companies take up digital technology, Lower Saxony offers digital bonuses, i.e. financial incentives. Finally, the establishment of the City Science Lab at Hafencity University as a thinktank and competency centre for digitalisation-related metropolitan development and the initiative *ahoi.digital* are good measures to further the digitalisation of enterprise in the HMR.¹⁶ However, as in most OECD regions, many enterprises in the HMR are not yet prepared for the changes that digitalisation will bring. Helping those firms find a way to use digital technologies in their workflows is hence of paramount importance.

A joint digital vision could help the metropolitan region make the most of digitalisation. Defining joint strategies, instead of fragmented approaches, how to seize the opportunities and address the challenges of the digitalisation of work processes would help the HMR to realise the innovation and productivity potential of digitalisation. At the same time, such strategies would provide an effective mechanism to tackle any adverse social impact that might arise such as the displacement of certain skill groups from the labour market. Finally, co-operation can boost ongoing efforts to use digitalisation for e-government practices, smart transport solutions and green energy generation, addressing important social and environmental challenges.

E-government: Using digitalisation to improve access to services in the HMR

Digitalisation does not only bring about new challenges for policymakers but also creates new opportunities to positively influence the daily lives of citizens. Digital approaches offer new solutions to public service delivery for public authorities. Administrative services are increasingly becoming available on line, simplifying their usage for residents and firms alike. Digitalisation can also give rise to efficiency gains through greater integration of public services, increase the sustainability and resilience of metropolitan regions via more accurate and cost-efficient air and water pollution monitoring, and reduce barriers to entry for entrepreneurs and small firms (OECD, 2018^[58]). In various districts of Lower Saxony, namely Cuxhaven, Harburg and Lüchow-Dannenberg, apps are available for administrative purposes. For example, Cuxhaven offers an app for waste management, informing users about collection dates, locations (disposal facilities, containers, etc.), unexpected changes, etc. The app adds to a more comprehensive website. The administrative districts of Harburg and Lüchow-Dannenberg have released apps for a wide range of services such as disaster and danger warnings (BiWAPP), registering and deregistering vehicles or informing families about unscheduled days off school. Online applications can also enrich an area's services to tourists as demonstrated by the app DAN APP 2.0, which provides comprehensive information about the district Lüchow-Dannenberg.¹⁷

Across the HMR, it is important to increase successively the acceptance of digital services. The introduction of digital access to public services should be implemented gradually, initially offering a complement rather than a substitute to conventional methods of accessing those services. Instead of following a “digital only” strategy, policymakers could follow an approach of “digital first”, which would prioritise the expansion of the digital provision of services without exclusively relying on it.¹⁸ A gradual introduction of digital service delivery might also help to ease concerns about data security, which is extremely important in Germany.¹⁹

Policymakers in the HMR need to reduce the bureaucratic fragmentation that residents face with administrative services; digitalisation can help to resolve this problem. At the moment, residents experience significant obstacles when they attempt to use administrative services across administrative borders. For example, while commuting flows designate the HMR as a consistent territory, administrative tasks such as registering a vehicle may only be completed in a person's district of residence. Greater co-operation and harmonisation between the services offered by the federal government, the states and administrative districts would ease citizens' administrative issues and lead to a more porous HMR.

Public transport is an area where digitalisation will create a more consumer-friendly environment. Public authorities have designed various strategies to utilise the possibilities of digitalisation to improve public transport and traffic in the region. In Hamburg, the project DIGITALE STADT is developing a strategic approach to topics such as transport and the environment. More opportunities and applications for using digitalisation for transport provision in an efficient, user-friendly and sustainable manner might arise through ongoing projects on intelligent transport systems (ITS).

Using digitalisation for smart transport solutions

Digitalisation offers new, innovative solutions to manage transport and to make it more sustainable. The metropolitan region has recognised this potential and is making significant strides forward to unleash it for the economic development of the HMR.

Intelligent transport systems (ITS) could constitute a way to bring the metropolitan region closer to its residents. Several ongoing initiatives already improved traffic and public transport across the HMR, thus directly affecting people's everyday lives. For example, a traffic planning tool called ROADS records and co-ordinates roadwork sites in Hamburg. An extension to neighbouring communities would help reduce the fragmentation of construction planning and ease congestion. ITS are not exclusively urban issues. They can also be implemented in rural areas. For example, in the HMR various districts have initiated an online system for collective buses and taxis that allow residents of remote areas to better plan and access nearby towns or cities. ITS can also streamline public transport planning and co-ordination across federal states.

The forthcoming ITS World Congress (ITS WC) 2021 can position the metropolitan region as a prominent global player in smart transport solutions. The congress is seen as an opportunity for displaying and implementing new, clean and consumer-friendly forms of transportation. Hosting this event has pushed the digital transport agenda in Hamburg forward. The projects that have been launched as part of the event, foster close co-operation and interplay of actors from industry, private and public sector, as well as local universities (ox 2.12). The World Congress offers a unique sounding board to test and then apply transport project ideas globally.

Box 2.12. ITS World Congress

The ITS World Congress proposes a strategy for the further development and implementation of measures of intelligent transport systems (ITS) in Hamburg:

- *Check-in/Be-out* (an app calculating the best tariff for the user's individual use of public transport at the end of the day).
- Expansion of SWITCH (a platform for the connection of different mobility solutions like public transport, car sharing offers and rental bike stations).
- Autonomous subway and buses (3 km test track in the Hafen City at the end of 2018), autonomous parking at the airport.
- The modernisation of (digital) transport infrastructures (5G test area, V2X communication).
- Optimisation of traffic management (real-time data, traffic flow management, construction site management).
- Development of a concept of ITS framework architecture for uniform, interoperable data use in the traffic area.

Source: Hamburg ITS World Congress (n.d.^[59]), *Experience Future Mobility Now*, <https://www.its2021.hamburg/>.

If successfully implemented and scaled up, ITS can give a major boost to digitalisation of transport management in the metropolitan region. As part of the congress, several agreements with industrial partners and sponsors have been concluded. For example, MOIA, a joint project with Volkswagen amounting to an investment of EUR 1 billion, will see the installation of initially 500 electric minibuses by the end of 2020 and could eventually expand to 1 000 electric vehicles in Hamburg for shared mobility. Furthermore,

an autonomous driving test course (3.5 km in the city centre) is under development, offering a useful platform for experimenting for applied researchers.²⁰ By leveraging the research on ITS, the HMR can not only strengthen a promising future economic sector but also improve the quality of life of its residents. Building upon ongoing projects and continuing the work on ITS can derive large economic returns for the metropolitan region. As part of the ITS WC, 70 projects led by private sector firms will be realised, attracting new firms to the region and offering business opportunities for existing ones. The newly founded Digital Hub Logistics recently founded will support this sector as an incubator for start-ups in the area of mobility.

More effort needs to go into including stakeholders from all parts of the HMR in the ITS initiative and to spreading the positive benefits it generates more widely. One of the main caveats of the ITS World Congress is its – so far – narrow focus on the city of Hamburg. Broader inclusion of firms and research institutes from other parts of the HMR could be mutually beneficial. Similarly, many of the transport solutions developed would also simplify the life of residents outside of Hamburg. For example, the installation of *check-in be-out* systems that automatically register the checking in and out of public transport rides could be extended to all parts of the Hamburg Traffic Association (HVV). Utilising ITS across wide parts of the HMR can foster the territorial integration of the metropolitan region, spread innovation to firms from more remote parts of the region and enhance the notion of regional identity.

Notes

¹ A diverse set of actors can enhance innovation. Governments can stimulate innovation through public sector initiatives; universities and research institutions provide the basis of new innovative products and technologies; and private sector firms are essential drivers of making economic use of innovation.

² See *Cluster policies* section for further details and more discussion on cluster policies across MRH.

³ The analysis of this report does not only build on quantitative evidence but also draws from qualitative evidence from the study missions to HMR, which included dozens of interviews and meetings with stakeholders from the private sector, research institutes, Chambers for Commerce and Industry, Chambers of Crafts and political administration at the federal state, district and municipal levels.

⁴ See OECD (2019_[60]) for further detail on recommendations of structuring and designing international STI co-operation.

⁵ The part of the dual education that takes place in enterprises follows national regulation. The vocational schools are in the domain of the federal states. The Chambers for Commerce and Industry and Chambers of Crafts are responsible for the exams.

⁶ For more information, see <https://www.yojo.de/>.

⁷ The sub-working group “skilled workers” of the office of the metropolitan region is currently compiling databases on the topic.

⁸ For some professions, classes exist across federal state borders. For example, Hamburg and Schleswig-Holstein have passed bilateral agreements such as the *Gastschulabkommen* which enables cross-border school/training attendance. However, these examples are exceptions in HMR.

⁹ Besides these innovation parks, several smaller technology transfer initiatives support firms, in particular start-ups, in HMR. These initiatives are often limited to smaller sector service, for example logistics (Next Logistics Accelerator, HASPA) or media (Next Media Accelerator, DPA).

¹⁰ The lack of continuous training and lifelong learning opportunities was highlighted by extensive feedback and comments from HMR stakeholders during the OECD mission interviews.

¹¹ The risk of automation approximately refers to the next 10 to 20 years. The regional estimates are based on data from 2016.

¹² While vocational schools are in regular contact with their company partners and are thus informed about digital progress, more comprehensive collaboration between all stakeholders involved in vocational and professional training would increase the effectiveness of training opportunities that address the demands of digitalisation.

¹³ In the metropolitan region Hannover-Braunschweig-Göttingen-Wolfsburg, the district of Braunschweig has created a local network that connects potential business angels, in the form of high net-worth residents, with local enterprises and entrepreneurs.

¹⁴ The growth initiative *Süderelbe AG* brings together actors from Hamburg and Lower Saxony to work together across federal state borders in order to foster regional economic development. It focuses on the sectors of food industry, port and logistics, as well as aviation.

¹⁵ See <http://www.mittelstand-digital.de/DE/Foerderinitiativen/mittelstand-4-0.html>.

¹⁶ *ahoi.digital* has the objective to establish Hamburg as leading location for informatics. For this purpose, 25 new professorships and 10 new junior professorships are established (1 500 new students). The four core topics of *ahoi.digital* are “Cognitive Systems”, “Cyber Physical Systems (CPS) and Smart Systems”, “Information Governance Technologies” and “Data Science”.

¹⁷ Another initiative for digital service provision is the project *Digital First* in Hamburg. In the near future, the citizens of Hamburg are supposed to do almost all public administrative tasks on line.

¹⁸ The statement does not refer to the specific strategy of the state of Hamburg.

¹⁹ To expand digital administration services, a compromise will have to be made between upholding data security and making services easy and affordable for citizens.

²⁰ For a complete overview of projects of the ITS World Congress: <https://www.hamburg.de/bwvi/projekte-its/>.

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Annex 2.A. Comparison with international and German metropolitan regions

Annex Table 2.A.1. Comparison of economic development with other metropolitan regions across the OECD – Extended set

	Total population	Share of total population in country (%)	Inhabitants per km ²	GDP (EUR million)	Share of GDP in country (%)	GDP per capita (EUR)	GDP per employed (EUR)
Athens (Greece)	4 889 101	45.4	402	127 278	56.9	17 570	55 526
Birmingham (UK)	5 638 865	8.5	447	160 917	7.2	27 796	60 871
Busan (Korea)	7 946 209	15.3	635	248 470	15.9	31 207	62 947
Dublin (Ireland)	3 365 126	70.8	97	226 423	87.3	65 314	144 836
Milan (Italy)	9 744 596	16	439	386 033	21.7	38 549	82 433
Lisbon (Portugal)	3 597 784	35	478	103 285	43	26 534	61 204
Manchester (UK)	7 078 612	10.8	512	64 417	2.9	24 440	58 293
Marseille (France)	3 065 274	4.6	286	91 455	4.3	28 080	63 235
Montreal (Canada)	8 254 912	22.6	6	262 698	19.5	31 567	63 556
Naples (Italy)	5 771 239	9.6	436	112 429	6.3	19 235	59 483
Oslo (Norway)	2 084 157	39.6	138	105 467	39	46 006	85 525

Notes: Metropolitan regions are composed of OECD TL2 or TL3 regions. See Footnote 5 for exact composition. USD converted into EUR as of 4 February 2019.

Source: Own calculations based on OECD (2018^[39]), *OECD Regional Statistics (database)*, <http://dx.doi.org/10.1787/region-data-en>, latest available data from 2016.

Annex Table 2.A.2. Labour markets and education in metropolitan regions in Germany

	HMR	Berlin- Brandenburg	Northwest	Frankfurt	Hanover	Central Germany	Munich	Nuremberg	Rhein-Neckar	Rhein-Ruhr	Stuttgart
Share of employed without vocational degree (%)	11.1	8.9	12.5	12.5	11.1	5.9	11.1	12.2	13.2	13.5	13.8
Change 2014-15 (%)	+7.7	+9.7	+7.6	+5.7	+8.0	+17.4	+4.6	+4.5	+5.7	+5.8	+4.8
Share of employed with vocational degree (%)	60.4	57.6	63.4	56.4	64.7	69.3	58.5	67.1	60.8	58.0	61.7
Change 2014-15 (%)	+2.2	+2.1	+2.8	+1.8	+2.2	+1.8	+2.5	+2.1	+2.1	+2.0	+2.2
Share of employed with tertiary degree (%)	14.4	18.7	10.5	17.9	13.8	16.5	18.9	11.9	15.6	14.6	16.1
Change 2014-15 (%)	+6.8	+8.5	+6.2	+6.4	+5.9	+3.1	+8.2	+6.5	+5.9	+5.8	+7.4
Share of employed in high-tech sector (%)	4.8	3.6	5.4	7.0	11.2	7.2	10.3	10.1	11.9	6.4	14.1
Change 2014-15 (%)	-0.2	-1.0	-0.2	+0.2	+0.3	+2.4	+3.1	-4.3	-1.2	-0.8	+1.5
Share of employed in creative sector (%)	3.3	3.4	1.7	3.2	2.7	2.5	4.1	2.0	3.1	2.6	3.1
Change 2014-15 (%)	+3.0	+5.3	+2.2	+3.3	+2.4	+2.0	+6.8	+3.3	+4.1	+1.7	+4.7
Share of students in university (% population)	2.5	3.7	2.3	4.1	3.4	4.0	2.9	2.8	3.6	4.5	2.8
Change 2014-15 (%)	+36.9	+26.5	+15.0	+38.3	+29.5	-0.2	+43.5	+56.6	+31.7	+62.5	+52.7
Apprentices per 1 000 residents	44.46	30.08	53.22	40.65	47.54	32.42	42.60	47.84	46.34	42.57	48.03
Vocational students per 1 000 residents	20.29	12.56	18.13	17.39	19.75	15.82	20.06	21.53	16.74	18.88	17.93
Students in university of applied science per 1 000 residents	12.19	10.85	8.44	16.73	8.21	8.59	8.72	8.98	11.54	15.22	15.22
Students in university per 1 000 residents	27.29	37.58	23.31	43.01	33.71	40.29	29.61	27.98	35.98	45.18	27.62

Notes: Figures take into account exact geographical borders of metropolitan regions, by aggregating observations over districts they are composed of.

Berlin-Brandenburg = Capital Region of Berlin-Brandenburg; Northwest = Bremen-Oldenburg in the Northwest; Frankfurt = FrankfurtRheinMain; Hanover = Hannover Braunschweig Göttingen Wolfsburg.

Source: Own calculations based on Federal Institute for Research on Building, Urban Affairs and Spatial Development (n.d.^[11]), *INKAR online: Indikatoren und Karten zur Raum- und Stadtentwicklung*, http://www.bbsr.bund.de/BBSR/DE/Raumbeobachtung/InteraktiveAnwendungen/INKAR/inkar_online_node.html (accessed on 18 December 2018), latest available data at the district level from 2015.

Chapter 3. Fostering sustainable and balanced development in the Hamburg Metropolitan Region

Abstract

Although the HMR boasts a high quality of life, there is potential to harness the region's full potential through more effective collaborative planning across the HMR. This chapter discusses policies to foster more sustainable and balanced development in the HMR and puts forward recommendations for further action centred on four dimensions: i) housing, land use and spatial planning; ii) mobility; iii) energy efficiency; and iv) quality of life.

Box 3.1. Summary of key findings and recommendations

The Hamburg Metropolitan Region (HMR) is an attractive area, endowed with strong assets to face the challenges of population growth and sustainable development. However, this chapter finds that quality of life could be further improved through greater co-ordination across the HMR. More efforts are needed to provide housing in all price segments and improve the accessibility of remote and peripheral areas of the HMR. The high quality of life in the HMR can be further improved and sustained through measures to safeguard natural and cultural resources while making these more accessible to all and utilising the full potential of the renewable energy transition underway in Germany.

- To counter the trend of increasing house and rent prices, the stock of low- and medium-income in the housing stock of the HMR should be increased in the places where it is needed. The HMR needs to better match housing supply to the population's needs both in terms of quantity and quality, encourage compact development of towns and cities, and enhance co-ordinated spatial planning within the HMR. This could be done by conferring spatial planning competencies to a regional planning association covering all or part of the HMR (for example, the Functional Urban Area).
- Accessibility in rural areas needs to be improved and the potential of digital mobility solutions could be harnessed to meet environmental goals and reduce spatial disparities in mobility. The proposed course of action includes shifting freight transport from road to rail and alleviating bottlenecks around the core city of Hamburg, implementing a single tariff scheme across the HMR, and increasing the use of public transport where possible.
- The energy transition in Germany has the potential to greatly transform the relationship between urban and rural areas, with rural areas poised to become suppliers of renewable energy such as wind energy. The HMR is in a unique position to take advantage of the energy transition. Measures need to be taken to retain and improve the acceptance of renewable energy production, while protecting green spaces through greater co-operation across administrative boundaries (for example, in biosphere reserves) and promoting energy efficiency to advance environmental sustainability.
- Leveraging the HMR's cultural assets could help raise the visibility of the whole region to the outside world and strengthen the appeal of the HMR for visitors, firms and skilled workers. Tourism, in particular, could benefit from a shared strategy broadening the focus from the core city of Hamburg to also include joint offers promoting different areas within the HMR.

Introduction

A holistic approach to sustainability should include careful consideration of ecological, social and economic dimensions. Building a strong, sustainable and inclusive HMR not only requires economic development (Chapter 2) but also environmental and social development. The HMR is a monocentric yet heterogeneous region, where the core city, its bordering districts forming the first ring, and the more peripheral districts forming a second ring are experiencing different dynamics (Chapter 1). While housing affordability and

availability are central concerns in the core area of the HMR, addressing vacancies and adapting housing to demographic change are more pressing issues in other areas. Many peripheral areas suffer from a low degree of accessibility to the core city by public transport, whereas the core city of Hamburg and its surrounding districts are struggling with bottlenecks both in passenger and freight transport. The outermost districts, where there tends to be less built-up land than in the innermost ones, have the potential to become renewable energy providers for the core city and urban agglomerations in West and Southern Germany, while the energy efficiency of buildings and transport is an important issue for the whole region. Seeing this as a simple urban-rural divide obscures the large diversity of spaces and contexts in the HMR, and thus the innate potential of each space that can be exploited to promote the region's overall growth and the well-being of its residents.

This chapter discusses policies to foster more sustainable and balanced development in the HMR and puts forward recommendations for further action. It is organised into four sections: i) housing, land use and spatial planning; ii) mobility; iii) energy efficiency; and iv) quality of life. In all these policy areas, different parts of the HMR bring different strengths to the table. It is important to understand these differences as opportunities for co-operation, through which the entire HMR can thrive not despite but because of the interdependencies between different areas. To fully harness this potential, greater collaborative planning in the field of housing, transport, environmental sustainability and branding is needed within the HMR.

Improving housing affordability and making spatial planning more effective

As in many metropolitan areas in which residents may live, work, socialise and commute over various administrative boundaries within a single day, developments affecting one place can spill over these boundaries. One such development is housing in the HMR. As shown in Chapter 1, the city of Hamburg's population growth has spilled over into its bordering districts and is expected to continue to do so. On the one hand, a housing shortage has been observed in the city of Hamburg, particularly in terms of low- and medium-income housing. On the other hand, other areas of the region must contend with the simultaneous phenomenon of vacancies and a rise in built-up land, as the population grows older and decreases. While the urban core of the city of Hamburg is growing and needs more space for housing and more affordable housing, in particular, areas at the periphery of the HMR often lack housing that is adapted to the needs of the population, such as smaller rental units and housing that is accessible to the disabled.

The Hamburg Metropolitan Region has adopted several policies to address challenges related to housing that differ between the very densified core area, adjacent densifying districts and outer districts, which may feature shrinking and ageing municipalities. Efforts are being made to address different challenges concerning housing at the level of the federal states and through some projects at the level of the HMR.

Responding to a lack of affordable housing and increasing competition between land uses

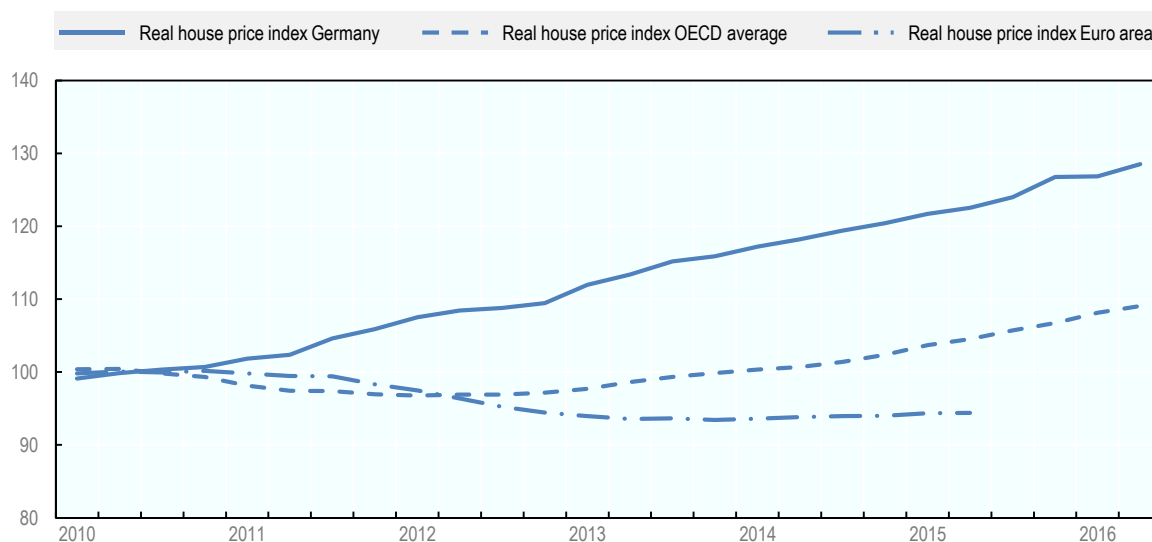
Housing affordability and provision is a particular concern in the region's core area, whereas many peripheral municipalities face a mismatch between the quality of housing and the needs of an ageing population.

Increasing the availability of affordable housing

Housing prices decreased or stagnated in the early 2000s in many districts and district-free cities in the HMR, and remained low due to low interest rates in the wake of the 2008 financial crisis (Holtermann and Otto, 2015^[1]). However, both rents and housing prices have risen in the years following the financial crisis, and are going up in Hamburg and in districts bordering on it. Even though housing prices in Germany are not among the highest in the OECD, real housing prices have increased faster than the OECD and Euro area average since 2010 (Figure 3.1). If this trend continues, the challenge of providing affordable housing in all price segments will become even more important. As can be seen in Figure 1.3, housing prices in Hamburg were among the highest in Germany in 2016 (Arbeitskreis der Oberen Gutachterausschüsse, Zentralen Geschäftsstellen und Gutachterausschüsse in der Bundesrepublik Deutschland, 2017^[2]) for both apartments and houses. Similarly, rents in the city of Hamburg are some of the highest compared to other German districts and district-free cities (Figure 3.2). While low- and medium-income housing is subsidised by each of the four federal states in the HMR, a main challenge in the upcoming years will be to ensure the affordability of housing for middle-income as well as lower-income groups.

Figure 3.1. Real housing prices have increased more rapidly in Germany than on average in the OECD and the Euro area in the last decade

Real housing prices seasonally adjusted 2010-16, index based in 2010

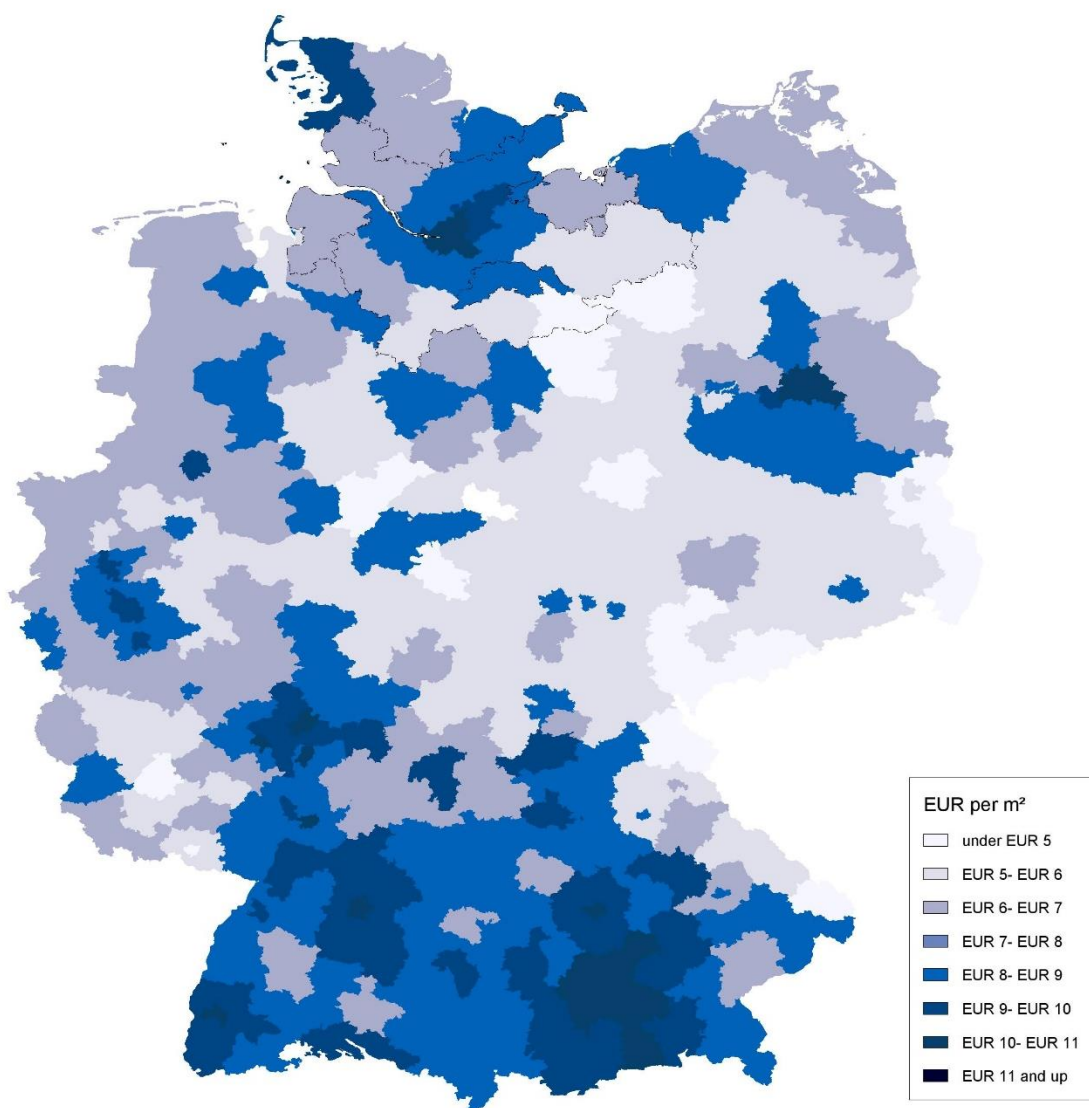


Note: OECD average data includes all available countries for the OECD area, Euro area data includes the OECD Euro area of 15. Real housing prices have been deflated using the private consumption deflator from the national account statistics.

Source: OECD (n.d.^[3]), *OECD Housing Price Database*, http://www.oecd.org/eco/outlook/House_Prices_indices.xlsx.

Figure 3.2. Rental prices in Hamburg and its surrounding districts are among the most expensive in Germany

Rental prices for newly constructed and already existing housing units in 2018, EUR per m²

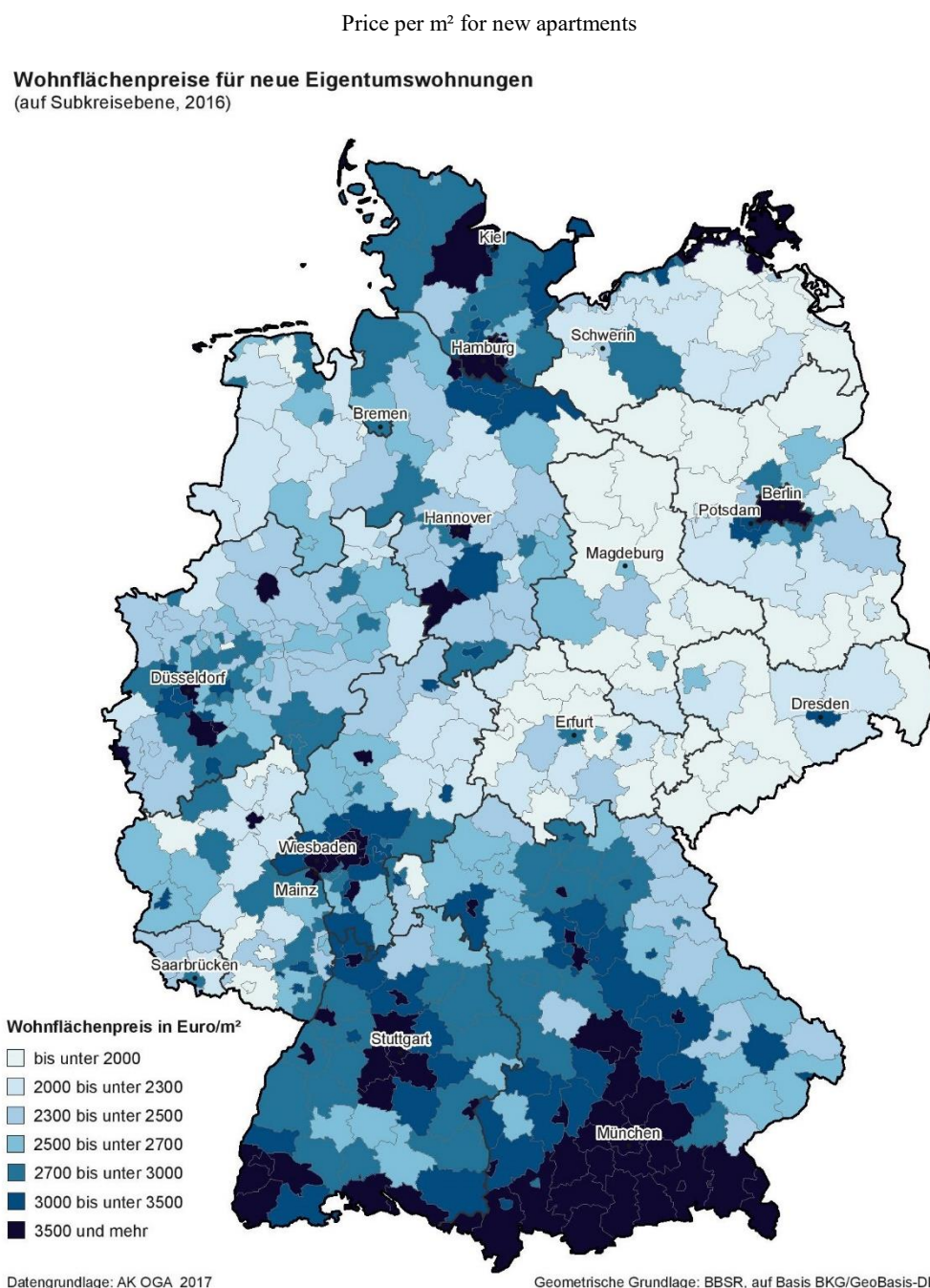


Source: , IDN ImmoDaten GmbH (2019_[4]), *BBSR-Wohnungsmarktbearbeitung*.

The increase in housing costs can be explained by an increase in land prices and the costs associated with preparing the land for construction. The lack of land made available for development in the urban core of the HMR can contribute to rising land prices by restricting the supply relative to demand. Rising housing costs may also be due to an increase in planning and building costs related to quality and regulatory requirements. An elevation in standards regarding energy efficiency, accessibility, stability and weather safety have all been found to contribute to higher building, and thus higher housing, costs (Walberg, Gniechwitz and Halstenberg, 2015_[5]). Rising construction costs are likely to contribute to rising house prices, especially in rural and peri-urban areas, where land is readily available

and construction costs constitute a large share of the price of a new dwelling. In contrast, they are less likely to play an important role in expensive areas in cities, where house prices are well above construction costs (Glaeser and Gyourko, 2018^[6]). At the federal level, the increase in building costs is being explored by the *Baukostensenkungskommission* (BKSK or the commission for a decrease in building costs) in the framework of the alliance for affordable housing. Another factor contributing to rising housing and rental costs is the declining stock of subsidised and social housing. Compared to other OECD countries, the share of social rental dwellings in the total housing stock is low in Germany as a whole (Figure 3.4).

Figure 3.3. The core city of Hamburg has among the highest housing prices for apartments



Source: Arbeitskreis der Oberen Gutachterausschüsse, Zentralen Geschäftsstellen und Gutachterausschüsse in der Bundesrepublik Deutschland (2017^[2]), *Immobilienmarktbericht Deutschland 2017*.

At the federal level, the initiative *Bündnis für bezahlbares Wohnen und Bauen-Wohnungsbau Offensive*, partially inspired by an earlier effort in Hamburg, aims to increase the pace of housing construction through ten separate measures (Sachs, 2017^[7]). Federal guidelines provide a framework for urban and regional planning, within which binding plans are made at different levels. Policy responses to housing shortages and rising rents

have also taken the form of policies aimed specifically at supporting low- and medium-income households. Rental caps have been introduced in a number of German municipalities since 2010, including the city of Hamburg and a number of fast-growing municipalities in Lower Saxony and Schleswig-Holstein. However, their effect on breaking the increase in rental prices is contested, with some findings indicating only a small or no effect on rising rents (Kholodilin, Mense and Michelsen, 2016^[8]). While rental price brakes may have a positive effect in the short term by taking the sharp edge off of rental increases, they may restrict the housing stock in the medium and long term. They may thus achieve the opposite of their intention, with rents and housing prices increasing in the long term due to an artificially restricted housing market.

In 2017, Germany reformed its urban planning law. The reform lifted barriers to densification and mixed land use in urban areas and lifted some noise pollution restrictions, introducing the “urban territory” category (*Urbanes Gebiet*) in the building code. This has been a step in the right direction to encourage the construction of housing and compact development. However, more could be done to encourage the construction of housing. While the construction of housing in all price segments is desirable, as a sufficient housing stock can help alleviate prices across the whole region, low- and medium-income housing are important parts of the housing stock and should be encouraged. Affordable housing takes many forms in Germany, among them social housing and housing provided by co-operatives (*Wohnungsbaugenossenschaften*). In addition, housing benefits are available to pay for market-based rent, providing an important targeted subsidy to alleviate rental burdens. While the stock of directly subsidised social housing is relatively low in Germany compared to other OECD countries (Figure 3.4), providers of publicly subsidised housing include municipal housing companies and co-operatives, individual landlords and commercial developers. Housing co-operatives have a rich history in Germany. They can build new housing and invest in modernising the existing housing stock. In the core city of Hamburg alone, housing co-operatives own around 130 000 housing units, which amounts to 20% of Hamburg’s overall rental housing stock (Hamburger Wohnungsbaugenossenschaften, n.d.^[9]). Housing co-operatives are based on a model of joint ownership, in which co-operative members, who have acquired shares in the co-operative, pay a (typically moderate) fee to live in one of their housing units which belong to all shareholders. Shares are reimbursed if a co-operative member decides to leave the co-operative. As democratic organisations, housing co-operatives regularly elect representatives. The state-owned building company SAGA is another important actor in the housing market of the HMR. Its building stock comprises approximately 130 000 housing units, which are rented, on average at a similar price as subsidised housing units. SAGA and housing co-operatives combined thus own around 260 000 housing units, making up around one-third of the rental market in the city of Hamburg.

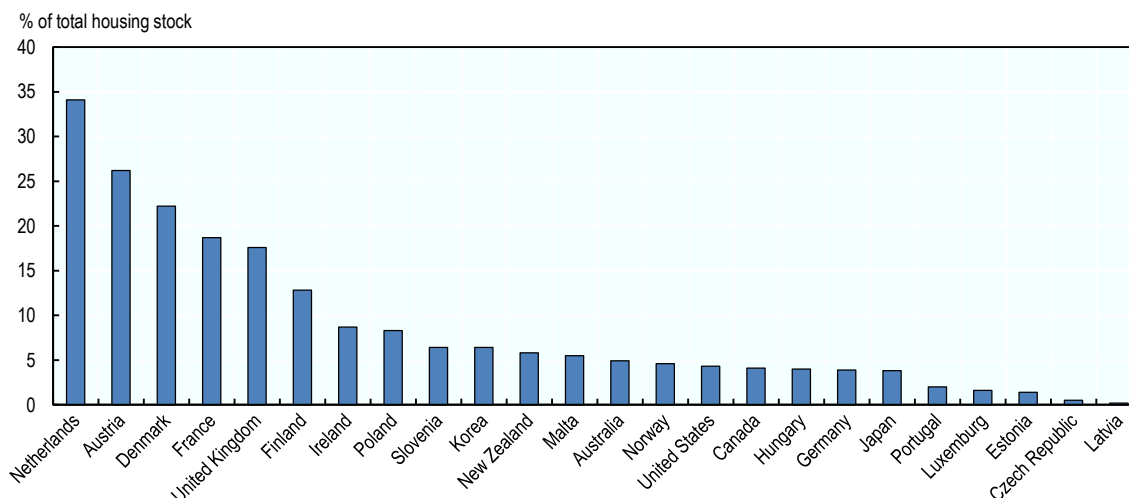
Box 3.2. The ten goals of the federal initiative *Bündnis für bezahlbares Wohnen und Bauen*

1. Provide building land and provide public land at a discounted and conceptually-priced standard.
2. Densify housing estates, close fallow land and building gaps.
3. Strengthen social housing promotion and co-operative living.
4. Create targeted tax incentives for more affordable housing.
5. Harmonising building regulations and reducing effort.
6. Reviewing standards and legal requirements in construction.
7. Encouraging serial construction for attractive and affordable living space.
8. Making parking lot regulations more flexible.
9. Structurally redesigning the Renewable Energies Heat Act (*Erneuerbare-Energien-Wärmegesetz*).
10. Working together to increase the acceptance of new construction projects.

Source: Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (2017^[10]), *Das Bündnis für bezahlbares Wohnen und Bauen: Das 10-Punkte-Programm*, <http://www.bmub.bund.de/N54291/>.

Figure 3.4. Germany's directly subsidised social housing stock is low compared to other OECD countries

Number of social rental dwellings as a share of the total number of dwellings, 2015 or latest year available



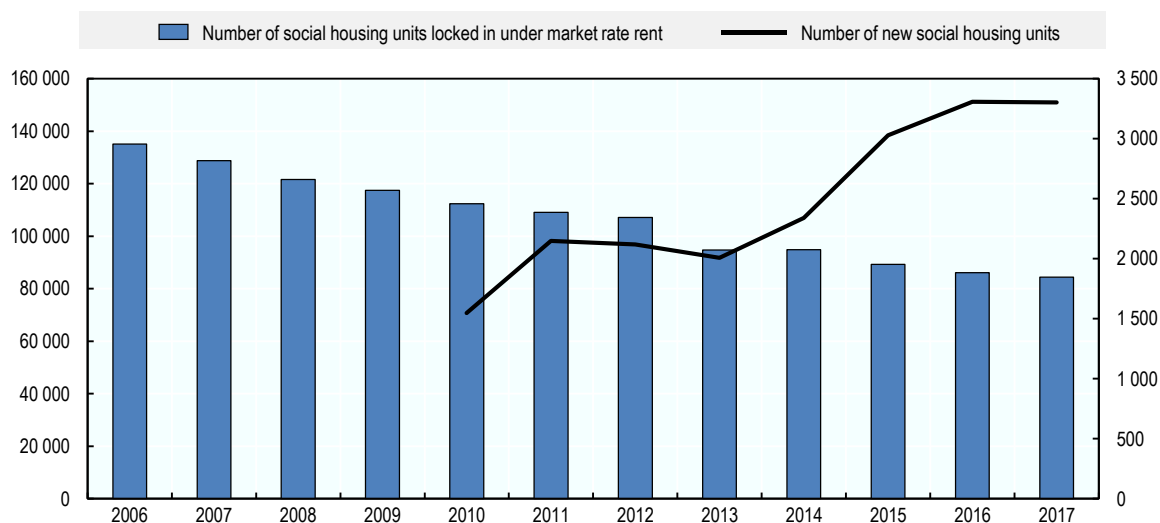
Note: Data refer to 2011 for Canada, Hungary, Ireland, Luxemburg and Malta; 2012 for Germany; 2013 for Denmark, Estonia, Japan and Poland; 2014 for Australia, Austria, France, Norway and the United Kingdom.

Source: OECD (n.d.^[11]), *OECD Affordable Housing Database*, <http://www.oecd.org/social/affordable-housing-database.htm>.

Although far from being the only way to ensure affordable housing provision in the HMR, the stock of directly publicly subsidised housing, or social housing, is undergoing several

changes that should be taken into account. Since federal reforms in 2006, the construction of social housing is a competency of the Länder, even though it is financed partially by the central government. Within the HMR, there are specific provisions regulating social housing provision. Newly constructed buildings with over 30 housing units must follow the rule of thirds (*Drittelmix*) in the city of Hamburg: one-third should contain subsidised housing units, one-third freely financed rental units and one-third owner-occupied housing units. Despite this requirement, and the fact that Hamburg has had the highest per capita rate of social housing allotment in Germany in recent years, the stock of social housing in the city of Hamburg and in other areas of the HMR has decreased in recent years. This trend has taken hold despite the fact that the number of new social housing units has risen (Figure 3.5). Developers and property owners of social housing are obliged to keep rents “locked in” under the average rate for a minimum of 15 years in return for tax benefits. However, even though many social housing units are being constructed, more units are falling out of their obligation to keep rents lower than average, creating a net decrease in the social housing stock. Monitoring this development and incentivising social housing construction could help formulate long-term strategies to cope with population growth, but it should not be the only type of housing construction encouraged. The construction of housing units in all price segments should be further incentivised to keep the housing stock in line with population growth.

Figure 3.5. The city of Hamburg’s stock of social housing has decreased despite an increase in new social housing units

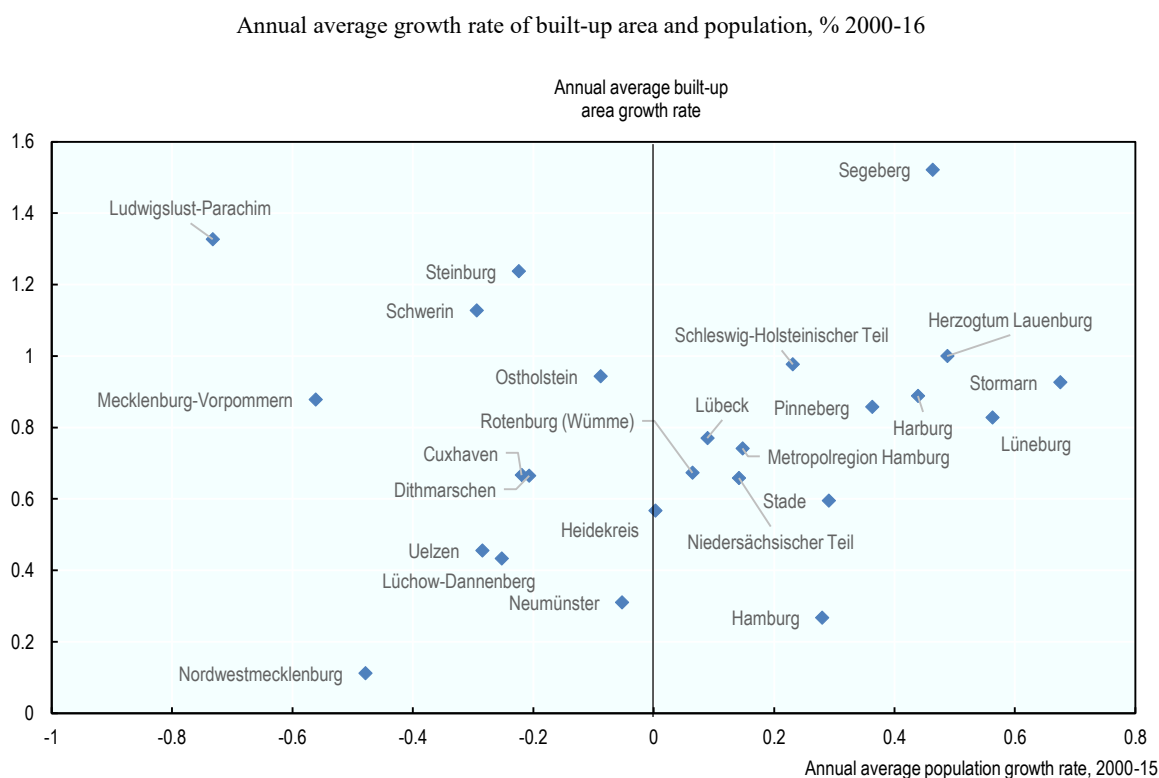


Source: IFB Hamburg (n.d._[12]), *Jahresbericht 2010-17*, Hamburgische Investitions-und Förderbank.

While the HMR is characterised by the coexistence of urban and rural areas within its territory, compact development should not only be considered in relation to large urban agglomerations. Land consumption has increased faster than the population between 2000 and 2015 in all cities and districts of the Hamburg Metropolitan Region except the city of Hamburg (Figure 3.6). The fastest average rates of built-up area growth were attained in the districts of Segeberg (1.52% per year), Ludwigslust-Parachim (1.33% per year), Steinburg (1.24% per year) and the district-free city Schwerin (1.13% per year). At the same time, three of these four areas simultaneously showed negative population growth during this period. Across the OECD, countries increased their built-up areas by 104%

between the years of 1950 and 2000 while their population increased only by 66% (OECD, 2012_[13]). This tendency is set to continue, with 30 out of 34 OECD countries on track to increase their consumption of land faster than their total population. Looking more closely, however, the disproportionate growth of built-up area occurred primarily outside of large urban agglomerations. In the HMR, each of the ten districts and cities that had a negative annual average population growth rate nonetheless increased their built-up area. A built-up area includes land for the uses of housing, recreation, transport, cemeteries and industry. Examining the growth rate of land used for buildings, a similar picture emerges. Figure 3.7 shows the average annual growth rate of land consumption for buildings plotted against the average annual population growth rate. It shows that the rate of land consumption for building has increased faster than the population in all districts and district-free cities of the HMR except in Stormarn, the district with the fastest population growth. This points to a need to encourage densification in planning and expansion of settlements in the HMR. Even though differing levels of density are among the main differences between “urban” and “rural” areas, compact urban development can have many benefits for residents of large and small cities, such as amenities that are more easily accessible by foot. Compact development can include making village cores more attractive by renovating housing in the centre and thus avoiding the hollowing out of village centres while keeping settlements less dense.

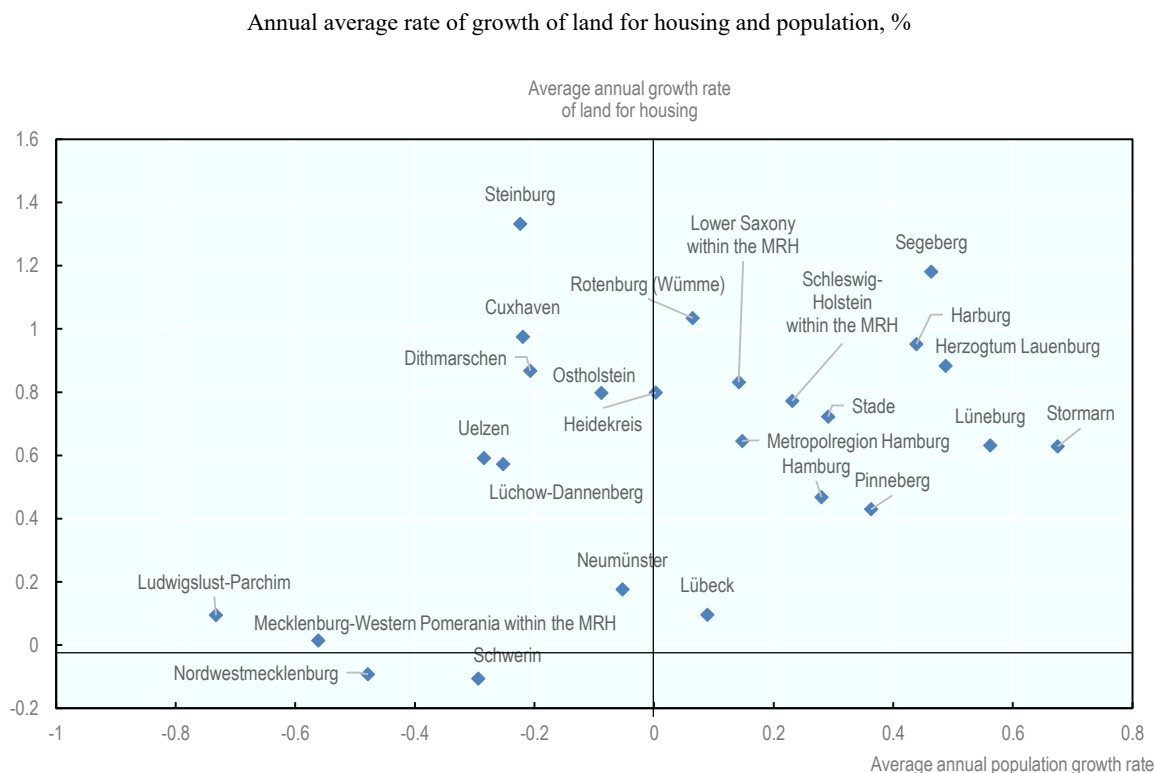
Figure 3.6. From 2000 to 2015, the consumption of land for built-up areas has grown faster than the population in all cities and districts in the HMR except the city of Hamburg



Note: Built-up area (*Siedlungs- und Verkehrsfläche*) includes area used for buildings, settlement, recreational areas and transport.

Source: Own calculations based on data provided by the office of the Hamburg Metropolitan Region.

Figure 3.7. From 2000 to 2016, land consumption of buildings increased faster than the population everywhere except in the district of Stormarn



Note: Built-up area containing buildings (*Gebäude- und Freifläche*) includes areas containing buildings and structures as well as open spaces which are subordinate to the purposes of the buildings (gardens, playgrounds, parking lots, etc).

Source: Own calculations based on data provided by the office of the Hamburg Metropolitan Region.

This increasing consumption of land is important to take into account when formulating policy for the HMR, as urban form can affect the environmental and economic performance of cities (OECD, 2012_[13]). At the moment, increasing competition between land uses characterises the region, which is trying to develop along specific axes and implement a “central spaces concept” of decentralised concentration and densification. The twofold situation of housing shortages in the core city of Hamburg and its neighbouring districts and an increase in building up of land in most of the region’s periphery calls for a granular approach to land use and construction, which takes into account the nuance of different growth patterns within the region. Urban sprawl in small or large settlements can lead to the loss of agricultural land, the decline of ecosystems and fragmentation of landscapes, less open space and longer distances to recreational areas, and an increased dependency on private car use, leading to “traffic congestion, longer commuting times and distances, climate change emissions, noise and air pollution” (Nilsson et al., 2014_[14]). Denser cities can reduce their carbon footprint and provide public services more efficiently. This increasing consumption of land is also important to understand contemporary urban dynamics because of the large economic value of land in the OECD (OECD, 2017_[15]), indicating that land should be seen as a resource for cities and regions. Most importantly, a granular approach should be taken to the development of built-up land, as urban sprawl in the second ring can coexist with housing shortages in the urban core. The demand for single-family houses seems to be rising across the HMR in the future, while demand for

apartment buildings seems to be increasing in and around its urban core but decreasing at its fringes. Encouraging compact and transit-oriented development can make this new development as sustainable as possible. The nature of the future spatial development of cities in the HMR is crucial if they are to benefit the region and its residents. A holistic approach to land use which takes into account the land requirements for housing, transport, industry, craft and commerce, nature and open areas could help reduce competition among actors, which could, in turn, ease the implementation of strategies seeking more compact development and building where it is most needed.

Even though the HMR does not have concrete competencies in the fields of planning and housing, it has been actively engaged in trying to ensure balanced spatial development and densification of urban areas within its territory. The HMR thus draws on a long tradition of integrating the issue of sustainable land use and inter-municipal co-ordination in regional co-operation. The HMR's project on inner development (*Leitprojekt Innenentwicklung*) is a recent example, with projects in five model towns and cities facilitating access to technical knowledge needed to guide densified planning and creating good examples for other municipalities in the HMR to emulate. The project focused on densification, upgrading open spaces in town centres, increasing retail opportunities in town centres, mobility and services, communication strategies, and strategies for participation to involve property owners and residents. The toolkit of instruments which proved to be effective tools in the planning and implementation of these projects were gathered and can provide valuable assistance to other municipalities in implementing similar strategies.

Overcoming a fragmented planning framework to plan long-term infrastructures

In order to develop integrated spatial plans, co-ordination in planning and housing policy within the HMR is indispensable. However, there has been no basis for joint planning since the *Regionaler Entwicklungsplan* (REK) in the year 2000, which could be entered in on a voluntary basis. In the years since the elaboration of this non-binding agreement, co-operation in planning matters has largely taken the form of individual projects, without an overarching strategy or guideline. Some of these have also been developed making use of the metropolitan funding system but without the direct support of the HMR Office. Co-operation in spatial planning across federal boundaries would involve co-operation between the supreme planning authorities and/or regional planning agencies in each of the four federal states comprising the HMR. However, co-ordination of housing policy in the region is made more difficult by the fact that spatial planning is organised differently in all four states comprising the HMR. The city of Hamburg, as a city-state, is responsible for the elaboration of its own plans, while the state of Mecklenburg-Western Pomerania has regional planning bodies (*Regionale Planungsverbände*) and Lower Saxony's districts themselves are responsible for spatial planning. In Schleswig-Holstein, the state has the planning authority (*oberste Landesplanungsbehörde*).

The resulting plans at the regional level are not harmonised between each other and operate at different scales, making co-operative planning across administrative boundaries difficult. In other German metropolitan regions (*Metropolregion*, MR), planning across administrative boundaries is done through the establishment of planning associations, for example in MR Rhein-Neckar (Box 3.3). The differences range from differences in the scale of analysis to the different concepts of planning which create friction between each other. The perceived competition between different forms of land use is a challenge for spatial planning, both at the local and at the regional levels, and is a hurdle for potential HMR-wide planning. While space devoted to housing, green spaces, commercial space and other uses such as transport has increased in areas that used to be sparsely built up and are

experiencing rapid population growth, vacant sites are present in some peripheral rural parts of the region. Municipalities have the final say in planning decisions and many have reservations about growing any further due to concerns such as the provision of sufficient infrastructure.

Table 3.1. Spatial planning competencies and guidelines in the HMR

	City of Hamburg	Lower Saxony	Mecklenburg-Western Pomerania	Schleswig-Holstein
State guidelines	Grüne, gerechte, wachsende Stadt am Wasser“ - Perspektiven der Stadtentwicklung für Hamburg	Landesraumordnungsprogramm (LROP) 2008, last updated 2017	Landesraumentwicklungsprogramm (LEP) 2016	Landesentwicklungsplan (LEP) 2010, update started in 2013 ongoing (to be completed in 2021)
Body with regional planning competencies	City of Hamburg	Districts Cuxhaven, Harburg, Heidekreis, Lüchow-Dannenberg, Lüneburg, Rotenburg (Wümme), Stade and Uelzen	Regional planning association Westmecklenburg	Ministry of the Interior
Regional plans	Same as federal guidelines	8 regional development plans	Regional planning programme Westmecklenburg	Regional plans for regional areas I, II and IV
Year of most recent plan	2014	2004 (Lüchow-Dannenberg) to 2017 (Cuxhaven)	2011, partial update started in 2013 is ongoing	2014, updated in 2018
Planning scale	City-state	District	Regional (planning region comprising two districts and the state capital Schwerin, a district-free city)	Regional (three planning regions are part of the HMR)

Source: Metropolregion Hamburg (n.d.^[16]), *Regionalplanung in der Metropolregion Hamburg*, <http://metropo-region.hamburg.de/regionalplanung/>.

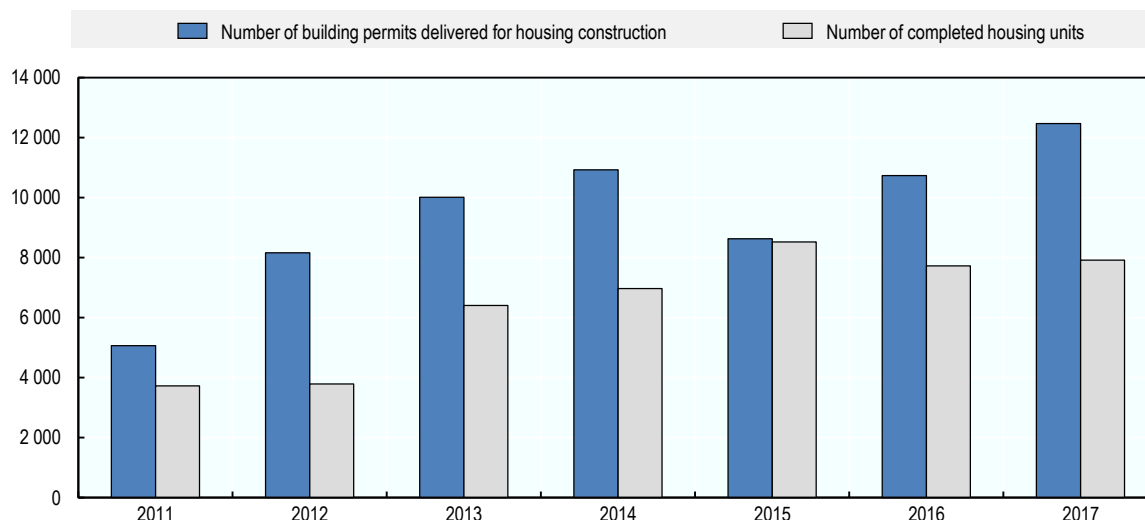
One area in which the fragmented planning structure results in inefficiencies is housing. In the four Länder composing the HMR, strategies and concepts regarding housing are focused mainly on its affordability (Table 3.2). Recognising the looming housing shortage and the need to stimulate the building of housing, Hamburg signed a contract with its seven urban districts (*Vertrag für Hamburg*) in 2011, to be integrated into the Alliance for Housing in Hamburg (*Bündnis für das Wohnen in Hamburg*). The main goal of this contract was to speed up the delivery of building permits, with the aim of delivering permits within six months of an application (Senat Hamburg, 2011^[17]). The contract also aimed to increase the construction of housing to 6 000 units per year, a goal increased to 10 000 units in 2016. In addition to the faster delivery of permits and construction of housing units, the new contract established that 30% of new housing units would be publicly subsidised, thus benefitting low- and medium-income households which have been particularly affected by the rise in rental prices in Hamburg (Senat Hamburg, 2016^[18]) and avoiding a concentration of social housing in specific areas. Hamburg's efforts to increase the provision of building permits have shown promising results, with the number of building permits having increased from 6 800 in 2011 to 12 411 in 2017. The difference between planned and constructed housing units points to potential growth in the future.

Table 3.2. State housing policies and strategies in the HMR

	City of Hamburg	Lower Saxony	Mecklenburg-Western Pomerania	Schleswig-Holstein
Strategy	Vertrag für Hamburg	Bündnis für bezahlbares Wohnen in Niedersachsen	Allianz für das Wohnen mit Zukunft in Mecklenburg-Vorpommern	Wohnraumförderungsprogramm 2015-2018 (continuation of Offensive für bezahlbares Wohnen in Schleswig-Holstein)
Actors	City of Hamburg, urban districts, housing industry associations	Ministry for the Environment, Energy, Construction and Climate Protection of Lower Saxony, Association of Housing and Real Estate in Bremen and Lower Saxony, businesses, chambers, various institutions and associations, districts and municipalities	Ministry of the Economy, Construction and Tourism of Mecklenburg-Western Pomerania and housing industry associations	Ministry of the Interior of Schleswig-Holstein Housing industry associations
Focus and goals	Construction of 10 000 housing units per year (since 2016), of which 30% are to be publicly subsidised, delivery of building permits within 6 months of application	Five working groups with the themes: subsidies and financing; land; construction regulations; buildings, planning and construction; development of existing housing stock	Continuity of financing and subsidies, demographic change, affordability for all, development of the existing housing stock, energy transition, urban planning	Focus on target regions characterised by a high increase in rents and growing housing demand by supporting the construction and renovation of 4 200 social housing units and supporting student housing, with incentives to increase energy efficiency and accessibility of privately-owned rental units

Sources: Own elaboration based on Senat Hamburg (2011^[17]), *Vertrag für Hamburg-Wohnungsneubau Vereinbarung zwischen Senat und Bezirken zum Wohnungsneubau*; Senat Hamburg (2016^[18]), *Vertrag für Hamburg- Wohnungsneubau Fortschreibung der Vereinbarung zwischen Senat und Bezirken zum Wohnungsneubau*; Bündnis für bezahlbares Wohnen in Niedersachsen (n.d.^[19]), *Startseite*, <https://www.buendnis-für-bezahlbares-wohnen.niedersachsen.de/startseite/>; Ministry of the Economy, Construction and Tourism of Mecklenburg-Vorpommern (2014^[20]), “Allianz für das Wohnen mit Zukunft in Mecklenburg-Vorpommern”; Innenministerium des Landes Schleswig-Holstein (2013^[21]), *Rahmen-Vereinbarung zur schleswig-holsteinischen Offensive für bezahlbares Wohnen*.

Figure 3.8. The number of building permits issued in the city of Hamburg has increased since the implementation of the *Vertrag für Hamburg* in 2011



Source: Amt für Hamburg und Schleswig-Holstein (2018^[22]), *Hochbautätigkeit und Wohnungsbestand in Hamburg 2017*, Statistisches Amt für Hamburg und Schleswig-Holstein.

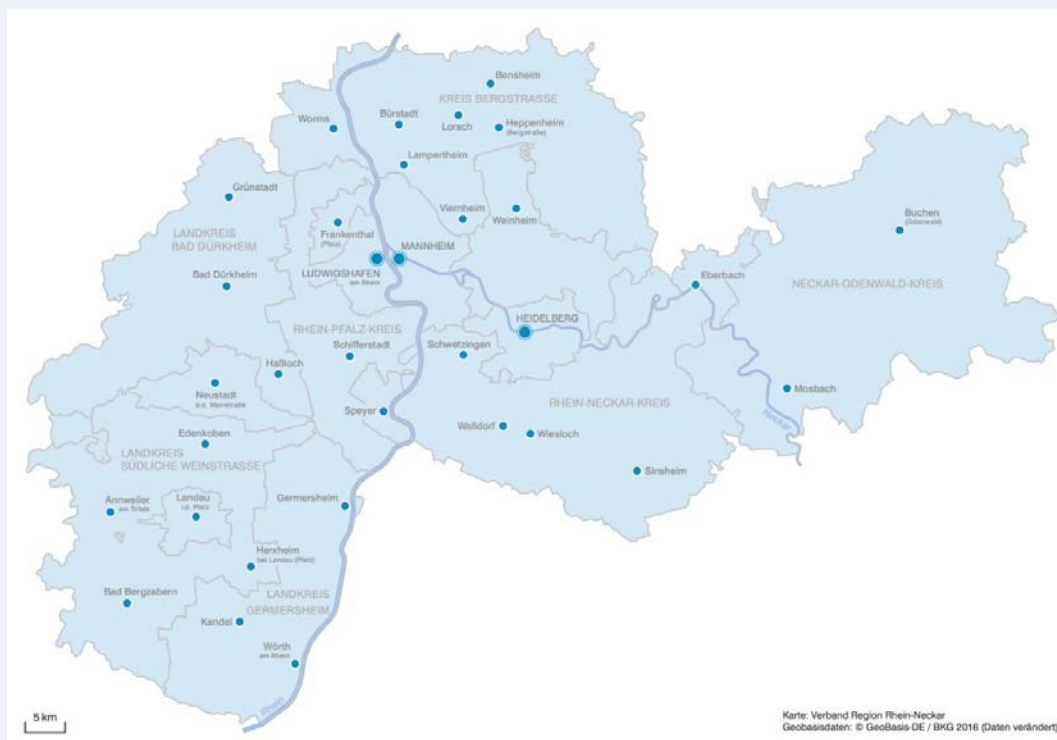
Similar initiatives have been employed in Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein, where the *Länder* have entered into co-operative agreements with housing industry associations to ensure the sustainable provision of affordable housing. The most inclusive of these is the grouping for affordable housing in Lower Saxony (*Bündnis für bezahlbares Wohnen in Niedersachsen*), which groups together businesses, chambers, various institutions and associations, districts and municipalities in addition to housing industry associations and the *Land*. The holistic view that many of these strategies bring to affordable housing is a welcome development. The areas of energy transition and efficiency, demographic change, urban planning and the development of existing housing stock are all related and have been used as considerations in affordable housing strategies. In rural areas facing population decline, the renovation and adaptation of the existing housing stock will be important to increase energy efficiency and increase the attractiveness of village cores. Provisions such as the one in Schleswig-Holstein, which sets the amount of social housing to be renovated in addition to that being newly constructed, are a good start toward framing the need for a higher affordable housing stock as a problem of housing provision, not only new construction. The planning of essential infrastructure such as housing could be better co-ordinated between the four *Länder* and planned in the long term.

Box 3.3. Spatial planning in the Metropolitan Region of Rhein-Neckar

Spatial planning beyond administrative borders in a German metropolitan region

Metropolregion Rhein-Neckar, or MR Rhein-Neckar, located in the southwest of Germany, is composed of 15 districts and district-free cities spanning 3 *Länder*: Baden-Württemberg, Hessen and Rheinland-Pfalz.

Figure 3.9. MR Rhein-Neckar



Source: Metropolregion Rhein-Neckar (n.d.^[23]), *Kartenmaterial*, <https://www.m-r-n.com/meta/medien-und-publikationen/karte> (accessed on 20 December 2018).

A state treaty from the year 2005 gave spatial planning competencies to the *Verband Region Rhein-Neckar*, a newly formed planning association. Signed by the three *Länder*, the treaty gave competencies to the *Verband* in the areas of economic development, to develop a regional landscape park and recreational area, to plan regional congresses, cultural, and sports events and for regional tourism marketing. They were also given the responsibility of co-ordinating activities in integrated traffic planning and energy supply on the basis of regional development plans.

The plans are formulated by the assembly of the association, which is democratically elected. Its 93 members comprise 70 members elected at the district or municipal level. In addition to these, district mayors and mayors of cities with more than 25 000 residents are automatically part of the assembly. The resulting unified regional plan sees its main goals as the maintenance of the region's high attractiveness as a living and economic area and further increasing its development opportunities.

Sources: Land Baden-Württemberg, Land Hessen, Land Rheinland-Pfalz (2005^[24]), *Staatsvertrag zwischen den Ländern Baden-Württemberg, Hessen und Rheinland-Pfalz über die Zusammenarbeit bei der Raumordnung und Weiterentwicklung im Rhein-Neckar-Gebiet*; Verband Region Rhein-Neckar (2013^[25]), *Einheitlicher Regionalplan Rhein-Neckar: Plansätze und Begründung*.

Targeting housing affordability by improving policy integration and co-ordination

The progress of *Vertrag für Hamburg*'s increase in building permits is a good start for the core city of the region to address affordable housing. However, housing must be seen as an essential infrastructure and planned in the long term in order to keep it affordable to all its residents throughout the whole HMR.

Match housing supply to needs

Encouraging housing construction generally should be a main goal followed by all actors of the HMR. While there must be an increase in the number of housing units in areas with a rapidly growing population, it is important that they have the right characteristics and target the right needs in the various areas. Rental units, multi-family homes, social housing units and housing adapted to the needs of an ageing population, for example, will speak to different segments of the population and can respond to their specific needs. Even though rural regions tend to be characterised by single-family homes, it will be necessary to build apartment buildings in some fast-growing rural regions (Chapter 1). In rural districts such as Lüchow-Dannenberg (Lower Saxony), one of the main challenges is densification and changing the nature of buildings, for example ensuring the re-use of farms and other vacant buildings. Projects in the HMR such as *Hofleben*, an inter-generational housing project in the district of Lüneburg, and *neues Leben auf Alten Höfen* in Lüchow-Dannenberg (both in Lower Saxony) show how old farms and similar buildings can be rehabilitated. Areas facing demographic change and ageing populations may face the additional challenge of a lack of housing opportunities tailored to the needs of elderly occupants. Zoning thus has to serve the specific needs of the area concerning the nature of housing. The HMR could also provide a platform for providing further transparency on the housing market of the region, using tools such as WoMo which are already at its disposal.

The HMR should carry out qualitative and quantitative needs assessments to make sure that its housing stock matches the different needs of the population and development patterns with regard to both quantity and quality. On the one hand, the supply of housing in the core area should keep up with population growth in order to remain affordable. On the other hand, the quantitative supply of housing must have the right qualitative characteristics of the housing stock.

- *Quantitatively*, different parts of the HMR have different needs regarding the housing stock. The city of Hamburg does not carry out a quantitative needs assessment of housing units but strong population growth will need to be accompanied by an increase in housing stock, particularly in apartments with one or two rooms to match the trend toward smaller households (Holtermann and Otto, 2015^[1]). Insufficient housing supply will lead to rising costs if demand for housing increases, which it likely will (Chapter 1). Furthermore, housing should be planned as a long-term infrastructure in the HMR and construction encouraged in all price segments. While incentivising developers to build social housing, and locking them in this designation for a pre-determined amount of time is a good way to increase the stock of social housing, there must be forward-looking planning in order to keep the social housing stock at a stable number even after this period is over. Currently, the city of Hamburg's social housing stock is declining even though the construction of social housing units is increasing, because older social housing is falling out of this category. This has to be addressed by making long-term housing plans that go beyond electoral cycles and continually monitoring the social housing

stock to ensure that it stays stable. Developers should also be provided with incentives to increase the amount of time they rent housing units under the average cost. However, social housing alone cannot ensure affordable housing for all. Increased supply in market housing can help reduce rents in the free market in the areas which are now experiencing a sharp increase in rent and housing prices, and should thus be encouraged. In other, more peripheral areas of the HMR, there should be a focus on the renovation of the existing housing stock to match the needs of its residents and, when new housing must be constructed, there should be a targeted impulse toward building new housing along transport corridors.

- Matching between housing *quality* and needs of residents should be supported in part by tailoring the size of housing units to household size. This would imply encouraging densification and increased housing stock in growing towns and cities while creating solutions for shrinking cities, where ageing and net out-migration can decrease the population substantially. Fostering innovative housing projects and strategies for elderly residents would help adapt housing supply to population characteristics. This approach could include encouraging the adaptive re-use of single-family homes or other buildings, for example through accessory dwellings. Many areas characterised by ageing populations are also facing a decrease in household size, as children age and move out of shared accommodations. However, high transaction costs, including the cost of moving, can inhibit people from leaving their large houses for smaller units. A key recommendation is thus to lower the transition costs of moving for elderly people who are looking to downsize by providing exchange platforms for housing and by providing moving support. This would make larger housing units available to those who might otherwise have constructed a new single-family home, thus limiting the amount of land used for new housing construction in shrinking areas. Another step toward limiting the transaction costs of moving would be to rethink the *Grunderwerbsteuer*, or land and real estate transfer tax, which today is very high in Germany and may provide disincentives to those trying to move by limiting mobility and leading to an inefficient distribution of the housing stock.

Encourage the compact development of towns and cities

Compact development should be encouraged by providing targeted support to municipalities. Making settlements more compact can benefit residents by providing more walkable spaces with basic services accessible closer to where people live. In cities and towns facing ageing populations, this could increase the autonomy of the elderly, while reducing residents' reliance on car transport. Municipalities could be encouraged to identify their own potential for re-densification, as well as vacancies and potential vacancies (Baulücken- und Leerstandskataster), and create holistic concepts for their densification. Incentives could be given at different levels, from tax incentives to technical assistance and grants, which could be given out to municipalities with innovative strategies and publicise them as best practices. Preventive vacancy management should also be promoted. Some German municipalities such as the small Bavarian town of Blaibach have successfully provided community spaces such as concert halls in formerly vacant lots that enhance the city with their architectural quality and can provide a point of civic pride (Bundesstiftung Baukultur, 2017, pp. 82-83^[26]). The key HMR project *Leitprojekt Innenentwicklung* has provided valuable impulses for densification, vacancy management and housing adaptation, but the possibilities provided by recent reforms in planning law can be exploited further. The toolkit developed by the HMR through this project is a valuable resource, and

expanding the dissemination of successful models featured in it could convince other municipalities of the benefits of densifying their town centres and providing help for new residents to renovate and move into existing housing units. Where greenfield development takes place, efforts should be made to ensure that it is as compact as possible.

Enhance co-ordinated planning within the HMR

Co-ordinating planning through the creation of a planning association covering a portion of the HMR (representing the Functional Urban Area) would benefit the region. Furthermore, an update of the regional development plan (REK 2000) encompassing recent development trends is desirable. Competition for space for housing, commercial activity, industry and free space means that the potential of the HMR is not being fully harnessed. The lack of co-ordination and co-operation may generate a cost for residents, businesses and subnational governments. OECD data shows that a higher level of administrative fragmentation of a metropolitan area, measured by the number of municipalities, is correlated with lower levels of labour productivity (OECD, 2015^[27]). Doubling the number of local governments within a metropolitan area diminishes its labour productivity by 6%, thus possibly reducing the gains from agglomeration benefits (OECD, 2015^[27]). OECD data suggests that urban areas with metropolitan governance bodies in place show less urban sprawl (Ahrend, Gamper and Schumann, 2014^[28]) and can mitigate the aforementioned productivity loss (OECD, 2015^[27]).

Housing and land use policy could be better integrated and co-ordinated throughout the HMR through the development of a regional plan. The region, heterogeneous as it may be, shows potential for co-ordination and co-operation which could help stem the perceived competition between land uses and ensure a more balanced spatial development. Co-ordination in planning throughout the HMR can help provide services at the right scale, since not every public service is best provided by individual municipalities or districts. In some cases, a service provided in one municipality, district or *Land* may also create positive or negative externalities for residents of other places, and co-ordinated planning can constitute a mechanism to address these. For example, building a new residential neighbourhood in one municipality can increase congestion throughout the metropolitan area if it is not well connected to the public transport network. At the same time, it might also increase the value of land and existing housing in the vicinity of the new development. Therefore, effective policies regarding land use, housing and other sectors go beyond the limits of the current planning regions as they are enmeshed in the functional area of the HMR. Defining the right areas within the territory of the HMR for settlement growth, commercial space, industry and green space by co-ordinating them throughout the HMR can make planning more efficient. Co-operative management and planning of space at the level of the HMR with clear directives of where to target settlement growth could help the region grow in a sustainable manner and should thus be a main goal of the region. Several projects of the HMR already aim at increasing co-operation in the management of space, for example, its industrial space concept GEFEK (*Konzept zur Gewerbeflächenentwicklung*) and the commercial space information system GEFIS (*Gewerbeflächeninformationssystem*). The latter provides information on commercial spaces available in the HMR online for investors. From 2019/20 onward, it will also contain an internal monitoring system for business promoters and planners in the HMR. However, joint planning instead of merely joint marketing could help the HMR avoid urban sprawl and manage land more sustainably. Other metropolitan regions in Germany do engage in joint spatial planning, even across state boundaries (see Box 3.3 on spatial planning in MR Rhein-Neckar). A state treaty between the four *Länder* composing the HMR could establish

a planning association within the office of the HMR and confer spatial planning competencies to it. Alternatively, implementing a more narrowly defined regional planning association could be more feasible politically and logistically, while still contributing to the co-operative planning needed for a sustainable region. The resulting planning region could also encompass the Functional Urban Area (FUA) of the HMR.

Box 3.4. Chicago Metropolitan Agency for Planning (CMAP)

Created in 2005, the Chicago Metropolitan Agency for Planning (CMAP) is the regional planning organisation for the north-eastern Illinois counties of Cook, DuPage, Kane, Kendall, Lake, McHenry and Will, comprising 284 communities. Operating under a public act and local by-laws, it is the official co-ordination and planning body for land use and transport. The CMAP's board of directors is composed of representatives from across the 7 counties represented in the agency, with 15 members: 5 from the city of Chicago, appointed by the Mayor of Chicago; 5 from suburban Cook County, appointed by county mayors in conjunction with the President of the County Board; and 5 members representing the remaining counties co-operatively appointed by the counties' mayors and chief elected county officials. The board is chaired by a mayor. The skills and backgrounds represented in the board's composition are varied, with approximately half of the board members being mayors, several former elected officials and other representatives from business and civic associations.

In its comprehensive plans GO TO 2040 and the subsequent ONTO 2050, the questions of transport, housing, economic development, open space, the environment and other issues impacting quality of life for the residents of the greater Chicagoland area are addressed. In 2010, CMAP established a Local Technical Assistance programme to encourage local planning work that follows the framework of the regional plan. Since then, it has initiated over 200 local projects with local actors including local governments, non-profit and intergovernmental organisations.

Source: CMAP (n.d.^[29]), *Local Technical Assistance*, <https://www.cmap.illinois.gov/programs/lta>.

Improving mobility management and harnessing new technologies to improve accessibility

As a region whose numerous ports (Brunsbüttel, Hamburg, Lübeck) and infrastructures such as the Kiel Canal support a large maritime and export industry, the HMR's priorities in sustainably managing transport and mobility throughout the region are twofold. While the metropolitan region requires good passenger transport management, freight traffic is also a major feature of the region and must be considered in tandem with passenger transport.

A crucial challenge for the whole HMR in rail transport is the creation of additional capacities at the bottleneck Hamburg Central Station, which is highly important for international, national and regional rail traffic. This significant role as a railway node has been recognised by the Federal Transport Infrastructure Plan 2030 (*Bundesverkehrswegeplan 2030*). Currently, measures to expand capacity of the Central Station and in other parts of the juncture Hamburg are being further examined by the federal government. The construction of the S4 line between the Central Station and Bad Oldesloe (Schleswig-

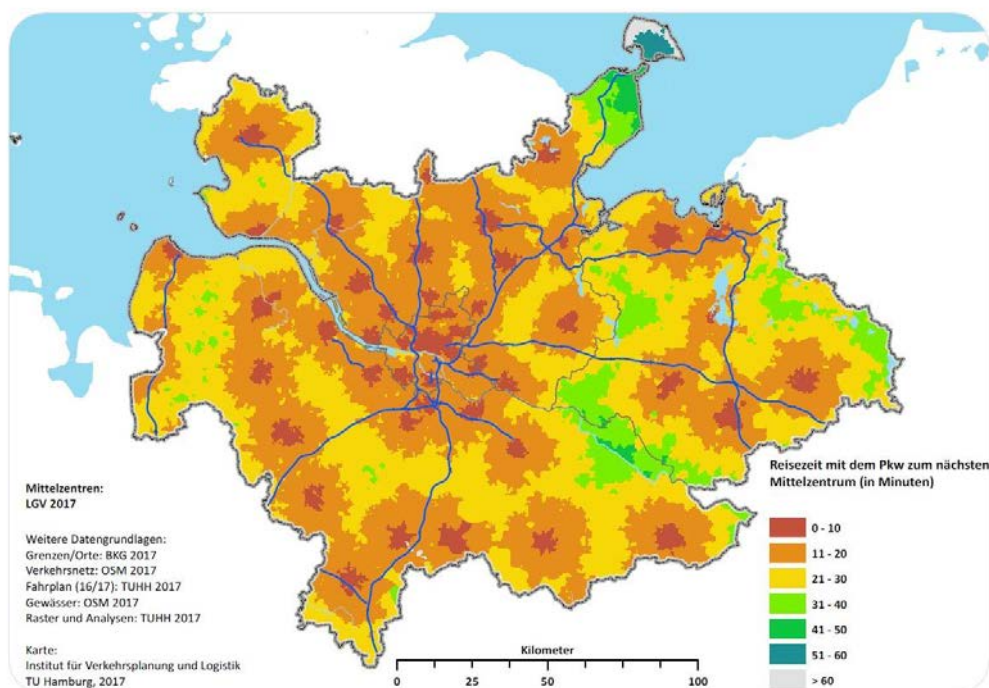
Holstein) will increase capacity by unbundling regional and long-distance traffic on this part of the trans-European Scandinavian-Mediterranean Corridor. Hence, this project is of particular importance for the HMR. It will additionally create the possibility to increase the capacity of the Central Station by the building of a new platform. Capacities are limited and will not be able to sustain increased passenger numbers (Holtermann et al., 2015^[30]). In addition to the rail station, the city of Hamburg itself is considered a bottleneck for road transport. Measures to relieve the traffic network include the extension of the rail node Hamburg and extensive works on the motorways A7, A1 and A26 as foreseen in the Federal Transport Infrastructure Plan, as well as the motorways A20, A21 and A23. The A26 (so-called “*Hafenpassage*”) will also serve to circumvent parts of the city centre. Good accessibility is in general also necessary in terms of symbolic coherence of the territory by connecting peripheral areas. In spite of the commitment to sustainable mobility, the importance of car traffic for the connection within the region must not be neglected. Bicycle traffic is playing an increasingly important role in the regional context, with the design of a network of cycle highways being one of the main projects in the HMR.

Countering disparities in accessibility

Efforts have been made at all levels of the HMR to provide the region with sustainable mobility services. Several large infrastructure projects are underway in the HMR which will have a sustained effect on both freight and passenger transport. Attracting more people to use local public transport will remain the primary objective of sustainable mobility management in the HMR. This is hoped to be achieved by strengthening public transport by increasing its capacity, more frequent scheduling and through tariff adjustments in areas of the region sufficiently populated to maintain transport infrastructure.

Improving accessibility in rural areas

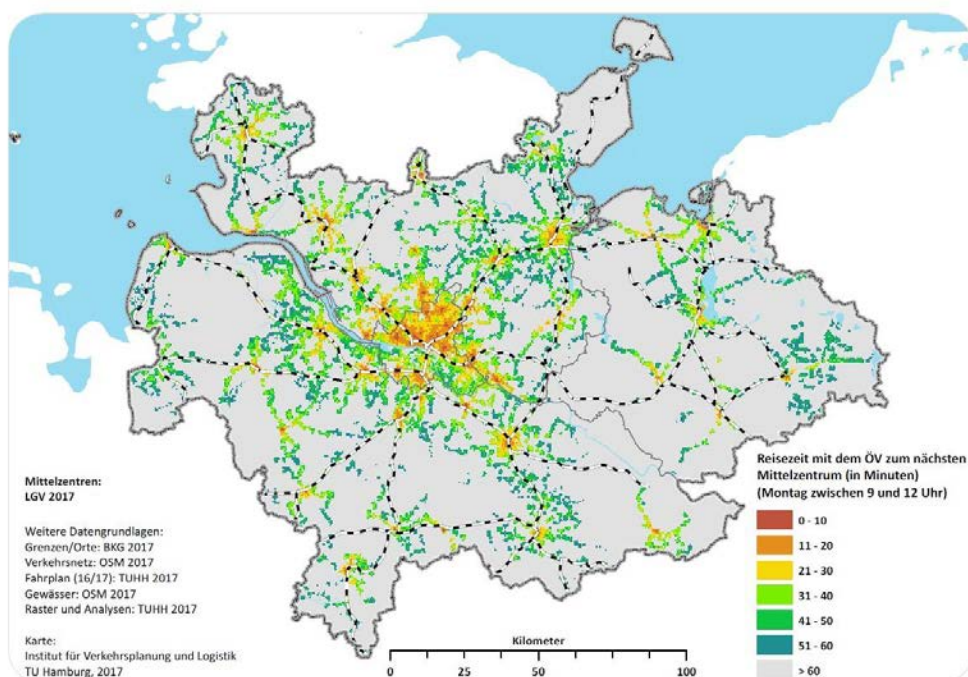
As in the field of housing, needs and challenges related to mobility vary throughout the heterogeneous region. While there are efforts underway to improve the network of light railways around the city of Hamburg (both the aforementioned S4 and the S21 lines), connectivity to the core city of Hamburg, the next largest agglomeration, or the next urban centre where specific goods and services can be accessed remains an issue in the region. The disparity in connectivity in different parts of the HMR is clearly visible when comparing the amount of time that is necessary to reach the next medium-level centre (*Mittelzentrum*) by car and by public transport. Figure 3.10 illustrates the accessibility of the next medium-level centre by car, showing that the vast majority of areas within the HMR are within 30 minutes of the next medium-level centre by car. In contrast, public transport only allows for accessibility of medium-level centres in over 60 minutes in much of the region (Figure 3.11).

Figure 3.10. Accessibility of the next medium-level centre by car in the HMR

Note: Medium-level centre (*Mittelzentrum*) is a qualitative description of an agglomeration in the German central place classificatory system, according to the administrative, social and economic functions it performs in a polycentric system of cities.

Source: Institut für Verkehrsplanung und Logistik TU Hamburg (2017^[31]), *Leitprojekt Regionale Erreichbarkeitsanalysen: Abschlussbericht und Erreichbarkeitsatlas*, <http://www.metropolregion.hamburg.de/erreichbarkeitsanalysen>.

While residents of the core city of Hamburg use more sustainable modes of transport on a daily basis, including 22% in public transport (BMVI und infas, 2018^[32]), peripheral areas of the HMR show a higher rate of car use. Policy goals emphasise the importance of multimodality in the region, but car use cannot be fully discounted in areas that are not well served by public transport. A feasibility study for high-speed cycle-lanes connecting different areas of the HMR has been conducted, laying the ground stone for commuter traffic to move from cars to bicycles. Other policies to facilitate the use of several different modes of transport are *Park-and-Ride* and *Bike-and-Ride* facilities, which exist throughout the region. However, these underlie different regulations according to the administrative districts they are situated in. Hamburg and some municipalities are moving to a fee-based model for these facilities. However, this could create a disincentive for those who could otherwise be willing to use them. Furthermore, without harmonisation between these and other districts, the presence of some fee-based and some free park-and-ride facilities greatly influences the conditions for multimodality in these places. Further efforts can be made to ensure that Park-and-Ride facilities provide enough capacity to fulfil demand and to encourage mixed facilities with parking spots for a number of different modes of transport (car, bike, scooters, etc.) to encourage multimodality. In addition, new developments in mobility brought forth by digital solutions should be taken into account when designing these facilities, including digital solutions such as real-time information on capacities and online booking options.

Figure 3.11. Accessibility of the next medium-level centres by public transport in the HMR

Note: Medium-level centre (*Mittelzentrum*) is a qualitative description of an agglomeration in the German central place classificatory system, according to the administrative, social, and economic functions it performs in a polycentric system of cities.

Source: Institut für Verkehrsplanung und Logistik TU Hamburg (2017^[31]), *Leitprojekt Regionale Erreichbarkeitsanalysen: Abschlussbericht und Erreichbarkeitsatlas*, <http://www.metropolregion.hamburg.de/erreichbarkeitsanalysen>.

Stakeholders are hopeful that new digital technologies can help improve traffic and mobility management while creating more flexible mobility arrangements for residents of rural areas. Hamburg's planning tool ROADS, for example, co-ordinates construction site planning within Hamburg and could be expanded to co-ordinate with surrounding communities. Rural areas are also being included in efforts to digitalise freight transport, with inland shipping and sluice management being focal points. Flexible forms of use are also expected to increase the mobility of those in peripheral regions where the public transport network is rather small. At the level of the HMR, a toolkit for flexible mobility services in rural areas has been created, which is available to municipalities looking for specific tools to improve service provision.

Reducing bottlenecks and increasing links with Scandinavia

The steady growth of commuters requires transport infrastructure development to cope with a lack of capacity in rail and road transport. Adding to this is the issue of environmental protection, with Hamburg recently being the first German city to ban older diesel vehicles on two road sections in a centrally located part of the city, and an ambition to shift more freight transport from road to rail and water. The overlapping of passenger and freight transport contributes to bottlenecks within the city of Hamburg. The circumvention of the city of Hamburg is seen as one of the most important ways to reduce bottlenecks in both passenger and freight traffic. The circumvention of Hamburg of freight and passenger

transport depends in part on the realisation of large infrastructure projects by the federal government through the Federal Transport Infrastructure Plan 2030 (*Bundesverkehrswegeplan 2030*). To improve the rail network, the building of the Fehmarn Belt fixed crossing and upgrading of the rail network to South Germany are underway through the federal state. The bottleneck in Hamburg further necessitates increased accessibility toward the south and toward Northern Europe.

The construction of the fixed crossing of the Fehmarn Belt is one of the central infrastructure projects of the trans-European Scandinavian-Mediterranean Corridor. The crossing will be built in the form of a tunnel and connect the Danish island of Lolland with the German island of Fehmarn. By connecting two high value-adding metropolitan regions in the form of Scandinavian urban centres and Northern Germany, it has the potential to stimulate the development of the Fehmarn Belt region and provide opportunities for certain fields of inter-regional co-operation. Districts set to be impacted by the fixed crossing of the Fehmarn Belt are working together to develop strategies on commercial spaces, marketing, tourism and road capacity at junction points. Comprehensive and integrated planning will be needed in order to maximise the opportunities represented by the Fehmarn Belt while minimising potential negative externalities such as reduced road capacity and noise pollution.

Collaborating on a regional level

The HMR shows evidence of collaboration on a regional level in public transport and other aspects of mobility, including transport infrastructures such as road and rail. The monocentric HMR region has no joint transport strategy but is connected by 761 000 commuters daily, of which 350 000 commuters enter Hamburg daily. Many of these commuters are served by the *Hamburger Verkehrsverbund*, or Hamburg Public Transport Association (HVV). The HVV serves an area of 8 616 km² including the city of Hamburg and parts of Schleswig-Holstein and Lower Saxony. HVV acts as the overall co-ordinating body for transport in the conurbation, providing a successful collaboration within the HMR. Even though transport infrastructures tangibly connect the region into a cohesive whole through the HVV, there is potential for more co-ordination between HMR actors. The fragmented tariff structure of the HMR further complicates the cohesiveness of the region as a whole. While a large part of the HMR is included in the territory covered by the transport association *Hamburger Verkehrsverbund* (HVV), this extends primarily to the districts immediately adjacent to the city of Hamburg. Three additional tariff associations cover the HMR: *Niedersachsentarif*, *Schleswig-Holstein-Tarif* and the tariff of the *Verkehrsverbund Bremen-Niedersachsen*. Moreover, the districts of Ludwigslust-Parachim, Nordwestmecklenburg and the district-free city of Schwerin are not part of any tariff scheme. The most successful example of a fully integrated tariff exists between the HVV and Schleswig-Holstein, where all tickets can be purchased for destinations within the HVV. However, this is not the case for any of the other tariffs, even though tariffs between the HVV and the transport association of Lower Saxony are partially integrated. This uneven development makes certain trips very expensive to take, and limits extended and intermodal use. For municipalities wishing to become part of the HVV, the financial contribution this entails can be prohibitive, thus creating a high barrier to entry into the transport association. However, concrete steps are being taken to expand the HVV tariff: from the end of 2019 onward, rail transport in four districts of Lower Saxony (Cuxhaven, Heidekreis, Rotenburg (Wümme) and Uelzen) will be covered within the HVV tariff on rail transport and season tickets.

Collaboration on the regional level has also taken place in the form of 5 North German *Länder* (Bremen, Hamburg, Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein) agreeing on a list of 24 urgently needed transport projects. The resulting Ahrensburger list sets out necessary, predominantly harbour-relevant traffic projects of supra-regional importance. They also include projects important for the connectivity of the HMR to other metropolitan regions in Germany such as Bremen-Oldenburg and Hannover-Braunschweig-Göttingen-Wolfsburg, including the motorway projects A20 and A39 and the optimisation of railway networks “Alpha-E”. This collaboration can be expanded on to lobby for infrastructure projects that would benefit the whole region. Furthermore, the Fehmarn Belt crossing could provide an impetus to stimulate further inter-regional collaboration with other European metropolitan regions.

Addressing mobility throughout the HMR

Co-operation among HMR actors, and potentially in a larger northern German framework, will be needed in order to build the large infrastructure projects that are already planned. Transport-oriented development along settlement axes could make better use of land value capture mechanisms to recoup some of the public investment in infrastructure. Park-and-ride and bike-and-ride services should be further expanded in areas where a demonstrated need for these exists in order to foster multimodality.

Integrate transport with housing and land use

A common regional plan for the HMR integrating transport with settlement and land use and encouraging transit-oriented development would benefit the region. Actors should also regularly elaborate priority lists of infrastructure development that would benefit the whole region. Developing housing and settlement along transport corridors or axes can be a good approach to the integration of housing and transport, but traditional infrastructure projects will not be the sole answer to demographic change, as large transport infrastructures such as highways can sometimes weaken small urban areas if alternatives to local economies are made more convenient. An integrated planning concept could focus on transit-oriented development and create strategies for places where public services are disappearing. Large infrastructure projects such as the planned highways are likely to have an important effect on mobility in the HMR. However, they will also affect other outcomes, such as housing prices and firm location choices. As many planned transport infrastructures extend across administrative boundaries, their effects on the housing and labour market will cross these boundaries too. Proactive and collaborative planning for these changes can help mitigate adverse effects and exploit the full potential of new infrastructure developments. With projects such as the Fehmarn Belt set to open the labour market even further, co-operation and co-ordination will be needed among the actors of the HMR in order to manage increased traffic and housing needs. Considering the realisation of large infrastructures as a means to increase mobility in the regional labour market rather than an end in itself can facilitate planning for their potential effects on other sectors, such as housing and land prices.

The integration of transport planning, spatial planning and economic development is crucial for sustainable regional development. It could help provide targeted relief of Hamburg through supporting medium-sized cities such as Lübeck and help keep the focus on quality of life rather than on growth. Greater integration of housing and transport can be achieved using instruments that are already partially available in the HMR. The housing and mobility calculator (*Wohn- und Mobilitätskostenrechner*, www.womorechner.de) could serve as a starting point for larger projects.

With the *WoMo* tool already at its disposal, the HMR could make greater use of it by creating a roadmap for municipalities and districts to use the tool in planning decisions. If this housing and mobility calculator's potential is fully harnessed, it could encourage the construction of affordable housing in neighbourhoods with higher land costs but lower transport costs, while focusing transit investments such that the amount that remote households spend on transport is reduced (Guerra and Kirschen, 2016^[33]). Thus, it should be made more accessible to individuals who may use it to make choices regarding their housing, while also being marketed to planners and policymakers in order to encourage informed and evidence-based policies for greater integration of transport and housing. It is worth considering the uses of a similar tool, the H+T (Housing and Transport) affordability index, developed by the Center for Neighborhood Technology (CNT) in the United States. The tool is specifically aimed at individuals, housing professionals, urban planners and policymakers. The CNT specifically encourages the use of the tool in policymaking and planning decisions and has prompted several successful projects in the US using the H+T index as the basis for decision-making (see Box 3.5). Packaging the *WoMo* tool into a toolkit with suggested uses and offering technical assistance to municipalities, districts, planning associations and other organisations wishing to integrate it into their planning process may lead to the better integration of transport and housing in places throughout the HMR. Specifically, it could be used as a pillar of a joint planning strategy for the HMR in order to select transport corridors and where to develop affordable housing.

Box 3.5. Selected applications of CNT's H+T index

The CNT has specifically encouraged the use of its H+T index by regional and local planners, housing professionals such as public housing agencies and non-profits, and policymakers. Beyond helping individuals make informed housing decisions, this has enabled a wide variety of actors to integrate transport and housing in their plans and strategies.

- In Chicago, the tool has been used by several agencies and organisations. The Chicago Metropolitan Agency for Planning (CMAP) used H+T costs as a liveability measure in its comprehensive regional plan “GO TO 2040”, while the Metropolitan Planning Council (MPC) used data from the H+T Index in a corridor selection analysis designed to identify potential bus rapid transit routes, while balancing community goals of increased liveability, reduced travel time and lower environmental impacts.
- In San Francisco, the Bay Area Transit-Oriented Affordable Housing (TOAH) Fund was established by the Metropolitan Transport Commission (MTC). This was partially due to the H+T index, which allowed to make the case for the integration of housing affordability and transport.
- State of Illinois: The measure of combined housing and transport affordability was adopted into law, with bipartisan support, as a planning tool for five agencies and as a consideration for those agencies' investment decisions in metro areas. The economic development, transport and housing agencies can use H+T to screen and prioritise public investments in metro areas, while the two financing agencies will recommend the use of the index for new siting decisions.

- El Paso, Texas: The City Council directed the City Manager to use the H+T Index for affordability determinations, to initiate the use of the index as a tool to benchmark costs and to adopt a 50% H+T affordability standard for all city funding and policy decisions.

Source: CNT (n.d.^[34]), *H+T® Index: Applications for Use*, <https://htaindex.cnt.org/applications/>.

Harmonise tariff schemes across the region

Actors across the HMR should make efforts to harmonise public transport and park-and-ride tariff schemes across the whole region and integrate last-mile transportation schemes within these. Although people commute across the HMR on a daily basis, the HMR comprises different tariff zones and structures that are only integrated to a varying degree. At the moment, the HVV (*Hamburger Verkehrsverbund*) comprises seven administrative districts spread over three states. The HVV has expanded several times in the past and continues to envision further expansion, currently planned for the year 2020. The financial costs associated with membership constrain the possibility of expansion to some districts, but tariff co-operations (*Übergangstarife*) may be used in these cases. While an expansion of the HVV to the entire HMR is not a necessity, there should be a concerted effort to integrate the tariff structures of different transport associations within the HMR to create a single HMR tariff or make the transition between tariff zones as smooth as possible. This would decrease the friction with which residents must now contend in their commutes while also serving as a marker of shared identity to residents and visitors alike. Integrating last-mile transport and on-demand mobility services into a general tariff for the metropolitan region could increase the number of users and reduce the cost of overlapping tariff schemes for residents of the peripheral HMR. These services will have to make special efforts to attract those who now drive their own car to use their services, instead of merely shifting passengers from other public transport services to new mobility services. The Switchh platform in the city of Hamburg is attempting to increase multimodality by simplifying the switch between public transport, taxis, rental cars and/or bicycles on flexible and short-term notice. Harmonising park-and-ride facilities by instituting a common concept can also promote multimodality.

Harness digitalisation to ensure service provision in peripheral and ageing areas

Municipalities and districts could benefit from using innovative methods, including digital instruments and public-private partnerships, to ensure mobility in rural areas. *Flexible Bedienformen*, or on-demand mobility services, have the potential to reach HMR residents throughout the whole region and improve accessibility in peripheral areas. Mobility services can also harness digitalisation to improve the accessibility of rural areas to jobs and services. One example can be found in the city of Lauenburg (Schleswig-Holstein), which is located 40 km outside of Hamburg and serves as a testing ground for innovative mobility solutions for rural areas. It is currently co-operating with the Technical University of Hamburg to implement a fully autonomous public bus transport system. Other ways to improve rural residents' mobility is the introduction of car sharing projects in villages, such as the project *Dörfliches Carsharing im Wendland*. Innovative mobility services can also serve to increase inter- and multimodality in peripheral areas of the HMR by connecting residents to other modes of transport. Bike-and-ride stations are now mandatory at every S-Bahn stop and park-and-ride services are set to be expanded upon. Digital solutions could

build on these built infrastructures. The upcoming Intelligent Transport System World Congress in 2021 has also stimulated the discussion around new forms of mobility, while innovative mobility solutions using online-based tools for shared buses and taxis have been implemented in some parts of the HMR. One such service is *ioki*, a subsidiary of Deutsche Bahn based in Frankfurt which provides, among other services, a ridesharing service in parts of the Hamburg area (though not the whole HMR) that is tightly integrated with public transport and the HVV tariff structure. Another example is MOIA, a subsidiary of Volkswagen. Its focus is on the development of app-based, on-demand offerings, including ride-hailing and ride-pooling services. Its services are currently offered in central Hamburg and will be gradually expanded to the outskirts of the city. A third example is Clever Shuttle, another ride-pooling shuttle service using digital technologies to bundle passengers with similar destinations. It has been in service in Hamburg with hydrogen-powered vehicles since 2017. By using digital tools and services to close the gap between public transport and first- and last-mile transport, there is a large potential to enable mobility without the need for car ownership, even areas lesser-served by public transport.

Leveraging the HMR's potential to advance environmental sustainability

Environmental sustainability can take different forms in the HMR, as it should be integrated into a holistic approach with housing and transport, yet also involves spatial planning through green spaces. Externalities generated by one local government in one of these sectors can adversely affect natural assets in other municipalities, districts or federal states. Co-operation between actors can thus seek to address these negative externalities and avoid them negatively impacting natural assets while maximising the positive impact they can have. Ensuring energy efficiency in the sectors of housing and transport has the potential to reconfigure the relationship between the urban core and rural periphery, with the rural areas as providers of sustainable energy and the core city as consumers. Sustainably managing green spaces and nature reserves can improve residents' quality of life, the attractiveness of the region for visitors and workers, and the sustainability of the region for the future.

Improving environmental sustainability by protecting natural assets and harnessing the potential of renewable energy production

Protecting green space and biodiversity

The HMR can build improve its environmental sustainability and attractiveness by protecting its many notable natural assets and green spaces. In particular, it can build its sustainability by strengthening and expanding its biosphere reserves. There are currently five United Nations Educational, Scientific and Cultural Organization (UNESCO) biosphere reserves in the HMR region, with further municipalities attempting to become part of one of them. Applications are made through the federal government but approval has to be given by all mayors in the region. There are reservations at the communal level, as these are wary of creating obstacles to further development of infrastructures such as housing. However, biosphere reserves could play a key role in bolstering strategies for development and differentiation within the region. They can have several distinct roles and functions, including an ecological one to combat climate change and preserve biodiversity, a role in sustainable regional development to sustain recreational and green areas, and a potential role in research and education. The protection of species and the maintenance of habitats will require co-operation between actors at all levels across administrative boundaries as sites must be linked through corridors. The *Biotopverbund* project (Habitat

Network Hamburg Metropolitan Region) of the HMR has laid the groundwork for further co-operation by making all relevant plans available digitally, consolidating them in a general map and initiating communication among responsible authorities across administrative borders. Additionally, the project has improved the habitat network by (re)connecting or upgrading a number of biotopes, including across *Länder* (e.g. between Hamburg and Schleswig-Holstein and between Lower Saxony and Mecklenburg-Western-Pomerania).

Box 3.6. UNESCO biosphere reserves in the HMR

UNESCO biosphere reserves are designated to areas zones that demonstrate and encourage a balanced relationship between humans and nature, encouraging the protection of biodiversity and sustainable development. By using zoning schemes that combine core protected areas with zones where sustainable development is fostered, they add to traditional conservation efforts. Local communities are highly involved in the management of these zones, with the integration of cultural and biological diversity a main goal. Biosphere reserves are also used to demonstrate sound sustainable development practices and thus act as sites for education, research and training.

Five biosphere reserves exist within the borders of the HMR:

- Schaalsee (Mecklenburg-Western Pomerania)
- Wadden Sea of Lower Saxony (Lower Saxony)
- Wadden Sea of Hamburg (Hamburg)
- Wadden Sea and Hallig islands of Schleswig-Holstein (Schleswig-Holstein)
- Flusslandschaft Elbe (Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein).

Flusslandschaft Elbe is Germany's largest inland biosphere reserve, covering parts of the five *Länder* Saxony-Anhalt, Brandenburg, Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein, and offering a valuable impulse for transregional co-operation in its management.

Source: UNESCO (n.d.^[35]), *Biosphere Reserves - Learning Sites for Sustainable Development*, <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/>.

Addressing the energy transition by harnessing the potential of renewable energy production

Renewable energy production and energy efficiency are important factors in the so-called energy transition to green energy in the HMR and in Germany as a whole. All four federal states present in the HMR and many districts and municipalities have different frameworks in place to transition to renewable energy consumption and energy efficiency, while renewable energy production also carries a large potential for the whole HMR. As one of the most successful sites for renewable energy production in Germany, particularly wind energy production, the HMR has the potential to be a pioneer in Germany and Europe for wind energy production. In particular, the joint project NEW 4.0 between Hamburg and Schleswig-Holstein provides an important example of how collaboration can help achieve

the goal of an energy transition while utilising the particular strengths of specific areas. NEW 4.0 (standing for Northern German energy transition) is an “innovation alliance” across the sectors of business, science and politics with the goal of showing how to supply the whole region of 4.5 million inhabitants with renewable electricity by 2035. The strategy depends on the collaboration of 60 partners in the region to reach their goal. This partnership has the potential to set a strong signal for the importance of collaboration and co-operation across state boundaries and to reconfigure the producer-consumer relationship between urban and rural areas.

However, renewable energy production is not readily accepted everywhere, with adverse effects on wildlife, the protection of endangered species and the quality of life of residents in the vicinity of renewable energy plants, especially wind energy plants, questioned. Renewable energy production is seen as competing with other forms of land use, such as housing, nature preserves and commercial space, creating an additional layer of reticence to an integrated planning process for these plants. Renewable energy production has been or will shortly be integrated into the regional plans of Lower Saxony, Mecklenburg-Western Pomerania and Schleswig-Holstein, as well as in the plans of individual districts. Public acceptance of energy infrastructures will be a crucial factor for the expansion of renewable energy production in the HMR. In an effort for public participation in renewable energy production, Mecklenburg-Western Pomerania has instituted a law (*Bürger- und Gemeindeneteiligungsgesetz*) mandating that 20% of the proceeds of wind energy production must go to residents and municipalities within 5 km of the wind energy plant.

In addition to the production of renewable energy, the energy transition will engender changes in the way energy is consumed. The HMR’s advantageous positioning bordering the North and Baltic Seas, encompassing urban agglomerations and rural areas, with a large maritime industry, puts it in a unique position to profit from and influence this development. Concretely, the HMR can profit from its high volume of onshore wind power and the potential of offshore wind energy, the connection of Scandinavia’s hydropower generation with the Central European grid, and the intersections of the supra-regional gas transmission pipelines with future liquified natural gas (LNG) terminals. In particular, the increasingly recognisable role of gas infrastructure as a necessary basis for the use of hydrogen as a storage and transport medium for wind power will have to be taken advantage of to further the use and development of renewable energy in the HMR.

Energy efficiency is currently addressed in the policy of each of the four federal states making up the HMR. Considering the large effect that rising standards of energy efficiency and other dimensions of construction have had on housing and rental costs, it is worth examining state policy on energy efficiency and ascertaining the extent to which energy goals are integrated with affordable housing goals. In the city of Hamburg, for example, energy efficiency in housing is reflected in the *Bündnis für das Wohnen in Hamburg* agreed upon between the city of Hamburg and its housing industry associations. In the document, the city of Hamburg guarantees the funding of energetic and comprehensive renovations of the existing housing stock, while housing industry associations will prioritise the training of planners and in the construction sector. Subsidies for the renovation of residential properties are available through the Investment and Funding Bank of Hamburg (IFB), which amounted to EUR 19.5 million in 2017. Mecklenburg-Western Pomerania, the energetic renovation of buildings is financed in the framework of the federal sustainability strategy. These include investment measures for the improvement of energy efficiency, subsidies for the use of renewable energies for heat use, and energy management examinations. In Lower Saxony and Schleswig-Holstein, the promotion of social housing and energy efficiency in buildings are integrated into federal policies. In Lower Saxony,

the strategy Efficiency First considers all consumption sectors but places a specific focus on the building sector.

Table 3.3. Climate and energy policy of the four *Länder*

	City of Hamburg	Lower Saxony	Mecklenburg-Western Pomerania	Schleswig-Holstein
Strategy	Klimaplan Hamburg	Leitbild einer nachhaltigen Energie- und Klimaschutzpolitik für Niedersachsen	Energiapolitische Konzeption für Mecklenburg-Vorpommern	Entwurf eines Gesetzes zur Energiewende und zum Klimaschutz Schleswig-Holstein (Draft legislation for energy transition and climate protection)
Actors	Hamburg Senate	Ministry for the Environment, Energy and Climate protection of Lower Saxony	Ministry of Energy, Infrastructure and Digitisation Mecklenburg-Western Pomerania	State parliament of Schleswig-Holstein, and Ministry for Energy transition, Agriculture, Environment and Rural areas of Schleswig-Holstein
Focus and goals	Integration of climate change mitigation and climate adaptation by reducing CO2 emissions by at least 80% by 2050 and creating a city resilient to climate change	Reduce greenhouse gas emission by 80%-95% by the year 2050, transition to almost fully renewable energy consumption by 2050, and utilise the full potential of the state for energy efficiency and savings by 2050 while limiting the amount of agricultural land used	Goals are centred on three main components: acceptance and citizen participation, energy policy and climate protection	Reduce greenhouse gas emissions by 80%-95% by 2050 (in comparison to values from 1990) Increase the share of electricity from renewable energy in gross electricity consumption to 300% by 2025 Increase the share of heat from renewable energies in heat consumption to 22% by 2025 Resource management and efficiency, energy saving and efficiency and the expansion of renewable energy
Timeline	Staggered timelines for reducing CO2 emissions by 2020, 2030 and 2050	2050	Staggered timelines for specific goals within the three areas	Staggered timelines for the reduction of greenhouse gas emissions

Sources: Senat der Freien und Hansestadt Hamburg (2015^[36]), *Klimaplan Hamburg*; Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz (2016^[37]), “Leitbild einer nachhaltigen Energie- und Klimaschutzpolitik für Niedersachsen”, Hannover; Landesregierung Mecklenburg-Vorpommern (2015^[38]), *Energiopolitische Konzeption für Mecklenburg-Vorpommern*; Schleswig-Holsteinischer Landtag/Ministerium für Energiewende, Landwirtschaft, Umwelt und ländliche Räume (2015^[39]), *Entwurf eines Gesetzes zur Energiewende und zum Klimaschutz in Schleswig-Holstein (Energiewende-und Klimaschutzgesetz Schleswig-Holstein-EWKG)*.

A main challenge remaining for the HMR is the integration of energy efficiency with housing policy and goals. Measures for environmental sustainability can sometimes disproportionately affect low-income households, as they spend a higher proportion of their income on goods and services to be taxed in the framework of environmental policy. Energy standards for new housing construction are sometimes seen particularly in the city of Hamburg as a barrier to affordable housing in that it could restrict the rate of new construction. However, Hamburg’s development bank IFB provides diverse information and counselling offers as well as funding programmes for the energetic renovation of residential and non-residential buildings, similar to the programmes offered by the investment bank of Schleswig-Holstein (IB). In Lower Saxony, individual administrative districts have set themselves goals and promoted programmes for building renovations.

These include the administrative district of Rotenburg (Wümme), which published its climate protection concept in 2013. Its aim of achieving a renovation rate of 1% per year for residential buildings has been promoted through several campaigns, while the district of Harburg has adopted a programme for the replacement of heating pumps and offers consumer counselling for energetic renovations.

Fostering a prosperous and environmentally sustainable HMR

Protect green spaces and foster biodiversity through greater co-operation across administrative boundaries

Green spaces should be conserved and, where possible, be enlarged in co-ordination with transport and settlement policy. The protection of natural areas to increase environmental sustainability and as recreational areas plays an important part in the coherence of the HMR. Co-operation at the level of the *Länder* and districts must be encouraged in order to ensure the sustainable joint management of recreational spaces such as biotopes that cross administrative borders.

Build on the potential of renewable energy production

The integration of land use and settlement policy should be continued in the form of the integration of renewable energy production in regional planning. Renewable energy production, specifically the production of wind energy, has the potential to reconfigure the relationship between the core city of Hamburg and its surroundings but only if the land and infrastructures necessary for its expansion are made available. The integration of land use and renewable energy production should be encouraged in a joint regional plan that lays where renewable energy production should take place and where infrastructures supporting it should be built.

Retrofit of buildings to be more energy efficient

Municipalities and households should be encouraged to retrofit buildings to become more energy efficient. While in some states, such as Schleswig-Holstein, there are few or no subsidies for energetic renovations available at the district or municipal level (but funding is available at the level of the state), municipalities can play a role in advising households to engage in building retrofitting and can do these renovations on their own buildings. In light of demographic change and a shrinking tax base, the retrofitting of municipal buildings could serve as a model for municipalities in the HMR to cut down on energy costs. Online-based tools such as the online value-added calculator (*Online-Wertschöpfungsrechner*) from the German Institute for Urbanism (Deutsches Institut für Urbanistik und Institut für ökologische Wirtschaftsforschung^[40]) can provide municipalities with the incentives to retrofit more buildings. In order to noticeably increase the energy efficiency of existing buildings, additional incentives like tax incentives with regard to energetic modernisation measures are necessary.

Enhance citizen participation

While it is too early to quantify the effects of new regulation encouraging monetary compensation for residents of areas affected by renewable energy production, particularly on the acceptance of wind energy production, financial incentives and the participation of residents in the planning process for wind energy plants have can increase acceptance of renewable energy production. The importance of civic participation in renewable energy

can be signalled by working at the level of municipalities to inform households of their possibilities for renewable energy use, with the dual goal of promoting more energy-efficient development and of raising the acceptance of renewable energy production. A growing body of literature asserts that, where residents are directly impacted by renewable energy production, their inclusion through monetary means, co-planning and information can help raise their acceptance (Langer, Decker and Menrad, 2017^[41]; McLaren Loring, 2007^[42]). For municipalities, participation in renewable energy production should take the form of informing households and engaging them in co-planning of renewable energy production sites where possible. Monetary inclusion of residents and municipalities and co-planning of renewable energy production sites should also be a goal followed by districts and *Länder* in their formulation of strategic plans.

Integrate energy efficiency, housing and land use planning

A main goal for the HMR will be to find measures to support energy efficiency in buildings while promoting affordable housing. Energy standards for new buildings are sometimes seen as at odds with the imperative to drive the construction of housing, especially in the city of Hamburg. In order to counter this and ensure the energy efficiency of new buildings, additional tax incentives may be needed. Retrofitting existing buildings can be costly for low-income households that would greatly benefit from lower energy costs. In addition to the renovation and retrofitting of existing buildings to make them more energy efficient, the preparation of integrated urban development plans including energetic concepts could encourage energy efficiency in the construction of housing throughout the region. The potential for the installation of solar panels on residential and commercial buildings throughout the HMR should be analysed, then property owners and renters directly approached about this potential. The HMR must also integrate renewable energy production into land use plans in order to avoid competition between different uses of land and to maintain their sustainability.

Enhancing quality of life and attractiveness of the HMR

Quality of life is composed of many factors that may seem intangible but quality of life and economic development are interdependent. Quality of life is, for example, an intrinsic driver of competitiveness. Ensuring high quality of life throughout the region, from the core to periphery, can help attract skilled workers. On the other hand, supporting small- and medium-sized enterprises (SMEs) in town centres can help retain rural populations who would otherwise migrate to an urban area, while boosting the local tax base. Quality of life can provide a framework for many other components of healthy and competitive territorial development. Recognising the role of quality of life in all aspects of life in the HMR, including environmental, economic and demographic sustainability, can help guide policy. Quality of life springs partially from the integration of the policy sectors previously illustrated. When housing or settlement, transport and energy policy are integrated within a shared spatial planning approach, policy goals regarding sustainable territorial development can be achieved while improving residents' quality of life.

Quality of life has many different definitions, ranging from life satisfaction to specific material and immaterial circumstances and facts. In the HMR, it is intricately tied to the linkages that connect its heterogeneous sub-areas. With a growing population in Hamburg and its surrounding districts and population stagnation or loss in the rather rural areas further outside of Hamburg, the HMR is characterised by a large heterogeneity of spaces, even within the “urban” and “rural” categories. Rural areas have a lower density of industries, lower economic growth and lower wages, and are more susceptible to adverse

effects of demographic change, with a main challenge being the preservation of basic services. In some instances, a lack of accessibility and broadband are characteristic of rural areas, although there is potential in the many natural areas, including nature preserves and biotopes, found in the region.

The dominant position of Hamburg leads many rural areas to orient themselves around a symbiotic relationship with the core city. Quality of life can be supported by harnessing the potential of linkages that exist between urban and rural areas while recognising the individual potential of each area. Reducing urban-rural disparities is a policy goal at the federal level of Germany. The federal commission for equal living conditions (*gleichwertige Lebensverhältnisse*) and the LEADER regions approach, supported by European Union funds to support local initiatives and exploit endogenous potentials are several instruments and policies targeting this divide. The HMR itself constitutes an important instrument to target urban-rural disparities. While the other thematic areas examined in this chapter, namely housing, mobility and environmental sustainability, all serve to connect the region in a tangible way, intangible aspects such as branding and visibility, coupled with material improvements, can serve to increase quality of life, increase cohesiveness of the region and thus encourage joint policymaking.

Promoting culture and tourism for an attractive HMR

Valorising cultural assets

Cultural appeal and tourism can be harnessed by the HMR in order to increase the attractiveness of the HMR to visitors and residents and improve quality of life in the region. Cultural production, including cultural assets and cultural and creative economies, can contribute to the development of a territory by creating jobs and economic value, and by improving the quality of life. Identifying and valorising cultural assets can encourage a positive image of a region, which in turn increases attractiveness and drives local economic development. Whether urban or rural, culture can also contribute to a better living environment. Culture can re-activate decayed industrial zones of inner cities and put smaller and lesser-known areas on the map as places to visit, work and live in (OECD, 2018^[43]). World-renowned cultural assets such as the *Elbphilharmonie* in the city of Hamburg and the UNESCO World Heritage Site *Speicherstadt* already act as magnets to Hamburg and the HMR as a whole. Historic towns such as Wismar (Mecklenburg-Western Pomerania) and Lübeck (Schleswig-Holstein), which both constitute UNESCO World Heritage Sites, as well as Lüneburg (Lower Saxony), offer a rich cultural history of the region and are valuable cultural markers. Lesser-known places and monuments throughout the HMR have been publicised by the HMR in an effort to encourage a broader understanding of the region's cultural heritage, including, for example, its industrial heritage (Box 3.7).

Reinforcing the value placed on cultural assets in the greater HMR can also be used as a driver for tourism if co-operation between the many actors in this field is successful. Efforts to strengthen tourism can involve improving infrastructure, promoting entrepreneurship and capacity building, which in turn increase the region's attractiveness for people to live and work. While infrastructure and cultural developments relating to tourism can improve residents' quality of life, increasing residents' quality of life also positively impacts their perception of further tourism development (Woo, Kim and Uysal, 2015^[44]).

Box 3.7. *Tage der Industriekultur am Wasser*: Highlighting industrial heritage whilst uniting the HMR

The HMR's days of industrial heritage by the water is a biannual cultural event held over two days across the entire HMR. Started in 2011, the event aims to celebrate industrial monuments along the region's waterways. In 2017, 131 sites were featured, including museums, shipyards, harbours and many others, in 68 locations throughout the whole HMR. Regional routes featuring 20 to 25 industrial sites and permanent attractions in the municipalities of Lauenberg, Neumünster and Schwerin were further highlighted in this event.

Not only do these days help valorise the industrial heritage of the region but they also use the river Elbe and its tributaries and canals as a connecting element in order to emphasise the shared economic history of the region. With over 18 000 visitors in 2017, the festival is a way to show residents other parts of the HMR and understand the region through a shared cultural heritage.

Source: Metropolregion Hamburg (n.d.^[45]), *Industriekultur am Wasser*, <http://metropolregion.hamburg.de/industriekultur>.

Utilising tourism as a driver of regional development

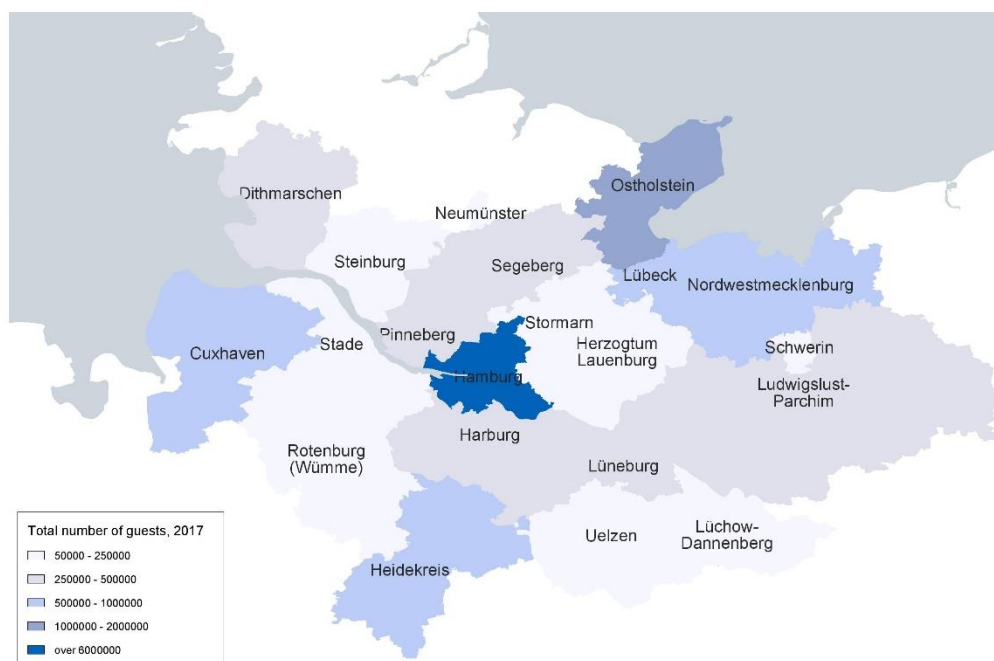
Using tourism and cultural attractiveness as part of a strategy for sustainable and balanced regional development implies two main areas for action. Improving accessibility of the region and creating targeted branding strategies are both crucial to the attractiveness of the HMR for tourists. Existing tourism brands within the region are deeply rooted and successful in their own branding and communication efforts. These include Baltic Sea, North Sea, Hamburg, Lübeck, Lüneburger Heide and other cities and areas. While the pooling of branding for tourism may provide a clear message and greater visibility for the region, the large field of tourism actors may pose a challenge to any joint strategy or branding. Any joint tourism strategies of the HMR must go hand in hand with improvements in regional transport links in order to allow guests to seamlessly discover the whole HMR.

Currently, tourism is unevenly distributed throughout the HMR (Figure 3.12) with the city of Hamburg receiving more visitors, at over 6 million, than any other single district or free city in the metropolitan region by itself (in tourism enterprises with more than 9 beds). However, the fragmented structure of tourism in the districts, with many small enterprises, makes a more nuanced view of tourism in the region necessary. Some coastal areas of the region in its so-called second ring are very successful areas for tourism (for example, the district of Cuxhaven has reported over 6.8 million overnight stays in the year 2017, taking all types of establishment into account), as are other places with particular natural and/or cultural assets. In fact, the number of overnight stays in the whole HMR is much larger than the number of overnight stays in Hamburg (25.2 million and 13.6 million respectively in 2017). Tourism has increased in the whole HMR, with the total number of guests having increased by 16.1% from 2013 to 2017. With a growing stream of visitors to the city of Hamburg, this growth could be directed toward the region at large by using the HMR brand to build and promote distinct routes and sub-regions, as has been done in the Netherlands with the strategy "HollandCity" (Box 3.8). Likewise, visitors to coastal areas could be offered complementary tourist packages in cities or other areas of ecological interest. The

greatest increase in the number of guests from 2013 to 2017 was seen in Schleswig-Holstein, where the total number of guests increased by 22.3%. This indicates a high interest of tourists in areas outside of the core city of Hamburg, particularly in the coastal areas of the North and Baltic Seas. This momentum can be built on to further increase the number of visitors to other parts of the HMR.

Figure 3.12. Guests to the HMR are mainly concentrated in the city of Hamburg

Total number of guests in 2017 by district



Note: The number of guests refers to those lodged in establishments with nine beds or more.

Source: Own calculations based on data provided by the office of the Hamburg Metropolitan Region.

Box 3.8. HollandCity

Spreading tourism through the Netherlands through distinct districts and storylines

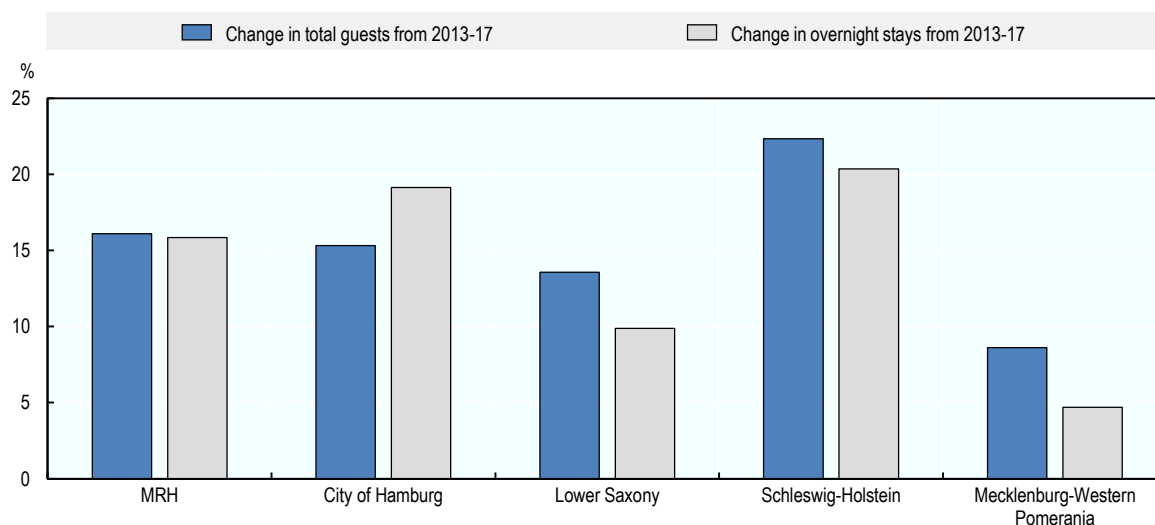
Facing an increase in touristic activity over the past years in the Netherlands, NBTC Holland Marketing, which is responsible for branding and marketing the Netherlands nationally and internationally, has developed a strategy to direct this growth toward the country as a whole. The *HollandCity* strategy aims to distribute tourism across all seasons and the entire country with the motto “supporting the known, introducing the new” (NBTC Holland Marketing, n.d.^[46]). The strategy highlights lesser-known attractions and sites outside of major centres while continuing to promote popular destinations and cities, and preventing tourism from concentrating there.

HollandCity presents the Netherlands as one large metropolis with three distinct districts and several storylines that can be explored in the form of an imaginary metro network. The storylines link different places around the country through a common theme, including Van Gogh, Hansa towns, flowers, and Dutch cuisine to name just a few (NBTC Holland Marketing, n.d._[46]). For example, visitors can thus be inspired to explore more of the country by discovering Van Gogh's connections with the Arnhem region and Brabant in addition to Amsterdam.

The Netherlands' small size and connectivity by public transport between the different places within each storyline are essential to the strategy's success. In addition to districts and storylines, interesting events help the strategy distribute visitors throughout the country and attract visits in the off-season. In 2016, for example, touristic promotion focused on "Jheronimus Bosch 500", with a year-long programme surrounding the 500th anniversary of the artist's death, while "Mondrian to Dutch Design" was promoted in 2017. To date, 11 of the 12 Dutch provinces are participating in the strategy, and NBTC is expected to work with provincial authorities and market operators to introduce additional storylines over the next 2 years (OECD, 2018_[47]).

Sources: NBTC Holland Marketing (n.d._[46]), *HollandCity*, <https://www.nbtc.nl/en/homepage/holland-marketing/hollandcity.htm>; OECD (2018_[47]), *OECD Tourism Trends and Policies 2018*, <https://dx.doi.org/10.1787/tour-2018-en>.

Furthermore, the trend from 2013 to 2017 shows that the percentage of overnight stays has increased more than the percentage of total guests only in the city of Hamburg, while the parts of the HMR in the other three *Länder* show a higher percentage increase in total number of guests than in the number of overnight stays (Figure 3.13). The HMR has created some marketing opportunities for day tourism using the slogan *#einfachmaltraus*, highlighting opportunities for day trips, often in green spaces, throughout the HMR. This trend toward day trips and day tourism can be further exploited by improving transport in the HMR, with the added benefit of improving the cohesiveness and increasing the porosity of the region for its residents.

Figure 3.13. Change in tourism trends in the HMR, 2013-17

Source: Own calculations based on data provided by the office of the Hamburg Metropolitan Region.

Strengthening urban-rural linkages to increase quality of life for all HMR residents

The success of the Hamburg Metropolitan Region as an attractive and sustainable place to work, live and invest in will hinge largely on the quality of life the area is able to guarantee. While tangible measures such as housing provision and mobility play a large part in this, other areas including subjective well-being and cultural amenities can promote a sense of regional identity that could encourage policymaking at the scale of the HMR.

Harness the potential of tourism for balanced development

The HMR would benefit from greater international visibility by co-operating in tourism branding and marketing. The city of Hamburg inhabits two separate roles in the region of the HMR. The city is seen both as a competitor for resources and as a magnet for outside visitors, talent and investment. The region should valorise its heterogeneity by using Hamburg as a gateway to build interest in tourists for the rest of the region. Specifically, the HMR should build on the strengths that a heterogeneous region such as itself brings with it in the area of tourism by spreading visitors out throughout the region. The interplay between urban and rural areas can be a strength in that a joint marketing of attractions in and around Hamburg, from coastal areas to the urban core, can convince tourists to discover new places and stay in the region longer than they would have otherwise. At the same time, strengthening the tourism sector throughout the region may increase the potential for sustainable and inclusive growth if SMEs are supported specifically to stimulate local economies and stimulate entrepreneurship.

To increase awareness of and interest in the region as a whole for tourists, sub-regions and storylines can be developed through historical and natural heritage, for example, using the history of the Hanseatic League, different coastlines, wildlife or biosphere reserves to distinguish areas and target them to different kinds of visitors. In particular, the shared cultural history of the Hanseatic League is still a large international signifier for the region and could constitute a foundation on which to build a shared tourism strategy. Existing

events valorising this heritage can be capitalised on and expanded, including museums and events in several cities and initiatives such as *Butter bei die Fische*, city walks jointly devised by and taking place in all seven Hanseatic cities (Buxtehude, Hamburg, Lübeck, Lüneburg, Stade, Uelzen, Wismar). Building on the sub-regions, routes can be developed that lead visitors to explore different aspects of the region's shared history or natural heritage. This approach could also be expanded to include more of Northern Germany outside of the HMR or a Hamburg-Copenhagen-Berlin triangle. Improving mobility and accessibility throughout the region will be a necessity for this kind of concept to work. Strengthening public transport throughout the region and integrating tariff structures to make the region as porous as possible should be a key goal for strengthening tourism in the region.

The HMR would benefit from elaborating a strategy to combine tourism, mobility and environmental sustainability throughout the region. Such a plan would be fundamental in integrating the aforementioned policy sectors with land use policy. One example of a strategy integrating different policy sectors horizontally and different actors vertically is the transnational *Sustainable Regional Tourism and Mobility Plan* along the Danube river. Elaborating such a plan and including a regional transport card for tourists within this structure can push tourists to stay in the HMR for a longer period of time while ameliorating the accessibility of rural areas and engaging in more sustainable mobility practices.

Use subjective well-being indicators to inform and monitor policy

Subjective well-being can be used as an indicator to guide policymaking in the HMR toward a more inclusive definition of equal living conditions. The German Basic Constitutional Law stipulates the importance of working toward equal living conditions (*gleichwertige Lebensverhältnisse*) in rural and urban areas. Subjective well-being indicators can provide a measure of quality of life while taking into account the inherent differences in infrastructure and density between urban and rural areas, and support the endeavour of increasing quality of life for all HMR residents. Measuring well-being inequalities within the region would require granular data on self-reported life experiences, providing a more complete picture of well-being than existing objective data on people's living conditions. Natural amenities can lead to higher prices of the houses located nearby, attract inter-regional migration flows and increase individuals' life satisfaction (OECD, 2014^[48]) but environmental quality cannot be measured only through objective data. Job satisfaction, perceived security (e.g. in public transport), civic engagement, proximity of public authorities, trust in local authorities, can vary greatly across different areas of a region. Another use of subjective well-being data could be to supplement domains that can be measured objectively as a complementary source of evidence.

Facilitate access to cultural amenities throughout the HMR

Access to cultural amenities throughout the HMR can also increase the region's porosity and cohesiveness to its residents while increasing its attractiveness to skilled workers. Regions with high levels of cultural amenities can attract workers with high levels of human capital (Falck, Fritsch and Heblich, 2011^[49]). Improving access to cultural amenities throughout the HMR could thus help foster a sense of community and develop a shared regional identity that makes all residents feel as though they have something to gain from the HMR. This could include improving access to cultural amenities in the city of Hamburg for HMR residents and increasing awareness of the various cultural offerings available in the HMR as a whole. The HMR could thus work to create a shared identity of place, while

also leaving room for the valorisation of individual identities, by supporting cultural events taking place outside the urban core of Hamburg and tying these to the HMR identity.

Conclusion: A holistic strategy to promoting sustainable development for all in the HMR

The integration of housing, transport planning, spatial planning and economic development is a key factor for sustainable regional development in the HMR. In order to sustain the high quality of life of the HMR and fully use the potential of the region to attract high-skilled workers, businesses, residents and visitors, the HMR can play a role in integrating policy sectors affecting quality of life. Fully harnessing the potential of the HMR as a regional organisation in order to integrate policy at the regional level can increase the quality of life for residents. All policy sectors explored in this chapter show potential for greater co-operation throughout the HMR and integration with each other. Housing, environmental sustainability, mobility and tourism influence each other and must be managed in such a way that positive agglomeration benefits are maximised and distributed throughout the whole HMR.

Inefficiencies caused by competition between parts of the HMR and different land uses should be taken into account and mediated. In order to stop competition between different actors within the HMR, greater co-ordination and the understanding of the HMR as a cohesive region will be necessary. The porousness of the region in administrative tasks and relating to transport should be prioritised in order to increase the coherence of the region and match administrative structures to the lived realities of residents who live, commute and socialise across the administrative boundaries of the HMR. This could be done by using the potential of digitalisation to further e-government on the regional scale and by introducing a shared HMR tariff.

The HMR as a co-operative body is in an advantageous position to provide targeted expertise to districts and municipalities while retaining a view of the region as a whole. The HMR can build on existing expertise to create comprehensive toolkits for municipalities and districts to manage demographic change affecting their region sustainably.

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