

People. Nature. Space.

Green infrastructure in the Ruhr metropolis

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Planning for the future

Our goal: to make the Ruhr metropolis the greenest industrial region in the world.

Not because being green and sustainable happens to be all the rage right now, but because it's the only way we can assure our survival. More than any other region in Germany, our region stands for the anthropocentric age that we are currently living in. Nowhere can the extended widespread effects of human activity on the planet Earth be seen more clearly.

What kind of future do we want? Now that this chapter has come to an end, the last piece of coal has been ceremoniously presented to the Federal President; our coal mines have been honoured as monuments in Essen, the Cultural Capital of 2010, leaving only their pumps behind to run for all eternity.

How will this region become sustainable? Resilient to climate change and able to meet other global challenges? How can we live in a climate-neutral way? What do we eat and how do we live healthily and sustainably? How do we stay mobile and interact with each other as a society? These are the challenges of the 'great transformation' that we are in the midst of. This transformation is not only necessary, it is already well underway. And it embraces all areas of society: our economy, our habitats and how we live together. Structural economic changes, social balance and economic interaction form a triad that is the very essence of green infrastructure.

We will remain an industrial region – not at the expense of our children, but for them. They should study, find work and be able to relax here, be proud of a Ruhr metropolis where production is climate neutral and where its material cycles are organised. It is essential to promote natural-based solutions, expand renewable energy sources, further develop green hydrogen technology and attract all industry-relevant companies. This is how the Ruhr area can once again be the pioneer of a booming energy region – this time, however, not by exploiting but by protecting both climate and the environment.

The current ruling of the Constitutional Court in Karlsruhe has opened doors as well as minds and made climate protection a fundamental right. This top priority demands and justifies a faster realignment of society. Indeed, human beings, nature and spaces must all interact in this important mission.

Green infrastructure is our key to success. The areas of activity include a variety of measures: supporting major climate protection goals by protecting nature and landscapes, especially wooded areas, in order to reduce CO₂ emissions; creating green urban areas to improve both quality of life and biodiversity – for health and environmental justice and as a location factor for the economy; expanding green infrastructural areas to cater for bicycle and pedestrian mobility – for everyday life and leisure time. We want to make it possible for all citizens to experience nature directly where they live, also as a means to motivate them to get involved.

The Ruhr Regional Association is taking the initiative with major landscaping projects. As an environmental and planning association with a century-old tradition, we are collaborating with many partners to create more green infrastructure in the Ruhr metropolis. We are not only organising the International Garden Exhibition 2027, but are also improving and revitalising five major regional parks on the sites of former coal mines. Visualising former coal slag heaps as recreational landscapes and locations for renewable energy sources is a further example of trendsetting projects that we are working on. However, there is still a lot to do before we are truly green such as reduce greenhouse gases, address inequitable living conditions, make overheated city centres more liveable in hotter months and decrease the number of motor cars travelling short distances.

This fact book addressing green infrastructure is our review of the past and a planning guide for the future. Clear graphics show where we are now and where potential for change is particularly worthwhile. With a wealth of precise data, it describes the key elements of green infrastructure and defines the central initiatives of our Ruhr metropolis. And it shows how human beings, nature and space can interact in order to create, and ensure, a sustainable future. I hope you enjoy reading our fact book – may it provide you with lots of inspiration for many new ideas.

We'd love to hear your thoughts!

Nina Frense

Associate Division Environment
and Green Infrastructure
Ruhr Regional Association



Green infrastructure

Investing in nature pays off

Anyone thinking of the Ruhr area tends to have the old pictures in mind: coal, steel and dust. Yet the extent of this misconception quickly becomes apparent when travelling in the Ruhr metropolis nowadays. For example, the conurbation is by no means a cramped megacity, but an urban landscape interspersed with numerous green belts. Economically, too, the region has been in the throes of structural change for decades, although progress was very hesitant for much of this time.

In terms of significant technological fields, the centrepiece of the federal state of North Rhine-Westphalia is in great shape by any European comparison. Thanks to extensive recent focus on the hot topics of technology, energy and climate policy, all-round conditions for the region are as good as they have been for 30 years. The Ruhr area could make a real comeback as an attractive region to live and work in. The goal: to make the Ruhr metropolis the 'greenest industrial region' in the world – and in this context, both labels are important: 'green' as well as 'industrial region'.

The development and expansion of green infrastructure in the Ruhr area play an important role in this process. The term describes a strategically planned network of natural and near-natural green and open spaces that can be seen across cities and conurbations as well as in rural areas. Green infrastructure acts like a vital ecosystem for society, performing crucial services in this respect.

Indeed, nature provides a plethora of necessities that serve as a basis of life and human well-being: food, water, fuel, building materials, natural protection from floods and soil erosion, climate regulation, carbon storage as well as improvements to air quality. And last but not least, nature provides unlimited leisure and recreational values.

Many of these 'ecosystem services' could not be evaluated in monetary terms up to now – not least because economic theory had, for a long time, defined nature as a free commodity, infinitely available, and thus with no price. However, if the air is polluted by harmful emissions, clean air can indeed become a scarce commodity. There is now methodology in place to evaluate ecosystem services in monetary terms. The Ruhr Regional Association (RVR) is a pioneer in this field and already provides comprehensive environmental monitoring.

There is proof that it is definitely worthwhile for society to invest in green infrastructure. Against the background of looming climate change, green infrastructure is important for survival and creates sustainable future perspectives for the Ruhr metropolis: more green areas and open spaces improve the quality of life, contribute to maintaining biological diversity and help reduce the consequences for health of global warming – especially in neighbourhoods with a particularly high population density. In addition, cities in the Ruhr area also profit as economic locations.

The historical roots of the concept of green infrastructure actually go back a good hundred years: as early as the 1920s and due to the strong growth of industry, coal mines and cities, the Settlement Association of the Ruhr Coal Region (the predecessor of RVR) prioritised keeping existing open and green spaces free from construction to secure the quality of air in cities.

The current ambitious programme is in accordance with the objectives of the European Union (EU): in 2013, the EU Commission – in its publication Green Infrastructure (GI) – Enhancing Europe's Natural Capital – signalled a new appreciation of the importance of nature and landscape for society, which

now benefit accordingly. And the European Green Deal currently being promoted by the EU Commission is aiming for greenhouse gas neutrality for the European Union by the year 2050. A total of around 1,800 billion euros from the EU budget is earmarked for this purpose in the years 2021 to 2027, at least 30 percent of which is allocated for measures relevant to climate protection. The expansion of green infrastructure also profits from this programme via the European Regional Development Fund (ERDF).

Green infrastructure connects human beings, nature and space, thus making an important contribution to the major transformation of the Ruhr area – namely, the ecological and economic conversion of the metropolis region with the long-term objective of climate neutrality. In essence, it is a regional solution initiative for a global challenge. In this respect, the Ruhr area can be a pioneer and role model for other European conurbations facing comparable challenges.

The shift from industrial to green areas

The Ruhr metropolis already has outstanding credentials to further expand its green infrastructure. For example, 20 percent of the Ruhr area consists of woodlands – and overall, green and open spaces have a share of 74 percent of the entire area. The big-

gest regional park in Europe is located here with 460 square kilometres; the RVR looks after 98 nature conservation areas. A total of 45 slag heaps with an area of about 1,550 hectares are already owned by the RVR, and a further 12 heaps will follow by 2035. There are 1,200 kilometres of leisure tracks available for cycling, and there will soon be 1,800 kilometres of everyday cycle tracks. There are 12,000 hectares of water areas. And as potential for more nature, diversity and climate resilience, the region still has many branches of industry and open areas in industrial estates that can be unsealed and grassed over.

The communes and their associations in the region have a great deal of experience with urban and open-space planning – for example, with projects like the International Building Exhibition (IBA) Emscher Park from 1989 to 1999, Essen as the European Green Capital 2017, and the International Garden Exhibition (IGA) Metropolis Ruhr 2027. But we can go back even further: in 1929, today's Grugapark in Essen succeeded what used to be the GRUGA (Big Ruhrland Garden Exhibition), which is considered Germany's first horticultural exhibition.

The IGA in 2027 is a clear example of the decentralised, polycentric approach of the Ruhr area. Organised in partnership with the cities of the Ruhr metropolis, this requires

What is green infrastructure?
A network of natural and near-natural spaces.

Fields	Woods	Gardens
Bodies of water	Parks	
	Urban green spaces and roadside trees	



Green infrastructure ...

... is strategically planned and always considered in the case of development projects (urban and economic development, infrastructure measures).

... is just as significant as grey infrastructure (traffic routes and utility networks). It is central to the functioning of society and the economy.

... is optimally planned when open spaces are directly interconnected and can form a network.

good, proven governance structures as well as networks. Five 'gardens of the future' located in Duisburg, Dortmund, Gelsenkirchen, Bergkamen/Lünen and the Emscher region around Castrop-Rauxel/Recklinghausen will serve as international showrooms of the IGA 2027. They display in exemplary fashion how locations shaped by the coal and steel industry can be revitalised.

The IGA comes with high expectations. Not only is it intended to expand green infrastructure and improve the image of the Ruhr metropolis, but it should also stimulate future investment and create new jobs. A study of the Ruhr Research Institute for Innovation and Structural Policy (RUFIS) sees an additional 8,700 jobs being created by the IGA – with 6,300 of them remaining in the Ruhr metropolis after the end of the exhibition. Planned investments of 440 million euros can stimulate added value of some 800 million euros, of which more than 650 million euros are to accrue to the region. Tourism will benefit along with property, garden and landscape construction. This means that the IGA does not just have a high recreational and leisure value, but it also represents a structural programme to benefit the region economically. The IGA demonstrates particularly well how

green infrastructure is useful to the population of the Ruhr area both economically and ecologically, but also how global questions about the future are addressed locally.

Green health, green justice

Above and beyond the IGA, the development of decent green urban neighbourhoods is the focus of many initiatives aimed at expanding green infrastructure. Green urban activity is also good for healthcare, as all residents benefit from ecologically intact urban accommodation with better-quality air, lower air temperatures in the summer months and an overall stronger climate resilience. The idea of the projects is to secure the ongoing further involvement of the communes and their residents; this is the way urban green spaces can promote social cohesion in parts of the city as well as foster residents' identification with the local Ruhr area.

The development and expansion of comfortable, environmentally friendly and fit-for-purpose mobility further helps to increase the general quality of life in cities and urban neighbourhoods. Apart from better provision of public transport, this also includes a

comprehensive network of cycle tracks as an alternative to motorised individual transport. Climate protection and adaptation are issues that come with huge societal and political pressures to act – and not just in conurbations. But the necessity to do so is particularly acute in urban areas, due to their high population and building density as well as the high share of CO₂-intensive industries.

So the objective of achieving climate neutrality as well as the expansion of green infrastructure sends an important message to established companies and start-ups in the metropolis region: the aim is to make companies and start-ups regard this transformation process as an opportunity and, in collaboration with the area's many further education and research institutes, to successfully establish themselves as pioneers of green technologies.

The Ruhr area, for example, has the best credentials to play a pioneering role in Germany for the use of 'green' hydrogen (produced free of CO₂) as a source of energy and basic material. Companies in Germany's chemical and steel industries can very quickly convert their production processes to being climate neutral if there are adequate supplies of green hydrogen. The CO₂ emissions of 'green steel' are 95 percent lower than those of steel produced conventionally with the help of coke. This is a way to secure the future sustainability of the industrial core of the Ruhr area's economy with its well-paid jobs – an important contribution to the social stability of the region.

Uniting economy and ecology

Another way to reconcile economy and ecology is to take a look at the environmental economy. A study carried out by the Handelsblatt Research Institute clearly showed that a diversified and innovative, environmentally economical industry cluster is has evolved between Hamm and Duisburg, a cluster that has the potential to economically revive the region. As a result of this development, environmentally economical companies and projects have emerged, often on the basis of insights and innovations gained from the coal and steel industry. It's all about making something new from the old. Concepts range from the utilisation of mine water for heat generation, the use of aluminium furnaces for storing energy and the production of efficient gas and steam turbines to the production of green hydrogen or the circular economy, in general. The Greentech.Ruhr initiative connects these innovative companies with research and education institutes as well as public institutions.

Without a doubt, green infrastructure and the environmental economy have the potential to provide the region with a truly sustainable model and to allow inhabitants of the region to identify even more closely with their local area. Above all, however, these efforts must not subside upon completion of the project Offensive Grüne Infrastruktur 2030 (Green Infrastructure initiative 2030). The conversion of the Ruhr metropolis is – and must remain – a long-term intergenerational project.

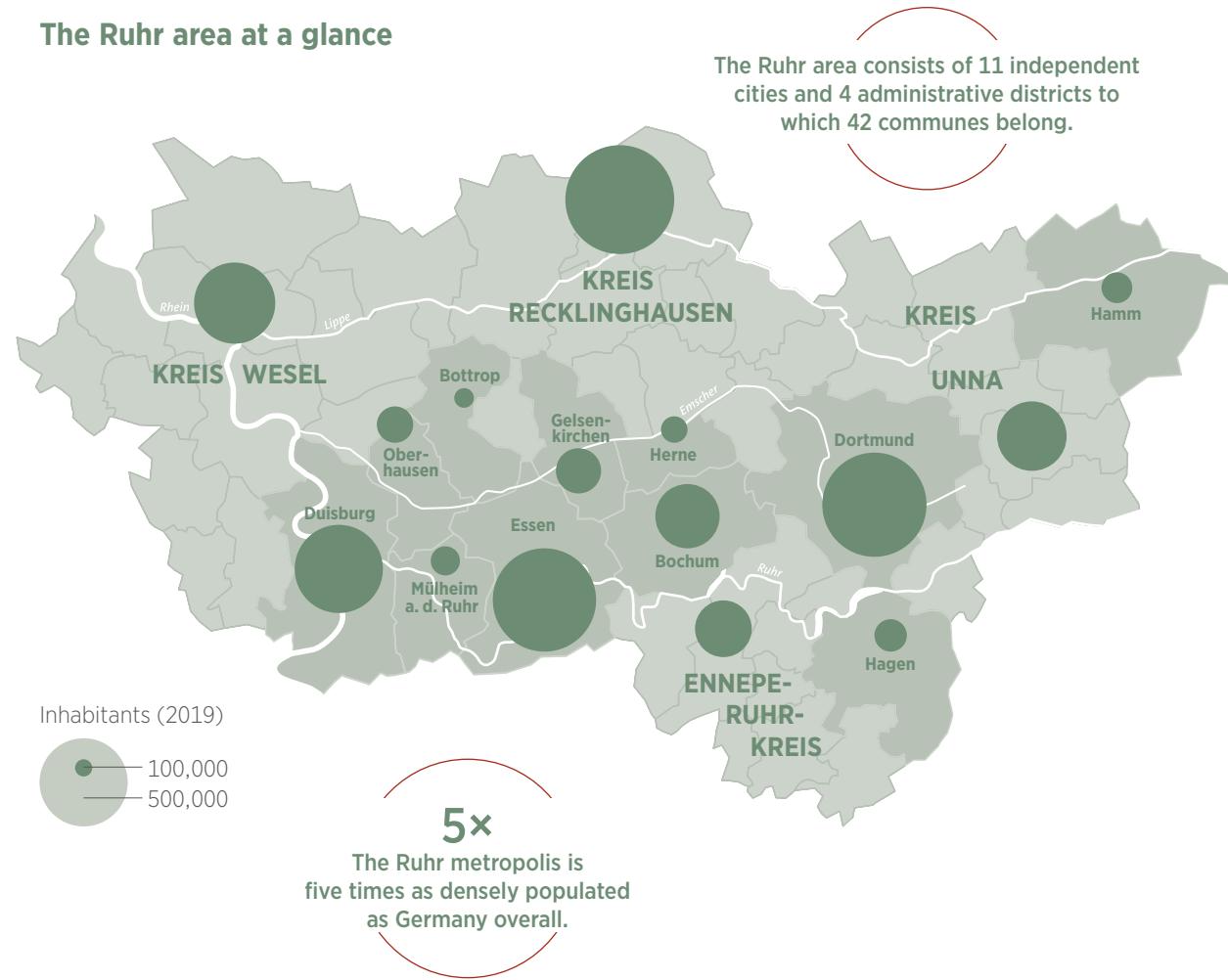
Dr Jörg Licher

Director Research
Handelsblatt Research Institute

The Ruhr metropolis

The Ruhr metropolis is one of the most densely populated regions in Europe – more than five million people live on just 4,400 square kilometres. The region, which was long characterised by coal mining and the steel industry, has undergone comprehensive structural changes, accompanied by a decline in population and economic setbacks. Today, the Ruhr area is a region shaped by industries of the future.

The Ruhr area at a glance



Fact sheet of the Ruhr metropolis



Sources: IT, NRW, RVR, Destatis, statistical offices of the federal states, own calculations



61 %

61 percent of the Ruhr area is green. It consists of woods, fields, parks and bodies of water – and therefore does not belong to the residential and traffic areas.

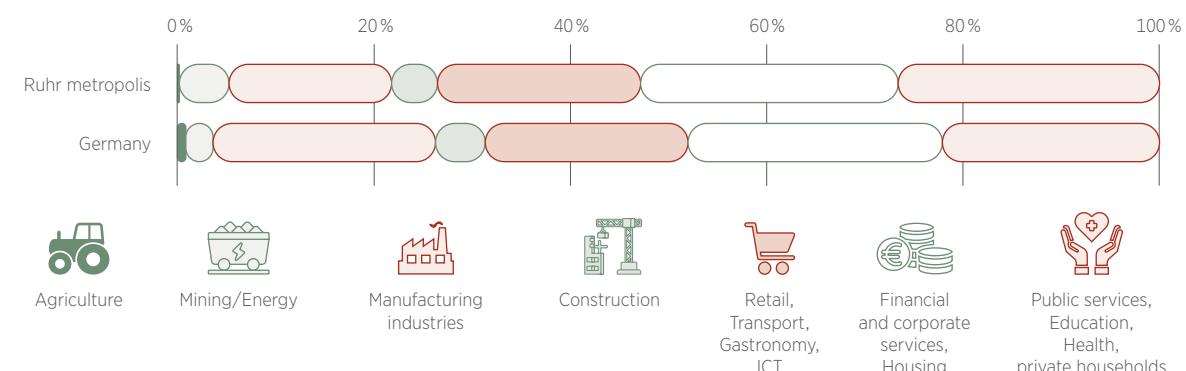
74 %

If residential free spaces are also counted, the share of open spaces (e.g. lawns and gardens between the houses) increases to 74 percent. Even in the densely populated metropolitan area, the value is still 53 percent.

Source: RVR

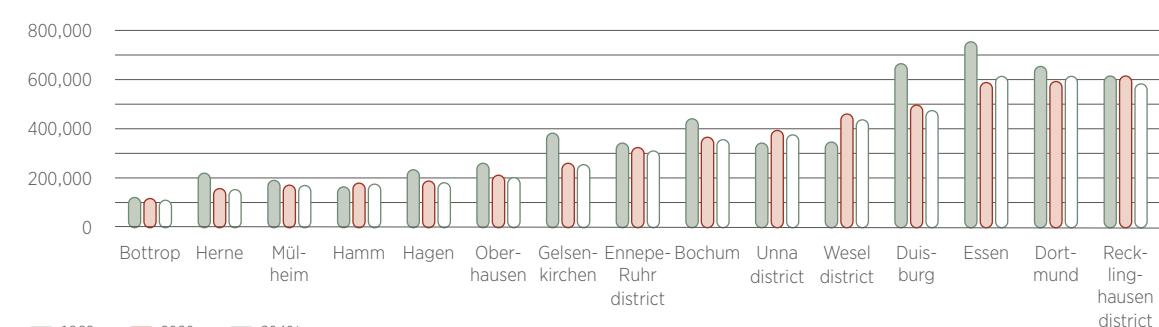
Economic sectors

Share of the sectors in added value, 2018



Sources: statistical offices of the federal states, own calculations

Population development



* Forecast: basic variant of the population advance estimate; source: IT, NRW

Age groups

Share of population, in %



Source: regional statistics

1

Ecology

Although humans and nature were long seen as polar opposites in the industrial era, they are truly long-standing partners for the future: in the Ruhr metropolis, rivers are being renaturalised, roofs and facades are greened, trees and woods are planted and slag heaps and old industrial areas are developed in order to create space for plants and animals. In this way, damage caused by climate change can be limited in the region. And the new biodiversity is impressive.

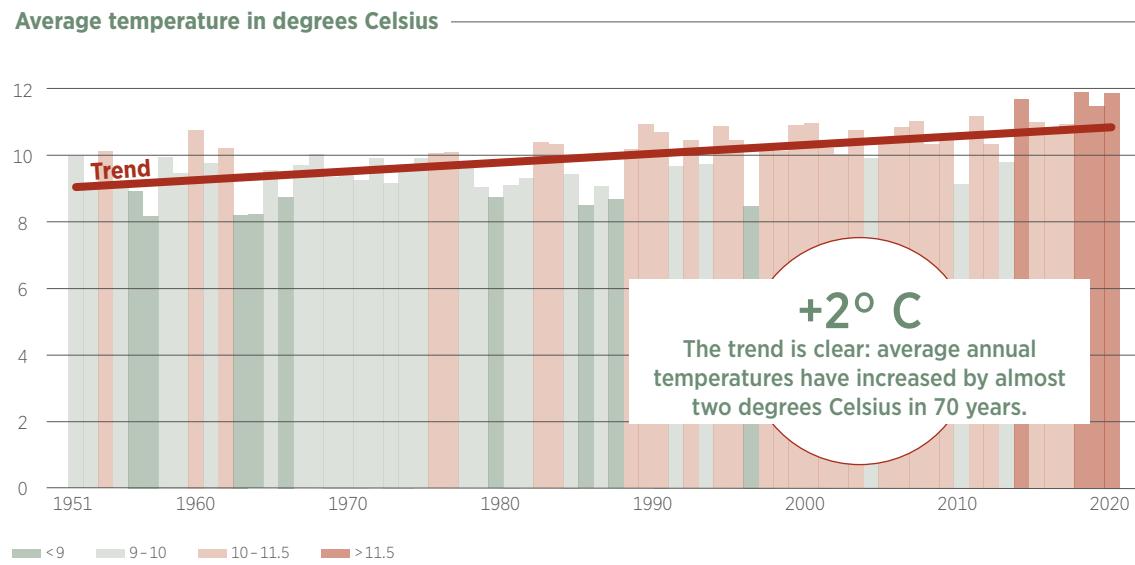


Climate change

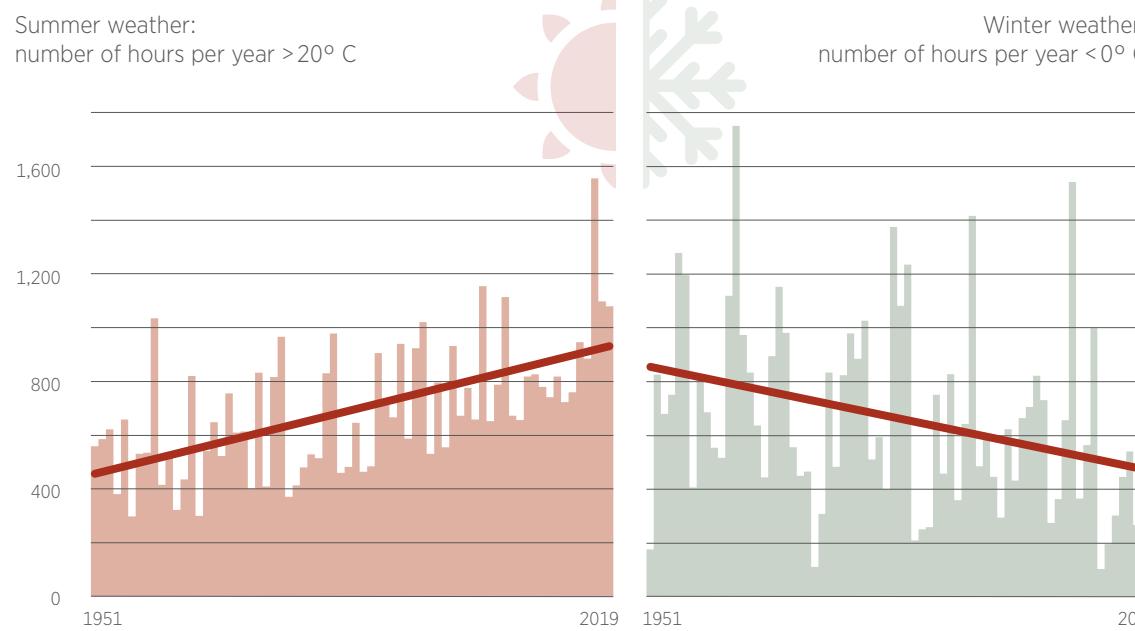
Climate change is having a big impact in the Ruhr metropolis. Since the middle of the 20th century, the average temperature has already increased by nearly two degrees Celsius. The consequences are serious, as densely built cities heat up more and heavy rainfall causes particular damage. The objective of regional climate policy is to make urban landscapes more resilient: additional green areas and air corridors, for example, serve to provide an increased cooling effect.

Power of climate change

Data from Essen-Bredeney weather station



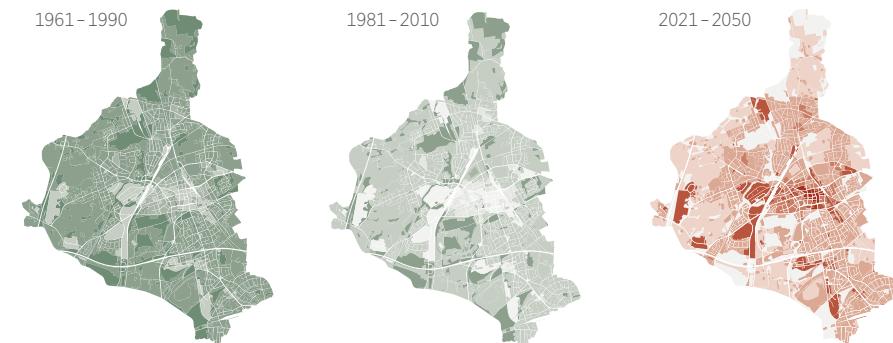
Summer weather:
number of hours per year >20° C



Sources: DWD, own calculations

Climate forecast until 2050

Example Gladbeck: average annual temperature



Sources: City of Gladbeck, RVR

Climate change locally – and what can be done to combat it locally

Effects of climate change (examples):

General

- Extreme weather events becoming more frequent (e.g. heavy rainfall/heat waves).
- Soil erosion increasing.
- Failed harvests and damage due to drought.
- More strain on health due to heat.

Nature

- Spread of immigrant animals and plants.
- Longer growing seasons (trees blossoming earlier, leaves falling later).
- Migratory birds come earlier and stay longer.
- Thermophile insects settling ever further north.

Climate protection: measures to mitigate the effects (examples):

- Energy revolution in industry, transport and energy sectors.
- More energy-efficient buildings (e.g. thermal insulation).
- Expansion of organic farming.
- Additional woodland areas to bind greenhouse gases.

Climate adaptation: measures to adapt to new realities (examples):

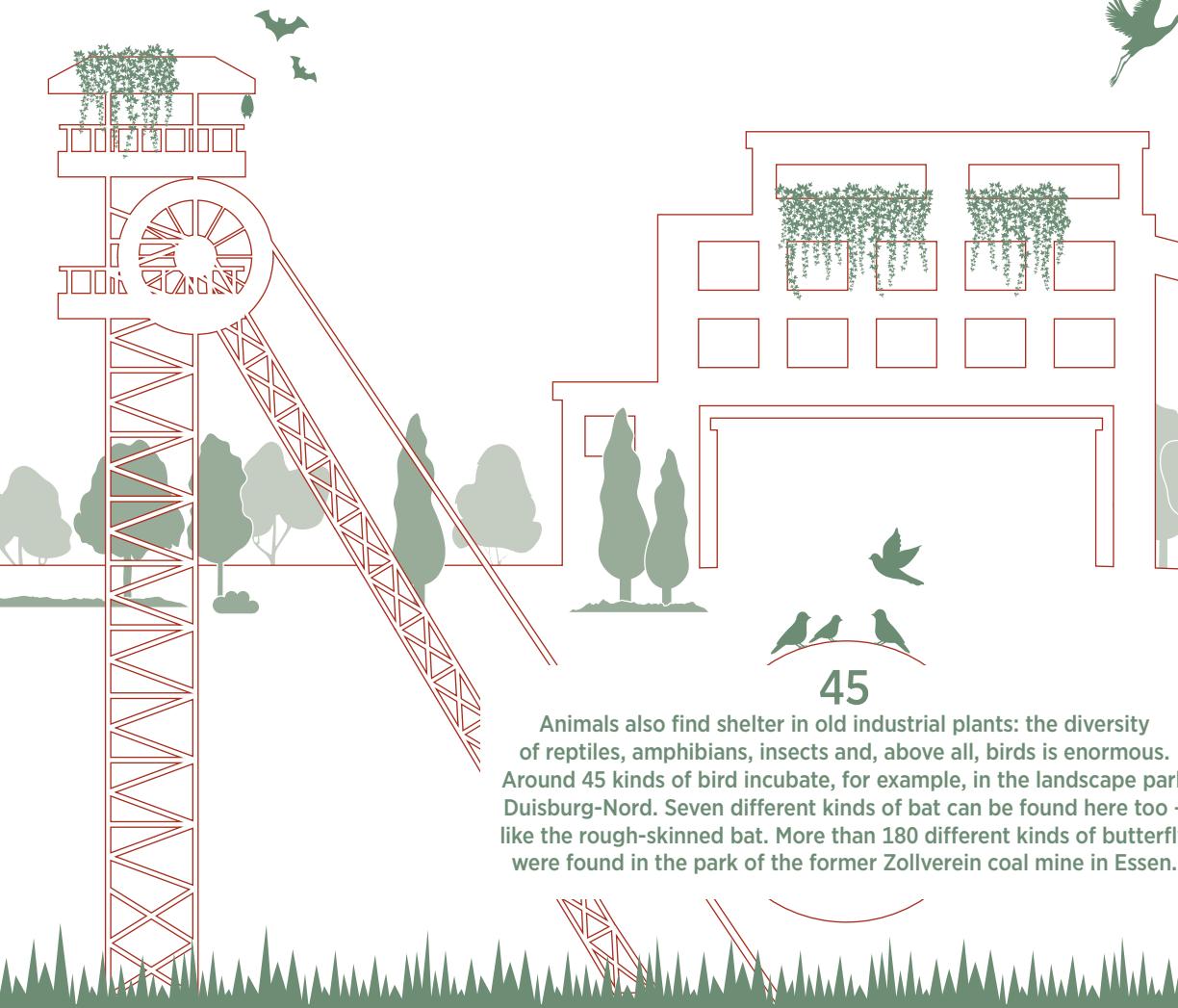
- Heat-adapted neighbourhood planning and creation of fresh air corridors.
- Risk management of urban flash flooding: more near-natural rainwater retention and seepage areas.
- Cooling effects by creating additional green areas.

Biodiversity

Given up on by the economy, but still of value for nature: in the past decades, many industrial areas in the Ruhr metropolis were abandoned. Undisturbed and unorganised, diverse flora and fauna were able to develop – a hotspot of biodiversity. Many specialised and rare species can be found here today: they include plants like the Little Red Robin bush and summer lilac – or animals like the ringed plover, natterjack toad or the blue-winged grasshopper.

The broad distribution of **industrial nature** is a USP of the Ruhr metropolis. It has many advantages: the newly emerging ecosystems provide **fresh air and cooling effects** at the same time, they serve as **recreational areas as well as cultural and educational spaces** for people. They also help to **shelter plants and animals**.

Many of the species found are known to be particularly **resilient to inhospitable conditions** and could well gain in importance as climate change progresses. The Ruhr metropolis already has a **higher degree of species and structural diversity** than its surrounding countryside where agriculture is dominant.



440

Diverse flora even manage to flourish alongside busy motorways: for example, 440 types of plant were found on Motorway 40 – most of them even on the central reservation of the dual carriageway.



45

Animals also find shelter in old industrial plants: the diversity of reptiles, amphibians, insects and, above all, birds is enormous. Around 45 kinds of bird incubate, for example, in the landscape park Duisburg-Nord. Seven different kinds of bat can be found here too – like the rough-skinned bat. More than 180 different kinds of butterfly were found in the park of the former Zollverein coal mine in Essen.

Diversity of flora in industrial nature areas

Total number of plant species found up to now

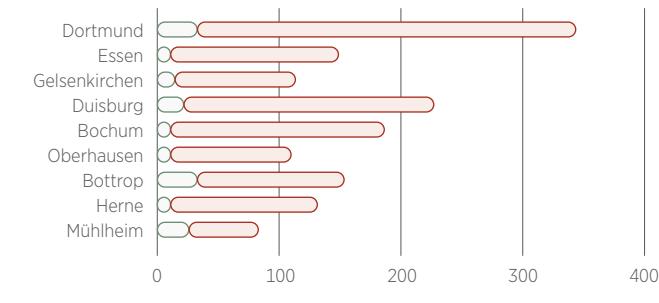


Sources: RVR, BSWR

There are **17 industrial wood-land areas** covering a total area of more than 200 hectares in the Ruhr metropolis. The abandoned areas are gradually becoming overgrown – initially with **poplars, willows and birches**, later with other kinds of tree. Despite inhospitable surroundings and nutrient deficiencies, the woods have more biodiversity than, for example, city parks.

Big biotope network in the urban landscape

Brownfield sites and slag heaps in the biotope network (only independent cities), in ha



Legend: Wasteland/slag heaps of outstanding importance for the biotope network, stage 1

Wasteland/slag heaps of outstanding importance for the biotope network, stage 2

Source: LANUV

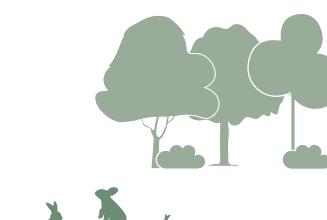
2,000

A total of 2,000 hectares of former coal mines, industrial plants and railway tracks are part of the biotope network in the Ruhr metropolis, created to sustain and expand biodiversity.



482

Many plants faced with extinction find new refuge on wastelands. For example, 482 kinds of plant were found on the site of the former Hansa coking plant in Dortmund, of which 41 are considered under threat in the Ruhr area – for example, the whorl-leaved cartilaginous kidney.

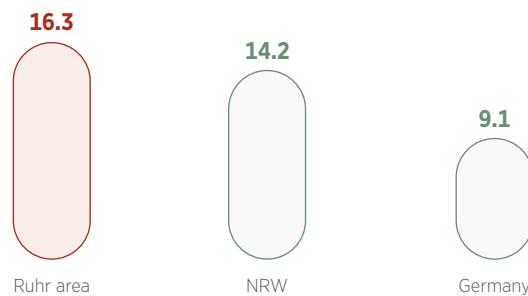


Soil, water and air

For a long time, the Ruhr metropolis was considered a filthy place – rivers dirty and enclosed, the air grey with exhaust fumes. However, the air quality has long improved, and at the same time the pollution of the waters has decreased – not least because some of them have now been renaturalised. Greenhouse gas emissions are higher here than elsewhere, due to the heavy industries which are strongly represented in the Ruhr area.

There is still work to be done

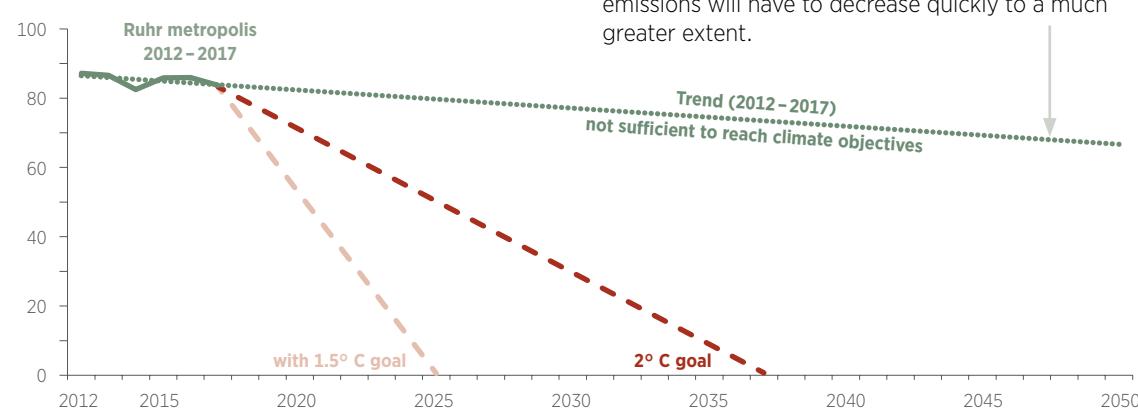
Greenhouse gas emissions per inhabitant, in t CO₂e*, 2017



* Without land use, forestry, waste management, and air traffic
Source: RVR

The struggle for clean air

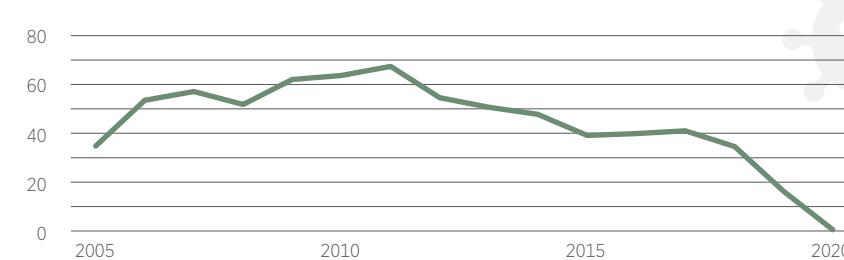
Greenhouse gas emissions, in m t CO₂e*



* CO₂ equivalent: measurement unit for volume of greenhouse gas emissions; source: RVR

Corona cleaning the air

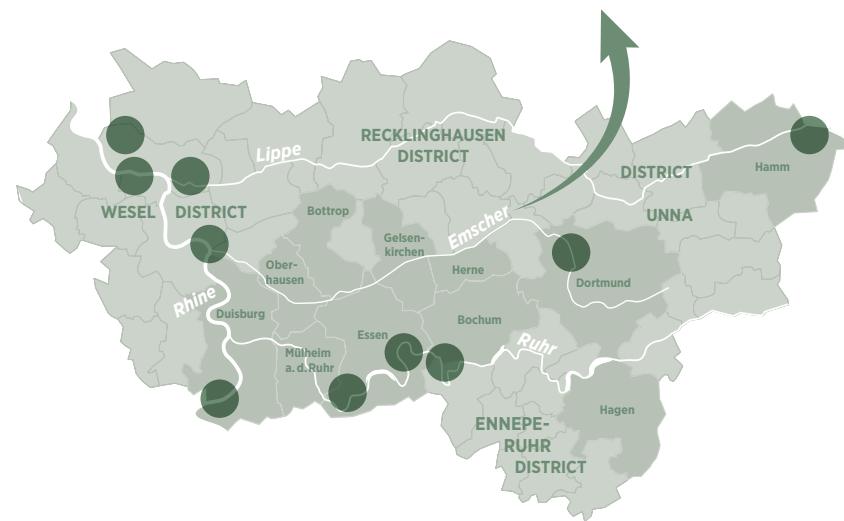
Percentage of monitoring stations in the Ruhr area with nitrogen dioxide – limit violations



Sources: RVR, LANUV, Wuppertal Institut

Rivers in the Ruhr area and renaturalisation projects

To free up the Emscher from sewage pipelines, a parallel sewerage system is being constructed. As a consequence, the river can be naturally diverted and have more space. The project, which has been underway since 1992, is costing more than five billion euros. However, in the interests of flood protection, the Emscher will have to remain dyked.



Sources: ELWAS-WEB NRW, BfN, LANUV, Emscher cooperative, RVR, own calculations

129.5 km²

The Ruhr metropolis has 129.5 km² of water area.

Water area

Share of total area, in %

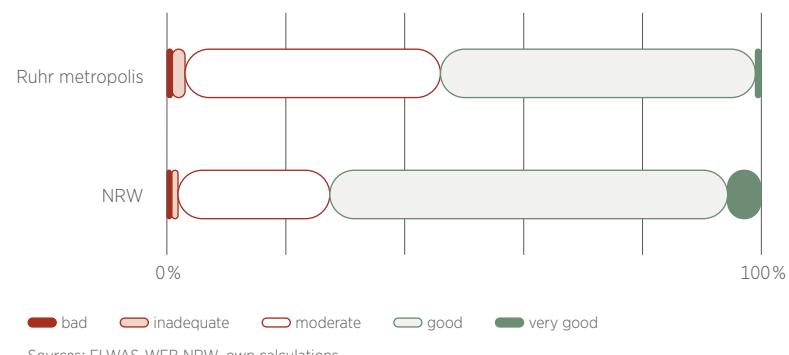
1.8

Ruhr area

2.9

Sources: Regional statistics, own calculations

Quality categories (saprobity)



The saprobity index illustrates the organic burden on the water – for example, from sewage pipelines.

Soil quality becoming better

Nitrogen excess on agriculturally used areas, in kg/ha of agriculturally used area



Sources: Inkar, UBA, own calculations

Nitrogen is an essential nutrient for all living beings. However, if too much of it is spread as fertiliser – for example, in the form of liquid manure – it can result in contamination of the groundwater or the acidification of terrestrial ecosystems.

The goal of the federal government is to reduce the nitrogen surplus to 70 kilograms per hectare of agriculturally used areas.

Woods and agriculture

Of course, there are fewer woods and farms in densely populated regions like the Ruhr metropolis than in rural areas. And yet, large sections of the area are devoted to forestry and agriculture. Apart from the production of wood and food, they perform other important functions – and not just for the protection of nature.

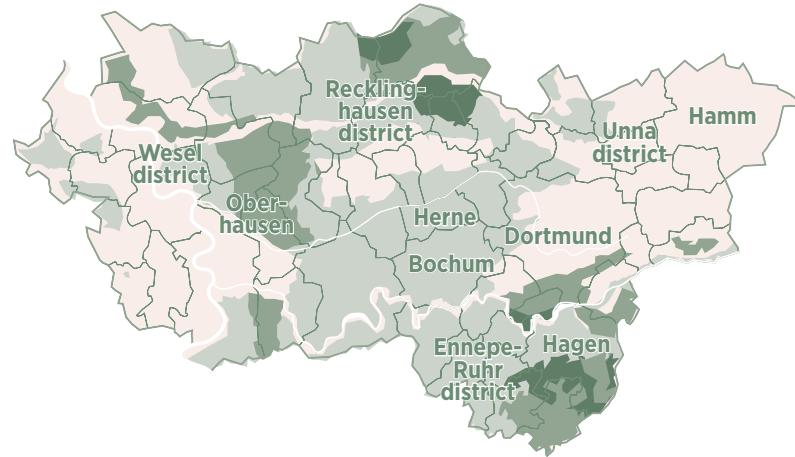
Woodland concentration

Share of open space covered by woodland areas

little woodland space <15%
woodland structures ≥ 15% and < 40%
woodland ≥ 40% and < 70%
predominantly woodland ≥ 70%

1/5

About one fifth of the Ruhr area is wooded. The figure for NRW is just over a quarter, and in Germany overall, as much as a third.



Sources: LANUV, RVR, IT.NRW, HAWK Göttingen

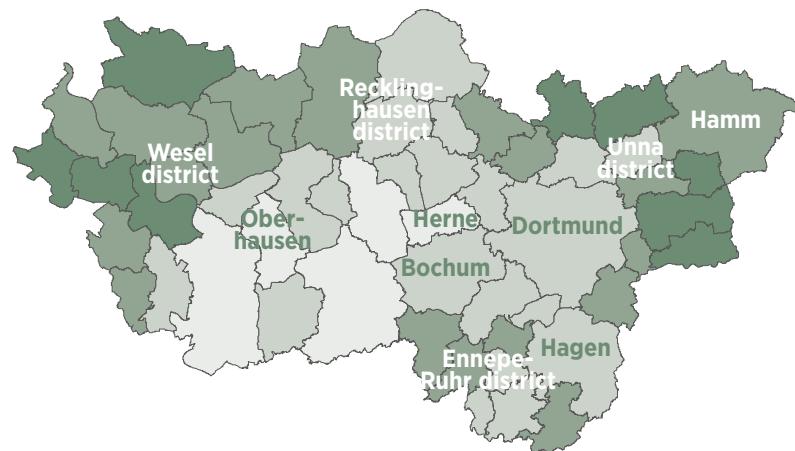
Multifunctional forestry: woodlands in conurbations serve a number of purposes. They offer people recreational space and are important for leisure and tourism. At the same time, they provide refuge areas for biodiverse flora and fauna – while helping to filter the air and protect groundwater.

Multifunctional agriculture: agriculture in urban areas is usually more diverse than in the countryside, for example, with regard to the field crops cultivated. At the same time, it performs different tasks: it offers services such as direct sales in farmhouse shops, it brings air and cooling effects into densely populated residential areas and contributes to the cultural landscape.

Agriculture

Agricultural area, in % of total area

<20%
20–40%
40–60%
>60%

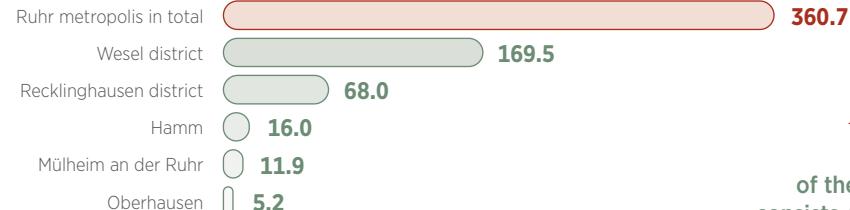


Large interconnected areas which are not divided up by arterial roads are of great importance to conurbations. They create **corridors for fresh air and wild animals**, while at the same time enlarging protection areas for plants and enhancing **biodiversity**. The **Green Infrastructure strategy** is to interconnect individual areas in the Ruhr metropolis, creating a regional green network for humankind and nature.

Sources: Landwirtschaftskammer NRW, IT.NRW

(Nature) conservation areas in the Ruhr metropolis

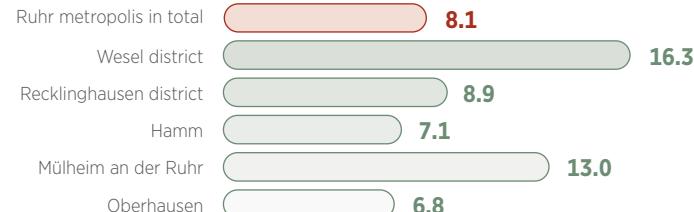
Nature protection areas: area in km²



8 %

of the Ruhr metropolis area consists of nature protection areas. Despite more than twice the population density, this quota in the Ruhr area is as big as in the whole of NRW.

Nature protection areas: share of the area, in %



Sources: IT.NRW, own calculations

Horticulture

Share of horticultural businesses as percentage of all agricultural businesses



12
Ruhr metropolis



6
NRW

Horticulture includes vegetable and fruit cultivation as well as tree nurseries.

The high proportion of vegetable cultivation is one reason why agriculture in the Ruhr area is able to generate double the revenues per hectare of cultivated area compared with the federal German average.

Source: Chamber of Agriculture NRW

Ecological farming can be expanded

Share of agriculturally used area, in %, 2016



Sources: IT.NRW, own calculations

Goal of the national sustainability strategy is an increase to 20 percent by 2030.

In comparison with rural areas, farms in the Ruhr metropolis are highly diversified and specialised, and this is typical of **cultivation areas close to conurbations**. Direct sales at weekly markets or in farmhouse shops also plays a bigger role. Farms have an average size of just over 40 hectares, the same as the average for the state of NRW.

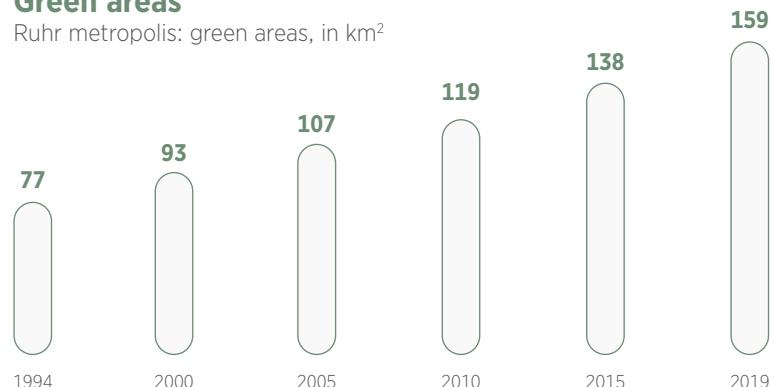
Sources: RVR, LANUV

Urban green spaces

Green areas are of key importance for urban spaces – they do, after all, mitigate those environmental burdens people in big cities tend to suffer from: parks, gardens and meadows filter the air, reduce noise levels and feelings of stress, and have a cooling effect in the summer. Even individual roadside trees, green roofs and facades have a measurably positive effect.

Green areas

Ruhr metropolis: green areas, in km²



Sources: IT.NRW, own calculations



Green areas do not include woods, but rather parks and other undeveloped, public green spaces which are freely accessible and used for recreational purposes.

... provides clean air
Individual trees reduce the burden of fine dust by 5–10%, several trees together by as much as 15%.

... has a cooling effect
The cooling effect can be felt from a distance of up to 300 metres. On hot days, a temperature reduction of 3° C is possible.

... also has social, health and economic advantages
Quality of life increases, feelings of stress are reduced – and property becomes more valuable.

... protects from flood damage
The city as a sponge: unsealed ground and green roofs and facades can keep back water and reduce surface water run-off.

ECOSYSTEM SERVICES of urban green space URBAN GREEN SPACE ...

... binds greenhouse gases
In the ground too: green ground in cities stores seven times as much CO₂ as the average ground in a city.

... reduces noise
Leaves, stems and branches absorb and distribute noise – and reduce the volume of noise.

Sources: IÖW, BMU, Natural Capital Germany, own calculations

Positive effects of green house roofs and facades



Insulation in the winter

Extensive green covering of a roof insulates about as effectively as conventional insulation (1 cm thick).



Cooling in the summer

Water evaporation from plants cools the surroundings and the plants cast a shadow.



Photovoltaics

Solar systems should not get too hot; cooling plants can enhance the efficacy of photovoltaic systems.



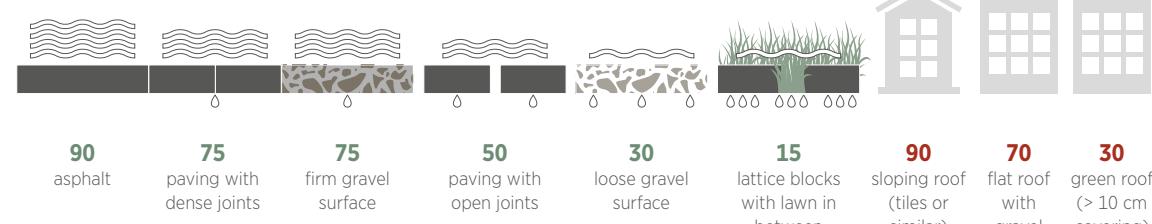
Noise reduction

Modern architecture favours reverberant building materials – like glass, steel and concrete. Plants can help reduce the noise.



Ground sealing

Proportion of rainwater which runs off, in %



Sealed surfaces interfere with water circulation, because rain flows away quickly and cannot evaporate – depriving nature of it. At the same time, there is increased danger of floods and erosion, as the ground beneath the sealed surfaces cannot store water.

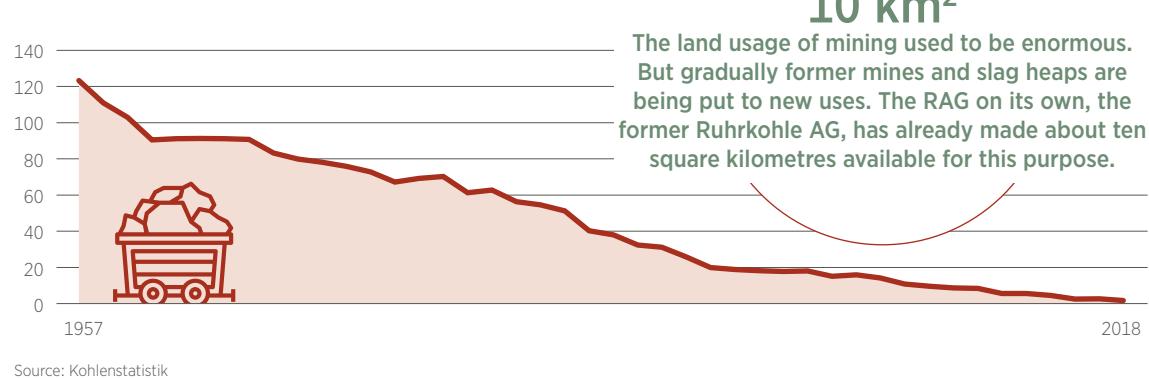
Source: Natural Capital Germany

Limited resources

Because of the coal mines, the Ruhr metropolis was long a symbol of the exploitation of finite resources. But the greening process of the region has long since begun, and that includes the expansion of renewable power sources. The surface areas themselves are another finite resource: new areas continue to be sealed for housing projects, yet urban planners increasingly favour the principle of urban redensification. And new green areas are also being created.

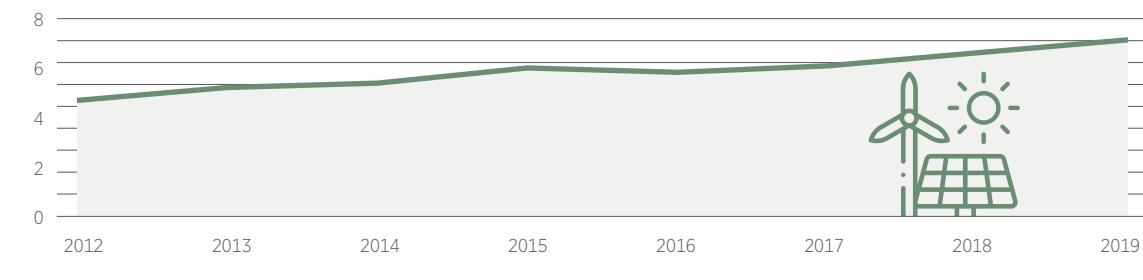
Coal on its way out ...

Coal production in the Ruhr metropolis, in m t



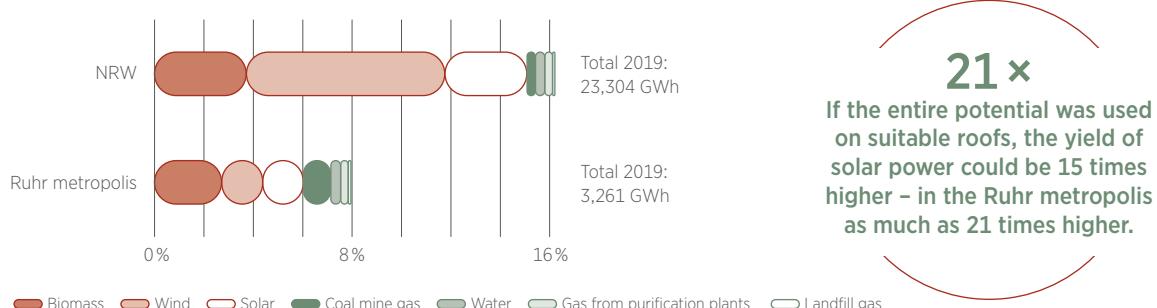
... to be replaced by green energy

Share of renewable energy sources in power consumption in the Ruhr metropolis, in %



Good returns

Electricity yield/consumption by energy sources, 2019, in % of total consumption

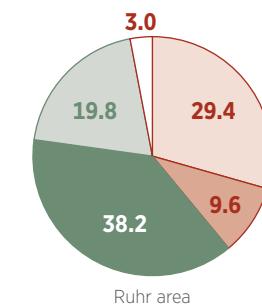


Competition for space between humans, the economy and nature

Particularly in densely populated areas, the **competition for surface** area is tough: people need space to live and for traffic. The economy needs space for factories, businesses and agriculture. At the same time, nature should also be able to spread out.



Shares of surface area, in %

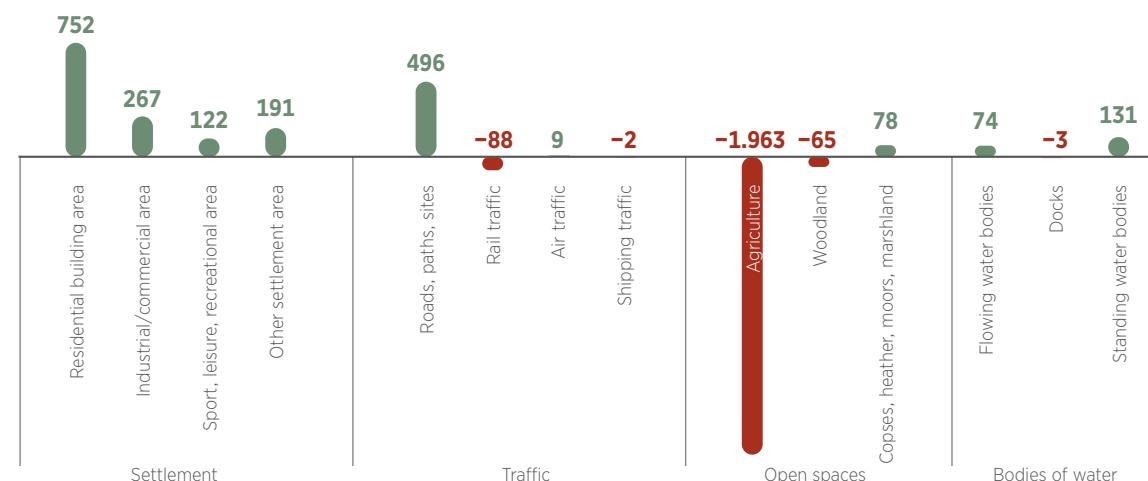


* Incl. cypresses, heather, moors, marshland

Source: RVR

Change of usage

Ruhr metropolis: **growth in surface area (+)** and/or **reduction (-)** between 2009 and 2018, in ha



On average, the settlement area of the Ruhr metropolis grew by about **150 hectares per year** in recent times, particularly at the expense of agriculture. And yet population figures have hardly risen in the same period. Land usage is moderate compared with other regions.

Source: RVR

Mobility

The densely populated, polycentric Ruhr metropolis does not leave too much space for traffic – and commuting time is particularly long. Up to now, the motor car is still the main focus of transport considerations, but that is set to change as soon as possible. Within the framework of so-called multimodal transport, the region is looking at a mix of transport modes. Apart from improving public transport, the bicycle track network is also being expanded.

Long way to work

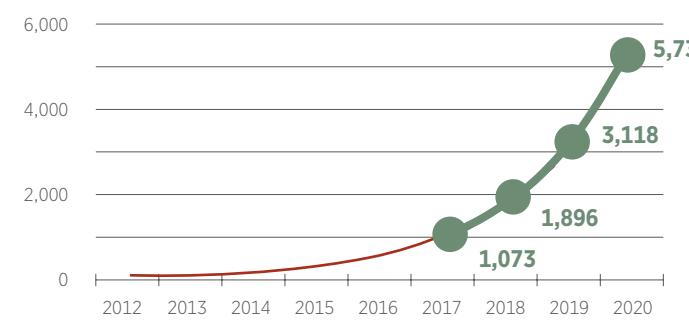
Average commuting distance to work, 2018, in km



52 %
of employees in the Ruhr area
have to leave their immediate
home community to go to work.

Electric mobility

Number of electric vehicles increasing



Motorisation

Number of cars per 1,000 inhabitants, 2020



178

There are 178 charging stations
per 1,000 km² in the Ruhr area.
The average in Germany is 43.

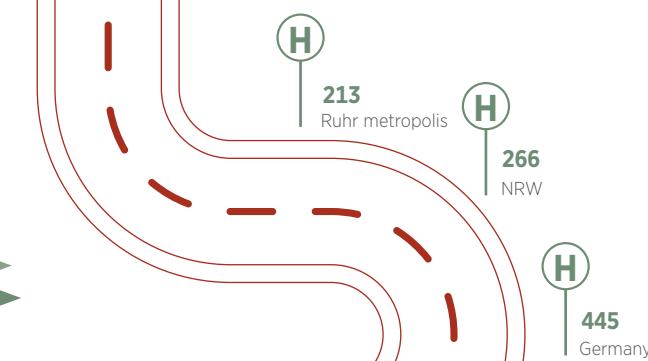


More than 200 cars now participating
in car sharing in the Ruhr metropolis.



Public transport nearby

Average distance in metres to next public transport stop, 2017, in the Ruhr metropolis



99 %

of people in the Ruhr metropolis
have a public transport stop less
than one kilometre away.

Good public transport use

Kilometres travelled by public transport per inhabitant*, 2018

NRW **580**



Ruhr metropolis **685**



* Only buses, underground and trams, without suburban rail (S-Bahn) and trains; data refers to member companies of the VDV (Association of German Transport Companies)
Sources: VDV, own calculations

The motor car is still king

Share of transport modes used in the Ruhr metropolis, 2017, in %



58



23



10



9

Possible destination:



25 %



25 %



25 %



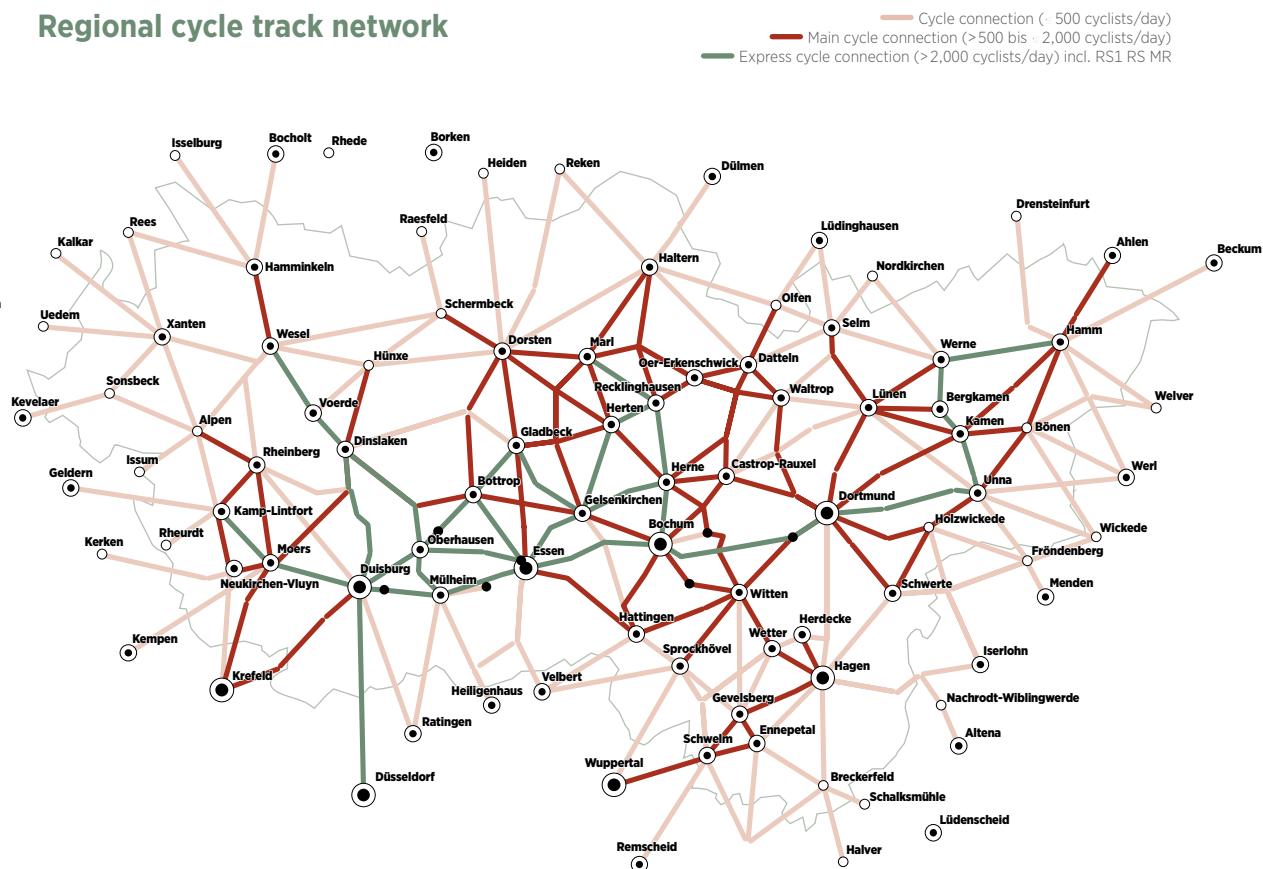
25 %

Regional train services are being improved
with the successive introduction of the
Rhine-Ruhr-Express (RRX): by 2030, there
will be trains at 15-minute intervals between
Dortmund, Duisburg and Cologne and
every 20 minutes between Oberhausen
and Düsseldorf.

Cycling

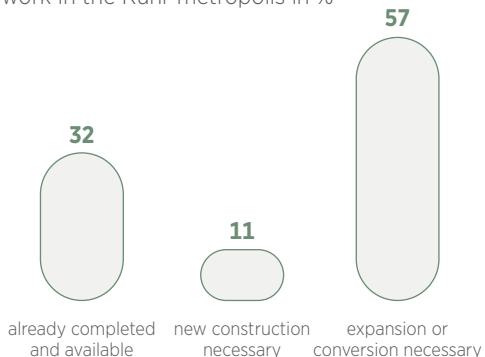
As a mode of transport, the bicycle is still somewhat underrepresented in the Ruhr metropolis: whereas in Germany, on average, every ninth trip is by bike, here it is only every eleventh. But that is set to change – by 2035, every fourth trip should be by bike. The expansion of bicycle traffic is a key element of the region's mobility concept. In this respect, the regional bicycle track network is currently being expanded to include two 'express' cycle tracks as the main axes for commuter traffic.

Regional cycle track network



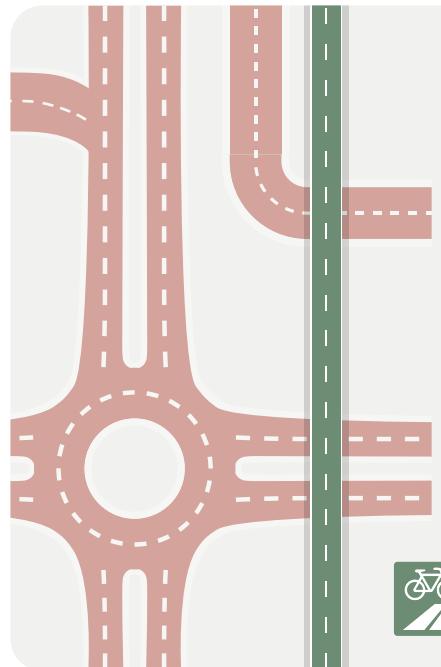
Stage of development

Stage of development of the planned cycle track network in the Ruhr metropolis in %



1,800 km
In terms of perspective, the everyday cycle track network of the Ruhr metropolis is to be expanded to a length of 1,800 kilometres. In addition, there will be hundreds of kilometres more of leisure cycle tracks.

Source: RVR



The idea of **express cycle tracks** like the future RS1 is to get people out of their cars and onto their bikes: when completed, the RS1 will be **more than 100 kilo-metres** long – and connect **ten Ruhr area cities** between Duisburg and Hamm without interruption. The track will be **four metres wide**, with extra lanes in each direction and a separate pedestrian path. There will be lighting in built-up areas, and snow and ice will be cleared in winter.

13 kilometres of the express cycle track are open so far, with more to follow soon.

The economic benefits of the express cycle track are estimated at about five times the construction costs. One kilometre of express track is expensive at about **two million euros**, but motorways cost 5 to 50 times more.

The express cycle track is expected to save **16,600 tonnes of CO₂** per year – because people are switching from car to bike.

From rail to bike

Selection of converted railway lines in the Ruhr metropolis

Erzbahntrasse
Bochum ↔ Gelsenkirchen

9 km

Ruhr-zur-Ruhr
Ennepe-Ruhr-Kreis

57 km

Rheinische Bahn
Essen ↔ Duisburg

21 km

Radweg Xanten-Haltern
Xanten ↔ Haltern

56 km

Rheinischer Esel
Dortmund ↔ Bochum

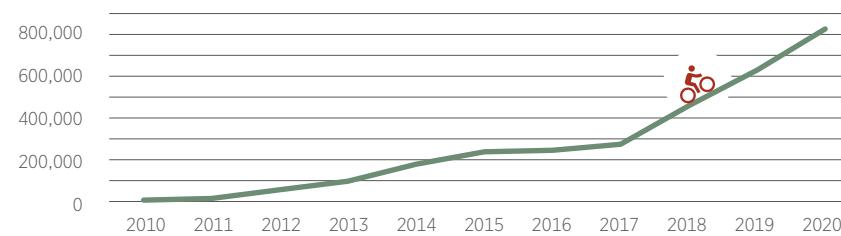
13 km

A special feature of the Ruhr metropolis are the many industrial railway tracks which have been converted to cycle tracks and are now being utilised in an innovative way.

Source: RVR

Hired bikes are very popular

Number of hires recorded in the metropolradruhr bike hiring system per year



Source: RVR

The metropolradruhr is the most commonly used hiring system in Dortmund and Duisburg.

2

Economy

The economy of the future has to be green and climate friendly – there is no escaping that. It is the objective of the Ruhr metropolis to actively bring about this change. The region already provides important impulses: conducting research on how to make new building materials out of old ones, what efficient and eco-friendly mobility is about and how hydrogen is becoming the fuel of the future. In this context, there are great hopes for the innovative start-up scene as well as for the sustainable conversion of big industry.



Natural assets

It creates fresh air, diminishes climate change and provides recreational space: nature certainly has a high value for human beings. And now the benefit created by these green services can even be quantified and measured in euros. Woodlands in the Ruhr metropolis, for example, create added value of many hundreds of millions of euros annually. Property prices also send an indirect message about natural assets.

Added value with property

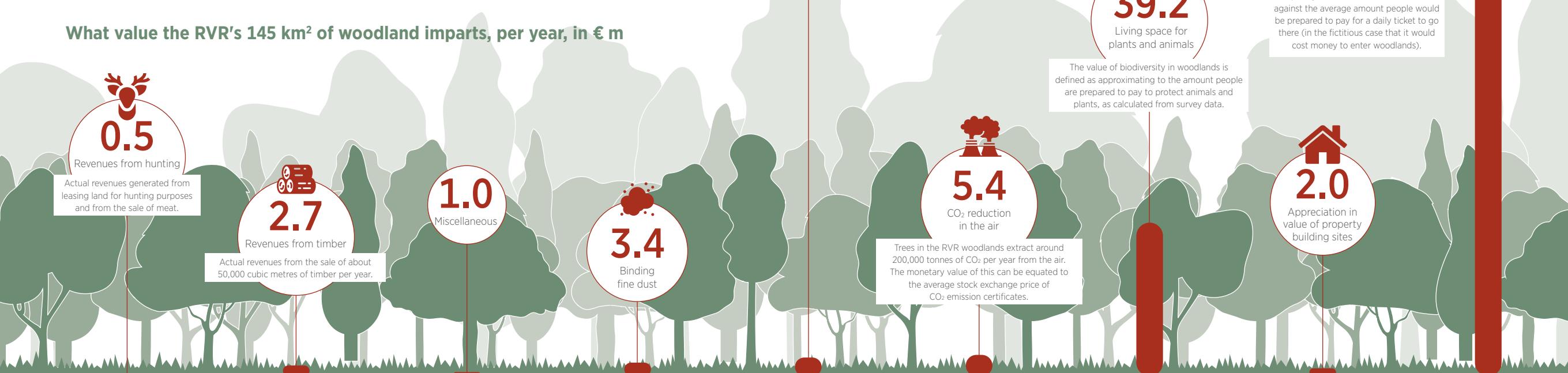
Big cities in Germany: ground value per m², 2008, in €



Real estate property increases in value when there is additional green in the neighbourhood, as studies bear out: for example, an analysis of data from Cologne concluded that the price of a normal property decreases with every kilometre distance from the next park, on average, by **6,000 euros**. Surveys show that people are quite prepared to accept costs if it means they have additional green in their neighbourhood: inhabitants of big cities say they would be prepared to pay on average around **25 euros per month** if one additional hectare of green space were created within one kilometre of their own residence.

Sources: DIW, Technische Universität Berlin, Helmholtz-Zentrum für Umweltforschung, own calculations

What value the RVR's 145 km² of woodland imparts, per year, in € m



The woods investigated here, owned by the RVR, comprise about a fifth of all woodlands in the Ruhr area. So the

Ruhr metropolis: what are the costs of the emissions?



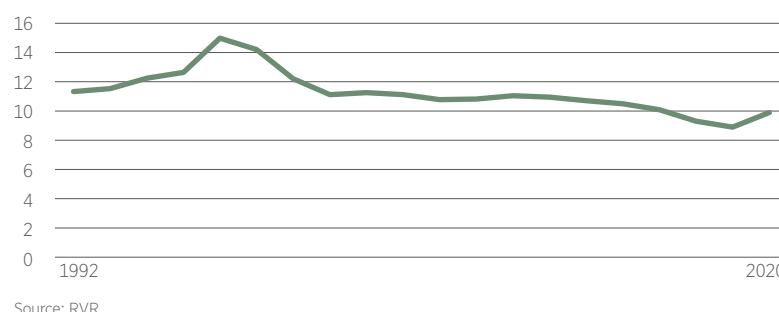
* For this measuring unit, the climate damage by all emitted greenhouse gases is converted and added to the damage by CO₂. Sources: BfN, UBA, EEX, RVR, Helmholtz-Zentrum für Umweltforschung, own calculations

Environment and economy

The Ruhr metropolis has a decisive advantage dealing with the imminent energy transition process and the green transformation of the area; it already has experience with comprehensive change processes due to the structural transformation of the region in recent decades. In fact, the region is already the most important location for the environmental economy in North Rhine-Westphalia. The hydrogen sector is also well represented.

Development of the labour market

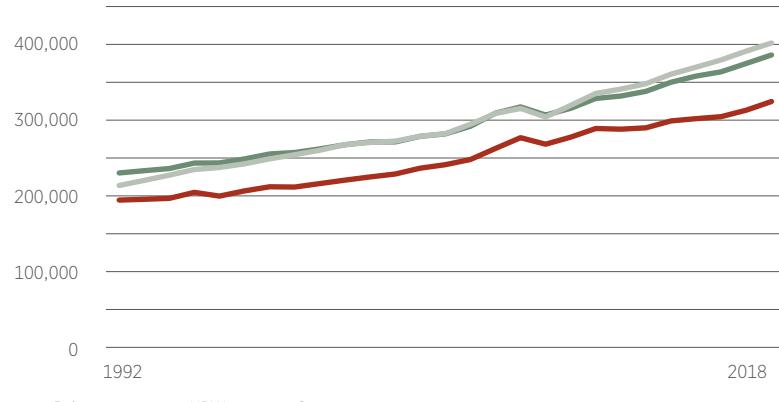
Unemployment rate in the Ruhr metropolis, in %



Source: RVR

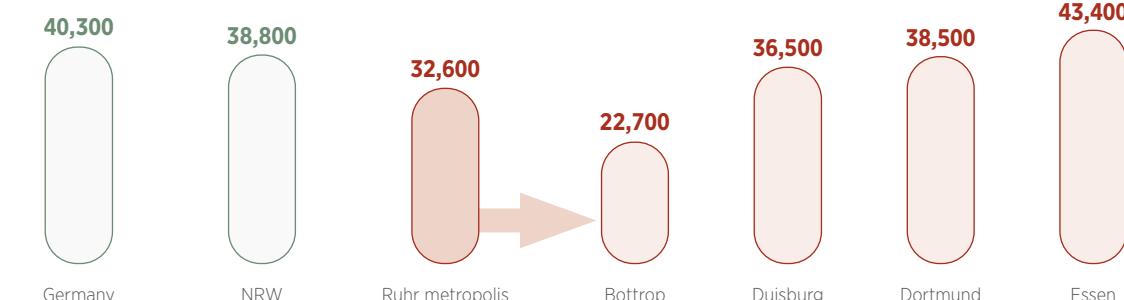
Economic strength

Economic performance per inhabitant (GDP per capita), in € (not adjusted for inflation)



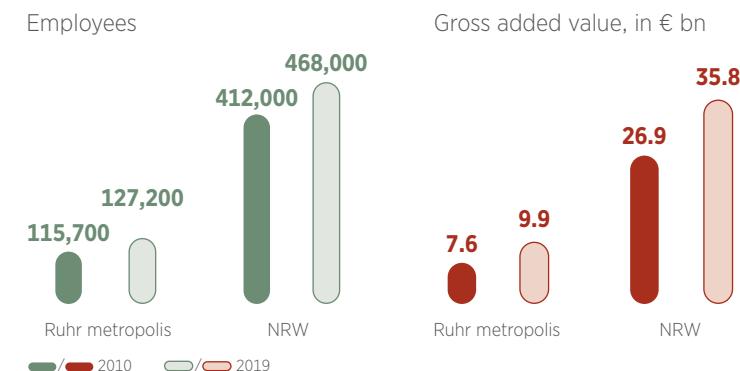
Sources: statistical offices of the federal states, own calculations

GDP per capita, 2018, in € (not adjusted for inflation)



Sources: statistical offices of the federal states, own calculations

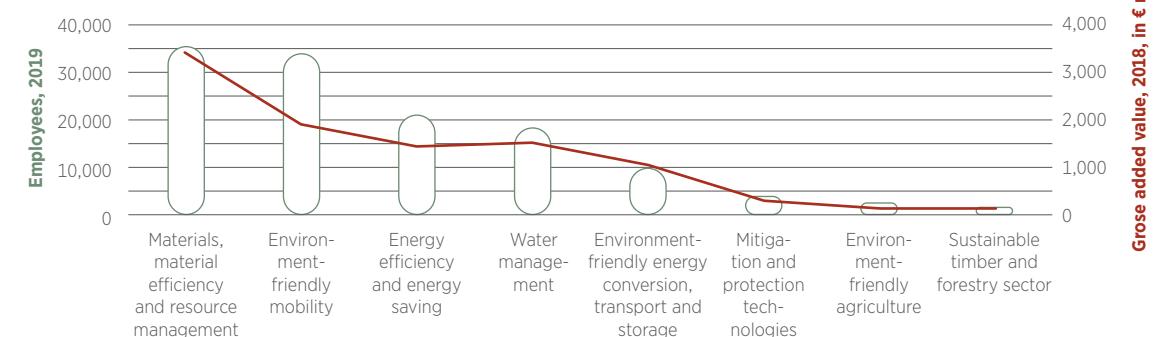
Environmental economy



In NRW, the Ruhr area is a centre of the environmental economy: while 25 percent of all North Rhine-Westphalia's employees live in the Ruhr area, as many as 27 percent of those working in the environmental economy live there. The region is seen as a model for successful green transformation.

Individual industries of the environmental economy

Employees and gross added value in the Ruhr metropolis



Three sub-sectors of the environmental economy are particularly strong in the Ruhr metropolis:

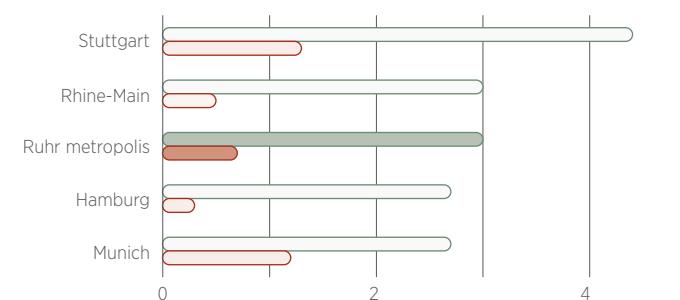
material efficiency and resource management, water management and environmental mobility

The **Greentech.Ruhr** network is a particular strength of the Ruhr metropolis – this is where experts from business, research and administration work together. They focus on concepts to **strengthen renewable energy forms** and programmes to adapt former coal mining areas ecologically and sustainably. A key future project of the energy industry in the Ruhr metropolis is the **Innovation City Bottrop**. The city is to become the model and laboratory for energy transition – and reduce its CO₂ emissions much earlier than other cities.

Sources: MULNV NRW, Prognos

The hydrogen economy

Research promotion and start-up companies



Legend: Research promotion: percentage share going into hydrogen projects; Company start-ups in the hydrogen economy (per 10,000 companies)

Source: IW Consult

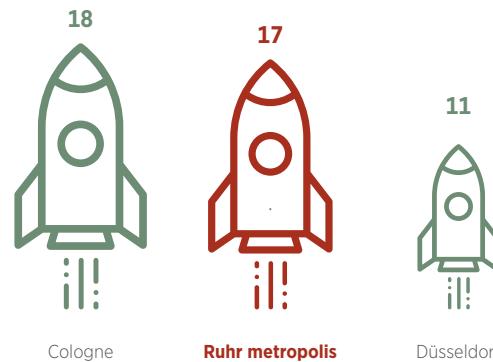
10 % is the share of environmental protection investments in all industrial investments in the Ruhr metropolis.

Green start-up scene

Innovative start-ups are making a key contribution to the transformation of the Ruhr metropolis from grey to green – i.e. from the coal and steel industry to the green energy, environment and mobility economy. The urban landscape is right up with the leaders in many future technologies – for example, in hydrogen or sustainability-oriented business ideas.

Strong start-ups

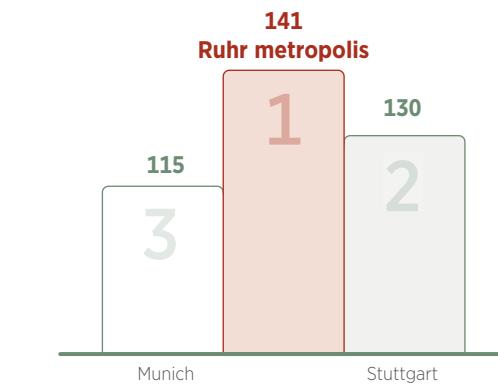
Start-ups in NRW: shares of the metropolises, 2019, in %



Source: Innovationsreport Ruhr (2020)

Sustainability

Top three in hydrogen ranking of the metropolis regions, number of points



The ranking consists of 11 individual indicators, for example, the share of companies that are comfortable with hydrogen or the share of relevant research institutes.

Source: IW Consult

Technology in demand

Business models of digital start-ups: share of sectors, 2019, in %



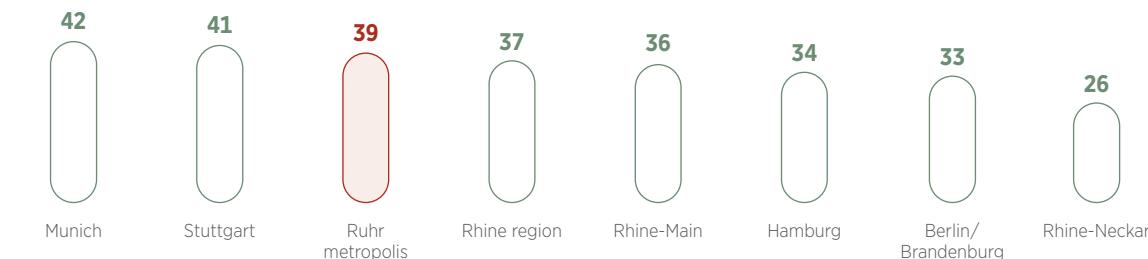
Source: Innovationsreport Ruhr (2020)

Germany Ruhr metropolis

The Ruhr metropolis also has many strong players in the area of e-sports and gaming.

Important specialists

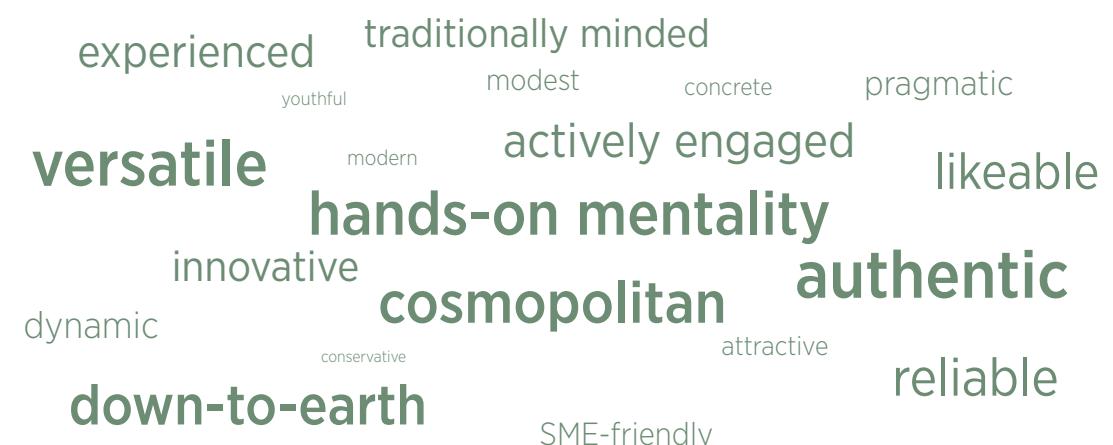
Share of MINT graduates among all university graduates, 2017, in %



Source: IW Consult

Image of the Ruhr metropolis

Company survey: what attributes would you credit the Ruhr metropolis with? Importance of the terms reflected in the frequency of their being mentioned



Initiatives

Network for social entrepreneurship

Social responsibility is also a focus of the start-up landscape in the Ruhr metropolis. Anthropia, for example, is a network for social entrepreneurship. The ideas of the young entrepreneurs are focused on topics like society, nature and humankind.

Ruhrvalley

Ruhrvalley is a research and innovation network which three higher education institutions and around 40 firms from the region have joined. The objective is to work together in an innovative and multidisciplinary way on future visions of mobility and energy supply.

Greentech.Ruhr

More than 170 companies, institutions and educational facilities in the Ruhr metropolis have joined the Greentech.Ruhr network. The objective is to forge ahead with the transformation process – away from coal and towards an environmental economy.

ruhr:HUB

The ruhr:HUB is a joint start-up initiative of six cities in the Ruhr metropolis (Bochum, Dortmund, Duisburg, Essen, Gelsenkirchen and Mülheim). The network supports and connects young digital companies in the region. The focus is on the environmental economy, digitisation, the energy transition and mobility in the future.

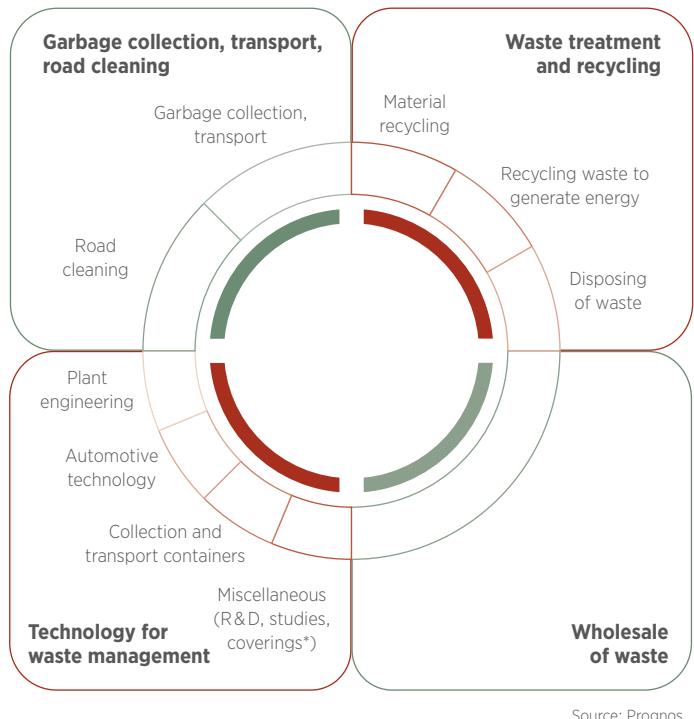
About 300 companies interviewed (2016); source: Mercator foundation

Circular economy

Every year, around 400 million tonnes of garbage are collected, transported, sorted, processed, recycled either to recover material or generate energy, and then disposed of. The waste produced both in the industry and commerce sectors as well as in private households is the primary focus of circular economy and public interest. However, construction and demolition waste are also a big source of raw materials.

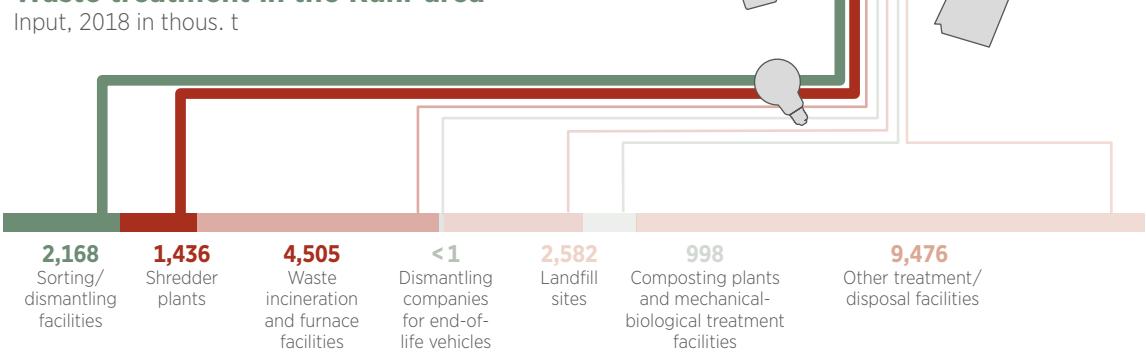
Market segments and subsections of a circular economy

The main task of companies in the recycling economy is to utilise potential elements of waste by making available the reusable material it contains for the manufacture of new products – thus completing the cycle.



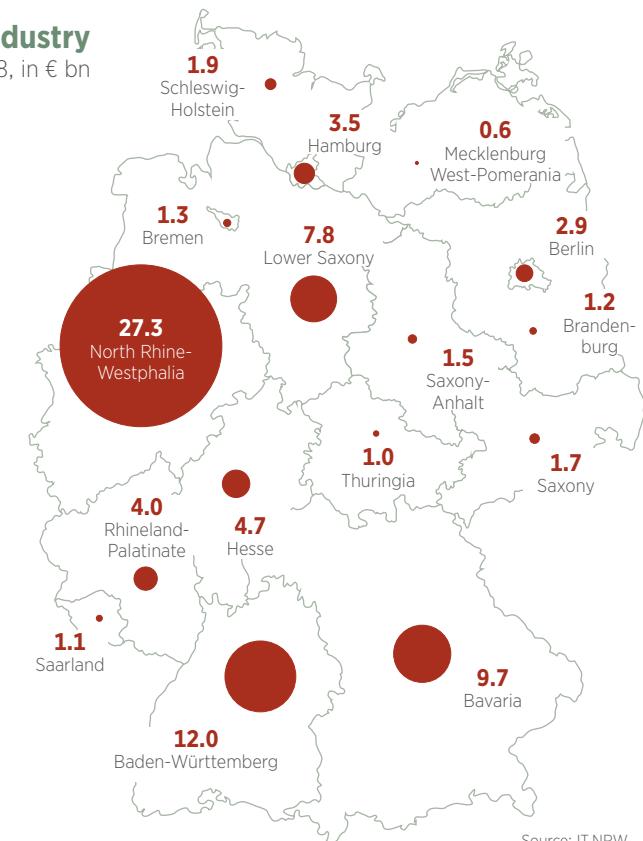
31 %
of all Germany's sorting facilities are in North Rhine-Westphalia. With a share of more than 19 %, NRW also has the most dismantlers of end-of-life vehicles, followed by Bavaria with 14 %.

Waste treatment in the Ruhr area



Revenues of the industry

2018, in € bn



478 kg of household municipal waste per inhabitant was produced in the Ruhr metropolis in 2018.

In 2021, the Federal Association for Secondary Raw Materials and Waste Management (BVSE) has **166 members** in NRW.
39 of them are in the Ruhr metropolis.

Currently, more than **310,000** qualified, motivated employees work in nearly **11,000** municipal and private companies at all levels of added value and generate revenues of around 85 billion euros. On a national level, there are just as many people working in the recycling industry as in the energy sector and nearly four times as many as in the water and sewage management industry. With a value added figure of around **28 billion euros**, the industry has become a **significant economic factor**.



To conserve scarce raw materials, the search is on – in the context of so-called **urban mining** – for ways to recover and reutilise secondary raw materials from durable goods and debris. For example, discarded car tyres are divided up into rubber, steel and textiles, and old construction waste is sorted and dismantled. Urban mining is complementary to waste management and, among other initiatives, is promoting the idea of constructing future **buildings, vehicles or products** in such a way that the raw materials they contain can be recovered without expensive recycling.

'Making new out of old'

When coal production came to an end and the Ruhr steel industry decreased in size, a substantial amount of wasteland was created. Making these areas green and inhabitable is one of the region's key projects. The revitalisation is accomplished primarily with the help of advance funding by public authorities, but in many cases this prompts subsequent, large-scale, privately financed investments. The Ruhr metropolis is seen as a model region for the revitalisation of former coal and steel industrial areas.

Nordsternpark (Gelsenkirchen-Horst)

Former utilisation
Coal mine

Period
1868–1982

Utilisation today
Landscape park (with water playground, goat farm, climbing facilities and amphitheatre with > 6,000 seats)

Settlements
Companies providing about 1,850 jobs, including the headquarters of Vivawest (housing company); event venue, hotel, gastronomy

Special features
The National Garden Festival took place at Nordsternpark in 1997, and it was the focal point of the European Capital of Culture year in 2010. It will also be one of the main locations of the International Gardening Exhibition 2027.

Rheinpark (Duisburg-Hochfeld)

Former utilisation
Iron foundry and rolling mill

Period
1851–2013

Utilisation today
Park area (with skating rink, gastronomy, promenade)

Settlements
In future: new Rheinort district for 4,500 people (residential and commercial area)

Special features
The Rheinpark will be a central location of the International Gardening Exhibition in 2027 in the Ruhr metropolis.

Sources: baukunst-nrw.de, RVR, City of Dortmund, City of Gelsenkirchen, Wirtschaftsförderung Duisburg, wasserstadt-aden.de, City of Bergkamen, zollverein.de, City of Essen, own research

Zollverein UNESCO World Heritage Site (Essen-Stoppenberg)

Former utilisation
Coal mine

Period
1851–1986

Utilisation today
Park, culture and business location; art gallery, monument trail, museums, choreographic stage, gastronomy, sculpture park

Settlements
150 companies, Folkwang University, trade fairs

Special features
The area has belonged to the UNESCO World Heritage Site since 2001. In 2010, Essen was the European Capital of Culture – and Zollverein was the centre of the associated events.

Mont-Cenis (Herne-Sodingen)

Former utilisation
Coal mine

Period
1875–1978

Utilisation today
Further education institute of the NRW Ministry of the Interior, bookstore, district office, energy park (solar plant, methane generating plant, battery storage)

Settlements
New district, including park, housing development, retail outlets and kindergarten

Special features
The academy building is made of tree trunks and glass. This houses a microclimate creating a Mediterranean climate all year round.

A wartime bunker in the vicinity of the former coal mine is being environmentally renovated in accordance with low-energy standards. Apart from 25 flats, a photovoltaic plant and a community vegetable garden are being installed.

30 % green

Around 10 km² of other old industrial and coal mining areas are to be revitalised in the coming years, of which at least 30% are planned as green and recreational facilities.

Further examples in Essen:

- New Krupp Park parkland on the site of the former Krupp steel foundry
- New Essen 51 district with 1,500 new flats (plus offices and retail outlets) on the side of the former Krupp railway factory
- 'University district – green centre Essen' on the site of the Essen-Nord freight station, with about 500 new flats, office buildings and around 1,800 jobs
- All projects with connection to the express cycle track RS1

Wasserstadt Aden (Bergkamen-Oberaden)

Former utilisation
Coal mine

Period
1943–2001

Future utilisation
Artificial Aden Lake with the new Wasserstadt district and around 300 flats. Part of so-called 'canal band' for the new use of the Datteln-Hamm canal (with nature protection area and revitalised slag heap)

Settlements
Residential estates, tourism (for example, recreational boating)

Special features
Wasserstadt is accessible from the Datteln-Hamm canal by boat. The area will be the main site of the International Gardening Exhibition 2027 in the Ruhr metropolis.

Costs of around 50 million euros of public financing were estimated for the development of the area. More than three times that sum are expected to follow in the form of private investment in buildings.

PHOENIX Lake (Dortmund-Hörde)

Former utilisation
Steel and iron works Hermannshütte Stahlwerk PHOENIX-West

Period
1839–2001

Utilisation today
Artificial lake and nearby recreational area (with boat marina, culture island, vineyard)

Settlements
At the PHOENIX Lake and the neighbouring PHOENIX West: > 150 companies providing > 1,500 jobs; housing estate, gastronomy

Special features
The lake is a habitat for nearly 50 bird species. The Skywalk PHOENIX-West has a footpath through a decommissioned steel mill.

Tourism

The Ruhr metropolis is increasingly becoming a tourism region. The number of overnight stays registered has recently increased far more than elsewhere. The surprisingly green metropolis with its many footpaths and cycle tracks is also popular with day trippers. In addition, there is an extensive cultural programme – with 200 museums, 100 cultural centres, 120 theatres, 100 concert halls and 300 regular festivals.

Tourist interests

Number of overnight stays in tourist accommodation



Corona
While the total increase in overnight stays in North Rhine-Westphalia was 43 percent between 1992 and 2019, the increase in the Ruhr metropolis soared to 108 percent.

Cultural tourism

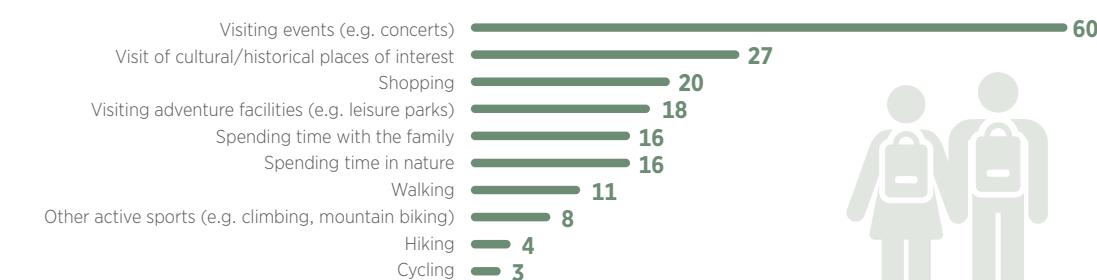
ExtraSchicht cultural festival



Extra Schicht
The festival 'ExtraSchicht – Night of Industrial culture' was born from the idea in 2001 to make the industrial heritage of the region visible and integrate it. Different events take place simultaneously in several cities in one night.

Magnet culture

What holidaymakers* do in the Ruhr area, mentions in %



* Tourists with at least one overnight stay, more than one mention possible; source: GfK



The International Gardening Show IGA is taking place in the Ruhr metropolis in the year 2027 – decentrally at different locations. The number of visitors expected is estimated at between **2.5 and 5 million**. The direct economic effect on demand arising from the IGA is assessed at **around 440 million euros**, plus indirect effects amounting to some **360 million euros**.

Source: RUFIS

Tourism by bike

First-class cycle tracks have long been an important economic factor for the Ruhr metropolis: surveys show that day trippers spend around **15 euros per day**, tourists on bikes **as much as 100 euros**. In 2019, tourism by bike generated revenues of more than **75 million euros** in the Ruhr cycling areas.

240 km
The Ruhr Valley cycle track is 240 kilometres long; it was opened in 2006 and 800,000 cyclists use it annually.

Economic effects of tourism

Example: Nordsternpark in Gelsenkirchen

In recent years, annual costs of around **0.8 million euros** for ongoing maintenance costs were offset by a **benefit of roughly double that amount**. To assess the latter figure, the fees paid by visitors were estimated and projected for the year. The additional added value of gastronomy and events in the park amounts to **0.5 to two million euros** per year.

Example: KulturKanal (canal rides on the Rhine Herne canal)

Around **200,000 visitors** per year spend **about five million euros**. Simulations show that this economic stimulus creates more than **70 jobs**.

Example: Hohe Mark Nature Park

The nature park in the north of the Ruhr area is especially popular with cyclists and horse riders and attracts 100,000 visitors every year. If tourism activities are given a further upgrade, revenues achievable are estimated at more than **25 million euros** per year and more than **500 jobs** could be created.

Sources: ift Freizeit- und Tourismusberatung, University of Duisburg-Essen, RVR, Hohe Mark Nature Park

3

Society

Nature performs important functions, especially in conurbations: it makes districts worth living in, has a cooling effect and creates good air, supports diversion and relaxation – and provides space for sports and exercise. Social justice today also means that everyone should have access to green areas. After all, the latter are a communal place – whether it's a park, an allotment or a cool urban gardening project.



Quality of life

There are many indicators to show that the Ruhr metropolis is still in the throes of a fundamental structural change – for example, its cities often fare badly in national rankings of quality of life. However, there is a lot going on between the Ruhr and the Emscher: in surveys, the majority agrees that recent developments point into the right direction. The expansion of green infrastructure is highly appreciated by the people.

Positive trend

Survey in the Ruhr metropolis:
how is the Ruhr area developing?
Answers in %

Source: Forsa



Urban development

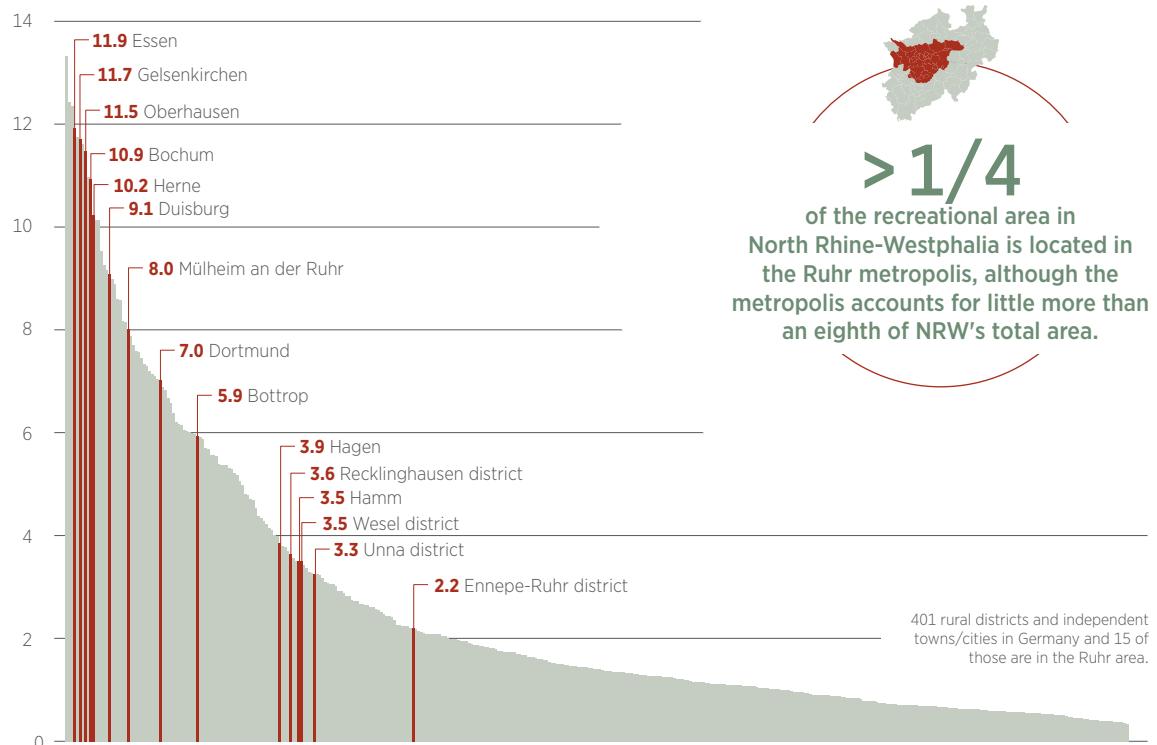
Size of the recreational space*, in km²



Sources: IT.NRW, own calculations

Lots of recreational space in the Ruhr cities

Share of total space, in %



Sources: regional statistics, own calculations

Parks are popular

Survey in the Ruhr metropolis: which leisure facilities do you use? Mentions in %*



* More than one mention possible; source: RVR

Nature calling in leisure time

Survey in the Ruhr metropolis: basic leisure requirement activities, mentions in %*

Experiencing nature **92**



Relaxation **91**



Scenic experience **87**



Education **69**



Culture **65**



Industrial culture **40**



Industrial nature **36**



* More than one mention possible; Source: RVR

Nature and quality of life

Survey in the whole of Germany: do you agree with the statement, 2019, in %



43
Absolutely
right



46
Quite
right



10
Not really
the case



1
Not the case
at all



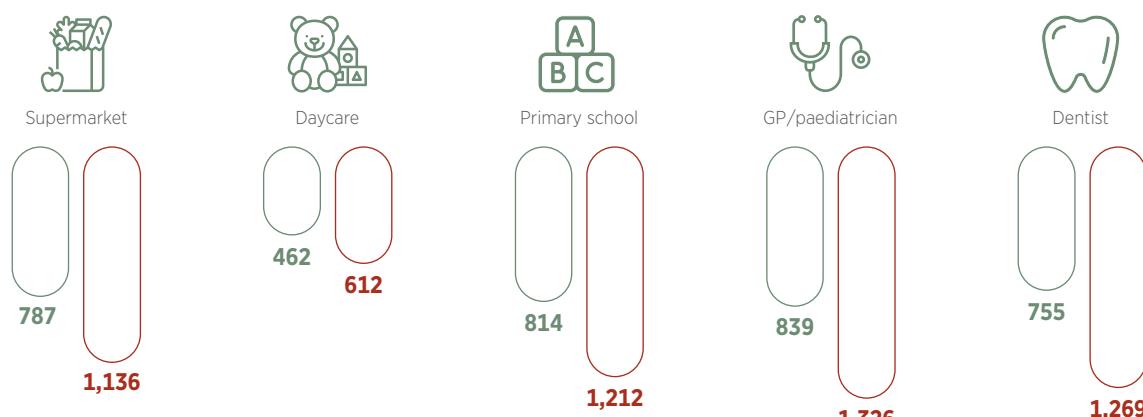
2
No
reply

'Natural diversity benefits my well-being and quality of life'

Source: BfN

All close

Average distance from place of residence, in m



Source: RVR

Living

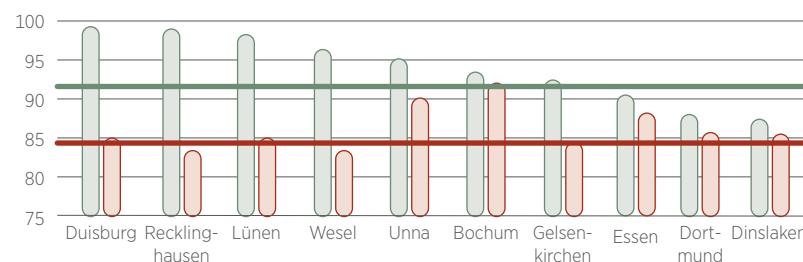
Of course, the Ruhr metropolis is characterised by industry – but it is still very green. Few of its five million inhabitants live far from the next park. In fact, most Ruhr cities are better served with green areas than the average German city. Moderate property prices present yet another advantage. This can be a competitive advantage for local companies looking for qualified specialists.

Green – within most people's reach

Percentage share of the population that can ...

 ... reach a large green space (> 10 ha) in ≤ 700 m
 ... reach a small green space (> 1 ha) in ≤ 300 m

—/— average in Germany*



* Cities in Germany with > 50,000 population; sources: IÖR, own analysis

Affordable living

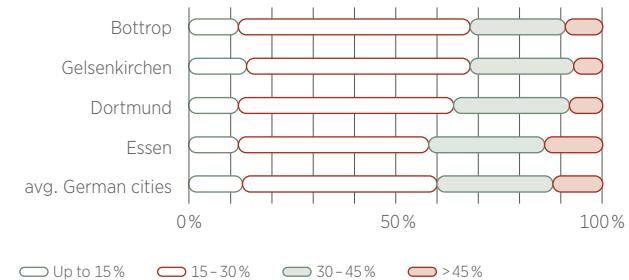
Costs per m², 2018, in €



Building land prices

Ruhr metropolis	Rhine metropolis	Rhine-Neckar
157	367	147

Rent load ratio: rent prices as % of net income



Source: Hans Böckler foundation

Real estate property prices

Ruhr metropolis	Rhine metropolis	Rhine-Neckar
1,796	2,406	2,538



Rent prices

Ruhr metropolis	Rhine metropolis	Rhine-Neckar
6.30	7.70	7.80

Source: IW Consult

Living quality attracts qualified specialists

Survey* among companies in the Ruhr metropolis, answers in %



Living quality



Real estate property prices

* How does the Ruhr metropolis fare when competing for specialists with other regions in terms of the following features?
Source: IW Consult

Compact design

Residential buildings, share in %, 2019



Single-family houses

67 %
Germany

62 %
NRW

53 %
Ruhr metropolis



Two-family houses

16 %
Germany

17 %
NRW

16 %
Ruhr metropolis



3 and more flats

17 %
Germany

21 %
NRW

31 %
Ruhr metropolis

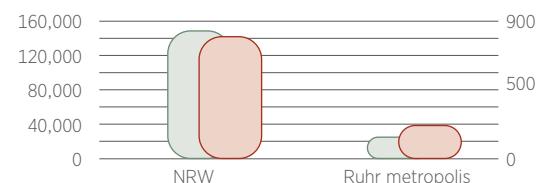


At 42 m², the living area per capita in the Ruhr metropolis is slightly below the German average (45 m²) and that of North Rhine-Westphalia (44 m²).

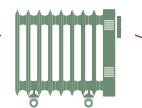
Source: regional statistics for the Ruhr metropolis, based on data from IT.NRW

Neighbouring flats emit heat

Heat requirements of residential buildings, 2019



—/— Heat requirements of residential buildings per year, in GWh, 2019, left scale
—/— Living area, in million m², 2019, right scale



In terms of heating and energy, the high population density in the Ruhr area is an advantage: as multistorey buildings require less heating than single-family houses, the average heat requirement per square metre of living space is considerably lower.

Heat requirements per m² living space, in kWh



Sources: IT.NRW, own calculations

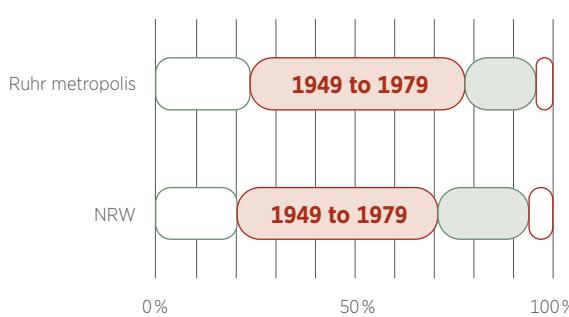
Lots of green in between



The apartment building estates in the Ruhr metropolis are characterised by the looser urban development style of the post-war years. Many areas were created in open row construction, mostly with substantial green areas between the houses.

Age of the apartment buildings

Share of apartment buildings by year of construction, in %



—/— Until 1948
—/— 1949 to 1979
—/— 1979 to 2000
—/— Since 2001

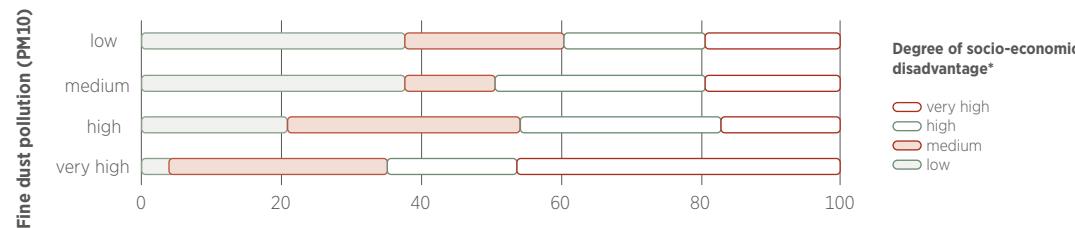
Source: IT.NRW

Environmental justice

Environmental burdens within big cities are distributed very unequally: in places where many people with low incomes live, the noise is often greater, the air worse and the next park further away than elsewhere. The Ruhr metropolis aims to offset these injustices and reduce overall environmental burdens. A first step in this direction is measuring the inequality and a second step is taking measures to adjust living conditions.

Air quality and social deprivation

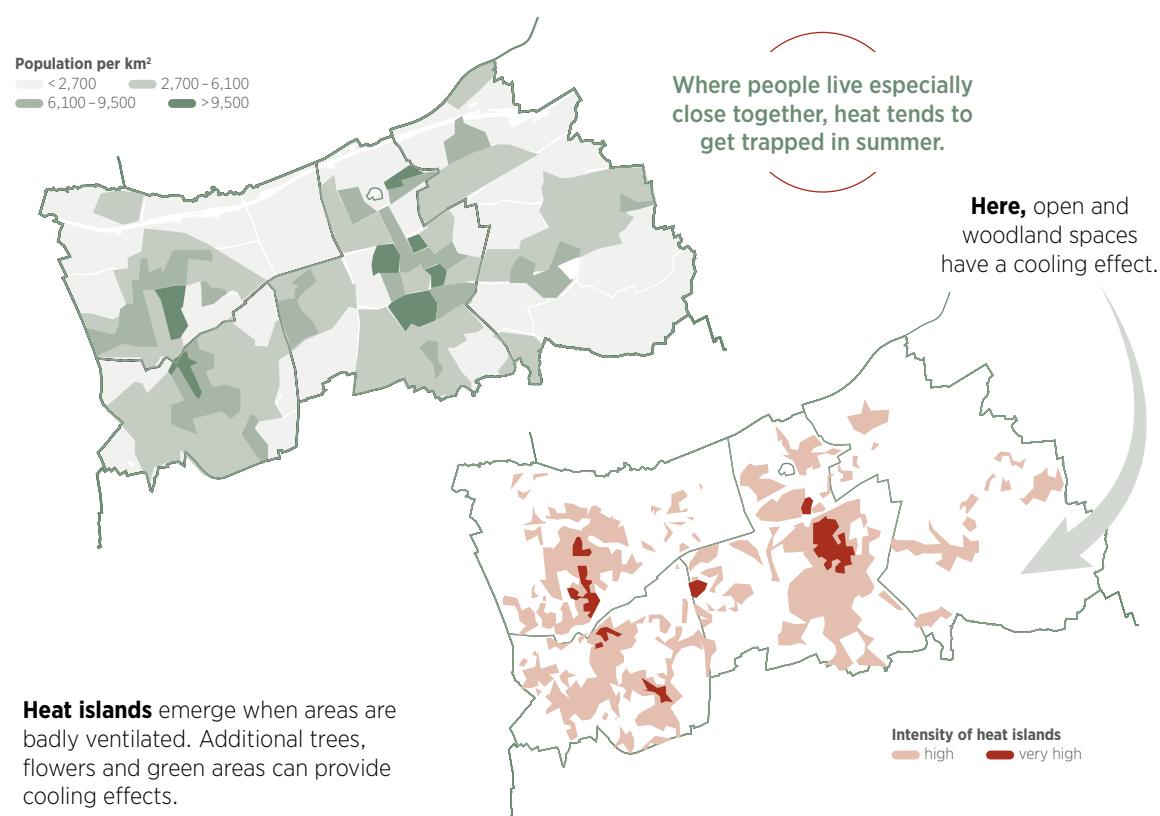
Example Dortmund: share of socio-economically deprived inhabitants* by degree of fine dust pollution, in %



* Criterion: share of unemployed and welfare recipients; source: International Journal of Environmental Research and Public Health

Heat burden and population density

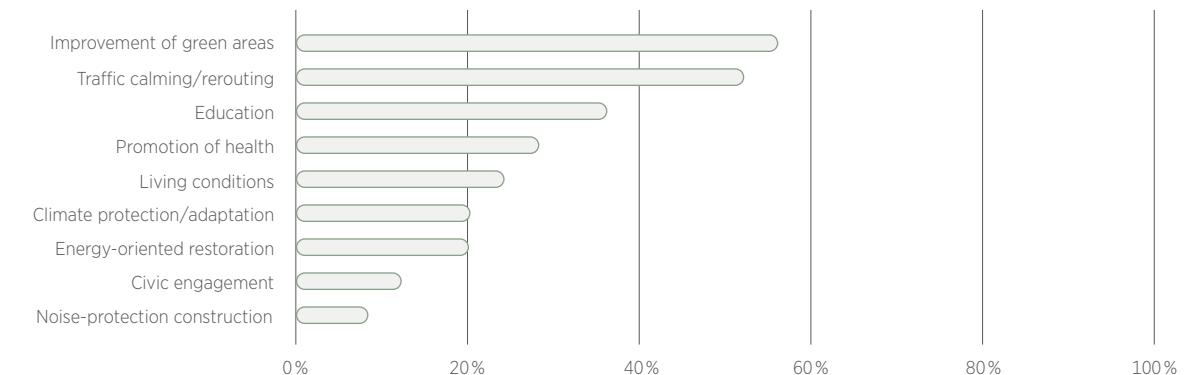
Example Herne: 'heat islands'* and population density by inhabitants, per km²



* Areas with a considerably higher temperature, compared to neighbouring areas
Sources: City of Herne, RVR

Priority for municipalities

Survey among municipalities: most important fields of activity for environmental justice



Sources: Planergemeinschaft Kohlbrenner, Federal Ministry for the Environment

Possible measures for more environmental justice



Analysis: identification of the socio-spatial distribution of environmental burdens in cities.



Planning to keep air clean/reduce noise: concrete measures for targeted reduction of burdens.



Urban development/land-use planning: integration of environmental justice and health aspects in municipal planning.



Participation: formal and informal processes to involve the public in central issues of urban development.



Traffic planning: reduction of car traffic, expansion of footpaths and cycle tracks, converting parking space into playgrounds and meeting places.



Landscape planning: create and maintain coherent green spaces in the entire urban area.



Objective: to create equal living conditions within cities.

Sources: RVR, Online-Toolbox Umweltgerechtigkeit, own research

Increased noise pollution due to traffic

dependent on household net income, affirmative share in %



26

Individuals with < 60% of medium income

23

Individuals with 60–150% of medium income

15

Individuals with > 150% of medium income

Source: Robert Koch Institute

Health

The high density of industry, traffic and people in the Ruhr metropolis has inherent dangers for health: the air is often full of fine dust, there are high noise levels and there is a social divide between poor and affluent areas. Ideally, future urban development is set to counter this – for example, by creating new green spaces. A first step is to identify the risks and research data from the region is helpful for this.

Urban green and health

Effect of urban green according to medical studies



Healthcare is one of the boom sectors in the Ruhr metropolis, employing around 353,160 people in 2020 – that is, 9.1 percent of all gainfully employed people liable to pay statutory social security contributions. Growing investment in the various areas of the health sector are to be expected in the coming years.

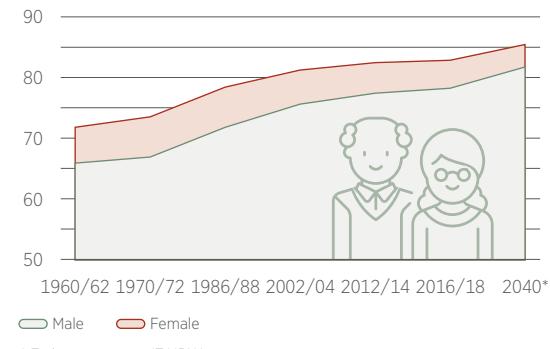


Coal mining played a key role in creating what is today a highly developed health sector in the Ruhr area. For example, in 1890 the world's first accident clinic, the Bergmannsheil, was founded in Bochum to treat miners. Today it belongs to the University Clinic of the Ruhr-University of Bochum and treats more than 80,000 patients per year.

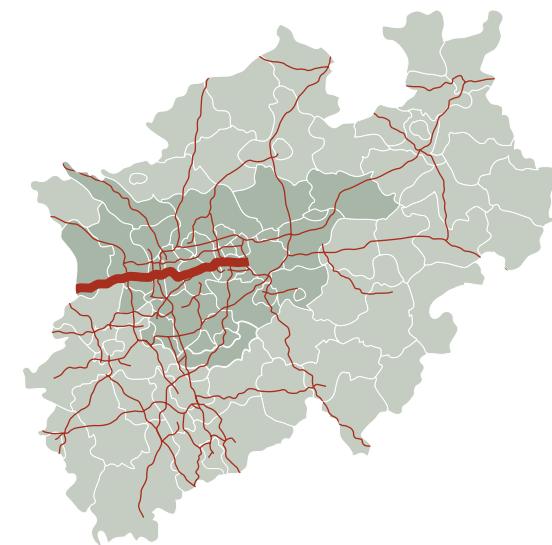
Source: RVR

Life expectancy

Development NRW



Average life expectancy in years, 2016/2018



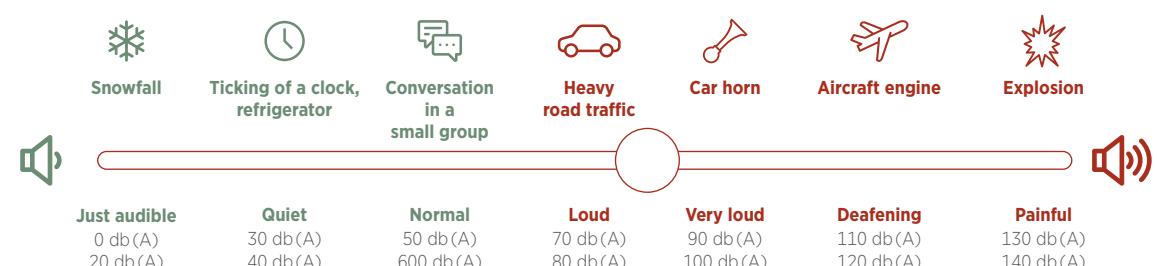
Motorway 40 is seen as a symbol of different kinds of health risks prevalent in the Ruhr metropolis: it is very busy and, in many places, leads right through housing settlements. According to a study by the Essen University Hospital, women who are exposed to traffic noise of more than 55 decibels at home are 30% more likely to become ill with acute depressive disorders. And the risk of suffering from a stroke is more than 2.5 times higher when someone lives by a road that is heavily polluted with fine dust.

Sources of noise

To sustainably improve health and the quality of life and locations, so-called noise maps are issued every five years for big conurbations as well as arterial roads, mainline tracks and major airports. On the basis of these and with active participation by citizens, noise action plans are drawn up and concrete measures implemented to reduce noise.

Source: MULNV NRW

What is loud and how loud?



Source: DGUV

Environmental education

Humans pay particular attention to what they know. Environmental education is one way to make the value of nature clear to people – especially in urban areas where the woods may be some way off. There are many facilities in the Ruhr metropolis to help us learn more about nature – they include biological stations, woodland schools and educational centres for the environment. The region's higher education institutions offer courses for green professions – for example, in natural sciences or environmental engineering.

Procedures and objectives of environmental education

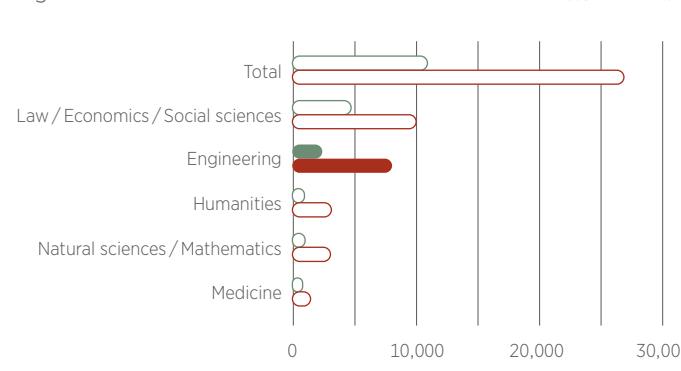
- Guided tours
- Hands-on activities
- Interventions
- Performances
- Games
- Nature trails
- Exhibitions
- ★ Analogue
- ★ Digital
- ★ Activity oriented
- ★ Interactive



OBJECTIVE:
An environment worth living in for everyone

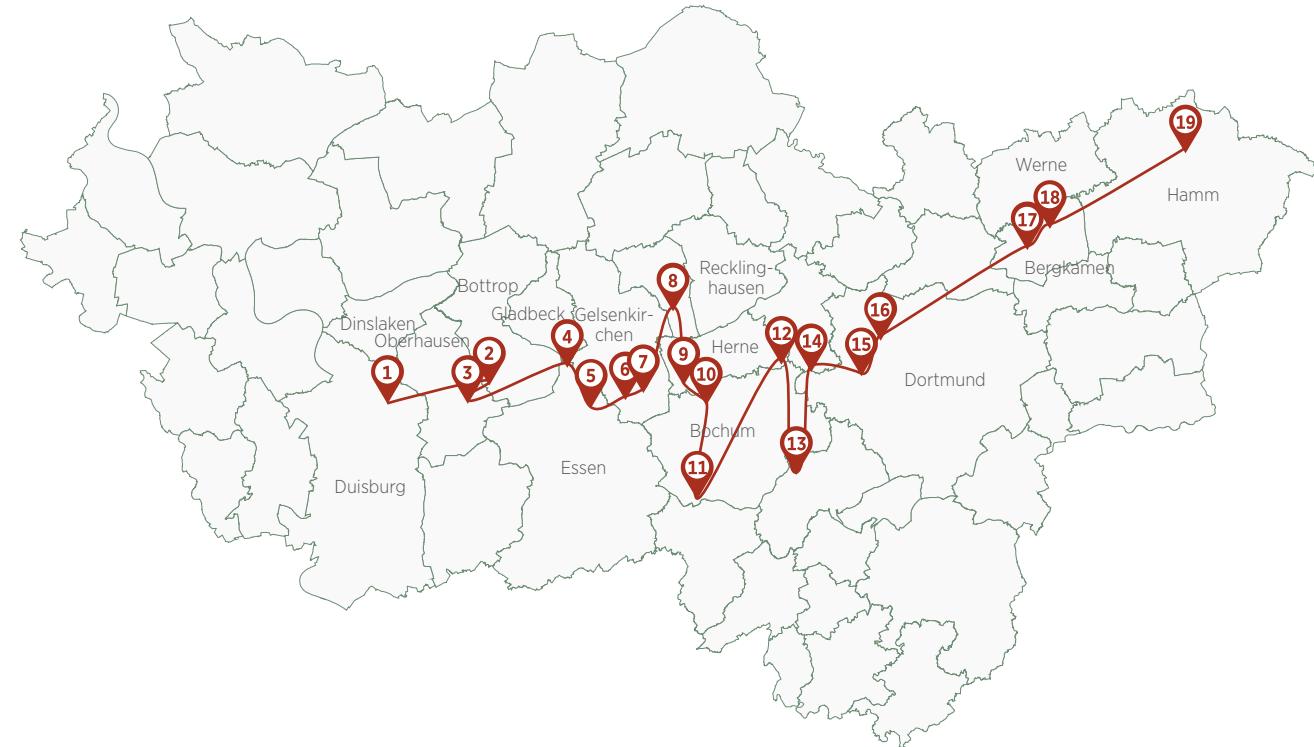
Number of graduates*

Higher education institutions in the Ruhr area



Sources: IT.NRW, IW Consult, RVR, NABU, BNE-Agentur NRW, own research

In the wake of the region's structural transformation, the Ruhr metropolis emphasises education. In no other German conurbation is there such a high density of higher education institutions as in the Ruhr area. Overall, there are **five universities, 15 technical colleges and two art academies**. Many people choose green courses of study such as environmental technology, environmental engineering and sustainable development.



Industrial nature route

Some abandoned industrial sites in the Ruhr metropolis were consciously ceded to nature in the last few decades; 19 such sites are now open for interested visitors.

- Duisburg-Nord landscape park
- Vondern fallow area
- Frintop railway park
- Schurenbachhalde
- Zollverein UNESCO World Heritage Site
- Mechtenberg landscape park
- Rheinelbe sculpture woods
- Hoheward landscape park
- LWL Industrial Museum – Hannover colliery
- Westpark
- LWL Industrial Museum – Heinrichshütte
- Lothringen slag heap
- LWL Industrial Museum – Nachtigall colliery
- Zollern slag heap
- Hallerey nature protection area
- Hansa coking plant
- Großes Holz slag heap
- Beversee nature reserve
- Sachsen slag heap



Environmental education in Ruhr metropolis

The environment portal of the Ruhr metropolis lists a total of around 70 educational facilities and 200 nature/experience sites. They include the central facilities of the RVR for environmental education and experiencing nature:

- RVR visitor centre Haus Ripshorst, Oberhausen
- RVR visitor centre Hoheward, Herten
- RVR visitor centre Bislicher Insel, Xanten
- RVR forestry expertise centre and environmental education station am Heidhof, Bottrop
- Ecological centre Westfalen, Bergkamen



Biological stations

- Biological station in Wesel
- Biological station in west Ruhr area in Oberhausen
- Biological station in Recklinghausen district
- Biological station in east Ruhr area in Herne
- Biological station in Ennepe-Ruhr district in Ennepetal
- Biological station Environment Centre Hagen
- Biological station Unna/Dortmund

Biological stations perform local nature protection work, but they also work scientifically and get involved in environmental education.

Green meeting place

Green infrastructure usually has social as well as ecological functions – for example, providing as a meeting place for people. This is demonstrated by the many allotments and community gardens characterising the Ruhr metropolis. Many old monuments of heavy industry are also converted into meeting places. Numerous former coal mines, slag heaps or coking plants are now made available for art, culture and leisure. There are also a number of more recent initiatives in urban districts like community gardens, Essbare Stadt (Edible City, home-grown food grown in the city) or nutrition councils.

Forms of urban gardening

Traditional forms	New forms	Intercultural/international gardens	Gardens: outside food banks
House gardens Allotment gardens	Community gardens Garden projects with participation by people in the neighbourhood who cultivate wasteland areas together.	People from different cultural backgrounds get together to cultivate vegetables and fruit from their families' home countries.	People looking for work grow fruit and vegetables for themselves and others, often organised by local food banks.
Neighbourhood or district gardens	Do-it-yourself crop gardens/ Rent-a-field initiatives	Farmers rent out fields to city dwellers to grow vegetables.	Guerilla gardening Unauthorised planting of urban areas – like traffic roundabouts – with crops.

Sources: MULNV NRW, BfN, own research

850 50
Germany Ruhr metropolis

Number of community garden projects

Source: Stiftung Interkultur

The functions of slag heaps today

Recreation	Sport/health	Places of identification	Renewable energies
Nature protection	Event venues		



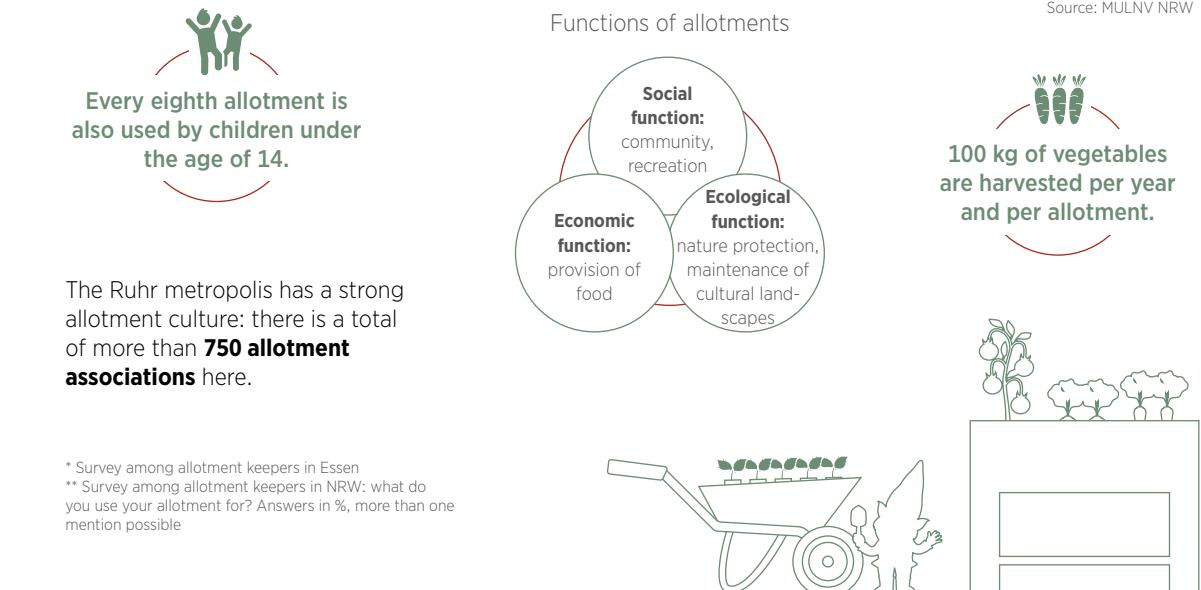
Source: RVR

Relaxation in allotment gardens*

31 % have been renting their allotment for 6 to 15 years	64 % use their allotment with someone else	95 % enjoy the peace and quiet	81 % meet friends
92 % grow fruit/vegetables	59 % play with children		

Reasons for using an allotment**

Source: MULNV NRW



REGIONALVERBAND
RUHR

The Ruhr Regional Association (RVR) is developing 45 slag heaps with a total area of 1,550 hectares for recreational and leisure landscapes – and there will be more in the coming years. The heaps, some of which are towering objects, are visible testimony of two centuries of coal mining in the urban landscape.

Many of the heaps can already be used for hiking or cycling, offering adventure paths or art installations.

Green infrastructure for people in the Ruhr metropolis

A route of 400 kilometres through the Ruhr metropolis connects more than 50 touristically attractive industrial monuments. Many are already being used as places of culture where people meet, and some also as museums. Centre of the industrial culture route is the Zollverein UNESCO World Heritage site in Essen. Its sister project is the Emscher Landscape Park, a regional park with around 20 main facilities and with an area of 450 square kilometres, the biggest regional park in Europe. It includes big parklands, traditional Ruhr parks, slag heaps and landmarks, the industrial nature route and a comprehensive leisure path network for cycling and hiking.

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Information
about the Green
Infrastructure
initiative of the
Ruhr metropolis
(In German)



Positions
regarding the
regional biodiversity
strategy of the
Ruhr area 2021
(In German)



The European
Green Deal



The new Leipzig
Charter Urban
Development



Greentech.
Ruhr
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