

EXURB

ENVIRONMENTAL

Sustainable interlinking of housing,
work, recreation and mobility

Imprint

Publisher:

Umweltbundesamt (German Environment Agency)
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This document is a translation of the German brochure
UMLANDSTADT umweltschonend
([https://www.umweltbundesamt.de/publikationen/
umlandstadt-umweltschonend-nachhaltige-verflechtung](https://www.umweltbundesamt.de/publikationen/umlandstadt-umweltschonend-nachhaltige-verflechtung))

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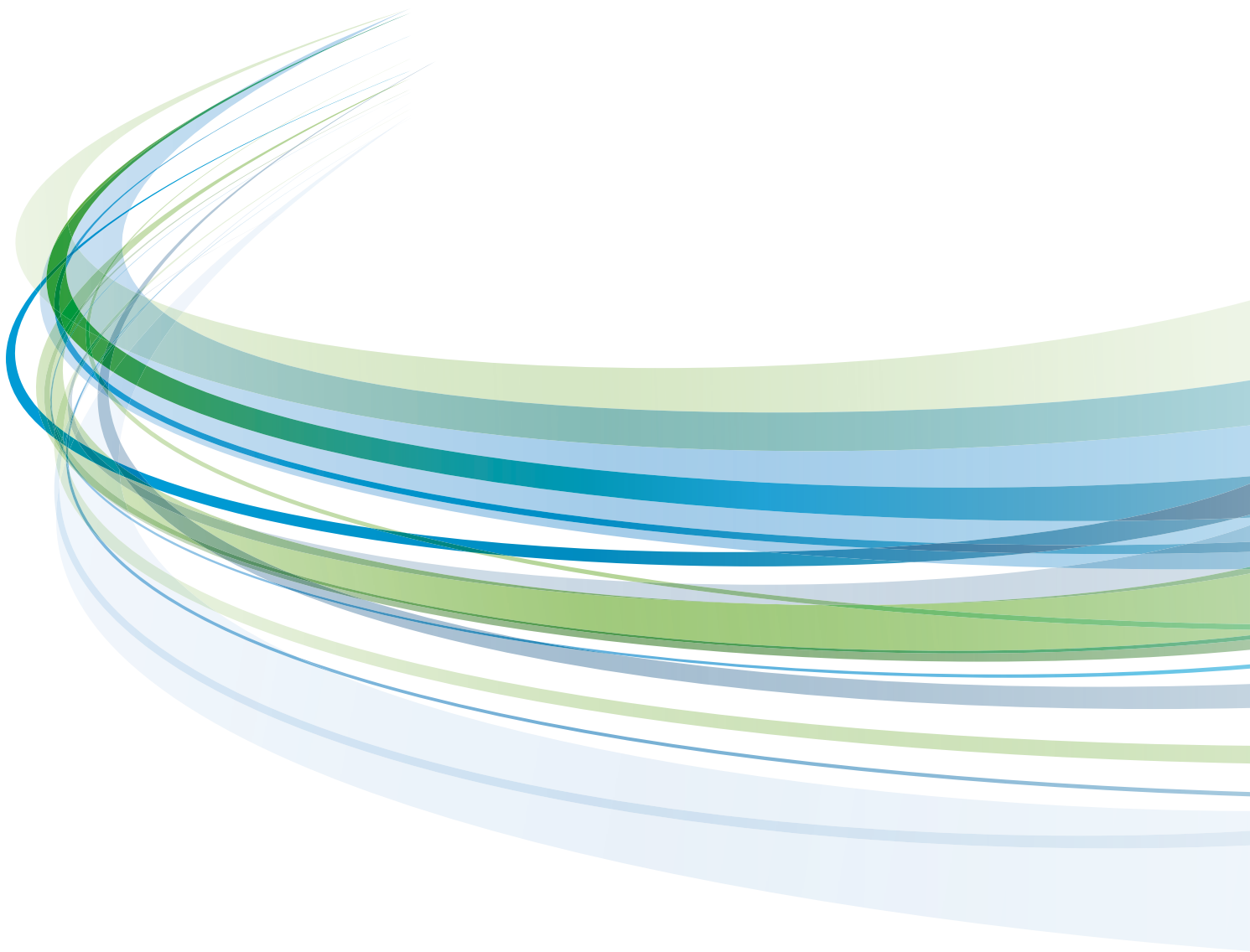
As at: June 2022

ISSN 2363-832X (Online)

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UBA Forum
mobil & nachhaltig 2021



Dear Readers,

Urban surrounding areas are becoming EXURBs: they are the centres of life for millions of people, links between cities and countryside and they are developing dynamically. Living in green environments is in demand. Digitalisation and the coronavirus pandemic have given a further boost to residential and commercial migration towards the surrounding countryside; and home office regulations have reduced long journeys to work. This new suburbanisation also raises issues for environmentally sound urban and spatial development. How can the relationship between the city and the surrounding area be made sustainable? What can the surrounding areas contribute to solving key ecological issues? Where and how can we live in such surroundings in a climate and environmentally friendly way? Where do residents of the surrounding areas work and go shopping? How do people travel between the surrounding area and the city in an environmentally friendly way? Where do city dwellers and residents of the surrounding area go for recreation?

What is needed are not only new concepts for sustainable relations between the city and the surrounding area, but also new environmentally friendly concepts for the surrounding area itself. We, the German Environment Agency (UBA), use the title “EXURB Environmental” (German: “UMLANDSTADT umweltschonend”) to help our brochure emphasise this new approach.

We will present ideas, approaches and concepts on how the surrounding area can develop sustainably by itself on one hand and together with the city on the other, which goals are in the forefront from an environmental perspective and which solutions, approaches and measures are necessary for their implementation. Not only does this brochure present visions and goals for an “EXURB Environmental” but also specific recommendations on how such a development can become a reality. Our focus is on the sustainable interlinking of housing, work, recreation and mobility.

The brochure “EXURB Environmental” is aimed at decision makers at the federal, state (German: Länder) and local levels, at planning, environmental and other associations, at urban, landscape and regional planning practitioners and at scientists. The brochure’s recommendations show the way towards environmental EXURBs. Improved cooperation between municipalities and coordination with the core city on an equal footing are basic prerequisites; it is important to jointly develop regional models and goals for housing, work, recreation and mobility and to provide incentives for the formulation of regional, interdisciplinary and cross-stakeholder concepts. To this end, new forms of cooperation must be initiated and promoted, good examples and peer-to-peer learning must be disseminated and administrations must be strengthened and trained so that they can fill sustainable regional management with life.

Look into the future

The desire to interlink the various fields together could permanently change the surroundings of large cities by making the dream of living in the countryside while also enjoying the advantages of a city possible. Whether it is a kindergarten or a playground, a café, bistro or store, a jogging track or a walk in the countryside – one can reach everything in just a few minutes on foot or by bike. In fact, if one wants or needs to travel further, you do not even need your own car because there are flexible public and private opportunities such as car sharing. The vision “EXURB Environmental” combines both: the advantages of big city neighbourhoods with the immediate access to nature. Admittedly, at first glance, combining the best of both worlds sounds rather utopian. This brochure invites you to go on a journey into the future: a journey with current developments, challenges and obstacles that need to be overcome. The journey is worthwhile because the vision of its destination beckoning at the end is a place that combines living, working and leisure in a resource-, climate- and environmentally friendly way, a place with short distances and a attractive centre where people enjoy spending their time, a place where people can live well, with a high quality of life and in a self-determined manner.

1 “EXURB Environmental”: the new centre

The concept “Exurb Environmental” covers the immediate surroundings of a large city, of the core city (see Figure 1). This can be Kiel in Germany’s very north, or Freiburg i. Br. and Munich in the south, Leipzig and Berlin in the east, Essen and Saarbrücken in the west. It includes villages and towns, commercial areas, traffic routes, agricultural and forest landscapes, nature reserves and local recreation areas with all the resulting advantages and disadvantages. “EXURB Environmental” is a place to live and sleep – often embedded in meadows, pastures, forests and wetlands as well as in the network of traffic connections

of metropolises. From the metropolis’s perspective, the surrounding area is often a place where many of its workers live, thus creating an extension to the city. The relationship often becomes competitive between business and residents. It is also a frequently congested “transit space” on the way to an actual destination. “EXURB Environmental” changes the perspective and focuses on the surrounding area as an area for independent living and development according to location specific challenges and potentials. This takes place against the backdrop of developments such as the digitalisation of the workspace, an increase in home office opportunities and the need to sparingly use resources such as land, raw materials and energy.

Urban regions of the Regiostar typology

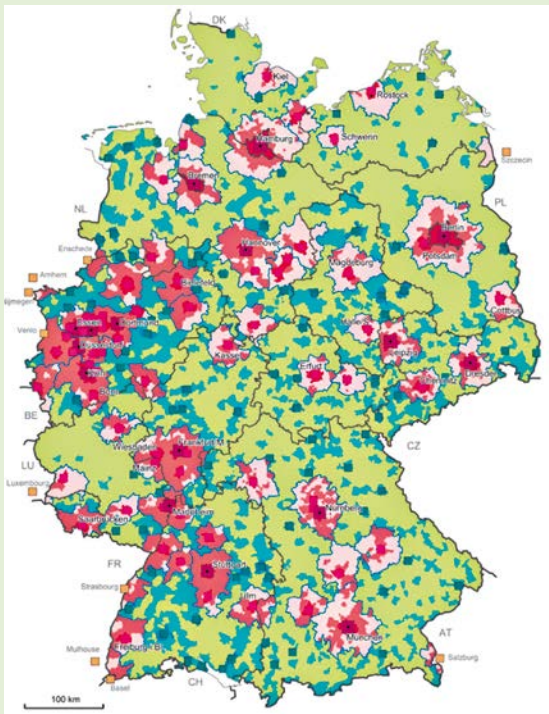


Figure 1

Source: BMVI 2020

The focus of consideration is the set on the inter-linked areas of the cities, oriented along the city regions typology of the Regiostar (BMVI 2020). Not only does this cover metropolises, regiopolises and large cities as “cities”, but also includes the surrounding medium-sized cities as well as urban, small-town and village areas of an urban region as “surrounding areas” (cf. the areas coloured in red).

1.1 Coveted and threatened

Urban surrounding areas are less densely populated than large cities. This makes it an attractive space for those in search of building land, be it for the construction of housing or establishment and expansion of businesses. But where building takes place, green spaces disappear and the soil is sealed. Roads need to be built or upgraded to provide access and connection to residential and commercial developments. Traffic increases accordingly, and as a result, open spaces and natural areas become scarcer. Yet it is precisely these features which attract residents and provide valuable services for surrounding areas and core cities: from providing drinking water to local recreation options to supplying regional foodstuff. Space for housing and commercial development, for recreation and leisure activities, for nature and landscape protection is limited in urban surrounding areas, too, and the various utilisation interests begin to compete with one another. In addition, local authorities usually decide for themselves about how to deal with these challenges. These contradictions can only be resolved if housing, working, recreation and mobility are jointly considered and interlinked in a way that is sustainable for the region. This is the prerequisite to establish development areas “Exurb Environmental” such that they combine both a high quality of life with climate, environmental and resource protection.

1.2 We can only succeed by uniting forces

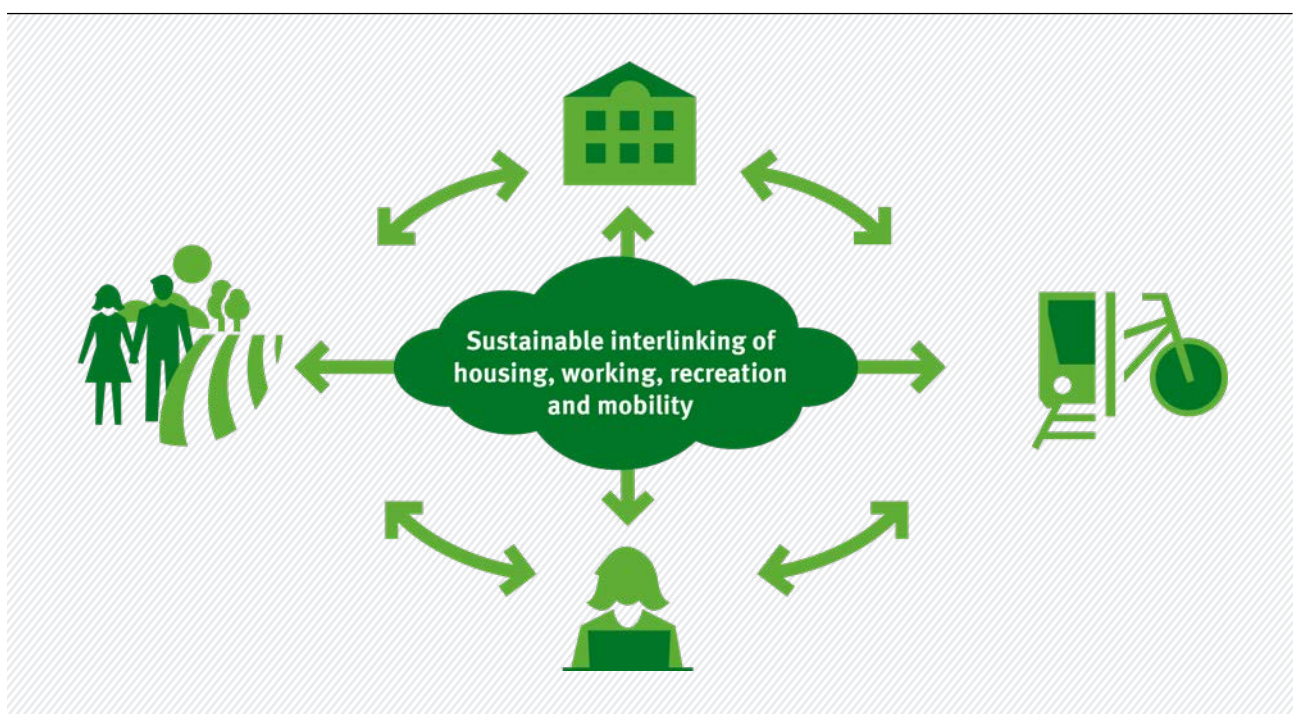
Surrounding municipalities, surrounding areas and the core city are closely interlinked; any change on one side causes consequences to arise on the other, especially when transport is concerned. For this reason, not only is it necessary to strengthen regional planning, but also to give greater importance to environmental concerns and to link them closely with specialist planning such as transport, noise abatement and landscape planning. This must include active and creative regional management which can identify common goals and strengthen cooperation between municipalities and other stakeholders. The regional development needs for housing, jobs, recreation and mobility must be more strongly addressed on a supra-regional basis and must be better interlinked in terms of planning, space management and organisation (cf. Figure 2).

A new vision for environmentally compatible **housing** emerges in residential development which includes the coordination with neighbouring municipalities and the core city and combined with attractive models for compact housing.

Mobile **working** offers the opportunity to reduce commuting routes and (re)design commercial areas in a sustainable manner. Open and green spaces in the settlement area are essential lifelines for **recreation**. They must be further developed in a networked and multifunctional fashion at all spatial tiers, from the neighbourhood to the region, and be made fit for supporting their diverse set of services – from adaptation to climate change to agricultural production. Avoiding motorised private transport (MPT) is crucial for sustainable modal shift in **mobility**. This can only be achieved if an efficient public transport is combined with a high proportion of bicycle and pedestrian traffic, sharing services and electric mobility. This interlinking can be coordinated at multifunctional “Mobility point PLUS” (German: “MobilpunktPLUS”) sites where not only can one change transportation modes (e.g. from bike to train) but one may also enjoy many other everyday uses such as groceries, day-care centres or sports clubs (see Chapter 4.2). This is the only way to establish high-quality open and green spaces, short traveling distances and environmentally friendly mobility.

Figure 2

Areas of need and content focus of the “EXURB Environmental”.



Source: UBA's own illustration

1.3 Research is needed

UBA has been addressing sustainable urban development in a variety of ways for years. The “Urban Environmental Protection” research agenda provides an important framework (UBA 2018). UBA presented its vision of “Tomorrow’s City” in 2017. According to the vision, the ideal city is compact, quiet, green and mixed; people live in an environmentally friendly manner and mobility is intermodal. The key to tomorrow’s city is a new way of addressing land –required is a significant reduction in the space dedicated to transport areas for cars in favour of housing, green spaces and active mobility (UBA 2017).

The UBA has laid considerable focus on the research of environmentally friendly rural development. To this end, we have examined positive examples for climate and environmentally compatible development of settlements. Topics included renewable energy generation close to home, demand-oriented public transport and the strengthening of rural and village centres as part of rural development and dismantlement following demographic changes (Heyn/Schwede/Süße 2018).

As the coordinator of the interdisciplinary scientific project of the BMBF funding directive “Urban Rural Plus” (German: “Stadt-Land-Plus”), UBA manages and interlinks 22 integrated projects throughout Germany and plays a key role in the development of national and international solutions for sustainable urban-rural partnerships (Bartke et al. 2021).

This report “EXURB Environmental” emphasises the significance of urban surrounding areas as transitions and links between cities and the countryside. In so doing, we tie in with the current processes at the level of the European Union within the framework of the 2030 Territorial Agenda and the New Leipzig Charter, both of which embed a sustainable, robust urban development into the functional connections and spatial context of a region. Both documents also aim for increasing the cooperation between municipalities and coordination with the surrounding and rural areas.

Regions of the BMBF funding project Stadt-Land-Plus (Urban-Rural-Plus).

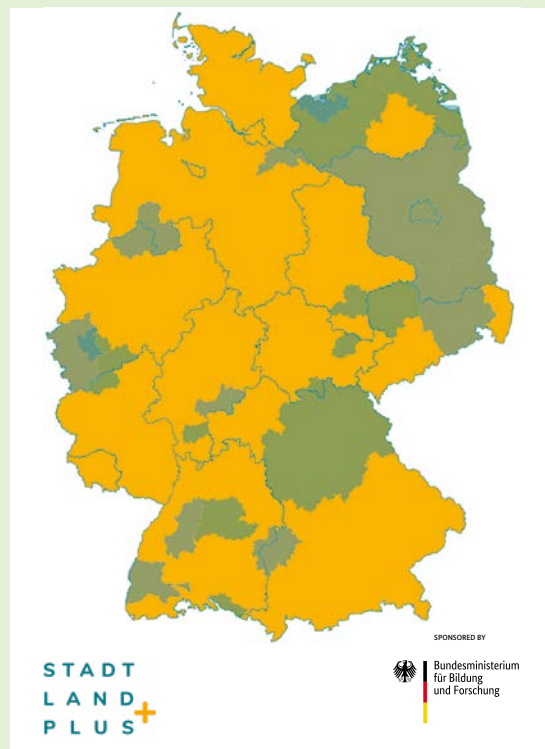


Figure 3

Source: Dr. Stephan Bartke, Stadt-Land-Plus Online 2021

Innovative solutions: The interdisciplinary research project “Stadt-Land-Plus” (English: Urban-Rural-Plus) is investigating innovative solutions for regional equality, the reconciliation of interests between urban and rural areas, sustainable inter-municipal housing markets and the regional circular economy, in 22 projects. The interdisciplinary project, funded by the Federal Ministry of Education and Research (BMBF) and coordinated by UBA, is part of the BMBF’s Research for Sustainability – FONA strategy.*

* Further information: <https://www.zukunftsstadt-stadtlandplus.de/>

2 “EXURB Environmental”: challenges and trends

Housing, work, recreation and mobility are the main development drivers in the surrounding areas of core cities. The first part of this chapter looks at interfaces that play a key role for surrounding areas and the relationship between cities and surrounding areas. Subsequently, the environmental impacts of these developments will be analysed.

2.1 Development drivers

(a) Residential and commercial shift to surrounding areas

Both population (housing) and commerce (work) have been migrating toward surrounding areas for decades. Suburbanisation, together with land development and the real estate market, has been an important driver for spatial development and its associated environmental impacts on the interlinked urban areas (BBSR 2016). Housing suburbanisation has shaped the relationship between core cities and their surrounding areas since the 1960s. There are many reasons for a shift toward surrounding areas: flats in the cities are too small, noisy and expensive, too little green space is available nearby, air quality is poor – in short, the quality of life is unsatisfactory. However, people aspire to their own ideas of “good living”. Owning a home in the surrounding area satisfies this longing for open spaces and self-determination (Menzl 2017). At the same time, metropolitan areas in the core cities and surrounding areas have recorded varying degrees of population growth over the past ten years. Re-urbanisation and suburbanisation have proceeded in parallel (Milbert 2017). The tide has turned since 2014 and recent studies show that all major German cities have been experiencing internal de-population compared to the surrounding areas and a new phase of suburbanisation is beginning which may accelerate. Against the backdrop of the coronavirus pandemic, initial observations suggest that a new dynamic suburbanisation is imminent (BiB 2020). And yet, something has changed. The desire for private property ownership is characterised by a greater trend toward shared housing and mobility concepts, more urban dynamism combined with the desire for natural environments and peaceful havens.

Commercial suburbanisation has been recognised as a driving force and influence on the shape and function of surrounding areas since the 1960s (Karsten/Usbeck 2001). Large commercial areas have often been established on the edges of cities and in their surrounding areas due to land availability. High land prices and displacement of commerce from cities have favoured this development as did the growth and functional development of office locations in suburban areas such as in the Rhine-Main region (Jansen et al. 2016). In addition, there is often competition between neighbouring municipalities to attract businesses, since municipalities are largely financed by business rates.

(b) Decoupling of places related to residence and work

Many people choose their residence location based upon the proximity to their place of work. Nevertheless, commuting routes¹ have emerged. Jobs, especially those in the knowledge and service economy, are concentrated in cities where housing is expensive. The distribution of higher professional qualifications and specialisation in the labour market keeps growing. The density of suitable jobs is decreasing and job changes often result in longer journeys. This in turn influences the trend of commuter numbers and distances travelled (Holz-Rau/Scheiner 2019). Moreover, in many households both partners work and at least one of them commutes. In addition, there are tax incentives at the federal level such as mileage allowance. The number of commuters in Germany increased from 14.9 to 19.3 million between 2000 and 2018 and commuting distances have increased (Pütz, Deutschlandatlas 2018; Dauth/Haller 2018: 5).

¹ A person is considered a commuter if they cross a municipal boundary on the way between their place of residence and place of work (https://www.deutschlandatlas.bund.de/DE/Karten/Wie-wir-uns-bewegen/100-Pendlerdistanzen-Pendlerverflechtungen.html#_0ak7xh0jg).

Considerable commuter flows are directed from the surrounding areas into the cities. However, there are also commuter connections between towns in the urban regions and between different core cities which are independent of the standard surrounding area to urban transport (cf. Figure 3). Some employees are increasingly able to work independently of location because the world of work has become more flexible and digitalisation has opened up new opportunities. This can increase the attractiveness of the surrounding areas as residential locations, especially if a good interlinkage is enabled by appropriate broadband networks and transport options. At the same time, further commuter routes, such as those between metropolitan areas, will also become more attractive.

(c) The car (still) dominates

Diverging locations for housing and work encourages transport. Nearly half of the kilometres driven by car are driven for journeys to and from work or fall within official work activities (Nobis/Kuhnimhof 2018). Residents of small towns and villages in urban regions travel in total the furthest daily distances of 44 kilometres on average. This figure is only 37 kilometres for residents in metropolitan areas (Nobis/Kuhnimhof 2018). Of these daily total traveling kilometres, an average of 37 kilometres are travelled mainly by car with the help of motorised private transport in small-town and village areas, as opposed to 22 kilometres in metropolitan areas with the help of motorised private transport. Figure 4 shows how suburbanisation

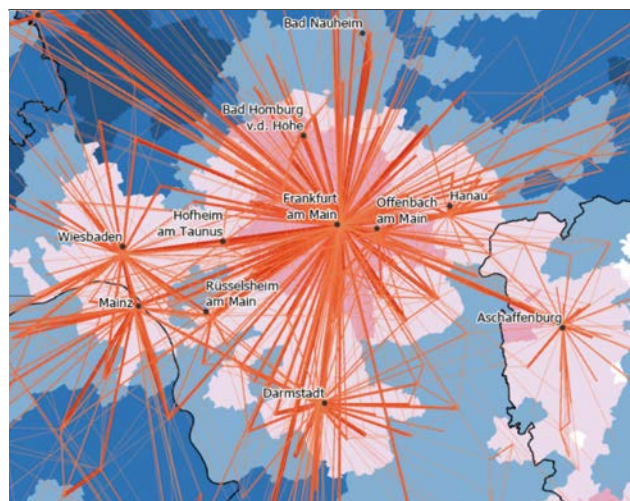
has a reinforcing effect upon car mobility and this has an impact on road infrastructure as well as creating a disadvantageous situation for public transport in particular.

Cars are very important for mobility in surrounding areas: the percentage of motorised private transport (drivers and passengers) traveling to work is twice as high in surrounding areas² (76 percent) than in metropolitan areas (39 percent). There is often a lack of suitable alternatives for everyday use due to the low settlement and population density which hinders the creation of appropriate public transport systems with frequent stops and connections. As a result, urban surrounding areas are inadequately connected or completely neglected in terms of public transport. The use of public transport therefore is inconvenient, time-consuming and expensive. Transfers between ticket zones, changes with long waiting times, low frequencies or overcrowded trains at peak times make bus and train use unattractive and sometimes impracticable. Bicycles are a form of acceptable environmentally compatible alternatives to private cars, at least in good weather. Longer distances could be covered by pedelecs or e-bikes. However, suitable infrastructure such as well-equipped, high-quality and detour-free (fast) bike lanes are often lacking. Safe bicycle parking or the carry-on of bikes onto public transport is often not possible. Park-and-ride facilities at railway stations can encourage people to switch between private cars and public transport, but on the other hand, there is a lack of attractive and secure parking facilities for (expensive) bicycles or even bicycle repair shops. The biggest challenge, however, is in the mind; people are often are unaware of the options available to them and they do not entertain the idea that a destination can be reached just as easily and even more relaxed by train than by car.

In addition to the dominance of cars, the continuing predominance of the internal combustion engine is relevant. A good charging infrastructure must be provided for better use of electricity in transport. Anyone considering the use of an electric vehicle needs a correspondingly sophisticated charging infrastructure at the place of residence or work. This also applies to electrically powered buses in public transport or delivery vehicles. The charging infrastructure can often

Figure 4

Rhine-Main commuter flows (both pointing toward Frankfurt and between large cities)



Source: www.deutschlandatlas.bund.de 2021

2 RegioStaR “Urban region – small-town, village area”

be more easily created in surrounding areas with a lower building density and a higher proportion of owner-occupied homes than in the city. However, the requirements for clean and climate-friendly transport will make motorised private transport more expensive in the future (Kasten et al. 2016; UBA 2019a). The impacts of these cost increases is generally more difficult to assess when choosing a place of residence.

(d) Leisure activities become more individual

Many people want to spend time in nature during their free time. More than two-thirds of Germans associate this with peace and recreation (BMU/BfN 2010). Sports focused on body conditioning in the open countryside have increased over the past decades. More than 15 million people in Germany now regularly engage in outdoor sports and use nature as a “sports facility” (Dufft in BfN 2019: 56). New trends in sports such as stand-up paddling have emerged and old ones are changing, for example jogging is increasingly being replaced by the growing popularity of trail running which takes you over hill and dale away from established trails. Individualised sporting activities such as cycling, mountain biking and hiking are on the rise and are overtaking club-based sports popularity-wise. Modern electronic devices can measure pulse, heart rate and performance and help achieve individual training goals. New sports equipment such as e-bikes open up greater distances and making increasing gradients more accessible.

This has consequences. A model of the utilisation pressure for local recreation shows the highest values in and around areas with high population density, i.e. in cities and in the surrounding areas of large metropolises (cf. Figure 5).

As a result of these developments, the demand for recreational space increases and recreational opportunities become more important, especially in dense areas (KORG 2020). The limitations in movement radius and coronavirus-based travel restrictions have additionally emphasised the importance of surrounding areas for local recreation.

From an environmental perspective leisure travel is significant, accounting for 28 percent of all travel in Germany. Residents of large cities travel similar distances to those living in rural areas (Nobis/Kuhnimhof 2018). Leisure travel decreased marginally from around 1.2 billion to slightly less than 1.1 billion

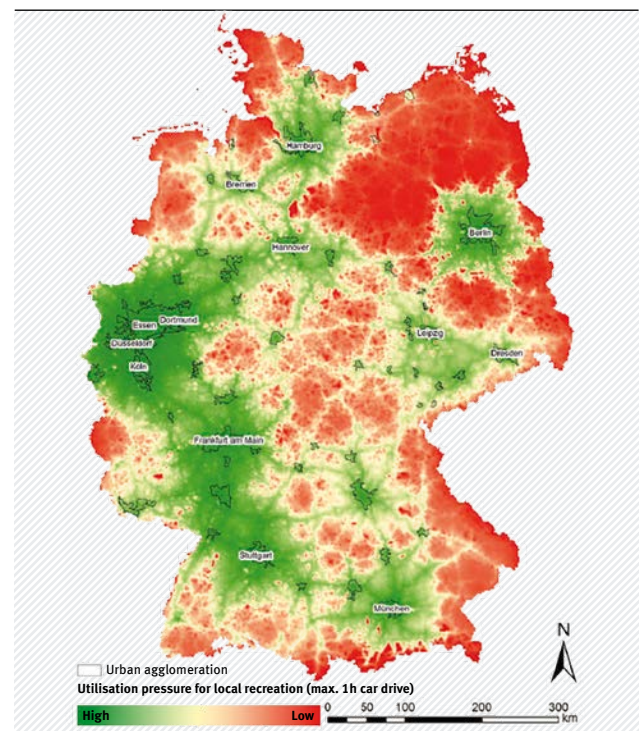
passenger kilometres per day between 2008 and 2017 (Follmer/Gruschwitz 2019). Since rural residents travel longer distances – for example to work – their leisure trips are somewhat less significant than those of urban residents (ibid.). Leisure travel in metropolises accounts for 40 percent of all passenger kilometres, while in small-towns and villages it accounts for only 30 percent.

(e) Digitalisation enables new “smart” concepts

Schools are closed, bus routes are shut down, there is a lack of facilities for daily needs and medical care. In sparsely populated regions, maintaining the legally guaranteed and basic “services and common infrastructure for the public, in particular the accessibility of facilities and provision of public services to all population groups” according to Section 2 of the Spatial Planning Law (ROG) is an increasingly complex challenge. Instead of an equivalence of living conditions (Section 1 ROG), these have become steadily more differentiated regionally. Digitalisation reduces the need for spatial proximity. This can increase urban sprawl and in turn lead to more traffic. The use of digital technologies can bring a great potential for the future

Figure 5

Modelled utilisation pressure for local recreation excursions within a maximum of one hour travel time by car



Source: Hermes et al. 2020, © UVP-Gesellschaft e.V.

improvement in public services with opportunities for environmental protection.³ This applies equally to rural areas and the surrounding areas of cities, but it can also help create jobs beyond attractive locations, both in large cities and commercial centres. Digital services and modern forms of working, such as home office, save long journeys to the doctor, to public services and to work. This can create improved living and working conditions in structurally weak rural and suburban areas, helping to make progress towards the goal of equal living conditions throughout Germany. Intelligent interlinking to environmental protection goals and sustainability can activate “smart” concepts and regions based upon an environmental perspective that simultaneously enable sustainable development and the revitalisation of local centres.

(f) The coronavirus pandemic has accelerated developments

Many office jobs were moved to home offices during the coronavirus pandemic. This raised new questions related to changing relationships between the city and the surrounding area. Will the surrounding area become a more attractive place to live if the need to commute is reduced and the choice of residence becomes increasingly independent to the place of work? A study by the Ifo Institute has shown that the coronavirus pandemic has a driving influence on suburbanisation. 13 percent of residents of large cities with more than 500,000 inhabitants plan to move to a smaller city or suburban area within 12 months, and about 34 percent of them say that the coronavirus pandemic has influenced this decision. More than half of this group in turn indicate that changes in the work life balance are a cause for this decision (Dolls/Mehles 2021). How will a possible trend towards living in the surrounding area affect land use and mobility? To what extent might commuting routes become fewer yet longer and more dependent upon car use? Many questions regarding the opportunities and risks of this development from an environmental perspective remain up until now unanswered.

2.2 Impacts on the environment

Land-take, urban sprawl, transport – the trend toward suburbanisation affects the environment in many ways. Environmentally compatible development must pay particular attention to these impacts.

Land-take for residential and commercial use

As a result of residential and commercial suburbanisation, more and more land will be taken up for housing and transport in the surrounding areas. The projection of settlement areas up to 2045 (Figure 6) shows where the focus lies: in the surrounding areas of expanding cities with tight housing markets (Behmer et al 2020).

Competition for new residents between municipalities, the dominance in building activity of single-family residential areas in the surrounding areas and the attractiveness of designating new commercial areas to municipalities leads to an increase in new land-take (BBSR 2019). Section 13b of the German Building Law (BauGB), which was newly introduced in 2017, also contributed to this trend. The section enables development plans to allow for residential use on sites of less than 10,000 square metres which are “connected to adjoining built districts”. A nationwide sample of the use of Section 13b BauGB by municipalities shows that this provision is primarily used to allow single-family residential zones in rural areas. The 250 development plans studied in 242 municipalities tended to be based on large lots and did not follow the principles of economical and efficient land-use (Frerichs et al. 2020). This is also shown by the high proportion of single- and two-family houses and more open settlement types in the urban surrounding areas (cf. Figure 7, BBSR 2020).

Significantly less new land is taken up in core cities than in the surrounding areas. A study of 33 urban regions (Siedentop/Meinel 2020: 11f.) shows that, with a few exceptions, 75 to 90 percent of land-take occurs in the surrounding areas of core cities which is also confirmed by a per capita analysis. In core cities, 3.4 m² were taken up per new inhabitants in the period from 2011 to 2017 while the average in the city regions studied was 8.8 m² per inhabitant (ibid.).

³ This issue is being investigated in the current UBA R&D project on “Environmental opportunities and risks of digitalised public services in suburbanised areas – a concept study using the example of the Wolfenbüttel district” (FKZ 3718 15 1060).

Industry and commerce also take up relatively large amounts of land in the urban surrounding areas as shown by evaluating the Monitor of Settlement and Open Space Development (IÖR Monitor). While most core cities (especially large cities) have a low share of industrial and commercial land within the settlement area, the shares in the surrounding areas of most core cities are high. For example, Berlin had a 13.9 percent share of industrial and commercial land in 2020, while the surrounding district of Teltow-Fläming had a 22.1 percent share (IÖR 2021). However, this finding is not clear-cut in every region.⁴

Land-take results in the loss of fertile soil or in the deterioration of its ecological quality. Open spaces and natural areas are fragmented, which has negative consequences for biodiversity and the landscape. Sealed surfaces are disadvantageous for water and climate cycles, which is becoming increasingly important against the background of heat waves and heavy rain events. Comparing soil sealing in single-family residential areas and in inner-city areas with multi-story residential buildings, it becomes apparent that a considerably larger area per inhabitant is sealed in single-family residential areas than in densely built-up areas (Penn-Bressel 2009). Last but not least, the required additional transport generates emissions, seeing as how the place of residence is the starting point for everyday mobility and thus an important lever for sustainable mobility.

Resource demand for infrastructure and buildings

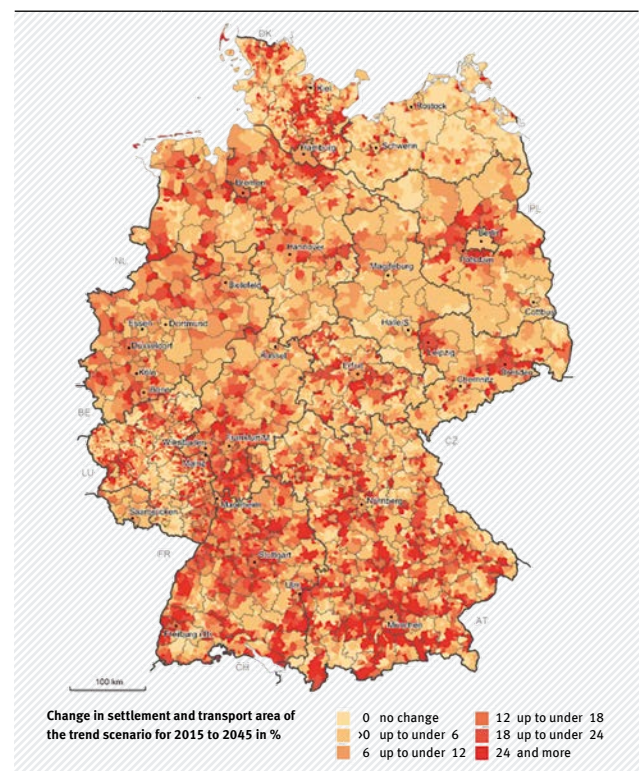
Living in surrounding areas goes hand in hand with the expansion of a supply and waste infrastructure and thus generates a greater demand for raw materials beyond building construction. Technical development is accompanied by new roads, sewers, potable water pipes, electricity and gas supply networks, and fibre optic cables for information and communications technology (ICT). New public transportation connections and bicycle and pedestrian paths are needed. Protective measures such as noise barriers or windows are often required in the vicinity of traffic noise. The technical development is independent of the settlement density so that expenditure increases disproportionately in relation to the decreasing building density (Schiller et al. 2009). Figure 8 illustrates

the relationship based on empirical and theoretical findings (Siedentop et al. 2006). Based on this, the following rule of thumb can be formulated: *“half the density = twice the development costs per residential unit”* (Schiller et al. 2009).

This also increases resource consumption because every metre of development infrastructure uses raw materials that require energy to process and transport (grey energy) and generates greenhouse gas emissions. Due to their looser development, single-family house areas tend to contribute to a higher resource consumption than denser and more compact construction. Using typical building material parameters for various single-family and multi-family housing areas, it was possible to calculate the specific material input per person based on case studies. Figure 9 shows that settlements with single-family houses, particularly those that are expected in the future, are significantly more material-intensive than those with multi-family houses. This finding applies both to the buildings themselves and to the required technical infrastructure. There is also a clear connection between a low floor-space index and extensive use of materials (Blum et al. 2017).

Figure 6

Settlement land projection to 2045



Source: BBSR 2019

⁴ Exceptions are Hamburg because of a large number of urban industrial and commercial sites due to the port area, and industrial cities such as Wolfsburg.

Utilisation pressure on nature and landscape

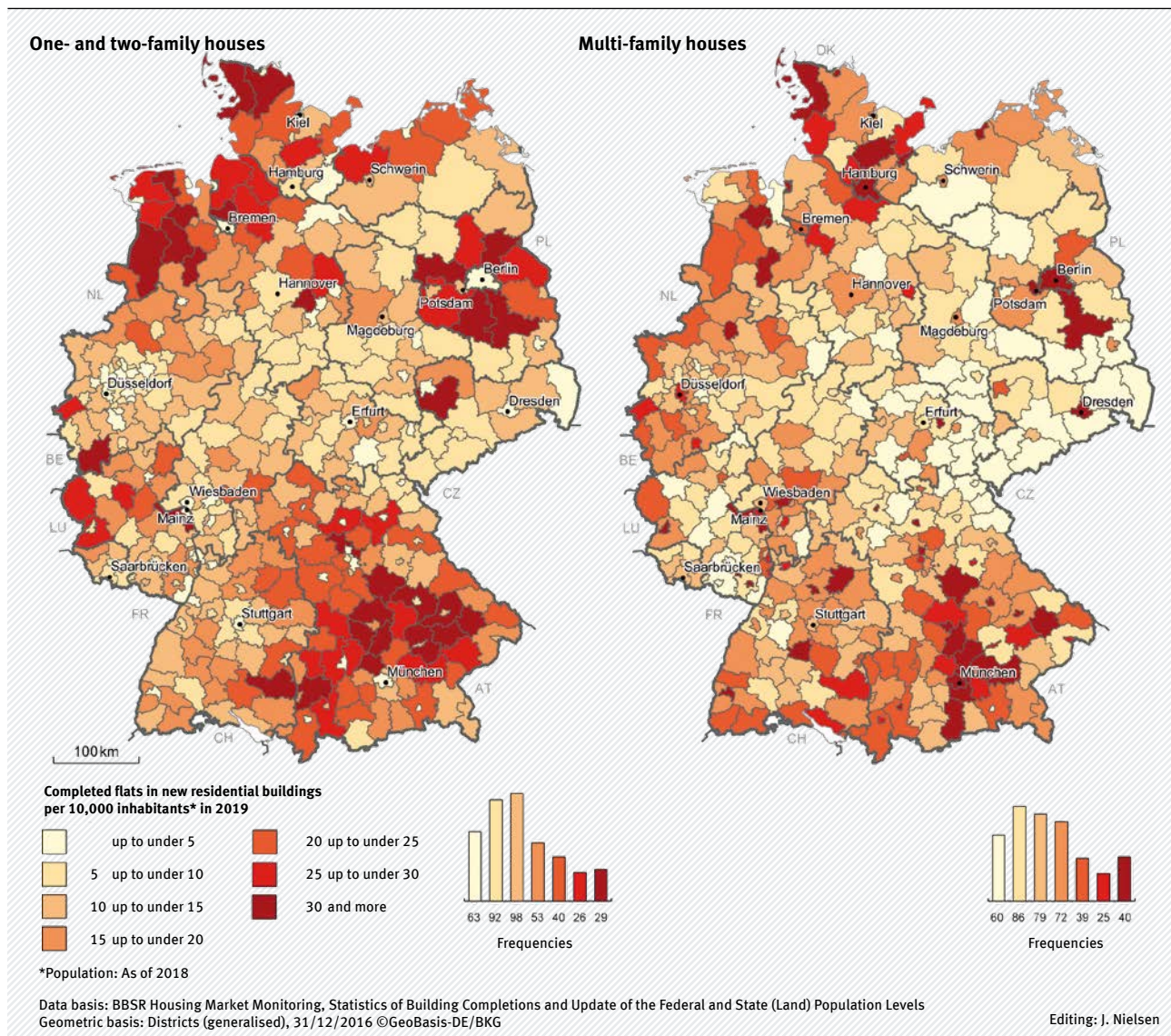
The open and green spaces in the urban surrounding areas are under a double strain. The demands for recreational leisure are becoming more diverse whilst at the same time, these open spaces are being lost. Urban sprawl, fragmentation and often mono-functional agricultural and forestry use further limit the suitability of existing open spaces. In the urban surrounding areas of many metropolises, there is a lack of attractive spaces for local recreation so the pressure of use on existing destinations is high (see yellow and red areas in Figure 10). In addition, the urban surrounding areas are often characterised by areas that are not open to the public because they are

privately owned or used for commercial purposes. Roads and railway lines form obstacles that are difficult or impossible to overcome further limiting the possibility to experience suburban areas collectively on foot or by bike.

While city dwellers travel to the surrounding areas to find leisure facilities that require large open space (e.g. sports and recreation venues such as swimming pools, climbing gyms or leisure parks), people living in the surrounding areas drive to the core cities, for example for shopping or leisure purposes such as visiting cinemas or cultural events. The resulting leisure traffic – often by

Figure 7

Building completion by single- and two-family houses versus multifamily houses



Source: BBSR 2020

car – has a negative environmental impact such as noise, air pollutants and greenhouse gas emissions.

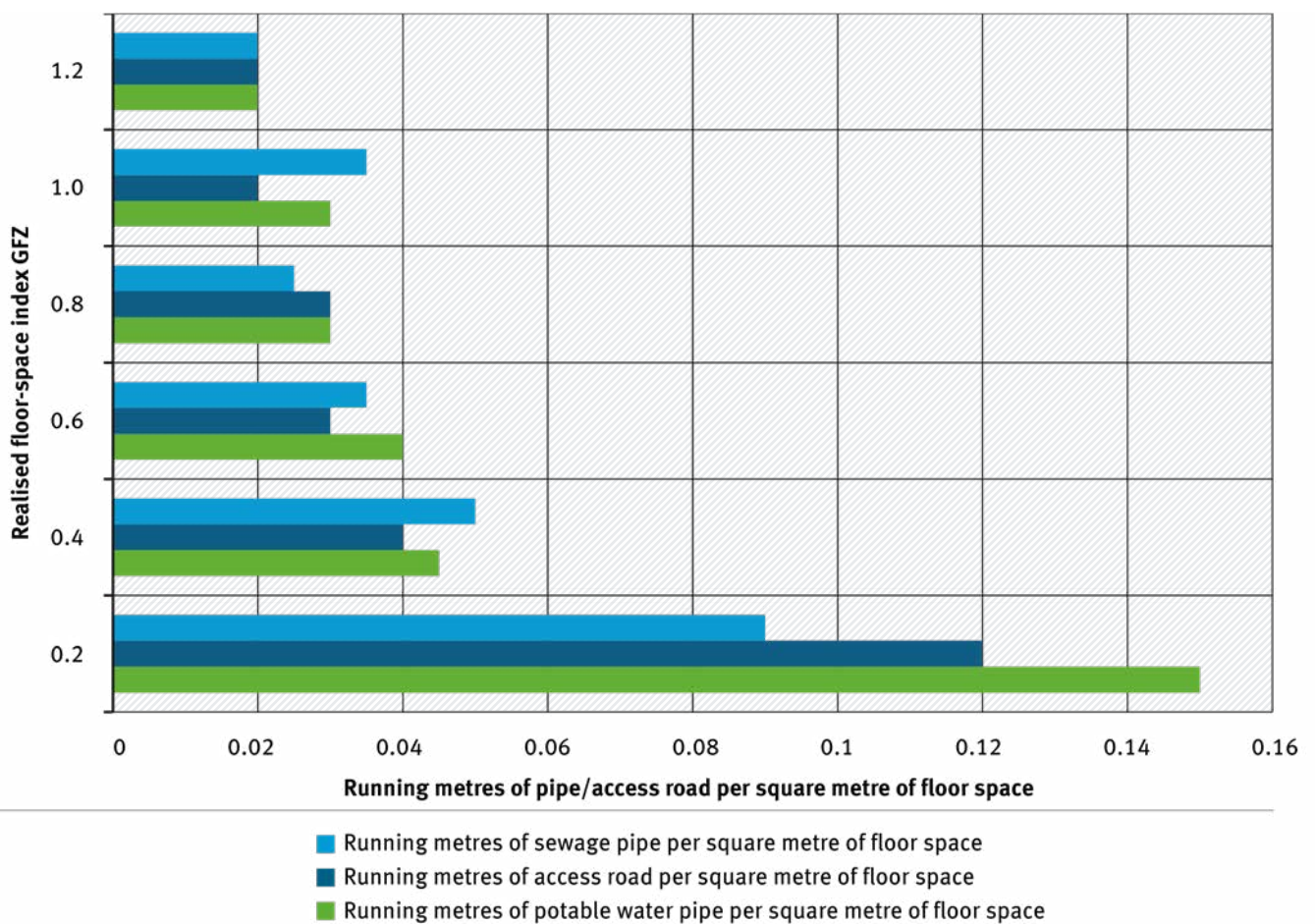
Last but not least, changed and intensified recreational uses can also lead to conflict between the various users and recreation seekers, as well as conflict with the interests of environmental protection and nature conservation (Dufft in BfN 2019). Recreational users such as hikers, cyclists and mountain bikers impair nature and the landscape when they become mass phenomena and cross-country rides intensify the use of landscapes and natural areas beyond the network of trails. Hotspots of recreation such as bathing lakes or tourist and cultural sights attract many visitors,

especially at weekends, as well as open-air events or thematic markets.

In the urban surrounding areas, noise conflict between motorcyclists, residents and recreation seekers can occur, especially in scenic areas. Narrow, winding valleys in particular often attract numerous motorcyclists with their twisting roads – especially during weekends and good weather.

Figure 8

Development costs for technical infrastructure as a function of building density



* Infrastructural expenditure for housing as a function of building density

Source: UBA's own illustration based on Siedentop et al. 2006

Emissions from Traffic

The high proportion of motorised private transport in urban-rural traffic is associated with considerable negative consequences for people and the environment such as emissions of greenhouse gases, air pollutants and noise. Surface areas are sealed over and landscapes cut up by roads. In Germany, road traffic caused by far the largest share of the 163 million tonnes of carbon dioxide (CO₂) emitted by transport in 2019, a total of around 96 percent. In terms of transport-related CO₂ emissions, metropolises and large cities fare better: here, lower emissions are produced per person and per trip than in more rural regions (see Figure 12) (UBA 2020a). This is mainly due to shorter distances. The comparatively high functional density makes it possible to do shopping and other errands quickly and easily on foot or by bicycle. Negative developments are mainly due to the high population increase in metropolitan areas over the last 20 years. Routes are becoming longer, daily

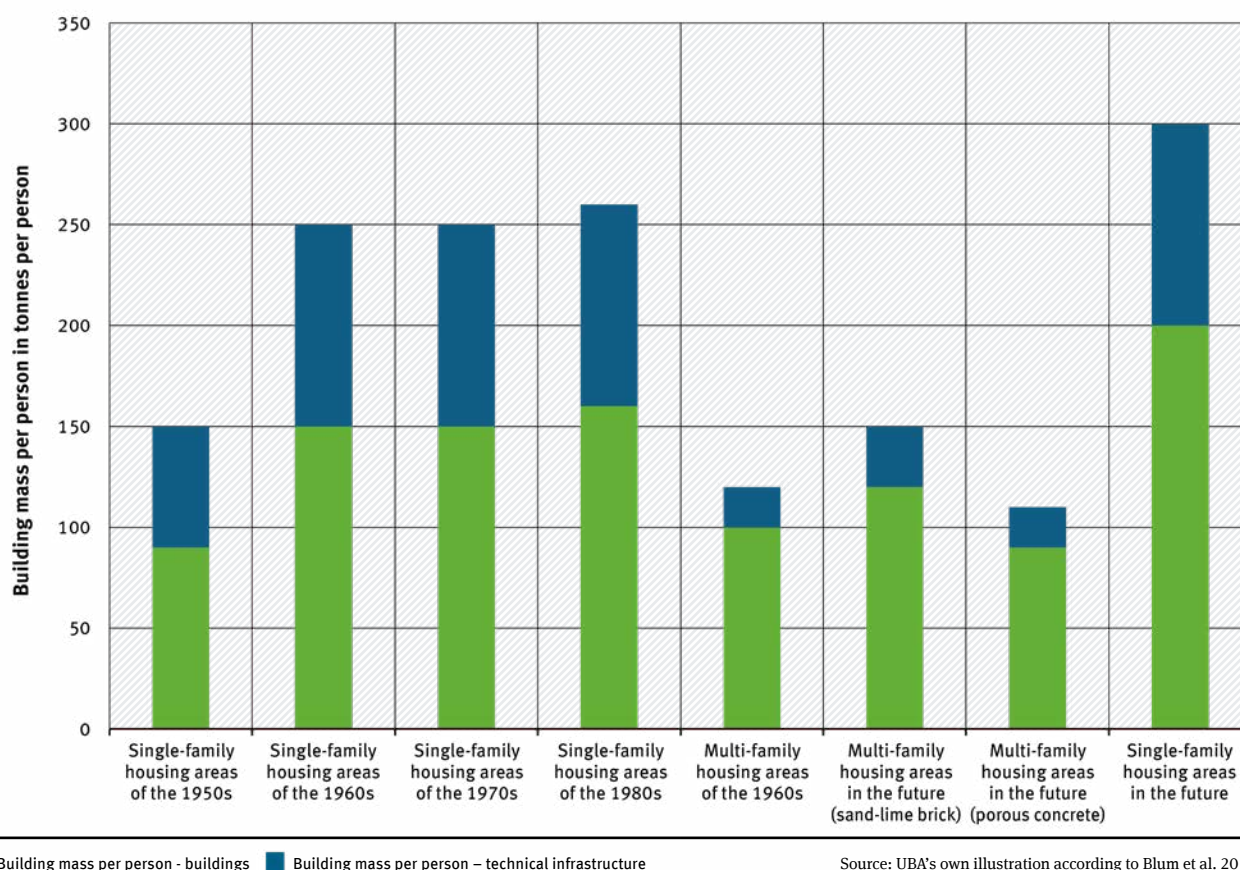
distances are increasing and residents are longer on the move. As a result, CO₂ emissions are increasing overall per trip as well as per person, even though to-date they have been lower in metropolitan areas than in rural areas (see Figure 11).

A high number of motor vehicles on the road worsen the air quality through nitrogen oxide and particulate matter emissions, even if the pollution in the surrounding areas is lower than in the city. In addition, traffic causes noise problems of varying degrees: apart from air traffic noise occurring within the proximity of airports, noise pollution is particularly dominated by road vehicles but also contributed to by rail vehicles. Traffic noise affects the health of many people. It equally reduces the quality of life in the city and in the surrounding areas. Measures to reduce noise are urgently needed (Wothge/Niemann 2020).

Figure 9

Material intensity of single- and multi-family residential areas

Different age groups



One main problem is posed by busy roads where many people live – especially if they are “transit points” along routes leading from the suburbs to and from the city. According to a representative population survey from 2018, 75 percent of respondents felt annoyed by road traffic in their residential environment (Rubik et al. 2019). Motorbikes, which can cause significant noise problems, also contribute to this assessment. In contrast to road traffic noise which occurs almost everywhere, rail traffic noise is more concentrated to corridors. High noise levels can occur depending on the type and frequency of trains. Nationwide, 35 percent of the population felt annoyed by rail traffic noise (Rubik et al. 2019). The situation is particularly serious along freight corridors, where the majority of traffic takes place at night (for example in the Middle Rhine Valley). There is significant potential for noise reduction here, which should be exploited in those surrounding areas around cities (UBA 2017a).

Conflict between housing and commerce

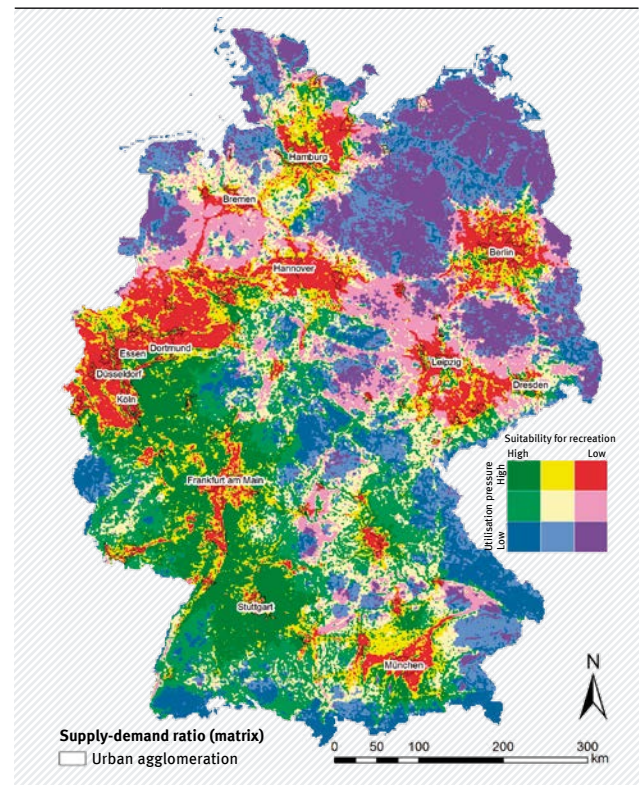
Noise conflicts can occur both in the city and in the surrounding areas if commercial and residential areas are located too close to each other. Such conflicts are called mixed situations according to the Technical Instructions on Noise Abatement (German: TA Lärm), which allow higher emission benchmarks. Mixed situations arise where areas of different quality and protection levels meet and noise reduction measures at the source are not sufficient. A joint working group of the Conference of Ministers of Construction (German: Bauministerkonferenz) and the Conference of Ministers of the Environment (German: Umweltministerkonferenz) developed regulatory proposals to deal with commercial noise conflicts when residential development is in progress (UMK 2020). The report contains a test case scenario to manage potential noise conflicts in inner-city densely populated areas. This includes organisational and procedural options as well as architectural and constructional approaches to noise reduction. All steps of the test case scenario should first be run through with the aim of resolving the conflict, and only then should passive noise protection measures be taken. The impact of commercial noise on human health must be considered in terms of both noise pollution and annoyance (UBA 2018a). In addition, traffic noise induced by commercial activities, for example during delivery and removal, is also problematic and has a significant impact that must therefore be mitigated.

Displacement processes and social inequalities

The environmental impact of residential suburbanisation cannot be considered in isolation from the social impact. Suburbanisation can increase social segregation between the city and surrounding areas as well as within the city and within surrounding areas. In some sub-areas, comparatively homogeneous social structures are formed with negative social consequences. But social injustices arise when, for example, people with lower incomes have to accept longer commuting distances and corresponding costs and time losses. Socially disadvantaged residents are also more likely to live in the immediate vicinity of access roads and arterial roads, where they are exposed to the negative effects of urban-rural traffic, especially noise and pollution from road traffic (BMUB 2016). Even in suburban areas and on the borders between cities and the surrounding areas, there are housing estates in many conurbations where socially disadvantaged population groups suffer from multiple environmental pressures such as lack of green and open spaces and noise pollution.

Figure 10

Within a radius of a maximum of one hour by car, high pressure of use and low suitability for recreation overlap



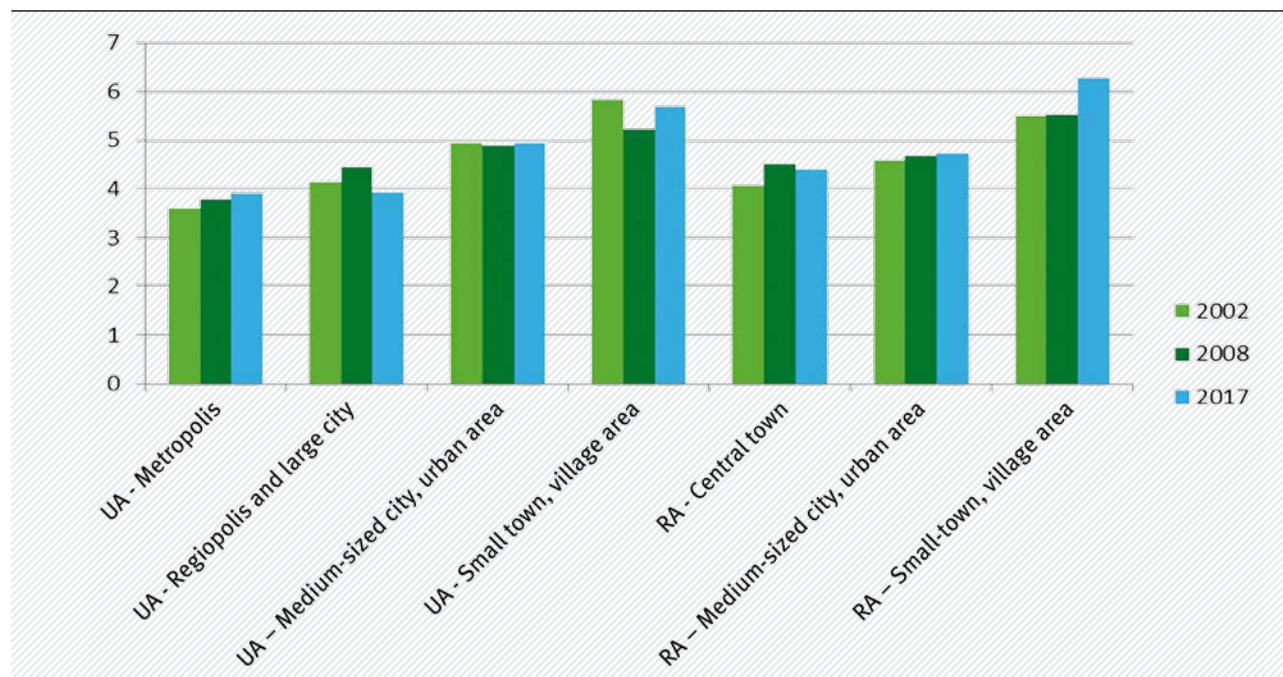
Source: Hermes et al. 2020, © UVP-Gesellschaft e.V.

Examples are large housing estates from the 1960s and 1970s on the outskirts of cities, often with poor public transport connections. These neighbourhoods mostly still belong to the core city administratively, but nevertheless have a suburban character with the associated opportunities (e.g. adjacent recreational

areas) and challenges (e.g. lack of mixed use) (Böhme et al. 2019). The residential location with a suburban character should not be ignored when considering sustainable partnerships between the city and the surrounding areas.

Figure 11

Transport-related CO₂ emissions per person and day by RegioStaR7



Source: UBA 2020a

3 “EXURB Environmental” – a journey through time

In the future, the urban surrounding areas of cities will be unrecognisable. Life pulsates again in the village and town centres. All around, it is green.

The change began with the federal government’s decision that no undeveloped areas should be taken for housing and commercial purposes. As a result of this “net zero” land-take, the municipalities of the EXURB are rediscovering their town centres. Where until a few years ago the townscape was characterised by a hodgepodge of buildings – some of them historic, attractive and worthy of preservation, however many of them shapeless post-war examples of architecture – there is now a lively, compact residential district. The municipalities have preserved attractive buildings, preserved the architectural character of the area and developed it further. Where there were once parking spaces for cars, there are now benches, bushes, trees and flowers.

The new houses are designed in such a way that they fulfil the residents’ wishes for community but also for opportunities for retreat, often with a small garden on the ground floor and a balcony or roof garden on the

upper floors. Facades and roofs are filled with greenery. The surrounding area, which for decades served mainly as a place to sleep, has become an active and viable living space. Cafés and small individual shops, services such as cobblers, dry cleaners, tailors and restaurants are available a short distance away from the residents’ doorsteps. Children play in the inner courtyard. Schools, kindergartens, shopping, sports and leisure facilities can be reached safely and quickly on well-developed footpaths and cycle lanes.

Working practices have also massively changed. The development began shortly before the coronavirus pandemic in the early 2020s, when digitalisation took over more and more areas of daily life. Good broadband connections ensure that commuting to work in the core city is rare. At many of the newly created “Mobility point PLUS” (German: “MobilpunktePLUS”) there are easily accessible co-working spaces with shared technical equipment. Those who do not have the opportunity to work from home because they lack space or the peace and quiet for example, can rent a room at these “Mobility point PLUS” locations for days, weeks or months or use them for meetings.

Figure 12

Inspiration for an EXURB Environmental



Source: Alice Schröder (Umweltbundesamt), iStock.com/Drazen_

The integrated cafés, bistros or sports and leisure facilities create opportunities for socialisation and the exchange of ideas. This creates a community between the residents of the surrounding area that goes beyond digital connections.

The “Mobility point PLUS” attracts crowd with a fundamental impact on mobility. They bring together electric and zero-emission public transport connections and cycle fast lanes. Here you can change trains to go to the core city, for example, charge electric vehicles, pick up a mail parcel or have a coffee. The railway, public transport companies and car companies cooperate as mobility service providers with versatile offers such as car sharing and ridepooling, where passengers with a similar destination come together based on apps. Bike stations with well-maintained pedelecs are available in every apartment block for a low annual fee, with three wheels or a trailer if required. Almost all residents forego a car of their own. They know that even if they use public transport and the flexible offers intensively, it will not be more expensive. They also save time and money on inspections, tyre changes and repairs.

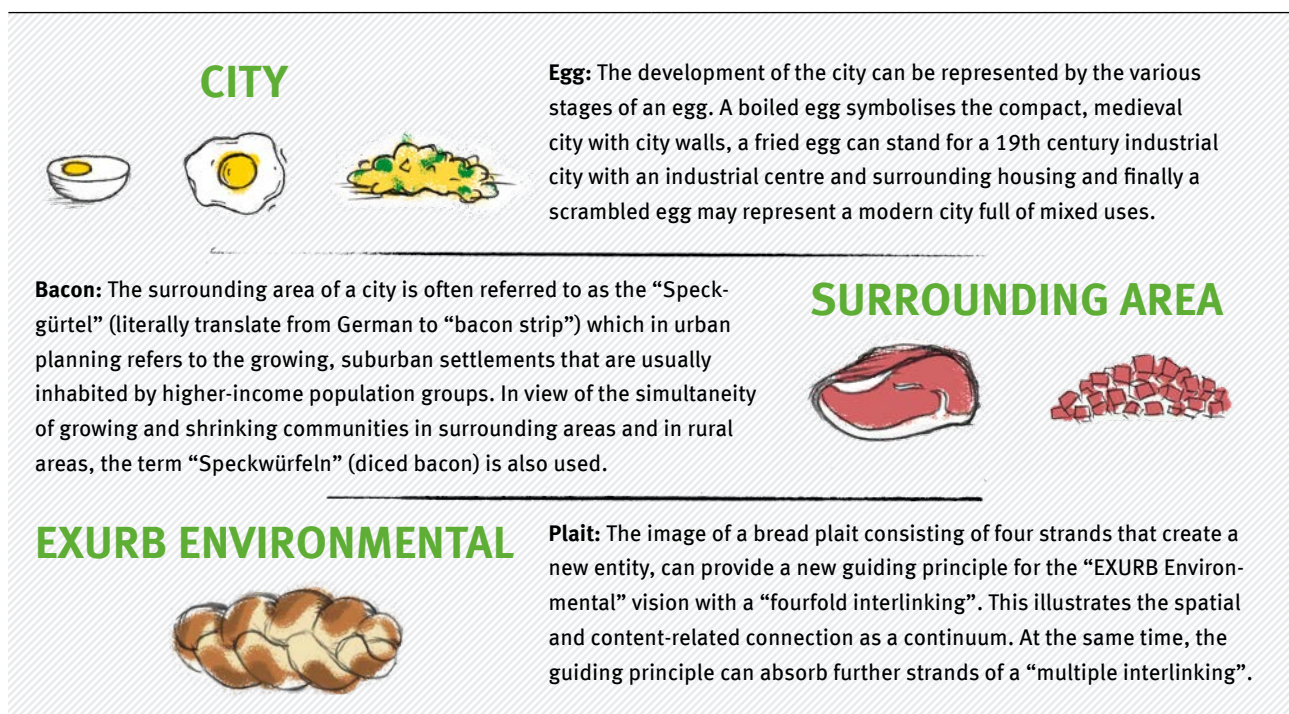
They can also comfortably cover longer distances by bicycle or pedelec on the well-developed cycling expressways. These connections run through green spaces and attractive landscapes. Exercise is fun in the EXURB.

Large contiguous open spaces are kept free of housing and commerce. That is why the surrounding area is green. This enables regional agricultural production, which is marketed within a relative short proximity to its place of origin. Orchards, woodlands, meadows and floodplains are laid out in such a way that they can survive dry summers and absorb large amounts of rain. Biotopes that were once fragmented have been reconnected with each other, which benefits biodiversity. Motorised traffic has decreased and is quiet and emission-free, the air is clean. Jogging and walking, exercising the dog and forest hiking, excursions to local destinations and going swimming, open-air cinema and climbing walls – everything is within a walking or cycling distance.

Figure 13

Culinary comparisons in the scientific planning field

egg, bacon and bread plait



Source: UBA's own illustration

Working together in the “Magical Square”

Where can we find historic developments suitable for creating attractive destinations with gastronomy and cultural offerings? Where can we (re)build the existing housing stock, while de-sealing built-up areas at the same time? Where can we deconstruct a road or make it fit for bicycle traffic? In which areas can we give back to nature and reconnect previously separated biotopes? The interlinking in the “magical square” of housing, working, recreation and mobility is negotiated in supra-regional committees of EXURBs and supported by the adaptation of legal regulations. In the meantime, the decision-making structures have been consolidated and, where necessary, moderators help to find common lines of development to distribute tasks sensibly and to work out solutions that benefit all sides. This development can also be seen in the way buildings are considered. The typical regional building styles, which are popular with residents and visitors, are gaining in value and strengthening the sense of identity.

“Fourfold interlinking” as a guiding principle of EXURB

In the sustainable design of the city and surrounding areas, spatial and functional relationships are at the centre. The challenges are met in an interdisciplinary

manner and with cooperation across administrative boundaries. This is done entirely within the guiding principle of a “fourfold interlinking” of the required fields of housing, work, recreation and mobility for a sustainable spatial development and design of the surrounding areas and the EXURB. Because the settlement, mobility and open spaces are developed in a functionally and spatially integrated manner, ever more liveable, environmentally friendly and sustainable urban regions are being created. Beyond municipal boundaries, those involved are working together to find solutions to people’s demands for housing, work, recreation and mobility. This is something individual municipalities alone have been unable to do for a long time. Negotiations on a common playing field transparently shows conflicts over goals and distribution patterns and minimises them as far as possible. The added value of common goals becomes clear. The coordination of development takes place with regional and inter-municipal cooperation and guarantees a spatially sensible distribution of tasks. The cooperation between municipalities leads to an identity of its own, which can be seen in the (culture) landscape and building culture in that area. This consistent interaction between the city and the surrounding areas improves the quality of life of the people both in the urban areas and in the surrounding areas.

Figure 14

Housing, work, recreation and mobility: Sustainable interlinking within EXURB Environmental



Source: TU Dresden, Meier 2021

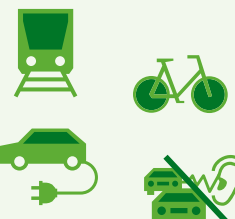
4 “EXURB Environmental” – sustainably interconnecting housing, work, recreation and mobility

The vision of “EXURB Environmental” requires a change of direction and coordinated planning in many areas of politics, planning and administration. This applies to the federal level, the states (Länder) and regions and local authorities which include municipalities, cities, districts and greater municipal

associations. Figure 14 summarises the goals and actions of the four thematic areas. Overarching this are the building blocks of a new cooperation in sustainable interlinking and the “Mobility point PLUS” (German: “MobilpunktPLUS”) which will be presented first.

Figure 15

Overview of goals and measures in EXURB Environmental

	A new cooperation in integrated planning to achieve sustainable interlinking	
	1 Coordinate space-saving intermunicipal housing 2 Spread new images for successful concentrated housing in surrounding areas	HOUSING
	1 Sustainable and cooperative management of commercial space 2 Promote home office and co-working 3 Systematic mobility management	WORK
	1 Create and protect regional open spaces and green infrastructure 2 Enable leisure and recreational options in the local environment 3 Environmentally friendly creation of leisure activities	RECREATION
	1 Encourage public transport and reduce motorised private transport 2 Encourage cycling in the surrounding area-city transport 3 Reduce motorised private transport and switch to electromobility 4 Abate traffic noise	MOBILITY
	Create attractive transfer points with functions related to daily needs	

Source: UBA's own illustration

4.1 New cooperation for integrated planning to achieve sustainable interlinking

Combined planning of settlements, open space and transport development requires close **cooperation between the planning disciplines and spatial levels** in the EXURB. It serves to integrate the diverse aspects of spatial, landscape, transport, settlement and noise abatement planning. The existing regional and sectoral planning instruments offer appropriate convergence of control which should, however, be improved in various aspects to achieve a supra-regional effect.

It is important to give greater consideration to environmental issues in spatial planning. This includes making spatial planning more binding and with better links to other planning disciplines so that mutual integration works more reliably. In addition, the layout of administrative planning areas often does not correspond to the actual interdependencies between cities and their surrounding areas. When it comes to transport development, there is a lack of sufficient commitment to include the urban-rural relationships institutionally and in concrete planning. **Spatial planning of interlinked housing, open space and transport in terms of content** should reflect the actual fields of action in the region, strengthen environmental concerns and have appropriate decision-making powers.

The existing options for integrated planning must now be used to promote sustainable relationships between the surrounding area and city despite existing limitations. The key instrument is **regional planning** that controls the efficient placement of land-use activities, infrastructure and settlement growth to be achieved across all disciplines. A well-integrated **Strategic Environmental Assessment (SEA)**, which has an early and ongoing influence on the planning process, can have particularly positive effects. SEA continuously organises and manages the planning process (Führ et al. 2021) and takes into account the relationships with other plans and programmes with an overall integrating effect. SEA also contributes significantly to planning transparency and comprehensibility for the public and specialist authorities (ibid.).

Landscape Framework Planning supports the goals of reducing land use and preserving and developing open spaces in suburban areas by

providing regional planning with important foundations for the designation of regional green corridors. **Transport Development Planning** has the potential to effectively control transport by jointly considering commuter flows between interlinked settlement areas. **Noise Action Planning** under the EU Environmental Noise Directive can support the safeguarding of green infrastructure by defining and protecting quiet areas (Hintzsche 2020).

Informal negotiation, communication and management processes complement and accompany formal planning (cf. Wolff/Mederake 2019). Such **regional management** requires additional human and financial resources, **new forms of governance** (associations, networks) and **stakeholders** (housing industry, mobility associations, landowners and land managers, civil society).

Agglomeration concept Cologne/Bonn



Figure 16

Source: Region Köln/Bonn e. V. 2019

Practical example of mobility and compact housing:

The Cologne/Bonn agglomeration concept formulates a growth perspective for a dynamically developing region on the time horizon up to 2040+. Based on a sustainable conversion and expansion of the mobility infrastructure, compact housing should be encouraged and open spaces protected. The specialist concept was developed by the region's institutions in a broad-based participation process and presented in 2020.

These bodies enable stakeholders to engage in dialogues at eye level and beyond their own disciplines. They can establish scenarios for future developments, develop visions, ideas and proposals for actions, initiate projects, enable participation and finally integrate the results into formal processes. An increased awareness that regional cooperation provides extensive mutual benefits and added value is crucial to success.

established for this purpose to foundations, institutions, companies and public law corporations (special-purpose associations). In some states (Länder) collaboration is regulated by law, for example the laws on municipal cooperation in North Rhine-Westphalia, Brandenburg and Saxony-Anhalt. These positive approaches should be further expanded and intensified.

At present, municipalities are working together to varying degrees. **Inter-municipal** cooperation ranges from informal and voluntary cooperation to contractual transfer of tasks to private law companies

Table 1



At a glance: Coordinated planning and cooperation in the EXURB

Level	Recommendations
Federal	▶ Promote cooperation processes and new forms of governance (associations, networks) in regional management ▶ Process and disseminate positive examples of informal regional management to encourage sustainable development of interlinked areas and support formal regional planning ▶ Initiate and promote peer-to-peer learning based on successful examples of regional management ▶ Develop and disseminate recommendations to encourage environmental consideration in regional planning. ▶ Encourage spatial and content-related expansion of structural policy funding programmes such as KoMoNa (Municipal model projects for the implementation of ecological sustainability targets in regions undergoing structural changes) to support sustainable regional management
States (Länder) and regions	▶ Support city - surrounding area cooperation and partnerships, e.g. in the context of structural support or competition ▶ Encourage regional planning to take into account the binding nature of environmental concerns ▶ Promote concepts and plans of neighbouring municipalities (e.g. in transport development and local transport) and other informal cooperation ▶ Initiate regional management processes that aim to develop common mission statements and agreement on common goals ▶ Support administrations to organise further training programmes in sustainable regional management
Municipal*	▶ Develop inter-municipal cooperation for joint projects and provide the corresponding personnel and financial capacities in the administration

* Note for this and the following tables on recommendations: In Germany, municipalities include both independent cities and cities/municipalities belonging to districts and municipal associations (e.g. districts, joint municipalities, association municipalities).

4.2 „MobilpunktPLUS“

“Mobility point PLUS” (German: “MobilpunktPLUS”) (cf. Figure 17) enables the public to experience sustainable interlinking of housing, work, recreation and mobility in a concrete form. For this purpose, existing public transport hubs or those yet to be established such as train stations and express bus lines on main transport routes can be used (cf. Chapter 4.6). They will be further developed in such a way that they can bundle a number of basic everyday functions of the EXURB.

“Mobility point PLUS” makes it possible to switch between the various means of environmentally friendly transport. It offers parking facilities for bicycles and repair service stations and rental bicycle stations and makes it easier to cover sections of the journey by

bicycle and then change to public transport. Flexible services such as shared taxis, on-call buses, community buses and car-sharing services can convey passengers to the “Mobility point PLUS” and back home. Carpooling integrated into the public transport system using shared-use private electric cars makes it possible to cover distances from further outskirts of surrounding areas to the public transport system. The infrastructure required on site, such as preferred parking spaces for carpools and e-charging stations, is sufficiently available. Mobility options are organised in a mobility app that can be used at any time to request offers which are tailored to individual needs. In this way, “Mobility point PLUS” greatly contributes to accessing the EXURB by public transport in an environmentally friendly way supplemented by sustainable mobility approaches and linking it to urban centres.

Figure 17

Inspiration “Mobility point PLUS” (German: “MobilpunktPLUS”)



Source: TU Dresden, Meier 2021

Table 2



At a glance: “Mobility point PLUS” (German: “MobilpunktPLUS”)

Level	Recommendations
Federal	► Use federal programmes to promote “Mobility point PLUS” which combines mobility, environment, social issues and culture, e.g. in the form of real laboratories/experimentation rooms ► German Rail action programme to upgrade railway stations into multifunctional centres
States (Länder) and regions	► Support the exchange between municipalities on best practice examples on “Mobility point PLUS”
Municipal	► Obtain and provide areas at transfer points and stations for use as “Mobility point PLUS” -centres ► Motivate and encourage potential operators and stores users, restaurants, clubs, art and cultural venues or coworking spaces; promote local initiatives for the creative design and use of “Mobility point PLUS”

Figure 18

New housing images in the EXURB Environmental



Source: TU Dresden, Seitz 2021

In addition, “Mobility point PLUS” offers many everyday functions. You can buy everyday goods, there is a postal and parcel service including a parcel station, automated teller machines (ATM) for banking transactions and acceptance points for repair services such as tailoring or bicycle repair are available. “Mobility point PLUS” makes it easier for residents to arrange their to-dos “en-route” and to avoid extra trips. Moreover, “Mobility point PLUS” provides a place for social life in the EXURB. It is easily accessible, is suitable for social events, for art and cultural events and promotes interaction and exchange of ideas and information. As an alternative to conventional forms of work and home offices, coworking spaces can be integrated into the “Mobility point PLUS”, as can small cafés, sports facilities, health care, libraries or social facilities such as daycare centres or meeting places for the elderly.

The bundled services can supplement functions in surrounding areas according to local needs and anchor them at new settlement centres along the main public transport routes. As an EXURB service centre, “Mobility point PLUS” helps to avoid traffic and to shift it to the means of transport of the environmental alliance. “Mobility point PLUS” can enhance the quality of life in the EXURB by creating vibrant suburban settlement cores and making them a “food hub”.

4.3 Housing

A more densely populated building and housing pattern is the prerequisite of sustainable, environmentally friendly and resource-efficient housing in the EXURB. Not only does this require new housing development concepts with a strong coordination between municipalities and a compact land use, but also can be supported by new housing ideas for an attractively designed environmentally friendly building style.

Module 1:

Coordinate efficient land use for housing across municipalities

Efficient land use for housing development can be ensured by an active and cooperative regional management which primarily uses existing areas in the EXURB. It enables active location and quantity control: surrounding communities develop building land according to need in coordination with the core city, with agreed standard values for building density and along aisles of rail-bound transport. Compensation mechanisms such as financial payments by the core city for housing construction to be created by surrounding municipalities and commitments to infrastructure development (e.g. expansion of rail-bound transport) provide additional incentives for land saving land use for housing development along the corridors of public transport. In this way, diverse and affordable living space can be created and the region’s attractiveness increased. This must be demonstrated as a clear added value for the region in order to encourage political players to act together. This has already been happening in some states (German: Länder) and regions (see practical examples). Overall, the states should improve the institutional conditions for active regional management. Regional planning links self-development in non-central areas providing reliable forecasts on natural population growth at the village district level. While doing so, existing settlement potential (e.g. vacancies, development of the existing stock) are taken into account instead of reference values based on population influx that took place in the past.

If regional inequalities have also been levelled out, companies settled and job opportunities created, if shopping facilities, schools and kindergartens are available, the urge to migrate to places with better offers and, consequently, the need for new housing will be reduced.

Existing vacant buildings can be converted, demolished or densified and unused commercial space can be converted into apartments. All this can preserve and make attractive and lively local centres and revitalise city centres. The difficult situation of the town centres after the coronavirus pandemic can thus be used as an opportunity to cover the housing demand. Incentives are created for conversion and reactivation of existing buildings in central locations that no longer meet requirements and make them attractive for new users e.g. for social infrastructure.

Residential development areas in the Stuttgart region

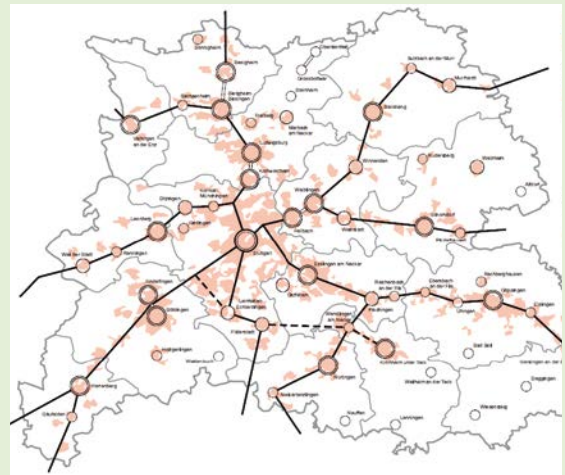


Figure 19

Source: Regionalplan Region Stuttgart 2009 (S. 52)

Practical example of residential development along mobility corridors: The Stuttgart Region links the goal of higher population densities in regional focal points with a rail connection. At the centre is the Verband Region Stuttgart that is responsible for regional planning, economic support, the S-Bahn and the regionally important public transport system and is therefore in a good position to plan residential development that is closely interlinked with work and mobility.

Figure 20

New housing images in the EXURB



Source: TU Dresden, Seitz 2021

Cities and their surrounding areas are rich anthropogenic deposits. Cities contain vast amounts of resources whose production has had a negative effect on the environment and the climate. For example Berlin has a residential building material stock of 134 tonnes per inhabitant and the Märkisch-Oderland district of 165 tonnes per inhabitant (IÖR 2021a). Strategies are needed to sustainably manage this “stock of materials” in the built environment for resource protection. These can include the recycling of building materials, reuse of building components, sustainable and modular construction (using standardised prefabricated components) and planning in-line with environmental, climate, and resource protection. Further measures are discussed within the topic of “urban mining”(Müller et al. 2017).

Table 3

At a glance: Land-saving development for residential use



Level	Recommendations
Federal	▶ Ensure that land-saving housing development targets are legally binding ▶ Agree on targets of efficient land use together with the states (German: Länder) within the federal-state dialog on land use ▶ Develop and implement a master plan for sustainable land management ▶ Abolish Section 13b BauGB: it allows building on settlement boundaries (in the outer area) and thus contributes to urban sprawl (cf. Chapter 2.2.) ▶ Promote sustainable and innovative forms of dense building and housing in communities in surrounding areas while taking into account noise protection requirements
States (Länder) and regions	▶ Introduce site and volume control in all states ▶ Strengthen regional planning and management, promote cooperation across municipalities ▶ Set quantity targets for settlement development in regional plans for secondary areas by setting density targets for housing as a basis for calculating the quantity targets (in inhabitants per hectare) and quantity targets for land-take (in hectares per year) ▶ Anchor quantity targets for land use in regional development planning and support implementation with personnel and funding ▶ Cooperative housing for municipalities that do not have land ▶ Link land quotas for self-development in non-central locations in regional planning with reliable natural and village-district specific population forecasts and back them up with quantitative data on the scope of settlement (e.g. upper limit for land allocation) ▶ Introduce cooperative regional monitoring of internal development potential
Municipal	▶ Continuously record and activate internal development potentials (e.g. gaps between buildings, brownfield sites, areas for densification) ▶ Take into account vacancies and new potential in the existing stock when there is a need for self-development ▶ Encourage an active land policy e.g. to secure available municipal land, including development of affordable housing ▶ Commit to pursuing a land policy geared to the common good ▶ Remove traffic areas in favour of green and open spaces, spaces for meeting and living together, and residential areas

Module 2:

Spread new images for successful densely populated housing in surrounding areas

High quality architectural and urban solutions can ensure **environmentally friendly housing** in the EXURB which is affordable for all population groups and meets the needs for open spaces and quiet, for recreation and meeting spaces (cf. Recreation Module 2). The focus is on multi-story development with healthy living conditions, social diversity and attractive public spaces. In this way, mistakes of past suburbanisation processes are avoided and attractive alternatives to the detached single-family houses are provided. Case studies on resource consumption consistently show that the potential savings in terms of material use, land use and climate protection are high with vertical densification (additional storeys and attic conversions), horizontal densification (closing gaps between buildings) and conversion, as when compared to the building on greenfield sites (WI 2021). Municipalities and regions are coordinating their efforts among themselves to develop concepts and models as to how these goals can be developed and implemented in areas with a high housing demand. Local political actors should be made aware of the need of efficient land use and of the opportunities offered by high-density housing, for example by showing best practice examples (Wahrhusen 2019).

Bonuses for the creation of living space in apartment buildings provide additional incentives and can also be used to expand social infrastructure. Conflicts of objectives between dense forms of housing and climate adaptation are countered by a variety of measures such as rain retention and avoidance of overheating. The limited urban space can be made multidimensionally usable. Green roofs can protect against heat and cold, less sealed and water-permeable surfaces can store rainwater and supply urban trees with water even during drought (sponge city). New images for environmentally friendly housing in the EXURB open the possibility of developing lively suburban settlement cores and integrating other functions such as social infrastructure, shared spaces, recreational options or co-working.

Settlement types, Hanover Region

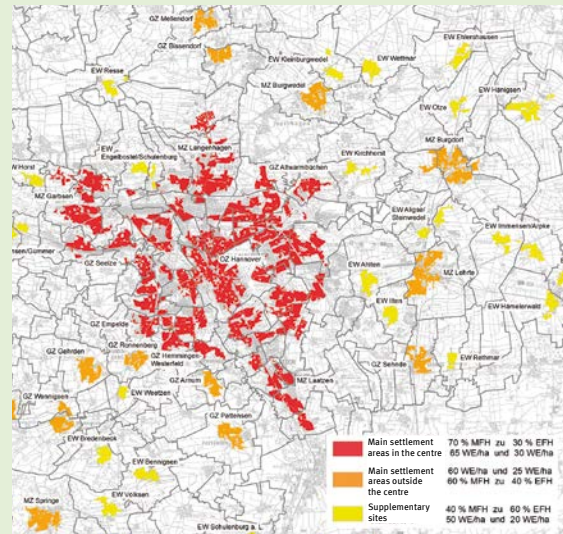


Figure 21

Source: Region Hannover, 2019 (S. 103)

Practical example of coordinated regional housing:

Since 2016 the Hanover Region has been responding to the housing demand in the city and surrounding area by implementing a coordinated regional housing initiative which supports municipalities in creating housing to meet demand. This includes activation of areas, support for price-controlled housing and bonuses for cities and municipalities that build multi-family houses. A “Regional Housing Supply Concept” was drawn up in close cooperation with the municipalities and the housing industry. Its aim is to concentrate the required housing in the main settlement areas in a socially “mixed” and high-quality form taking into account the respective conditions in urban and rural areas.*

* Further information:
https://www.hannover.de/content/download/801400/file/endbericht_regionales_wohnraumversorgungskonzept_region_hannover.pdf



Table 4

At a glance: New images for successful high-density housing

Level	Recommendations
Federal	► Demonstrate, promote models and communicate good examples for environmentally friendly housing in the EXURB ► Initiate competitions for environmentally friendly neighbourhood and residential developments in suburban areas ► Support joint building projects (building groups, building cooperatives) to implement housing concepts in suburban areas ► Provide financial incentives for high-density housing in the EXURB e.g. within the framework of Credit Institute for Reconstruction (German: Kreditanstalt für Wiederaufbau (KfW)) loans ► Encourage promotion of compact, climate-friendly neighbourhoods as part of the National Climate Initiative (German: Nationale Klimainitiative (NKI))
States (Länder) and regions	► Develop regional concepts for high-density building and housing ► Support multi-story residential construction in suburban and rural areas with subsidies (e.g. bonuses for multi-family housing)
Municipal	► Support areas for multi-family housing within the framework of urban development contracts, purchase agreements and concept awards (especially in tight housing markets) and provide them within the framework of urban land-use planning ► Create compact, self-contained buildings with quiet residential courtyards in the EXURB

4.4 Work

In the fields of commercial space development, mobility management and the use of modern forms of work have a great potential for sustainable urban-rural partnerships.

Module 1: Sustainable and cooperative management of commercial areas

The EXURB requires innovative concepts in the future to develop new and existing commercial areas with efficient land use and reducing the volume of traffic. As a rule, commercial areas are used monofunctionally. This should be stopped where possible and a mixed commercial and residential use should be promoted. Commercial areas unused over weekends can be used as possible green structures and multifunctional areas. Mixed commercial and residential uses must be organised such as to provide adequate noise protection and ensure quiet residential conditions. Increased noise tolerance in urban areas must be minimised for existing urban commercial sites to make sure that higher residential density and short travel distances are not compromised by excessive commercial noise. Municipalities should therefore pay attention

to appropriate regulations during the planning of commercial and residential areas (GAR BW 2019).

Commercial areas jointly allocated by several municipalities enable development that can ensure space-saving land use and reduce traffic (Veres-Homm et al. 2019). They have the advantage that they overall require less space and locations that are favourable in terms of transport and are environmentally less sensitive can be chosen (possibly with good railway and waterways connections). Where no such sites are available, commercial land development across municipalities can help create an economically viable demand for a railway connection or intermodal transportation. An annual saving of 118,000 to 355,000 tonnes of CO₂ equivalents can be achieved when 80 percent of newly allocated commercial areas are jointly developed (Veres-Homm et al. 2019). Joint parking management across companies can achieve optimum use of parking spaces and minimise land use.

Existing and future industrial parks should be planned and developed in such a way that the companies established there can cooperate as efficiently as possible. The EXURB Environmental presents a huge potential: joint procurement or office space usage

and climate-neutral supply and disposal can save costs and help protect the environment. Cooperative concepts bring advantages as they can make joint public transport services lucrative or more efficiently use office space (reducing space use and energy consumption per capita). Well-utilised, jointly developed commercial spaces can relocate and consolidate freight transport. Thus they have a positive impact on modal shift and make an important contribution to the energy transition in transport by combining locally produced renewable energy with an efficient charging infrastructure for electric cars and trucks (Veres-Homm et al. 2019). Concepts of cycle management similar to “industrial symbiosis” can activate environmental protection potentials by using residual materials from one process as raw materials for

another process. Such approaches should be taken into account in the future when companies are established on a site as they can offer great environmental protection potential (cf. IAT 2019).

In order to achieve this, municipal stakeholders are needed in addition to the local companies. The aim is to improve the ecological, economic and social competitiveness of the companies, the site and the region and to ensure good working and housing conditions for the citizens.

Table 5



At a glance: Efficient land use for commercial space development

Level	Recommendations
Federal	▶ Provide advice and training materials, establish consulting centres for sustainable business park management and highlight economic, ecological and social potential (e.g. land desealing options with positive effects on microclimate and water management) ▶ Organise and further develop funding programmes for area managers specifically for the EXURB (analogous to climate protection managers) with the goal of permanent funding ▶ Check to what extent existing funding frameworks may counteract inter-municipal development of commercial sites (e.g. funds to support regional economic structures, such as the German „Gemeinschaftsaufgabe ‚Verbesserung der regionalen Wirtschaftsstruktur‘“ (English: “Shared Task on the Improvement of the Regional Economic Structure”). ▶ Establish a land fund to take over and redevelop old industrial and brownfield sites
States (Länder) and regions	▶ Targeting federal and European Union funds to initiate appropriate consulting and training services for the EXURB ▶ Strengthen regional development with a focus on environmentally friendly jobs and structures ▶ Appoint an area manager: a responsible person is needed to develop commercial areas in a networked and environmentally friendly way or to strengthen the network. This post may be located in a regional planning association or in an independent agency. ▶ Strengthen inter-municipal cooperation in the EXURB and create the necessary foundations for this, e.g. by cooperation agreements, inter-municipal working groups and area managers as mediators and moderators (Veres-Homm et al. 2019).
Municipal	▶ Strengthen inter-municipal cooperation between the various departments in the municipalities (e.g. urban planning, business development, environmental and green planning, climate protection) and jointly develop sustainable industrial parks from the outset (via regular workshops, a staff unit in the municipal administration, round tables, seminars and further training courses). ▶ Elaborate development concepts for industrial sites ▶ Actively support networking among companies so that sustainable business parks can be established; encourage networking, e.g. through business breakfasts, advisory events, action days and programmes, support the formation of associations (e.g. business cluster associations)

Module 2:

Promote home office and co-working

The home office has become a new, everyday form of work for many people. Data on the proportion of employees who are able to work from a home office vary widely, ranging from 15 to 49 percent in the period March to May 2020 (UBA 2020: 17). At least for partial work from home, the values seem to lie more at the upper end of this range (Behrens/Bellmann 2021). From an environmental perspective, it is important to use the opportunities presented by this development for the EXURB and to counter possible negative effects with intelligent solutions (see Chapter 2.1).

However, there are many jobs in industry, trade and agriculture that cannot be relocated to the home office. These must also be taken into account for sustainable urban-rural partnerships and for an environmentally friendly design for work and commuting routes (see Work Modules 1 and 3). It is not currently possible to predict to what extent the demand for office space in the cities can be reduced – possibly just the use of the space will change (e.g. fewer classic workplaces/individual offices, more meeting spaces instead, Leitel 2020). There are also calls to use the trend towards home offices to convert office space into living space (Alliance of Social Housing Associations 2021). In both cases it would be an important environmental gain if such changes in the use of existing office space are realised.

Co-working in the district of Wolfenbüttel



Figure 22

Source: iStock.com/Drazen

Practical examples of co-working in the district of Wolfenbüttel: The district of Wolfenbüttel is planning a co-working space at the site of an old barracks. The district administration, the DRK district association, a co-working specialist, and other partners are involved. The major employers in the region are also involved in the project. From an environmental point of view, the goal is to achieve a significant reduction in commuter traffic in the region through a more flexible workplace design.

Table 6

At a glance: Home office and co-working spaces

Level	Recommendations
Federal	▶ Integrate the development of co-working spaces in suburban and rural areas into funding programmes ▶ Provide information regarding the opportunities for co-working for the sustainable development of the different spaces in the surrounding areas (e.g. through good examples, events) ▶ Allow the costs of setting up and maintaining workplaces in private homes and the use of co-working spaces to be tax deductible
States (Länder) and Regions	▶ Bring together, support and network stakeholders and potential interested parties for co-working spaces across municipalities (e.g. through business development)
Municipal	▶ Support co-working pioneers in the EXURBs, e.g. in the search for suitable existing properties and change of use concepts to meet the respective needs

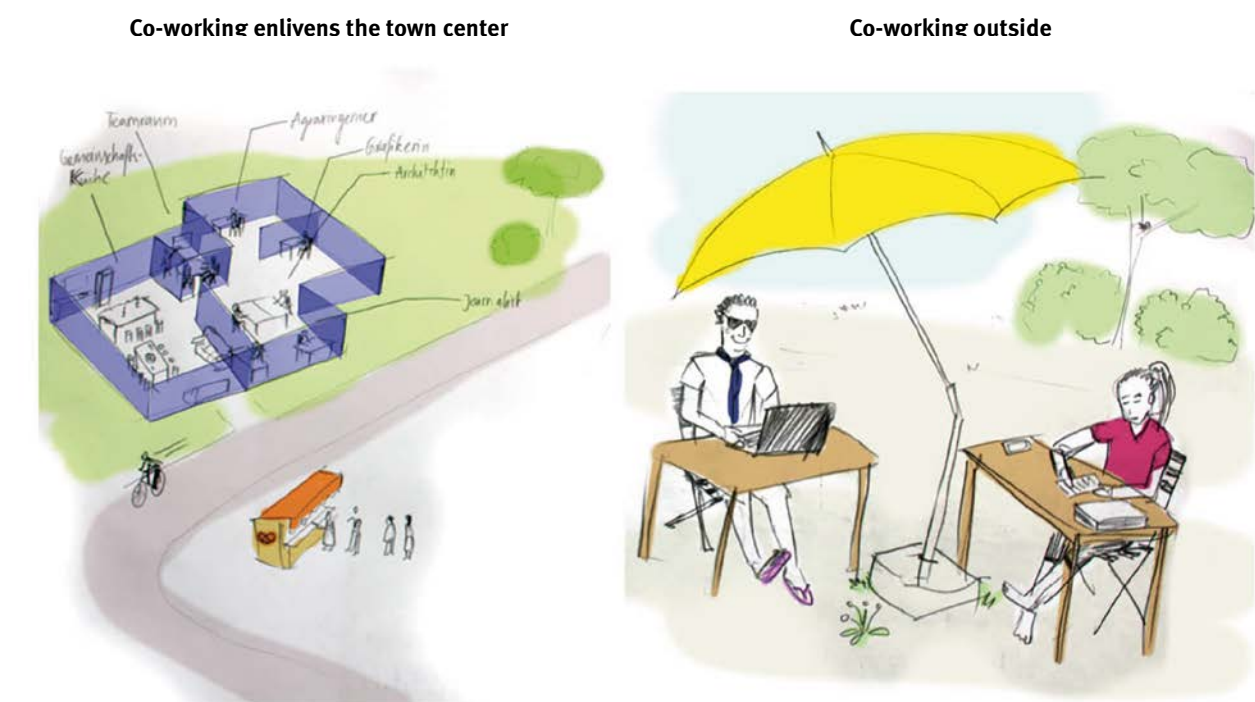


Another goal for sustainable urban-rural partnerships is the realisation of co-working spaces. The concept is already established in many cities but is not yet widespread in suburban or rural areas. Yet it can trigger many positive effects here in particular. It is an opportunity to reintegrate the “work” factor, to avoid dormitory towns, to utilize vacancies, to support social networking and thus ultimately to contribute to the development of the surrounding area as a centre for living. Co-working can strengthen the local economy, open up new business models for local hotels or gastronomy, or expand the possibilities for using association/club areas. Combinations with social infrastructure such as daycare centres are also possible (Bähr et al. 2020). Co-working spaces can contribute to the preservation of social places and infrastructure in the surrounding area and thus to the provision of public services. At the same time, they require a corresponding infrastructure (e.g. broadband, gastronomy, care services).

From an environmental point of view, existing real estate suitable for conversion includes former barracks (see example Wolfenbüttel), former restaurants and also railway stations or bank branches – all are advantageous locations (Bähr et al. 2020). However, different co-working business models are needed in suburban areas as opposed to urban centres (ibid.). Some of the winning entries in the #mobilwandel2035 competition run by the German Ministry for the Environment, Nature Conservation and Nuclear Safety show what these concepts can look like (<https://www.bmu.de/mobilwandel2035>).

Figure 23

Co-working in the EXURB



Source: TU Dresden, Amelung 2021

Module 3:

Systematic management of mobility

A significant proportion of the environmental pollution caused by public institutions and businesses is due to company and work-related traffic. According to the Federal Statistical Office, 68 percent of employees use a car to get to work. Even for short journeys of less than five kilometres, the car is the preferred means of transport for about 40 percent of those in employment. Systematic mobility management, which is well integrated with the municipal services offered by EX-URBs, can make a significant contribution to modal shift and a more efficient organisation of transport. It influences the demand for passenger transport and aims to make it more environmentally and socially acceptable as well as more efficient. Measures taken in the areas of information, communication, motivation, coordination, service offers and also infrastructure facilities can promote the use of environmentally friendly means of transport. Mobility management relies on different levels within the region, the municipality and business. The municipalities are fundamentally a central player in the design of sustainable transport services.

At the operational level, municipal institutions, businesses, administrations and schools can implement concrete measures – both cooperatively or across companies. The different target groups of EXURBs (e.g. new citizens, employees, tenants) are addressed. In the context of close links between the city and the surrounding areas, municipalities and companies, both regional and municipal mobility management and company-related mobility management play a decisive role in making transport sustainable. Measures for a more flexible choice of work location (see Work Module 2) and communication measures in place (e.g. mobility information for new employees, video conferences), can avoid traffic without restricting mobility. Incentives such as job tickets or the promotion of walking and cycling for journeys to work strengthen the modes of transport in the environmental network.

Municipal mobility management



Figure 24

Source: VRS online 2020

Practical example of municipal mobility management: The municipal mobility management of the Rhine-Sieg Transport Association (VRS) in North Rhine-Westphalia provides a network for municipalities, transport providers, businesses, schools and other mobility service providers in the region. The services offered range from personal advice and the organisation of an exchange of information and experience to qualification measures and the facilitation of cooperative ventures. In addition, there are advisory services for schools, kindergartens and other educational institutions. The Mobility Management Department is one of three coordinating offices in the NRW Future Mobility Network and works in cooperation with three other transport associations.

* Further information: <https://www.vrs.de/service/mobilitaetsmanagement>



Table 7

At a glance: Mobility management

Level	Recommendations
Federal	▶ Establish and finance a federal mobility management programme as a permanent task at federal level ▶ Introduce mandatory mobility management in all senior and higher federal authorities and their business regions (stipulated in the programme of measures for sustainability in the federal administration) ▶ Gradual introduction of mobility management for private companies and municipal institutions with 250 employees or more - Step 1: Incentives and funding for the introduction of mobility management for private companies and municipal institutions. Instrument: Establish and finance a federal funding programme for mobility management at the Federal Ministry of Transport and Digital Infrastructure as a permanent task at federal level - Step 2: Mandatory mobility management for private companies and municipal institutions with 250 or more employees at the end of the second funding period under the federal programme
States (Länder) and regions	▶ Establish incentives and funding for the introduction of mobility management for private companies and municipal institutions through funding programmes at State (Länder) level
Municipal	▶ Establish incentives for the introduction of mobility management for private companies and municipal institutions through funding programmes and their implementation at municipal level

4.5 Recreation

The open and green spaces of the EXURB are not only important for recreation seekers in the residential environment, but also for day trippers and day tourists. Depending on their differing size and distance - neighborhood, district-related, city-wide, city-regional – they also fulfil different needs for active and passive recreation. Considering the goals and recommendations, we show how these spaces should be designed as a central component of sustainable urban-rural partnerships.

Green Network Hamburg



Figure 25

Source: © BUKEA, Schulz-Schaeffer 2020

Practical example Green network Hamburg:

The Green Network Hamburg links parks, play and sports areas, allotment gardens and cemeteries through green connections. It consists of twelve radial landscape aisles and two green belts. The landscape aisles are widely connected green and open spaces that extend from the surrounding areas to the city*

* Further information: www.hamburg.de/gruenes-netz

Module 1:

Protecting and shaping regional open spaces and green infrastructure

Large-scale coherent open space networks are a basic prerequisite for the development and qualification of green infrastructure with its diverse ecosystem services at regional level (BfN 2017). To this end, the outer areas must be constantly protected from development – especially in the EXURB. This can only be achieved if the land use is controlled in a binding manner (see Housing Module 1) and the open spaces are secured in planning terms via greenways, green corridors, etc. For the protection of open spaces, synergies arise on a case-by-case basis with the designation of “quiet areas” in accordance with the EU Environmental Noise Directive. These areas are to be protected against an increase in noise in terms of noise prevention. However, as there are no generally accepted valid selection criteria, the relationship between urban land-use planning and the designation of quiet areas is not explicitly regulated. As a result, errors in the designation of “quiet areas” can call into question their legality and thus their binding effect. The legal basis must be further developed and incentives created to designate such areas. Within this context, it should also be ascertained whether a legal authorisation can be created to designate quiet areas as “quiet protection areas” analogous to the protected parts of nature and landscape according to Chapter 4 of the Federal Nature Conservation Act (BNatSchG). This could prevent certain disruptive behaviours in quiet areas.

In addition to the protection of open spaces, their qualification is an important task for the future (KORG 2020). The aim is to create networked, multi-functional, accessible and tangible green systems on all levels from the urban regions to the districts. To this end, green elements and water network structures and large-scale landscapes are networked with each other from single plots of land through districts and neighbourhoods to urban regions. These green networks and connecting corridors support ecosystem services such as the supply of fresh air and climate adaptation. In addition, they form valuable elements for the biotope network between open countryside and residential areas. It is also important to link the green connections between inner-city and urban regional open spaces with corridors for active mobility. This is to ensure that both local recreation areas that are of regional importance and densely



Table 8

At a glance: green and open space development

Level	Recommendations
Federal	▶ Provide consistent legal protection of outer areas (see Housing Module 1). ▶ Formulate guiding principles for the development and qualification of landscape and open space networks in the surrounding area and in the urban region ▶ Develop recommendations for linking green infrastructure and active mobility in the EXURB ▶ In addition to the categories of “quiet areas in urban agglomerations” and “quite areas in rural areas”, introduce a third category of “quiet areas for settlement structures smaller than urban agglomerations” ▶ Specify the exact selection criteria and action measures relevant for “protected quiet areas” for public authorities in order to avoid an overly heterogeneous administrative practice and thus simultaneously strengthen the instrument of “protected quiet areas” itself.
States (Länder) and regions	▶ Secure regional greenways, green corridors, etc. through planning ▶ Raise awareness of the importance of open spaces “by the doorstep” and their qualities (e.g. information, environmental education, information on landscape features, tour suggestions) ▶ Establish and support regional parks and green belts in and around conurbations ▶ Provide information to prepare for regional climate change and develop strategies ▶ Promote key projects at the regional level ▶ Support the development of regional value chains for agricultural products
Municipal	▶ Consistently keep outer areas free of buildings (see Housing Module 1) ▶ Link open and green spaces with active mobility and create “paths into the countryside” ▶ Use funding instruments (e.g. urban development funding) to develop multifunctional regional and municipal green infrastructure ▶ Establish and promote careful ecological management of green spaces with the involvement of relevant stakeholders (e.g. through the sharing of experience, training, guidelines) ▶ Combine the leasing of municipal agricultural land with set requirements for recreation, structural diversity, water management, etc. ▶ Set an emphasis on open space design, create climate friendly “oases”, preserve green and open spaces with a continuity of landscape use and design like a “time oases” (Schmidt et al. 2010)

populated inner-city areas are accessible in an environmentally friendly and health-promoting manner and to reduce commuting and leisure traffic (see Mobility Module 2).

Regional open spaces close to cities are to be developed and designed in such a way that they form attractive local recreation areas. The regional identities of landscape areas must be taken into account and strengthened, and the recreational infrastructure must be equipped with path networks and attractive destinations. They can be made accessible in an environmentally friendly way through appropriate visitor management (see Recreation Module 3).

In addition to the natural, near-natural and man-made green and open spaces, more attention should be given to landscapes used for agriculture and

forestry. The aim is to achieve greater integration of agriculture and recreational use in the EXURB. This can be achieved by increasing the structural diversity of the landscape and careful development for recreation. Synergies for the preservation of biodiversity and the strengthening of regional value chains for regional and sustainable food should be used. The protective and recreational function of the forests is strengthened.

The development of open spaces in the urban region also supports adaptation to climate change, for example, since they are areas where cold and fresh air corridors develop and are preserved. Further they promote water retention in the area both with regard to periods of drought on the one hand and to heavy rainfall events. Water retention can lower the impact of flooding events.

Conference of the regional parks and green rings (German: KORG)



Figure 26

Source: KORG Netzwerk 2021

Practical example Conference of National Parks and Green Belts: in 2012, regional parks and green belts merged to form a nationwide informal network in which 19 organisations are currently involved. The participants are committed to qualifying and strengthening open spaces in Germany. They complement and support formal planning levels and instruments. One important goal is to strategically strengthen multifunctional open space network systems in urban regions and conurbations.*

* Further Information: www.korg-deutschland.de

Module 2:

Enable leisure and recreational options in the residential environment

Providing for multifunctional leisure and recreational options in the residential environment¹ (within 5 minutes walking distance) increase the quality of life for residents in the EXURB and reduces motorised traffic. Leisure and recreational options within the pedestrian’s residential environment are of key importance especially for children, adolescents and less mobile people who are typically not able to travel long distances. Further, such places in proximity to the place of residence encourages exercise, promotes health and reduces traffic. A playground located along the way back from daycare or a café located next to a supermarket can reduce the need to travel further distances for everyday activities. Other multi-use facilities such as accessible recreational areas, car parks abandoned over weekends and market or commercial spaces (cf. Work Module 1) can also improve the quality of life in surrounding areas and counter the increasing use pressure on land.

In connection with the goal of establishing more compact urban forms of housing in surrounding areas (cf. Housing Module 2), multifunctional public, semi-public and open green spaces are of increasing importance for interaction and coexistence within the EXURB. For this purpose, it is important to bring together residents who own and help shape these spaces. At the same time, in order to make better use of the strengths of the surrounding area, existing barriers (busy roads or commercial areas) must be overcome. Open and recreational spaces in the residential environment should be connected on a large scale and integrated into an overall network in order to make better use of the advantages of surrounding areas such as the proximity to larger recreational areas (cf. Recreation Module 1).

¹ Residential environment, action-spatial unit comprising the area within walking distance in which the daily or frequently recurring activities of the associated residential population take place outside the home (shopping, trips to school, etc.) (Source: Spektrum Lexikon).

In addition, it is important to preserve, promote and support leisure options. This may include cultural facilities or offers such as open-air cinemas and the preservation of swimming pools, sports facilities and various club offers. Potential synergies arising from new forms of work results in a growth in opportunities for the surrounding areas, allowing for them to develop into new centres of work and life. This opportunity should be exploited and cooperation should be supported (cf. Work Module 2 and “Mobilpunkt-PLUS”). The options of “co-production” in the sense of “the common good” and community-promoting cooperation between citizens, administration and politics should be used creatively to maintain and further develop social infrastructure in the EXURB (Löffler et al. 2015). Even in the suburban space, such a focus on social aspects can open up new opportunities for green and open spaces to be created which can provide meeting space and community venues as has been discussed and practiced in urban areas for some time (Selle 2010).

With a view to creating sustainable urban-rural partnerships, it is important that leisure areas in the form of green and open spaces in the immediate residential environment, both in the city and especially in densely populated settlement areas with high development pressures, are preserved, further developed and maintained in order to reduce trips to the surrounding areas (UBA 2019).

Tabelle 9



At a glance: Leisure and recreation in the residential environment

Level	Recommendations
Federal	▶ Promote concepts to maintain and further develop leisure facilities and social infrastructure in suburban areas (swimming pools, sports facilities, cultural facilities, clubs etc.) as well as concepts of cooperation directed towards the common good and promoting the community (“co-production”) ▶ Use synergies for “burden sharing” from other policy areas, e.g. financing of social infrastructure in municipalities as compensation for infrastructure burdens (e.g. Section 36k of the Renewable Energy Act (EEG))
States (Länder) and regions	▶ Initiate cooperation to support, maintain and promote recreational spaces and leisure facilities across community boundaries ▶ Establish public transport service to leisure facilities and social infrastructure
Municipal	▶ Create, maintain and further develop multifunctional green and open spaces in suburban residential districts (climate friendly, exercise and health promoting, suitable for use by different population groups), connect them to the pedestrian and cycle path network and ensure good accessibility by public transport ▶ Initiate co-production, create areas for collaborative use ▶ Ensure simultaneous and further development of green infrastructure (including green roofs and façades) in the residential environment, particularly in the case of compact suburban housing within the framework of urban land-use planning

Module 3:

Making leisure activities environmentally friendly

The disturbances caused by leisure activities, especially at visitor hotspots, should be avoided as much as possible. An important goal is to create recreational opportunities in the “normal landscape” which are more accessible for users and thus relieve the pressure on particularly popular destinations of the EXURB. Examples include visitor guidance via well-designed and well signposted pathways, the creation of zones for intensive exercise and quiet recreation opportunities. Protection zones for nature, information boards, coordinated places to stay and infrastructure such as public toilets or public transport connections are important measures to avoid conflicts between recreation needs and landscape and nature conservation (Dorau/Grießer 2018).

Visitor monitoring including visitor counting and surveys as well as digital and interactive visitor guidance (Schmücker et al. 2019) can also help prevent overuse of particularly popular sites. Such measures enable the protection of natural areas and help avoid excessive traffic and associated noise problems. Volunteer and full-time rangers and landscape guides can contribute to the protection of landscapes by guiding visitor use, especially when the visitor numbers are high, pointing out the risks of overuse and conflicts and at the same time explaining and informing visitors about the value of nature and the landscape.

Table 10



At a glance: Environmentally friendly leisure activities

Level	Recommendations
Federal	► Prepare and communicate good examples of qualified leisure options in the area, e.g. to relieve visitor hotspots, provide visitor management, offer digital tools and direct communication (e.g. rangers, guides)
States (Länder) and regions	► Develop policy recommendations for municipalities, planning offices and event organisers to avoid and manage conflicts caused by recreational use ► Support regional cooperation on issues related to visitor management in open space and recreation areas, e.g. by creating leisure opportunities in the area and making the “normal landscape” attractive for the leisure users ► Information about further recreation sites outside of the visitor hotspots
Municipal	► Support visitor management using smartphone applications ► Deployment of rangers, landscape guides at visitor hotspots and in protected areas ► Qualify and publicise open and green spaces beyond visitor hotspots in the EXURB ► Introduce and publish regional guidelines for avoiding and managing conflicts caused by noise from recreational activities

4.6 Mobility

Sustainable transport requires behavioural and technological changes. As a result, traffic can be avoided and individual mobility will shift toward environmentally friendly means of transport powered by sustainable powering methods and fuels. Nationwide measures such as increasing the CO₂ price or levying a nationwide mileage-based car toll and other transport policy instruments can steer users away from private car use and towards the use of environmentally friendly modes of transport. Such measures create a framework that enables the actors involved to effectively shape transportation in the urban-rural scale (UBA 2019a, UBA 2020b). Last but not least, this framework includes sufficient funding for cities, municipalities and districts so that they can provide the necessary persuasion in terms of personnel – for example, with “caretakers” on site. Approaches that encourage playful forms of mobility in the EXURB can also encourage changes in behaviour. The four modules are of particular significance for reducing traffic in the urban-rural relationship and to make it environmentally friendly.

Module 1:

Support public transport and reduce motorised private transport

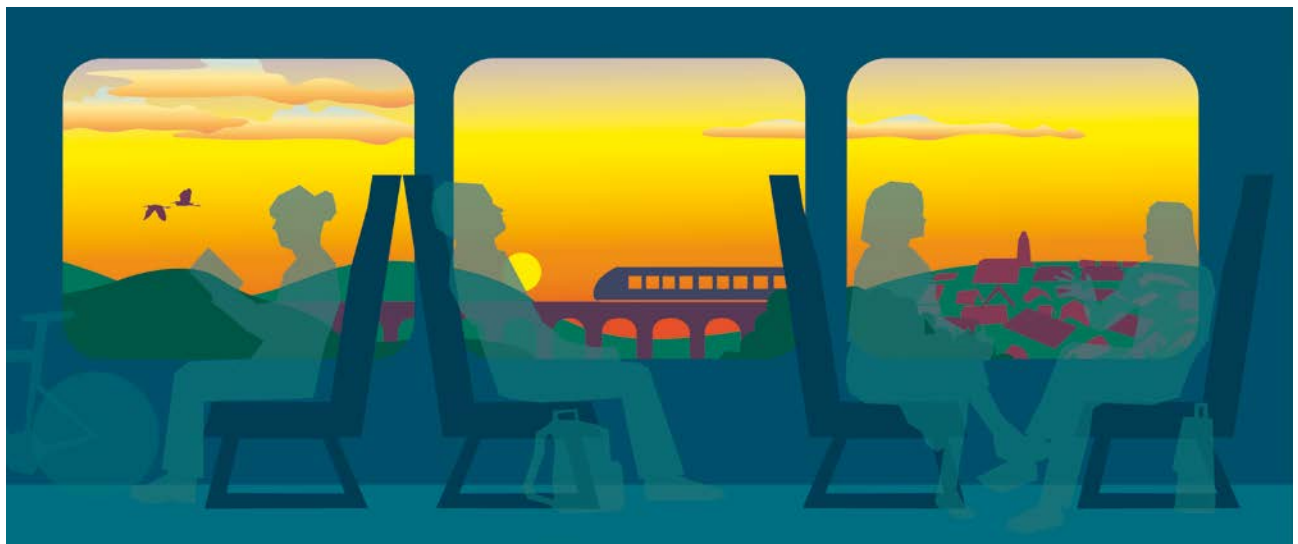
Public transport is an environmentally friendly alternative for many trips that would otherwise be made by car. It should be the backbone of urban-rural transport because it can cover long distances (often in the double-digit kilometre range) within a short amount of time. Public transport has special features that are otherwise reserved for motorised private transport. Means of transport such as buses and trains have significant environmental advantages over motorised private transport. Greenhouse gas emissions of a bus per passenger kilometre are only about half that of a car when considering the average passenger load (Allekotte et al. 2021).

A strong public transport system has a well-developed and qualitatively attractive range of services that can be used for (relatively) reasonable prices. In accordance with the respective local transport plans, line-based and demand-oriented public transport services as well as “mobility on demand” (car sharing, ride pools) complement each other at suitable locations and in suitable areas of operation. Having mobility platforms placed in the hands of public authorities allows for the smooth linking of different services.

Rail-bound passenger transport and express bus lines on main transport corridors with few stops and clear source/destination relationships shorten travel time. In addition, efficient mobility in a region can be

Figure 27

End of work in public transport



Source: TU Dresden, Amelung 2021

ensured through the creation of feeder and shuttle services, e.g. in the form of district bus/city bus systems in small and medium-sized cities, flexible services (on-call buses, shared taxis) or community buses, and ride-sharing services integrated into public transport or other ridepooling services. This “feeder function” will be significantly strengthened by future automated

and networked vehicles provided that corresponding services will be available on the mobility market. “Robotaxis”² will not compete with public transport and will be thoroughly regulated by law. Distance permitting, bicycles and pedelecs can also be used to get to and from public transport hubs. Parts of the travel distances between cities and surrounding areas can be comfortably travelled by bicycle because there are good connections between public transport stations and the main cycle routes and fast cycle lanes. A sufficient number of secure parking facilities at railway stations and bicycle-sharing services (in surrounding areas) and service stations is also necessary.

Easy public transport access systems and attractive and easy-to-understand tariffs, accompanied by good advertising and special promotions (campaigns, transport events) are further components of a high-quality public transport offer for the EXURB.

Electromobility also plays an increasingly important role in public transport. As a result of the implementation of the revised EU directive on the promotion of clean and energy-efficient road vehicles, electromobility will quickly become widely established in public transport. Transport infrastructure and residential development are coordinated. This leads to the development for residential uses to be based on the public transport network. When new residential areas are built, public transport access is ensured (cf. Housing Module 1).

Karlsruhe regional light railway



Figure 28

Source: Karlsruher Verkehrsverbund GmbH

Practical example regional light railway: The Karlsruhe model combines tram and railway to form a regional light railway system. The aim is to create direct connections between inner-city tram and S-Bahn systems and regional railway lines. Karlsruhe is considered a pioneer of such models. Such a railway system was first introduced here in 1992. With a route length of over 500 kilometres, the Karlsruhe light railway system is now one of the largest light railway networks in the world.

² Robotaxis are self-driving, driverless cabs.

Table 11

At a glance: Encourage public transport and reduce motorised private transport



Level	Recommendations
Federal	▶ The expansion of services and the improvement of public transport quality will be made financially sustainable using regionalisation funds in accordance with the Regionalisation Act (German: Regionalisierungsgesetz) and the Act on Federal Financial Aid to Improve Transport Conditions in Municipalities (German: Gesetz über Finanzhilfen des Bundes zur Verbesserung der Verkehrsverhältnisse in Gemeinden) as well as the creation of additional financing options. ▶ Introduce car tolls nationwide based on mileage and use the revenue to finance public transport or cycling.
States (Länder) and regions	▶ Make the provision of interstate public transport networks on important regular bus routes a mandatory task of the states (German: Länder) (e.g., supplementing existing regional bus routes with attractive express bus routes).
Municipal	▶ Strengthen public transport financing instruments and establish public transport as a mandatory task of municipalities

Module 2:

Strengthen cycling in urban-rural transport

In addition to public transport, cycling in particular represents an important opportunity for recreation through exercise and as an important alternative to individual transport in Germany’s diverse set of surrounding areas. Although weather conditions and individual health aspects can set limiting factors, urban-rural distances or partial distances tend to be short and can often be covered easily by bicycle or pedelec. An essential prerequisite is that facilities for daily activities are well located in the EXURB and placed along attractive routes which are easily accessible by bike. Being able to cycle across municipal and planning area boundaries is a central component in planning; the ability to cycle should guide housing and transport development so that they support sustainable mobility between cities and surrounding areas. In the future, commuting by bike should be widely accepted. It should allow for many people to actively travel their daily journeys in the surrounding area. The nationwide network of cycle routes in towns and districts are coordinated with each other and offer seamless connections between towns in the surrounding areas or between the city and the surrounding area. The network of high-quality fast cycle links

with clear signage and regular service stations along routes offers opportunities for leisure purposes and to travel comfortably without detours between daily destinations. Fast cycle links are not to go through protected areas, but preferably through agricultural areas. Structural elements should be used to enhanced these infrastructures such as hedges or fruit trees in avenues. Increasing the biodiversity can also be seen as a potential aspect of attractiveness. However, in cases where these recommendations are not possible, cycle lanes follow safe routes and separated from car lanes along existing transport links. Bicycle commuting will be promoted as part of a binding operational mobility management through measures such as secure parking facilities, changing rooms and showers.

In addition, taxes and financial incentives such as providing discounts for the purchasing and use of company bikes or competitions between organisations can further motivate people towards choosing to travel by bicycle for their daily commute. Where commuter distances are too long, there are either opportunities along the main cycle routes to park the bike safely and, if possible, free of charge, to then switch to public transport options. Where possible

Table 12



At a glance: Cycling in the surrounding area - urban mobility

Level	Recommendations
Federal	▶ Continuing financial support for fast cycle routes for urban-rural connections together with the states (German: Länder) and municipalities ▶ Support funding for rental bike stations in medium-sized cities and in the urban surrounding area ▶ Promote funding for multimodal mobility stations within the municipal guidelines
States (Länder) and regions	▶ Promote cycling in the urban surrounding area for everyday trips through programmes and campaigns ▶ Reduce existing “proof of need” hurdles with a defined threshold value such as “at least X cyclists must pass a point along the planned cycle lane per peak hour” for the construction of cycle lanes on state and federal roads ▶ Make it easier to take bicycles on public transport vehicles
Municipal	▶ Coordinate the financing and construction of fast cycle routes including signposting and service stations with a focus on urban-rural areas at regional planning or district level ▶ Promote multimodal mobility stations or “Mobility point PLUS” (German: “MobilpunktePLUS”) ▶ Make bicycle parking spaces mandatory by law for new commercial areas or new buildings ▶ Set up a programme for signposting footpaths and cycle lanes at railway stations or mobility hubs and other public transport stations in cooperation with the local transport associations

the opportunity to take the bicycle as a carry-on item should be offered free of charge or at a low cost (cf. Mobility Modules 1).

Bike sharing services offer a good availability of rental bikes, even in financially less lucrative locations in the surrounding areas, which facilitates the switch between cycling and public transport. Pedestrian travel is always considered as part of settlement development and transportation planning. Footpaths between public transport stations and stops lead safely and comfortably into residential areas. Signage indicating the length and duration of routes is standard at stations, stops and major destinations. As a result, more leisure trips are being made via various modes using various forms of environmentally friendly transportation.

Fast track bike path



Figure 29 Source: AGNH des Hessischen Ministeriums für Wirtschaft, Energie, Verkehr und Wohnen 2021, © HMWEVW – Corinna Spitzbarth

Practical example of cycling in surrounding areas:

The southwest fast cycle route from Brandenburg to Berlin is a good example of successful inter-city cooperation promoting cycling in the surrounding areas. The project partners Landkreis Potsdam-Mittelmark, the district of Berlin Steglitz-Zehlendorf, the state capital Potsdam, the city of Teltow and the municipalities of Kleinmachnow, Stahnsdorf, Nuthetal, Schwielowsee and Werder (Havel) want to open up new transport routes for commuters in particular. The inter-city cooperation project was developed on the basis of the Berlin Brandenburg Joint State Development Plan, which came into force in 2019.

Module 3:

Reduce motorised private transport and switch to electromobility

Transport sustainability strategies should also aim to optimise motorised vehicles – and in particular private car use – where it is still necessary. This includes, for example, the establishment or modernisation of Park+Ride (P+R) car parks and an expansion of parking space management in towns and the surrounding areas. Carpooling agencies or commuter portals should link car journeys (see Mobility Module 1). Reduced or privileged parking spaces for carpools and a price structure is differentiated according to location (or proximity to the city centre) and should be considered when developing transfer points in order to offer environmentally friendly alternatives to the car. This can make carpooling much more attractive and, when combined with P+R, also serves public transport; digital solutions are already facilitating the implementation of such systems today. Car-sharing concepts and concrete car-sharing offers from municipal and voluntary mobile facilities, private companies and also civic engagement, contribute to reducing the number of privately owned cars needed and to making it possible to live without your own car in the future, even in rural areas. In addition, car-sharing vehicles should be powered by electric motors.³

³ See also Blue Angel for car sharing service - Eco-label 100, <https://www.blauer-engel.de/de/produktwelt/alltag-wohnen/car-sharing>

The remaining individual transport by car should be covered by battery-powered electric vehicles wherever this is compatible with the usage profile. The range of electric vehicles is increasing and prices are falling, so that by 2030 at least four fifths of new cars should be electric. While in operation, electric cars are free of harmful exhaust emissions and therefore do not pollute the air. Battery-powered electric vehicles already have a clear climate advantage over internal combustion engines (Kämper et al. 2021). Nevertheless, even with electric cars, environmental impacts remain – for example in the manufacturing of the batteries and the provision of electricity, or through tyre and brake wear. In addition, at higher speeds such as on connecting roads between the city and the surrounding area, electric cars are about as noisy as cars with internal combustion engines (UBA 2013). It is therefore also true that trips done by electric car should also be used as infrequently and

as efficiently as possible, e.g. through carpool options and shared ownership.

Charging in public spaces should be widely available in order to make the use of electric vehicles more attractive. A sufficiently comprehensive charging infrastructure should also be established in the surrounding areas. This would allow for electric vehicles to be charged not only at home or work but also in other places, for example while shopping. This is particularly needed for plug-in hybrids which rely on both electricity as well as either diesel or petrol. Due to their design these cars have a smaller battery capacity than fully electric vehicles and thus need to be charged more frequently. The most suitable locations for charging options could also be transfer points for public transport or meeting points for carpools (see “Mobility point PLUS”).

Table 13



At a glance: Motorised private transport and electromobility

Level	Recommendations
Federal	▶ Advocate for a tightening of the European CO₂ fleet target values for new cars: by 2025 a reduction of 30 percent (instead of the current 15 percent) compared to 2021 and by 2030 a reduction of 80 percent (instead of 37.5 percent). ▶ Alternatively, introduce a national electric vehicle quota for new cars in 2030 of at least 85 percent. ▶ Bonus system for vehicle purchase (a bonus is levied for vehicles with high CO₂ standard emissions, which is then used to support battery-powered electric vehicles) ▶ New regulations for financial incentives for carpooling and electromobility (e.g. Federal Travel Costs Act, Income Tax Act)
States (Länder), municipal	▶ Strengthen parking management in rural and suburban centres ▶ Establish a charging infrastructure that fully covers the EXURB and whose development is financially and organisationally supported by coordinating bodies in addition to the federal government.

Module 4:
Traffic noise reduction

Noise can be controlled at the source, on the propagation pathway or at the place of emission. Noise protection at the source is always preferable to measures at the point of emission such as soundproof windows and walls. Efforts to reduce noise affect different aspects: in order for quieter vehicles to be built, the registration requirements set in international procedures must be tightened. Furthermore, users of very quiet vehicles should enjoy advantages; the users of very loud vehicles should experience disadvantages. This could be achieved, for example, with the introduction of a new regulation of national noise stickers for motorbikes and cars which conforms to EU law. Regular checks should ensure that vehicles are not operated unnecessarily loudly. In addition, spatial planning should strive for the greatest possible separation between source and place of emission. However, the greatest effect is achieved by reducing motorised traffic and shifting to more environmentally friendly modes of transport, especially for the EXURB (see Mobility Modules 1 to 3).

In order to reduce or resolve traffic noise problems, the instruments and measures available for noise reduction must be used even more ambitiously and efficiently. In addition to measures at the source, the appropriate instruments must be coordinated and targeted according to the local problems: from road technology (e.g. noise-reducing road surfaces) to traffic regulation (e.g. speed limits) to traffic and urban planning. This is done within the framework of noise management action planning according to the EU Environmental Noise Directive, which still needs to be strengthened with more ambitious targets and more scope for action for local authorities. Reducing the speed limit to 30 km/h on inner-city roads and to 80 km/h on connecting roads located near built-up areas is particularly cost-effective and can be effective rather quickly.



Table 14

At a glance: Traffic noise reduction

Level	Recommendations
Federal	▶ Strengthen noise management action planning, either through the introduction of ambitious targets in accordance with the EU Environmental Noise Directive or by increasing noise protection requirements in specialist legislation. ▶ Make 30 km/h the standard speed limit in built-up areas ▶ More leeway for municipalities to order road traffic measures for noise reduction ▶ Regulations for national noise stickers for motorbikes and cars designed to conform to EU law
Municipal	▶ Integrated ambitious traffic and noise management action planning with adequate solutions for the individual local conditions. ▶ Reduction of noise from motorbikes through regular police checks and speed limits ▶ Provide user benefits for especially quiet vehicles (verified by means of noise stickers)

5 Conclusion and outlook

For sustainable development, the surrounding area must be considered as a space in its own right. It has specific challenges to overcome, while also being closely linked to the core city. Its future will depend on action in four fields - housing, work, recreation and mobility. The vision of an “EXURB Environmental” will only succeed if all fields are developed jointly and in an integrated manner.

The vision of the UBA imagines a change in perspective: the surrounding area is much more than a transit area or a dormitory town defined by commuter relations to the city. In the future, it will be the centre of work and life for more people than today, while the quality of the environment will improve. As an “EXURB Environmental”, it has specific development pathways, tasks and opportunities. In doing so, it is important:

- ▶ to build in a way that protects the environment, the climate and resources and saves land,
- ▶ to protect open spaces from urban sprawl,
- ▶ to qualify open spaces by their various functions for recreation, leisure and sport, health and climate adaptation,
- ▶ to implement the transformation of mobility.

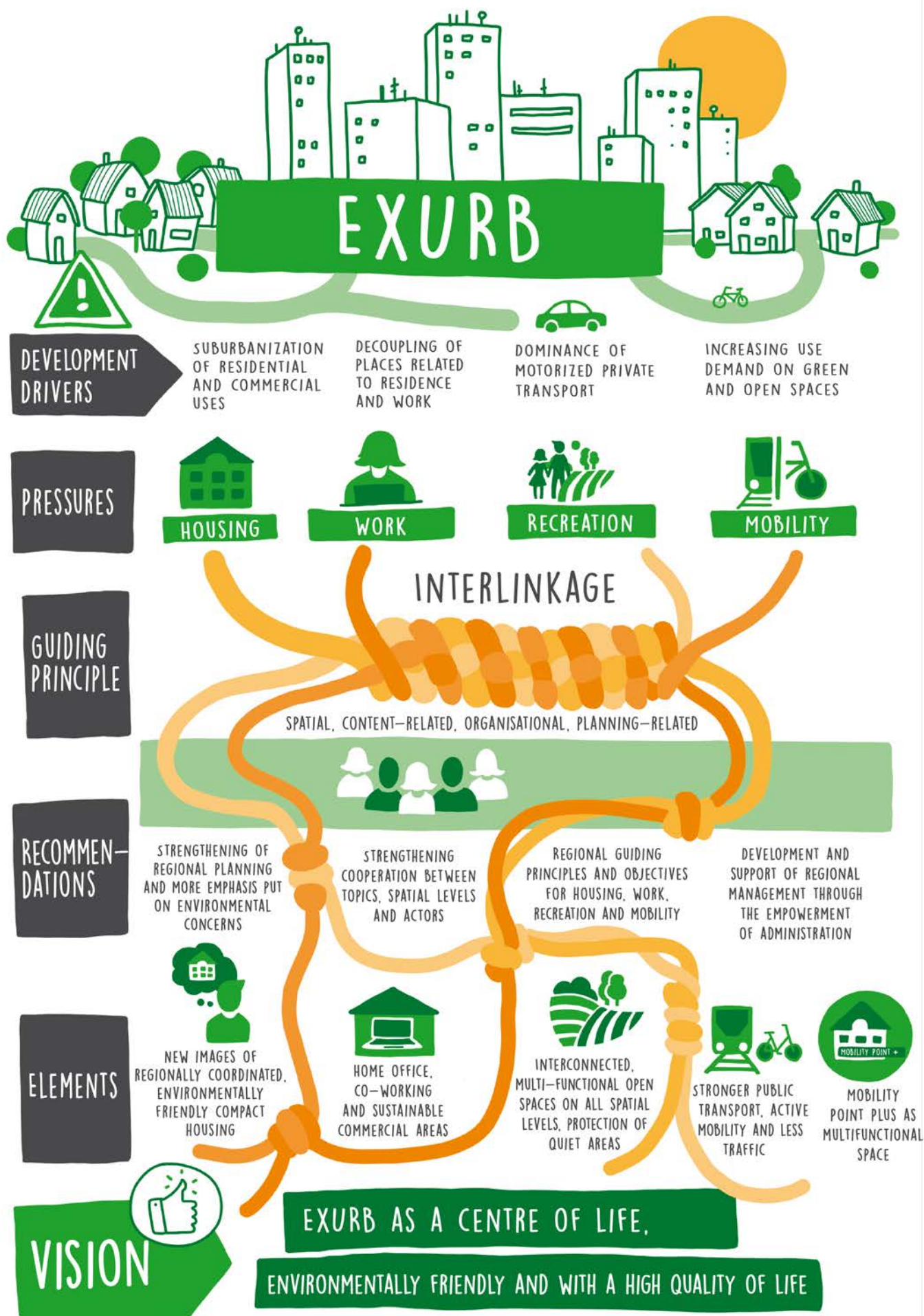
In view of advancing digitalisation and the coronavirus-pandemic, UBA are recognising new realities in life: in the future, some work will take place in a home office or co-working space, traffic will be avoided, active mobility will merit a larger share of surrounding area transport, recreational and leisure opportunities will be available in the local area as will shopping in the small corner shop. Digital mobility platforms are helping multimodal mobility to achieve a breakthrough and owning a car is becoming less important in favour of shared services. With its combination of housing, work, recreation and mobility, the vision of the “EXURB Environmental” makes a decisive contribution to improving the quality of public life.

In order to make the UBA vision a reality, goals and measures were formulated in twelve modules. In addition to many individual measures, two central goals are:

- ▶ (a) In order to promote sustainable urban-rural relations, we need flexible and strong cooperation between the surrounding areas and the city and between the municipalities in the surrounding area. Obstacles that slow down inter-municipal cooperation in the fields of residential and commercial land development, ecological transport transition and city-regional open space development must be removed. Mutual benefit and common guiding principles must come to the fore. In addition to strong formal regional planning, which takes greater account of environmental concerns, we need a variety of informal types of regional management, support for specialist planning, targeted funding and best practice examples. Instead of individual planning, we need a “fourfold interlinking” as the new guiding principle for the future which takes into account and links the fields of housing, work, recreation and mobility in an integrated way.
- ▶ (b) The “Mobility point PLUS” (German: MobilpunktPLUS) plays a central role as a hub for sustainable design. “Mobility point PLUS” is a transfer and linking point for sustainable mobility and a place for local supply, leisure and cultural facilities as well as for work and social infrastructure. It has the opportunity to become a real, tangible living centre, an “EXURB Environmental”.

Our goals, recommendations and measures are important starting points for sustainable partnerships between the urban surrounding areas and the city and environmentally sound development. However, they do not stand in isolation. They require support from synergetic ideas from other fields of action. These include, for example, regional food production, climate-friendly energy supply and sustainable infrastructure systems. Interdisciplinary themes such as climate adaptation, decarbonisation and digitalisation play an important role in the fields of housing, work, recreation and mobility. However, these are also focal points in their own right that require further scientific, planning and political consideration in terms of their significance for the sustainable development of suburban areas. Various questions on these topics are addressed, for example, within the framework of the “Stadt-Land-Plus” (Urban-Rural-Plus) funding program (see Infobox 3).

It is also worth taking a closer look at some of the “intersections” of content as well as space in the interconnected areas. One example is the relationship of active mobility in the surrounding area to city traffic and its overlap with the urban regional open and green spaces. Another is the changing world of work – also following the coronavirus-pandemic – and its opportunities and risks for sustainable mobility as well as for public services and social infrastructure. These and other issues of sustainable urban-rural partnerships will continue to require the attention of scientists, regional development stakeholders, municipalities, planners and politicians in the years to come.



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