BBSR-Analysen KOMPAKT 15/2020

India, Germany and Europe

A Spatial Perspective at SDG 11 on Sustainable Cities and Communities

Responding to crucial challenges in urban and rural development the United Nations decided on the New Urban Agenda and on the 2030 Agenda and the Sustainable Development Goals (SDGs). This publication checks the progress made in implementing the New Urban Agenda against the SDGs and vice versa. In order to understand the spatial patterns, a national and supranational spatial perspective is taken on some of the SDGs. Given the cross-sectoral nature of cities and communities and their sustainable and resilient development, SDG 11 constitutes an interconnection point and thus covers:

- Adequate and affordable housing
- Level of motorisation and traffic casualties
- Land-use and protected landscapes as well as connection to public water supply and waste in its broadest sense

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within the Federal Office for Building and Regional Planning

Joint foreword

Dear Reader,

the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) and the National Institute of Urban Affairs (NIUA) signed in 2018 a Joint Declaration of Intent to cooperate on different aspects of evidence-based research and expert positioning as well as policy advice. Several expert workshops and a series of joint presentations at the United Nations World Urban Forums 2018 and 2020 have led to a better understanding of our common challenges and to better knowledge of possible solutions.

A first joint publication of BBSR and NIUA (BBSR-Analysen KOMPAKT 06/2019) was dedicated to spatial structures and trends in India, Germany and Europe. The analysis focused on population development and migration, urbanization and suburbanization as well as land-use for new settlements. The positive resonance by readers encouraged us to continue our joint analytical work.

The United Nations remind us with their revised World Urbanization Prospects of 2018 of the urbanization changes affecting all countries worldwide. In that respect, our joint work and expert exchange are a part of the bilateral urbanization partnership between the responsible ministries in India and Germany.

In the framework of our cooperation, we develop and deepen a comparable picture of the spatial structures and trends in our countries and continents. In doing so, we try to find and further strengthen a common data-oriented language that is based on national and supranational data sources and may contribute to making global data sets compatible.

Our joint efforts are guided by the thematic priorities defined in the New Urban Agenda of the United Nations and its references to the Sustainable Development Goals (SDGs) – this publication focuses on SDG 11 on Sustainable Cities and Communities.

We wish you a stimulating reading.

Dr. Markus Eltges
Director of the Federal Institute for Research on Building, Urban Affairs and Spatial Development

Hitesh Vaidya
Director of the National Institute of Urban Affairs

Introduction

BBSR and NIUA continue with this publication on the Sustainable Development Goal 11 in India, Germany and Europe as well as the accompanying publications on SDG 3 and SDG 4 their efforts in identifying and applying a comparable approach to reporting on urban and rural development. The publication describes the findings in texts and maps in the same way as it discusses similarities and dissimilarities from national and supranational perspectives – all within the limits of available and comparable data sources.

The United Nations set a new policy framework for urban and rural development with the 2030 Agenda and the Sustainable Development Goals (SDGs) in 2015 and the New Urban Agenda in 2016. Their revised World Urbanization Prospects (UN DESA 2018) provide updated estimates and projections of the urban and rural population for all countries of the world as well as their major urban agglomerations.

Reporting on the implementation of the New Urban Agenda will start in 2022. UN-Habitat, the housing and settlement programme of the United Nations, is expected to provide evidence-based and data-oriented reports – so called Quadrennial Reports – every four years from that year on. Member States of the United Nations are invited to report on the national and sub-national implementation by 2021. This publication contributes to these reporting mechanisms.

As cross-references between the New Urban Agenda and the 2030 Agenda are evident, the SDGs and their underlying indicators constitute the analytical pattern of the publication. Considering the availability of data sources at national and supranational level, it covers with regard to SDG 11 (Inclusive, Safe, Resilient and Sustainable Cities and Communities) the following selected sub-goals (the figures in brackets refer to the numbering of the Global Indicator Framework adopted by the General Assembly of the United Nations):

- New residential buildings (SDG 11.1.1)
- Renting prices (SDG 11.1.1)
- Level of motorisation (SDG 11.2.1)
- Traffic casualties (SDG 11.2.2)
- Land-use (SDG 11.3.1)
- Protected landscapes (SDG 11.3.1)
- Public water supply (SDG 11.3.1)
- Amount of waste (SDG 11.6)

While data availability determines the analysis, national or even supranational programmes support respective development and change. Given the cross-cutting nature of SDG 11 as well as the different constitutional settings of India and Germany, this part of the introduction mentions crucial aspects in that respect. European aspects are referenced in the respective chapters.

Housing is one of the basic needs of people and must remain affordable. In India, the construction of new residential dwelling units seems to be very important in the context of the country. It also signifies the expansion of the built-up area with increasing population. In Germany, in very dynamic centres and agglomeration areas, the strong influx of new residents raises the costs of housing. This results in displacement effects on citizens by wealthier new citizens. In Germany, the Federal Ministry of the Interior, Building and Community (BMI) launched in 2014 the Alliance for Affordable Housing and Building (BMI 2020) to deal with current housing policy challenges. As part of the dialogue process, solutions to these challenges are developed together with the Länder, municipalities and their associations. This dialogue aims at meeting the increasing housing needs and taking into account social, demographic and energy requirements.

Traffic casualties may be closely linked to the level of motorisation and contribute to a higher adult mortality in developed and developing countries as well as emerging economies. SDG 11 also envisages a reduction in deaths by road traffic accidents by half until 2030. India committed itself at the Road Safety Conference, held in Brazil in 2015, to reach this level. In Germany, car-ownership is still an issue, though programmes supporting a wide range of mobility materialise in diverse forms, depending on the respective urban and rural settings.

Open and qualified green spaces are of utmost importance for urban sustainability and the physical and mental well-being of inhabitants. In addition, these spaces may counteract air pollution generated in cities. SDG 11 also focuses on the availability of green spaces in cities and communities. Due to increasing urbanisation and densification as well as population growth, green spaces are under pressure. According to the revised World Urbanization Prospects of UN DESA (2018), more than half on India's population is estimated to live in urban areas by 2050. Without planning green spaces in a sustainable way and protecting them against change in land-use, cities and communities would most probably be severely affected. Access to safe water is a basic need and is also a major focus of SDG 11 (and SDG 6) in the same way as solid waste management is a crucial aspect of sustainable and resilient urbanization.

New residential buildings

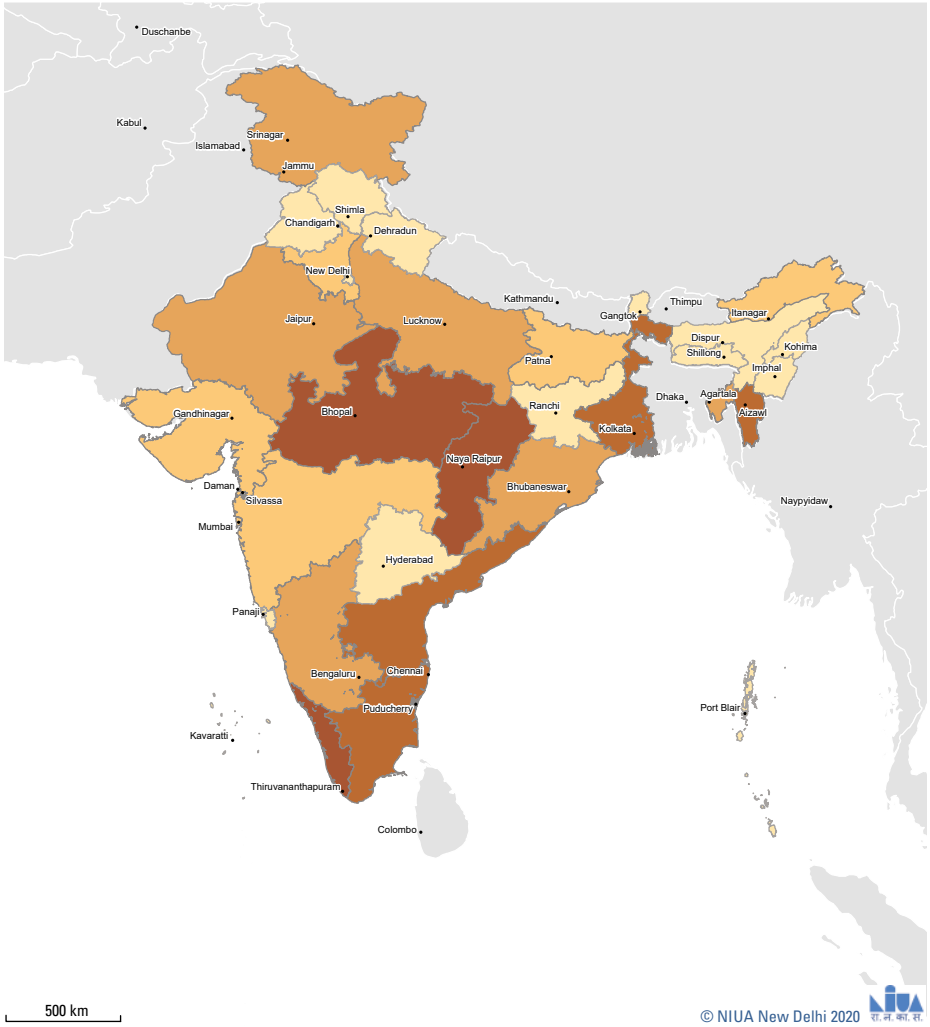
As per the Census of India (Registrar General India 2011), 38.3 % of households in India with 3 or more members live in one-room dwellings and 2.9 % in dilapidated dwellings. Thus indicating the housing crisis in cities in India, constructing new residential building units seems crucial for the country's context. In addition, the built-up area expands and the population increases.

It can be observed that 30.52 % of the households in Chhattisgarh live in newly constructed residential units representing the highest share in the country. States like Madhya Pradesh and Kerala report with 26.35 % and 26.16 % respectively, similarly high shares of urban households living in newly constructed residential building units. In Chhattisgarh and Madhya Pradesh, where levels of urbanization are very low, the high shares indicate, on the one side, an ongoing rural-urban transformation. On the other side, the high number of urban households living in new residential building units in Kerala indicates that in-situ urbanisation there took place due to the emerging large number of new census towns. In parallel, states like Andhra Pradesh, Tamil Nadu and West Bengal also report a high share of households living in newly constructed residential building units. Like Kerala, these states witnessed an emerging large number of new census towns resulting in the construction of new residential building units.

At the other end of the spectrum, states such as Goa, Sikkim, Nagaland, Uttarakhand and Himachal Pradesh show no urban households living in new residential building units. These states, except Goa, are characterised by a low population density and a low urbanization rate explaining their low share of households living in new residential building units. Highly urbanized areas like the Union Territory of Chandigarh and the Union Territory of Delhi interestingly report a low share of new residential building units. All these states show very dense built-up areas and lack available spaces for news construction sites. Urban centres in states such as Gujarat and Maharashtra report a lower share of households living in new residential building units.

The spatial variations indicate that states with a large number of new urban centres show a high share of households living in new residential building units. Sparsely populated as well as highly urbanized states though reveal a low share of such households.

New residential buildings in India



Number of housing units constructed per 1,000 existing dwelling units, 2018

- up to below 5
- 5 up to below 10
- 10 up to below 15
- 15 up to below 25
- 25 and more
- no data or inadequate sample size

Data source: National Statistical Office 2018
Data origin: Drinking Water, Sanitation, Hygiene and Housing Condition
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

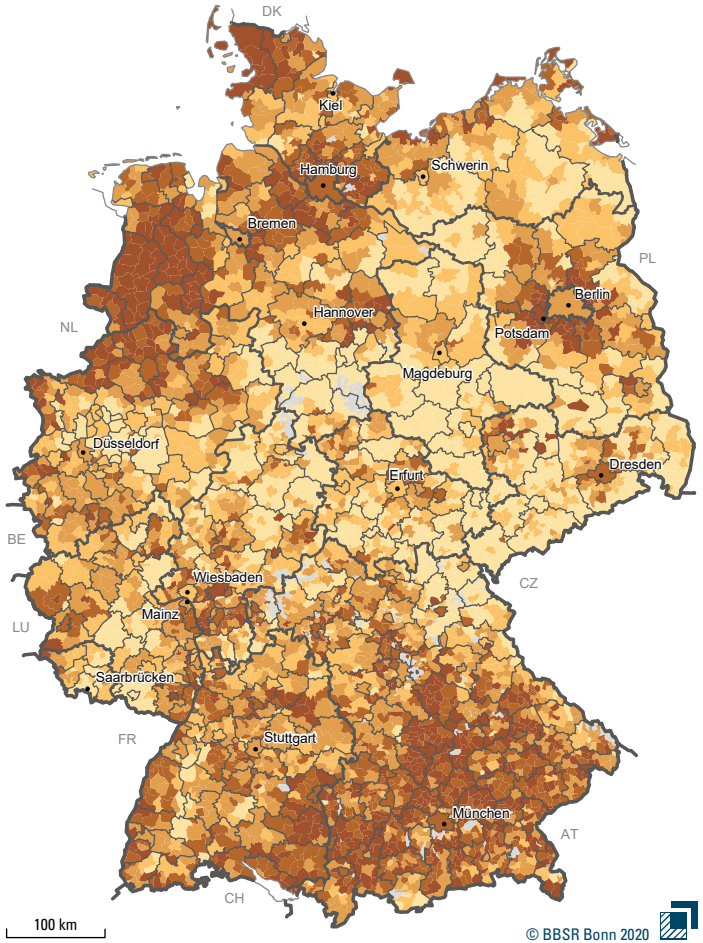
Disclaimer: The information on this map has been created with the highest degree of accuracy possible. However, NIUA cannot be held responsible for errors, omissions or positional accuracy. The depiction of boundaries is not authoritative.

New apartments are primarily needed and built where the population is growing most. However, it is not only the population growth that requires new living space, but also changing demands by new structures of households and living standards.

Housing requirements in Germany are based on both, the influx of new residents as well as the increase of one-person households and the growing demand of inhabitants for larger personal living spaces. The fact that building new homes and flats is sometimes cheaper than renovating old ones, particularly with regard to complying with new energy standards, also leads in some cases, particularly in areas with a shrinking population, to new buildings even if older residential buildings in the neighbourhood fall vacant.

Although financial aspects matter, the structure of existing buildings and the individual demands of those generating property prevail.

New residential buildings in Germany



Number of completed housing units per 1,000 existing housing units, average of 2015/2016/2017

- up to below 3
- 3 up to below 5
- 5 up to below 8
- 8 up to below 10
- 10 and more
- unincorporated and uninhabited areas

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Statistical Offices
Geometric basis: Associations of Municipalities (generalised borders), 31.12.2017
© GeoBasis-DE/BKG
Author: A. Milbert

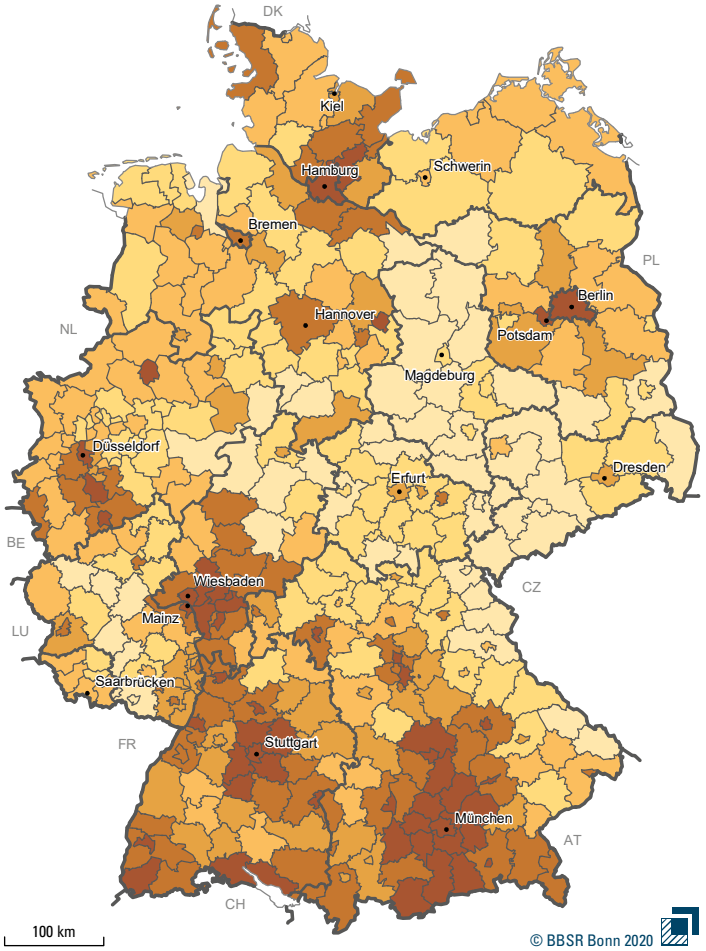
Renting prices

A package of measures was approved at the 2018 Housing Summit in Germany launching a joint housing campaign by the Federal Government, the Länder and the municipalities. It shall enable the construction of 1.5 million new apartments during the legislative period from 2017 to 2021. In 2017, overall 245,000 new flats were built and in 2019 already 293,000, the latter constituting 84 % more than in 2009 when only 159,000 new apartments had been constructed. However, a shift from constructing one- and two-family houses to multi-family houses and multi-storey apartment buildings gets visible.

The regional centres of construction activity reflect the regional differences in population development. They may be found in the southern part of Germany, in the surrounding areas of the big cities and in some border regions with Belgium, the Netherlands, Luxembourg, France and Denmark. Space availability limits construction activity on the local level. As the demand for new apartments is highest in large cities, though they might lack construction sides, many new apartments are built in their surrounding areas. There, the highest construction activity is recorded in small towns and rural communities with around 30 new apartments per 1,000 existing apartments. Some larger cities report having built 36 new flats per 10,000 inhabitants in 2019 in the same way as in rural counties of higher density 37 new apartments per 10,000 inhabitants had been constructed in the same year.

New apartments are also built in areas suffering from population decline. Many municipalities are in competitive situations to attract new citizens and thus designate new affordable housing projects. Young families in particular are supposed to settle in these new residential areas. In contrast to the trend of constructing new buildings, some municipalities are however promoting the renovation of old buildings, particularly in order to (re)revitalise older village and city centres.

Renting prices in Germany



Average renting price, excluding heating and other additional costs, new on the market in Euro per square metre (property rent), 2017

- up to below 5.20
- 5.20 up to below 6.00
- 6.00 up to below 6.80
- 6.80 up to below 7.60
- 7.60 up to below 9.00
- 9.00 and more

Data source: Spatial Monitoring System of the BBSR
Data origin: BBSR-Monitoring System of the Real Estate Market
Geometric basis: counties (generalised borders), 31.12.2017 © GeoBasis-DE/BKG
Author: A. Milbert

The housing market and its rental sector has become an important factor of choice for a large group of the urban population in India, particularly migrants, unemployed and under-employed people and those of the lower stratum of society (Kumar 2016).

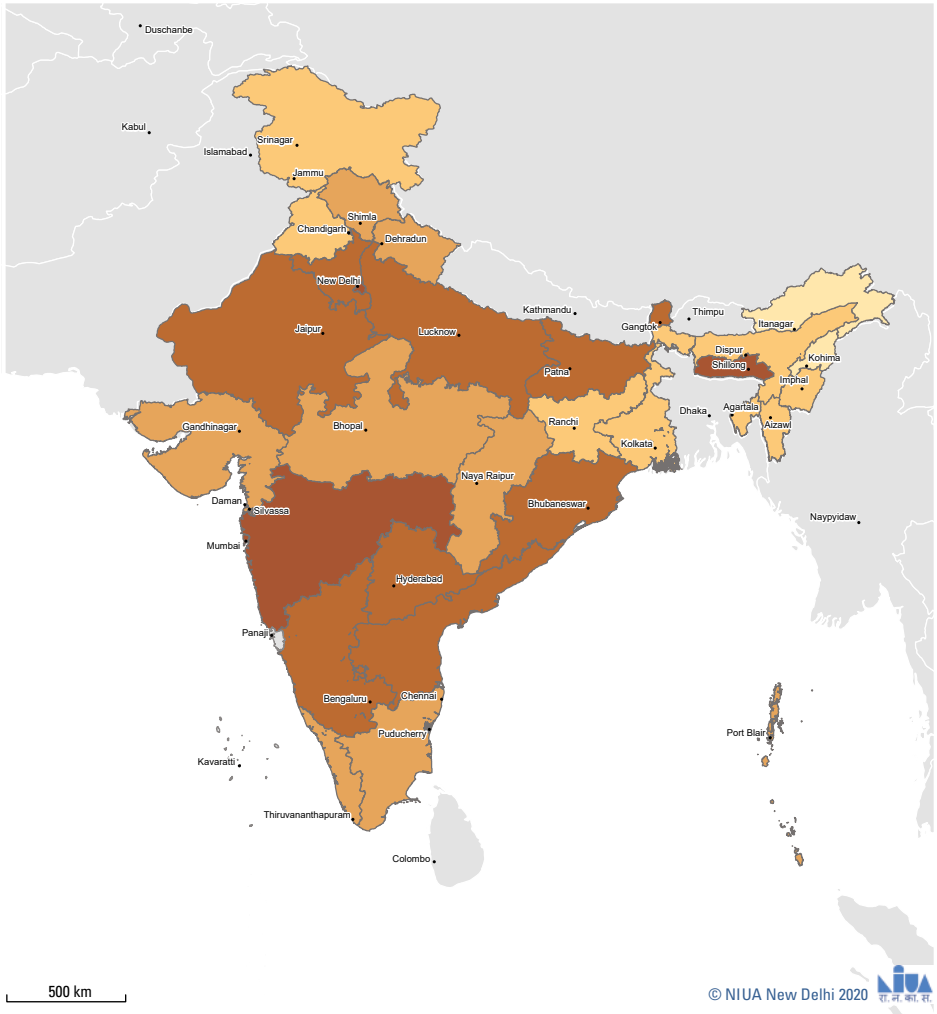
The National Statistical Office (NSO) estimates that nearly a third of urban households lived in 2018 in rental accommodations. The share at state level of households living in rented accommodations swifts between 88.4 % in Daman & Diu and 3.8 % in Lakshadweep amongst the Union Territories as well as from 67.5 % in Himachal Pradesh to 6.7 % in Manipur amongst larger states. Amongst larger states, Sikkim, Arunachal Pradesh, Meghalaya, Telanganga, Andhra Pradesh, Karnataka and Tamil Nadu show a higher share of their urban households living in rental accommodations.

Rental prices vary widely amongst states. Estimates within the course of the NSO survey on drinking water, sanitation, hygiene and housing conditions (2018) show the average rental price of 168.39 Indian Rupee / 2 Euro per m² as reported for the urban part of Maharashtra. High rental prices root in high land prices in the Mumbai Metropolitan Region, including the Cities of Thane and Navi Mumbai. Maharashtra is also home to other cities like Pune showing also high prices for rental accommodations. Following Maharashtra, Delhi reports an average rental price of 156.59 Indian Rupee / 1.86 Euro per m². Both receive a large number of inner-Indian migrants across all income categories resulting in an increasing pressure on rental prices. States like Meghalaya (135.55 Indian Rupee / 1.61 Euro per m²), Karnataka (133.86 Indian Rupee / 1.59 Euro per m²) and Chandigarh (133.02 Indian Rupee / 1.58 Euro per m²) report almost similarly high rental prices. States like Sikkim, Telangana, Odisha, Rajasthan and Bihar face higher average rental prices in urban areas.

At the other end of the spectrum, Arunachal Pradesh reports an average rental price of 49.67 Indian Rupee / 0.59 Euro per m². Following Arunachal Pradesh, Nagaland (55.57 Indian Rupee / 0.66 Euro per m²) and Mizoram (66.51 Indian Rupee / 0.79 Euro per m²) communicate rental prices which are also amongst the lowest. These states are all located in the mountainous terrain of the northeastern part of the Himalaya and are sparsely populated – a fact that might explain the low level of rental prices.

States like Tamil Nadu, Puducherry, West Bengal, Assam, Jharkhand, Punjab and Jammu & Kashmir report similarly low rental prices.

Renting prices in India



Average renting price in Euro per square metre, 2018

- up to below 0.70
- 0.70 up to below 1.00
- 1.00 up to below 1.30
- 1.30 up to below 1.60
- 1.60 and more
- no data or inadequate sample size

Data source: National Statistical Office 2018
Data origin: Drinking Water, Sanitation, Hygiene and Housing Condition
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

Note: 1 Euro = Indian Rupee 84.19 (as of 30.09.2018)

Disclaimer: The information on this map has been created with the highest degree of accuracy possible. However, NIUA cannot be held responsible for errors, omissions or positional accuracy. The depiction of boundaries is not authoritative.

Level of motorisation

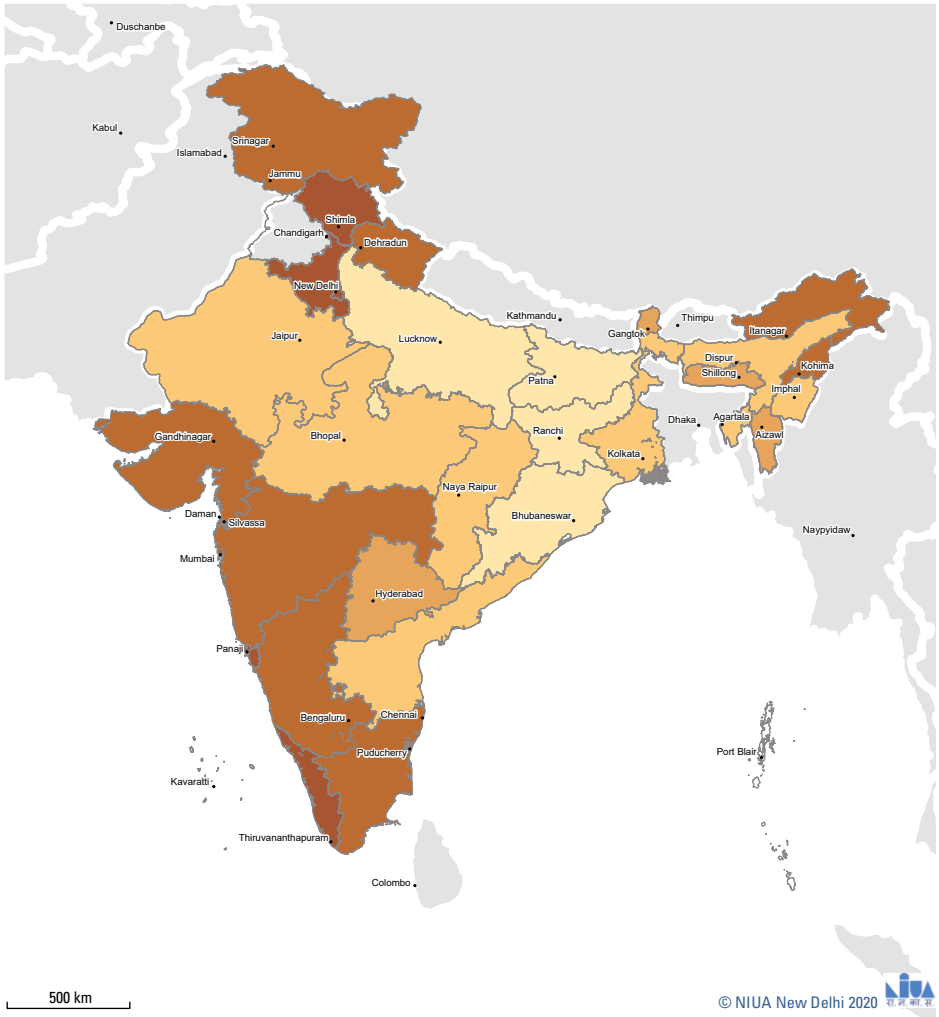
One of the main modes of mobility in India is road transport. However, people are more dependent on two-wheelers in the same way as access to a personal car is still perceived as a symbol of affluence. In any case, mobility is the most important aspect of urbanization and economic development of a region, particularly in India.

The Road Transport Year Book 2016–2017 provides the total number of registered personal cars at state level (Government of India 2019). Calculating the number of registered personal cars per 1,000 people is carried out on the basis of the latest population projection in relation to the Census of India (Registrar General India 2019). In 2017, there were 253.3 million registered vehicles, amongst which 91.8 % are registered in a non-transport category. 28.6 million vehicles are registered as personal cars, constituting around one tenth.

The Union Territory of Chandigarh shows 408 registered personal cars per 1,000 people being the highest in the country. Goa follows with 164 personal cars and Delhi with 161. Chandigarh and Delhi are home to the wealthiest people in India. Goa is similarly urbanized and one of the famous touristic destinations. Daman & Diu is the next one in line with 85 personal cars per 1,000 people, followed by Kerala (69 personal cars), Haryana (66 personal cars) and Puducherry (63 personal cars per 1,000 people). At the other end of the spectrum, the Island State of Lakshadweep has only 2 registered personal cars per 1,000 people, followed by Bihar (3 personal cars), Odisha (8 personal cars), Uttar Pradesh (9 personal cars) and Jharkhand (10 personal cars per 1,000 people).

Generally speaking, states with higher levels of urbanization and income per capita show higher levels of motorisation. Low-income states and those which are less urbanized are characterised by lower levels of motorisation. Mountainous states like Himachal Pradesh, Uttarakhand, Jammu & Kashmir and Arunachal Pradesh show interestingly higher levels of motorisation, most probably because people there depend on personal cars in hostile terrains.

Level of motorisation in India



Number of registered cars per 1,000 inhabitants, 2017

- up to below 10
- 10 up to below 20
- 20 up to below 30
- 30 up to below 40
- 40 and more
- no data or inadequate sample size

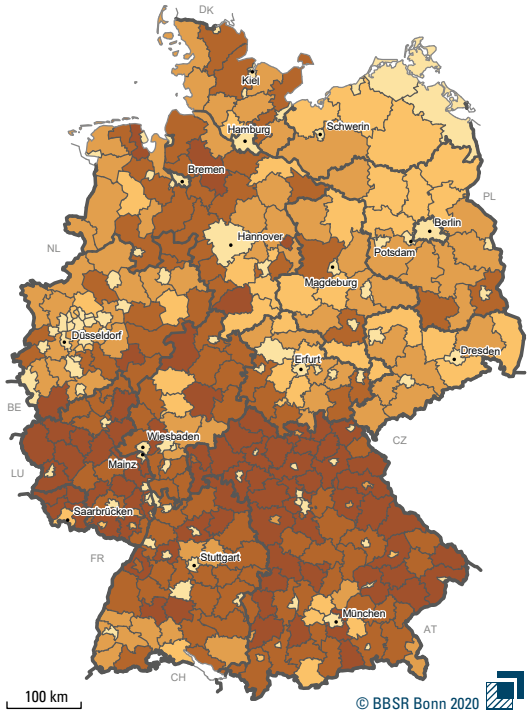
Data source: TRW, Ministry of Road Transportand Highways & National Commission on Population
Data origin: Road Transport Year Book, 2016–2017 and Population Projection: 2011–2036
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

Disclaimer: The information on this map has been created with the highest degree of accuracy possible. However, NIUA cannot be held responsible for errors, omissions or positional accuracy. The depiction of boundaries is not authoritative.

1 out of 2 Europeans owns and uses a personal car. This relation results in approx. 230 million cars moving and standing on Europe's streets. The highest number of cars may be found in Luxembourg, Italy and Finland. Particularly in rural areas, there are more cars in use, with the exception of Spain, Greece and Romania where the highest share can be found in the capital cities. Differences between eastern, western, southern and northern countries in Europe are not necessarily obvious. In Poland and the Czech Republic, the share of car ownership is higher than in France for instance. Generally speaking, France and Spain, but also the UK, show below average numbers of cars.

50 % of all journeys in Germany were taken in 2017 by personal car (BMVI 2019), 30 % on foot and 10 % by public transport apart from other modes of transport. On average, 550 out of 1,000 persons own a car. The once historic difference between the eastern and the western part of Germany still persists. The lower level of motorisation in the eastern part of Germany is, amongst others, likely due to lower household incomes. The availability of personal cars in suburban areas is particularly high. It is obviously more attractive for many employees living in suburbia and working in the city to use a car instead of any other mode of transport. The degree of motorisation, however, does not influence the frequency of accidents and casualties. In cities for example, the level of motorisation is especially low although the traffic volume caused by in-commuters, day tourists and shoppers is particularly high and thus the number of people injured and killed in road traffic accidents.

Level of motorisation in Germany

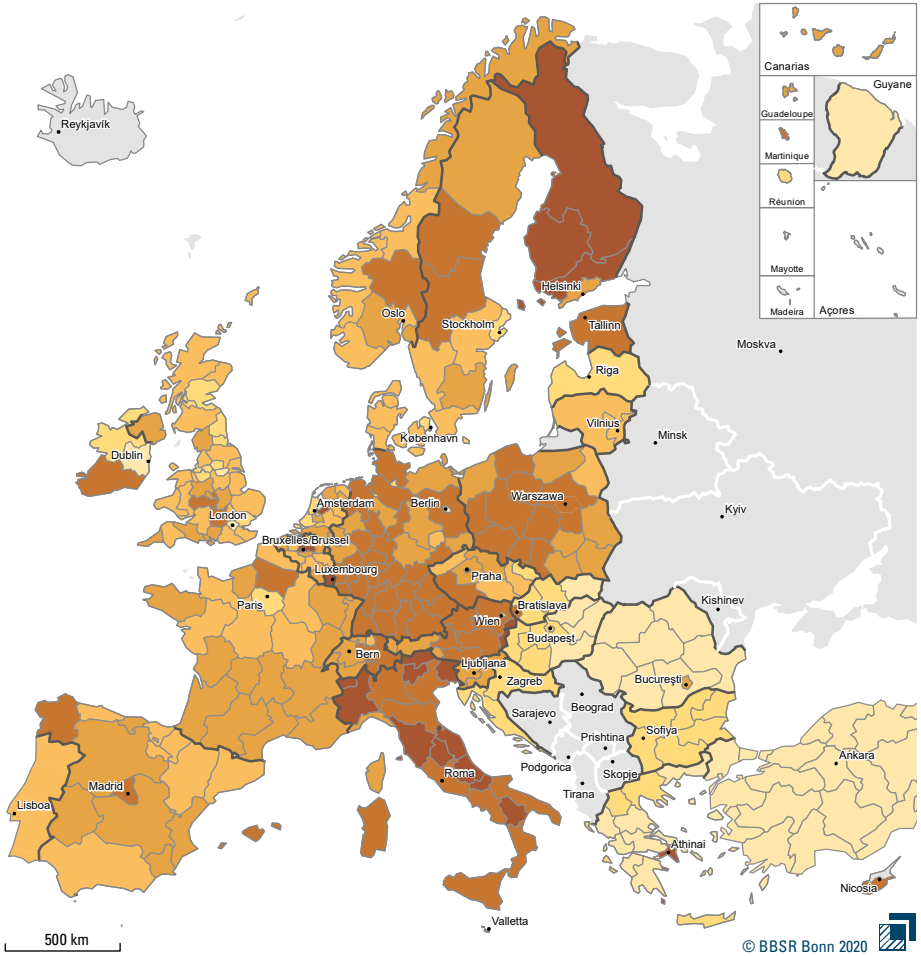


Number of private cars per 1,000 inhabitants, 2017

- up to below 540
- 540 up to below 570
- 570 up to below 600
- 600 up to below 630
- 630 and more

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Motor Transport Authority, market
Geometric basis: counties (generalised borders), 31.12.2017 © GeoBasis-DE/BKG
Author: A. Milbert

Level of motorisation in Europe



Number of private cars per 1,000 inhabitants, 2017*

- up to below 350
- 350 up to below 450
- 450 up to below 500
- 500 up to below 550
- 550 up to below 650
- 650 and more
- no data

Data source: Spatial Monitoring for Europe
Data origin: Eurostat
Geometric basis: GfK GeoMarketing, NUTS 2 regions
Author: R. Binot

*EL; PL; TR: 2016
PT: national value

Traffic casualties

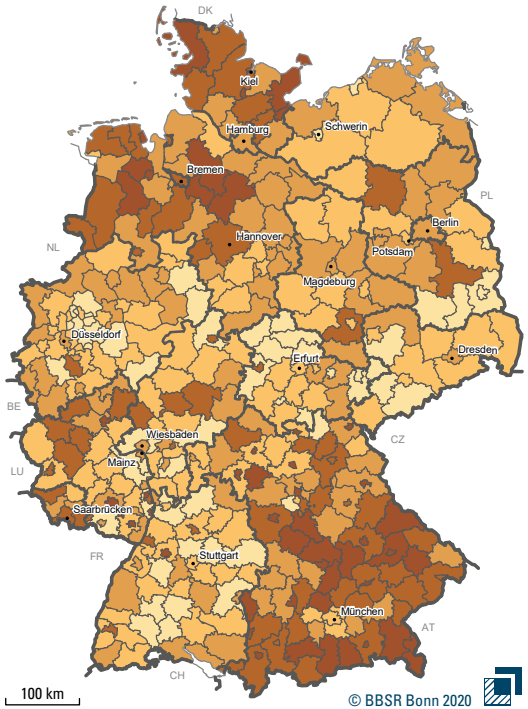
Large differences exist in traffic casualties in Europe between the countries. These national differences as well as the relative homogenous regional pattern within the respective single country indicate specific modalities in traffic.

The highest number of traffic casualties with more than 5 persons injured or killed in traffic accidents per 1,000 people is visible in Austria followed by Germany with almost 5 persons. Norway and Denmark report the lowest rates with 1 person each. Traffic casualties generally occur at higher rates in rural regions where a personal car has to be used more often than any other transport mode due to respective mobility structures.

In many rural regions, the number of traffic accidents with injured or killed persons is higher than in urban regions. Driving too fast on country roads and motorways and disregarding traffic rules are the most common causes.

However, in urban areas mainly pedestrians, but also cyclists, are injured or killed by traffic accidents. Driving under the influence of alcohol constitutes the reason of only 4 % of all traffic casualties (Destatis 2020). In the past 20 years, the number of fatalities decreased by 60 %, the one of seriously injured persons by 40 % and the one of slightly injured person by 15 % (DVR 2020).

Traffic casualties in Germany

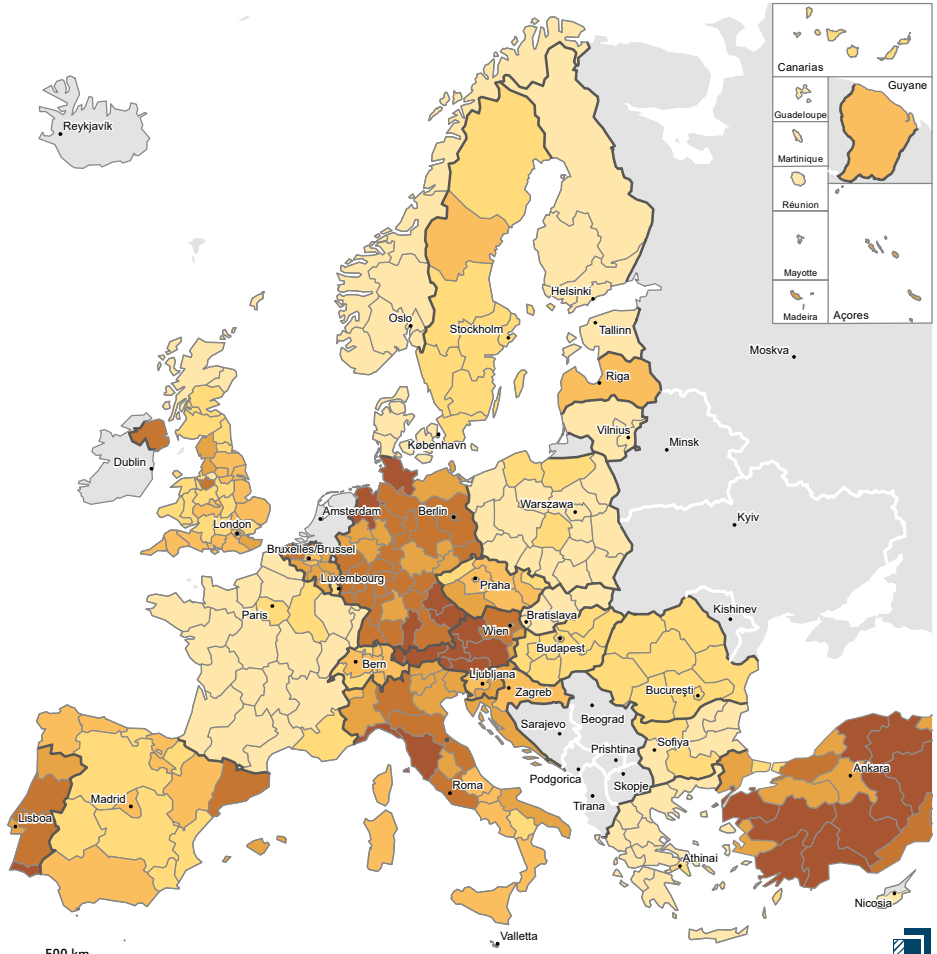


Number of persons injured or killed in traffic accidents per 1,000 inhabitants, 2017

- up to below 4.0
- 4.0 up to below 4.7
- 4.7 up to below 5.4
- 5.4 up to below 6.1
- 6.1 and more

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Statistical Offices, market
Geometric basis: counties (generalised borders), 31.12.2017 © GeoBasis-DE/BKG
Author: A. Milbert

Traffic casualties in Europe



Number of persons injured or killed in traffic accidents per 1,000 inhabitants, 2017

- up to below 1.5
- 1.5 up to below 2.5
- 2.5 up to below 3.5
- 3.5 up to below 4.5
- 4.5 up to below 5.5
- 5.5 and more
- no data

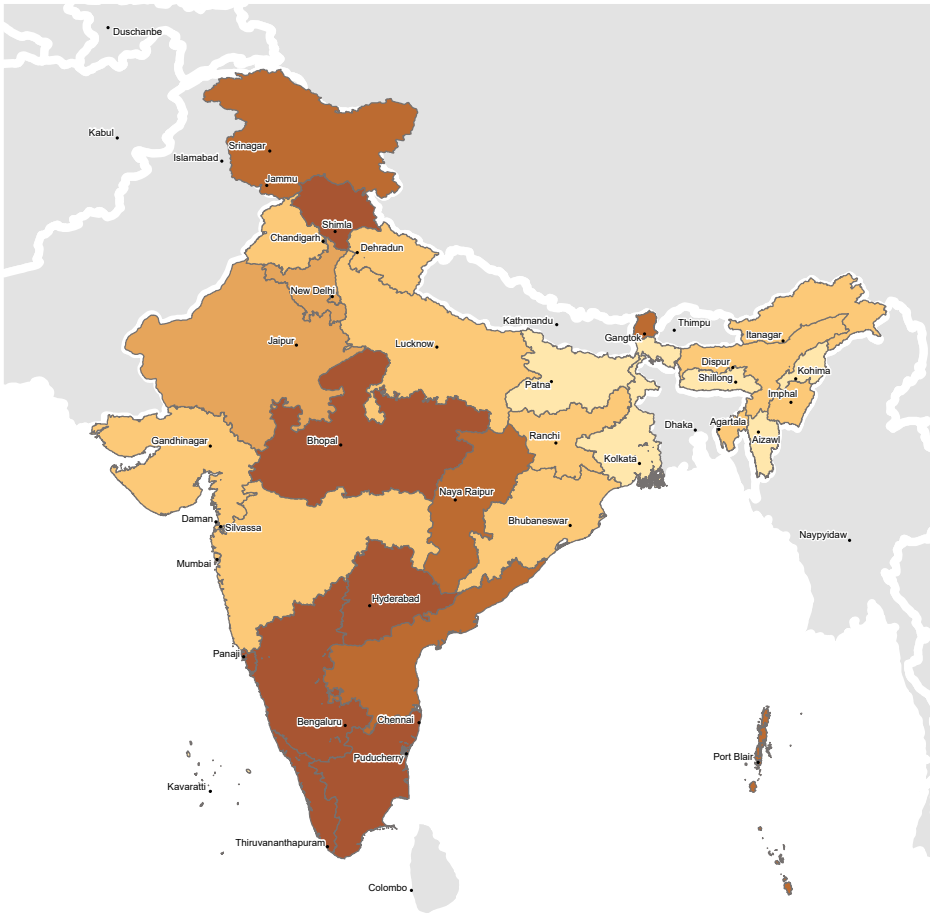
Data source: Spatial Monitoring for Europe
Data origin: Eurostat
Geometric basis: GfK GeoMarketing,NUTS 2 regions
Author: R. Binot

PL, TR: 2016

According to World Road Statistics (2018), the highest number of road and traffic injuries amongst 199 countries happen in absolute figures in India, followed by China and USA. The study on road accidents in India (2018) suggests that altogether 469,418 injuries and 151,417 deaths out of 467,044 road accidents happened in India in 2018. At the national level, approximately 0.47 injuries and deaths per 1,000 people due to road accidents were stated in 2018. An increase of 0.46 % in road accidents and 2.4 % of deaths were noted between 2017 and 2018.

Spatial variations of road accidents, injuries and deaths are conspicuous at the level of states and Union Territories. The total number of persons injured or died in road accidents is high in Tamil Nadu (87,753), Madhya Pradesh (65,368), Karnataka (62,552) and Uttar Pradesh (51,920). However, Kerala (1.4) shows in terms of population share the highest share of road accident injuries and death per 1,000 people, followed by Puducherry (1.3), Goa (1.2) and Tamil Nadu (1.2). Amongst the larger states, Bihar, West Bengal and Jharkhand are characterised by the lowest share of traffic casualties per 1,000 population. Altogether 14 states and Union Territories have a higher share of traffic casualties compared to the national average as mentioned before. Increasing road accidents and deaths could negatively influence India's progress towards accomplishing SDG 11. Attitudinal change of the individual behaviour is needed in the same way as the road environment and vehicle conditions targeting at a reduction of road accidents and casualties would have to be enhanced. Following and sanctioning strict traffic rules, particularly for saving lives in urban and suburban areas, would also be required. Rectifying black spots should be given priority. Including road safety manuals in school and college curriculae could be a useful way of raising mass awareness and thus avoiding the juvenile deaths due to road accidents.

Traffic casualties in India



Number of persons injured or killed in traffic accidents per 1,000 inhabitants, 2017

- up to below 0.2
- 0.2 up to below 0.4
- 0.4 up to below 0.6
- 0.6 up to below 0.8
- 0.8 and more

Data source: Transport Research Wing, Ministry of Road Transport and Highways
Data origin: Road Accidents in India, 2018
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

Disclaimer: The information on this map has been created with the highest degree of accuracy possible. However, NIUA cannot be held responsible for errors, omissions or positional accuracy. The depiction of boundaries is not authoritative.

Land-use

India is a predominantly rural country, underlined by the fact that 3.4 % of its surface is covered by built-up areas. The share of built-up areas in relation to the total areas covered ranges from 0.32 % in Jammu & Kashmir to 79.2 % in Chandigarh. The highly urbanized Union Territory of Delhi shows with 57.1 % a high share of the built-up area. The territories of mountainous states like Sikkim (0.34 %) and Arunachal Pradesh (0.64 %) are covered to less than 1 % by built-up areas. Uttarakhand, Himachal Pradesh, Assam, Nagaland, Rajasthan and Madhya Pradesh report very low levels of built-up areas.

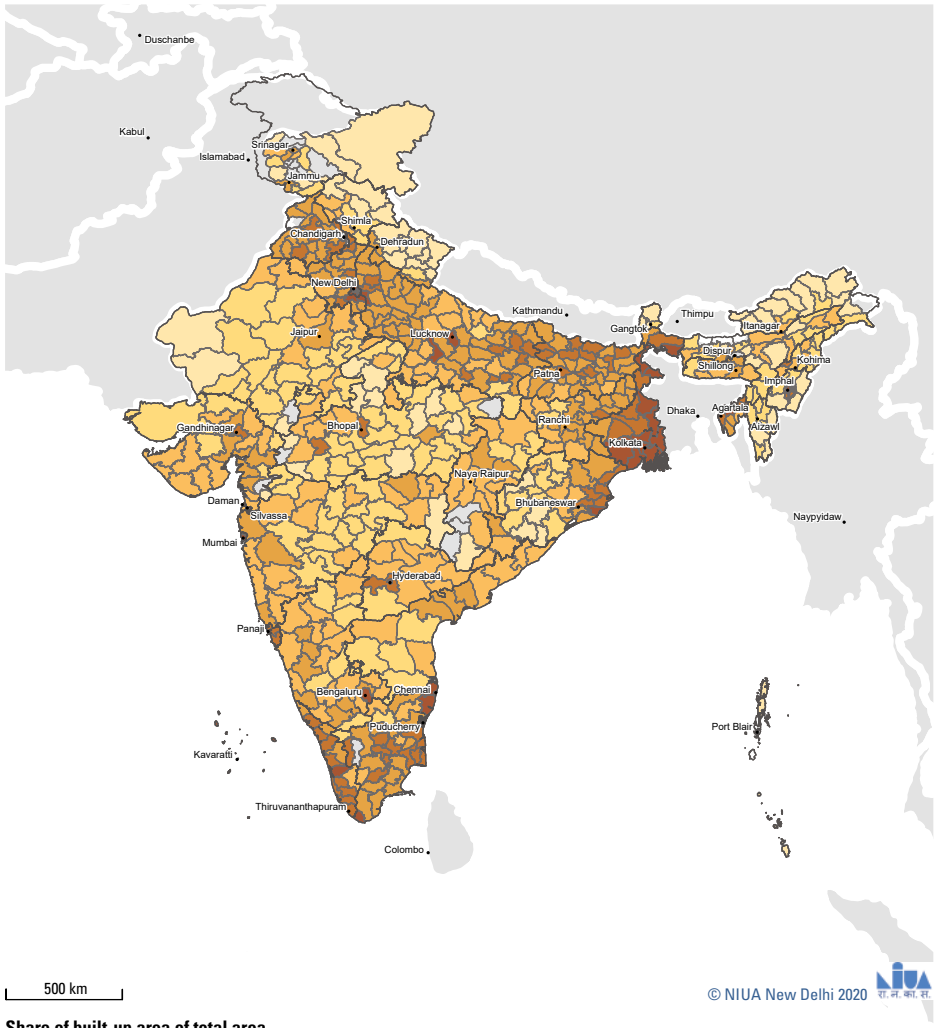
Most states with low shares of built-up areas are located in the mountainous areas of the Himalaya. These states show very low population densities and shares of built-up areas. States such as Rajasthan and Madhya Pradesh are largely covered by deserts or forests and thus report low levels of built-up areas. States situated in plains like West Bengal, Tamil Nadu, Kerala and Punjab show high levels of built-up areas.

A wide variety of levels of built-up areas exists across districts. Highly urbanized districts like Hyderabad (90.9 %) and Chennai (90.5 %) are covered to 90 % by built-up areas. Highly urbanized districts in the Union Territories of Chandigarh and Delhi as well as other metropolitan districts like Kolkata, Mumbai, Mumbai Suburban, Bengaluru Urban and Haora report very high levels of built-up areas. These districts also show very high population densities.

Altogether 302 districts are higher built-up than the national average. Only 78 amongst these districts show a share of built-up areas of more than 10 %. The majority of these districts is located in West Bengal, Kerala, Tamil Nadu and Uttar Pradesh. Ladakh and Kargil in Jammu & Kashmir show with 0.02 % in both cases the lowest share of built-up areas. This is due to the inhospitable terrain in these districts. Still under 0.1 % as the share of built-up areas lie the Districts of North Sikkim, Lahul and Spiti, Upper Dibang Valley, Chamoli, Rudra Prayag, Doda and Uttar Kashi.

Most mountainous districts of Arunachal Pradesh, Uttarakhand and Himachal Pradesh also report very low shares of built-up areas. This is the same for districts situated in the hostile terrains of the Deccan Plateau.

Land-use in India



Share of built-up area of total area in percent, 2015–2016

- up to below 1
- 1 up to below 2
- 2 up to below 4
- 4 up to below 8
- 8 up to below 15
- 15 and more
- no data

Data source: Builtup-area, 2015–2016: NRSC, ISRO, Hyderabad, India
Data origin: Digital Database Bhuvan-Thematic Services, LULC (50K), 2015–2016 (https://bhuvan app1.nrsc.gov.in/thematic/thematic/index.php, as accessed on 27.06.2020)
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

Disclaimer: The information on this map has been created with the highest degree of accuracy possible. However, NIUA cannot be held responsible for errors, omissions or positional accuracy. The depiction of boundaries is not authoritative.

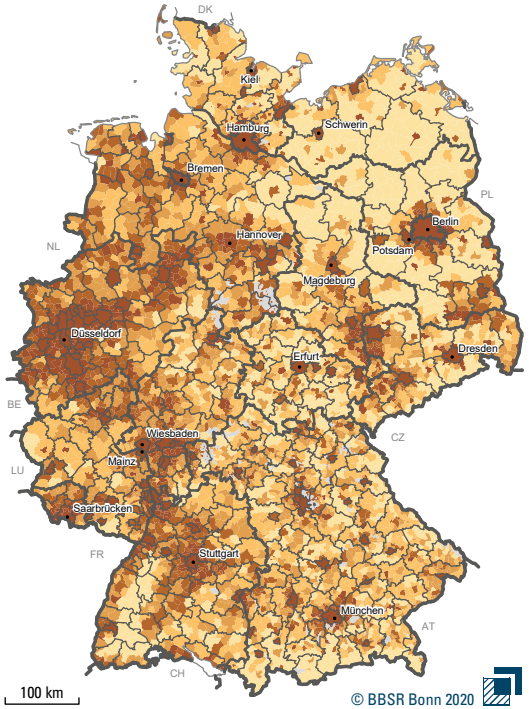
Analysing land-use in Europe means applying remote sensing data and processed satellite images, due to the absence of area-oriented statistics in most European countries.

The Corine Land Cover provides harmonised data on land-use in its broadest sense. Given the respective data of 2018, 4.7 % of the land surface of EU27-2020 is used for urban purposes, i. e. anthropic land for settlement and traffic purposes. Malta and Belgium show with 28.6 % and 20.3 % respectively the highest values while Germany counts for 9.2 % – a figure deviating from values offered by statistical sources.

13.8 % of the area of Germany is used for settlements and traffic. The area size has almost doubled in the past 60 years. This approach destroys fertile soil permanently and deprives it from agricultural use. Land-use at the municipal level is connected to the city seize and intensity of land-use. Large cities use between 30 % and 75 % of their area for settlement and transport purposes, medium and small towns – depending on their location and administrative boundaries – use at minimum 5 % and at maximum of 95 % of their area (BBSR 2020).

Protecting and maintaining inner green areas and open spaces might be of relevance. Furthermore, almost all municipalities intend to intensify the built-up areas instead of dedicating further areas for settlement purposes.

Land-use in Germany

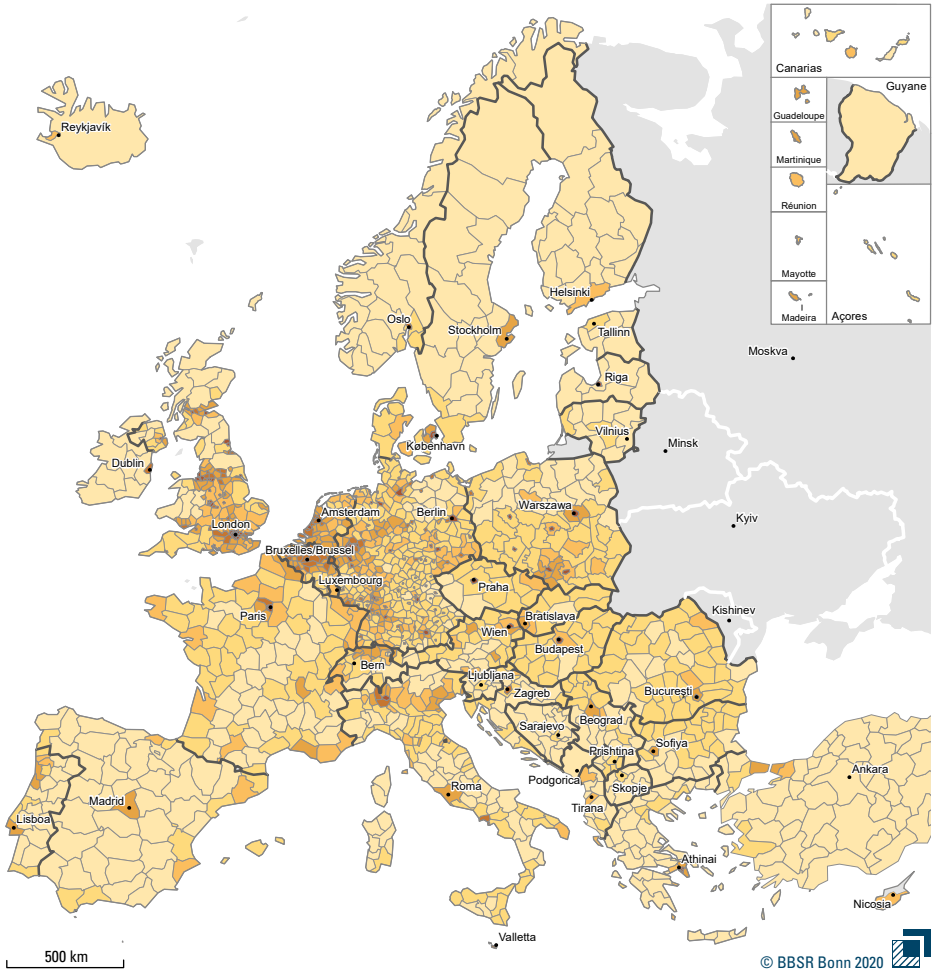


Share of settlement and transport area of total area in percent, 2017

- up to below 9
- 9 up to below 12
- 12 up to below 16
- 16 up to below 24
- 24 and more
- unincorporated and uninhabited areas

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Statistical Offices
Geometric basis: Associations of Municipalities (generalised borders), 31.12.2017
© GeoBasis-DE/BKG
Author: A. Milbert

Land-use in Europe



Share of settlement and transport area of total area in percent, 2018

- up to below 4
- 4 up to below 8
- 8 up to below 12
- 12 up to below 25
- 25 up to below 50
- 50 and more
- no data

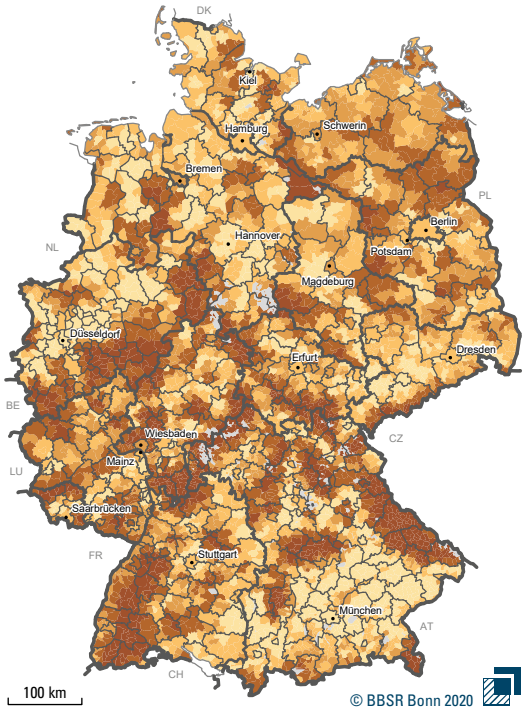
Data source: Spatial Monitoring for Europe
Data origin: Corine Landcover 2019, Eurostat
Geometric basis: GfK GeoMarketing, NUTS 3 regions
Author: R. Binot, V. Schmidt-Seiwert

Protected landscapes

Altogether 26 % of the area of the European Union (EU27-2020) are protected by both, European and national regulations. Germany belongs with a share of nearly 39 % to the group of countries showing a higher percentage of protected areas, Luxembourg with nearly 50 % reports the highest share and Finland with 13 % the lowest one. Protected areas are delineated in EU27 almost equally by national and municipal regulations (NATURA 2000). Both respective shares are of around 18 %. NATURA 2000 and nationally protected areas overlap on many sites. On EU average, sites of municipal significance (Council Directive 92/43/EEC on Habitats) cover half of the NATURA 2000 areas. This share ranges from 11 % in Latvia to 75 % in Malta.

A total of 39 % of the land area of Germany is under protection. 10 % of all municipalities are located entirely in a protected area. The largest contiguously protected areas may be found in scenic forests, heaths, lake landscapes and floodplains. The larger the land-use the smaller is the area share under nature conservation. However, the categories of protected areas differ in their protection status and the associated restrictions for the use by humans. Nature reserves and biosphere reserves are guaranteed the highest protection status. They cover about 13 % of the land area. Significant parts of the biosphere reserves are not shown on the map – one of them being the Wadden Sea as part of the North Sea.

Protected landscapes in Germany

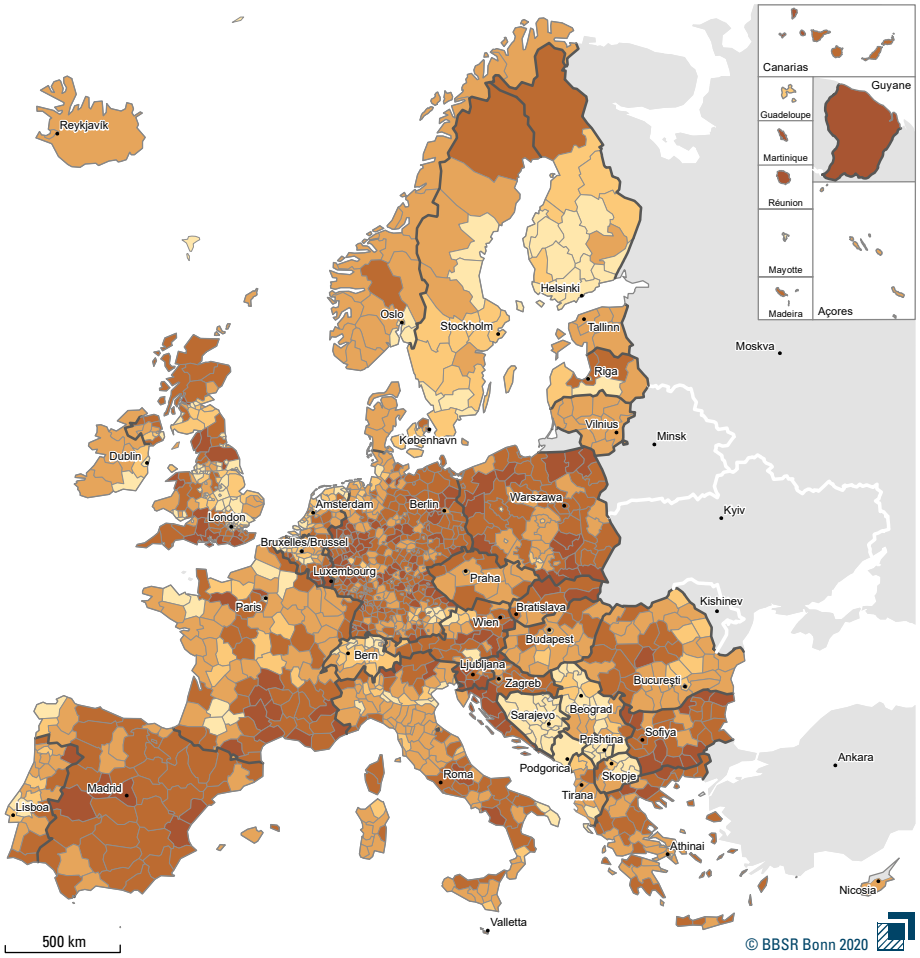


Share of the area of Natura 2000 zones, special protected areas, nature reserves and national parks of total municipal area in percent, 2017

- up to below 5
- 5 up to below 20
- 20 up to below 50
- 50 up to below 100
- municipality is entirely within a protected area
- unincorporated and uninhabited areas

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Agency for Nature Conservation
Geometric basis: Associations of Municipalities (generalised borders), 31.12.2017
© GeoBasis-DE/BKG
Author: A. Milbert

Protected landscapes in Europe



Share of protected areas* according to European and national definitions in percent, 2019

- up to below 5
- 5 up to below 10
- 10 up to below 25
- 25 up to below 50
- 50 and more

Data source: Spatial Monitoring for Europe
Data origin: World Database on Protected Areas as of November 2019
Geometric basis: GfK GeoMarketing, NUTS 3 regions
Author: R. Binot, V. Schmidt-Seiwert

*Natura 2000 Areas and nature reserves, national parks, protected landscapes and protected areas according to national definitions.

Overlaps of areas according to European and national definitions as well as of Natura 2000 Areas are considered.

In India, spatial analysis faces limitations in the availability of local level data on the share of protected landscapes. The ENVIS Centre on Wildlife and Protected Areas subordinated to the National Ministry of Environment, Forest and Climate Change provides information on the percentage of the respective area of a state covered by protected areas, national parks and reserved forest.

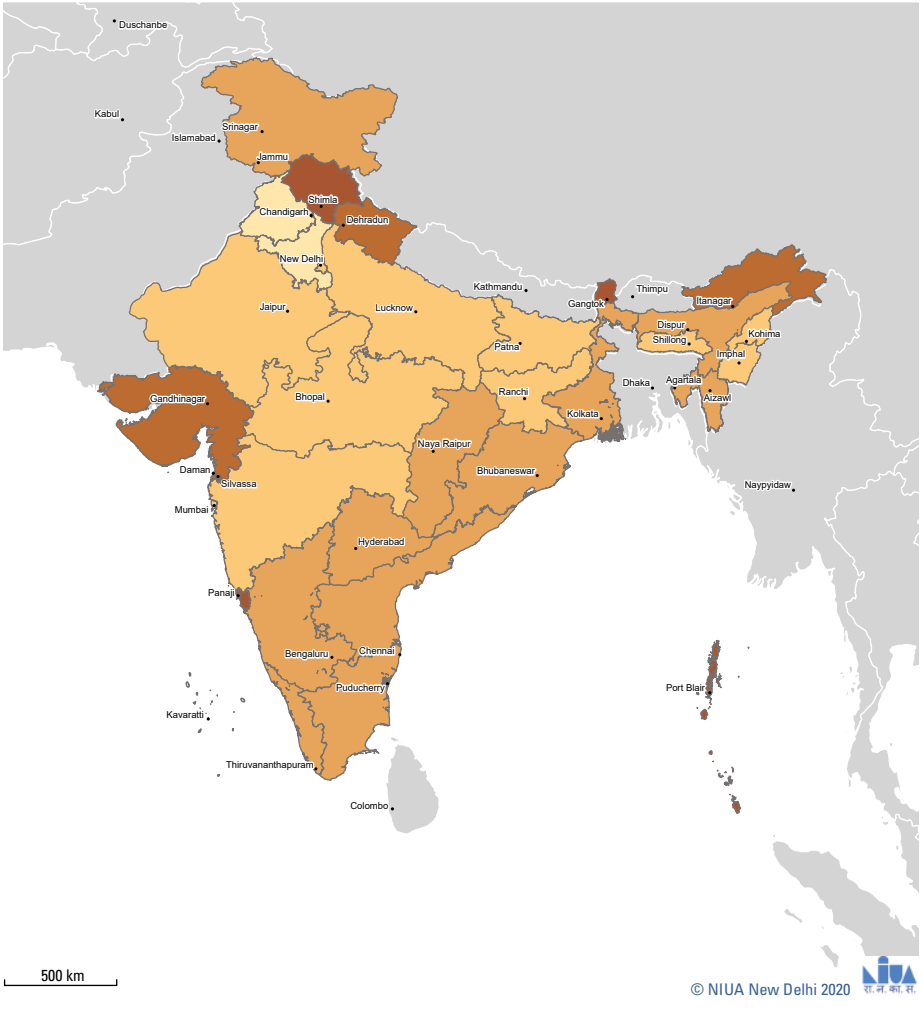
The Union Territory of Chandigarh shows 22.8 % of its area as covered by protected landscapes, which is the highest value amongst all union territories, followed by Andaman & Nicobar Islands with 19 % of its territory covered by protected landscapes. Amongst the states, the area of Sikkim is covered by 30.8 % with protected landscapes, which is the highest in the country, followed by Goa (25 %) and Himachal Pradesh (15.1 %). It seems worth noting that Himachal Pradesh is the least urbanised state of India, though his cities and settlements are lush green and sustainable from an ecological point of view. Uttarakhand (14.6 %) shows a similar high proportion of its territory covered by protected landscapes. Expect from Arunachal Pradesh with a share of 11.7 %, none of mountainous northeastern states reports a high proportion of its area covered by protected landscapes. In Gujarat for example, 8.8 % of its territory is covered by protected landscapes.

On the other end of the spectrum, the coral island Lakshadweep does not cover any protected landscape. Haryana and Punjab show with a share of 0.7 % and 0.8 % respectively the lowest percentage of their respective area covered by protected landscapes. These two high-income states witnessed extreme deforestation processes in the past decades because of land-use changes related to urbanisation. Highly urbanised areas like Puducherry (1 %) and Delhi (1.9 %) possess less green areas due to their dense urbanised structures.

The development in mountainous states often resulted in preserving pristine landscapes due to their harsh terrain compared to the states located in the plains of the Ganga-Yamuna River Basin. Chandigarh and Goa are good example how states may protect their qualified green and open spaces despite a high urbanisation rate.

Considering recreation areas in selected cities: In India, there is a lack of city-level data on recreational areas. The master plans of 21 cities developed in accordance with the Urban Green Guidelines (Government of India, Ministry of Housing and Urban Affairs 2014) are the only source of information. It thus may be noted that Greater Nodia in the National Capital Region of Delhi is the largest area in a city used for recreational purpose.

Protected landscapes in India



Share of protected areas, nature reserves and national parks of total state area in percent, 2019

- up to below 1
- 1 up to below 4
- 4 up to below 8
- 8 up to below 15
- 15 and more

Data source: National Wildlife Database, Wildlife Institute of India
Data origin: ENVIS Centre on Wildlife and Protected Areas, 2019
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

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Connection to public water supply

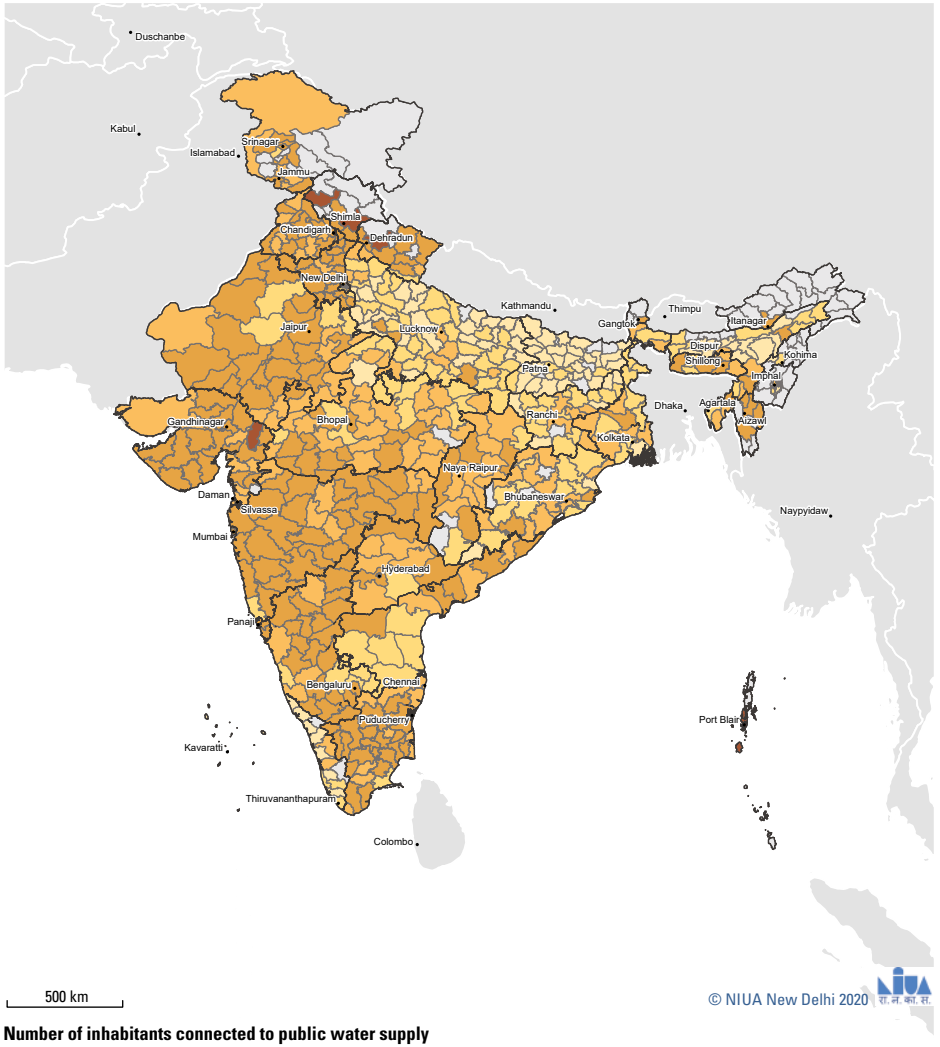
The 4th round of the National Family Health Survey (NFHS) (2015–2016) also provides data on water supply at household level. Piped water supply to premises and land of households are considered as public water connection. 10 districts, i. e. the ones of South Andaman, Ajaw, Panchamal, Kangra, Una, Shimla, Supiyan, West District of Sikkim, Chamoli and Tehri Gadwal report a coverage of 100 %. These districts are all characterised by a very small share of urban population and are located mountainous and inaccessible terrains of Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh and Andaman &Nicobar Islands. 5 districts in Bihar, i. e. the ones of Supaul, Araria, Khagaria, Jamui and Arwal report a non-coverage of public water supply in urban areas.

Amongst highly urbanised metropolitan districts, the ones of Pune (98.4 %), Chandigarh (97.9 %) and Mumbai (97.3 %) report almost universal access to public water supply. Highly urbanised districts like Northeast Delhi, East Delhi, Kolkata and Thane show a coverage of more than 90 %. At the other end of the spectrum, Chennai (65.8 %) and South Delhi (69 %) face obvious deficits in coverage.

In term of spatial distribution, it can be stated that a large number of districts in the developed states of Gujarat, Maharashtra, Rajasthan, Punjab, Haryana and Tamil Nadu prove that more than 75 % of their urban households have access to a public water connection. The majority of these districts lie on the Deccan Plateau which is a region in India facing water scarcity. Districts in Bihar, Uttar Pradesh and the northern part of Madhya Pradesh are located in the Ganga River Basin where less dependence exists in terms of public water connectivity. There are 5 districts in Bihar where none of the urban households have access to public water supply, followed by another 15 districts where the coverage of public water supply is less than 10 %. These states are amongst the lower-income states of India and have easily available access to groundwater. Similarly, the districts in the Brahmaputra Basin of Assam show a large number of urban households not depending on public water supply. A large number of these urban households depend on other water supplying sources like hand pumps, wells and tube wells.

Facing the challenges of foresighted water crises, the Government of India enacted the Jal Jeevan Mission and started the Water for Everyone Programme aiming at the supply of safe drinking water to all households in India by 2024.

Connection to public water supply in India



Number of inhabitants connected to public water supply of all inhabitants in percent, 2015–2016

- up to below 25
- 25 up to below 50
- 50 up to below 75
- 75 up to below 100
- all inhabitants are connected
- no data or inadequate samples

Data source: IIPS & ICF, 2017
Data origin: National Family Health Survey 4, 2015–2016
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

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In most districts of Germany nearly or already 100 % of all residents do have a connection to public water supply. Almost 70 % of the water derives from pure ground water and spring water. The remaining part is surface water, riverbank filtrate and enriched ground water. Only in 30 of the 401 districts, less than 97 % of the population is connected to public water supply. Private water companies supply the remaining 3 % via their water extraction systems. Only a small part provides itself by its own water pumps.

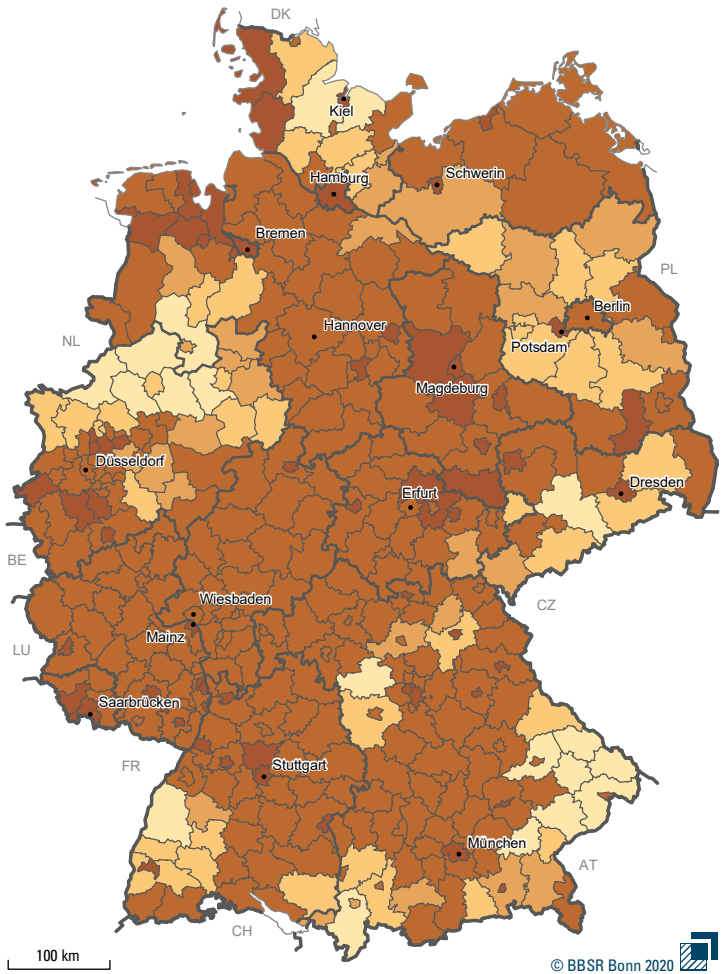
Private households in Germany have already achieved a great deal in saving water. Due to increasingly exchanging old household appliances, such as washing machines and dishwashers, as well as installing water-saving fittings, the daily water demand will decrease even further.

Compared to other European countries with regard to the water quantities used, Germany is already part of the lower third – without sacrificing comfort and quality of life. Lower water use nevertheless may cause local piping problems. Due to many people moving from rural to urban regions, demographic change and water conservation, water may be kept on hold in drinking water networks. This may affect the drinking water quality.

Water from the public supply is of drinking water quality. In Germany, the monitoring of drinking water is regulated by the Drinking Water Ordinance (Trinkwasserverordnung). This regulation prescribes guidelines for the treatment of drinking water and its properties. A basic requirement is that drinking water needs to be pure and fit for human consumption. It must not contain any pathogens and substances in harmful concentrations. The regulation specifies further obligations of the utilities as well as what and how they have to follow when monitoring the drinking water quality.

Unlike bottled water, tap water is regularly checked, in some cases even daily. It is also cheaper, the 121 litres of drinking water daily used per person on average are available free of charge for around 27 Cents (UBA 2020)

Connection to public water supply in Germany



Number of inhabitants connected to public water supply of all inhabitants in percent, 2017

- up to below 97.0
- 97.0 up to below 99.0
- 99.0 up to below 99.5
- 99.5 up to below 100.0
- all inhabitants are connected

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Statistical Offices, market
Geometric basis: counties (generalised borders), 31.12.2017 © GeoBasis-DE/BKG
Author: A. Milbert

Waste

The total amount of waste generated in Germany is around 400 million tons on a long-term average per time unit. Half of the volume derives from the construction industry and demolition activities, including road demolition. Around 50 million tons each are municipal waste and waste from production and trade. Therefore, regional differences in waste generation per person are due to different regional economic structures.

The amount of waste is, in addition, higher where collection points and waste treatment plants are located. Not every district is equipped with the necessary capacities so that strong inter-municipal cooperation in waste treatment exists between districts.

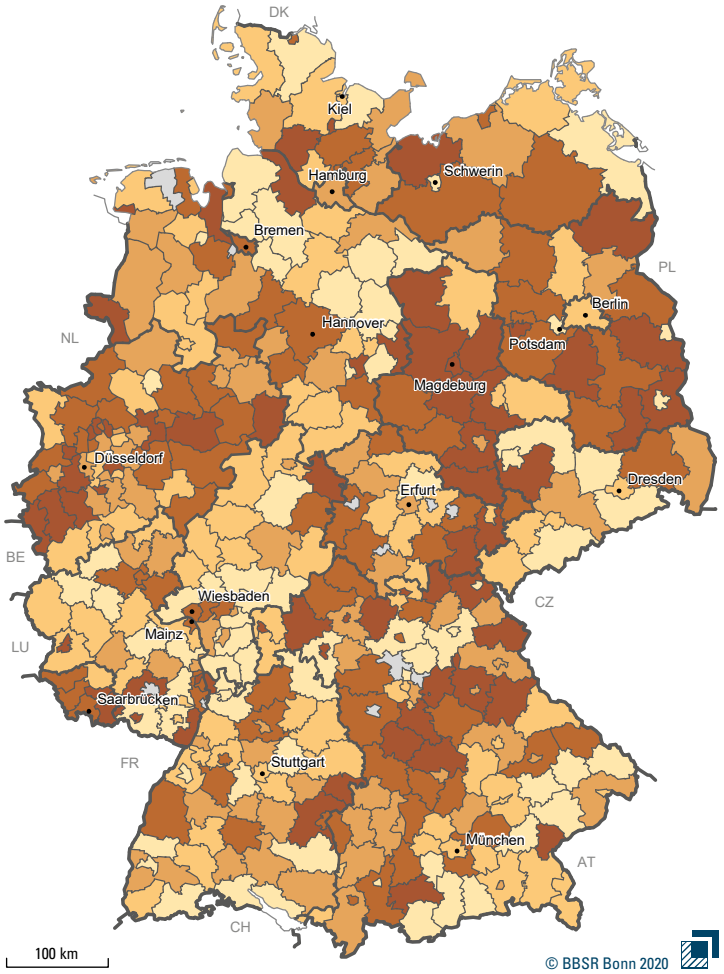
Modern waste management concepts include all necessary steps to be taken: from collecting and transporting waste to processing it for material or energy recovery. Paper or organic waste is collected separately at the point of origin for easier recycling. Further processing or treatment takes place in the technical facilities provided for the respective type of waste. Mechanical-biological treatment processes divide waste which is not collected separately.

The material sorted out is recycled in a next step. The remaining fraction is deposited in landfills after biological treatment. Applying thermal treatment means that the energy generated during combustion is generally used as electrical energy, heat or process steam.

Bio waste can also be used for generating energy. For this purpose, it is fermented first in biogas plants to harvest usable biogas. There are special disposal processes for hazardous waste guaranteeing the destruction or conversion of the respective pollutants. Depending on the type and nature of the hazardous waste, treatment in special waste incineration plants or in plants for chemical-physical treatment takes place.

Around 300 million tons of all types of plastic are produced worldwide each year. At the end of its life cycle, some plastic and its particles end up in the seas. Already today, square kilometre-sized garbage whirlpools are drifting around the oceans. So far, avoiding plastic waste mainly relates to pricing plastic bags and avoidable products. This approach nevertheless only half-heartedly tackles the problem of plastic packaging and the use of plastic in almost all consumer goods.

Waste in Germany



Self-collected or delivered waste collected by enterprises in tons per person, 2016

- up to below 700
- 700 up to below 1400
- 1400 up to below 2400
- 2400 up to below 4000
- 4000 and more
- no data

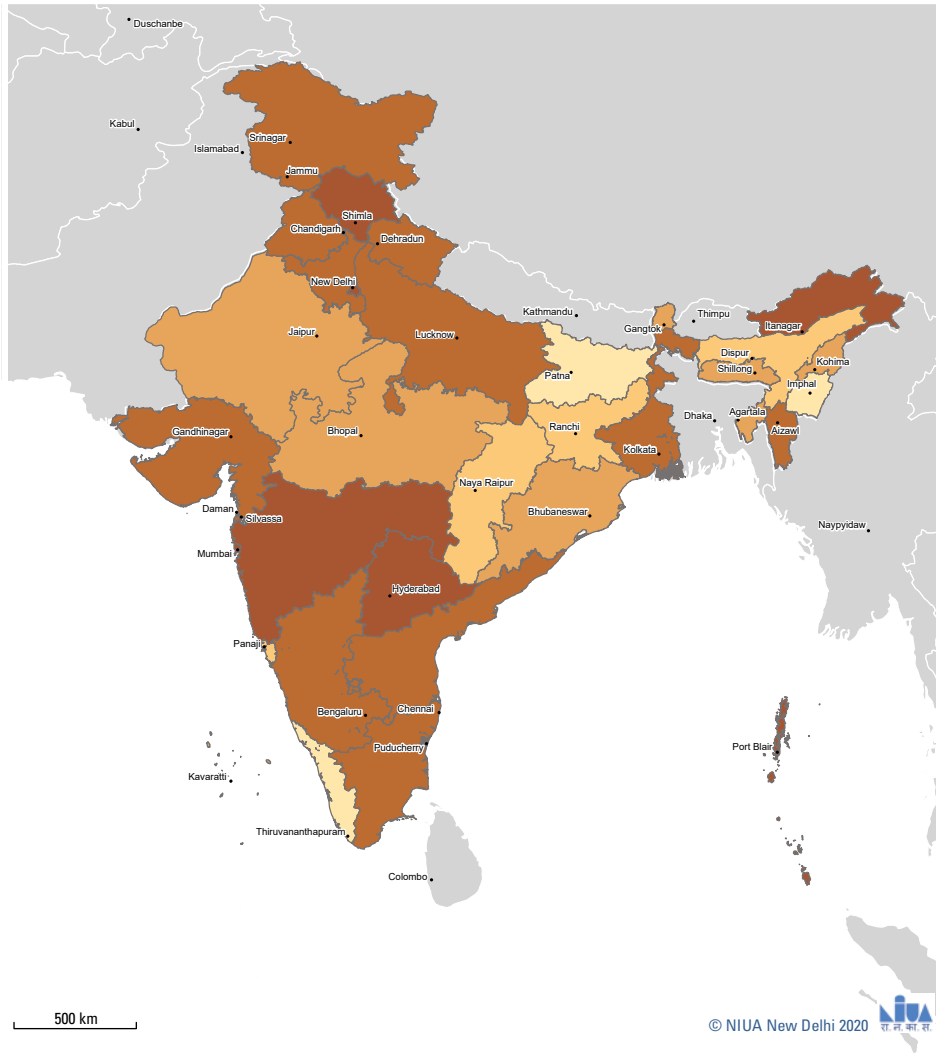
Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Statistical Offices, market
Geometric basis: counties (generalised borders), 31.12.2017 © GeoBasis-DE/BKG
Author: A. Milbert

In a country like India facing a rapid increase of the urban population, Municipal Solid Waste (MSW) will be a major field of urban action in the future. According to the Annual Report (2018–2019) of the Central Pollution Control Board (CPCB) providing data on the annual collection amount of MSW in tons per day at state level, a total of 1.52 lakh tonnes of MSW is generated, out of which 1.49 lakh tons are collected for disposal or treatment. The per capita collection of MSW amounts 0.12 tons per year.

In terms of spatial patterns at state level, Andaman & Nicobar Islands show the highest annual collection share of MSW per capita (0.26 tons per capita), followed by Arunachal Pradesh (0.21 tons per capita) and Delhi (0.20 tons per capita). These states and the Union Territory are followed by Telangana, Puducherry, Himachal Pradesh, Uttar Pradesh and Maharashtra. At the other end of the spectrum, Kerala reports the lowest collection rate of MSW per capita (0.01 tons per capita), preceded by Manipur (0.05 tons), Bihar (0.06 tons), Chhattisgarh (0.07 tons) as well as Jharkhand and Goa (each of 0.08 tons per capita).

Generally speaking, states and union territories with higher income levels such as Delhi, Telangana and Maharashtra show a higher per capita collection amount of MSW. Urban local bodies and urban centres of the high-income states are usually endowed better with infrastructure enabling them to manage their MSW more efficiently. States with lower income levels such as Bihar, Chhattisgarh and Jharkhand show lower levels of per capita collection of MSW. The predominantly weaker institutional capacities of urban local bodies in states of lower income levels affect their ability to collect and manage MSW. Amongst the lesser developed states of India, Uttar Pradesh, Madhya Pradesh, Odisha and Rajasthan are better performing in that respect.

Waste in India



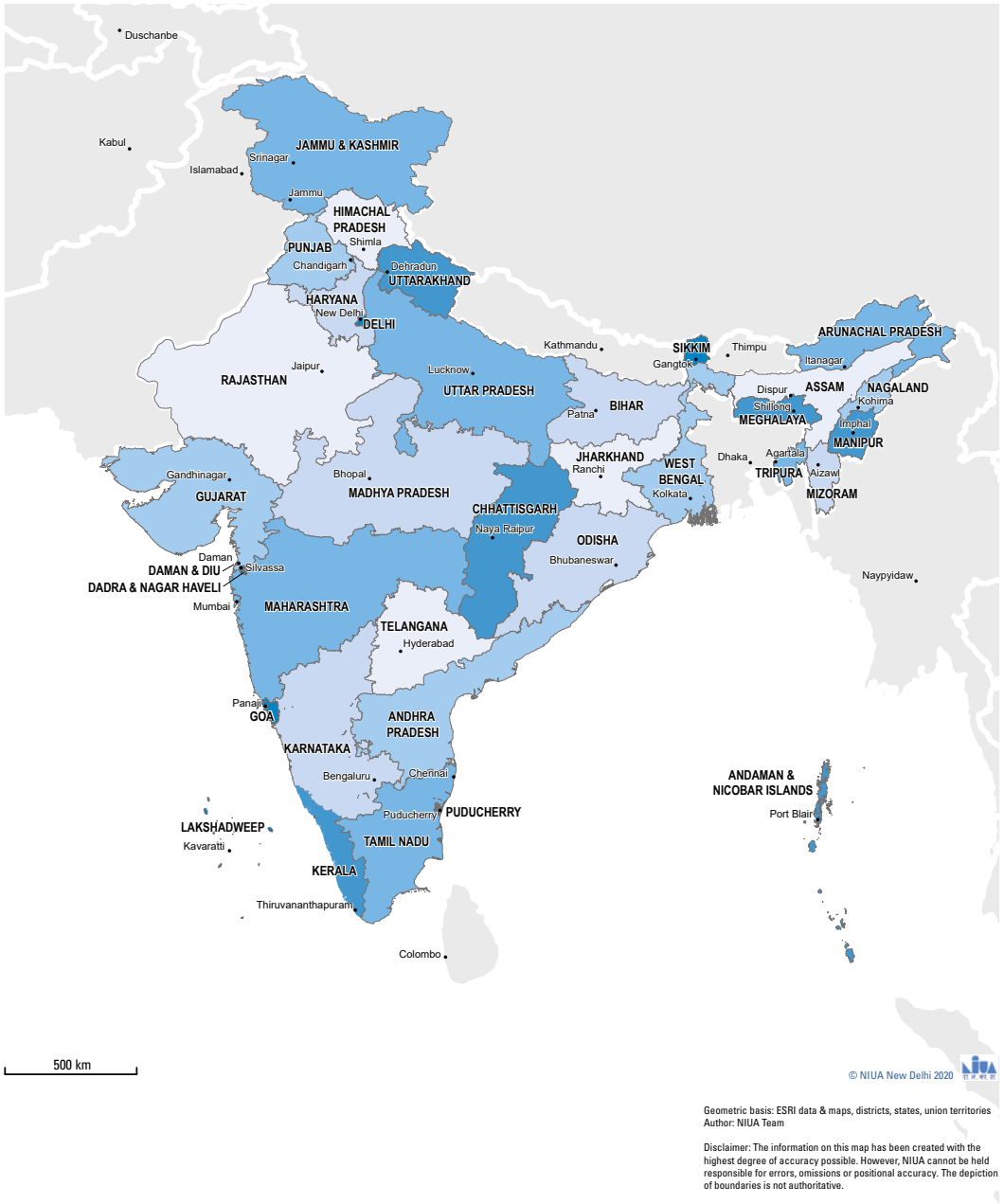
Municipal solid waste collected in tons per person, 2018–2019

- up to below 0.06
- 0.06 up to below 0.09
- 0.09 up to below 0.12
- 0.12 up to below 0.15
- 0.15 and more

Data source: Status Report on Municipal Solid Waste
Central Pollution Control Board, 2019
Data origin: Population Projection; Census of India, 2019
Geometric basis: ESRI data & maps, districts, states, union territories
Author: NIUA Team

Disclaimer: The information on this map has been created with the highest degree of accuracy possible.However, NIUA cannot be held responsible for errors, omissions or positional accuracy. The depiction of boundaries is not authoritative.

States, capitals and union territories in India



States and capitals in Europe

Geometrische Grundlagen: GfK GeoMarketing
Bearbeitung: R. Binot

Conclusion

This joint publication is another milestone of the cooperation between BBSR and NIUA. Its underlying common understanding of analysing spatial structures as well as the collaboratively intercultural cooperation of both institutions shows that the envisaged blueprint of joint spatial research in the area of urban and spatial development might be of added value for both, methodological approaches and policy advice.

The joint analysis compares the spatial structures as defined by selected indicators of SDG 11 on Sustainable Cities and Communities. It uses, in a large number of cases, the lowest common data level possible in India, Germany and Europe and develops a common visual language, partly with variations. Taking new residential buildings and renting prices, traffic casualties, land-use, protected landscapes as well as connection to public water supply and waste as examples, the joint approach also illustrates how visualisation and mapping might be applied to reveal the situation on the ground in regions and cities. Not really surprising matters the size, the function and the relative wealth of a city: a larger city would show another spatial picture than a medium-sized city, a small town or a rural municipality. In the same way, it would need a different response by decision-makers than for other types of settlements.

Due to the cross-cutting nature of SDG 11, which relates to inclusive, safe, resilient and sustainable cities and communities, the range of its indicators is wide. Unlike other SDGs, they are more complex and sometimes address the underlying issue only indirectly. It is thus not a surprise that comparing them is challenging in a national and international setting. Just to take the example of new residential buildings: they might touch fundamental human rights in some countries and relate to available income in others. In India, the topic would relate to slums, in Germany it would do so with regard to affordable housing conditions and unnecessary consumption of space by individuals. This is the same when analysing the connection to public water supply (connection to a secure water supply versus an underutilised water supply network) or waste (collection and recycling of waste versus avoidance and recycling of waste). The indicators applied and maps produced here are to be understood as first steps towards building common indicators.

Using the indicators also reveals the necessity to define them in a clear and meaningful way. Considering land-use (SDG 11.3.1) for example, there is the need to define precisely which areas are taken into account as areas for settlement and traffic purposes according to the type of actual use. In terms of sustainability, it is also challenging to state whether reducing the amount of green spaces turning into building sites could mean that a city might become more sustainable. Even nationally set targets, like the one of 30+ hectares of land per day by 2030 according to the National Sustainable Development Strategy of Germany, do not determine – for obvious reasons – which share in reducing is attributed to every single municipality nor do they prescribe the amount of land to be converted at maximum.

Similar to the other SDGs, all SDG-11-related sub-goals are closely intertwined: traffic, water supply, waste and air pollution for example are to be analysed against population density as well as the intensity of land-use. And so should the strategies cope with them. Why not linking the integrated development of the settlement area in a municipality with the distribution of financial means as proposed in the framework of the European Union and their Structural Funds?

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Information
This publication is accompanied by two other publications on SDG 3 (11/2020) and SDG 4 (13/2020). The chapters visualise the spatial analysis of SDG 11. Alternating maps illustrate the spatial perspective on SDG 11 in India, Germany and Europe by taking national as well as supranational views wherever feasible. The colour code used follows the choice of the United Nations, which assigned an orange-brownish colour to SDG 11. Two general maps in bluish colour-facets complete the sequence of maps. They serve the purpose of a map-reading guidance and cover Europe and India in administrative terms showing their respective states and capitals, in the case of India also its union territories.

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