Stiftung Die grüne Stadt

Green Cities

Cities for Living In

Data | Facts | Arguments for more Green in the City

What we do today, decides what the world will look like tomorrow.

Boris Pasternak

Content

Introduction

In this era of climate change urban greenery becomes an important factor for our future. Attractive well maintained green areas are important meeting places that enable cultural life and social interaction to develop without consumption obligations. A green residential environment increases the quality of life and even more: green generates quantifiable monetary values because well planned and constructed green spaces reduce the cost for preventable health damage and subsequent security installations in public open spaces.

Living in green spaces increases the identification, contentment and responsible behaviour within your own district. Urban green animates people to exercise and enjoy active leisure pursuits. And a green working environment has positive effects: it leads to greater creativity and pleasure of working as well as reduced sick leave. How important gardens and parks are for people in cities is made clear in situations like the Corona crisis:

Urban green becomes an anchor of hope in turbulent times.

However, it is clear that sustainable urban growth is green growth. Nature as the green infrastructure must become an integral part of future urban development. The possibilities are manifold here: green to be planned from the start as roof, facade and inner courtyard greenery and intelligently retrofitted for existing buildings, green on grey company grounds and traffic zones. Green on the paths for bicycles and pedestrians and the trees appear to be green pearl necklaces.

We are providing decision-makers and citizens with information about the most important advantages of green cities with this brochure.

Let yourselves become convinced!

Eiko Leitsch
Chairman of the Board of Trustees of the Foundation The Green City

Climate resilience, sponge-city and green urban surfaces are important topics for the city of the future. Landscape architects, landscape gardeners and tree nurseries have the tools to adapt cities to the changing conditions and make them secure for the future.

Philipp Sattler

Director of the
Foundation The Green City
(Die grüne Stadt)

The City of Today
Loud, hot, crowded

About 7.7 million citizens in Germany live in the large metropolitan areas of Berlin, Hamburg, Munich and Cologne.

More than 18 million people have chosen to live in cities with more than 100.000 inhabitants. A number that is increasing.

Furthermore, numerous employees commute daily to their workplace in the centres, frequently by car. Because local transport and long-distance travel is either too inflexible or too expensive for many. City outskirts are not well connected.

Increasingly more people no longer want to commute but live in the cities. Green spaces are making way for the construction of housing. Green spaces, brownfields and fresh air corridors are being reduced or even completely eliminated in favour of offices and housing.

Traffic noise, heat, particulate matter, crowding, stress

Everyday life is becoming increasingly exhausting for people, plants and animals. There is a lack of green spaces to exercise and meet in. Car traffic makes the problem worse. Breathing air is polluted, the temperatures are higher in summer than in the countryside. Approximately 80 percent of the population of Europe is exposed to high concentrations of particulate matter.

In Germany alone about 70,000 people die every year from the effects of air pollution.

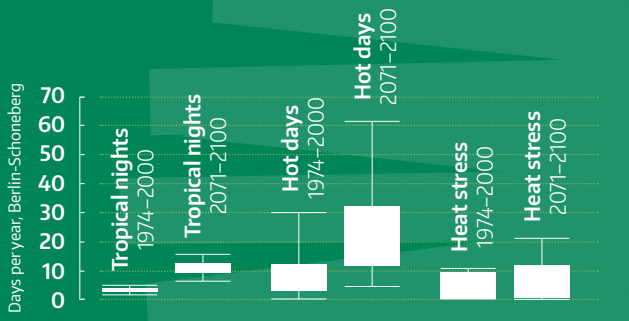
Climate protection, biodiversity, health, life quality, sustainability

Green in the city improves the quality of life. Green spaces also contribute to higher biodiversity, trees improve the quality of air and provide cooling. Because they convert carbon monoxide into oxygen and bind particulate matter. The older a tree is, the bigger its filtration capacity is. But young trees and other plants also make cities cleaner and healthier.

Green cities are the cities of the future. Here the many problems that were created by urbanisation and climate change are being resolved with natural methods. Climate protection, biodiversity and sustainability contribute to health and quality of life in green cities. Therefore, these topics are central to contemporary green urban development. As well as being the central topics of this brochure.

Heat stress in the city

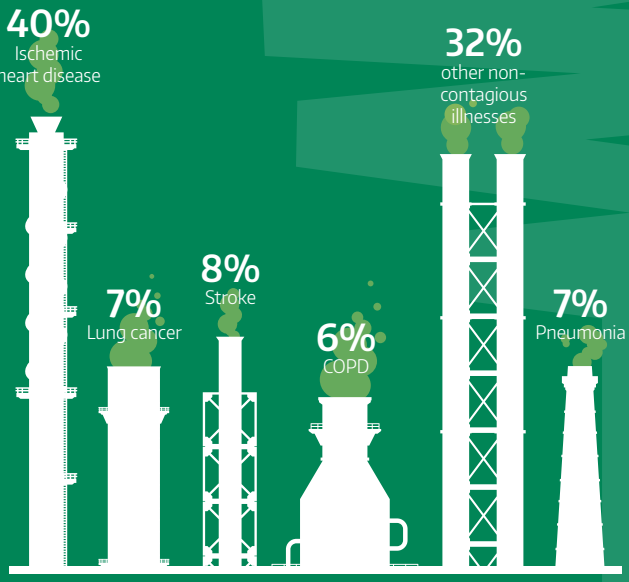
Climate change will cause a massive increase of **hot days** (>30°) and **tropical nights** (>20°) by 2100



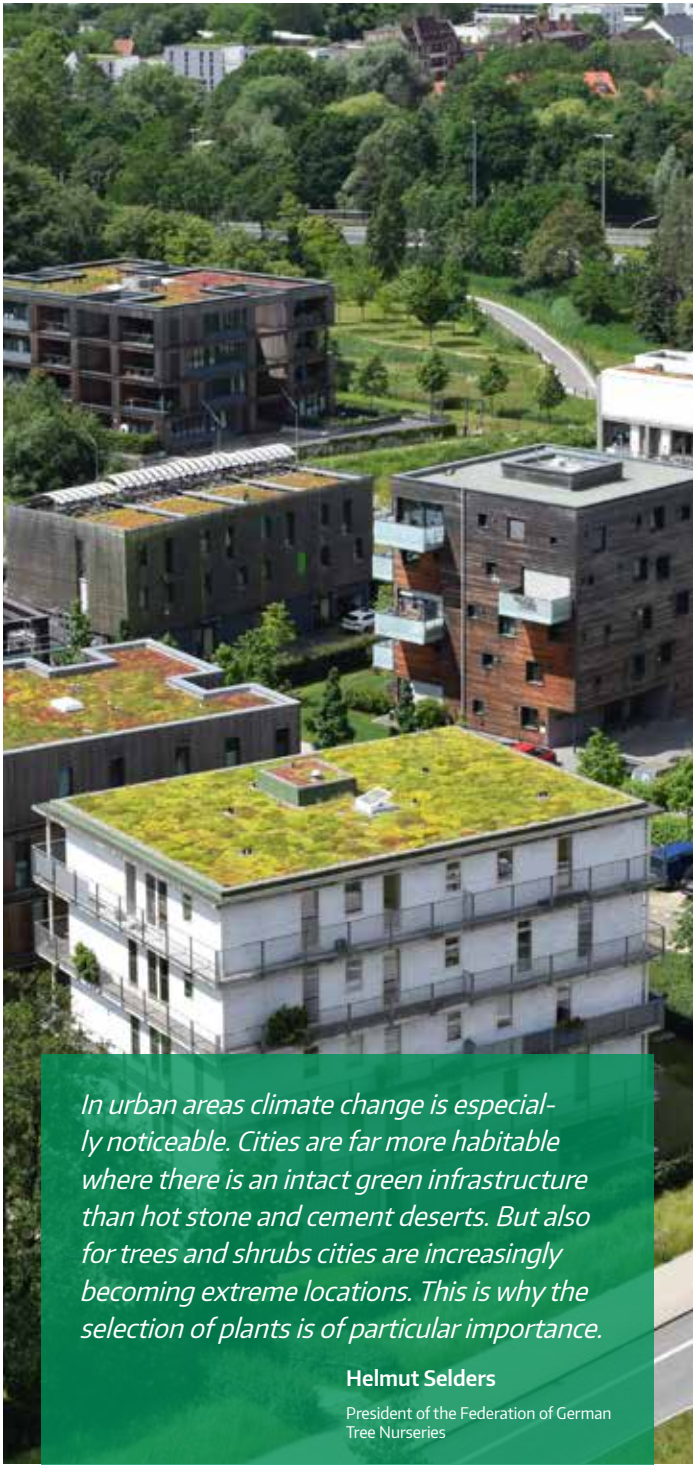
Source: Robert Günther, Leibniz University Hannover, 2014

Air pollution

In Germany alone **about 70,000 people die every year** from the effects of air pollution.



Source: Environmental Agency EEA 2017



In urban areas climate change is especially noticeable. Cities are far more habitable where there is an intact green infrastructure than hot stone and cement deserts. But also for trees and shrubs cities are increasingly becoming extreme locations. This is why the selection of plants is of particular importance.

Helmut Selders

President of the Federation of German Tree Nurseries

Climate Protection

Living streets, roofs and facades

Green cities are better able to cope with climate change. Plants are the key players here. Living urban surfaces are perfect CO2 storage areas and excellent oxygen producers.

Parks and open spaces, roadside trees, city woods, green roofs and facades generate fresh air even in densely populated regions and municipalities. With its continuous growth city green reliantly produces oxygen and binds particulate matter.

Natural air conditioning

The shade cast by plants and the evaporation are a sure guarantee for the necessary cooling of our cities. Heat islands often do not occur in cities with a high proportion of green spaces. Trees and shrubs are therefore key players in a city in which people like living. Because green city surfaces produce biomass and oxygen from sunlight and water while at the same time breaking down carbon dioxide.

Responsible decision makers therefore reduce sealed areas. Because unsealed areas can absorb and store significant amounts of rainwater. Permeable soils work like strongholds against flooding during heavy rainfall. Plants can grow well here and in return they produce fresh air. In addition they work protectively like natural insulation even at extreme temperatures.

Bulwarks for stormy times

The undisputed champions of CO2 storage are old trees. With increasing age they bind increasingly more climate damaging gas. A mature old beech tree consumes about 12,5 kilogrammes CO2 per year and 80 trees compensate a tonne together annually. Trees and shrubs contribute to improving air quality, generate shade and provide cooling. Deciduous trees are highly effective natural filters for dust and air. Coniferous trees are experts for binding the extremely health-endangering particulate matter. In addition nitrogen oxide and sulphur are absorbed by green plants and as such filtered out of the air.

City trees offer big advantages also in stormy times as they function as windbreaks and prevent damage to buildings. Healthy trees can stand up to higher wind forces. That is why it is important that city trees are professionally maintained and regularly checked.

Bulwark Tree

1 mature city tree

can at
15-20 m
height
develop
100-150 m²
surface area and
1.200 - 1.500 m²
absorption area.

Imagine this approx. 100-year-old beech tree at about 20 m high and with a crown of approx. 12 m diameter. With more than 600,000 leaves it increases its 120 m² surface area by 10 times to about 1.200 m² leaf surface. With the airspaces of the leaf tissue a total surface area for the gas exchange of approx. 15,000 m² exists. This corresponds to about two football fields! 9.400 l = 18 kg carbon monoxide is processed by this tree on a single sunny day. With a content of 0.03 % carbon monoxide in the air about 36.000 cbm of air must flow through these leaves. Bacteria, fungal spores and other harmful materials floating in the air are mostly filtered out. At the same time the air is moistened as the tree consumes and evaporates about 400 l water the same day. The 13 kg oxygen that the tree generates as a waste product through photosynthesis is sufficient for the needs of about 10 people. As well the tree produces 12 kg sugar on this day which it uses to generate all its organic substances. Some of it is stored as starch, from others it constructs its new wood. If this tree is felled to build a new road or because someone has complained that the shadow is too big or because a tool shed is being built there, then approx. 2,000 young trees with a crown volume of 1 cbm each will need to be planted if you want to fully replace the tree. The costs would amount to about 150.000,- € .

Source: Foundation The Green City (Die grüne Stadt)

Natural Air Conditioning

1 mature city tree

annually stores
3.500 kg CO_2

Filtration
of
36.000
m^3
air/daily*

O_2

production
of **4.600** kg
oxygen

CO_2 compensation
of **11**
air conditioning units

CO_2 compensation
1
medium-sized car*

*with a leaf surface area of 15,000 m²

*at 24.000 km/annually

Considering the intensive agriculture in many places, cities are becoming increasingly important for nature conservation with their range of habitats.

Svenja Schulze

Federal Minister of the Environment, Germany (BMU), Master Plan City Nature 2019

Biodiversity
The city as an ark

The pressure on biodiversity is very high due to the overcrowding in cities and the intensification of agriculture. This is why it is more important than ever to develop cities as places of biodiversity.

The target of only sealing 30 new hectares a day in Germany, as demanded in the sustainability strategy, is still far away. At least the land usage has been reduced from 80 hectares (2009) to 58 hectares (2017). But green spaces are still under pressure and we should not lose sight of the sustainability goal.

The diversity of the species – also called biodiversity – is the basis for the balance in the animal and plant world. That is how ecosystems remain stable. This functions best in a city full of green with diverse biotopes and various usage forms. Now already the biodiversity in cities is often bigger than in open countryside, the city is becoming an ark.

Diversity and ecosystem services

Biodiversity basically represents an incomparable rich treasure for the development of medicines and other urgently needed substances. However, with every exterminated species important information, substances and future chances are irretrievably lost.

So that the ecosystems remain stable, exploitation and nature protection must be well balanced. Only in this way can we preserve the ecosystem services and as such a functioning environment long-term. Only in

this way can we ensure that nature continues to contribute to our wellbeing and to a healthy livelihood.

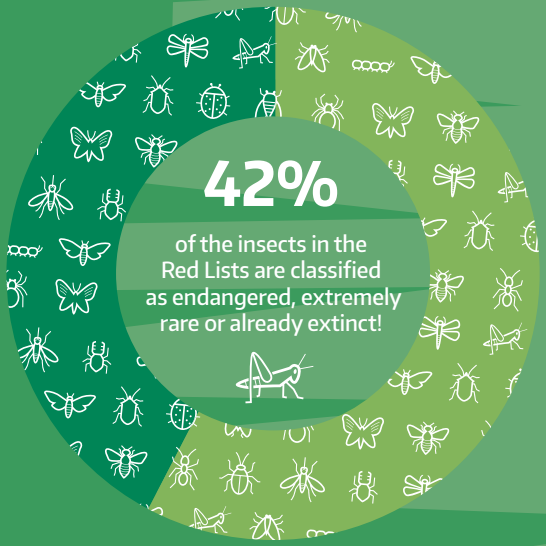
Refuges for city nature

In practical terms: where numerous plant species flower, correspondingly there is also habitat for lots of insects. This way citizens gain important spaces for experiencing nature and attractive natural experiences with so-called city nature. The enthusiasm for nature increases and with it the understanding of natural phenomena and the willingness to protect animals and plants.

Changes often start with small steps. An example: the campaign "save the front garden" promotes diverse green habitats in gardens. It informs why gravel gardens are not helpful in the time of climate change and loss of biodiversity and appeals for colourful living front gardens. These gardens are easy to care for if professionally landscaped. They are a refuge for insects and a real benefit for humans and nature.

Extinction of species

In Germany there are **33,300 species of insects**, that is **70%** of all animal species.



Source: Federal Ministry of the Environment, Germany (BMU).

City as refuge

In Berlin you can find **two thirds** of the breeding birds that are **endangered** or **threatened with extinction** in Germany.

Source: Master Plan City Nature - BMU

Health
Exercise and encounters

City parks and green spaces are the everyday local recreation areas. Exercise in natural or near-natural surroundings provides enjoyment of sport, play and leisure time as well as balance and vitality.

The more professionally designed and well-maintained parks there are in individual city neighbourhoods, the more citizens feel good and healthy. This is confirmed by numerous surveys. Because a network of parks that are interconnected throughout the whole city ensures outdoor exercise and encounters.

Green cities are also a big enrichment for psychologically disadvantaged people. "We observe that inhabitants of cities have a higher risk of suffering stress related illnesses and secondary complications than rural residents," emphasizes Adli Mazda, author of the book „Stress and the City". As a senior consultant at the Berlin Charité clinic he has daily contact with patients. And the scientists of the Central Institute for Mental Health (ZI) in Mannheim, arrive at the same result: inner-city green parks can directly improve the daily wellbeing of city residents. Moreover, Prof. Dr. Andreas Meyer-Lindenberg, the medical Director of the Clinic for Psychiatry and Psychotherapy, is convinced that green spaces are especially important for people who have difficulties regulating negative emotions.

For free and outside

Green cities offer numerous free opportunities and many leisure activities. These contribute to the identi-

fication of people with their residential area and they feel at home. They also interact with each other. As well public parks are often the only places where city residents can meet without barriers and consumption obligations. In regard to environmental justice, crises like epidemics make it clear that urban open spaces are also important places to relax and rest.

Sport, apart from in club facilities, increasingly takes place today in public spaces. In addition to sports like jogging and cycling, today more and more there are trend sports like yoga or calisthenics. The city parks are increasingly being used for these sports.

Relaxed encounters

Clever politicians create local possibilities and residents in green cities often only need to go short distances on foot or on a bicycle. It is best if these possibilities are integrated into the green spaces. This enables relaxed encounters in spite of diverse activities.

City green is good for people

Does the regular utilisation of **parks** and public **green spaces** improve **physical and mental wellbeing**?

Source: Institute Forsa, BGL 2015 (www.galabau.de)

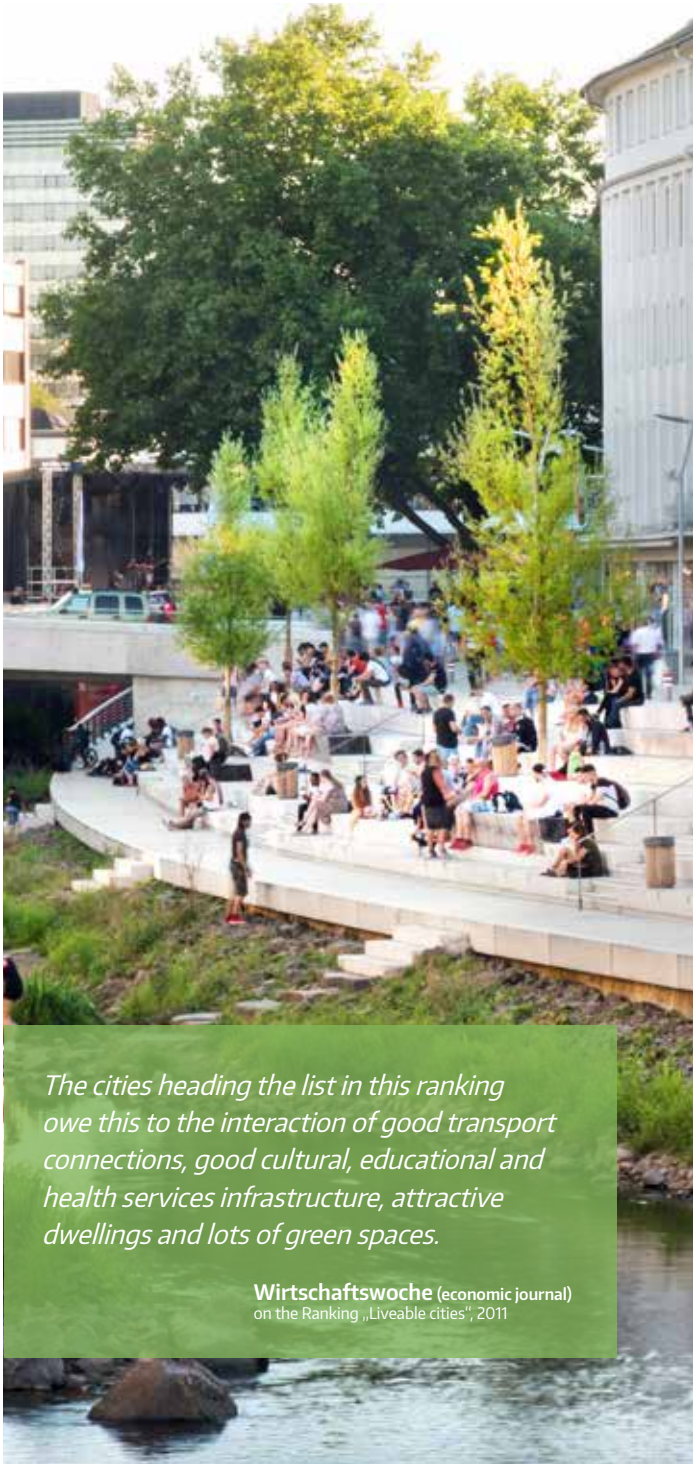
Green spaces near dwellings increase activity

However, less than 15% of older people in industrial countries achieve the physical activity levels recommended by the WHO.

<15%

Achieve the recommended physical activity levels

Source: Study University of Leipzig 2018



The cities heading the list in this ranking owe this to the interaction of good transport connections, good cultural, educational and health services infrastructure, attractive dwellings and lots of green spaces.

Wirtschaftswoche (economic journal)
on the Ranking „Liveable cities", 2011

Quality of Life
The value of open spaces

In 2050 more than 80 percent of Germans will be living in cities. Therefore, it is even more important to prepare our cities for tomorrow. Because plants need time to grow and they are urgently needed: people like living in green cities.

More than half the global population lives in cities in overcrowded spaces. In Europe it is even three quarters of the populations and in Germany about 60 percent today. The experts agree that the trend will increase as cities offer employment, culture and interaction. Where overcrowding continues to increase, professional solutions for qualitative compensation must be provided.

Green city centres promote identification

Nowadays people desire a green residential and work environment in the middle of the city. Due to smart and mobile technologies a significant part of urban life can take place outside. This is why attractive green urban areas are increasingly in demand.

Green cities are popular with residents and visitors. The parks are often known far beyond the city limits. They are tourist highlights and characterize the image of large cities. Munich is associated with the English Garden and the floodplains of the Isar. Berlin with the Zoological Garden and the park Gleisdreieck (triangular station). London is associated with Hyde Park and Regent's Park. New York with Central Park and The Highline.

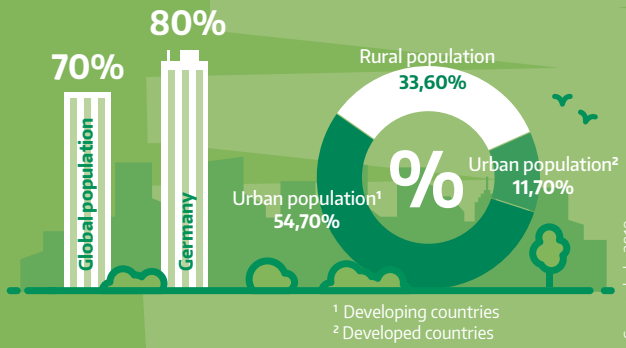
Increase value with green

Investing in parks and maintaining public green spaces is also worthwhile financially for cities: accordingly a survey by the Technical University of Vienna open green spaces can increase the value of properties by 20 percent and more.

This is also valid for investments in private green spaces. Homeowners increase the value of residential and industrial properties with professional green spaces on the grounds and buildings. You can observe this development for a long time already on construction panels: without the words park, garden and green with lavish illustrations, nothing can be sold in the construction industry. Cities and municipalities can establish incentives for more green and promote the investments with corresponding programmes.

Mega trend urbanisation

According to the UNO in 2050 nearly **70% of the global population** will be living in urbanised communities.
In **Germany** more than **80%**.

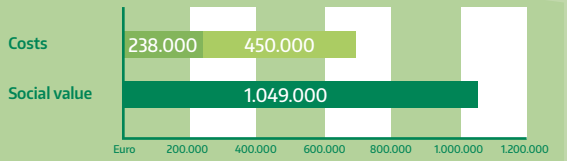


Source: bpb, 2019

Identification and values

The economic **value of city green** is difficult to calculate but **undisputed**.

Balance sheet for an additional hectare of city green



max. investment and maintenance costs

loss of social benefits due to renouncing any development / construction

Source: BfN 2016

There is no alternative to climate-friendly urban development that is based on more living green. This is why we need a comprehensive investment program from the Federal Government for green and blue infrastructure, apart from the funding of urban development, that also considers the means for the professional maintenance of green spaces.

Lutze von Wurmb

President of the Federal Association for Garden, Landscape and Sports Fields, Germany (BGL)

Sustainability

Green infrastructure needs maintenance

Cities of the future are sustainable cities. Green infrastructure that is professionally landscaped and maintained contributes to the long-term functionality of the cities. Future generations profit from this as well.

Green cities prepare for climate change with forward planning of green developments. These are designed by landscaping specialists to be sustainable and climate resilient so they can cope with the challenges of increasing temperatures and rainfall. Garden shows and international garden exhibitions are the acknowledged format for integrated urban and regional development in the sense of sustainable green infrastructure. The infrastructure – green and no longer only grey – contributes to counterbalancing extreme weather conditions and to maintaining or even increasing the quality of life in cities.

Blue-green instead of only grey

In the time of climate change the water cycle is especially important. Water elements and planted retention basins, open lawn areas, urban meadows and urban woods can absorb rainfall and as such protect from flooding. These systems are also called sponge-cities as they collect rainfall and keep it in circulation. They can cope better with heavy rainfall and the rainwater can be used to water trees and flowerbeds. Sewage treatment plants and drainage systems are not overwhelmed.

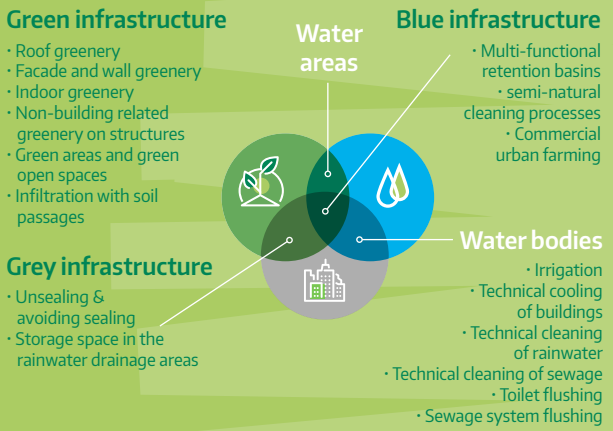
Long usage with professional maintenance

Sustainable useable city green and a blue-green infrastructure are as essential for people in future as the technical infrastructure of a city. Important in this case is that the parks are professionally designed and constructed by landscape architects and landscape gardeners and are then permanently well maintained by communal green authorities and maintenance enterprises.

People do not like using badly maintained urban green spaces. They degrade quickly into rubbish tips or become a dog field. Also for sustainability reasons citizens are right to demand good maintenance for urban green. Only this way is green infrastructure up to being used intensively and only then do such investments in city green pay off long-term.

Sustainable infrastructure

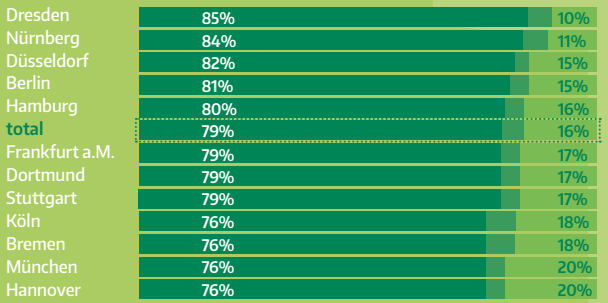
The cooperation enables new perspectives **ecologically and economically**.



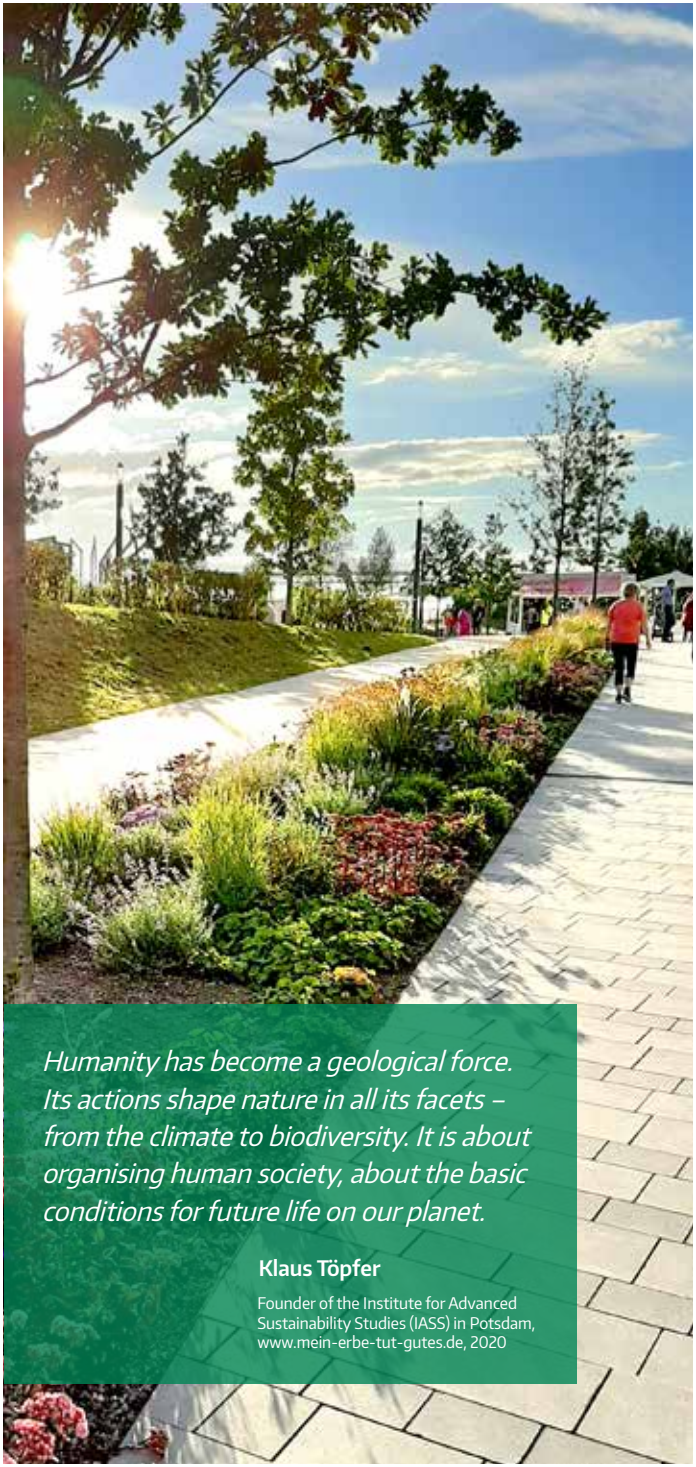
Source: networks-group.de

Professional maintenance

According to the demand of citizens public parks and green spaces should be ...



Source: Forsa/BGL 2015



Humanity has become a geological force. Its actions shape nature in all its facets – from the climate to biodiversity. It is about organising human society, about the basic conditions for future life on our planet.

Klaus Töpfer

Founder of the Institute for Advanced Sustainability Studies (IASS) in Potsdam, www.mein-erbe-tut-gutes.de, 2020

The City of the Future
Green, resilient, attractive

... relies on climate resilience

- reduces the heat island effect
- improves the micro climate
- reduces particulate matter pollution
- reduces extreme weather conditions
- contributes to achieving the climate protection goals

... increases biodiversity

- promotes city nature and its development
- creates experiences and awareness of nature
- offers animals and plants diverse habitats
- sustains natural resources and substances
- makes optimum use of the ecosystem services

... preserves health

- creates space for sport and leisure activities
- guarantees exercise as the basis for fitness
- improves mental health through encounters
- makes rest and relaxation possible for everybody
- offers prophylaxis against undesirable developments

... increases life quality

- ensures free offers in open spaces
- generates identification with the residential area
- encourages encounters in public spaces
- benefits the image of the city
- increases the value of properties

... secures sustainability

- expands the green-blue infrastructure
- reduces energy costs with greenery on buildings
- reduces costs for CO2 reducing measures
- stabilises the urban water balance
- supports environmentally friendly mobility

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