

# Sustainable, Climate-Resilient and Vibrant Cities

## Good practices from Covenant of Mayors signatories



**Covenant of Mayors**  
for Climate & Energy



## FEATURED CITIES

02

-  Energy performance of buildings
-  Managing water flows
-  Facilitating sustainable mobility
-  Renaturing urban spaces
-  Managing urban growth

 Lisbon

 Barcelona

 Bologna

 Glasgow

 Umeå

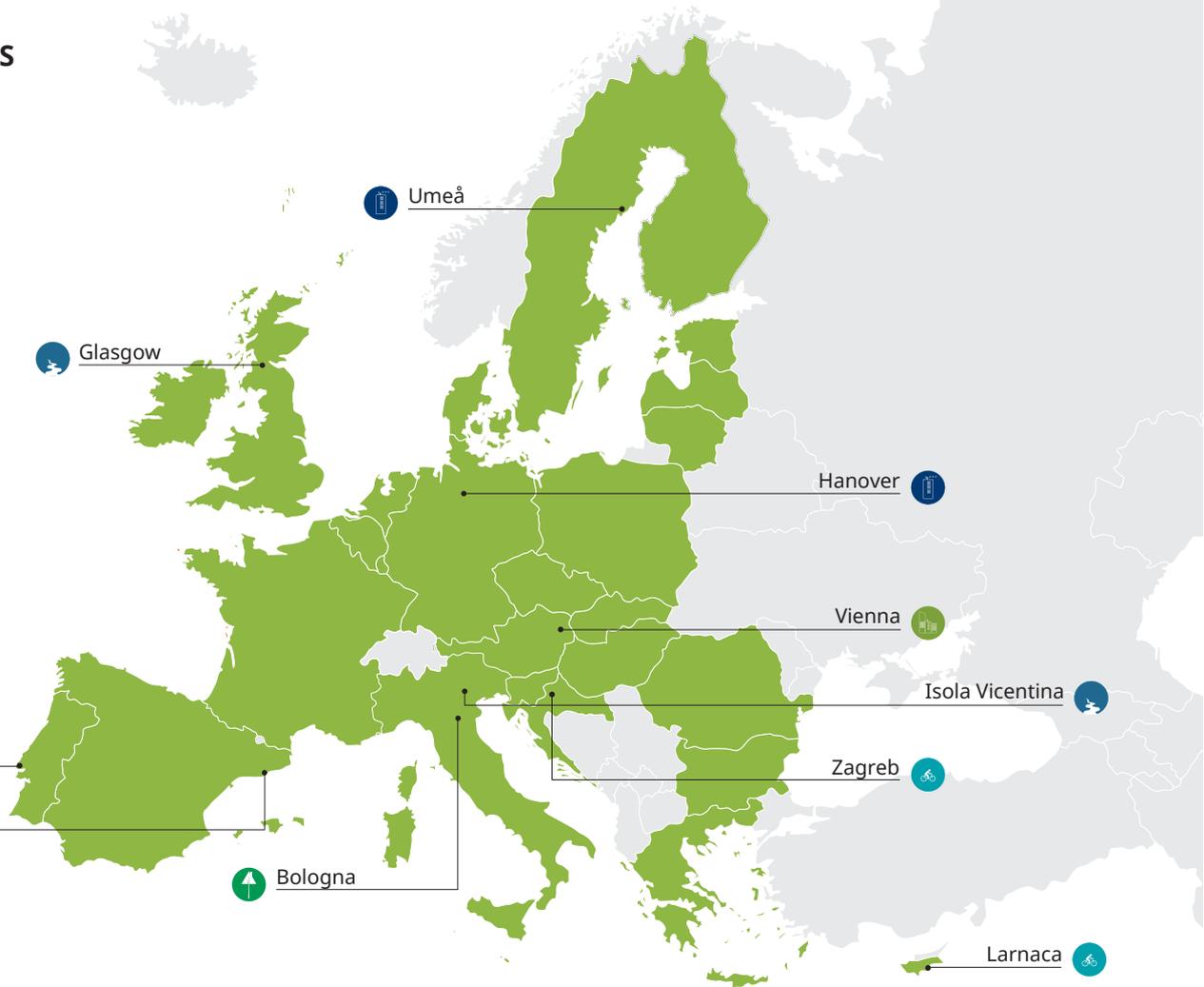
 Hanover

 Vienna

 Isola Vicentina

 Zagreb

 Larnaca



## ABOUT THE COVENANT OF MAYORS GOOD PRACTICE BROCHURE

Covenant of Mayors signatories commit to carrying out local actions to mitigate climate change, adapt to its unavoidable impacts, and facilitate access to secure, sustainable and affordable energy. This brochure takes us on a tour around Europe to discover some of the best practices from Covenant signatories.

In these pages you will find real examples of climate change mitigation and adaptation from European cities. The cases are arranged according to five thematic challenges: improving the energy performance and resilience of buildings, managing water flows, facilitating sustainable mobility, renaturing urban spaces and managing urban growth.

Get ready to be inspired by the Covenant signatories' achievements and spread the word within your community!

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## AN INTEGRATED APPROACH TO CLIMATE CHANGE MITIGATION AND ADAPTATION

*Cities are facing severe climate and energy challenges. Many are doing their part to mitigate climate change, including efforts to save energy and use more renewable energy sources. Despite this, cities are already feeling the effects of climate change and have no choice but to find ways of adapting to the risks.*

*Mitigation and adaptation are equally important to build decarbonised and resilient cities. Signatories of the Covenant of Mayors for Climate and Energy have committed, since 2015, to implementing an integrated approach to climate change mitigation and adaptation.*

*The good practices presented in this brochure show how combining adaptation and mitigation measures can help cities make better planning decisions and solve key challenges.*

### ADDRESSING KEY URBAN CHALLENGES

Numerous challenges faced by cities are rooted in urbanisation. But many are also linked to mitigation and adaptation, which the Covenant of Mayors community addresses through local energy and climate action:

**Improving the energy performance and resilience of buildings** is a key component of climate change mitigation, as buildings account for 40% of energy consumption in the EU. Indoor heating and cooling is also becoming increasingly challenging as cities need to adapt to more extreme temperatures. While climate change may reduce energy demand for heating in the winter in some areas, it increases the need for cooling in the summer. This requires energy-efficient systems that can provide thermal comfort without generating more emissions.

**Managing water flows is becoming a critical issue** given the increasing flood and drought risks and water shortages facing many parts of Europe. Setting up innovative water management structures for rainwater reuse is one example of how cities can adapt to these risks without dramatically increasing energy consumption. Similarly, drawing up flood prevention schemes, widening or fortifying the riverbanks can lessen the impact of extreme weather events and flooding on the surrounding areas.

**Facilitating sustainable mobility** is beneficial both in environmental terms - for climate change mitigation - but also in societal terms - for improved air quality and better quality of life. Sustainable and more resilient urban transport systems mean not only less pollution, but more resilience in the face of increasing climate risks to critical infrastructure.

**Renaturing urban spaces** contributes to climate change mitigation because green areas serve as 'carbon sinks', thanks to their ability to absorb carbon dioxide from the atmosphere. This is also a key component of adaptation, as renaturing urban spaces increases the absorptive capacity of the soil in case of heavy rainfall, and has a cooling effect on the built environment among other benefits.

**Managing urban growth** is an important means of reducing the negative impacts of scattered housing and commercial developments on the environment and quality of life in cities. Compact, connected, and well-planned cities tend to have lower greenhouse gas emissions and infrastructure-related costs and are also more resilient to extreme temperatures and floods.

### **SEARCHING FOR CO-BENEFITS**

The benefits of energy and climate measures very often extend beyond climate change mitigation and adaptation. Green spaces, for example, bring social and health benefits, and compact and connected cities are associated with larger, more productive wildlife habitats and recreational areas in urban peripheries as well as time savings for commuters. Making the most of these so-called 'co-benefits' makes cities more attractive and helps to make the measures more popular.

### **ABOUT THE COVENANT OF MAYORS FOR CLIMATE AND ENERGY**

The Covenant of Mayors for Climate and Energy brings together local and regional authorities voluntarily committing to implementing the EU's climate and energy objectives on their territories. This unique bottom-up movement started in 2008 with the support of the European Commission and now incorporates over 6,800 signatories\*. In 2015, it took on new objectives when merging with the Mayors Adapt initiative on climate change adaptation. The Covenant of Mayors for Climate and Energy stepped up the initial CO<sub>2</sub>-reduction commitment (now set at a 40% reduction by 2030) and

included adaptation to climate change as part of its mandate. Signatory authorities at local level share a vision for decarbonised and resilient cities with universal access to secure, sustainable and affordable energy.

To realise this vision, signatories commit to developing Sustainable Energy and Climate Action Plans for 2030 and to implementing local climate change mitigation and adaptation measures.

## **COVENANT OF MAYORS SIGNATORIES' VISION FOR 2050**

### **MITIGATION**

**ACCELERATING THE  
DECARBONISATION OF  
TOWNS AND CITIES**

### **ADAPTATION**

**STRENGTHENING THE  
CAPACITY TO ADAPT TO  
UNAVOIDABLE CLIMATE  
CHANGE IMPACTS**

**SECURE,  
SUSTAINABLE,  
AFFORDABLE  
ENERGY**

**INCREASING ENERGY  
EFFICIENCY, THE USE OF  
RENEWABLES, AND IMPROVING  
ACCESS TO ENERGY**

*\*as of July 2016*



## IMPROVING THE ENERGY PERFORMANCE AND RESILIENCE OF BUILDINGS

### ENERGY-EFFICIENT CITIES

#### **Hanover, Germany**

#### *Large-scale energy retrofitting of public and private buildings*

- Population: 524,000
- Joined the Covenant of Mayors in 2008 and Mayors Adapt in 2014
- CO<sub>2</sub> reduction target: 40% by 2020
- Climate impacts: extreme temperatures, flooding, droughts, storms

06 *Like many German cities, much of Hanover's housing stock was built immediately after World War II. Many of the buildings are still in their original condition, except in some instances where modern windows have been installed. One of the city's major objectives in its 2008-2020 Climate Protection Programme is to improve the standards of its building stock to save energy and CO<sub>2</sub>.*

Together with four local partners, Hanover carried out an extensive retrofitting programme for public and private buildings between 2006 and 2012. The refurbishment included connecting the buildings to a district heating system, which generates heat using wood pellets, and installing better



insulation for energy savings and better comfort in case of extreme temperatures.

The municipality also offered training courses on energy efficiency to architects and craftsmen, gave energy advice to consumers, conducted an energy saving campaign, and launched a website to inform tenants and landlords about energy saving opportunities, insulation, and heating and cooling.

These activities were delivered as part of the EU-funded Concerto/act2 project that aimed to advance renewable energy solutions, improve energy efficiency, and promote the combined generation of heat, power, and/or cooling. Hanover and Nantes were the project's demonstration cities. The energy measures were financed jointly by housing associations, through Concerto, from subsidies offered by the KfW bank, and by the local proKlima fund.

#### **PROJECT IN FIGURES:**

- 55 buildings comprising 34,200 m<sup>2</sup> retrofitted and connected to district heating
- 50 training course participants
- implementation cost: €5.6 million; EU contribution: €2.7 million

#### **MITIGATION AND ADAPTATION EFFECTS:**

- *energy consumption reduced from 250 kWh/m<sup>2</sup>a to 70-100 kWh/m<sup>2</sup>a*
- *3,600 tonnes of CO<sub>2</sub> in total saved per year*
- *energy savings of 3,650 MWh/a, 70% of final energy, 92% of primary energy*
- *8 MWh of renewable energy generated per year*
- *improved thermal comfort in buildings*

#### **CO-BENEFITS:**

- lower energy costs for tenants
- greater ownership among residents of their neighbourhoods and the local environment
- better understanding of energy efficiency among residents
- new skills for craftsmen and architects
- boost to local businesses
- increase in property value
- improvement to surrounding environment, more attractive city

#### **MORE INFORMATION:**

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- Concerto/act2: <http://bit.ly/2aTgbuN>

## Umeå, Sweden

### Creative financing for energy renovation

- Population: 110,000
- Joined the Covenant of Mayors in 2011
- CO<sub>2</sub> reduction target: 40% by 2020
- Climate impacts: extreme temperatures, precipitation and ice, flooding, storms

Umeå is home to Sweden's largest energy efficiency projects. Starting in 2008 and ending in January 2016, the city retrofitted 130 municipal buildings. At 425,000 m<sup>2</sup>, this represents over half of the total surface area of the building stock owned by the municipality in the city. This project, led by the municipality's properties department, is expected to reduce energy consumption by 20%.

Umeå's project is financed by Energy Performance Contracting (EPC). EPC is a form of 'creative financing' for capital improvement, which enables the funding of energy upgrades through eventual cost savings. Under this EPC arrangement, the contractor implements the energy efficiency project and uses the stream of income from the cost savings to repay the costs of the project, including investment costs. If savings are lower than the guaranteed level, the contractor would pay the difference.



In Umeå, savings were always higher than calculated, so the EPC arrangement proved beneficial for all parties.

First, the contractor conducted an inventory in each building to evaluate the expected profits from the various actions envisaged. Then the project was carried out in three phases: planning and procurement of contractors; execution; and optimisation. All three phases were completed in January 2016.

The project also included a large training programme on the heating, ventilation, and control systems used in the retrofitted buildings for about 30 Umeå municipal employees. The contractor organised the training in their Training Centre in Huddinge, Sweden, and upon completion of the various courses participants could take a test and obtain a certification.

#### PROJECT IN FIGURES:

- retrofitting of 130 municipal buildings covering 425,200 m<sup>2</sup>
- implementation cost: €13 million
- energy savings of about €1 million per year
- 30 municipal workers trained

#### MITIGATION AND ADAPTATION EFFECTS:

- CO<sub>2</sub> reduction of 5,800 tonnes CO<sub>2</sub> equivalent per year
- energy savings of 14,000 MWh/a
- improved thermal comfort

#### CO-BENEFITS:

- job creation
- new skills for craftsmen
- lower future maintenance costs

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## MANAGING WATER FLOWS FORWARD-LOOKING AND RESOURCE-EFFICIENT CITIES

### **Glasgow, United Kingdom** *Protection from river flooding*

- Population: 612,000
- Joined the Covenant of Mayors in 2009 and Mayors Adapt in 2014
- CO<sub>2</sub> reduction target: 23% by 2020
- Climate impacts: extreme temperatures, flooding, rising sea levels, storms

Normally a shallow river, the White Cart Water is prone to flash flooding. Its water levels can rise by six metres after just 12 hours of rain, threatening vulnerable suburbs downstream. Public awareness of such flooding risks in the 1980s and 1990s, and predictions of more intense periods of rainfall made devising a flood prevention scheme a priority for the Glasgow City Council. In 2006, the council promoted and approved Scotland's then largest flood prevention scheme for the White Cart Water and its tributary, the Auldhouse Burn.

The scheme is based on the catchment management principle. This involves the formation of three flood storage areas upstream of the city to temporarily hold back the bulk of floodwater generated by



extreme rainfall, and control the release of water passing downstream. The scheme combines cutting-edge engineering solutions and natural flood risk management techniques. Given that many of the affected buildings are tenement apartment blocks, the scheme provides flood protection relief to more than 7,200 homes and 40 businesses. The White Cart Water project has already protected against significant flood damage, for example during storms in 2011 and 2012, and will ensure that the area covered remains a viable place to live and work for generations to come.

After four years of construction, the White Cart Water flood defence project was completed in December 2012.

#### **PROJECT IN FIGURES:**

- installation of three large flood storage reservoirs, six surface water pumping stations, and two new road bridges
- 4,500 metres of new flood defence walls
- over 7,000 new trees
- 22 acres of new, biologically diverse and robust wetlands
- implementation cost: €63 million (£53 million)

#### **MITIGATION AND ADAPTATION EFFECTS:**

- over 7,200 homes and businesses protected
- flood damage reduction savings of €13 million (£11 million) in 2011-2012 Damages averted during major storms in February 2011, November 2011 and January 2012
- better water retention
- improved carbon capture

#### **CO-BENEFITS:**

- better river water quality
- extensive habitat creation
- emissions and monetary savings as transport of 180,000 m<sup>3</sup> of materials (i.e. clay) was avoided thanks to the use of site-won material

#### **MORE INFORMATION:**

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- White Cart Water project: [www.whitecartwaterproject.org](http://www.whitecartwaterproject.org)

## Isola Vicentina, Italy

### Prevention, protection and preparation for flood risks

- Population: 10,000
- Joined the Covenant of Mayors in 2014
- CO<sub>2</sub> emission reduction target: 22% by 2020
- Climate impacts: flooding, soil erosion



The small town of Isola Vicentina is prone to flooding when violent storms cause the local river to overflow. Since signing up to the Covenant in 2014, Isola Vicentina has revised

its water management plan to integrate climate change adaptation and mitigation. The municipality has designated a ten hectare pilot area to conduct a simulation on how preserving wooded and green areas instead of building new houses would improve the resilience of its territory to flooding and erosion.

Scenarios prepared by the contracting consultancy with scientific support from the University of Venice show a 41% decrease in the maximum area affected by flooding if the area was completely reforested compared to current land use. The municipality has gained a better understanding of the need to preserve wooded and green areas and envisages converting part of the agricultural land into wooded areas.

The city also consulted citizens and local businesses to find out which flood protection measures they prefer. Comparing this feedback with integrated hydrogeological analyses, the municipality set out to clean up rivers and streams, enlarge existing ditches, create new ditches along roads and three retention basins, and expand existing critical sewer pipes. These measures were jointly funded by the municipality's infrastructure budget, the consortium managing the rivers and streams, and private landowners for private streams. Through

four debates with citizens, the municipality has gathered ideas and feedback on its interventions, and informed and trained people on how to respond in case of emergency and extreme weather conditions.

#### PROJECT IN FIGURES:

- ten hectare reforestation pilot project
- 50 protection interventions in 24 targeted areas, such as creation/enlargement of ditches and retention basins
- 200 participants at each of the four citizens' debates

#### MITIGATION AND ADAPTATION EFFECTS:

- better water retention and resilience to flooding
- greater resistance to soil erosion
- improved carbon capture
- improved resilience through raised awareness and increased local capacity to respond to flooding

#### CO-BENEFITS:

- improved land use management and maintenance of rural and green areas
- better stability of urban infrastructure
- more attractive green spaces for citizens to enjoy

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## FACILITATING SUSTAINABLE MOBILITY ACCESSIBLE AND HEALTHY CITIES

### **Larnaca, Cyprus** *Away from cars, towards walking and cycling*

- Population: 85,000
- Joined the Covenant of Mayors in 2011
- CO<sub>2</sub> reduction target: 40% by 2020
- Climate impacts: extreme temperatures, rising sea levels, flash flooding

*Larnaca is well-suited for cycling and walking, with few elevations of over 20 metres above sea level, and relatively short distances between different city districts. However, the low-lying position of the city also makes it vulnerable to rising sea levels.*

Cypriot law requires that, as of July 2011, every development occupying an area larger than 1,200 m<sup>2</sup> must dedicate a quarter of the total parking space available to bicycle parking. With this in mind, the municipal town planning committee has integrated bicycle parking places into spatial planning specifications for apartment buildings, hotels, and multi-storey car parks. In the latter, bicycles can be borrowed for free once you have parked your car.



The Piyale Pasia Avenue, a popular path with beautiful views of the sea, has been rebuilt and elevated. It now includes 2.5 km of cycling and pedestrian paths, thus creating a five km cycling and pedestrian sea front and reducing exposure to rising sea levels. Additional pedestrian streets, bicycle parking places, and parking spaces for hybrid/electric cars were also constructed on Piyale Pasia Avenue. Similar measures are to be implemented all over the city.

Through the European Mobility Week Award scheme, Larnaca has received distinctions for five consecutive years (2011–2015) for

its efforts to raise public awareness of sustainable mobility issues and implement measures that facilitate a shift towards sustainable urban transport. Larnaca ranked among the top three finalists for the European Mobility Week Award in 2011.

#### **PROJECT IN FIGURES:**

- five km cycling and pedestrian sea front
- more park-and-ride and bicycle parking spaces
- implementation cost for Piyale Pasia Avenue renovation: €7.7 million

#### **MITIGATION AND ADAPTATION EFFECTS:**

- energy savings of 60 MWh per year (park-and-ride) and 5,110 MWh per year (reconstruction of Piyale Pasia Avenue)
- emission reductions of 16 tonnes CO<sub>2</sub> equivalent (park-and-ride) and 1,364 tonnes CO<sub>2</sub> equivalent per year (cycling path)
- greater resilience to rising sea levels

#### **CO-BENEFITS:**

- less traffic noise
- better air quality
- more attractive city centre and seaside, where cultural events regularly take place

#### **MORE INFORMATION:**

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## Zagreb, Croatia

### Efficiency boost for public transport

- Population: 790,000
- Joined the Covenant of Mayors in 2008
- CO<sub>2</sub> reduction target: 21% by 2020
- Climate impacts: heat waves, droughts, flooding

*With 1.5 to two million trips per day, Zagreb boasts an extended public transport network of trams, buses, funicular and suburban trains, as well as 200 km of cycle paths. Zagreb has been taking steps to improve the energy efficiency of its public transport system since signing up to the Covenant of Mayors in 2008.*

Between 2010 and 2012, the city's bus fleet was replaced by 160 clean fuel and energy-efficient buses, including 100 low-floor biodiesel and 60 compressed natural gas (CNG) vehicles. Equipped with air conditioning, CCTV, and emergency buttons, the new fleet is safer and more comfortable, without consuming more energy. A further 70 low-floor trams were also introduced, which contributes to better air quality and accessible public transport. The rise in trips by public transport shows that it is becoming a safe and attractive alternative to private cars.

Furthermore, the city has installed detectors to collect traffic information at key intersections on one of its most congested traffic arteries. Travellers can now obtain transport information through 147 LED display panels available at public transport stops.

Zagreb implemented these measures as part of its involvement in the EU-funded CIVITAS ELAN project.

Zagreb was keen to discuss its transport strategy with citizens, and organised mobility dialogues in nine local committees, as well as 15 meetings in retirement homes. This engagement continues with 'Dialogue on mobility in Zagreb', a two-year



EU-funded project involving citizens from five city districts and the city council.

#### PROJECT IN FIGURES:

- better tram performance, with cumulative delay at one intersection (Savska Cesta) reduced by 17.84%
- cycling for unimodal journeys up from 5.8% (2009) to 10.1% (2012)
- 68.8% share of sustainable transport modes in 2009, up to 74.66% in 2012 (34.33% walking and cycling; 40.33% public transport)

#### ADAPTATION AND MITIGATION EFFECTS:

- reduction in SO<sub>2</sub> and PM<sub>10</sub> emissions by 27.47% and 22.28%, respectively, in Savska Cesta corridor

#### CO-BENEFITS:

- less noise (between 11.1% and 27.6% in Savska Cesta corridor)
- safer public transport: total number of attacks on transport company employees reduced by 35.7%; total number of attacks on ZET (Zagreb Electric Tram) drivers reduced by 54.5%
- more accessible public transport
- improved satisfaction with information provided to transport users
- better air quality

#### MORE INFORMATION:

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## RENATURING URBAN SPACES GREEN AND RESILIENT CITIES

### Lisbon, Portugal Gardens in the city

- Population: 580,000 (inner city), 2.5 million (metropolitan area)
- Joined the Covenant of Mayors in 2008 and Mayors Adapt in 2014
- CO<sub>2</sub> reduction target: 20% by 2020
- Climate impacts: extreme temperatures, flooding, rising sea levels, storms, water shortages, coastal erosion



*Lisbon faces a number of climate-related challenges, including flash flooding, water shortages, and an urban heat island effect.*

*These climate risks, along with decades of soil sealing due to rapid urbanisation, and a severe financial crisis since 2009, prompted the city to invest in a range of quick, low-cost green infrastructure solutions. Together, these create an effective 'climate tool'.*

The city's master plan has included an ambitious green infrastructure programme since 2008. This was aligned with the Covenant of Mayors mitigation target in 2009, and updated in 2012 to include climate adaptation. As part of this plan, the city developed 107.23 hectares of new green areas between 2009 and 2014.

The urban allotment garden programme is one of Lisbon's climate measures. Most of these allotments have been built on new green areas developed by the municipality, for example on brownfield land. There are two types of allotments: larger ones of over 100 m<sup>2</sup> for social uses, providing subsistence to those who cultivate them; and smaller ones of between 50 m<sup>2</sup> and 100 m<sup>2</sup>, for recreational and educational purposes. The latter is reserved for organic production.

While rental of these allotments is usually charged at €0.9/m<sup>2</sup>/year, the municipality subsidises the costs for associations and people benefitting from the social-use allot-

ments, who pay 10% and 20% of the normal price depending on the allotment size.

So far, 11 gardens are already open within the city, with a further seven planned and three others under consideration.

#### PROJECT IN FIGURES:

- 32 ha of gardens created
- the surface of urban allotment gardens should reach 54-61 ha

#### MITIGATION AND ADAPTATION EFFECTS:

- improved hydrogeological stability and water retention
- reduced urban heat island effect
- reduced risk of floods through improved water retention in soil
- greater natural capture of greenhouse gas emissions
- more robust natural habitat
- increased pollination

#### CO-BENEFITS:

- education on nature preservation
- promoting healthy food
- more social cohesion
- less poverty

#### MORE INFORMATION:

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## Bologna, Italy

### Plan for regenerating and greening urban spaces

- Population: 387,000
- Joined the Covenant of Mayors in 2008 and Mayors Adapt in 2014
- CO<sub>2</sub> reduction target: 20% by 2020
- Climate impacts: extreme temperatures, water shortages, droughts, storms, forest fires

*Bologna, like many Italian cities, is increasingly prone to extreme weather events, particularly extreme heat. In June 2014, the city adopted a Municipal Operative Plan (POC) in an effort to create a more pleasant and resilient environment. The plan consists of 28 projects specifically aimed at increasing the amount green space in the city and promoting urban safety. Some of the measures include reducing soil consumption through green and blue requalification actions focused on improving landscape maintenance and watershed management, and regenerating or transforming abandoned industrial and commercial buildings.*

As a result, Bologna will benefit from 17,000 m<sup>2</sup> of new public and private green areas. The total area of sealed surfaces has also been reduced in favour of semi-permeable and permeable surfaces. A total of 125,295 m<sup>2</sup> of new building space will have been cre-



ated, of which 2,474 m<sup>2</sup> is intended for social housing. To further enrich the new green spaces, 375 new trees will be planted.

These green spaces have the additional purpose of improving local microclimatic conditions during summer heat waves. Bologna is using a special index called RIE, taken from a tool used in the Italian city of Bolzano, to measure the microclimatic performance of its public spaces.

The measures carried out in Bologna are the result of agreements between the municipality and private developers, who fund the plan's implementation. The city council

approved the plan in 2015. Measures should be completed within five years, with many already completed or under development.

#### PROJECT IN FIGURES:

- 17,000 m<sup>2</sup> of new public and private green areas
- 125,295 m<sup>2</sup> of renovated building space
- 375 new trees planted

#### MITIGATION AND ADAPTATION EFFECTS:

- 28,000 m<sup>2</sup> and 15,000 m<sup>2</sup> respectively, of additional semi-permeable or permeable surface area
- reduction in urban heat island effect
- reduced storm water flooding and runoff
- better city energy performance - replacing old buildings expected to save 5,000 tonnes of CO<sub>2</sub> a year

#### CO-BENEFITS:

- job creation
- greater biodiversity
- better quality public spaces
- 29,000 m<sup>3</sup> per year reduction in rainwater load in sewage system
- rise in property values
- better air quality

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## REGULATING URBAN GROWTH DENSE AND LIVEABLE CITIES

### Vienna, Austria

#### Addressing the urban heat island effect

- Population: 1,730,000
- Joined the Covenant of Mayors in 2012
- CO<sub>2</sub> reduction target: 20% by 2020
- Climate impacts: extreme temperatures, storms

Projections suggest Vienna's population will increase from 1.8 million to two million by 2030. This is likely to result in urban densification, fewer open spaces, and ultimately higher temperatures in the city compared to temperature in the less urbanised periphery, a phenomenon known as the urban heat island effect (UHI). The city administration, together with external experts, developed the UHI-STRAT project to address this phenomenon. The project, which was completed in 2015, formed part of a broader Central European project, 'Urban heat islands – Development and application of mitigation and adaptation strategies and measures for counteracting the global urban heat islands phenomenon', supported by the European Regional Development Fund.



The project enabled Vienna to identify and evaluate 37 measures to address the urban heat island. These included, for example, constructing parks, planting trees, and practicing rainwater management. The project also explored ways to raise awareness and promote public acceptance among citizens of the measures. The evaluation process used to define the measures incorporated aspects such as micro and mesoclimatic conditions; urban ecology and design; economics and environmental economy; and feasibility and acceptance. As a result of this evaluation, a number of greening projects

have been implemented in the city. Among these are the transformation of a 400 m<sup>2</sup> gravel roof into a green roof and the installation of a 850 m<sup>2</sup> green wall on the building that houses the city's Waste Management Department.

#### PROJECT IN FIGURES:

- compendium of 37 adaptation measures developed

#### MITIGATION AND ADAPTATION EFFECTS (GREEN FACADE):

- temperature in areas surrounding greened buildings reduced by several degrees Celsius in summer
- improved thermal comfort in buildings
- 50% heat transfer reduction through building (W/m<sup>2</sup>) in summer, and 17% reduction in winter, due to green facades

#### CO-BENEFITS:

- better quality of life
- improved appearance of buildings
- better pollutant filtration and noise protection
- greater biodiversity

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## Barcelona, Spain

### Lively and sustainable streets in superblocks



- Population: 1,605,000
- Joined the Covenant of Mayors in 2008 and Mayors Adapt in 2014
- CO<sub>2</sub> reduction target: 40% by 2020
- Climate impacts: extreme heat, heat waves, water shortages, flooding, rising sea level, droughts

*Whilst Barcelona has developed, the surface occupied by green spaces in the city has remained limited. Over the years traffic has increased, leaving less room for leisure and pedestrians. To reverse this trend and reduce the city's environmental impact, Barcelona has introduced the so-called 'superblocks' or 'filling the streets with life' programme.*

The superblocks programme is linked to the city's climate change commitments, as well as to its climate, urban mobility, green infrastructure, and biodiversity plans. Its aim is to free up space for green areas and recreation by reducing the amount of traffic and vehicles on certain streets. The programme began in 2014 with four pilot projects, and will be extended throughout the city from 2017 onwards. The €10 million allocated to the 2017-2020 phase of the project comes from the municipal budget.

Since the transport sector accounts for 28% of Barcelona's CO<sub>2</sub> emissions, the programme has the potential to significantly

reduce the city's carbon footprint. At the same time, by building up the city's green spaces, Barcelona is able to address the urban heat island effect and create habitats that will encourage biodiversity. Further benefits include reducing storm water runoff and flooding. All in all, the result is a more liveable and resilient city.

#### PROJECT IN FIGURES:

- 95% of residents now have a bicycle lane within 300 metres of their home
- 300 km of bicycle lanes to be built

#### MITIGATION AND ADAPTATION EFFECTS:

- 159,100 tonnes of CO<sub>2</sub> to be saved annually
- surface area of public/car-free spaces increased by over 23 ha in pilot areas
- reduction in urban heat island effect
- reduced risk of storm water runoff and flooding

#### CO-BENEFITS:

- better air quality
- healthier and more active lifestyles and greater interaction among residents
- less traffic and noise
- improved public safety

#### MORE INFORMATION:

- Irma Ventayol i Ceferino: [iventayol@bcn.cat](mailto:iventayol@bcn.cat)

## HOW TO SIGN UP?

Signatories now pledge to reduce CO<sub>2</sub> emissions by at least 40% by 2030 and to adopt an integrated approach to tackling mitigation and adaptation to climate change.

Joining the Covenant of Mayors requires a formal political commitment. The adhesion form needs to be signed by the Mayor or an equivalent representative of the municipal council.

Further information:  
[www.eumayors.eu](http://www.eumayors.eu) > Participation

## MORE INFORMATION

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for Climate & Energy

