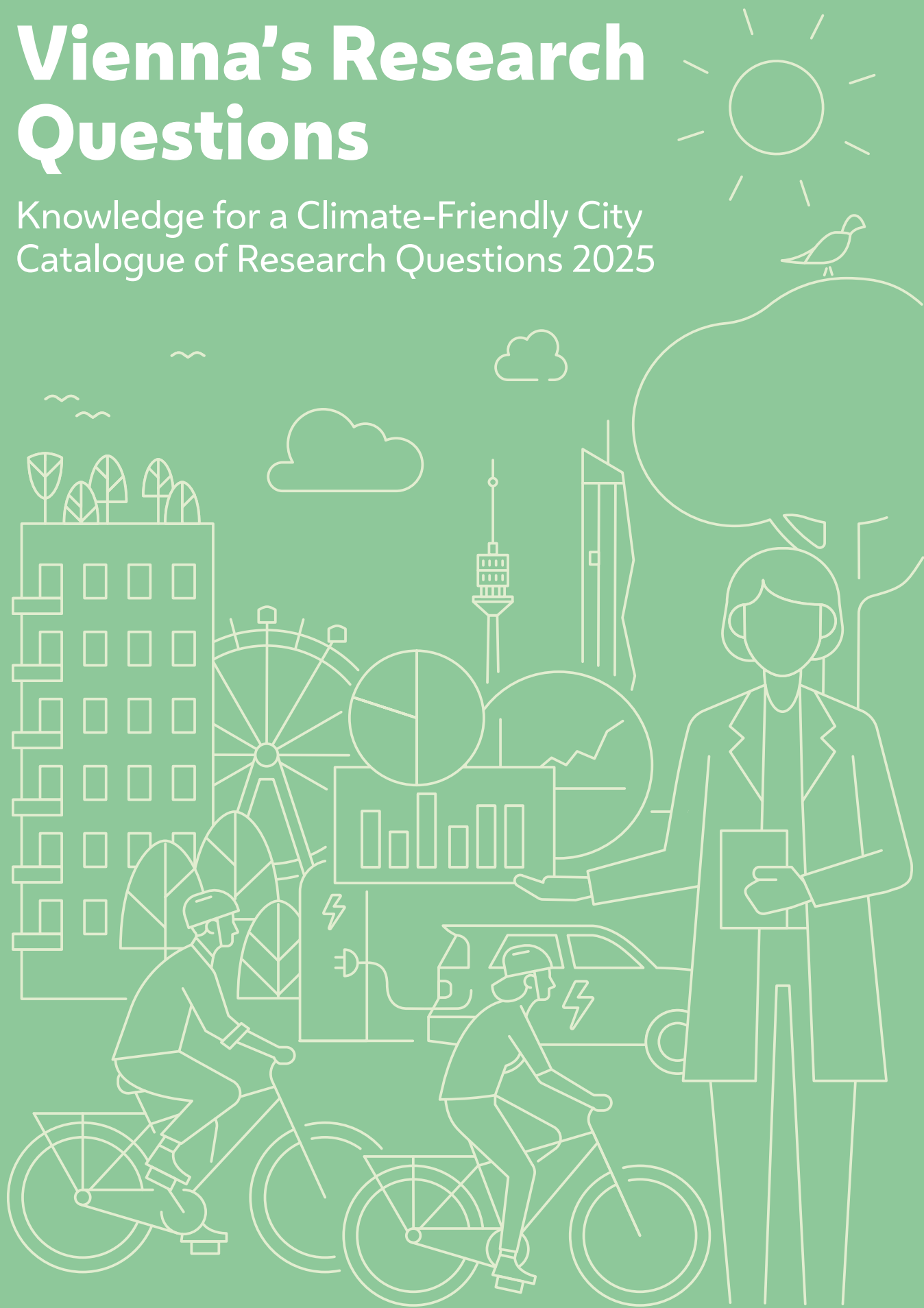


# Vienna's Research Questions

Knowledge for a Climate-Friendly City  
Catalogue of Research Questions 2025





# Foreword

When it comes to climate protection, Vienna has been playing a pioneering role for many years now. With Austria's first climate act, the City of Vienna has defined a clear and binding legal framework for its path to net zero by 2040. The Smart Climate City Strategy and the Vienna Climate Guide set out the goals, strategic instruments and concrete measures required to make our city climate resilient and climate neutral by 2040.

With the measures already implemented, Vienna has recently succeeded in significantly reducing CO<sub>2</sub> emissions, undertaking large-scale expansion of its renewable energy supply and making substantial investments in public transport for an even denser and more sustainable network. Nevertheless, the challenges that lie ahead are huge. Given the increased incidence of heatwaves, drought and torrential rainfall, it is evident why we need to continue pursuing a consistent climate policy to maintain and protect our resources and livelihood.

At a time when the effects of climate change are increasingly making themselves felt, we need strong research partners who provide new findings for evidence-based measures and work with us to develop

innovative approaches and sustainable solutions. Here in Vienna we are lucky to have 26 universities and more than 120 research institutes that conduct excellent research and harbour enormous potential in terms of knowledge, expertise and innovation.

This catalogue of research questions in the fields of climate change mitigation, climate change adaptation and the circular economy is an important step in that direction. It serves to provide impetus and guidance for scientists and practitioners to develop research projects aimed at making our city more resilient and sustainable. The catalogue identifies relevant research questions and is designed to facilitate and encourage collaboration between researchers and the municipal administration.

I cordially invite all scientists to play an active part in this process! Together we can map out our future pathway to ensure that Vienna remains one of the world's most liveable cities for generations to come.

**Dr. Michael Ludwig**  
Mayor of the City of Vienna

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# Preamble

The tangible negative effects of climate change are becoming ever more clearly evident, posing growing challenges for cities worldwide – and Vienna is no exception. With its Smart Climate City Strategy, the City of Vienna has set itself ambitious sustainable development goals that are likewise designed to ensure a high quality of life for everyone living in Vienna, both now and in the future. The Vienna Climate Guide defines the key leverage points and measures to be taken in order to achieve the city's climate goals.

Perhaps the most important tools for tackling the impending challenges in the fields of climate change mitigation, climate change adaptation and the circular economy are research and innovation. Vienna will be required to develop, test and implement new approaches in order to meet the targets it has set itself. New technologies have a role to play here, but social innovations and new scientific processes are also becoming increasingly important. The latter are more strongly inspired by the needs of local people, more broadly accepted, and support the piloting of new solutions.

## **COOPERATION WITH SCIENCE AND RESEARCH AS A PILLAR OF VIENNA'S CLIMATE POLICY**

The goals of Vienna's Smart Climate City Strategy can only be achieved through inter- and transdisciplinary interaction and collaboration among all the relevant actors in the city. Science and research, in particular, play an essential role here, helping us to better understand the causes of anthropogenic climate change, predict future climate trends and assess the associated risks. Equally importantly, they also help us to better analyse and forecast the effects of climate change on different spheres of life. The science and research communities are key partners in developing the necessary solutions and assessing the impact of planned measures. Last but not least, science and research also provide the evidence that allows the local government and administration to introduce well-founded, targeted and effective measures and explain to the public why they are needed. Communication of scientific research findings and evidence-based action are essential in order to gain public acceptance for government measures and sharpen people's awareness of the impact of their own initiatives and patterns of behaviour.

As one of the largest university cities in the German-speaking world – home to 26 universities, private universities, universities of applied sciences and teacher training colleges, together with some 200,000 students – Vienna is outstandingly placed for interaction between the municipality and the science and research community. Back in 2019, the City of Vienna and its universities signed an agreement to strengthen Vienna's position as a leading research and innovation hub by fostering closer collaboration. The present catalogue of research questions, 'Vienna's Research Questions', is designed to intensify this collaboration still further.

## **RESEARCH BASED ON REAL REQUIREMENTS AND ISSUES FACING THE CITY**

The catalogue of research questions was the outcome of a process of intensive dialogue between the institutions of the City of Vienna – from the municipal departments to Wiener Stadtwerke (Vienna public utilities) and the various municipal agencies and enterprises – and representatives of the city's universities. In total, more than 200 experts participated in 16 themed workshops.

The starting point for this catalogue of research questions were the issues that were judged by the municipal institutions to be of prime importance with a view to developing and implementing the tools, programmes and measures required to achieve Vienna's climate goals. This is by no means to imply that the questions raised here are the only relevant ones. On the contrary, a deliberate selection was made to place the focus on questions regarding which the municipal stakeholders identified an immediate need for specific research findings.

In this respect, the catalogue of research questions should also be viewed as a 'living document': on the one hand, advancing climate change and the necessity of adapting to it will constantly throw up new questions that likewise require research; on the other hand, experience shows that in many cases scientific findings in turn give rise to new questions that are likewise highly relevant. The present catalogue should thus be taken as a momentary snapshot and initial impulse that will need to be evaluated and updated at regular intervals.

## PRODUCTION, IMPLEMENTATION AND EVALUATION OF THE CATALOGUE OF RESEARCH QUESTIONS:

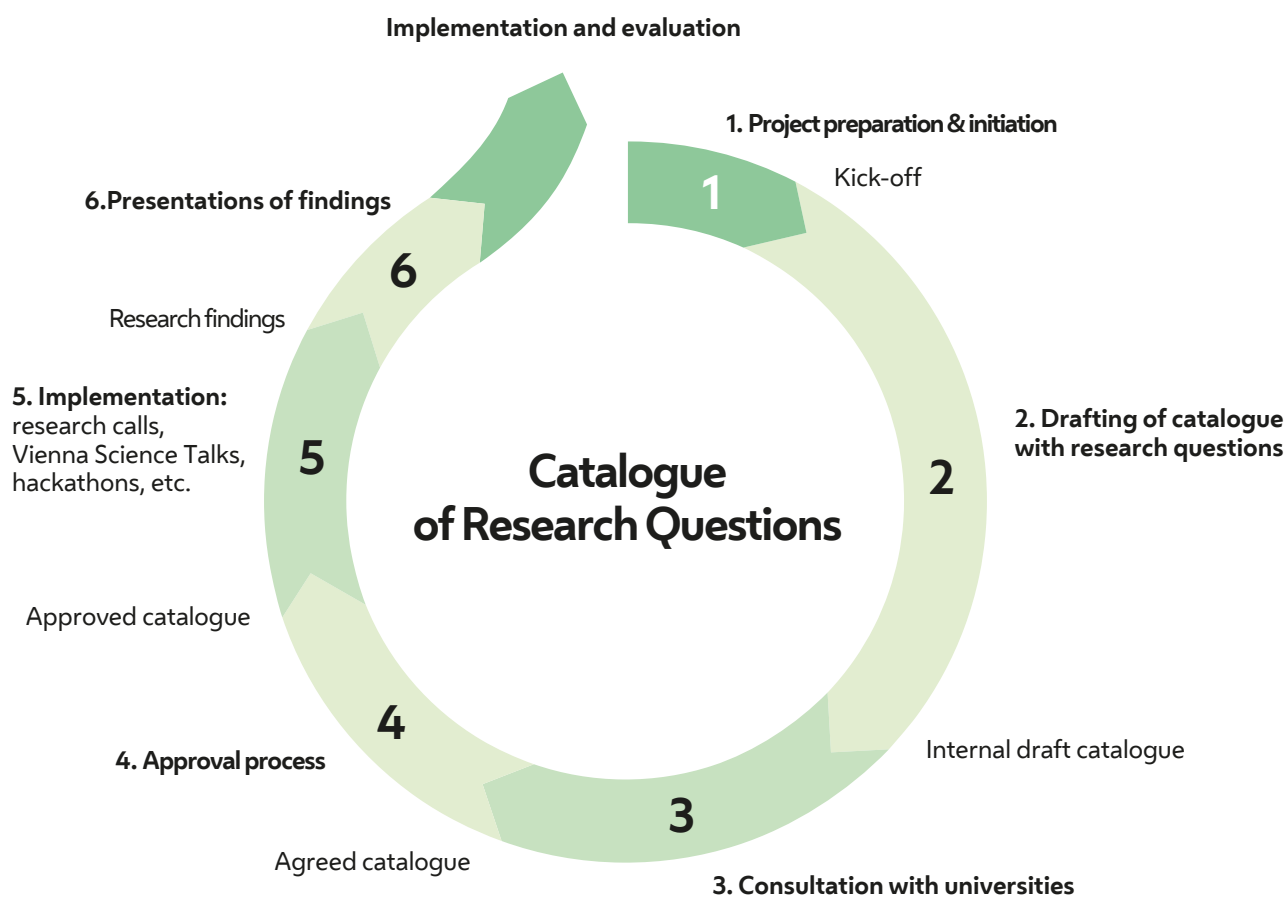


Fig. 1: Process for production, implementation and evaluation of the catalogue of research questions in the fields of climate change mitigation, climate change adaptation and the circular economy

### THREE Cs: THE CATALOGUE OF RESEARCH QUESTIONS COVERS THE FULL SPECTRUM OF CLIMATE-RELATED TOPICS

The contents of the catalogue are structured to align with the key thematic foci of the Smart Climate City Strategy and the Vienna Climate Guide. The catalogue comprises research questions from the following fields:

- **Climate change mitigation:** The City of Vienna has set itself the goal of being fully net zero by 2040. This requires a reduction in energy consumption and a full transition to renewable energy sources – which in turn calls for new solutions in a range of different areas, first and foremost the mobility and buildings sectors.
- **Climate change adaptation:** Alongside the increasing incidence of extreme weather events, the growing number of heatwaves is of particular relevance for Vienna as the latter have a huge impact on people's health but also on natural ecosystems and urban infrastructure. This raises the significance of a

large number of questions, from the need to redesign public spaces and preserve biodiversity through to protecting the public from the negative health impacts of climate change.

- **Circular economy:** Alongside the transition to clean energy, sustainable development calls for careful use of natural resources and new economic forms that reduce the material footprint and allow used materials to be fed back into the cycle in an optimum way through reuse and/or recycling. This pertains to the manufacturing and waste management sectors as well as to construction.

**Climate justice, awareness-raising and inclusion** are important overarching themes that relate to all of the 3 Cs. Climate change affects everyone, but it does not affect everyone equally. For this reason, climate policy is always inherently social policy. The key objective here is to factor in different needs and the impact of measures on different social groups as far as possible when drafting and implementing policy in all three fields (climate change mitigation, climate change adaptation and the circular economy). At the same time,

however, it is also important to incentivise people to change their patterns of behaviour and come up with innovative processes to engage different social groups and mobilise individual initiative.

## FOR WHOM IS THE CATALOGUE OF RESEARCH QUESTIONS INTENDED?

The present catalogue of research questions is an essential building block to further strengthen the existing collaboration between the municipal administration and the city's diverse science and research community.

- **For universities** the catalogue is designed to provide orientation, enabling them to align their research foci towards the specific requirements of municipal bodies. Research projects can be better designed for practical application when they are planned in dialogue with the future users, when they have access to real data provided by the municipal administration, and/or when real-life application scenarios are available as a 'test bed' for analyses, laboratory simulations or pilot runs.
- **For the institutions of the City of Vienna**, the catalogue offers the opportunity to obtain solid answers to questions from their everyday practice and thus build up a corpus of evidence-based expertise for the development of precisely targeted programmes and measures.

To facilitate cooperation between the universities and the City of Vienna, theme leaders have been nominated for the individual clusters and research questions. The theme leaders are organisational units and/or staff of the City of Vienna and its agencies and enterprises. They play an active role in responding to enquiries and acting as the point of contact for ongoing discussion with researchers.

## OPENING UP ACCESS TO RESOURCES

Resources are essential for research, and especially for research on urban challenges. Besides financial research grants, these resources include incorporation of research projects and their methods and findings in real-life field tests, access to high-quality data and expert practitioners from relevant fields, and the opportunity for interaction with local stakeholders and members of the public, e.g. via citizen science projects.

The City of Vienna makes verified figures, data and municipal documents available to the public as open government data for free and unrestricted further use, especially for science and research purposes ([digitales.wien.gv.at/open-data](https://digitales.wien.gv.at/open-data)). These comprise, for example, geodata from Municipal

Department MA 41 – Surveying, Mapping and Geoinformation, including a detailed land survey of the entire municipal territory of Vienna ([wien.gv.at/stadtentwicklung/stadtvermessung/geodaten/viewer/geodatendownload.html](https://wien.gv.at/stadtentwicklung/stadtvermessung/geodaten/viewer/geodatendownload.html)).

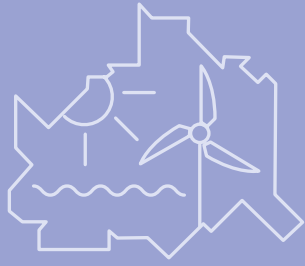
The department's specially created geodata viewer offers users the opportunity to view up-to-date digital maps of the entire Vienna urban area online and download the associated geodata ([wien.gv.at/geodatenviewer/portal/wien](https://wien.gv.at/geodatenviewer/portal/wien)).

## OVERVIEW OF CONTACT POINTS AND RESEARCH SUPPORT SERVICES OF THE CITY OF VIENNA

The central point of contact for Vienna-based scientists and researchers is the Director's Office for Science, Research and Business Location, part of the Chief Executive Office. It provides assistance in matters relating to higher education and research, coordinates the City of Vienna's science and research agendas, supports collaborations and organises networking events for researchers from universities, research institutes and experts from the municipal administration to address current urban challenges ([bl-wfw@mdgb.wien.gv.at](mailto:bl-wfw@mdgb.wien.gv.at)).

The City of Vienna attaches great importance to providing funding and support for science, research and technology. The municipal administration maintains funds to support research and awards prizes in recognition of scientific excellence. The following bodies are the contact points for higher education and research funding in Vienna:

- Municipal Department MA 7 – Cultural Affairs, Science and Research administers the City of Vienna's Anniversary Fund, manages funding calls and awards prizes for outstanding achievement [wien.gv.at/kultur/abteilung/foerderungen](https://wien.gv.at/kultur/abteilung/foerderungen)
- Municipal Department MA 23 – Economic Affairs, Labour and Statistics looks after the City of Vienna's funding for universities of applied sciences. [wien.gv.at/kontakte/ma23](https://wien.gv.at/kontakte/ma23)
- The Vienna Science, Research and Technology Fund (WWTF) is a private, not-for-profit fund that provides financial resources for outstanding scientific research via competitive calls for projects. [wwtf.at](https://www.wwtf.at)
- The Vienna Business Agency provides funding for start-ups in all phases of business development and promotes cooperation between companies and universities. [wirtschaftsagentur.at](https://wirtschaftsagentur.at)



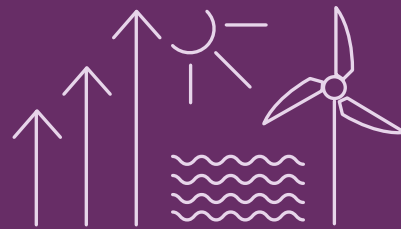
By 2030 half, and by 2040 100% of Vienna's final **energy consumption** will originate from **renewable** or **carbon-free** sources.\*\*

By 2030,  
**75%**

of the **energy requirement** for digital services and infrastructures of the City of Vienna and its municipal enterprises will be covered by **renewables**, rising to 100% by 2040.



Vienna's energy grids allow for a **decentralised, renewables-based energy supply.**



**Renewable** and **carbon-free energy production** in Vienna increases threefold by 2030 and sixfold by 2040, compared to 2005 levels.\*\*

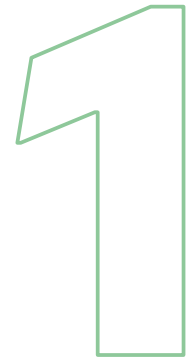


Our heat supply will be 100% **fossil free by 2040.**



Buildings are used to generate as much **solar power** as possible.

# Thematic cluster Energy Supply



The following climate goals relating to energy supply in the metropolitan area are embedded in Vienna's Smart Climate City Strategy. The City of Vienna aims to have an energy supply based on renewables, a large proportion of which are produced in the region and used locally. Energy consumption is expected to decrease markedly thanks to significant improvements in energy efficiency (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- By 2030 half, and by 2040 100 % of Vienna's final energy consumption will originate from renewable or carbon-free sources.\*\*
- By 2030, 75% of the energy requirement for digital services and infrastructures of the City of Vienna and its municipal enterprises will be covered by renewables, rising to 100% by 2040.
- Vienna's energy grids allow for a decentralised, renewables-based energy supply.
- Renewable and carbon-free energy production in Vienna increases threefold by 2030 and sixfold by 2040, compared to 2005 levels.\*\*
- Our heat supply will be 100% fossil free by 2040.
- Buildings are used to generate as much solar power as possible.

The research questions in the Energy Supply cluster are derived from the Smart Climate City Strategy and its goals. Scientific findings relating to these questions are therefore instrumental in helping Vienna achieve its climate goals.



\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

\*\* Including any utilisation of geothermal energy from the surrounding region.

# Renewable energy installations in the urban context

Further research is required to increase the potential for environment-friendly power generation within the metropolitan area. In particular, there is a need for technological advancements that make it easier to integrate the installations into the urban environment (e.g. space requirements, visual appearance). Furthermore, empirical findings on the interactions between energy installations and the urban environment (plants, microclimate, etc.) are required in order to help avoid adverse side effects.



## RESEARCH QUESTIONS\*

1. **Are there any overlooked alternative power sources that Vienna can potentially exploit** (e.g. within the city's underground railway infrastructure)?
  - a) What design options are available to ensure that the necessary infrastructure (e.g. PV arrays, transformer stations) is carefully integrated into the cityscape?
  - b) Which spaces and sites in Vienna can potentially be used for the installation of transformers, neighbourhood substations or heat storage facilities? Do vacant buildings have potential for this kind of use?
2. **What impact do alternative energy technologies have on the cityscape and how can they be designed so as to blend in with their surroundings as well as possible?**
  - a) What impact do drilling works for geothermal probes have on the roots and crowns of trees? How can these works be carried out without causing damage to trees?
  - b) How does a higher density of ground-source and air-source heat pumps influence the growing conditions for plants in urban areas and what recommendations can be derived from these findings?
  - c) How do solar roofs – on car parks, for example – affect the microclimate in the immediate vicinity of the installations?
3. **How does an increasing concentration of decentralised infrastructure for renewable energy sources affect the urban environment?**

\* See also the research questions in the Climate-Proof Green & Outdoor Spaces cluster.

## THEME LEADERS

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# Electricity grids, storage and integrated energy systems

The natural fluctuations in the supply of different renewable energy sources pose a major challenge for the stability of the power grid. It is therefore important that the spatial planning of the grid and the power supply infrastructure are designed to enable the use of as large a share of renewables as possible in future. As the basis for this, the energy flows within and between electricity and heating grids and mobility systems need to be modelled and then gradually refined using increasingly precise and temporally detailed data. The research should focus on the conditions prevailing in the urban area, taking account of interactions between Vienna and the surrounding region. As well as looking at the technical aspects, appropriate operational and business models also need to be elaborated.



## RESEARCH QUESTIONS

### 1. What requirements in terms of expansion and modification of the grid and management of the energy system result from the decentralisation of power generation facilities?

- a) What measures (grid expansion, demand-side management, P2X, curtailment of infeed) can compensate for the volatility of future renewable power generation and help avoid short-term grid overload? What short- and long-term storage facilities are required and what capacity do they need to have?
- b) How can local electricity producers and users (e-charging hubs, electrolysers, e-boilers, heat pumps, cooling facilities, batteries) be interconnected and managed?
- c) What potential is there to enhance flexibility through grid-compatible use and/or management of Vienna's charging infrastructure? To what extent can vehicle-to-grid (V2G) technology be of relevance (i.e. needs-based feeding of power from electric vehicle batteries back into the grid)?

### 2. What might be potential climate-friendly, resilient energy concepts for specific urban applications?

- a) What is the impact of different charging hub systems in existing high-volume buildings (e.g. increasing provision of rapid EV charging infrastructure on large-scale retail premises) in terms of capacity utilisation and the potential need for further expansion of the Vienna power grid?
- b) How can the high power consumption and waste heat potential of data centres be optimally incorporated into integrated energy supply concepts?
- c) What can be done to strengthen the resilience of public-sector institutions with regard to emergency energy supply (e.g. schools in the event of prolonged power outages)?
- d) What can be done to provide Vienna's industrial and commercial zones with a sustainable, climate-friendly energy supply?
- e) What steps are necessary in order to phase out gas in the catering and hospitality sector, where it is often still used for cooking?
- f) How can the waste heat from underground car parks be put to good use? Can underground car parks be used as a starting point for geothermal deep drilling? What other design options and sustainable approaches can be employed in the refurbishment of existing underground car parks?

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# Heating networks and heat storage

To date, a substantial proportion of the energy required for heating and hot water has come from natural gas. As a replacement, besides the expansion of the district heating network, heating solutions are also required for parts of the existing built-up area that are not connected to the district heating system. An important field of research here focuses on the optimisation of existing heat storage technologies for both centralised and local use, the development of completely new ones, and their integration into the existing infrastructure. Alongside these technical solutions, legally and economically robust business models also need to be elaborated for their management and operation.



## RESEARCH QUESTIONS

- 1. How can heat be stored in a cost- and energy-efficient manner?** Solutions are required for short-term storage, i.e. as a replacement for fossil-fuelled peak-load boilers, as well as for seasonal storage (allowing excess heat produced in summer to be stored for use in winter).
- 2. How can local heating/energy networks be implemented in existing densely built-up areas of the city that are not connected to the central district heating network?** Which heat sources and operating models are suitable for this purpose, and how can synergies be achieved by interconnecting multiple local networks?
- 3. How can pricing and regulatory mechanisms be used to encourage investment in the decarbonisation of the district heating supply and further expansion of the network?** What models and regulations used for urban district heating providers in other EU countries could also deliver added value for Vienna?

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# Green gases and chemical energy carriers

Gaseous and liquid energy carriers can store quantities of energy for prolonged periods of time. The production and use of such non-fossil energy carriers (from biogenic waste, for instance, or from water and renewable electricity) can be an important component of a resilient, climate-friendly energy system. However, in order to make a realistic assessment of their potential for use in the Vienna metropolitan area and lay the necessary groundwork, solid scientific data are required as a basis for planning.



## RESEARCH QUESTIONS

- 1. Which chemical energy storage media** (e.g. hydrogen, ammonia, methane, methanol, LOHC, new battery technologies) **are ideally suited for integration into the urban setting?** Factors such as the necessary infrastructure, safety and approval aspects and performance coefficients all need to be taken into account. What role can logistics hubs like the Hafen Wien dock facilities play in this?
- 2. How is the availability of biogenic waste for the production of green gases and/or use in energy systems likely to develop** in the Vienna metropolitan area in the future?
- 3. What are the economic implications of using green gases,** taking into account the availability and costs of technology, maintenance of parallel infrastructures, and new build and operation of infrastructure for green gases (especially as compared to district heating systems)?

## THEME LEADERS

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# Carbon capture and utilisation

Carbon dioxide is not only emitted during energy supply, but also during the production of electricity and heat in biomass power plants and waste incinerators. As a contribution to achieving net zero, this CO<sub>2</sub> should be captured and put to productive use. The economic potential of negative emissions solutions can likewise be leveraged; firstly, however, the relevant technologies need to be refined and associated legal and economic questions also need to be clarified.



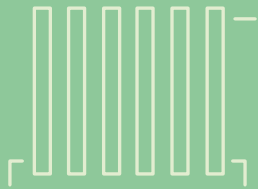
## RESEARCH QUESTIONS

- 1. What technological innovations can be employed to make the capture, use and, where applicable, storage of carbon dioxide more (energy) efficient and cost-effective?**
- 2. How can captured CO<sub>2</sub> be utilised on a large scale in future to generate high added value for Vienna?** What CCUS pathways could be relevant for high-value applications and long-term carbon storage in Vienna?
- 3. What are the requirements regarding suitable sites for direct air capture (DAC) facilities?** Are there any such sites in the largely densely built-up Vienna metropolitan area?

## THEME LEADERS

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Per capita final energy consumption for heating, cooling and hot water in buildings falls by

**20% by 2030**

and 30% by 2040.\*\*

The associated per capita CO<sub>2</sub> emissions fall by

**55%**

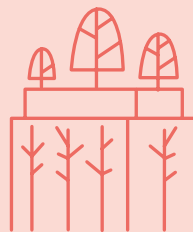
by 2030 and to **zero** by 2040.



**Greening, shading and passive cooling**

of buildings are standard, active cooling systems are powered by renewables.

Developers' competitions in the **subsidised housing** sector drive social **innovations** and new solutions for mitigating and adapting to climate change – especially greening measures.



**Greening of buildings** improves the urban **microclimate**, especially in densely built-up areas.



The **decarbonisation** of Vienna's **healthcare sector** is accelerated by prioritising measures to improve energy efficiency and conserve resources.



By 2030 half, and by 2040 100% of Vienna's final **energy consumption** will originate from **renewable** or **carbon-free** sources.\*\*\*



All planned buildings and urban developments in Vienna are assessed in terms of their contribution to **adapting to climate change** and optimised where necessary.

# Thematic cluster

# Construction & Buildings



Decarbonisation of existing buildings, reduced energy consumption and passive cooling of buildings are just some of Vienna's climate goals, as detailed below and set out in the Smart Climate City Strategy. In future, key features of buildings in Vienna should include a long useful life, multi-purpose design, efficient use of materials and low energy consumption (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- Per capita final energy consumption for heating, cooling and hot water in buildings falls by 20% by 2030 and 30% by 2040.\*\*
- The associated per capita CO<sub>2</sub> emissions fall by 55% by 2030 and to zero by 2040.\*\*
- Greening, shading and passive cooling of buildings are standard, active cooling systems are powered by renewables.
- Developers' competitions in the subsidised housing sector drive social innovations and new solutions for mitigating and adapting to climate change – especially greening measures.
- Greening of buildings improves the urban micro-climate, especially in densely built-up areas.
- The decarbonisation of Vienna's healthcare sector is accelerated by prioritising measures to improve energy efficiency and conserve resources.
- By 2030 half, and by 2040 100% of Vienna's final energy consumption will originate from renewable or carbon-free sources.\*\*\*
- All planned buildings and urban developments in Vienna are assessed in terms of their contribution to adapting to climate change and optimised where necessary.

The following research questions in the Construction & Buildings cluster are derived from the Smart Climate City Strategy and its goals. Scientific findings relating to these questions will support the City of Vienna in achieving its climate goals.



\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

\*\* Compared to the average for the period 2005–2010

\*\*\* Including any utilisation of geothermal energy from the surrounding region

# Decarbonisation of existing buildings

The decarbonisation of existing buildings is an important step towards reducing greenhouse gas emissions in the metropolitan area. During conversion from fossil fuels to a renewable energy supply, different types of buildings present a whole range of challenges relating to the fabric of the buildings as well as to building use categories and their associated requirements.



## RESEARCH QUESTIONS

- 1. What technical prerequisites and solutions need to be put in place** to minimise the energy requirements of existing buildings in Vienna and cover those requirements using renewable energy sources?
  - a) Which technical solutions are most efficient for which buildings under which conditions, and what expertise is required in order to implement those solutions?
  - b) Which cost-effective and 'minimally invasive' methods can be used to convert 19<sup>th</sup>-century buildings from high-temperature to low-temperature heating systems?
- 2. Which non-residential buildings with high energy consumption require special attention when it comes to decarbonisation of existing buildings?**
- 3. What potential do insulation / (internal/external) insulating materials (including alternative ones) offer for upgrading the thermal insulation of historic buildings with structured facades?** How can we create the prerequisites for using this potential?
- 4. What effect do the necessary adaptations of existing buildings (energy efficiency, renewable energy supply, circularity, etc.) have on rents and on operating, maintenance and utilisation costs?** Can refurbishment works create additional amenity value that justifies the increased costs (communal spaces, greened courtyards, etc.)?
- 5. Which AI applications can help to reduce the energy consumption of buildings?**

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# Cooling of buildings in existing built-up areas

Climate change and rising temperatures mean that cooling is playing an increasingly important role in urban areas. Buildings that are particularly difficult to refurbish, because their outer shell is listed as historic, for example, pose a special challenge in this respect. Of special interest are passive cooling methods involving greening, shading and external sunblinds, as well as new technological solutions that do not release additional waste heat into the environment, e.g. systems that exploit the cooling potential of energy networks by means of ground collectors and deep probes.



## RESEARCH QUESTIONS

**1. How is climate change affecting cooling requirements in the built-up areas of Vienna?**

**2. What might be potential efficient future cooling strategies for existing buildings in Vienna?**

- a) How can energy consumption resulting from the use of cooling appliances be kept to a minimum?
- b) What alternative passive methods can be used to cool buildings without consuming additional energy?

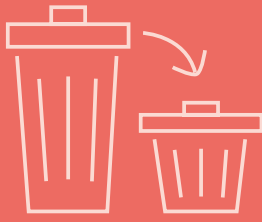
### Special question:

Are there differences between European and Austrian standards with regard to calculation of final energy consumption for room heating and/or room cooling? In view of climate change, is there a need to modify building-related standards accordingly?

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### Less waste is produced

thanks to a wide range of waste prevention measures.



Vienna's waste management system achieves **net zero** by

# 2040.



By 2050,

# 100%

of Vienna's non-avoidable waste is **recycled**.

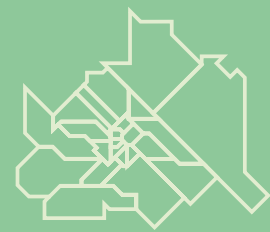


### Circular planning

and construction to maximise conservation of resources is standard from 2030 in newbuild and refurbishment projects.

### The City of Vienna champions

a sustainable urban economy by introducing appropriate legal frameworks and targeted subsidy schemes, by creating 'living labs', and as a public-sector client.



Vienna **exceeds** the EU target of a

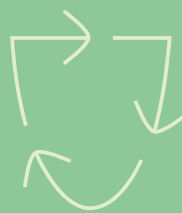
# 60%

recycling rate by 2030.



### Products manufactured in Vienna

are durable, easily repairable, reusable and recyclable, and their production processes are largely waste and pollutant free.



In 2030, Vienna has a **global** reputation as the hub of a resource-efficient circular economy and attracts investment and talent in this sector.

By 2040, at least

# 70%

of the building components, products and materials recovered from demolitions and major refurbishment projects are reused.

# Thematic cluster

# Circular Economy



Circular planning and construction, waste reduction, and recycling and reuse of materials are key climate goals of Vienna's Smart Climate City Strategy\*. Alongside the focus on waste management, the City of Vienna's efforts towards zero waste and a fully circular economy are primarily aimed at embedding circular principles within the construction sector.

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- Less waste is produced thanks to a wide range of waste prevention measures.
- Vienna's waste management system achieves net zero by 2040.
- By 2050, 100% of Vienna's non-avoidable waste is recycled.
- Circular planning and construction to maximise conservation of resources is standard from 2030 in newbuild and refurbishment projects.
- The City of Vienna champions a sustainable urban economy by introducing appropriate legal frameworks and targeted subsidy schemes, by creating 'living labs', and as a public-sector client.
- Vienna exceeds the EU target of a 60% recycling rate by 2030.
- Products manufactured in Vienna are durable, easily repairable, reusable and recyclable, and their production processes are largely waste and pollutant free.
- In 2030, Vienna has a global reputation as the hub of a resource-efficient circular economy and attracts investment and talent in this sector.
- By 2040, at least 70% of the building components, products and materials recovered from demolitions and major refurbishment projects are reused.

\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)



# Circularity in the construction sector

The implementation of circular principles in the construction sector requires the development and ongoing evolution of technological solutions as well as the establishment of legal frameworks to create planning certainty for all stakeholders. At the same time, however, the lack of available data (life cycle assessments of building materials, for instance) makes precise planning and evaluation of sustainable construction projects difficult. Furthermore, the potentially higher costs associated with reuse of materials and implementation of innovative technologies are a critical factor that is currently still hindering the dissemination of circular practices in the construction sector.



## RESEARCH QUESTIONS

- 1. Which legal regulations and/or standards need to be evaluated and, where necessary, amended in order to successfully implement circular principles in the construction sector** (e.g. regarding storage of materials, warranty issues, amendment of legislation to facilitate refurbishment)?
  - 2. What data** (e.g. on material flows and stocks) **are already available and where is there still a need for data to be collected?**
  - 3. Which factors are responsible for making circular construction methods more expensive than conventional ones at present** (despite the former aiming for 'simple building' avoiding wasteful use of materials)? At what point and/or under what conditions does the increased planning workload associated with incorporation of circular principles pay off?
  - 4. How can the principles of a circular, recyclable and resource-efficient approach be applied to the refurbishment of existing buildings?**
    - a) What are the obstacles (e.g. approval of materials, fire safety)?
    - b) What structural engineering/technical solutions are available for circular refurbishment of existing buildings?
- Special question**  
How can circular principles be incorporated into tendering criteria for construction works and/or facility management services? What would be the economic and/or legal implications of such tendering criteria?

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# Circular value chains in the construction sector

In order to embed circular economy principles within the construction sector, new value chains and markets need to be established for secondary raw materials. Digital marketplaces could be used to facilitate trade, though other barriers such as the lack of standardisation and transparency remain. Creating cost transparency is essential, in order to foster fair competition between primary and secondary raw materials and promote sustainable materials.



## RESEARCH QUESTIONS

- 1. How do existing linear value chains, logistics processes and corporate networks need to be modified** in order to enable the implementation of circular principles in the construction sector (including appropriate business models) and embed them for the long term?
- 2. How can 'markets' be established for secondary raw materials?** What is required in terms of digital platforms, physical storage and transshipment premises and/or collaborations? Where do legal, structural and economic obstacles lie?
- 3. What can be done to create cost transparency in the pricing of secondary raw materials** (definition of product category rules, valuation of regional closed-loop value chains)?
- 4. Are government incentives required to support the establishment of circular business models?**

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# Tools, materials and technologies for resource-efficient construction and refurbishment

Resource-efficient construction and refurbishment requires the use of digital tools such as BIM to enable effective management of material flows and transparent visualisation of the life cycle of building materials. The aim of optimising material efficiency creates new requirements for building techniques and materials in both new build and refurbishment projects.



## RESEARCH QUESTIONS

- 1. Which digital tools are suitable for modelling the circularity of built structures and optimising systems in the planning, operational and disassembly phases?**
  - a) Where can BIM be used more widely (structural/civil engineering)?
  - b) What interfaces are required between different programs and file formats (e.g. compatibility of GIS and BIM data)? What are the current limits of the systems?
  - c) How can data be amalgamated and analysed via a central database (materials register)? (Development of models)
- 2. What methods can be used to quantify and optimise the use of resources in the construction sector** (e.g. reduction of amount of concrete used in tunnel construction, life cycle assessment of timber frame structures, reduction of pollution from building sites)? What standards and specifications can be applied in tendering procedures for construction works?
- 3. What materials and construction techniques can be used to facilitate resource-efficient, low-emission upgrade and/or refurbishment of existing buildings** (residential buildings, office complexes, etc.)? How can conflicting objectives be resolved, e.g. resource efficiency vs. energy efficiency and/or durability vs. circularity?

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# Zero Waste

Waste prevention and recycling are an integral part of a functioning circular economy. Implementation of the zero waste strategy calls for an appropriate legal framework, innovative (recycling) technologies and new business models based on circular principles, particularly with regard to reuse, repurposing and repairability.



## RESEARCH QUESTIONS

- 1. What measures can be put in place to incentivise product repair?** What amendments to the waste management legislation would make sense from an ecological point of view, and what effects might such amendments be expected to have? How could the legal framework for the waste management legislation at federal level be amended to facilitate reuse and repurposing?
- 2. How could ongoing financial subsidy of product repairs be financed** (e.g. by earmarking a certain percentage of the value-added tax)?
- 3. How will waste flows and amounts of waste develop in future (quantity, material) and what (new) recycling technologies will be required for this purpose** (e.g. recycling and/or recovery of materials from facilities for the generation and storage of renewable electricity, various fibre composite materials, etc.)?

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# Circular urban and neighbourhood planning

A range of approaches are available for incorporating circular principles into neighbourhood planning: adaptive reuse and regeneration schemes that extend the life cycles of existing built-up areas and buildings, thus conserving valuable soils while simultaneously ensuring sustainable land use, together with models for multiple and temporary usage. Life cycle analyses are required at neighbourhood level to evaluate the ecological and economic effects of urban development projects. Furthermore, policy on vacant buildings and repurposing of existing buildings needs to be optimised to ensure efficient use of resources and minimise land consumption.



## RESEARCH QUESTIONS

- 1. What criteria need to be taken into account when drafting planning guidelines at the neighbourhood level in order to support the development of a circular neighbourhood?** How can the latter be incorporated into planning processes in a structured manner?
- 2. What might be a potential standard approach for calculating the overall life cycle costs (carbon and material footprints) of urban neighbourhoods** (taking account of building life cycles, usage patterns/mobility habits, energy system, etc.) and/or a solid basis for decision-making regarding future development of existing buildings and built-up areas (demolition/new build vs. refurbishment/regeneration)?
- 3. How can valuable soils**, e.g. those that are particularly rich in nutrients, among others, **be conserved and/or reused** within the neighbourhood ('circular soil')?

### Special question

How does the impact of soil compaction caused by construction site depots and materials handling areas compare to the impact of removing and replacing topsoil?

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Private motor vehicle ownership falls to

**250**  
per 1,000  
inhabitants

by 2030, and the amount of parking available in public spaces is gradually reduced.

The share of journeys in Vienna made by **eco-friendly modes of transport**, including shared mobility options, rises to

**85 %**

by 2030 and to well **over 85 % by 2050.** \*\*



**Commercial traffic**

within the municipal boundaries is largely **CO<sub>2</sub> free** by 2030.

Vienna offers **high quality of life in all districts** of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and **participatory** decision-making.

Per capita CO<sub>2</sub> emissions in the transport sector fall by

**50 % by 2030**

and 100% by 2040.\*\*\*



Vienna promotes and realises the concept of the **15-minute city** – with short distances to services and amenities, lively, mixed-use neighbourhoods and **re-design** of streets to provide more space for active mobility options, public transport and pleasant places to linger.

Non-fossil-powered vehicles as a share of new vehicle registrations rises to

**100 %**  
by 2030.\*\*\*\*



All social groups, especially vulnerable ones, are **protected** against the health risks associated with climate change.

**Mobility guarantee:**  
It's easy to **get around** in Vienna **without owning a car.**

\*\*The wider definition of ecomobility encompasses walking, cycling and public transport plus shared-use schemes such as car sharing and car pools. \*\*\* Baseline year 2005 \*\*\*\* With the exception of special-purpose vehicles

# Thematic cluster Mobility



In accordance with its Smart Climate City Strategy, the City of Vienna pursues the principles of a climate-neutral transport policy suitable for the urban environment, reducing the need for mobility as far as possible, shifting private car traffic to efficient modes of transport, and transitioning from fossil-fuelled to carbon-free engine types (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- Private motor vehicle ownership falls to 250 vehicles per 1,000 inhabitants by 2030, and the amount of parking available in public spaces is gradually reduced.
- The share of journeys in Vienna made by eco-friendly modes of transport, including shared mobility options, rises to 85% by 2030 and to well over 85% by 2050.\*\*
- Commercial traffic within the municipal boundaries is largely CO<sub>2</sub> free by 2030.
- Vienna offers high quality of life in all districts of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and participatory decision-making.
- Per capita CO<sub>2</sub> emissions in the transport sector fall by 50% by 2030 and 100% by 2040.\*\*\*
- Vienna promotes and realises the concept of the 15-minute city – with short distances to services and amenities, lively, mixed-use neighbourhoods and redesign of streets to provide more space for active mobility options, public transport and pleasant places to linger.
- Non-fossil-powered vehicles as a share of new vehicle registrations rises to 100% by 2030.\*\*\*\*
- All social groups, especially vulnerable ones, are protected against the health risks associated with climate change.
- Mobility guarantee: It's easy to get around in Vienna without owning a car.

The following research questions in the Mobility cluster will also be instrumental in helping Vienna achieve its climate goals.



\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

# Parking space

At present, a large proportion of the street space is used for parking of private vehicles. This limits the space available in the public domain and neglects potential multifunctional and sustainable uses. Potential alternative uses and organisational models need to be explored and their impact on the urban space evaluated.



## RESEARCH QUESTIONS

- 1. What alternative functions and uses of public on-street parking spaces produce the greatest ecological and social effect, to what extent and in which locations?** What impact would alternative parking models have on the public (street) space? And what effects can be observed in spaces that have already been redesigned?
  - a) How could the public streetspace be redesigned in an ecologically and socially inclusive manner to encourage more diverse use of on-street parking areas?
  - b) To what extent can different kerbside management models be used to facilitate dynamic, multifunctional use of on-street parking areas according to different usage needs?
  - c) What models can be used to increase availability of private outdoor car parks (e.g. at large-scale retail facilities, among others) for public uses?
- 2. How do communal and/or neighbourhood indoor car parks affect the volume of traffic and what impact do they have on the city's climate footprint?**
  - a) How should communal indoor and outdoor car parks be built and designed so as to be as climate-friendly as possible? What can be done to ensure that such measures are implemented?
  - b) How do mobility hubs or multiple uses in communal indoor car parks (on the periphery of new-build developments) affect people's mobility habits and the climate footprint?
  - c) How can the actual demand for parking spaces be calculated for new-build projects?
  - d) What measures, tools and concepts are required to adapt existing indoor car parks with unutilised capacity (e.g. those in residential buildings, among others) for more multifunctional use, sustainable temporary use and/or repurposing

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# Usage patterns, availability & accessibility of eco-friendly mobility options

In order to design new mobility options successfully, it is imperative to gain an in-depth understanding of the usage patterns and needs of different target groups. The aim here is to improve the accessibility of these options and make them more attractive for diverse sectors of the population, including marginalised groups and people with limited mobility, as well as for different occupational sectors and modes of work.



## RESEARCH QUESTIONS

- 1. What new survey methods and/or data models can be developed to collect data about journeys made and/or mobility habits within the urban area?**
- 2. What different usage patterns, requirements, barriers and expectations are there with regard to sustainable mobility solutions** (e.g. on-demand bus services, among others) and active mobility options (walking, cycling, etc.)? To what extent can these solutions and options be made more efficient, equally accessible and sustainable for different segments of society?
- 3. How are climate warming and demographic change affecting the use of climate-friendly modes of transport and active mobility options?** And how are the latter trends affecting requirements in terms of accessibility and density of stops on the public transport network?
- 4. What are the potential effects of corporate mobility measures in terms of climate change mitigation, modal shift and health benefits,** how can such measures be organised, rolled out on a large scale and evaluated, and what can be done to raise awareness of such measures (e.g. multi-company mobility management schemes on industrial/trading estates, etc.)?
  - a) What mobility models and structures are required to make the work-related mobility habits of different occupational sectors (e.g. mobile care workers, SMEs and tradespeople, among others) climate-friendly and climate-proof?
  - b) What accompanying measures (push factors) are required from the City of Vienna to ensure successful implementation of corporate mobility management schemes?

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# Vehicle engine technologies

The transition to alternative zero-emission engine technologies is an essential step towards reducing emissions and promoting sustainable mobility. A key factor for successful management of this transition is the installation of charging infrastructure at different types of parking facilities as well as for vehicle sharing schemes and on-demand bus services. Vehicle engine technology should also be taken into account in studies aimed at reducing the heat input from stationary and moving vehicles in the street space.



## RESEARCH QUESTIONS

- 1. How can conventionally powered special-purpose vehicles/plant & machinery be successfully converted to and operated using zero-emission engine technologies?** What conditions and operational requirements need to be put in place for this purpose (future scenarios up to 2035)?
- 2. How can semi-public parking facilities (such as retail/supermarket car parks) with charging points be used to expand provision of basic charging infrastructure?** What potential sites are available? What usage models and access modalities could be developed and implemented for this purpose?
- 3. How can charging infrastructures for sharing schemes and on-demand bus services be expanded and operated so as to meet demand while minimising conflict and maximising cost efficiency?** What expansion strategies are required for charging infrastructure to support ongoing prioritised roll-out of sharing schemes using emission-free vehicles (future scenarios)?
- 4. To what extent can measures relating to vehicle size, vehicle design and equipment (e.g. air conditioning) and engine technology bring about a reduction in heat input** from vehicles in the street space, and how can their effects be quantified (in stationary as well as moving traffic)?

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# Urban logistics

The efficiency and sustainability of urban logistics can be significantly improved by installing various urban logistics hubs for transshipment of goods (including peri-urban multimodal hubs plus small-scale micro-hubs within the urban area) and by using vacant premises for this purpose. Besides building up a corpus of data and knowledge on logistics processes in Vienna, the objective is to identify suitable locations for hubs, assess their possible impact on the surrounding environment and define the optimum functions for various hub-based models.



## RESEARCH QUESTIONS

1. **How can a broad corpus of data be collected on logistics and commercial traffic in Vienna?** What methods can be employed to calculate future demand for inner-city logistics premises and model potential spatial requirements scenarios?
  - a) To what extent can suitable vacant premises and existing infrastructure be identified, recorded and activated for urban logistics purposes (e.g. for inner-city micro-hubs)?
  - b) What impact do urban logistics hubs in (vacant) existing premises have on surrounding retail businesses and/or the surrounding neighbourhood?
  - c) What policy frameworks are required to make the business models of urban logistics hubs sustainable for the long term? What can be done to promote and facilitate cooperation in hub systems?
  - d) What additional functions can peri-urban multimodal logistics hubs like the Hafen Wien port facilities perform (e.g. with regard to renewable energy supply, transshipment of materials for the circular economy) and what new tasks do these entail? What other potential sites could be activated as pilot projects?
2. **Which hub-based models and networks are suitable** for a city-friendly, ecologically and economically sustainable urban logistics system in Vienna and how can they be implemented to meet local needs?

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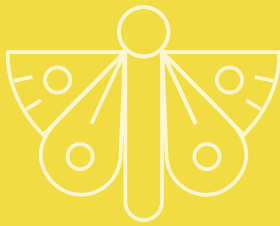


In Vienna, as much **rainwater** as possible is fed back into the local natural or near-natural **water cycle**.



In new urban development zones, provision is made for **high-quality green public spaces** at an early stage of the planning and design process.

To mitigate and protect against summer overheating, **green and open spaces** are newly created and existing ones expanded and structurally upgraded to improve the urban microclimate.



Vienna promotes **biodiversity**.



All citizens of Vienna have access to **high-quality green space** within a radius of 250 metres.

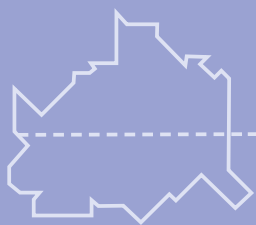
The City of Vienna creates an **excellent pool of data** and utilises this for decision-making and management purposes, as well as making it publicly accessible ('open government data').

In the interests of people's health and well-being, **air, water, soil, noise, heat and light pollution** are all **minimised** as far as possible.



The **natural functions of the soil** are maintained through preservation of existing **unsealed** surfaces and creation of new ones.

Vienna creates additional new woodlands and green spaces as **recreation areas** for its growing population and to **improve the urban microclimate**.



The share of green space in Vienna is safeguarded for the long term at over **50%**.

The city's **food supply** is largely sourced from the city itself and the surrounding region, preferably from organic producers supplemented by urban agriculture.

By **2030** the healthy life expectancy of the Viennese population has increased by **two years**.<sup>\*\*</sup>

# Thematic cluster Green Spaces & Urban Ecology

# 5

The following climate goals relating to green spaces and urban ecology are embedded in Vienna's Smart Climate City Strategy. Intact, climate-resilient ecosystems and low levels of environmental pollution are essential to Vienna's high quality of life (SCCS).<sup>\*</sup> High-quality green and open spaces are to be expanded and new ones created.

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- In Vienna, as much rainwater as possible is fed back into the local natural or near-natural water cycle.
- In new urban development zones, provision is made for high-quality green public spaces at an early stage of the planning and design process.
- To mitigate and protect against summer overheating, green and open spaces are newly created and existing ones expanded and structurally upgraded to improve the urban microclimate.
- Vienna promotes biodiversity.
- All citizens of Vienna have access to high-quality green space within a radius of 250 metres.
- The City of Vienna creates an excellent pool of data and utilises this for decision-making and management purposes, as well as making it publicly accessible ('open government data').
- In the interests of people's health and well-being, air, water, soil, noise, heat and light pollution are all minimised as far as possible.
- The natural functions of the soil are maintained through preservation of existing unsealed surfaces and creation of new ones.
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- The city's food supply is largely sourced from the city itself and the surrounding region, preferably from organic producers supplemented by urban agriculture.
- By 2030 the healthy life expectancy of the Viennese population has increased by two years.<sup>\*\*</sup>

The research questions in the Green Spaces & Urban Ecology cluster are aligned towards the goals of the Smart Climate City Strategy.



<sup>\*</sup> Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

<sup>\*\*</sup> Baseline year 2019

# Monitoring of green spaces in relation to climate change

Climate change and changed weather conditions, particularly periods of extreme heat and drought, are having a profound impact on the thermal and hydrological balance of ecosystems. This in turn affects the resilience of ecosystems and increases the risk of damage as a result of extreme weather events. In order to allow early detection of these changes, suitable methods and data sources for continuous monitoring are of decisive importance.



## RESEARCH QUESTIONS

- 1. How is climate change affecting the hydrological balance and the temperature of waterways, woodland and grassland?**
- 2. What data sources, methods and techniques are suitable for continuous monitoring?** Variables to be monitored include, e.g. temperature; weather/atmospheric conditions; low water levels in/dry-out of small waterways and bodies of water; changes in soils due to heatwaves/drought; water retention in the landscape; changes due to invasive non-native species; levels of pollutants in water and sediments; levels of carbon sequestration in woodland, grassland and open countryside.
- 3. How can strategies for prevention, early detection and control of forest fires be optimised** with regard to the specific conditions in Vienna's woodland areas, and what background data are required for this purpose?
- 4. What impact do urban development zones have on the ecosystem dynamics of extensive green areas in the immediate vicinity?**

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# Green space as recreation space

Green space fulfils the twin functions of habitat for flora and fauna and recreation space for large numbers of people. Appropriate management of green and recreation areas is important in order to reconcile the needs of different user groups and safeguard the overriding objectives of preserving biodiversity and maintaining ecological sustainability.



## RESEARCH QUESTIONS

**1. How is the increasing pressure of intensive use affecting the social and ecological sustainability of recreation areas?** What background data are required in order to optimise their management (channelling of visitor flows)?

**2. How can green areas be designed so as to simultaneously fulfil their function as recreation space for local people and their different usage patterns** (e.g. observing, exploring, sport, etc.), as well as their function as an intact ecosystem in the interests of maximising biodiversity?

**3. Which functions relating to biodiversity, recreation and microclimatic effects can be assumed by which inner-city green spaces?** What are

the preconditions for this multifunctionality, and where do its limits lie?

a) How can existing (physical, legal) barriers be removed to allow existing near-natural inner-city green spaces ('urban wildernesses') to be used as local recreation areas, thus allowing people to experience nature?

b) What is the estimated requirement for ecological offset sites to compensate for new areas of sealed surfaces, and to what extent can these sites fulfil recreational functions?

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# Ecosystems and biodiversity

Biodiversity in cities is under increasing pressure from urbanisation, the growing amount of sealed surfaces, and environmental pollution. This trend is being substantially exacerbated by advancing climate change. Natural habitats for plants and animals in cities are undergoing a sharp decline, with a resulting loss of biodiversity. At the same time, however, the various green and open spaces within the urban area harbour as yet unused potential for enhancing biodiversity.



## RESEARCH QUESTIONS

- 1. How are different animal populations and habitats changing in response to urban expansion and advancing climate change?** Which environmental factors are of relevance here?
  - a) What potential do different green spaces have for enhancing biodiversity?
  - b) What factors (size, contiguous stepping-stone biotopes) have an impact on the mix of different species and should be taken into account when designing green spaces to enhance biodiversity?
- 2. What impact are climate change-related migrations of non-native species (neobiota) having on local species and their habitats (flora and fauna)?**
- 3. How do different urban green spaces (parks & gardens, cemeteries, green roofs, gravelled areas, allotment gardens, etc.) and aquatic habitats affect biodiversity?**
  - a) What potential do different green spaces have for enhancing biodiversity?
  - b) What factors (size, contiguous stepping-stone biotopes) have an impact on the mix of different species and should be taken into account when designing green spaces to enhance biodiversity?
- 4. How can biodiversity be effectively embedded within the planning framework and the discourse on climate change adaptation?** For instance, what recommendations (e.g. for planning experts) and/or concrete specifications should be defined for ecological stepping stones, corridors and offset sites?
  - a) How can nature conservation areas be inter-linked to ensure that species are protected?
  - b) What size do horizontal and vertical offset sites need to be in order to help enhance biodiversity, and how effective are they at doing so?

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# Regional food supply system and consumer behaviour

A sustainable food supply system and a functioning urban agriculture sector are key elements of the ecological transformation. However, there is unequal access to regional, seasonal, organic food products across the population. Accompanying research and solid empirical information are required in order to make the food supply system as sustainable as possible and actively involve the public in the process.



## RESEARCH QUESTIONS

- 1. How must user-friendly structures be designed** in order to provide all social groups, as far as possible, with access to regional, seasonal, organic food products?  
regional food products; avoidance of food waste) among the Viennese population as a whole and/or in specific target subgroups (e.g. schoolchildren, healthcare sector)?
- 2. Based on the status quo, what can be done to promote climate-friendly eating habits** (high proportion of organic, plant-based, seasonal and
- 3. Could local demand be adequately covered by food produced in Austria without placing an excessive burden on natural resources?**

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Vienna offers **high quality of life in all districts** of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and **participatory** decision-making.

**Greening of buildings** improves the urban **micro-climate**, especially in densely built-up areas.

Developers' competitions in the **subsidised housing** sector drive social **innovations** and new solutions for mitigating and adapting to climate change – especially greening measures.



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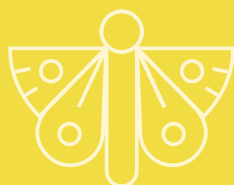


In Vienna, as much **rainwater** as possible is fed back into the local natural or near-natural **water cycle**.

**Greening measures, shading** features and other installations in the public space substantially reduce the (perceived) ambient temperature in summer and provide the backdrop for vibrant, **climate-proof neighbourhoods**.



All planned buildings and urban developments in Vienna are assessed in terms of their contribution to **adapting to climate change** and optimised where necessary.



Vienna promotes **biodiversity**.

**Greening, shading and passive cooling** of buildings are standard, active cooling systems are powered by renewables.

Vienna promotes and realises the concept of the **15-minute city** – with short distances to services and amenities, lively, mixed-use neighbourhoods and **re-design** of streets to provide more space for active mobility options, public transport and pleasant places to linger.

Vienna's **water supply** and waste water management infrastructure is maintained and operated to a high standard and in a resource-efficient manner

# Thematic cluster Climate-Proof Green & Outdoor Spaces



The climate goals below, as set out in Vienna's Smart Climate City Strategy, are designed to help provide our city with high-quality, climate-proof green and outdoor spaces. A high proportion of green and natural spaces, consisting of woodland, grassland, bodies of water and parks, are to be protected for the future, upgraded – with regard to climate resilience, among other aspects – and further high-quality spaces are to be added (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- Vienna offers high quality of life in all districts of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and participatory decision-making.
- Greening of buildings improves the urban microclimate, especially in densely built-up areas.
- Developers' competitions in the subsidised housing sector drive social innovations and new solutions for mitigating and adapting to climate change – especially greening measures.
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\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)



# Amenity value of public spaces

In times of climate change and increasing incidence of heatwaves, public green and outdoor spaces are growing in importance as recreation areas in the local neighbourhood. These spaces require innovative design approaches to ensure that they meet the diverse needs of different social groups. The aim is to create public spaces of high social value that support the physical and mental well-being of all users.



## RESEARCH QUESTIONS

- 1. How do public spaces need to be designed** in order to provide recreation and relaxation for people who have a particular need for public spaces with free access?
  - a) What requirements do different groups of people have with regard to their preferred public recreation areas?
  - b) How should outdoor space be designed for inclusivity, based on the latest research findings?
- 2. What impact do different types of redesign have on the social value of public spaces** and the physical and mental well-being of different user groups?

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# Equitable distribution and accessibility of green spaces

Given the increasing incidence of summer overheating in the city, the question arises as to how existing spaces – private, semi-public and public – can be made accessible for use by different groups of users and adapted to the diverse needs of those groups. Exploring the legal, design-related and social aspects opens up an opportunity to make the transformation towards inclusive, accessible and equitably distributed public spaces for all user groups.



## RESEARCH QUESTIONS

### 1. How can additional (outdoor) spaces be brought into use in order to relieve pressure on public spaces?

- a) What role can public buildings, subsidised housing complexes, private premises, vacant buildings and clubhouses play as potential spaces for (partial) public use?
- b) What incentives can be employed to motivate property owners, clubs, etc. to make their private premises available for (partial) public use?

c) What legal aspects, esp. liability considerations, need to be taken into account in order to potentially make private premises accessible for public use and open up (semi-) public buildings (e.g. schools) for multiple uses?

### 2. How severely are different groups of people affected by multiple disadvantage and what background data are available on those groups, and/or what data still need to be collected? How can redesign of the public space help to compensate for multiple disadvantage in urban neighbourhoods in an overheated city?

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# Guidelines for climate-proof design of green and outdoor spaces and integrative planning processes

Green and blue infrastructure is an essential component of a sustainable city. To ensure efficient and effective climate-proof design and evolution of this infrastructure, we firstly need evidence-based guidelines on the impact of different design elements. Secondly, it is necessary to involve different disciplines and incorporate various background data into the planning process. To this end, disciplinary barriers need to be overcome and planning processes and tools need to be coordinated and aligned in terms of content and timing.



## RESEARCH QUESTIONS

**1. How can green and blue infrastructure be designed as effectively as possible – considering the impact of different design elements on quantitative (microclimate, hydrological balance, biodiversity) and qualitative factors (usability, community building, amenity value), as well as any potential synergy effects?**

- a) What estimates can be made with regard to the expected impact, costs and spatial requirements of different design elements?
- b) Can concrete implementation rules/target values be defined for the design of green spaces on building plots (cf. Green Space Factor) and/or the design of public spaces? If so, which?
- c) What tools are suitable for small-scale

modelling of the microclimatic effects associated with different design options for buildings and public spaces (facade greening, choice of materials, amount of shading, proportion of sealed surfaces, etc.)?

**2. How can (larger) industrial/trading estates be designed with a view to climate change adaptation (or indeed mitigation)?**

**3. What might be a potential overall scheme for integrative planning and evaluation of public spaces, incorporating expertise from different disciplines (biology, architecture, landscape planning, environmental health, construction, etc.) as well as background data from various sources (basic geodata, data on vegetation, microclimate, etc.)?**

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# Environmental auditing and evaluation of outdoor space design

Economic and ecological evaluation of outdoor space design involves environmental auditing methods that factor in the environmental impact of materials and construction methods and the long-term ecological, economic and social benefits of green spaces and bodies of water in urban areas. The challenge lies in how to quantify the societal benefits of green infrastructure and the ecosystem services it performs in monetary terms.



## RESEARCH QUESTIONS

- 1. What can be done to ensure that green and blue infrastructure is installed and maintained in a sustainable manner** (sustainable building materials, carbon-neutral construction methods, circular economic principles)?
  - a) What system could potentially be used to evaluate special types of urban areas (e.g. industrial/trading estates)?
  - b) Can quantification of ecosystem services in monetary terms create greater awareness of their value (and the need to protect them)?
  - c) How can the effectiveness of incentives or subsidy schemes for climate adaptation measures be measured (e.g. by means of an impact analysis of existing instruments)?
  - d) How can the rising costs associated with climate change be counteracted with the aid of low-cost green space concepts (e.g. spontaneous vegetation) (costs of non-action compared to investment costs)?
- 2. What might an environmental audit of outdoor space design and frequently used elements** (ground surface materials, edging and fencing, various green areas) **comprise?**
- 3. What approaches can be employed to calculate the economic value of green and blue infrastructure?**

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# Selection of future-proof plants and care of existing vegetation

In the face of climate change, cities are confronted with the challenge of adapting their planting strategies to create resilient, biodiverse and climate-proof green spaces. This includes identifying and selecting future-proof plants as well as care and maintenance of existing vegetation.



## RESEARCH QUESTIONS

1. **Which tree and plant species are especially resilient with regard to the changing climatic conditions** (water and care requirements, heat resilience, etc.)? How can experience and recommendations from other cities with similar climatic conditions be applied in Vienna?
  - a) What role do neophytes play in future-proof planting schemes?
  - b) What climate-proof solutions can be employed for planting of (grassy) urban spaces (e.g. new approaches featuring walkable meadow lawns, regional seed material)?
2. **How can the existing vegetation be kept in a healthy condition?**
  - a) What can be done to improve and facilitate care and maintenance of existing vegetation, particularly through use of digital technologies?
  - b) Besides the routine care and maintenance measures, what can be done to create the right conditions for healthy growth of existing trees?
  - c) What are the potential benefits of less intensive care and maintenance measures (less frequent mowing/pruning)? What can be done to raise public acceptance of low-maintenance green areas and (less intensive) care regimes (given that the visual appearance is likely to change as well)?
  - d) How do different (less intensive) care and maintenance regimes affect costs, and to what extent should the cost of maintaining existing vegetation be taken as an indicator for planting decisions going forward?
  - e) What methods can be used to estimate the substrate and water requirements of small-, medium- and broad-crowned trees that are not rooted naturally in the ground, both now and in future in the light of advancing climate change?

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# Design and unsealing of ground surfaces

Combined with a lack of vegetation, low levels of evaporation and densely built structures, sealed surfaces are a major contributor to the urban heat island effect. Targeted unsealing measures and well thought-out design of ground surfaces offer a plethora of approaches to counteract urban overheating and optimise the micro-climate and thus quality of life in urban areas.



## RESEARCH QUESTIONS

- 1. Which surface materials are particularly well suited to preventing the formation of local (heat) hot spots and ensuring good water permeability?**
  - a) What practice-based method could be used to evaluate existing solutions (e.g. nature-based solutions), and what findings and potential measures can be derived from it?
  - b) What methods can be used to analyse the heat budget of ground surface materials? How does the heat budget affect the durability and maintenance requirements of materials with regard to their climate change mitigation effects?
- 2. What impact do winter maintenance measures and the associated requirements have on the design and effectiveness of ground surfaces?**
- 3. What can be done to promote soil health for the benefit of existing vegetation (subsoil/unsealing measures)?**

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# Water features and greened surfaces in public spaces

In view of the challenges posed by climate change, cities face the task of developing sustainable, multifunctional solutions for the use and design of urban spaces. Greening, water features and renewable energies play a pivotal role here.



## RESEARCH QUESTIONS

1. **What design options are available for areas of water und water features** (mistifiers, spray showers, splashpads and so on) **to prevent the growth of pathogens?**
  - a) What potential effects would the greening of retail parks, sound barriers, car park walls, etc. have on the urban climate?
  - b) What depth of substrate is required on the roofs of buildings and underground car parks to support long-term planting of trees/other greenery?
2. **What can be done to optimise the use of grey water in the interests of resource conservation and circularity?**
3. **What additional surfaces can be used for greening and/or solar panels** (e.g. sound barriers, car parks)? What do the interactions between greened surfaces and photovoltaic installations look like in detail?
  - c) What potential synergies exist between different sustainable uses on sealed surfaces? What can be done to minimise competition between different uses (solar panels, trees, greening of facades)?
  - d) How can care and maintenance of green roofs be optimised when they are additionally used for solar PV installations (e.g. particular mix of plants plus technical aids)?

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# Water management

Climate change is changing precipitation patterns and causing increasingly frequent episodes of torrential rainfall, and cities need to respond with innovative concepts to optimise use of different water resources, protect urban infrastructure and build resilience against the impacts of climate change.



## RESEARCH QUESTIONS

- 1. How will precipitation patterns develop in the future** (amounts, regional distribution, extreme rainfall events)?
- 2. What methods are suitable for calculating the natural water balance and evaporation capacity** of different types of building and ground surfaces?
- 3. What spatial requirements need to be factored in for the integrated installation of 'sponge city' measures** – for retention, seepage/run-off and evaporation of rainwater – at different levels of scale (building plot, local neighbourhood, city district)? What innovative, (cost-) efficient, scalable solutions could be employed at these different levels?
- 4. How can winter maintenance and rainwater management measures be reconciled in public spaces** (key issues: liability for pathway maintenance, salt ingress into green areas and protection of groundwater)?
- 5. What can be done to optimise the drinking water and rainwater cycles?** What hygiene-related, legal and economic issues (cost-benefit analysis) need to be resolved in this context? What are the associated requirements with regard to water mains and piping systems? What can be done to raise public acceptance of secondary water use?
- 6. What dimensions do storage facilities (for seasonal/annual storage) in urban water management systems need to have to ensure security of supply?**
- 7. What impact is the increasing use of heat pumps having on groundwater levels?**

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All social groups, especially vulnerable ones, are **protected** against the health risks associated with climate change.

**Health literacy** is improved at individual and organisational level – Vienna focuses on **health promotion and disease prevention.**

By **2030** the healthy life expectancy of the Viennese population has increased by **two years.\*\***

**Mobility guarantee:** It's easy to **get around** in Vienna **without owning a car.**



**All social groups** are empowered to play an **active role** in the **co-creation** and transformation of the city.

Vienna initiates large-scale mission-led research and **innovation projects** as a contribution to the **socio-ecological** transformation.

The city-wide roll-out of **learning communities** ('Bildungsgrätzln') by 2030 and the subsequent evolution into a Learning City will create learning spaces that are tailored to local neighbourhoods, communities and lifestyles – supported by **multiple use** of buildings and spaces.



Vienna boasts a comprehensive, needs-based, inclusive programme of **digital education** for all sectors of the population.

# Thematic cluster Climate Justice



In accordance with the Smart Climate City Strategy, social cohesion and equality of opportunity are the common denominator for the City of Vienna's activities, including those in the fields of climate change mitigation, climate change adaptation and the circular economy. Vienna's pathway to net zero is designed so as to ensure that everyone in Vienna benefits from it as much as possible and nobody is left behind or excluded (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- All social groups, especially vulnerable ones, are protected against the health risks associated with climate change.
- Health literacy is improved at individual and organisational level – Vienna focuses on health promotion and disease prevention.
- By 2030 the healthy life expectancy of the Viennese population has increased by two years.\*\*
- Mobility guarantee: It's easy to get around in Vienna without owning a car.
- All social groups are empowered to play an active role in the co-creation and transformation of the city.
- Vienna initiates large-scale mission-led research and innovation projects as a contribution to the socio-ecological transformation.
- The city-wide roll-out of learning communities ('Bildungsgrätzln') by 2030 and the subsequent evolution into a Learning City will create learning spaces that are tailored to local neighbourhoods, communities and lifestyles – supported by multiple use of buildings and spaces.
- Vienna boasts a comprehensive, needs-based, inclusive programme of digital education for all sectors of the population.

Scientific findings relating to the following research questions in the Climate Justice cluster are instrumental in helping Vienna achieve the goals set out above.



\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

\*\* Baseline year 2019

# Climate policy and strategies

The principle of climate justice also needs to be reflected in the relevant municipal climate strategies and funding policy, meaning that the latter need to take account of the needs of different social groups, and particularly those who are most severely affected. Appropriate indicators, assessment mechanisms, approaches and frameworks are therefore required to evaluate the strategies from the climate justice perspective.



## RESEARCH QUESTIONS

- 1. How can climate policy strategies and programmes be designed so as to ensure that they are socially just and take adequate account of the needs of different social groups?** To what extent should groups that are particularly severely affected be directly involved in designing the measures?
  - a) Which urban structures/systems/(legal) frameworks promote or hinder climate (social) justice?
- 2. What impact do the strategies and programmes have in terms of climate (social) justice?** What assessment mechanisms and indicators are required to evaluate the social impact of climate-related measures?
  - b) How would higher social benefits in the form of financial payments or non-cash benefits affect public acceptance of climate policy measures, and would these encourage people to adopt a climate-neutral lifestyle?
- 3. What might a climate-friendly, socially just funding policy look like?**
  - a) Do the city's monetary funding programmes in the fields of climate change mitigation/climate change adaptation/green economy take adequate account of the needs of all social groups?
  - b) What support services and/or structures are required to assist different social groups in building their individual resilience and adaptability to climate change?

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# Climate change and health

Climate change can have both direct and indirect impacts on people's health. The rising temperatures, in particular, detrimentally affect different social groups to varying degrees. In order to take appropriate measures, research and data are required on the direct and indirect consequences of extreme heat, the potential for access to cool premises during heatwave periods, and the impact of heat and climate change on working conditions, e.g. in service and care occupations, among others. (See also the research questions in the Mobility cluster.)



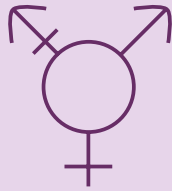
## RESEARCH QUESTIONS

- 1. What are the direct and indirect impacts of extreme heat on the health and psychosocial status of different social groups?** To what extent are the impacts of extreme heat on health and psychosocial status gender specific?
- 2. How does social inequality affect access to cool/air-conditioned premises?** Which social groups are especially disadvantaged? How can the requirement for publicly provided infrastructure ('cooling zones') be assessed?
- 3. What impact is climate change expected to have on working conditions** (of various occupational groups)? Which group is most severely affected? What measures need to be put in place to protect employees?

## THEME LEADERS

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Vienna is a **diverse city** that promotes **gender equality** and opportunities for participation for all who live here.

Vienna offers **high quality of life in all districts** of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and **participatory** decision-making.



Vienna supports **healthy, active ageing** – care-dependent Viennese citizens receive high-quality care at home or close to home for as long as possible.

The City of Vienna supports projects that actively encourage **cultural participation** – from plain-language and multilingual outreach activities to a wide range of **free** events.



Vienna develops and employs various **tools to give the public a say** in budgeting and use of public funds.



**All social groups** are empowered to play an **active role** in the **co-creation** and transformation of the city.

**'Living labs'** are created at neighbourhood level to pilot **innovative new methods** and processes and build **networks** of local stakeholders.



The opportunities for **public participation** offered by the City of Vienna are **visible** and accessible to all.

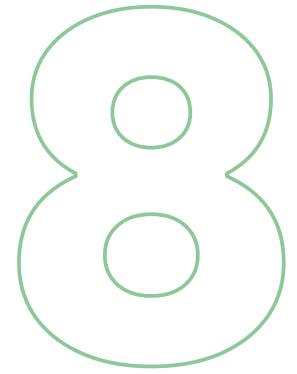


Vienna boasts a comprehensive, needs-based, inclusive programme of **digital education** for all sectors of the population.

Raising **awareness** of **sustainable, resource-efficient development** is a standard **teaching objective** in all educational institutions.

In Vienna, specific challenges relating to **sustainable development** are identified and resolved cooperatively by the municipal administration, higher education and research institutions, companies and end users.

# Thematic cluster Public Awareness, Inclusion & Participation



In line with its Smart Climate City Strategy, the City of Vienna is also relying on the engagement and initiative of the Viennese public. The aim is for as many people as possible to get actively involved in the endeavour as and when they are able, contributing their experience and ideas in the development and implementation of innovative projects and climate-related measures (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- Vienna is a diverse city that promotes gender equality and opportunities for participation for all who live here.
- Vienna offers high quality of life in all districts of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and participatory decision-making.
- Vienna supports healthy, active ageing – care-dependent Viennese citizens receive high-quality care at home or close to home for as long as possible.
- The City of Vienna supports projects that actively encourage cultural participation – from plain-language and multilingual outreach activities to a wide range of free events.
- Vienna develops and employs various tools to give the public a say in budgeting and use of public funds.
- All social groups are empowered to play an active role in the co-creation and transformation of the city.
- 'Living labs' are created at neighbourhood level to pilot innovative new methods and processes and build networks of local stakeholders.
- The opportunities for public participation offered by the City of Vienna are visible and accessible to all.
- Vienna boasts a comprehensive, needs-based, inclusive programme of digital education for all sectors of the population.
- Raising awareness of sustainable, resource-efficient development is a standard teaching objective in all educational institutions.
- In Vienna, specific challenges relating to sustainable development are identified and resolved cooperatively by the municipal administration, higher education and research institutions, companies and end users.

The following research questions in the Public Awareness, Inclusion & Participation cluster pertain to the goals of the Smart Climate City Strategy outlined above. Scientific findings relating to these questions will help us to realise those goals.



\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

# Communication on climate issues

Vienna's climate goals, especially the goal of achieving net zero, require far-reaching transformations in the ecological, economic and social spheres. To ensure that these transformations are lasting and sustainable, the measures need to be communicated in a targeted way to different social groups and sectors of the population. This also calls for new, innovative communication strategies and media that actually speak to the diverse needs and living environments of different target groups, ideally bringing them on board as partners in the climate-friendly urban transformation.



## RESEARCH QUESTIONS

- 1. How must communication on climate issues be designed for specific target groups**, and how should it take account of and speak to different social groups and sectors of the population?
  - a) Communication targeted at children and young people is of relevance with a view to creating a climate-friendly city. What narrative and participatory approaches could be effective here, e.g. via social media?
  - b) What communicative formats and approaches can be used to bring the target group of early adopters and urban lifestyle innovators on board as reliable partners, and ideally as ambassadors, for community communication strategies promoting a climate-friendly city?
  - c) What is the impact of different communication strategies and tools with regard to public acceptance of e.g. greening of buildings and facades, mobility measures and redesign of public spaces?
- 2. What communication strategies and media are required** to bring different target groups on board and involve them in planning processes for a climate-friendly city?
- 3. What new future narrative can be drafted** that engages different social groups, has a mobilising effect, and avoids over-emphasis of menacing dystopian scenarios that can trigger a negative response?
- 4. What communication strategies can be developed** to counteract the increasing spread of fake news, half-truths and conspiracy theories around climate policy?

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# Climate literacy

In order to create a sustainable, climate-friendly city, it is important to bring everyone in Vienna on board. To do this, structures need to be put into place that allow the Viennese public to play their part in the transition to net zero and indeed drive the transformation themselves. Raising levels of climate literacy among the general public is imperative in order to promote and support informed consumer decisions and sustainable lifestyles. At the same time, people's different living environments, needs and levels of awareness need to be taken into account. The challenge lies in presenting the facts in such a way that they not only become understandable, but that they can also be applied in people's everyday lives.



## RESEARCH QUESTIONS

- 1. How do attitudes towards climate-related issues vary across the population?**
- 2. To what extent do climate literacy and awareness increase climate-friendly behaviour and public willingness to support climate policy measures?** How do levels of climate literacy vary across the population? What targeted climate literacy measures can be implemented outside the education system to facilitate engagement and participation among different social groups?
- 3. What structural and motivational incentives close the gap between climate literacy and willingness to support climate-related measures on the one hand, and actual individual behaviour on the other?**

### Special question

To what extent can small-scale community initiatives like urban gardening groups help to enhance climate resilience? How do community initiatives of this kind need to be organised in order to raise awareness of climate issues?

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# Participation

Everyone living in Vienna – regardless of ethnicity and nationality – should have the opportunity to be actively involved in the sustainable development of our city. Above all, the aim is to reach social groups who are or will be severely affected by climate change and its consequences. Suitable methods, processes and models are required for this purpose.



## RESEARCH QUESTIONS

- 1. What forms of public participation are suitable for generating a feeling of self-efficacy, especially with regard to transformation processes towards a sustainable city?** Which of the above have already got off to a promising start in Vienna?
- 2. Do the participatory methods and processes currently in use adequately reflect the diversity of our society** and address different social groups, including marginalised ones, and their points of view?
  - a) What existing or prospective indicators are suitable for evaluating the success of participatory initiatives?
  - b) Based on the evaluation of existing initiatives and completed participatory processes, what potential is there to broaden the scope of public participation (especially with regard to subject matter, actors, formats)?
- 3. To what extent are new statistical models required for proportional weighting of various social groups when they are involved in participatory processes** addressing the question of climate justice? What might these statistical methods look like?
- 4. How can participatory budgeting be rolled out further and used to promote climate justice?**
- 5. How can participatory processes relating to remodelling of public spaces be designed to be as inclusive as possible?**

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The  
**City of Vienna  
champions**

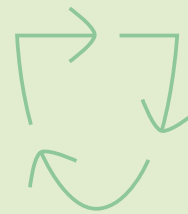
a sustainable urban economy  
by introducing appropriate  
legal frameworks  
and targeted subsidy schemes,  
by creating 'living labs',  
and as a public-sector client.



The City of Vienna and  
Viennese businesses establish  
a **climate action  
alliance** for the joint  
development of a sustainable  
urban economy.

Vienna offers **high  
quality of life in  
all districts** of the  
city – by investing in public  
infrastructure and mitigating  
and adapting to climate  
change, strengthening  
community cohesion and  
providing a wide range  
of opportunities for  
public involvement and  
**participatory** decision-  
making.

In 2030, Vienna is one of  
**Europe's top five research  
and innovation hubs** and a  
magnet for top-flight international  
researchers and the research units of  
international corporations.



In 2030,  
Vienna has a **global reputation**  
as the hub of a  
resource-efficient **circular economy**  
and attracts investment and  
talent in this sector.

# Thematic cluster

## Markets & Financing



The following climate goals relating to Vienna as a location for business are embedded in Vienna's Smart Climate City Strategy. The City of Vienna aims to be a pioneer in terms of creating a thriving yet sustainable economy that secures the basis for a good life, both now and for future generations (SCCS).\*

**Vienna's climate goals**, as set out in the Smart Climate City Strategy:

- The City of Vienna champions a sustainable urban economy by introducing appropriate legal frameworks and targeted subsidy schemes, by creating 'living labs', and as a public-sector client.
- The City of Vienna and Viennese businesses establish a climate action alliance for the joint development of a sustainable urban economy.
- Vienna offers high quality of life in all districts of the city – by investing in public infrastructure and mitigating and adapting to climate change, strengthening community cohesion and providing a wide range of opportunities for public involvement and participatory decision-making.
- In 2030, Vienna is one of Europe's top five research and innovation hubs and a magnet for top-flight international researchers and the research units of international corporations.
- In 2030, Vienna has a global reputation as the hub of a resource-efficient circular economy and attracts investment and talent in this sector.



\* Smart Climate City Strategy Vienna (SCCS): [smartcity.wien.gv.at/en/strategy](https://smartcity.wien.gv.at/en/strategy)

# Market dynamics and the labour market

Climate policy goals are often at odds with the prevailing logic of the market, be it due to inadequate or simply flawed economic incentives, a lack of regulatory provisions, market failure, or the asynchronicity between future demand and current investment. New approaches are required to resolve these conflicting priorities and steer market dynamics towards promoting sustainable development.



## RESEARCH QUESTIONS

- 1. In what sectors do the prevailing market conditions** (e.g. lack of economic incentives to take action; market failure in the supply of products; lack of synchronicity between future demand and foresighted investment, e.g. in training of qualified staff) **hinder the implementation of climate-friendly solutions?** What can be done, for instance in terms of financial incentives, regulatory and/or innovation policy and public infrastructure and land-use policy, to shift these market dynamics?
- 2. What is the economic impact of government subsidy programmes – on the supply side as well as on the demand side?** How can the public sector provide incentives to broaden the supply of climate-related services (e.g. building renovation) and thus exert a damping effect on prices? In what roles can the public sector participate in new markets itself (at least temporarily), not only to exert a corrective effect, but also to actively create or shape them?
- 3. What new forms of economic governance, organisation and coordination are required for constellations of multiple actors** to cope with the high degree of complexity and multidisciplinary involved in the climate transformation (e.g. collaborative networks, public-private joint ventures to build the necessary expertise, renewable energy cooperatives, etc.)?
- 4. What regulatory provisions and/or incentives are required to support resource-efficient 'as a service' models (e.g. mobility as a service)?**
- 5. What role do non-market factors play in the dissemination of energy-efficient technologies** (such as, e.g. heat pumps, house insulation, electric cars) and solutions (e.g. public transport)?
  - a) To what extent can non-monetary instruments (e.g. public information campaigns) encourage the introduction of energy-efficient, climate-friendly technologies and solutions?
  - b) Are there currently any energy-efficient, climate-friendly technologies and solutions that are not being adopted by consumers, despite the monetary savings (the so-called energy-efficiency gap)? What are the reasons for this?
- 6. What climate-related measures would have a positive impact on Vienna's labour market** (especially for low-skilled and disadvantaged groups) and/or the local economy?
- 7. What methods can be used to model the economic effects of the climate crisis on the labour market?**

## THEME LEADER

- Municipal Department MA 23 – Economic Affairs, Labour and Statistics, Head of WIEN 2030 Business & Innovation Strategy, Gerrit Thell, [gerrit.thell@wien.gv.at](mailto:gerrit.thell@wien.gv.at)



# Cost transparency and financing

Financing of climate change mitigation and adaptation measures is a key challenge that calls for innovative and sustainable approaches and solutions. When considering financing options, the costs of inaction should naturally also be taken into account. Besides exploring alternative financing models and assessing the effectiveness and efficiency of subsidies and disincentives, analysis of suitable legal frameworks is also required.



## RESEARCH QUESTIONS

- 1. What alternative financing models could be employed to cover the costs associated with pending climate change mitigation and adaptation measures?** What is the legal framework with regard to piloting of alternative financing models?
- 2. What models are suitable for pre-financing of infrastructure that will not go into full use right away, but is more efficient to instal in advance in conjunction with other works,** e.g. installation of district heating mains or geothermal probes during tramline maintenance? What costs are associated with the repurposing of existing infrastructure, but also with the dismantling and/or phase-out of obsolete infrastructure (exnovation)? What financing models would be conceivable in this context?
- 3. What methods can be used to model the economic effects of the climate crisis on the urban economy?** Is it possible to quantify and 'offset' the opportunity costs and/or the costs of inaction or acting too little/too late (both for individual sectors and overall)?
- 4. Alongside subsidy schemes ('pull measures'), how can disincentives ('push measures'), conditions attached to subsidies and/or termination of subsidies for practices that are harmful to the climate help the City of Vienna achieve its climate goals?**

## THEME LEADER

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# Competitiveness, locational factors & services of general economic interest

The transition to a sustainable economy not only presents challenges; it also opens up great opportunities, especially with regard to competitiveness and locational advantages. This can bring economic benefits for individual enterprises as well as attracting business to Vienna. It also highlights the role of the public sector in securing provision of modern services of general economic interest to ensure social and economic stability in times of major transformation. The aim is to position Vienna as an innovation leader in the field of climate change mitigation and as an attractive location for talent and investment.



## RESEARCH QUESTIONS

- 1. To what extent can a consistent shift towards alternative energy sources generate advantages in terms of competitiveness and innovation, both for individual market participants as well as for the local urban economy?**
- 2. What potential does Vienna have to position itself competitively on the global stage as an innovation leader in the fields of climate change mitigation, climate change adaptation and the circular economy, and thus as an attractive location for talent and investment?**
- 3. What potential benefits in terms of competitiveness and resource conservation can be derived from Vienna-based regional (re-)structuring schemes/clusters enabling greater shared use of business premises, use of waste heat and/or recycling of waste products as secondary raw materials?**
- 4. To what extent must the public sector ensure greater provision of (new) services of general economic interest (e.g. cool zones) in order to prevent social and economic upheaval in the context of major transformation processes such as climate change mitigation, climate change adaptation and the shift to a circular economy?**

## THEME LEADER

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Vienna City Administration

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