

Adaptation Measures to Urban Heat Islands Effects



Urban Heat Islands – Strategy Plan Vienna

SMARTWB, Vienna, April 3-5, 2024

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Urban Heat Islands – Strategy Plan Vienna

Department of Landscape, Spatial and Infrastructure Sciences

Institute of Landscape Development, Recreation and Conservation Planning

Institute of Landscape Planning

University of Natural Resources and Life Sciences, Vienna

Christiane Brandenburg, Doris Damyanovic, Florian Reinwald,

Brigitte Allex, Christina Czachs, Birgit Gantner

Department of Economics and Social Sciences

Institute for Sustainable Economic Development

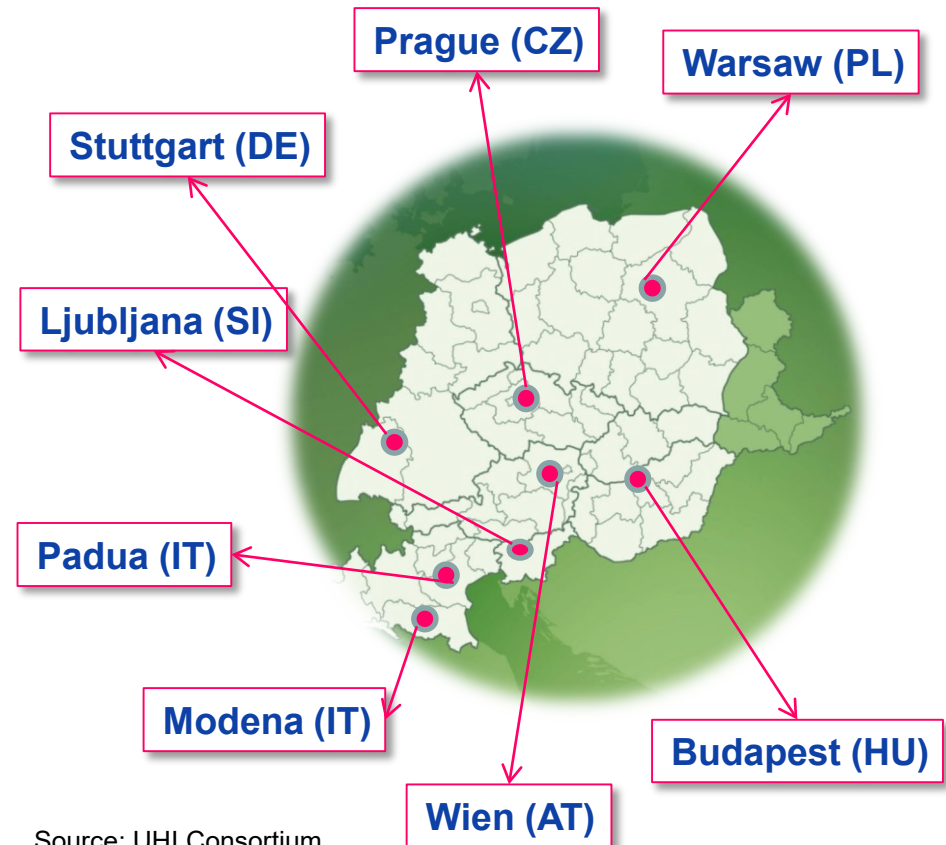
Markus F. Hofreither, Ulrich Morawetz, Martin Kniepert

On behalf of

Municipal Department 22 – Environmental Protection Department Vienna



Part of international
Project: UHI - Development
and application of
mitigation and adaptation
strategies and measures
for counteracting the global
Urban Heat Islands
phenomenon



Source: UHI Consortium

<http://www.eu-uhi.eu/>

Structure and content of the presentation

Motivation and background

Assessment of measures

Possible measures

Outlook

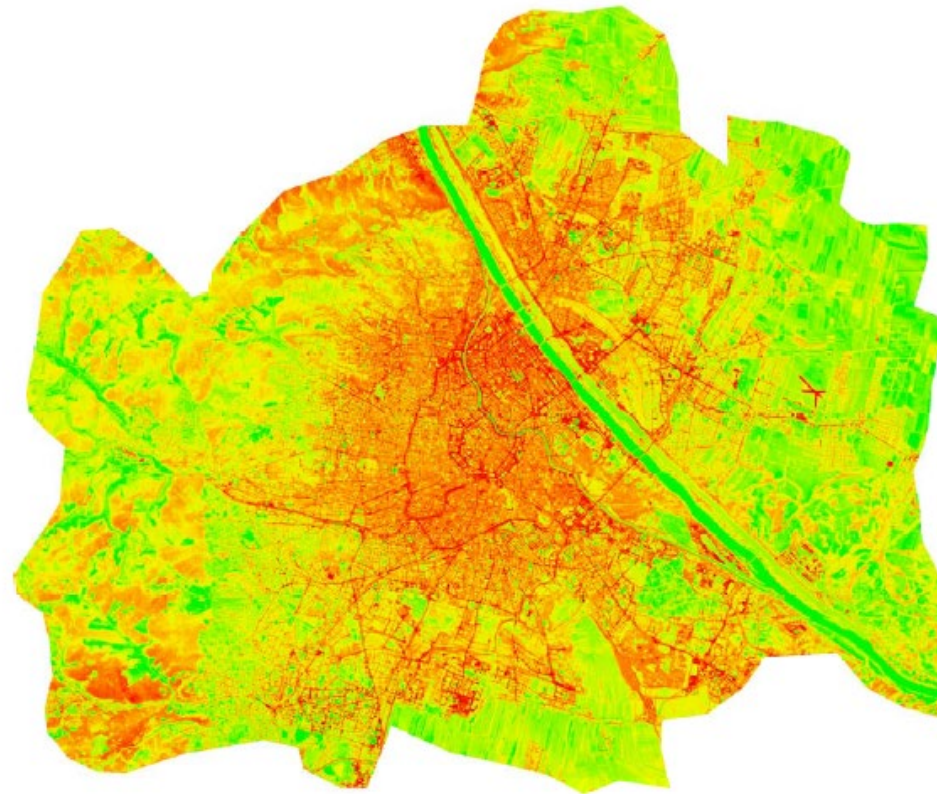


Surface temperatures in Vienna,
15. August 2001, evening

Motivation and background

Spatial development of Vienna

- Strong growth
- Development of brownfields and agricultural areas
- Increasing (re)densification
- Increasing degree of soil sealing
- Increasing building densities
- Loss of green spaces
- ...



Oberflächenstrahlung



Motivation and background

ORF NEWS, <https://orf.at/#/stories/3352962/> 30.3.2024

„Unsichtbarer Killer“: Warnung vor Folgen großer Hitze

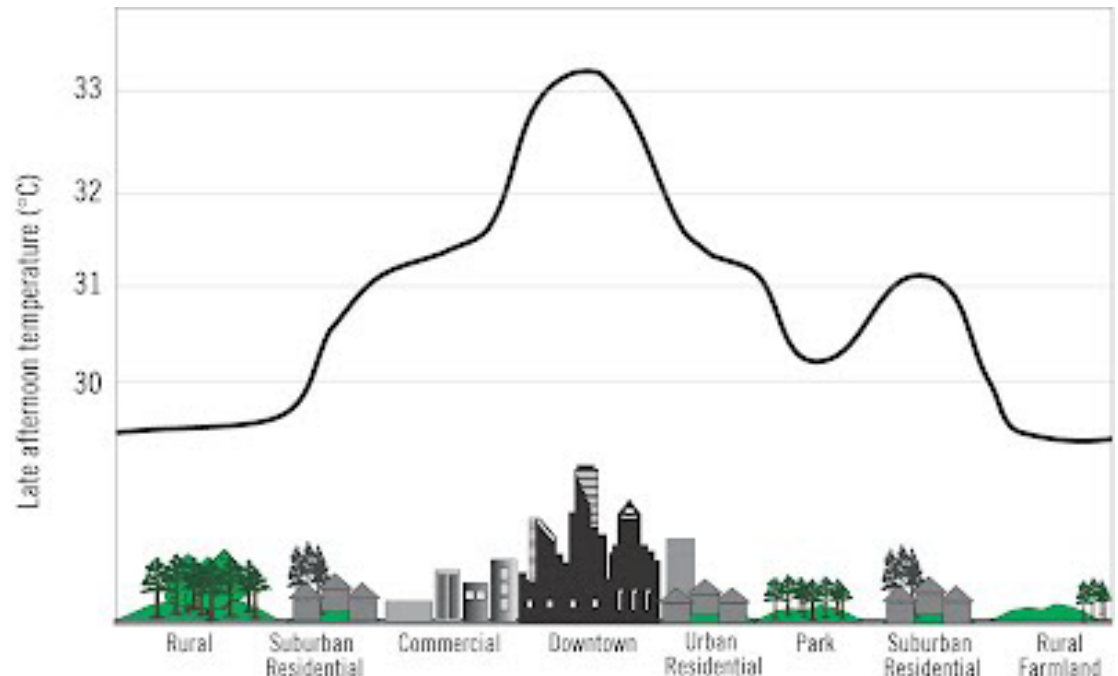
Die Internationale Föderation der Rotkreuz- und Rothalbmondgesellschaften (IFRC) und die US-Behörde für internationale Entwicklung (USAID) haben vor extremer Hitze als „unsichtbarem Killer“ gewarnt. ... Europa erwärmt sich am schnellsten. ...

"Invisible killer": Warning about the consequences of extreme heat

The International Federation of Red Cross and Red Crescent Societies (IFRC) and the US Agency for International Development (USAID) have warned that extreme heat is an "invisible killer". ... Europe is warming the fastest. ...

Urban Heat Island

- UHI effects triggered a.o. by dense building and high degree of soil sealing
- Heat periods start earlier and last longer
- Increasing number of hot days and tropical nights
- ...



Source: UHI Consortium

Consequences

- Health impacts – e.g. problems of the respiratory or circulatory system,...
- Reduced work performance
- Emergency services – e.g. increase of operations, ...
- Increase of energy consumption – e.g. power blackouts, ...
- Breakdown services – overheated engines, ...
- Heat damages on traffic routes
- Heat-induced breakdowns in public transport
- Impacts on tourism
- ...



Consequences

- Urban fleeing → recreational areas
- Urban fleeing → Sommerfrische (<https://sommerfrische-neu.boku.ac.at/>)
- ...



Grinzing: Formerly a summer resort for Vienna's middle-class society

Aims of the project “UHI-STRAT Vienna”

- Development of a **strategy plan for the City of Vienna** to implement urban and open space planning measures as well as urban ecology measures that reduce urban heat effects
- **Identification of possibilities of action** for the City of Vienna based on tools of the control levels of urban planning and development
- Identification of opportunities to **raise awareness and promote acceptance** of measures that reduce urban heat effects
- ...



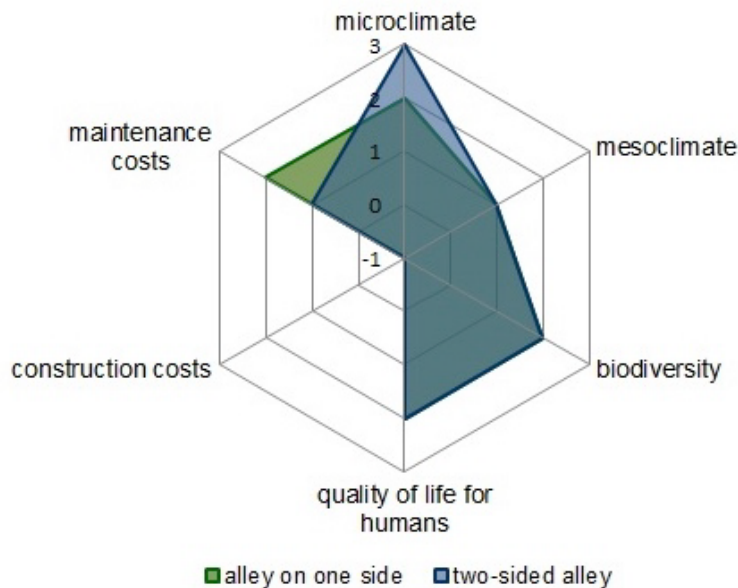
Methodological approach

- Literature research
- Several workshops with architects, employees of the city council of Vienna, land use planners, landscape ecologists, meteorologists
-

Resulting in:

- 37 adaptation measures and
- more than 60 sub-measures
- strategical/planning and technical measures

Criteria for the assessment of the measures



Climate	Micro climate
	Meso climate
Biodiversity	Biodiversity
Life quality	Life quality for humans
Economy	Construction: cost, materials, labor
	Maintenance: cost, materials, labor
Implementability	City council
	Private
	Public
	New planning
	Old stock , recovery, renovation
	Long term feasible: > 5 years
Acceptance	Short term feasible: uot to now and up to 5 years
	Politicians
	Constructors
	Residents
	Industry / Trade
	Management



Detailed
description



3.3.2 Maßnahme – Gewässerbegleitende Grünräume mit Nutzungsmöglichkeiten



Spiderweb: siehe Erläuterung auf S. 25

Beschreibung der Maßnahme

Wasser hat ein hohes Wärmespeichervermögen, gleicht also – vor allem bei großen, tiefen, stehenden Gewässern – Temperaturspitzen aus. Die tageszeitlichen Schwankungen sind geringer. In der Nacht ist es wärmer, tagsüber jedoch deutlich kühler. Ab einer Größe von rund 1 ha haben Gewässer eine deutliche Auswirkung auf die Temperatur und Luftfeuchte ihrer Umgebung (Schwab & Steinicke 2003).

Gewässer eignen sich aufgrund ihrer geringen Rauigkeit auch gut als Luftleitbahnen, entlang derer es zu einem Kaltluftaustausch kommen kann. Durch den Ausbau der Grün- und Freiflächen entlang von Gewässern bzw. durch die Sicherung der Randbereiche vor Bebauungen können Kaltluftströme gefördert werden.

Die bestehenden Fließgewässer in der Stadt sind meist durch stark verbaute, geradlinig verlaufende Ufer geprägt und die Abflusssgeschwindigkeit ist zumeist einheitlich und hoch. Durch eine naturnahe Gestaltung der Gewässer und ihrer Uferzonen können diese sowohl als Erholungsräume für Menschen als auch für die Biodiversität in der Stadt stark aufgewertet werden. Die Anlage bzw. der Ausbau und die Vergrößerung

von gewässerbegleitenden und nutzbaren Grün- und Freiflächen – insbesondere entlang von Fließgewässern im dicht verbauten innerstädtischen Gebiet (zahlreiche Beispiele dazu gibt es wie z. B. den Donaukanal, Wienfluss, Liesingbach, einige Wienerwaldtäler, etc.) – kann hier eine UHI-sensible Adaption doppelt unterstützen. Diese Maßnahme entfaltet ihre Wirkung in Bezug auf eine Verbesserung der Lebensqualität von Menschen und fördert gleichzeitig den Luftaustausch in der Stadt.

Synergien

- Steigerung der Lebensqualität und des Wohlbefindens
- Schaffung neuer/weiterer innerstädtischer bzw. siedlungsnaher Freizeit- und Erholungsmöglichkeiten
- Positiv für Biodiversität

Herausforderungen

- Erhaltungsintensiv
- Erhaltung der Gewässerhygiene
- Gerade in dicht verbauten Gebieten kann es schwierig sein, entlang der Gewässer ausreichend Platz für Grünräume zu schaffen

Für die Umsetzung der Maßnahme relevante Lenkungebenen

Stadtentwicklungsplan, Fachkonzept Grün- und Freiraum, Waldentwicklungsplan, Flächenwidmungs- und Bebauungsplan, Grünanlagenverordnung, Wasserrechtsgesetz, Parkleitbild

Spider web

Levels of
management

Synergies

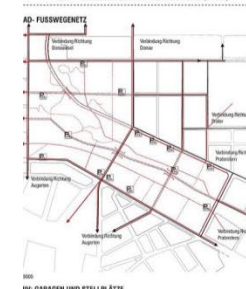
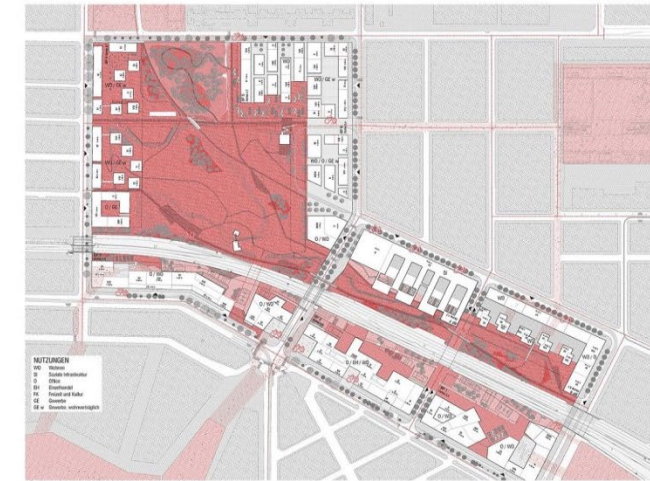
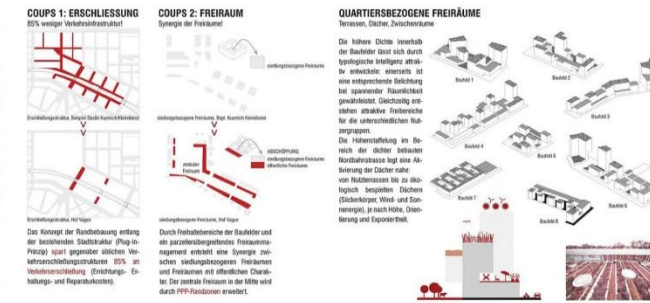
Challenges



Overview of planning and control levels

Challenges in the implementation of the UHI STRAT Vienna:

- Implementation of measures implemented by the city, developers and individuals
- Different spatial reference levels (total city, county, residential district, building block, public space, park, monument, ...)
- Various control levels and processes (interfaces / interface)
- Competing objectives of the Vienna Urban Development - conflicting objectives
- Synergies with other actions



Overview of planning and control levels

- Climate and adaptation measures = legal cross-cutting
- International law (eg. as the UN climate convention)
- Federal laws (eg. Climate Protection Act)
- State laws (eg Viennese Nature Conservation Act, BO Vienna)
- Implementing regulations (eg. SWW, renovation regulation)
- Technical standards (Thermal performance of buildings)
- ...

Overview of planning and control levels

- ...
- Directives (eg. skyscrapers in Vienna - Urban guidelines)
- Strategic instruments (eg. STEP , KLiP)
- Internal policies (eg. Ecological purchase)
- Planning Aids (eg. Manual for public space planing)
- Funding instruments under private law (eg . as green roofs vertical greening)
- Funding for preservation agriculture
- (Spatial-) research and concepts
- ...

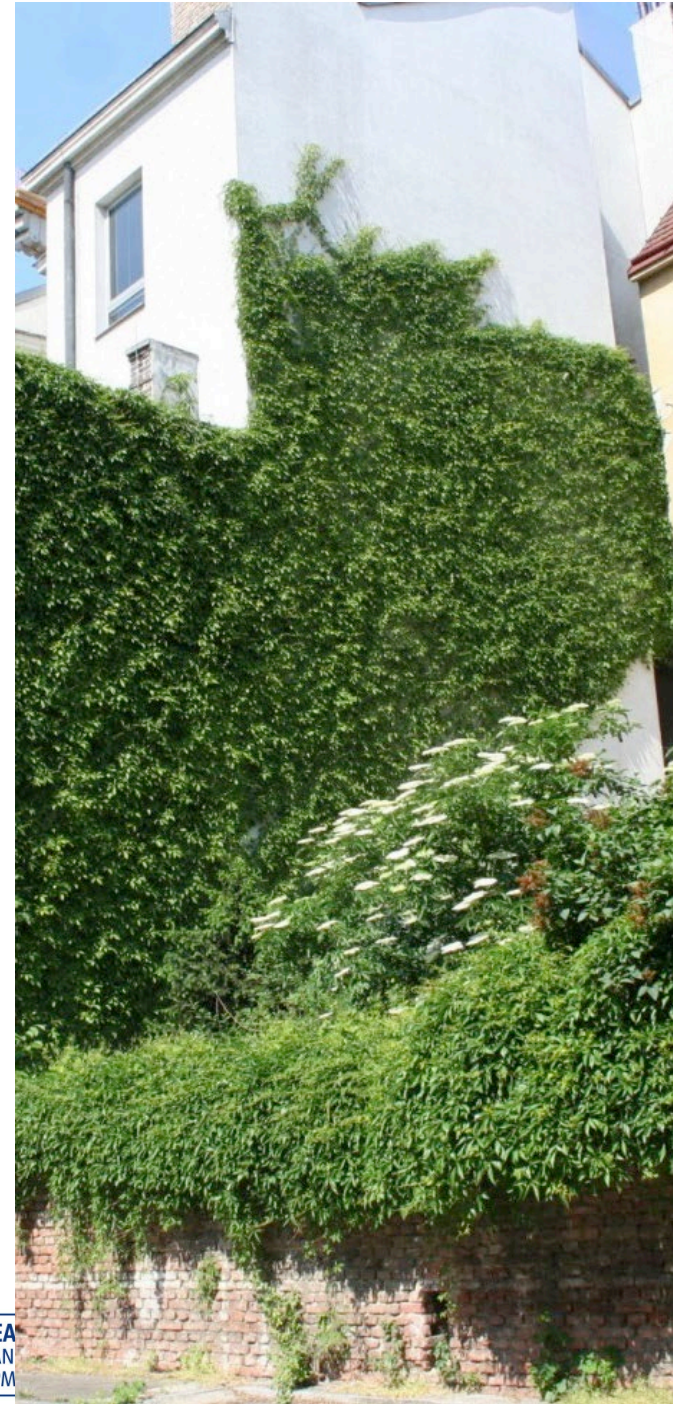
Funding of private activities

Green Roofs

According to the height (cm) of the root-permeable structure thickness:
8-25 € per square meter, max 2 200 €.

Courtyard- / Vertical greening

75% for horticultural companies,
max . 2 200 €



Funding of private activities

- Fundings for ecological farming
- Compensation of damage by wildlife
-

Municipality of Vienna:
2000 ha organic farming
60 ha vineyards



Overview of steering level

Central implementation instruments –
main approaches:

- Master plans and urban development models
- Zoning and development planning
- Developer competitions, housing and public housing initiative
- Public utility buildings
- Promotions
- Research projects and planning aids
- ...

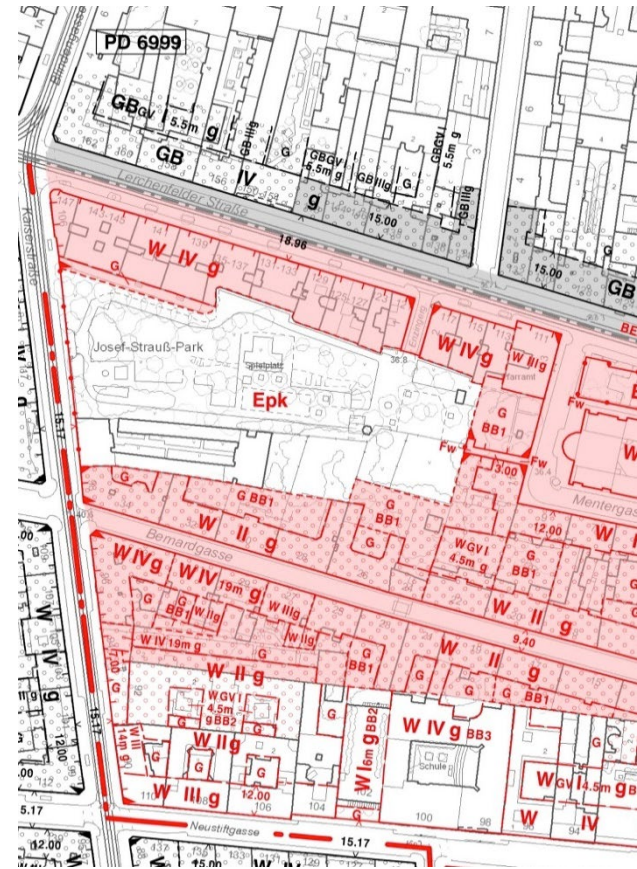




Zoning and development planning

Changing the existing practice in the zoning and development planning by consideration climate and UHI effects, e.g.:

- Alignment, positioning, height of buildings
- Tree safeguarding and planting
- Window orientation
- Reduction of sealing
- Gardening, landscape architecture
- Arcades, passages, passageways or arcades
- Securing and implementation of green and open spaces and green roofs
- Securing agriculture land
(agriculture land = 4th crop rotation / land for settlement developing)



Guiding Plan for Green Space

Viennese evergreen: These areas are **protected forever** as high-quality green spaces. No construction is allowed there. Exceptions are facilities for recreation or for forestry and agriculture.

Future green: Areas that are **developed into green spaces** when the current use changes. In this case, they become part of Vienna's evergreen.

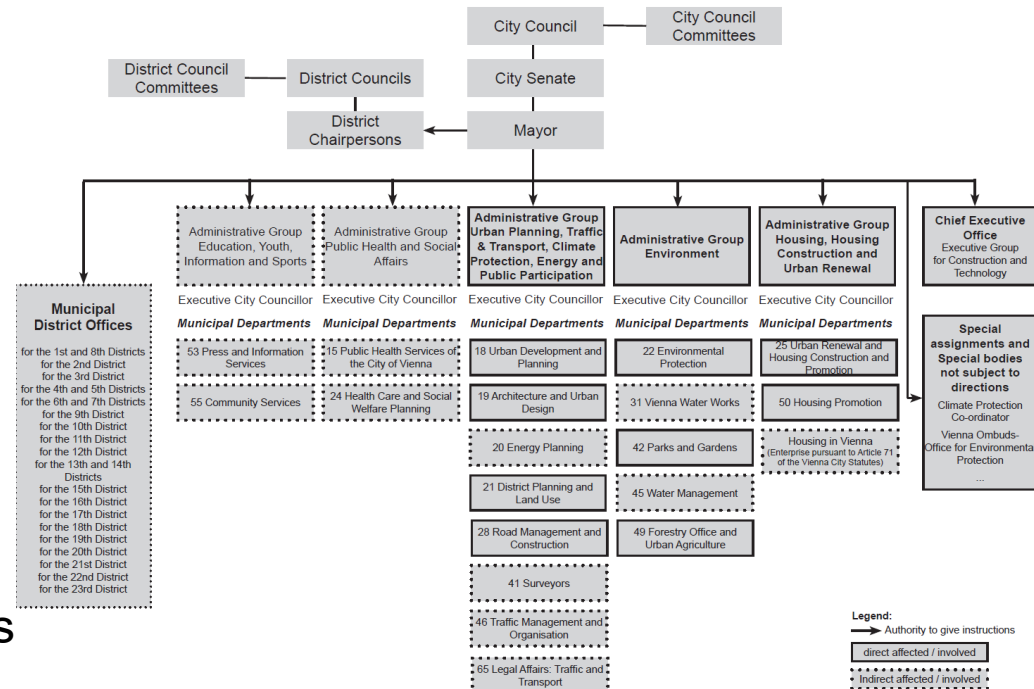
Changeable green: Green spaces whose qualities will be **preserved in the future**. Their location or layout can change provided that the green space function is maintained or improved.

Green reserve: Green spaces that are **preserved in the long term**. They can only be reclassified as building land if the additional demand has been demonstrated and the municipal council decides....



Challenges

- UHI is a longitudinal and cross-sectional matter
- A total of 5 administrative groups, 20 municipal departments, 5 superior units and institutions related to the City as well as Vienna's 23 districts affected in their spheres
- Various control levels and processes (intersections/junctions)
- Competing aims of Vienna's urban development – conflicts of aims
- Synergies with other measures



Modelling micro-/meso-climatic impact

Area 1 –Karlsplatz



Area 2 - Nordbahnhof



→ **Simulation of effects of different measures – ENVI-met**

Department of Building Physics and Building Ecology, Vienna University of Technology

Modelling urban ecology, urban and open space design as well as quality of life

Qualitative (and quantitative) assessment

- Living Lab
Architects, employees of the city council of Vienna, land use planners, landscape ecology, Landscape planners, ...
- Literature research
- Expert interviews



Some proposed measures

- Planning measures
- Technical measures
- Public relations
- Green infrastructure



Measures water

- Increasing the amount of water (standing and flowing waters as well as water installations)
- Increasing the supply of (children's) open spaces related to water
- Increasing the possibilities to use inner city flowing waters (e.g. accessibility,...)
- Use of alternative irrigation and water collection systems
- Provision of drinking water in open spaces and buildings
- ...



Measures shading

- Shading of open spaces close to buildings
- Shading of open spaces remote from buildings (e.g. parks, leisure and sports facilities)
- Shading of open spaces in streets
- ...



Measures buildings

- Active/passive cooling of buildings (e.g. ventilation, long-distance cooling, component activation, insolation,...)
- Shading devices on buildings (e.g. blinds, sliding shutters, photovoltaic systems,...)
- Water cooling of buildings
- Extensive/intensive green roofs
- Vertical greening of buildings
- Reduction of the percentage of window surface
- ...



Measures mobility

- Cooling of overground and underground transportation facilities of local public transport
- Cooling of public transport
- Using water ways as transport routes
- ...

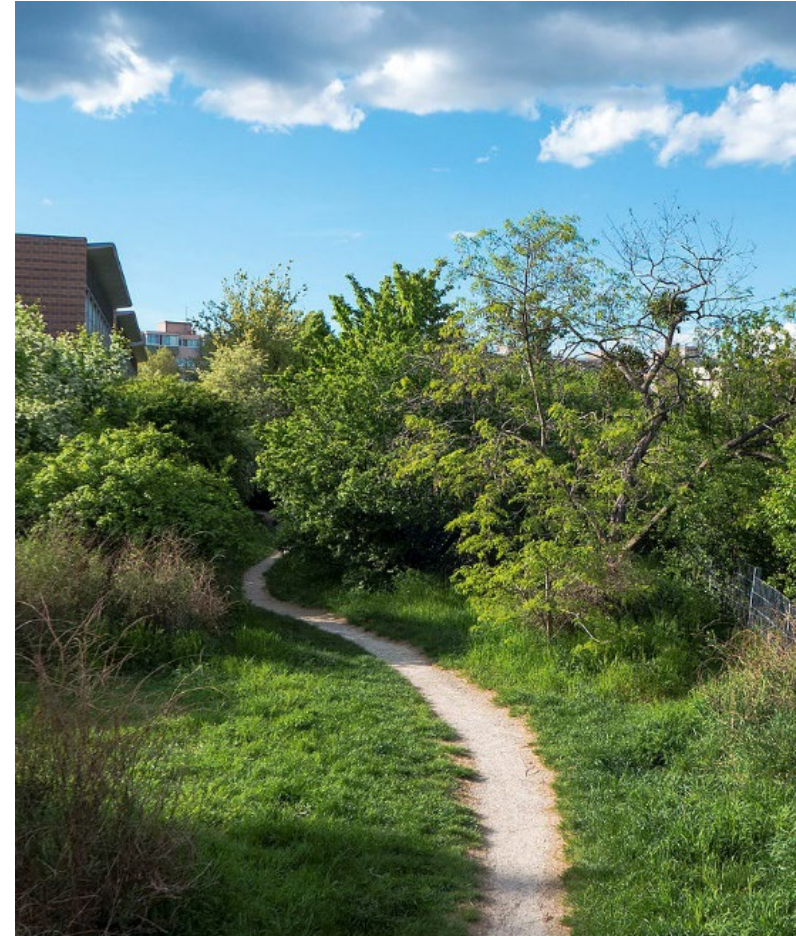
Measures de-sealing

- De-sealing of areas – residential areas/operational areas
- De-sealing and greening of tramway tracks
- ...



Measures green infrastructure

- Installation and extension of roadside vegetation, green and open spaces as well as inner courtyards and backyards
- Linking inner city green spaces
- Riverside green spaces leading into the urban areas
- (Temporary) use of brownfields as green and open spaces
- ...



Wien 03 Erdberger Stadtwildnis

Measures green infrastructure

- ...
- Allowing spontaneous vegetation on areas of little or no use
- Planting additional woodland areas
- Additional parks (> 2,5 ha, > 50 ha)
- Conserving old trees and increasing the number of trees
- Selection of adequate tree species adapted to future climate changes
- ...

Public relations

Vienna heat warning system and Vienna heat health monitoring (Provincial Sanitary Board,...)

- Information on behaviour at high temperatures (e.g. Vienna Social Fund, Vienna Chamber of Labour, ...)
- Information on cool places (e.g. internet forums, city guides, Kathpress – Vienna's coolest churches, information for homeless people ...)
- Awareness raising (e.g. free fridge thermometers through the City of Vienna food hotline, ...)
- ...

→ mainly short-term measures



<https://www.stadt-wien.at/wien/news/kuehle-plaetze-im-sommer.html>

The „coolest“
Church
(Foto: Wolfgang Beigl)



The third man tour

(Foto: Magistrat der Stadt Wien Wien Kanal)



Initiative
for climate
protection
„Cool
climate
without
power
(Foto Stadt
Wien Votava
/ PID)



Conclusion

- The City of Vienna has firmly incorporated and takes actions on climate protection
- Adaptation to climate change/UHI less developed
- Existing short-term measures – information, awareness raising, long-term measures and strategies necessary
- Different scales and many planning and control levels are concerned
- Wide range of possible measures
- Wide range of stakeholders and departments have to be involved
- Existing tools (to a large extent) suitable for the implementation of measures to reduce UHI effects



Thank you!

BOKU University
Department of Spatial, Landscape and Infrastructural Sciences
**Institute of Landscape Development, Recreation and Conservation Planning, Institute
of Landscape Planning**



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