

Help, the Alps are Glowing!

Thoughts on a Spatial Climate Plan for the City of Lienz

Master thesis (TU Vienna, June 2024)

written by

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Alpine Climate Board of the Alpine Convention

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Presentation content

- » Background of the thesis
- » Approach
- » Results
- » Lessons learnt

Background of the thesis

- » Climate change calls for a transformation of spatial structures in Alpine cities
- » Current instruments fall short when it comes to creating climate-friendly spatial structures
- » Urban & regional planning can make a crucial contribution to climate mitigation and adaptation
- » Climate plans for Alpine towns - localisation of climate-friendly measures are missing
- » Thesis was not commissioned by the city of Lienz



Fig. 1 Stream „Zauchenbach“ (self-created image, taken from Linken Iselweg on 15.10.2021)

Research question

Hypothesis:

- » If climate-friendly measures are located, they are more likely to be implemented

Objective:

- » First draft of a Spatial Climate Plan
- » Find a suitable methodology
- » A radical & visionary approach was chosen



Fig. 2 Analogue master thesis (self-created image, taken on 08.06.2024)

Definition

Spatial Climate Plan

- » Is not a comprehensive climate plan that includes all topics (e.g. does not include measures in the health sector)
- » Focusses on the spatial level and on the localisation of the measures
- » The most important output is not the plan, but the process of planning and the methodology used
- » Planning that leads to being able to locate suitable integrated measures for climate mitigation and adaptation as well as spatial structures that enable climate-friendly behaviour on a plan



Fig. 3 Analogue master thesis (self-created image, taken on 08.06.2024)

Planning area

City of Lienz

- » Southern Alps (AT), Population: approx. 12.000
- » Capital of the district of Lienz (East Tyrol)
- » Located at the junction of the rivers Isel and Drau
- » Located in the heart of the Alpine Convention region

Why did I choose the town of Lienz as a case study?

- » Numerous challenges facing Alpine towns as a result of the climate crisis can be addressed
- » Innovative approaches in urban and regional planning, wide network

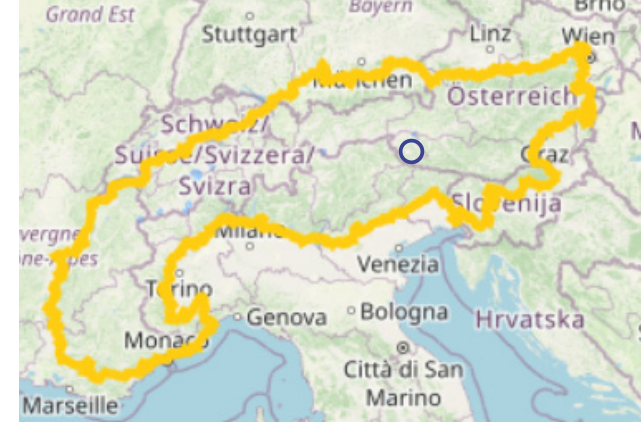


Fig. 4 Location of the city of Lienz in Alpine Convention region (Alpine Convention 2024, self-edited)

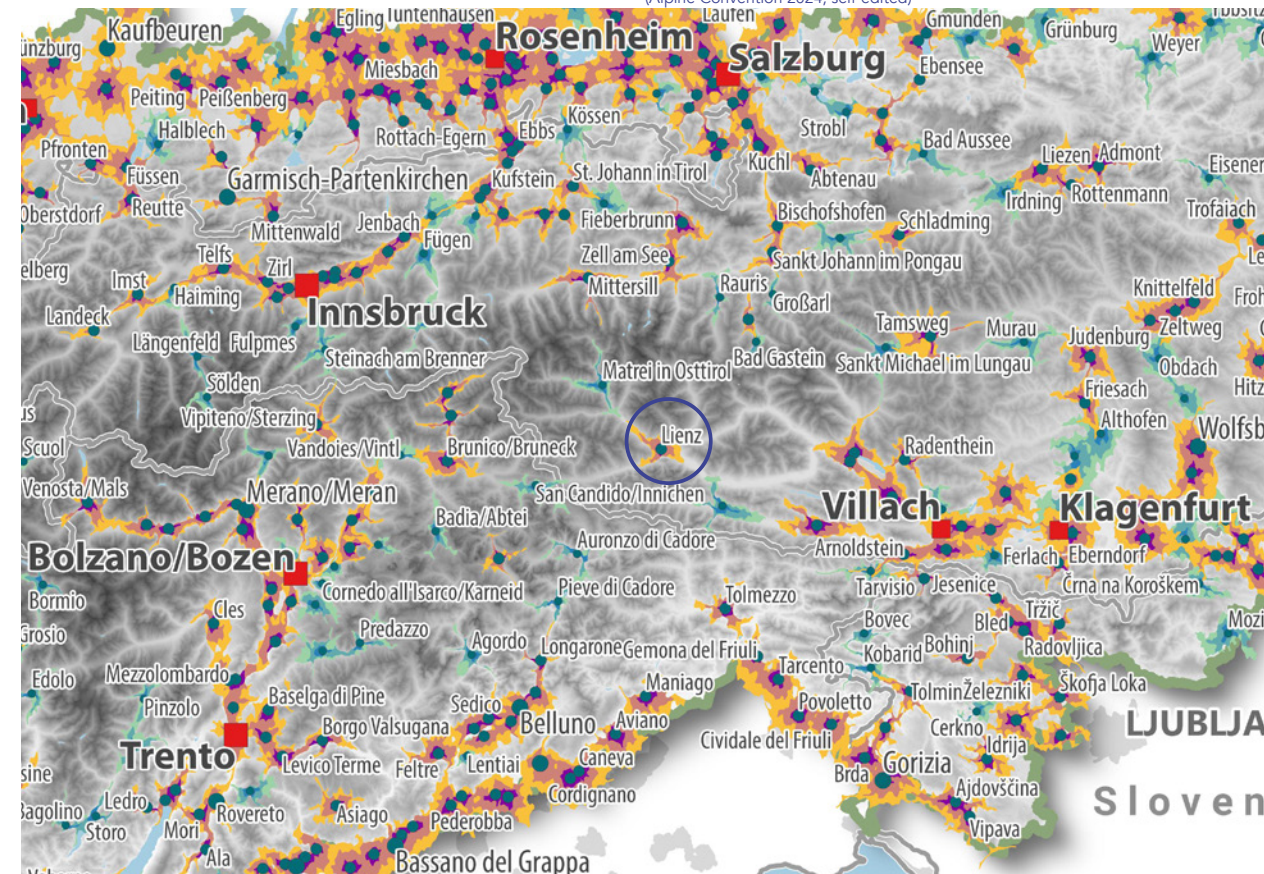


Fig. 5 Location of the city of Lienz in the Alps (Chilla et al. 2022b, self-edited)

Planning area

- » Planning area was not defined on the basis of municipal boundaries or other administrative boundaries
- » Based on the functional urban structure
- » Size of the planning area: approx. 4.000 hectares
- » People living in the planning area: approx. 20.500 people
- » On-site visits were particularly useful for the definition of the planning area

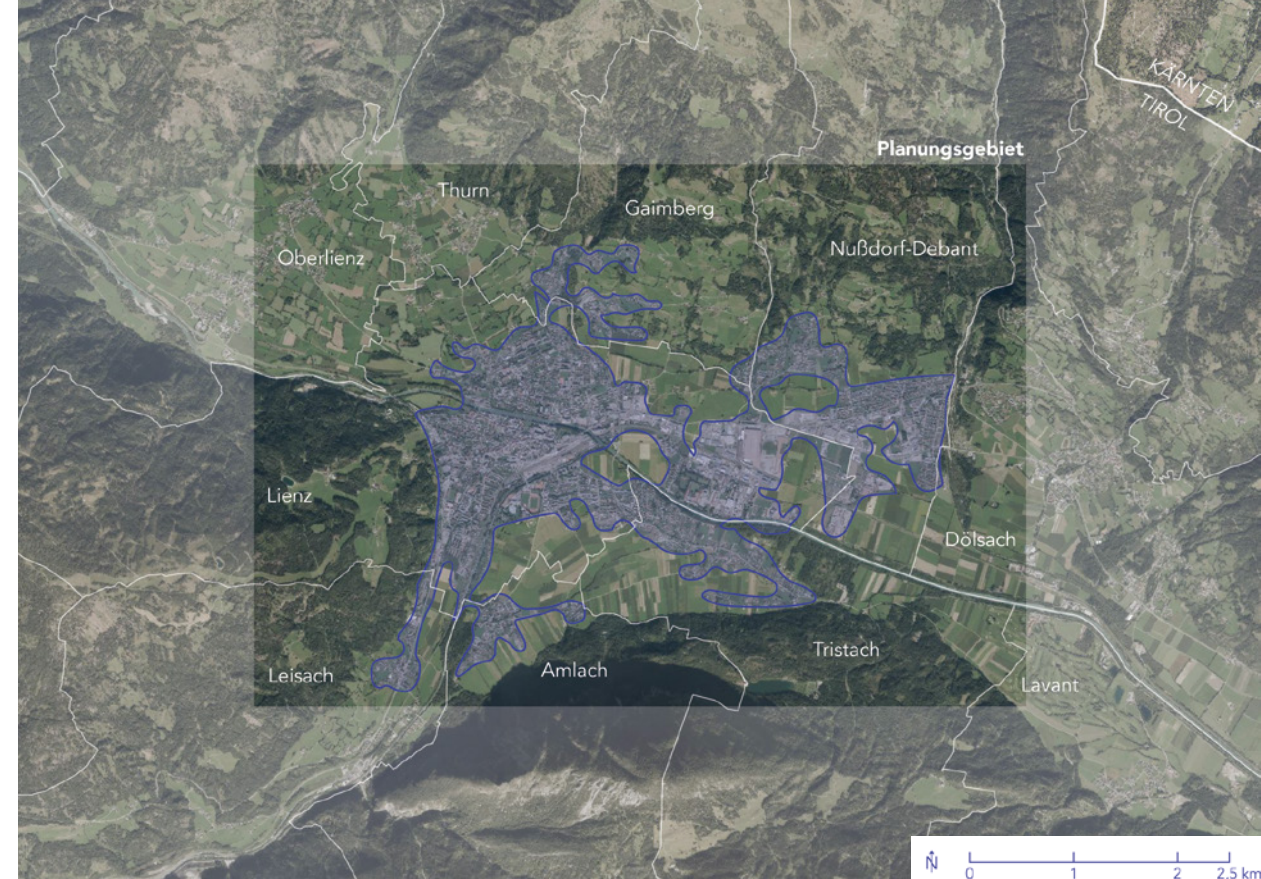


Fig. 6 Definition of the planning area (self-created image, Map base: Land Tirol - data.tirol.gv.at 2023 (Orthofoto Tirol), Land Kärnten - KAGIS 2021 (Orthofoto Kärnten), BEV 2022 (Verwaltungsgrenzen))

Definition of the planning area

- Settlement area city of Lienz
- Municipal boundary
- Federal state boundary

Effects of the climate crisis

- » What effects will climate change have on the spatial structures of Alpine towns?
- » Examples:
 - › Heavy rainfall events lead to more frequent and intense flood events
 - › Dry periods in summer lead to water shortages
 - › Prolonged periods of high temperatures lead to heat islands in heavily sealed areas

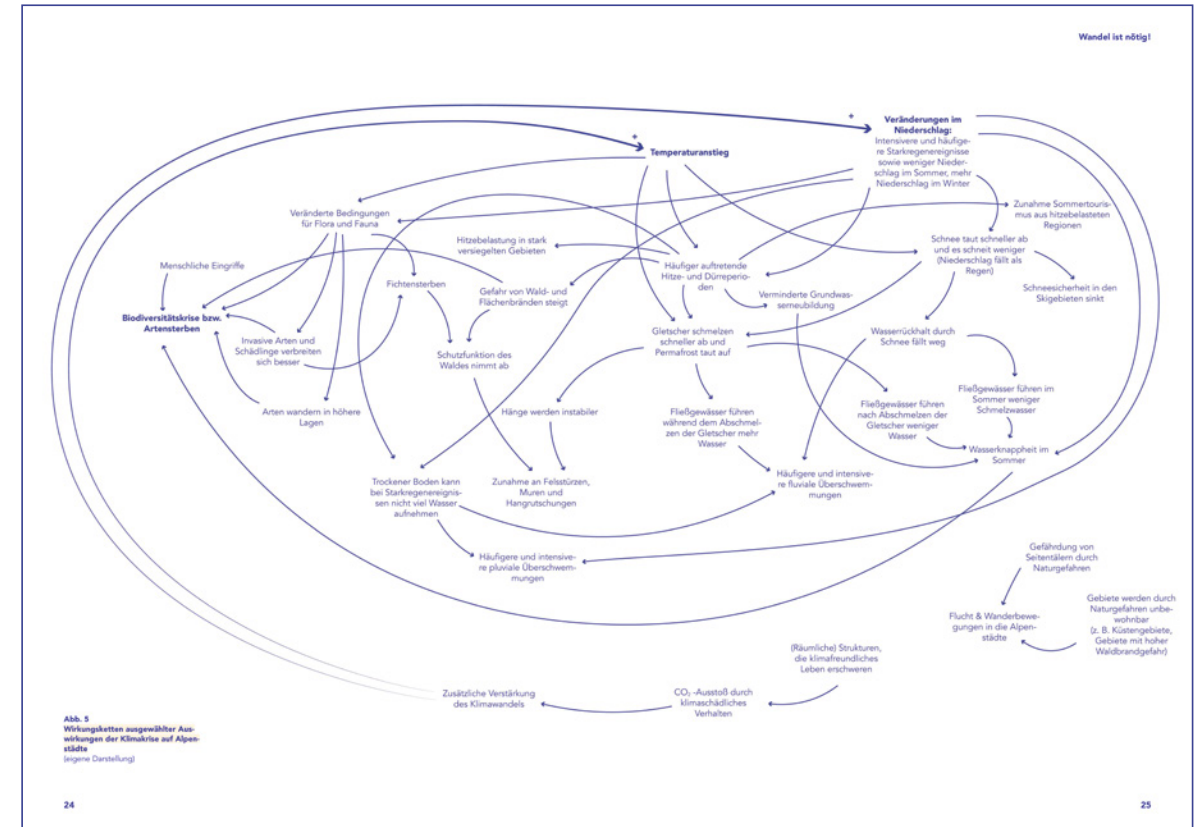


Fig. 8 A glimpse inside the master thesis - excerpt Effects of climate change on Alpine cities (self-created image)

Reflection of selected Climate Plans and Tools

» Where do I see gaps in the climate plans / What is innovative?

Criticism:

- » Measures with a spatial reference are mentioned, but rarely localised
- » Maps are available, but are almost exclusively limited to the analysis level
- » The focus is on the energy sector - an integrated view is usually missing
- » Measures fall short - transformative vision is missing

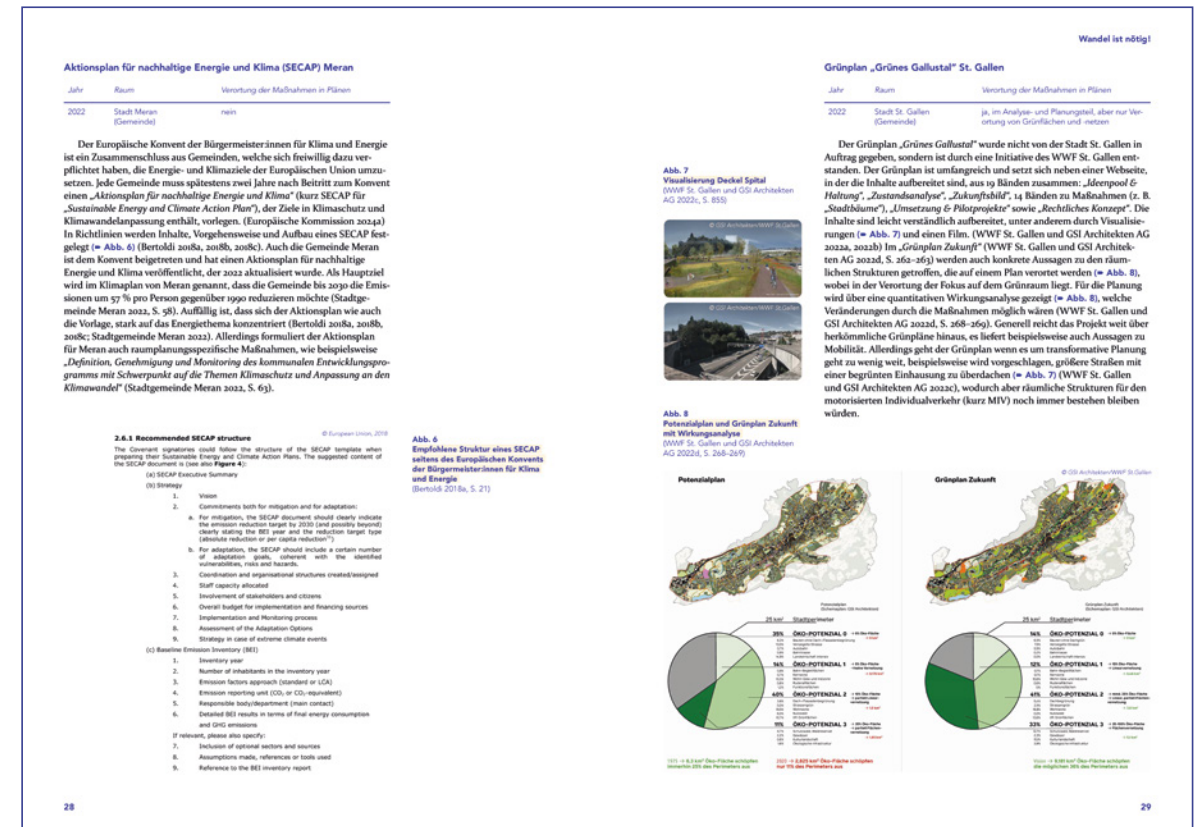


Fig. 9 A glimpse inside the master thesis - excerpt Reflection of selected Climate Plans and Tools (self-created image)

Climate profile of the city of

Lienz

» Climate-relevant data

- › Researching and analysing relevant data
- › e.g. Demographic change - older people are particularly sensitive to heat

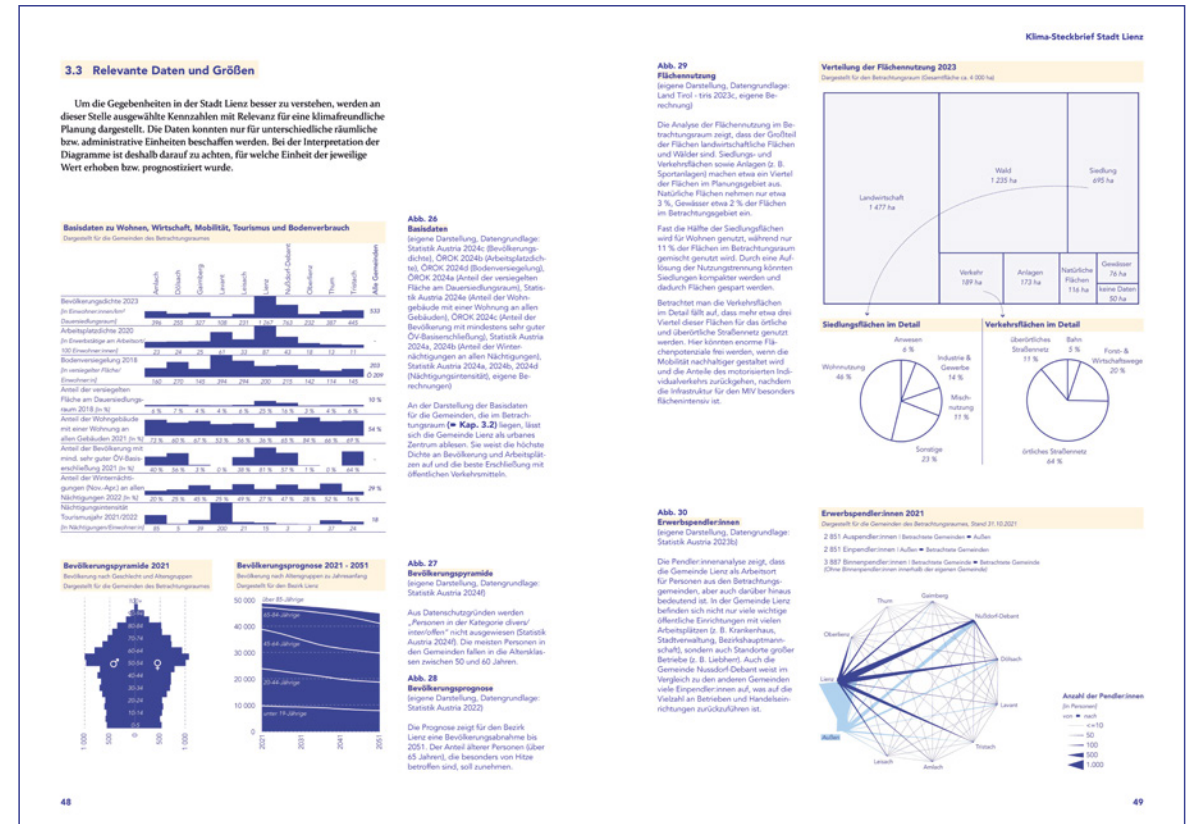
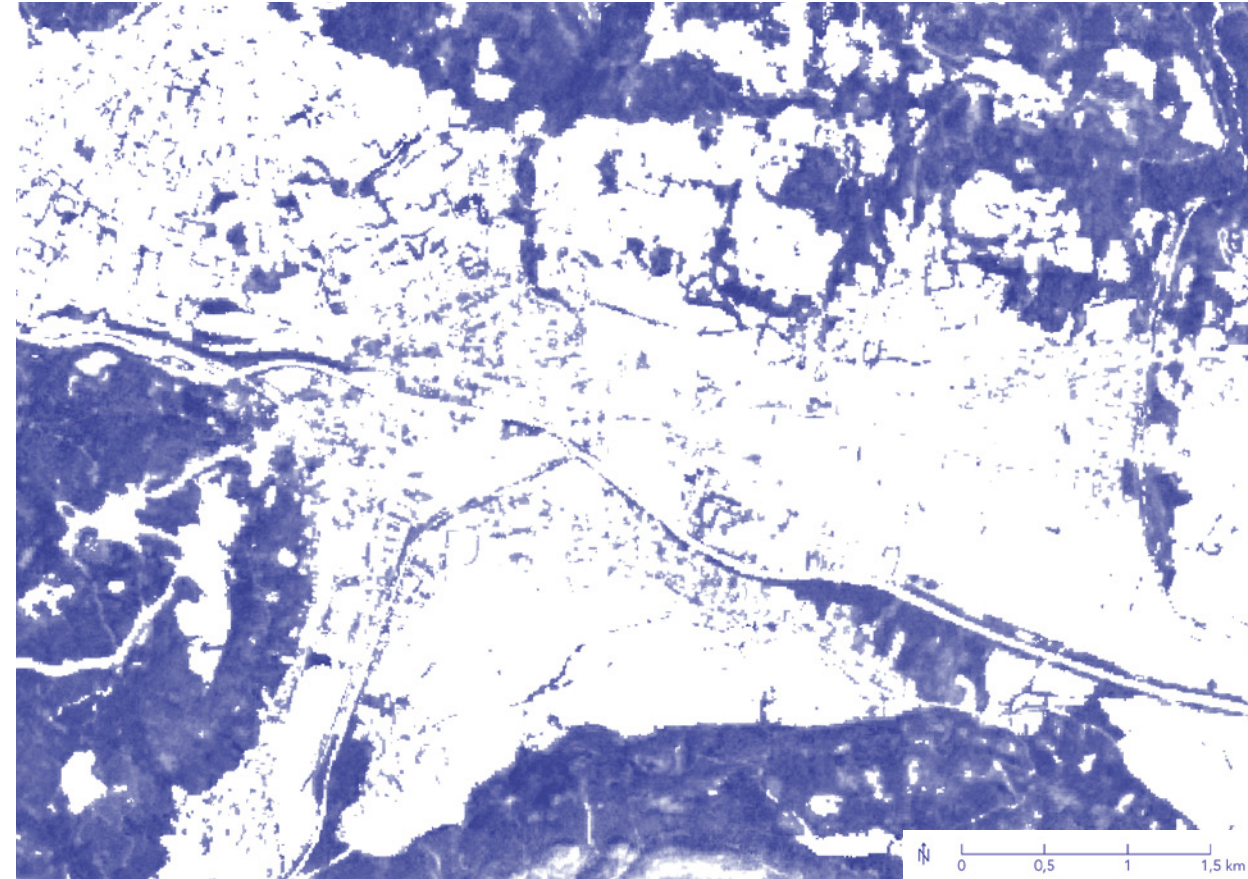
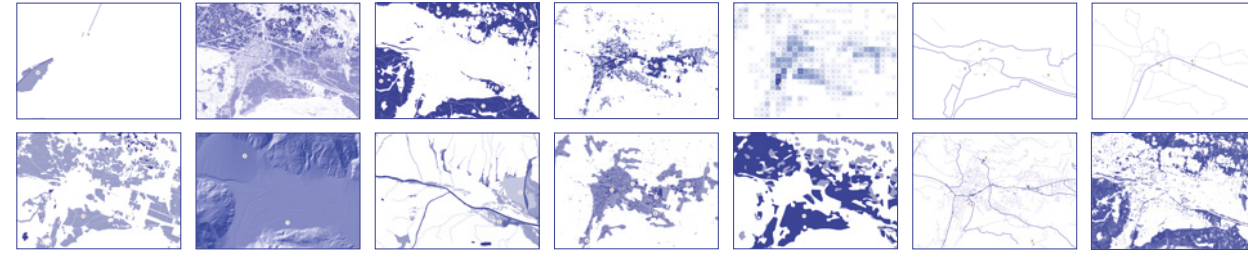


Fig. 10 A glimpse inside the master thesis - excerpt Relevant Data (self-created image)

Climate-relevant spatial structures

- » What action is needed to create climate-friendly spatial structures in the city of Lienz? + where?
 - › *Gaps*
 - › *Potentials*
- » Layer analysis of spatial data in the GIS
 - › *e.g. solar potential, cycle paths*
- » Example - Degree of tree cover:
 - › *Lack of coherent green connections across the valley*



Heavily greened areas

Degree of tree cover

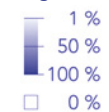
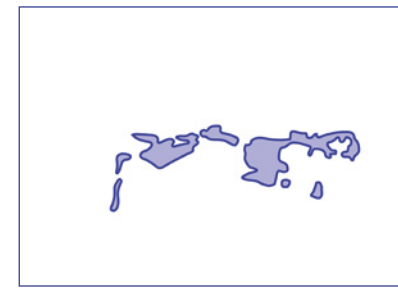


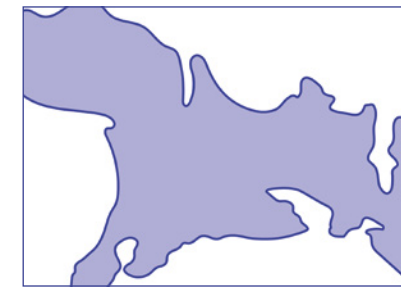
Fig. 11 Degree of tree cover, Data status 2018 (self-created image, Map base: EEA 2020b)

Climate-relevant spatial structures

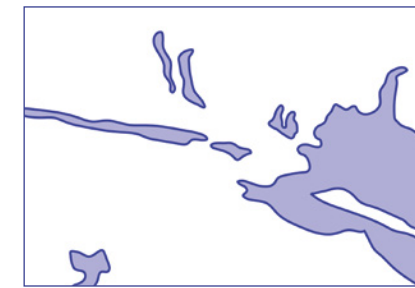
- » Identification of areas where action is particularly needed
 - › e. g. Heavily sealed areas
- » Heatmap: Overlay of these layers
 - › Transformation areas: especially on the outskirts of the city (car-centered spaces)
- » Action requirements formulated for the Spatial Climate Plan
 - › e. g. improving the infrastructure for climate-friendly mobility



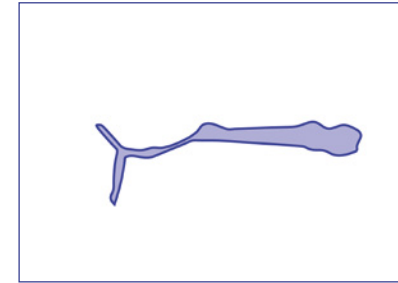
Heavily sealed land



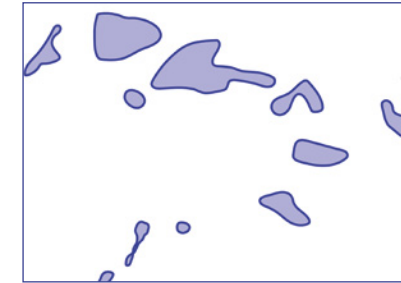
Areas with low tree cover



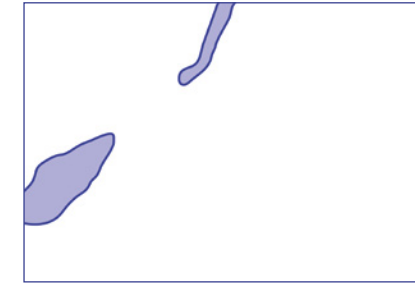
Flood risk areas



Structures designed for motorised private transport



Areas with urban sprawl tendencies



Ski resorts with decreasing snow guarantee

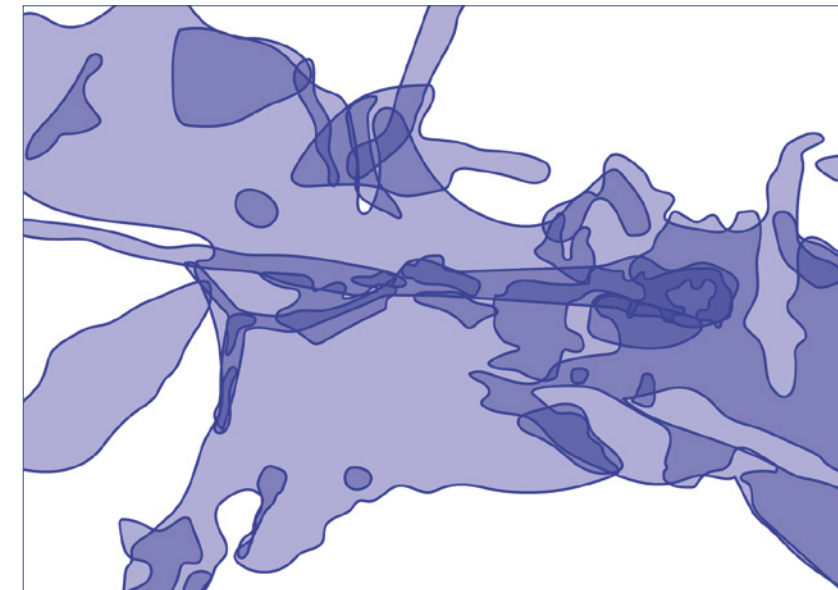


Fig. 12 Localisation of areas where action is particularly needed (self-created image)

Relevant planning framework

- » Overarching objectives and laws
 - › *To which objectives can the Spatial Climate Plan contribute?*
 - › *e. g. Alpine Convention, UN Sustainable Development Goals*
- » Strategies, plans & projects of the city of Lienz
 - › *Do these contribute to climate-friendly spatial structures?*
 - › *e. g. positive: mobility centre, separation of uses in the zoning plan is not climate-friendly*

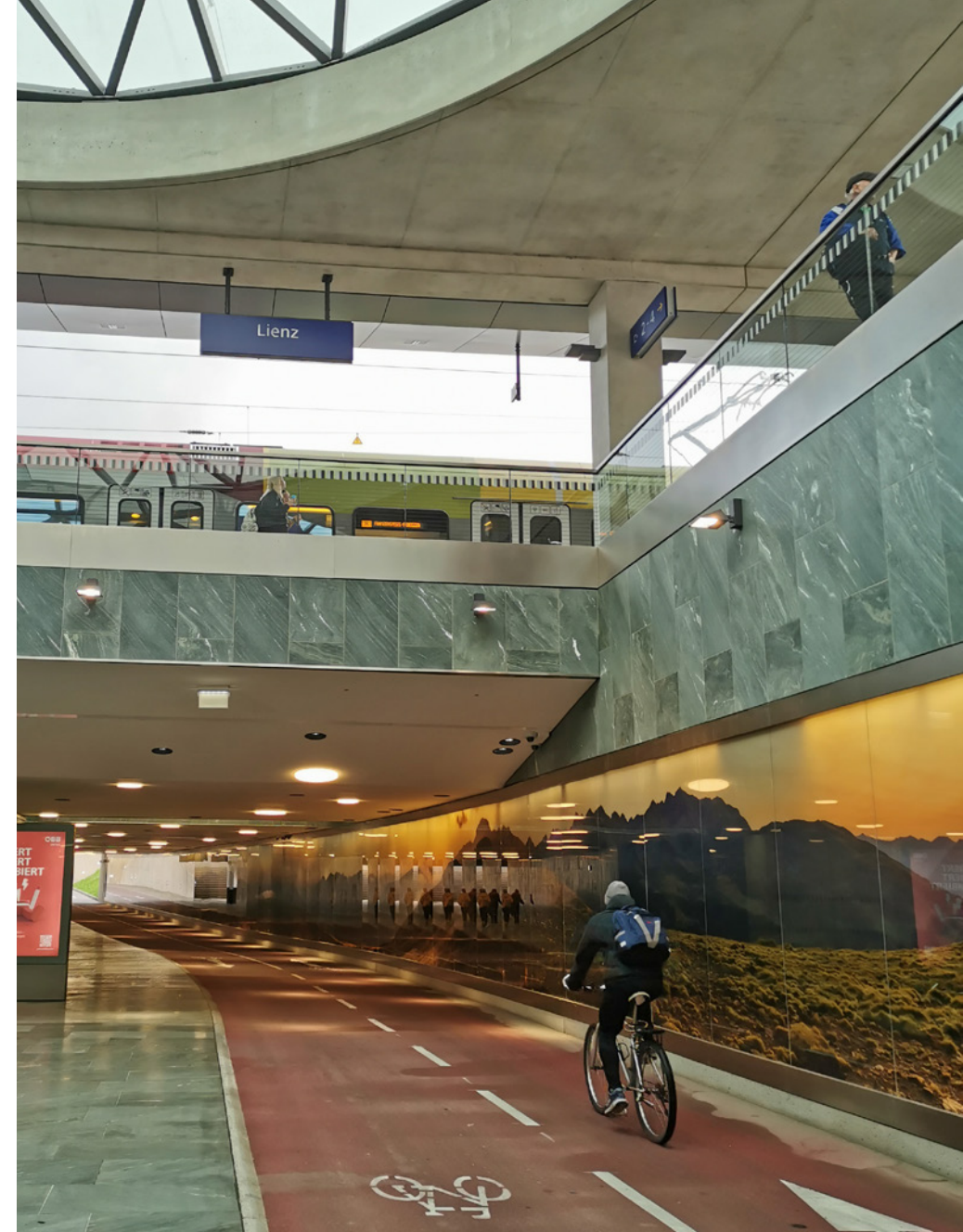


Fig. 13 Mobility-hub Lienz (self-created image, aufgenommen von der Unterführung am Bahnhof Lienz am 25.10.2023)

Vision

- » Vision for climate-friendly spatial structures for the city of Lienz
- » Development of the plan was not a linear process
- » Particularly helpful for the conception:
 - › *Review of climate plans, climate tools and relevant literature*
 - › *Identification of the need for action*
 - › *Working with sketches*
 - › *On-site visits*
- » Planning / measures should ...
 - › ... *contribute to mitigation & adaptation*
 - › ... *be integrated*
 - › *Removal of structures that make climate-friendly behaviour more challenging*



Fig. 14 A glimpse inside the master thesis - excerpt of the Vision-chapter (self-created image)

Vision

Guiding principles:

- » Definition:
Climate-friendly spatial structures
 - › ... *should contribute to climate mitigation and adaptation*
 - › ... *and enable climate-friendly behaviour*

Aims:

- » Strongly summarised



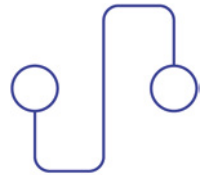
Rich biodiversity



High quality of life



Realised energy transition



Realised mobility transition



Pleasant micro- & mesoclimate



Low land consumption

Fig. 15 The six goals of the Spatial Climate Plan (self-created image)

Spatial vision

- » Rough localisation of the most important spatial measures
- » Improvements in the green network
 - › e.g. biodiversity corridors **1**
- » Natural flood prevention
 - › e.g. renaturation of the river wetlands **3**
- » Climate-friendly settlement development
 - › e.g. densification towards the centre and increasing the amount of green space in settlements **7**
- » Improvement of climate-friendly mobility
 - › e.g. creation of corridors for sustainable mobility **9**
- » Transformation of skiing slopes
 - › Sustainable tourism zones **6**

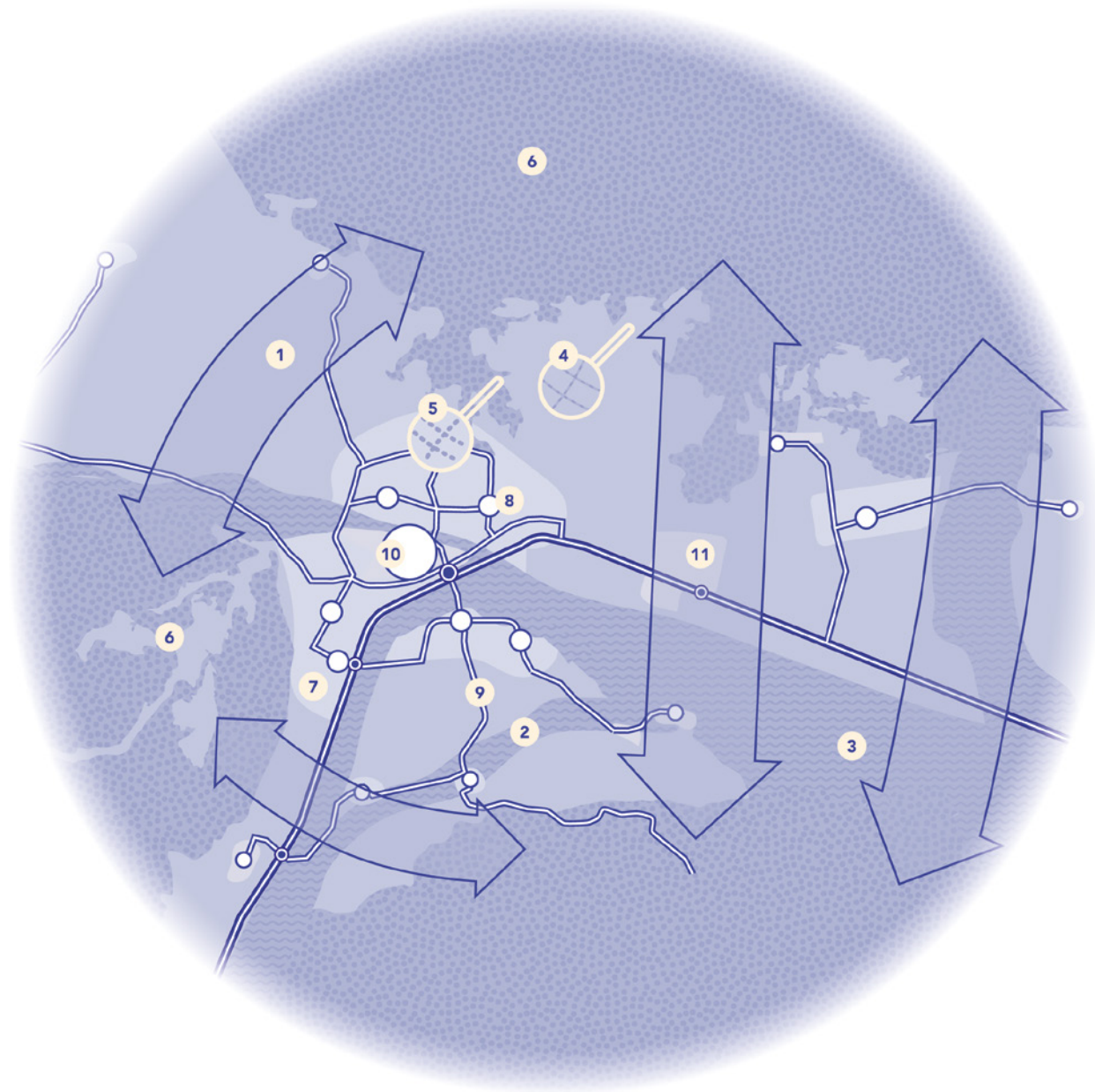


Fig. 16 Schematic plan of the spatial vision for the city of Lienz (self-created image)

Plan for climate-friendly spatial structures

- » More detailed localisation of the measures & textual description
- » e.g.
 - › *Mobility hubs*
 - › *Densification areas with an increased amount of green space*
 - › *Green bridges*
 - › *Areas for a combination of agriculture and photovoltaic panels*



Fig. 17 Plan for climate-friendly spatial structures for the city of Lienz (self-created image, Höhenlinien: EEA 2016)

Visualisations of the future

- » Comparison of the present and planning situation to illustrate the spatial measures
- » Thought to be communicated:
The quality of life improves when the measures are implemented
- » Example: Green industrial zone



Fig. 18 Visualisations of the future: Green industrial zone (self-created image)



60 measures for the climate-friendly city of Lienz

- » Evaluation using a spider diagram: How much does the measure contribute to the achievement of the goals?
- » Measures are divided into topics:
 - › *e.g. rainwater management - use of water-permeable surfaces,*
 - Energy - construction of wind parks in former ski resorts*

Rainwater management

Water-permeable surfaces

All surfaces are designed to be water-permeable (e.g. bus lanes, cycle- and footpaths)



Energy

Wind parks in former ski resorts

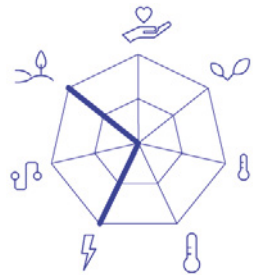


Fig. 19 Excerpt from the table of measures (self-created image)

Effect of the Spatial Climate

Plan

- » Reflection:
How effective are the measures proposed in the Spatial Climate Plan?
- » Comparison of selected layers in the present and planning situation
- » e. g. comparison of the green space:
 - › *Green spaces in the planning area increase from one third to half of the total area*

Heavily greened areas (Present)

Degree of tree cover

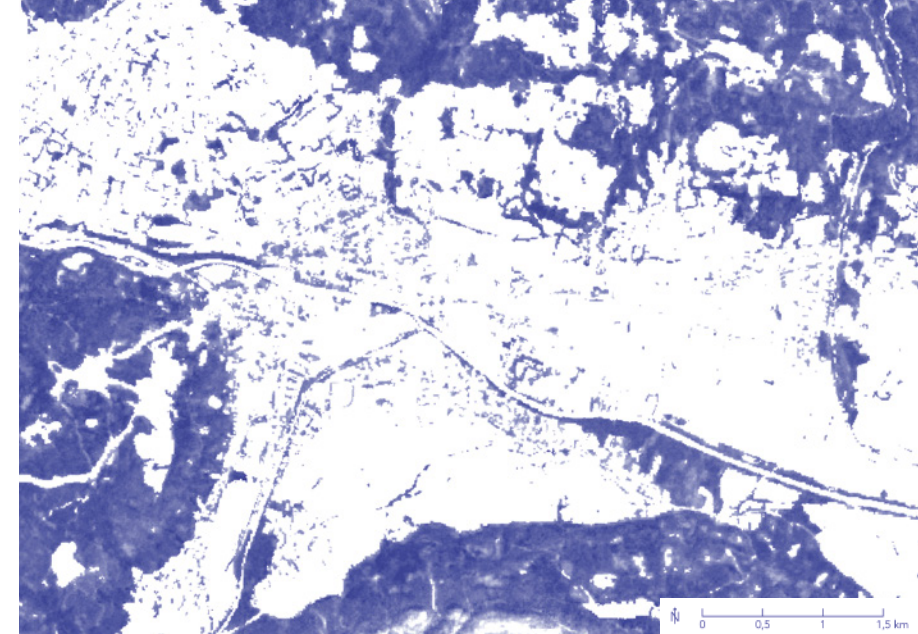
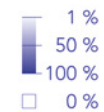


Fig. 20 Degree of tree cover, Data status 2018 (self-created image, Map basis: EEA 2020b)

Heavily greened areas (Planning)

- Forest land & bushes, riverbank vegetation & wetland forests, parks, hedge belts, green bridges
- ▨ Biodiversity corridors in settlement zones



Fig. 21 Heavily greened areas - planning Spatial Climate Plan (self-created image)

Lessons Learnt

- » Challenging to find a suitable methodology
- » Quantitative effect analysis
 - › *Extrapolation to all Alpine towns - contribution to overarching objectives*
 - › *Review of the effect (feedback loops)*
- » Additional consideration of the meso-regional level (mobility, energy, meso-climate) and neighbourhood level (e.g. KlimaKonkret plan)
- » Spatial Climate Plan cannot replace climate plans, but can add to them

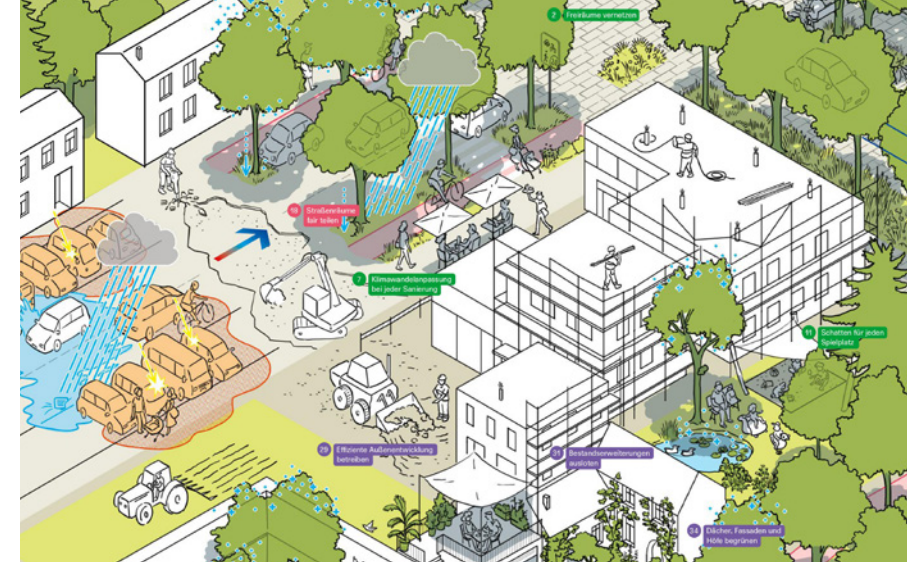
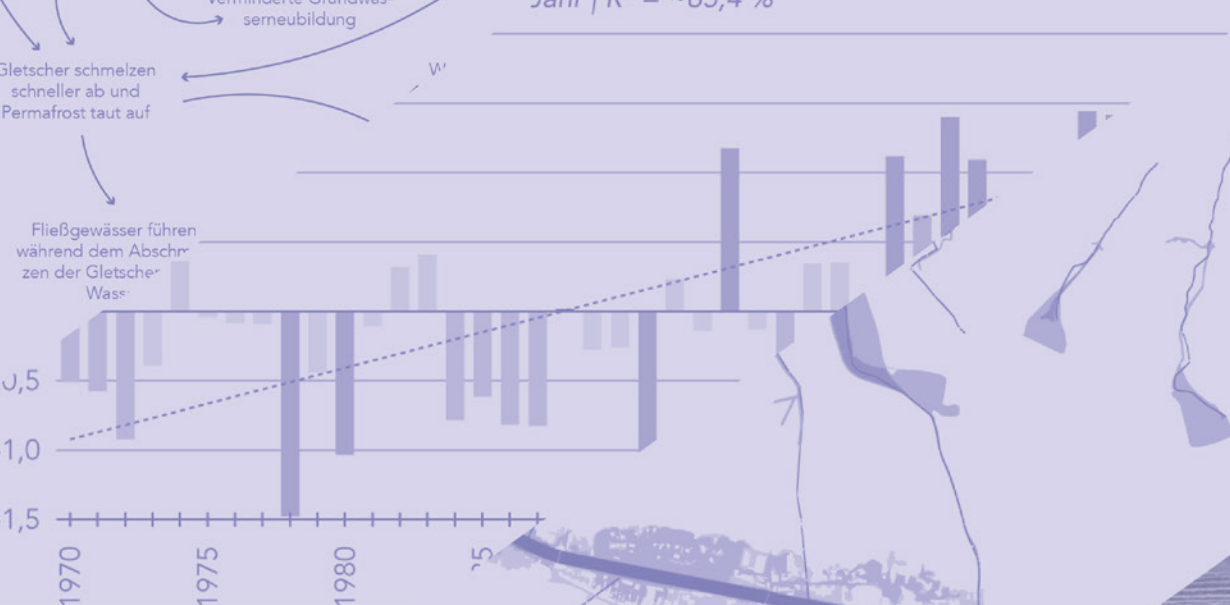


Fig. 22 Excerpt from the KlimaKonkret plan (CCCA 2020)

Lessons Learnt

- » Unresolved: Appropriate integration of a Spatial Climate Plan into the existing legal and instrumental framework
 - › *Additional research / stakeholder process*
- » Spatial Climate Plan as commissioned work with the participation of the local public
- » The Alps are 'glowing' - role models are needed for climate-friendly development - Spatial Climate Plan as a tool
 - › *Get in action!*



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Download the full thesis here

» <https://doi.org/10.34726/hss.2024.109630>



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