reviewed paper

Climate Proofing Spatial Planning Policies in Austria – Case Studies and Findings

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1 ABSTRACT

The Austrian Panel on Climate Change (APCC, 2014), as well as the next report version (2021) emphasise that spatial planning policies have to be empowered to combat climate change. While the 2014 version contained a rather modest presentation of spatial planning and mobility approaches, the future version will have a full chapter on "spatial planning and climate change". Usually, APCC reports tend to trust sources that are highly validated and highly agreed upon by many experts. "Climate proofing" should be a process to measure the mitigation and adaptation impact of spatial strategies and programmes, but so far there is only poor evidence that this exists: we believe that spatial planning is powerful, but it is hard to prove this in qualitative and/or quantitative terms and numbers.

Keywords: criteria, policy, strategy, climate proofing, spatial planning

2 INTRODUCTION

The Institute of Spatial Planning at TU Wien has already organised two courses under the branding "Planners for Future" to fill this knowledge gap, and to improve learning about climate proofing for spatial planning policies, one of the successes of these lectures was the founding of the "build for future" group, an association of architecture and spatial planning students (Build for Future 2021), organised as subunit of "Friday for Future". This paper reports on three selected spatial strategies, comparing their status on environmental impact today with a clearly improved future "version" to show our results.

One case study dealt with the expansion of ski areas in Tyrol. The Spatial Planning Act, the Nature Conservation Act and the cableway programme of the federal state were examined for indicators on climate-friendly developments. The results showed that there were no clear parameters in all three instruments. As a consequence, we developed an evaluation tool for such extensions. This is a two-phase-system, which provides for a point system in combination with "K.O. criteria" (i.e., snow reliability, glacier protection and protected areas).

Whereas Austria is still the European champion in terms of land use, the German concept of the "Eco Account", which prescribes compensation measures for construction projects, was examined for effectiveness. Again, a lack of proportionality was found and an adapted climate proof version, based on qualitative and quantitative indicators, was developed for Austria.

Another topic introduced in this paper is the problematic amount of secondary residencies in several touristic regions e.g., Wörthersee, which lead to increasing vacancy, land use and rental fees. In order to establish a climate friendly and sustainable development in that region, two international vacancy taxations (France and City of Vancouver) were compared and adapted to the spatial requirements of the Wörthersee region. If applied, the vacancy rate in this region would be reduced by 25 percent and up to 50 percent within five years.

So far, a few findings around the climate proofing of spatial strategies and policies are possible: there are a lot of reports and analyses criticising the lack of "evaluation culture" around climate proofing of spatial strategies and policies, but still very few attempts to really try exactly that. Also, many experts emphasise the necessity of "adaptive resilience" (Jesse et al. 2019) instead of former mitigation approaches, but they don't show workarounds on how to improve this „climate proofing toolkit" for spatial strategies and policies. At the TU Wien, we will go on to work on that toolkit, improving the given methods and developing new ones that will definitely use more criteria than the CO2 balance.

3 STATE OF RESEARCH AND METHODOLOGY

The connection between spatial planning and the climate crisis has entered the scientific discourse. We, as spatial planners, presume to create resilient cities and regions through sustainable and foresighted spatial development (e.g. city/region of short distances, mixing, provision of public services). Yet in the past and probably the future, certain development trends (e.g. individual traffic, urban sprawl, soil sealing) did and will not correspond to this goal. Responsibility for this is generally assigned to policy makers. Yet even as spatial planners ourselves, we only have a very limited knowledge of the impact that spatial planning policies, instruments and programmes actually have on the climate crisis.

As part of the Climate Proofing course, students analysed selected strategies, instruments, and programmes for their ACTUAL impact and outlined TARGET proposals. The basis for this analysis was a jointly developed criteria grid, which shows in which areas there is a lack of information and data to support statements quantitatively and qualitatively. The course proceeded as follows using a concrete spatial context (regional or neighbourhood/settlement) as a basis:

- Jointly develop indicators (for impact strength) and criteria (for the transformative transition between ACTUAL and TARGET)
- Analysis of selected plan documents, programmes and instruments (to what extent these are aligned with adaptation strategies of the climate crisis and what the impact strength is in the ACTUAL and TARGET to be assessed)
- Recommendations for action and suggestions for improvement (increase of effectiveness, repeatability).

In the instruments of spatial planning, there is a shortfall in liability between the smallest unit (individual buildings) and an entire federal state. This is true regardless of whether they are directly spatially effective instruments (e.g. settlement expansions, developer inside competitions) or the "classic" indirectly spatially effective instruments (e.g. subsidies). Regions are one such spatial category for which often no one is explicitly "responsible". For subspaces, e.g., neighbourhoods, relevant data is often not available. Within the framework of the course, a conscious attempt was made to model such " understeered intermediate spaces" in their climate balance. The three selected case studies (ski area assessment, landscape account, mobilisation of unused dwellings) identify missing information and missed potential and give an insight into what they could achieve.

4 CASE STUDIES

4.1 Ski area expansions in Tyrol

A screening of the Regional Planning Act, the Nature Conservation Act and the cableway programme of the Federal Province of Tyrol for climate-relevant factors was carried out. Included were those that are also of particular relevance for the sensitive alpine ecosystem. Initial results showed the following:

First and foremost, purely economic factors, such as profitability or competitiveness, are used in the instruments for assessment. Although soil and nature conservation are addressed, concrete measures or demands for climate protection are not mentioned. In practice, the nature of the existing indicators allow even climate and environmentally damaging location decisions for ski resorts to be presented as "environmentally sound" (Hahn et al. 2020).

The student group developed a simple but effective two-phase ski area assessment tool to address this. The first phase of the assessment includes three crucial criteria (snow reliability[1], glacier protection[2] and protected areas[3]), which determine whether the project should be considered at all. Only if all three criteria are met (1. the area has snow guarantee; 2. glacier areas are not affected; 3. protected areas remain

[1] Snow thickness from 30 to 50 cm; presence of snow in 7 out of 10 winters; snow cover from the end of December to the end of March (Schickhofer 2017).

[2] Rapid glacier retreat is the most obvious feature of climate change in the Alps. If the project affects a pristine glacier, it will fall through the review.

[3] The area apportionment of protected areas should no longer be valid. If an area is protected in any form, it must be absolutely unassailable.

untouched) can phase two be applied. For this purpose, seven additional criteria were defined (Table 1), which have been assigned a rating from -1 to 3. The higher the score, the more sustainable is a realisation of a ski area project in terms of climate protection, but a total of 2/3 of the points must be achieved to pass the Climate Proofing.

Using this list of criteria, two expansion plans in Tyrol were evaluated by the group. The St. Anton Kappl extension as well as the Ötztal-Pitztal link do not fulfil the prescribed criteria of the first phase. Even if this was the case, it had not been possible to carry out a climate proofing under the specified factors for both projects due to lack of accessibility to the required data.

Criteria	Scale: -1 (very poor) to 3 (very good)
Elevation	Up to 2000m = 3 points; 2000-2250m = 2 points; 2250-2500m = 1 point; above 2500m = 0 points.
Ecological footprint	Ringler (2017) derived a value system for the ecological footprint of ski resorts. The range is from 5 (Oberschwende) to 120 (Sölden). 0-30 = 3 points; 30-50 = 2 points; Over 70 = 0 points
Positive displacement effects	In rare cases, ski area connections lead to positive relief effects (e.g. traffic load, utilisation pressure). If this is to be expected, it should be rewarded.
Land consumption of new slopes	The more area is used, the less points should be given for this. 0-10 ha= 3 points; 10-20 ha = 2 points; 20-30 ha = 1 point; 30 ha + = 0 points.
Compensatory measures	If compensatory measures are provided beyond the environmental impact assessment (UVP) in the case of an extension, this is to be positively rewarded with points.
Maximum CO2 value	Every expansion is accompanied by CO2 emissions during construction and later during operation of the plant. Maximum permitted limit values would have to be introduced here.
Maximum water consumption	In view of the fact that less water will be available in the Alpine region in the future, the water consumption of existing snowmaking systems must be determined in advance in the event of an expansion. If this exceeds the maximum value to be defined, an expansion would have to be prohibited.

Table 1: Criteria catalogue for climate proofing of ski area expansions in Tyrol by Hahn et al. 2020

4.2 Eco account for Austria

In order to minimise the ecological consequences of construction projects, the so-called prohibition of deterioration was established in the 1970s in Germanys Federal Nature Conservation Act. It is based on the following consideration. For a construction project (regardless of its size and the initiator(s)), an ecological compensation action (for example, unsealing, renaturation, woody planting or measures to protect biodiversity and species diversity) must be taken, because in principle, no deterioration for nature and landscape may result from this construction project (Wende et al. 2005; Froger et al. 2015).

The compiled criticisms of the student group (Doden et al. 2020b) are as follows:

There is a disproportionality between intervention and compensation. The compensation areas are too small to be seen as compensation

The compensation areas are not site-specific, i.e., for example, an affected community does not have to benefit from a compensation measure even though a construction project is being carried out there.

Instead of implementing a compensatory measure, it is also possible to make compensatory payments to an "eco-account". This can subsequently be used to carry out measures. However, these compensation payments are disproportionate to the actual costs of the compensation area, as they are much cheaper.

The most important thing for a possible implementation in Austria is therefore a plausible specification of the proportionality between intervention and compensation, in order to reduce the negative impact on the environment and to compensate it on a high level. The abstraction of interventions in nature should be avoided by a clear intervention-compensation key, with a focus on areas.

Transferring the concept to Austria, this instrument could look like this. In the case of an intervention of size x, another area of size x must be qualitatively upgraded and another (also of size x) must be de-paved. This results in an impact-compensation ratio of 1:2. However, there is the possibility to reduce the compensation measure through adaptation or mitigation, i.e. compensation within the impact area. Since the German model has no specifications as to where these compensation measures should take place, the idea was expressed here to include an additional factor with regard to the distance radius.[4] This should ensure that the immediate surroundings also benefit (Doden et al. 2020a).

The previous specifications for the "eco-account" in Germany still have few criteria for climate protection, which is why the student group created three qualitative and three quantitative indicators for the evaluation of the construction projects (Table 2), in order to be able to carry out climate proofing for the accruing projects here as well. Together with a sensible measure of site-specific and obligatory compensation measures, it is possible to estimate the impact on climate change.

QUANTITATIVE		QUALITATIVE	
Land consumption	Area ration between replacement area and intervention area	Interdisciplinarity & Diversity	Gender distribution during procedure implementation
Area equity	Building/green space ratio and accessibility	Environmental Justice	Arrangement of the areas to the settlement area/impact on the quality of life, popularity of the city.
Climate Change Adaptation	Expansion/maintenance of critical infrastructure (e.g. flood protection)	Climate Change Adaptation	Quality of nature conservation/ecological & temporal sustainability of measures/environmental education.

Table 2: Indicators of a Climate Proofing by means of a Landscape Account in Austria by Doden et al. 2020a

4.3 Housing activation contribution

At the intersection of protecting key soil functions and reducing greenhouse gas emissions is the examination of sustainable settlement development on the basis of a vacancy tax (David et al. 2020). The taxation of vacant housing serves policy makers as a market-activating instrument to limit speculation (voluntary vacancy) and the associated problems of housing availability (Segú 2020). Existing analyses are extended here by the aspects of "climate impact". For this purpose, international examples of vacancy taxations were analysed and possible applications in Austria were discussed. The models were not created with the aim of being exact forecasts, but rather to visualise the potential of a housing activation contribution or vacancy tax as climate mitigation policy (David et al. 2020).

The Empty Home Tax (EHT) was introduced in Vancouver in 2016. Homes that are declared, designated, or deemed vacant are subject to an annual tax of 1% of the assessed taxable value. In other words, a constant tax rate based on property value. Vacancy rates have already been noticeably reduced in four years and more housing units have been added to the market (City of Vancouver 2020). The "Taxe sur les Logements Vacants" (TLV) was passed in 1998 with the aim to bring more apartments onto the market. Apartments that have been vacant for at least two years were taxed at 10% of the rental price. If vacancies persist, the tax rate also increases. Relevant effects on vacancy rates have been demonstrated (Segú 2020).

	0 SCENARIO Development without intervention in the Wörthersee region	SCENARIO 1 Taxation based on Vancouver model Consistent tax rate based on property value	SCENARIO 2 Taxation based on the French model Increasing tax rate based on presumed rent charged
Change in vacancy rate	0%	-51,5%	-24%
Effect on CO2 emissions from new buildings	+120.400t	-142.900t	-66.700t
Change in sealed surfaces	+10,71ha	-18,56ha	-8,56ha

Table 3: Comparison of the scenarios up until the year 2026

Potentials of the application in the Wörthersee region are modelled by the students in three scenarios until the year 2026: A zero scenario, an implementation of a vacancy tax modelled after Vancouver's EHT, and a scenario developed after France's TLV. The zero scenario is intended to represent the development of vacancy without planning or political intervention, with a constant percentage of vacant residential buildings and an extrapolation of the average new buildings 2011-2018. For the applications of the respective vacancy levies, the empirical percentage changes on the units added to the housing market were adopted for the Wörthersee region. This was based on an idealised model in which the activation of vacancy leads to a

[4] Within the 5 km radius, the general provisions apply. However, if this distance is exceeded, the area already determined for compensation is calculated with a factor of 1.1. For each additional 25 km of distance, the factor is increased by 0.2.

termination of construction activities. The achievable positive effects for the housing market and the climate balance can be seen in Table 3. The CO2 savings effects were calculated using a primary energy approach: what amount of CO2 would be saved if additional new housing units did not have to be built in the first place while mobilising existing housing.

5 DISCUSSION

Before conclusions can be drawn about how future climate proofing work should be done, it is important to establish the conceptual framework within which any climate proofing can and should operate. While there has been (Birkmann und Fleischhauer 2009) a strong awareness for over 10 years that spatial development is appropriate for climate change mitigation, a serially proven and versatile "toolkit" for doing so is still lacking. This is a very unsatisfactory state of affairs, especially for future planning practice, because in the context of resilience, we have long had to assume transformative resilience, rather than adaptive resilience (Hat und Stöglehner 2019). Transformative resilience entails using the climate crisis as a lever to achieve a new target state, because the "old" state would merely lead to the time before the crisis. The students' analyses presented show how any spatial developments can be subjected to climate proofing using the "toolkit" of simple sets of criteria. These were able to coherently integrate both mitigation and adaptation measures.

An example of how the assessment toolkit of site planning has not yet arrived at climate proofing is, for example, that while the environmental impact assessment tool is capable of modelling the effects of a siting decision in great detail, it is not suitable for arguing this in a much larger system boundary of climate adaptation, or the principle question of the "necessity" of the project is not asked. In short, this tool is designed to do something it was not designed to do in the first place. In future designs of climate proofing, it will therefore be important to define and test both process- and subject- and object-related measurement criteria (Birkmann und Fleischhauer 2009). The reflection between the statement of quantitative and qualitative measurement criteria must lead into a "double loop learning", which means that phenomena are not only understood and measured, but new spaces of interaction are created through participation and education processes (theLivingCore 2019).

6 CONCLUSION

The course Climate Proofing of spatial planning instruments in Austria has fulfilled the claim of not only trying out climate proofing, but also opening up new spaces of interaction in the process, through an impressive and versatile set of criteria. In this set, the much-vaunted CO2 is merely a supporting actor (albeit an important one!). The four most important categories and findings were:

Area criteria (including saved sealing in m², ratio between intervention and replacement areas).

Processual and behavioural criteria (e.g. footprints of mobility and consumption behaviour between ACTUAL and TARGET, change in quality of life, but also fairness and diversity in the mapping of actors in the decision-making processes)

Primary energy criteria (CO2 savings through mobilisation of existing buildings instead of additional primary energy expenditures through new buildings)

Future criteria (respecting FUTURE environmental conditions including appropriate back-casting of current strategies, e.g. evaluation of future snow reliability and the amount of heat days).

A general challenge in climate proofing is the lack of data basis or access to data sets. Another weakness of already existing climate proofing is the lack of or inaccessible method documentation. This makes the comparison of findings and benchmarks impossible and precludes further development and discourse. However, the fact that there is “no data” (or just poor data) is not an excuse for neglecting climate proofing research nor investing creativity. Herein, creativity means to develop alternative research patterns. This means to collect data oneself, or (if not possible due to resource shortage) to use not obviously meaningful, but related data as proxies and to interpret them with regard on their value in climate proofing statements. The case studies presented in this article show exactly this way of working in an outstandingly successful and convincing way.

With further case studies or a creative extension of such criteria, the climate change impact of spatial planning instruments could at least be made more comprehensible in the future and, after these learning effects, it could be better ensured that these instruments could develop a considerably increased binding force and seriality, especially in the "under-controlled intermediate spaces" (Department für Raumplanung 2014). Future research on climate change and climate proofing should follow the “polluter pays principle”, in addition to the aspects of an increased seriality and liability of the policies (as mentioned before). The examples shown in this paper have their spatial focus in rural areas, this orientation might fit well for Austria (with about 35% of the people living in cities), but not at all for the future elsewhere: Globally, the proportion of people living in cities is currently 55%, in only a few years it may be 65% or more. This means that dense urban structures should be given more attention in climate proofing in the future. Here, the experiences from climate proofing experiences in rural areas could be adapted and promoted.

Finally, the question arises who will coordinate the international research with the goal of the "best possible" climate proofing methods. The authors of this paper believe, that this role should be filled by the IPCC (International Panel on Climate Change), and also by a much stronger policy prescriptive character of the climate change assessment reports.

7 REFERENCES

Austrian Panel on Climate Change (APCC) (2014): Österreichischer Sachstandsbericht Klimawandel 2014 (AAR14). Online verfügbar unter https://ccca.ac.at/wissenstransfer/apcc/aar14, zuletzt aktualisiert am 31.03.2021, zuletzt geprüft am 31.03.2021.

Birkmann, Jörn; Fleischhauer, Mark (2009): Anpassungsstrategien der Raumentwicklung an den Klimawandel: „Climate Proofing“ – Konturen eines neuen Instruments. In: Raumforschung und Raumordnung Spatial Research and Planning 67 (2), S. 114–127. DOI: 10.1007/BF03185700.

Build for Future (2021): Fridays For Future Austria - Gruppe Build for Future. Online verfügbar unter https://fridaysforfuture.at/allianzen/build-for-future, zuletzt aktualisiert am 31.03.2021, zuletzt geprüft am 31.03.2021.

City of Vancouver (2020): Empty Homes Tax Annual Report - January 1, 2019 to December 31, 2019. Online verfügbar unter https://vancouver.ca/files/cov/vancouver-2020-empty-homes-tax-annual-report.pdf.

David, Johannes; Janesch, Theresa; Pichler, Reinhard (2020): Wohnaktivierungsbeitrag. Climate Proofing gezeigt an der Wörtherseeregion. In: Planners4Future Reloaded. Climate Proofing. TU Wien, S. 1–39.

Department für Raumplanung (2014): ENUR - Energie im urbanen Raum. TU Wien. Online verfügbar unter http://enur.project.tuwien.ac.at/, zuletzt geprüft am 25.01.2014.

Doden, Leo; Pfander, Noah; Werluschnig, Rafael (2020a): Landschaftskonto. Soll-Zustand (Österreich). In: Planners4Future Reloaded. Climate Proofing. TU Wien.

Doden, Leo; Pfander, Noah; Werluschnig, Rafael (2020b): Ökokonto. Ist-Zustand (Deutschland). In: Planners4Future Reloaded. Climate Proofing. TU Wien.

Froger, Géraldine; Ménard, Sophie; Méral, Philippe (2015): Towards a comparative and critical analysis of biodiversity banks. In: Ecosystem Services 15, S. 152–161. DOI: 10.1016/j.ecoser.2014.11.018.

Hahn, Clara; Langgartner, Nikolaus; Rosenbock, Philipp (2020): Tiroler Skigebietserweiterungen. Tagebuch. In: Planners4Future Reloaded. Climate Proofing. TU Wien, S. 1–11.

Hat, Kinga; Stöglehner, Gernot (2019): How Resilient is Growth? Resilience Assessment of Austrian Municipalities on the Basis of Census Data from 1971 to 2011. In: Sustainability 11 (6), S. 1818. DOI: 10.3390/su11061818.

Ringler, Alfred (2017): Skigebiete der Alpen: landschaftsökologische Bilanz, Perspektiven für die Renaturierung. Hg. v. Verein zum Schutz der Bergwelt e.V. München.

Schickhofer, Matthias (2017): Schwarzbuch Alpen. Warum wir unsere Berge retten müssen. 1. Auflage. Wien: Brandstätter.

Segú, Mariona (2020): The impact of taxing vacancy on housing markets: Evidence from France. In: Journal of Public Economics 185, S. 104079. DOI: 10.1016/j.jpubeco.2019.104079.

theLivingCore (2019): Ganzheitliches Lernen ermöglichen. In: theLivingCore, 15.09.2019. Online verfügbar unter https://www.thelivingcore.com/ganzheitliches-lernen-ermoeglichen-durch-single-double-triple-loop-learning/, zuletzt geprüft am 21.05.2021.

Wende, Wolfgang; Herberg, Alfred; Herzberg, Angela (2005): Mitigation banking and compensation pools: improving the effectiveness of impact mitigation regulation in project planning procedures. In: Impact Assessment and Project Appraisal 23 (2), S. 101–111. DOI: 10.3152/147154605781765652.