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Mental barriers in planning for cycling along the urban–rural gradient

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ABSTRACT

As studying planning practices and planners' motivations along the urban–rural gradient has not been common practice, we scrutinize the regional differences in the understanding of cycling planning of Austrian municipal administrators using three questions from a previous on-purpose survey. These questions serve as simple proxies for decisions that need to be made from the perspective of a climate change mitigation-driven transformation of transport planning. The administrators were asked (1) to rank the priorities for transport modes in the case of conflict of space allocation, (2) to name the quantity of bicycle parking provision in projects, and (3) to mark pictures of bicycle parking stands they consider fulfilling the needs of cyclists. The chosen priorities indicate that traditional understanding and mental barriers persist among administrators in an urban–rural gradient. In urban as well as rural areas administrators in charge of cycling planning, still prioritize cars (in terms of infrastructure and space) over bicycles. And up to one quarter of responses – from urban as well as rural municipalities – state that they don't know if the amount of bicycle parking spaces provided meets legal requirements or exceeds them. These mental barriers need to be overcome for an improved and accelerated introduction of necessary cycling policies.

Introduction

Studying urban–rural differences in transport mode utilization has been common practice in mobility studies in various contexts (eg. Brezina et al., 2021b; Bruzzone et al., 2021; Follmer et al., 2016; Lemmerer et al., 2013). With cycling, urban–rural differences have been reported as well, e.g. in shopping behavior by transport mode (Grössl et al., 2010) or regional differences in modal split shares (Tomschy and Steinacher, 2017). In contrast, however, there have not been many studies focusing on planning practices regarding cycling infrastructure and planners' motivations along the urban–rural gradient. Massink et al. (2011) noted that the only feasible climate mitigation strategy needs to thoroughly restructure urban mobility organization. The last decade's experience made it clear that rural mobility organization is as well in dire need of reorganization. While the positive climate value of cycling is a pressing reason for the promotion of cycling policies (Ahrens et al., 2013), it is not the only one: More liveable human settlements (e.g. Gehl, 2011), fair space allocation therein (e.g. Knoflacher, 2015) and improved health (e.g. Douglas et al., 2011; Goodman et al., 2012) to name a few.

Barriers to cycling which arise from the built environment, originate from human actions and therefore can be changed by human action. Decision-makers such as administrators and planners are responsible for shaping the built environment and the (quality of the) transport policy implementation and therefore may act as either driving or restraining forces. Administrators fall mainly in the second stream of Kingdon's (1995) Multiple Streams Framework (MSF), formation and refining of policy proposals. The first and third stream are the problem recognition stream and the politics stream. According to the MSF, all three streams must align for a new policy or measure to be implemented. In this work we focus on administrators as part of the second stream together with cycling infrastructure.

For cycling policies, previous work has identified considerably large gaps between ambitious conceptualizations and consistent implementation of cycling policies. As early as the turn of the millennium, Vigar (2000) observed the shift towards alternative transport regimes to be much stronger in transport planning rhetoric than in actual actions for promotion or implementation. Similarly, Sagaris (2015) appraises this increasing orientation towards sustainable transport modes on

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paper as mostly just a tactic. In the decades since, ample strategies for sustainable transport have been developed. In many places however, plans were not sufficiently differentiated when it comes to implementation (Bell and Ferretti, 2015). Although a large amount of guidebooks exists for many places and contexts (eg. City of Toronto, 2008; Hager et al., 2009; Kempton, 2002; Reis et al., 2008; Spath + Nagel, 2008), Brezina and Castro Fernandez (2017) and Pilko et al. (2015) highlighted a considerable gap between ambitious policy drafting and effective on-site realization.

While implementation failure can be identified easily, overcoming the preceding mental barriers is more difficult and requires interactive and participatory processes so that intentions and outcomes coincide (Banister, 2014). Subsequently, planning systems need to change and invoke relevant key actions or dynamics that make cities more cycle inclusive rather than hoping for a single 'silver bullet' (Frey, 2014; Pilko et al., 2015; Sagaris, 2015).

Based on these findings, subsequent work has carved out the differences in users' individual barriers to cycling on the one hand and the mental barriers in policy making and infrastructure design among decision-makers on the other hand (Brezina et al., 2020). A close link exists between institutional and resource barriers, as political powers allocate funding to policies according to their preferences (Banister, 2014). To sum up, pertinent literature diagnoses a public apathy towards alternative transport forms in combination with decision-makers treating active modes as illegitimate.

Building on previous work, where the interaction between planners, administrators and advocates has delineated mental barriers in planning for cycling (Brezina and Castro Fernandez, 2017; Brezina et al., 2019; Brezina et al., 2020), this research focuses on administrators only.

We scrutinize regional differences and commonalities in planning understanding using a previous survey that focused on eliciting administrator's understanding of and attitudes towards cycling policies (Brezina et al., 2021a). The survey included questions such as "which occurrences of barriers in planning and implementation of cycling measures have you already experienced", "with whom have you experienced these barriers" or "what kinds of experiences did you have in the past to overcome barriers in planning and implementation" among others, which were analysed previously (Brezina et al., 2020). As the initial survey was designed to address the exploration of policy priorities and potential mental barriers, we consider this to be an appropriate data source.

Given that, we utilize three unstudied questions on the understanding of policy priorities and hands-on bicycle parking matters (Brezina et al., 2021a) and apply a regionally distinct quantitative analysis. In question number one the administrators were asked to rank the priorities for transport modes in case of space allocation conflict within their field of action. Then they were asked about what quantity of bicycle parking is provided in projects. Finally, the participants were requested to mark pictures of bicycle parking stands that they consider would fulfil the needs of cyclists, with multiple responses being possible. Question one focuses on the decisions needed to be made in terms of climate change mitigation. The priorities selected shall depict, if traditional, barrier-laden understanding persists or if mental barriers based on past patterns may have been overcome. Bicycle parking provision is surveyed in questions two and three. It is widely regarded as a key ingredient of bicycle infrastructure provision resonating with actual (and prospective) user needs (Celis and Bolling-Ladegaard, 2008; Envall, 2012; Kempton, 2002; van Huissteden, 2009) and is in need of sufficient quality (Guit, 1993; Stude, 2017; Tran, 2021).

We claim that the appraisal of parking quality and quantity requirements may serve as an indicator on barriers in planning. Our hypothesis is that rural and urban administrators who are responsible for planning appraise cyclists' necessities differently.

The next section lays out the Austrian context, while the following one introduces survey participants and their distribution according to location, gender and age. Following up on that, section four displays the results which are subsequently discussed in section five together with their likely implications. Section six concludes our findings and gives a contextualized outlook on further needs of research.

Austrian context

The mobility masterplan for the year 2030, the most recent national-level transport policy document, designates 12.5 % of CO_2 emission reductions to come from mobility behaviour, and explicitly suggests to strengthen active mobility for that purpose (BMK, 2021).

While the implementation of road and rail infrastructure involves a multitude of actors and processes (Shibayama et al., 2017), for planning and implementation of cycling measures, municipalities are directly responsible in the Austrian planning hierarchy (Pfaffenbichler et al., 2009), a finding which is also consistent with public perception (Illek and Mayer, 2013, p. 311).

Above municipalities, federal states act as coordinative and funding support bodies on a voluntary basis. Municipalities can apply for financial aid from the federal state for implementation of infrastructural measures. The nation's direct role emerges only in the national road code and occasional funding schemes, as well as some indirect interests such as climate mitigation policies, health and safety (BMK, 2021; Pfaffenbichler et al., 2009). A federal cycling policy coordinator has been in office since February 2008, in unison with the regularly revised national cycling masterplan (Heinfellner et al., 2015; Koch, 2006; Thaler et al., 2011). Federal states followed suit with appointing regional cycling policy coordinators, while most municipalities – with the exemption of some cities – do not have dedicated cycling policy personnel. In bigger cities the municipal planning and implementation of cycling infrastructure can also become a multi-layered process over a longer period of time with many agents involved (Hladschik and Kirchberger, 2013).

While the national road code "Straβenverkehrsordnung" governs behaviour of road users, the design of parking provision is regulated separately by the nine federal states by means of building codes and regulations. Therein, where applicable, individual minimum parking standards for cars and bicycles are prescribed. The "Austrian research association for roads, railways, and transport" (FSV) issues technical guidelines on how to design transport infrastructures, called RVS, which provide the technological state of the art. Guideline 03.07.11 "Organisation and number of parking spaces for private transport" suggests a parking standard for cars and bicycles that includes different factors of settlement structure and existing transport regime. But in contrast to the federal state codes, the guideline is not legally binding and building codes-based parking lot provision may deviate from guidelines (Schopf and Brezina, 2015).

The national compendium on quantitative cycling data provides information on cycling modal shares only at the level of federal states (Illek and Mayer, 2013). The most recent Austrian national transport survey "Österreich unterwegs" had been conducted in 2013 (Follmer et al., 2016). Although its results are not representative at the municipal level, they may serve us as an indicator of regional cycling modal shares. Fig. 1 shows the box plot of municipal cycling modal shares distinguished by class of statistical Urban Rural Typology (see data and methods). Extreme values reach as far as 100 % and result from the data source not being representative at the municipal level. Table 1 shows the summary statistics of the data in Fig. 1. It can be seen that the shares differ only very little, from 5.0 to 6.2 %. This indicates the homogeneity of cycling shares across different types of settlement in Austria at coarse aggregation levels.

Data and methods

The paper at hand is based on the dataset openly available from Brezina et al. (2021a). As reported in Brezina et al. (2020), the initial questionnaire was sent to official email-addresses of all Austrian

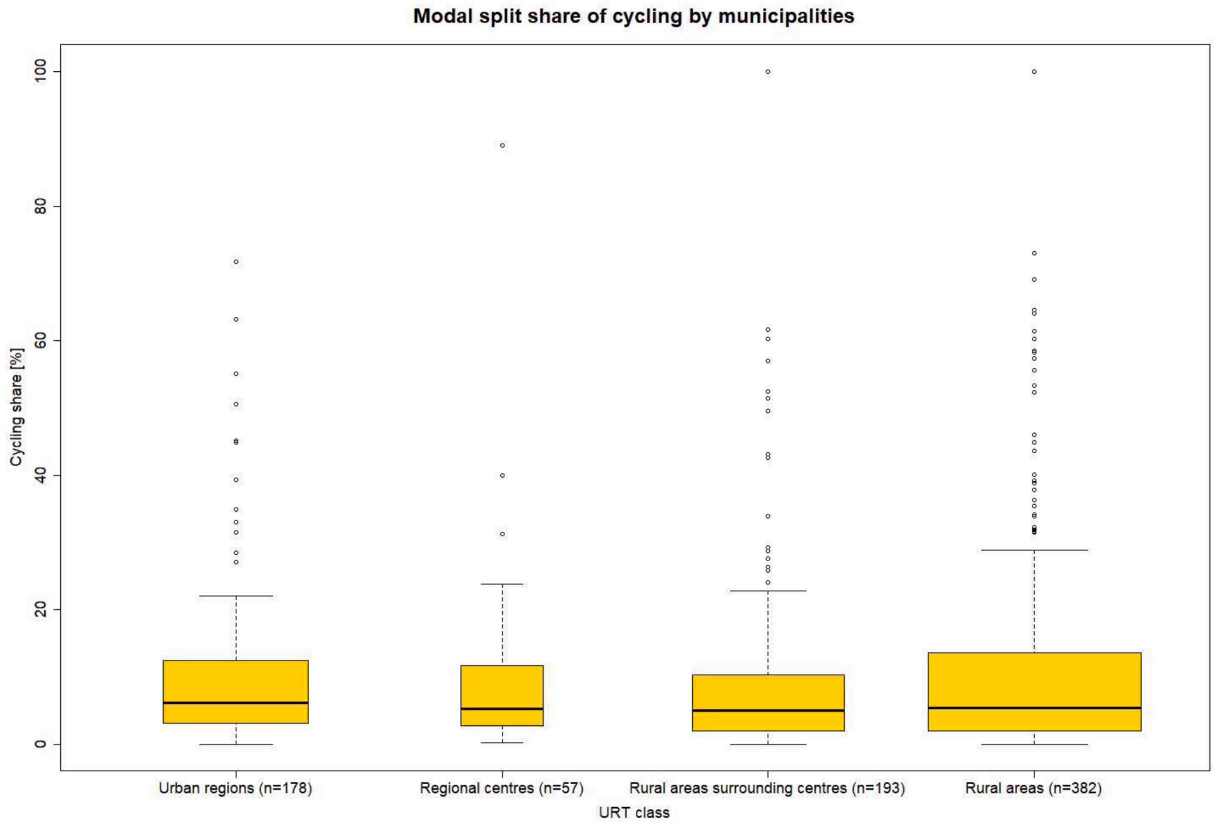


Fig. 1. Box plots of modal split share of cycling in Austrian municipalities by URT class. Extreme outliers result from the data source, Austrian national transport survey "Österreich unterwegs" (Follmer et al., 2016), not being representative at the municipal level.

Table 1
Representative values of municipal cycling modal splits by URT class. Source: Austrian national transport survey "Österreich unterwegs" (Follmer et al., 2016).

URT Class	N	Median	Mean	SD	IQR
SR 100	178	6.2	9.7	11.1	9.2
RZ 200	57	5.3	9.6	13.4	8.8
LR 300	193	5.0	9.2	13.1	8.3
LR 400	382	5.4	10.7	13.9	11.6

municipal (n = 2,117) and district administrations (n = 79) to be filled out by an administrator familiar with cycling planning issues.

For spatial classification of survey results, in this study we use the four main classes of the Urban Rural Typology (URT) calculated by Statistics Austria. URT classes distinguish the municipalities by population density, number of inhabitants and accessibility. Table 2 gives an overview of the population, our sample and the sample share for both number of municipalities and number of inhabitants in the four main URT main. Our sample covers 153 or 7.2 % of the 2,117 municipalities and Viennese districts in Austria. When referring to the number of inhabitants, the sample size has a share of 15.0 %. We received the largest relative response from *urban regions* (15.0 % mun., 22.2 % inh.). The largest absolute response came from *rural areas* (80 from 78 municipalities), resulting in a coverage of 6.3 % of municipalities and 6.6 % of inhabitants. With only 6 municipalities representing *regional centres* (7.7 % mun., 7.2 % inh.), the validity of responses from this URT class is rather limited.

From the 153 municipalities we received 155 responses, as from two municipalities two administrators participated in the survey. The present data is not representative for the URT classes, due to a different participant share than the population (Table 2). However, the survey allows for interpretations of administrators' attitudes regarding allocation of space and the provision of bicycle parking facilities.

Fig. 2 locates those municipalities that answered our survey, indicating a disperse regional distribution of participation.

Table 2
Number of inhabitants (inh.), participating municipalities (mun.) and number of responses by URT class. Number of responses and number of municipalities differs in the URT class LR400 as from two municipalities two responses by obviously-two different people were given. Sources for demographic data.[1]

URT class	URT name	Population		Sample		Sample share [%]		Responses	
		Mun.	Inh.	Mun.	Inh.	Mun.	Inh.	N	Share [%]
SR 100	Urban regions, central to peripheral	253	4,720,492	38	1,048,398	15.0	22.2	38	24.5
RZ 200	Regional centres, central and intermediate	78	479,630	6	34,608	7.7	7.2	6	3.9
LR 300	Rural areas surrounding centres, central to peripheral	555	1,340,921	31	100,392	5.9	7.5	31	20.0
LR 400	Rural areas, central to peripheral	1,231	2,381,863	78	157,496	6.3	6.6	80	51.6
Total		2,117	8,922,906	153	1,340,894	7.2	15.0	155	100.0

Rounding differences were not compensated.

[1] http://https://www.statistik.at/web_de/klassifikationen/regionale_gliederungen/gemeinden/index.html, https://www.wien.gv.at/statistik/bevoelkerung/bevoelkerungsstand/.

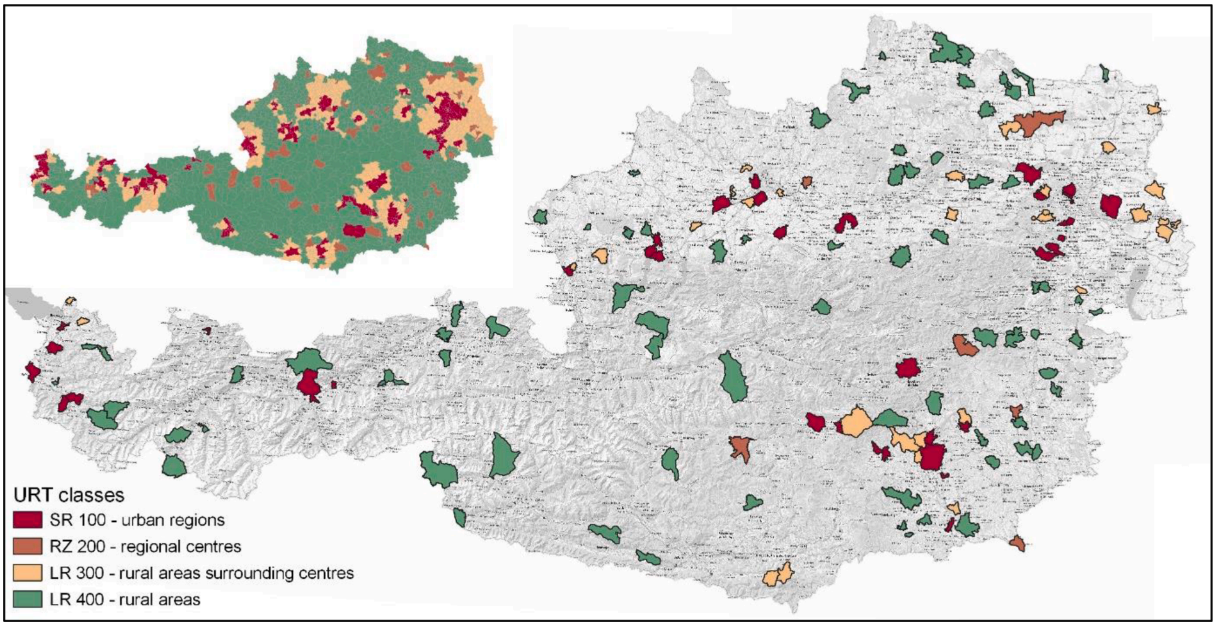


Fig. 2. The distribution of survey responses by URT class over Austria. The insert shows the nationwide distribution of URT classes.

Table 3 indicates that the sample contains more males than would be expected in the population at large.

The average age of the participants is 50.6 years (SD 10.1). Regarding age groups, Table 4 indicates that most of the respondents are from the age group 50–59. The distribution across age groups is fairly similar across different URT classes. More than 60 % of the respondents responsible for cycling planning are older than 50 years. The highest share (52.5 %) of the age group 50–59 years can be found in the URT *rural areas* (Table 4).

The respondents have been working in their field of action on average for 11.4 years (SD 8.8). Overall, the highest share of participants has a professional experience of 6 – 10 years (23.9 %) in the field of transport. In the *urban regions* class, around two thirds of the respondents have a professional experience of 10 years or less. In all other classes, the share for 10 years and lower ranges from 50.0 % (*regional centres*) to 58.1 % (*rural areas surrounding centres*) (Table 5).

Table 6 indicates the personal bicycle usage patterns of the surveyed professionals. A little less than a third of them cycle several times a week (29 %). A high share of administrators with an affinity for cycling is revealed across all URT classes. The bicycle administrators in the *urban regions* have the highest share of daily bicycle users at 26.3 %. Bicycle use seems to be lowest in the *rural areas surrounding centres* class, where about 42 % of respondents stated that they cycle only *several times a year* and less or *never*. *Rural areas* and *rural areas surrounding centres* show similarities in the distribution of bicycle usage. Both classes show small numbers of *daily* and *never* users with higher shares of intermediate usage frequencies. In *rural areas surrounding centres* the usages of *several times a week* and *less often than several times a year* are highly pronounced, while *once a week* is absent.

Leaving the geographical distinction briefly aside, Table 7 groups the survey participants by professional experience in field of action and by frequency of bicycle usage. While respondents with shorter professional experiences show considerable shares with low frequencies of usage (e. g. 1–2 years: 17.4 % *several times a year*; 6–10 years: 18.9 % less often than *several times a year*), the experienced participants appear to cycle more often (16–20 years: 30 % *daily*; more than 20 years: in sum 47.8 % *several times a week* or *daily*).

Results

Considering that the survey respondents are the persons in charge of cycling planning in the surveyed municipalities, it is surprising to learn that these persons still rank motorized private transport most prominently in terms of road space provision in the case of land use conflicts. All URT classes show similar rankings. However, priorities regarding cycling were ranked lowest (1.7 to 2.0), with the exception in the *regional centres* class, which ranked public transport last and cycling third. But due to the comparably small response (N = 5) in subgroup *regional centres* these results must be handled with care (Table 8).

Multiple linear regression was carried out to investigate the relationship between rank of priorities for cycling infrastructure in case of conflict of space allocation (see Table 9). There was a significant relationship between the response variable (rank of priorities for cycling infrastructure) and the age of respondents ($p \leq 0.001$). The ranking of the cycling infrastructure declined with the increasing age of the respondents: The older the respondents are, the lower ranked cycling was. No significant effects on the ranking priorities by regional distribution (URT class), gender, professional experience in field of action and bicycle usage were found.

The $R^2_{adj.}$ value was 0.09, so 9 % of the variation in ranking cycling

Table 3
Survey respondents by gender.

Gender	All		Urban regions		Regional centres		Rural areas surrounding centres		Rural area	
	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]
Male	120	77.4	31	81.6	6	100.0	26	83.9	57	71.3
Female	33	21.3	7	18.4	0	0	4	12.9	22	27.5
Prefer not to say	2	1.3	0	0.0	0	0	1	3.2	1	1.3
Total	155	100	38	100	6	100	31	100	80	100

Rounding differences were not compensated.

Table 4
Survey respondents by age group.

Years	All		Urban regions		Regional centres		Rural areas surrounding centres		Rural areas	
	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]
20–29	6	3.9	0	0.0	0	0.0	1	3.2	5	6.3
30–39	18	11.6	9	23.7	0	0.0	3	9.7	6	7.5
40–49	36	23.2	8	21.1	2	33.3	10	32.3	16	20.0
50–59	68	43.9	12	31.6	2	33.3	12	38.7	42	52.5
60–69	27	17.4	9	23.7	2	33.3	5	16.1	11	13.8
Total	155	100	38	100	6	100	31	100	80	100

Rounding differences were not compensated.

Table 5
Survey respondents by professional experience in field of action.

Years	All		Urban regions		Regional centres		Rural areas surrounding centres		Rural areas	
	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]
1–2	23	14.8	9	23.7	0	0.0	4	12.9	10	12.5
3–5	29	18.7	8	21.1	2	33.3	4	12.9	15	18.8
6–10	37	23.9	8	21.1	1	16.7	10	32.3	18	22.5
11–15	23	14.8	5	13.2	1	16.7	2	6.5	15	18.8
16–20	20	12.9	4	10.5	0	0.0	5	16.1	11	13.8
More than 20	23	14.8	4	10.5	2	33.3	6	19.4	11	13.8
Total	155	100	38	100	6	100	31	100	80	100

Rounding differences were not compensated.

Table 6
Survey respondents by bicycle usage.

Bicycle usage	All		Urban regions		Regional centres		Rural areas surrounding centres		Rural areas	
	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]
Daily	21	13.5	10	26.3	1	16.7	3	9.7	7	8.8
Several times a week	45	29.0	12	31.6	2	33.3	12	38.7	19	23.8
Once a week	14	9.0	4	10.5	1	16.7	0	0.0	9	11.3
Several times a month	24	15.5	3	7.9	2	33.3	3	9.7	16	20.0
Several times a year	16	10.3	5	13.2	0	0.0	2	6.5	9	11.3
Less often	28	18.1	3	7.9	0	0.0	9	29.0	16	20.0
Never	7	4.5	1	2.6	0	0.0	2	6.5	4	5.0
Total	155	100	38	100	6	100	31	100	80	100

Rounding differences were not compensated.

Table 7
All survey respondents by professional experience in field of action (horizontal) and by frequency of bicycle usage (vertical).

Bicycle usage	1–2		3–5		6–10		11–15		16–20		More than 20	
	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]
Daily	0	0.0	2	6.9	6	16.2	2	8.7	6	30.0	5	21.7
Several times a week	11	47.8	12	41.4	11	29.7	4	17.4	1	5.0	6	26.1
Once a week	2	8.7	2	6.9	3	8.1	4	17.4	0	0.0	3	13.0
Several times a month	3	13.0	6	20.7	6	16.2	2	8.7	4	20.0	3	13.0
Several times a year	4	17.4	2	6.9	3	8.1	3	13.0	4	20.0	0	0.0
Less often	2	8.7	5	17.2	7	18.9	6	26.1	5	25.0	3	13.0
Never	1	4.3	0	0.0	1	2.7	2	8.7	0	0.0	3	13.0
Total	23	100	29	100	37	100	23	100	20	100	23	100

Rounding differences were not compensated.

Table 8
Rank of priorities in case of conflict of space allocation, WM…weighted mean, SD…standard deviation.

Mode of transport	All N = 142		Urban regions N = 37		Regional centres N = 5		Rural areas surrounding centres N = 29		Rural areas N = 71	
	WM	SD	WM	SD	WM	SD	WM	SD	WM	SD
Motorized private transport (roads and parking areas)	3.2	1.1	3.2	1.2	3.4	1.3	3.4	0.8	3.0	1.1
Cycling (separated infrastructure and parking areas)	1.8	0.8	1.9	0.8	2.0	0.7	1.8	0.8	1.7	0.8
Walking	2.6	1.0	2.5	1.0	3.2	0.4	2.2	1.0	2.8	0.9
Public transport	2.4	1.1	2.4	1.2	1.4	0.5	2.5	1.1	2.5	1.1

Note: Mandatory ranking of the four provided modes on a scale from 4 (highest priority) to 1 (lowest priority).

Table 9
Regression coefficients for predicting rank of priorities for cycling infrastructure in case of conflict of space allocation.

Variable	B	95 % CI	β	t	p
URT class	0.00	[0.00, 0.02]	0.13	1.52	0.130
Gender	0.19	[-0.10, 0.48]	0.11	1.29	0.199
Age	−0.03	[-0.39, −0.10]	−0.31	−3.41	<0.001
Professional experience in field of action	0.00	[-0.13, 0.19]	0.03	0.36	0.719
Bicycle usage	0.01	[-0.06, 0.86]	0.03	0.35	0.725

Note: $R^2_{adj.} = 0.09$ (N = 142; p = 0.003); CI = confidence interval for B.

infrastructure can be explained by the model containing URT class, gender, age group, professional experience in field of action and bicycle usage. However, this implies that 91 % of the variation is found to be unexplained. In contrast to the importance of cycling for younger respondents, the multiple linear regression with the car ranking as dependent variable showed that older respondents significantly tend to prioritize car-oriented space allocation (not shown here).

With the exception of *urban regions*, the majority of bicycle parkings provided follows the minimum standards of regional building regulations: 53.6 to 65.5 % in *rural areas* (Table 10). In *urban regions* 35.1 % of respondents assert that the amount of bicycle parking is provided according to guideline 03.07.11. In *rural areas* this guideline is only loosely adopted by 3.4 to 7.2 % of respondents. From 13.8 to 27.5 % of responses chose the *I don't know* answer, except for the *regional centres* group, where no one selected this answer.

In order to assess the administrators' appreciation of bicycle parking, they were asked in question three to grade different bicycle parking stands (Fig. 3) on whether they would fulfil cyclists' needs.

According to the total respondent sample, the *Sheffield stand* meets the needs of cyclists best (53.6 %), and the *wheel-bender stand single concrete* meets the needs the least (1.4 %). Looking at the different URT classes, the *Sheffield stand* is most frequently mentioned in *urban regions* (81.1 %) and *rural areas surrounding centres* (58.6 %). In URT class *regional centres* the *design stand 2* runs first (80.0 %), while in class *rural areas* the *wheel-bender stand staggered metal* has been picked most often (52.2 %) (Table 11).

The assessment of bicycle parking needs is particularly interesting when the frequency of bicycle use is included in the analysis (Table 12). Respondents who frequently cycle themselves mention the *Sheffield stand* most often (62.6 %). In contrast, respondents who cycle just *several times a year and less or never* indicate that the *wheel-bender stand staggered metal* is a facility sufficient for bicycle parking (48.8 %). In both groups the *wheel-bender stand single concrete 2* ranks worst (1.0 – 2.4 %) (Table 12).

Discussion

In contrast to the demands of strategic documents such as the "Mobilitätsmasterplan 2030" (BMK, 2021) cycling is not yet regarded as a priority: cycling policy administrators rank cycling infrastructures low on their priority list in general and by geographic distinctions as well. Walking and public transport show similar rankings, while the provision of extra lanes and parking lots for motorized private transport are still in the lead in all geographic classes. In light of the necessity for a thorough change in transport behaviour, as voiced by Massink et al. (2011), this car-prioritizing attitude appears to be a major mental barrier in planning.

The bicycle usage of respondents displays a distinct distribution, especially in the URT classes *rural areas* and *rural areas* surrounding centres, where usage frequencies *daily* and *never* are almost equally small, while frequencies in between have been chosen more often. We do acknowledge this peculiarity within our responses, but the incomplete picture (we didn't ask administrators for their motivations for cycling or not cycling) doesn't allow us to speculate about reasons behind those frequent and very infrequent usage of cycling are among the participating administrators.

Based on the answers to questions two and three, we found inconsistencies in quality pretensions in bicycle parking provision from urban to rural and from frequent to sporadic cyclists among responsible administrators. The answers from Table 10 indicate that *guideline RVS 03.07.11 is applied* and that *minimum standards are exceeded* may easily be combined, because both denote bicycle parking provision in excess of the minimum standards by law. Interestingly a quite high percentage (13.8 – 27.5 %) responded with *I don't know* to question two. While *rural areas* were in the lead (27.5 %), the *urban regions* followed suit (21.6 %). These rather high shares of *I don't know* contrast the answers that indicate the exceeding of minimum standards. It also may be regarded as an alarming sign that the plentifully available guidelines (eg. City of Toronto, 2008; Hager et al., 2009; Kempton, 2002; Reis et al., 2008; Spath + Nagel, 2008) either don't reach their addressees – public administrators – or are wilfully neglected. This appears to be consistent along the urban–rural gradient.

In the setting of *urban centres*, the share of *I don't know* answers may be explained with the fragmentation of public administration departments and hence the specialization in knowledge of respondents. Maybe respondents were specialized in matters of riding infrastructure and had less competence in matters of parking infrastructure. We suppose that in municipalities of *rural areas* – which means small towns and villages and thus small administrations – there is less division of duties and administrators are more generalists than in urban administrations. In that case the notable amount of *I don't know* answers may be either a strong indicator for a knowledge gap or for a "I don't care" attitude. Both explanations offer adverse circumstances for an expected quick and concise change in transport planning preferences and thus need to be seen as a mental barrier to planning.

Table 10
Quantity of bicycle parking provision.

Bicycle parking provision	All		Urban regions		Regional centres		Rural areas surrounding centres		Rural areas	
	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]	N	Share [%]
According to the minimum standards of the building regulations of the federal state	64	45.7	7	18.9	1	20.0	19	65.5	37	53.6
According to the Austrian guideline RVS 03.07.11 "Organisation and number of parking spaces for private transport".	20	14.3	13	35.1	1	20.0	1	3.4	5	7.2
Minimum standards are exceeded	14	10.0	6	16.2	1	20.0	2	6.9	5	7.2
I don't know	31	22.1	8	21.6	0	0.0	4	13.8	19	27.5
Other	11	7.9	3	8.1	2	40.0	3	10.3	3	4.3
Total	140	100	37	100	5	100	29	100	69	100

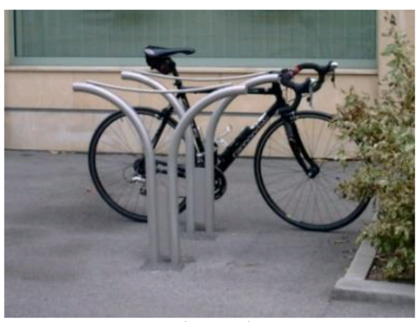
Rounding differences were not compensated.


Wheel-bender stand single concrete 1


Wheel-bender stand staggered metal


Design stand 1


Wheel-bender stand concrete 2


Design stand 2


Wheel-bender stand design


Combination stand 1


Sheffield stand


Combination stand 2


Wheel-bender stand basic

Fig. 3. Different surveyed bicycle parking stands.

Table 11
Which bicycle parking stand fulfils the needs of cyclists (multiple responses possible).

Bicycle parking	All N = 140		Urban regions N = 37		Regional centres N = 5		Rural areas surrounding centres N = 29		Rural area N = 69	
	n	Share [%]	n	Share [%]	n	Share [%]	n	Share [%]	n	Share [%]
Wheel-bender stand single concrete 1	8	5.7	0	0.0	0	0.0	0	0.0	8	11.6
Wheel-bender stand staggered metal	53	37.9	7	18.9	1	20.0	9	31.0	36	52.2
Design stand 1	32	22.9	11	29.7	3	60.0	9	31.0	9	13.0
Wheel-bender stand single concrete 2	2	1.4	0	0.0	0	0.0	0	0.0	2	2.9
Design stand 2	54	38.6	19	51.4	4	80.0	12	41.4	19	27.5
Wheel-bender stand design	17	12.1	3	8.1	1	20.0	7	24.1	6	8.7
Combination stand 1	58	41.4	21	56.8	2	40.0	14	48.3	21	30.4
Sheffield stand	75	53.6	30	81.1	3	60.0	17	58.6	25	36.2
Combination stand 2	33	23.6	13	35.1	3	60.0	9	31.0	8	11.6
Wheel-bender stand basic	29	20.7	2	5.3	1	20.0	5	17.2	21	30.4

Table 12
Bicycle use and needs of bicycle parking stands by “own cycling frequency” (multiple responses possible).

Bicycle parking	Several times a month or more often N = 99		Several times a year and less or never N = 41	
	n	Share [%]	n	Share [%]
Wheel-bender stand single concrete 1	5	5.1	3	7.3
Wheel-bender stand staggered metal	33	33.3	20	48.8
Stand design 1	26	26.3	6	14.6
Wheel-bender stand single concrete 2	1	1.0	1	2.4
Stand design 2	46	46.5	8	19.5
Wheel-bender stand design	11	11.1	6	14.6
Stand combination 1	46	46.5	12	29.3
Sheffield stand	62	62.6	13	31.7
Stand combination 2	25	17.2	8	19.5
Wheel-bender stand basic	17	20.7	12	29.3

The additionally given open responses to questions two and three assert that the installation of bicycle parking stands is done according to the local needs and opportunities, as well as according to the financial resources available. Bicycle stands are installed at recreational facilities, schools, public transport stops, and at other places of public interest. Furthermore, respondents pointed out that the requirements from the Austrian guideline RVS 03.07.01 may be far too ambitious, resulting in recently-installed bicycle stands frequently remaining unoccupied. These latter answers were given by the *rural areas* participants.

Survey respondents from *urban areas* cycle more often than the respondents from *rural areas* do. While the combined share of *less than once a week* amounts to about one third of the sub sample (31.6 %) in *urban regions*, their counterparts amount to 51.7 % in *rural areas surrounding centres* and 56.3 % in *rural areas*. This seems to be in contrast to the modal split of cycling in the URTs, which is equally low along the urban–rural gradient.

While in the total survey sample, the robust and theft-reducing *Sheffield stands* are regarded by the majority as the ones that meet cyclist needs the best, there are distinct differences in parking infrastructure preferences by geographic type. The *wheel-bender stand staggered metal* receives an absolute majority of nominations in rural areas with 52.2 %. In the literature, the quality of these types of stands is frequently regarded as inferior (Stude, 2017). In opposition, in *rural areas surrounding centres*, preference to this stand is down to 31.0 % and both *design stand 2* (41.4 %) and *combination stand 1* (48.3 %) as well as the *Sheffield stand* (58.6 %) are regarded as the best in meeting cyclists' needs.

The *wheel-bender stand staggered metal* is the most popular choice (48.8 %) among those administrators who themselves cycle very little. Among those cycling frequently, the *wheel- bender* is selected down to one third – still an alarmingly high value for a stand named after its devastating impact on bicycles. Most of the administrators cycling frequently agree that the *Sheffield stand* would meet cyclists' needs the best (62.6 %).

In general, around two thirds of *rural areas* administrators are aged 50 +. This age group's strong presence in the sample may not be surprising, as in general decision making seniority is expected to increase with age and experience. The other geographic classes show just a moderately younger age structure. The lack of young administrators suggests the conjecture that old-fashioned car centric mindsets prevail – thus another dimension of planning barriers for cycling. This finding is supported by the fact that the only significant correlation with the ranking of cycling is the age of respondents: the older the respondents are the more they favour car-oriented planning. The URT class shows no significant effect.

Conclusion

We have surveyed 155 cycling policy administrators from Austrian municipalities in terms of their understanding of planning priorities and cyclist needs. Our findings for cycling planning support what has been observed in general for transport planning elsewhere (Bell and Ferretti, 2015; Sagaris, 2015): the prioritization of sustainable transport is mostly more of a rhetorical tactic than an on-the-ground implementation dictum.

Our hypothesis was that depending on location, administrators may have different priorities in terms of cycling policies. Administrators universally prioritise car needs and their infrastructures over those for cycling. In this regard, only little distinction can be made between different geographic locations, so the hypothesis is not verified. But age plays a significant role: The prioritized ranking of cycling infrastructure declined significantly with age of responding administrators.

Similarly, the negligence or ignorance of the numbers of bicycle parking places needed shows little urban–rural distinction. In contrast, a pronounced distinction is certifiable in terms of quality awareness with parking devices by urban and rural respondents. And we assume the documented shortcomings to be resulting mostly out of lack of knowledge than willingness, as a self-ascertained willingness of the same survey participants to design cycling infrastructure properly was highlighted earlier (Brezina et al., 2020).

Based on the analysis of these three simple proxy questions, we recognize notable planning barriers towards cycling. These barriers need to be overcome quickly and comprehensively to meet the transport sector's promised contributions to climate-change mitigation. While urban areas show first signs of policy adaptation, the potential for overcoming barriers is high in rural areas. But overcoming these barriers quickly does not appear to be an easily achievable task as it calls for breaking up entrenched cycles of dated conceptualizations and actions (Frey, 2014). Thus, the necessary tools for overcoming these barriers ask for further research, both in urban areas to accelerate the changes as well as in rural areas to initiate a speedier overcoming of planning barriers with active modes in general and cycling in particular. In this context, at least three research directions appear noteworthy.

First, decision-maker's residential selection: do regions with already progressive cycling policy implementation attract planners and administrators with little or no mental barriers and vice versa?

Second, potential differences in users' requirements in parking facilities between rural and urban areas need to be studied – possibly leading to regionally specifiable guidelines.

And finally, coming back to Kingdon's (1995) Multiple Streams Framework, future research should also a) dive into the problem recognition stream, as it sets the agenda for the problems to be addressed, and b) into the politics stream, as it poses another relevant barrier to the actual implementation of cycling infrastructure.

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CRediT authorship contribution statement

Tadej Brezina: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Helmut Lemmerer:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Ulrich Leth:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The raw survey data are open access available at: https://doi.org/10.17632/tfkgpmgf9t.1.

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