Natural Hazards under Climate Change Conditions: A Case Study of Expectations and their Normative Significance in Protecting Alpine Communities

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Abstract: Climate change increases the frequency and intensity of certain kinds of natural hazard events in alpine areas. This interdisciplinary study addresses the hypothetical possibility of relocating the residents of three alpine areas in Austria: the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys. Our particular focus is on these residents' expectations about such relocations. We find that (1) many residents expect that in the next decades the state will provide them with a level of natural hazards protection, aid, and relief that allows them to continue to live in these valleys; (2) this expectation receives some legal protection but only when it is associated with fundamental rights; and (3) the expectation is morally significant, i.e., it ought to be considered in assessing the moral rightness or justness of relocation policies. These results suggest legal changes and likely extend to many other (Austrian) alpine areas as well. **DOI: 10.1061/(ASCE)NH.1527-6996.0000543.**

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Introduction

Alpine regions are particularly sensitive to climate change. As a result, the frequency and intensity of certain kinds of natural hazards in these regions has already increased, and will likely increase further in the future. Rising temperatures, for example, facilitate rock falls and avalanches; extreme precipitation events will cause a higher number of damaging floods (APCC 2014; Gobiet et al. 2014; Stoffel et al. 2014).

To protect alpine communities from natural hazards, especially under climate change conditions, states have funded dams, avalanche barriers, and various other measures. In cases in which such events have still caused serious damages, emergency aid and disaster relief were provided too. All of these actions are costly. So, assuming that the frequency and intensity of climate-related natural hazards in alpine regions increases further (which is likely), and assuming that state budgets continue to be scarce (which is likely as well), at some point in the future—maybe not too distant—states may consider planned relocations of some of these communities. That is, rather than funding protection and disaster aid and relief time after time, they may offer (e.g., Rohrhofer 2012, 2015) or even force (e.g., 20 Minuten 2014) residents to leave their communities and settle elsewhere (providing them with at least partial compensation for the loss of their homes and/or properties).

In discussing the normative dimensions of planned relocations in response to natural hazards—what *ought* to be done with regard to them—scholars have so far mainly focused on questions such as states' responsibility for these hazards or their ability to pay for relocations. The focus has also mainly been on an international context, and in particular on developing countries (e.g., on the relocation of Pacific island states due to sea level rise) (e.g., Heyward 2020; Heyward and Ödalen 2016; Zellentin 2015). This interdisciplinary study breaks new ground. We investigate the possibility of *domestic* planned relocations with regard to three alpine areas in Austria: the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys. Moreover, we focus on a normative phenomenon that has so far received little attention, namely residents' *expectations* about being protected from natural hazards and provided with disaster aid and relief in the case of such hazards.

In particular, we attempt to shed light on three questions about these expectations: First, what do these expectations look like? Second, do they support a legal claim against relocation or for compensation in current Austrian Public Law? And third, how morally significant are these expectations, i.e., to what extent ought they to be considered in assessing the moral rightness or justness of relocation policies? These questions will be addressed in separate sections. The geography part of our study reports questionnaire surveys and qualitative interviews. These surveys and interviews suggest that many residents of our study areas share the following expectation, henceforth referred to as Expectation E: "We expect that in the next decades the state will provide us with a level of natural hazards protection, aid, and relief that allows us to continue to live in our valley" (with "the state" referring here to public authorities at all levels, including the state of Austria, the province of Styria, as well as the relevant community administrations). The law part of our study investigates the legal significance of the harm that planned relocations would cause by frustrating Expectation E. We will argue that Expectation E receives some legal protection

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when it is associated with fundamental rights. The (applied) philosophy part of our study addresses Expectation E's moral significance. We propose two kinds of conditions for the moral significance of expectations, epistemic and justice-related ones. Then we argue that Expectation E fulfills these conditions to a high extent.

While our discussion will be limited to the role of expectations of continued residency in three particular alpine regions, we will finally suggest that aspects of it may also generalize to other cases.

Expectations in the Sölk, Johnsbach, and St. Lorenzen/Schwarzenbach Valleys

Expectations, as we understand them in this study, are a special type of predictions, i.e., beliefs about the future (Meyer and Sanklecha 2011, 2014). Most importantly, expectations play an important role in people's plans. When expectations are frustrated people are therefore harmed in that it is difficult or impossible for them to realize these plans. For example, if residents' expectations to be able to continue to live in our study areas were to be frustrated by them having to relocate then these residents could no longer use their houses and properties and they could no longer work as waiters in local restaurants or as rafting guides at nearby rivers. But do residents really have this expectation? To test this hypothesis we gathered empirical data, derived from a questionnaire survey and qualitative interviews.

Study Areas

In our study, we focus on three alpine valleys in Styria, Austria (see Figs. 1–6). All three study areas were affected by natural hazard events in the recent past. (1) The Johnsbach valley is located in the Gesäuse region at the border of the Ennstal Alps (Northern Limestone Alps) and Eisenerz Alps (greywacke zone) (97.8 km^2), while the other two are part of the Low Tauern in the Austrian Central Alps; (2) the Sölk valleys are located in the northern part of the Schladming Tauern region (288.2 km^2); and (3) the St. Lorenzen/Schwarzenbach valleys are located in the Rottenmann Tauern (21.0 km^2).

Parts of these valleys are classified as so-called hazard zones, i.e., areas exposed to an increased risk of being affected by natural hazards. These zones are defined as areas endangered by torrents or avalanches so that their permanent use for settlement and transport purposes is not possible, is only possible with disproportionate expenditure or is adversely affected by this risk. There is either an absolute ban on building new buildings in these zones (red zones),

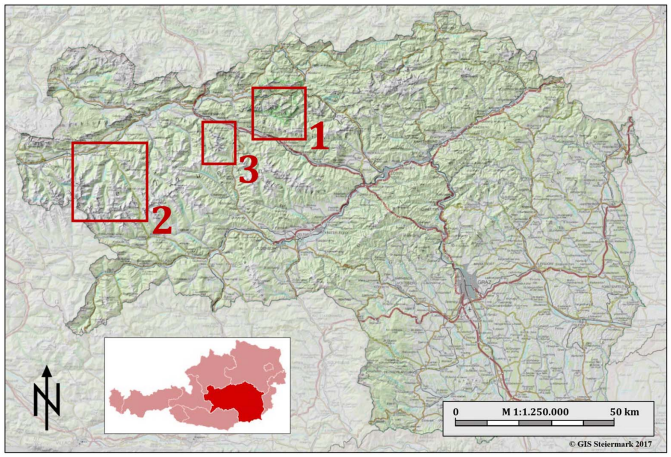

Fig. 1. Study areas: (1) Johnsbach valley, (2) Sölk valleys, and (3) St. Lorenzen/Schwarzenbach valleys. (© GIS-Steiermark 2017.)

Fig. 3. Picture of Sölk valleys, May 31, 2016. (Image by Florian Ortner.)

Fig. 2. Picture of Johnsbach valley, September 27, 2015. (Image by Florian Ortner.)

Fig. 4. Picture of Sölk valleys, May 31, 2016. (Image by Florian Ortner.)

Fig. 5. Picture of Sölk valleys. August 10, 2016. (Image by Florian Ortner.)

Fig. 6. Picture of Sölk valleys, August 18, 2016. (Image by Florian Ortner.)

or the construction of new buildings is only possible when special conditions are met (i.e., protective measures) (yellow zones). The hazard zone plan is publicly accessible and is revised in irregular time intervals depending on changed conditions within the areas (die.wildbach 2011). In Table 1, we provide a list of major natural hazards events in the study areas, which were classified as extreme (Level 4 on the four-level intensity scale), and occurred in the last two decades.

Methods

For collecting data on the populations' natural hazard perception and their expectations on protection and responsibility, two different methods were applied. Both research methods were applied in the summer of 2016. At least one major natural hazard event occurred in every research area in the decade prior to this summer, which may have had an effect on participants' responses and suggests that the population was well aware of the natural hazards situation.

First, we received quantitative data from a questionnaire survey carried out in the research areas. The survey was realized in different ways depending on the mail distribution possibilities. Every household received one questionnaire package. A questionnaire package included the questionnaire itself as well as a return address envelope with postage prepaid, so that no expenses were incurred for the participants, and was accompanied by a cover letter introducing and explaining the project aims. The questionnaire itself was divided into the following sections: (1) demographic data; (2) assessment of subjective perception of the past, present, and future natural hazard situation; (3) personal approach to natural hazards (knowledge and emotions); (4) social networks and local ties; (5) responsibility; (6) information channels; and (7) exposure to and protection from natural hazards. Apart from the demographic data, most of the question items had a five-step answer range from *fully agree* over *rather agree*, *neither* to *rather disagree*, and *completely disagree*.

In total, we received 296 completed questionnaires; that means 23.3% of all households answered, which corresponds to 13.5% of all inhabitants. Although, at first sight, these numbers may not look very high, note that the total of inhabitants also includes children; people may have shied away from the effort of obtaining additional surveys from the nature park center or local inns (only one or two questionnaires were included per household); and, most importantly, response rates of (self-administrated) postal mail surveys tend to be rather low in general (Bird 2009). The analysis of the data was realized with the statistics software package SPSS (versions 23 and 26).

Second, we conducted 20 qualitative interviews by applying the principles of the problem-centered interview, a method that aims to gather subjective perceptions and ways of processing social reality as well as objective evidence on human behavior (Witzel 2000; Witzel and Reiter 2012). Each interview was audio-recorded and supported by a specifically developed interview guide, a short questionnaire on demographic data at the beginning of the interview, and a postscriptum afterward.

For the selection of interview partners, we intended to cover a range of inhabitants that regularly address or confront natural hazards as part of their political or professional roles. The aim was to precisely approach this group, because we assume that the awareness of natural hazards is most likely above average among these test persons. If this group has a high expectation that the valleys will remain habitable, the same likely applies to the population as a whole. Our sample included, for example, the mayor, vice-mayor, fire department chiefs, rangers, members of the mountain rescue service, the mountain and nature watch, and the avalanche commission. The interview partners were approached directly by the project team, the project as well as the research aims were explained, and the persons were asked if they were willing to participate and would be available for an interview. None of them refused to participate. The length of the conducted interviews varied between 30 min and 1.5 h.

Results Regarding Expectation E

To structure our data we developed the following six categories: assessment of the natural hazard situation (AS), emotions (EM), exposure (EX), protection (PR), consequences (CO), and responsibility (RE). A total of 23 question items were selected from the questionnaire and assigned to the six categories. In the subsequent tables, full data is provided for the total population (Total pop.) results as well as for the inhabitants who live in (yellow or red) hazard zones in particular (HZ pop.).

A total of 48.7% of all survey participants stated that they live in a hazard zone, either yellow or red; 32.4% stated that they do not live in a hazard zone; 15.5% do not know if they are living in a hazard zone; and 3.4% did not specify. Providing separate results for self-declared hazard zone inhabitants is motivated by the assumption that these inhabitants consider themselves more

Table 1. Major natural hazards events in the study areas in the last two decades

Date	Type	Description
Johnsbach valley		
June 21, 2012	Fluviatile solids transport	After a heavy thunderstorm with hail, 80 mm of precipitation fell in a very short time. As a result of this heavy rain, several banks of the stream were breached, wild wood and large amounts of debris were mobilized, and landslides occurred. Alluvial cones were flooded and graveled over, and a bridge was clogged. The road had to be closed to heavy traffic.
Sölk valleys		
August 11, 2002	Fluviatile solids transport	Due to heavy rainfall, the Kleinsölk stream experienced extreme flooding. The river banks were cracked, the stream was displaced and massive deposits of debris were deposited in the stream bed. Several bridges were torn away and about 700 m of solid wood were deposited in the stream. One bridge was undercut.
July 17, 2010	Fluviatile solids transportflood	A heavy rainfall event with a total precipitation of approximately 130 mm in 2 h and the concatenation of different hydrogeomorphological processes resulted in an extreme event that caused numerous slope and river embankments as well as floods and fluviatile solids transport. In some cases, large areas of slopes were washed away. In the main area, the area of damage was about 151 ha.
July 20, 2012	Fluviatile solids transportflood	Due to heavy rainfall, massive erosion of on local creek occurred along the access road. In the course of this catastrophic event, this forest road was eroded over a distance of approximately 1 km, and slope undercuts were made on the right bank, during which logs and debris entered the stream. Subsequently, bedload and debris drifted towards the valley. Stream beds were filled, stream faults occurred and the floodwater masses advanced towards the building complexes.
August 4, 2017	Fluviatile solids transport	Due to the intense heavy precipitation, bedload mobilization from landslides, erosion and bank cracking occurred. In many areas, logging has also drifted. Localized landslides also contributed to bedload mobilization. In these cases, the bedload retention barriers trapped much of the bedload.
January 17, 2019	Avalanche	A series of weather systems from the north and northwest brought large amounts of precipitation to the northern side of the Alps this January. A local alpine pasture was threatened by avalanches from both sides. Due to the fact that they were flowing avalanches and therefore the ranges were small, no damage occurred.
St. Lorenzen/Schwarzenbach valleys		
June 23, 2012	Fluviatile solids transport	A heavy thunderstorm with hail and 122 mm of precipitation led to a hazardous event with numerous landslides and debris flows, which resulted in floods with strong bedload mobilization. Many settlement areas were affected for the first time by flooding and damage to infrastructure facilities. Furthermore, the federal road bridge was blocked and a closure of roads due to the damage was the result.
July 21, 2012	Fluviatile solids transportdebris flow	After a strong thunderstorm with hail, 80 mm of precipitation fell in a very short time. This repeatedly resulted in numerous landslides in the catchment area of the streams and an extensive mudslide occurred, which caused massive damage in the settlement area. The extreme peak discharge of the debris flow led to large-scale outburst floods. Almost all bridges were destroyed. In the area of the village, massive landfalls of debris, wild wood, and various other carried material occurred. Several municipal pipelines were damaged or destroyed.
September 11, 2012	Fluviatile solids transport	Heavy rainfall with hail occurred again in the valley. The existing construction sites of the torrent and avalanche control were severely damaged. Invert and lateral erosion occurred in the stream bed. Some estates in the upper part of the village area, large bank cracks occurred and the stone embankments were partly eroded and cracked.

Source: Data from WLV (2021).

endangered and at risk than those who do not believe to live in such a zone. In a few cases, where the results are in stark contrast to those of the whole population, the results for the ignorant (i.e., people who do not know if they are living in a hazard zone or not) are shown as well (Ignorant pop.). Only valid data, namely data that were specified (participants gave an answer by making a cross on the questionnaire) were evaluated and are shown.

Complementing and supporting the results of the questionnaires, we briefly present our findings from the interviews regarding each category. The results are summarized, and if possible a general statement is derived from each of them. To provide typical examples from the interviews, quotes for each category, which were translated from German into English, are presented subsequently.

Assessment of the Natural Hazard Situation

This category estimates the communities' perception of the natural hazard situation in general, their experiences from the past, as well as an outlook in the future. It shows that residents of alpine valleys are highly aware of natural hazards in their regions, perceived an increase of hazardous events in the last decades, and expect an additional increase in the future, especially due to climate change. This perception is even higher among residents living in hazard zones (see Table 2).

The analysis of the interviews shows that a significant majority of the respondents have the perception that they are living in an area with a lot of natural hazards. Not all gave a corresponding statement, but among those who addressed this topic, most of them reported a noticeable increase over the last few years and expect even more natural hazards in the future. Some respondents indicated climate change as the primary cause for the hazard situation and none of them believed that the number of events will decline (AS):

> "Well, due to the predominant landscape and mountains, natural hazards naturally pose a certain threat, both in winter and in summer."

> "[. . .] the natural hazards [situation], I must honestly say, somehow poses great danger for us."

> "The danger is so manifold. It can start with a large amount of precipitation in summer or with heavy snowfall."

Table 2. Assessment of the natural hazard situation category

Item number	Fully agree	Rather agree	Neither	Rather disagree	Completely disagree
AS1		I am living in a region with a lot of natural hazard events.			
Total pop. (%)	21.6	47.7	11.6	14.1	5.0
HZ pop. (%)	30.8	50.0	13.3	5.8	0.0
AS2		The frequency of natural hazard events increased over the last decades.			
Total pop. (%)	31.1	42.6	9.8	12.3	4.3
HZ pop. (%)	37.6	43.6	9.4	8.5	0.9
AS3		The frequency of natural hazard events will increase in the future.			
Total pop. (%)	36.7	43.8	8.1	10.5	1.0
HZ pop. (%)	44.4	39.8	8.3	7.4	0.0
AS4		Climate change will certainly exacerbate the natural hazard situation.			
Total pop. (%)	41.7	47.6	6.6	2.8	1.4
HZ pop. (%)	45.0	45.0	8.6	1.4	0.0

Emotions

The emotions category assesses the feelings of the inhabitants regarding natural hazard events in their valleys and also approaches their corresponding attitudes. To some degree, people are afraid of and worried about possible natural hazard events. Furthermore, people are very concerned about the effects of climate change on their personal life. The percentage of people sharing this view is even higher among residents living in hazard zones (see Table 3).

During the interviews, only two-thirds of the respondents gave a clear statement regarding their emotions with regard to natural hazards. Of these people, some felt pretty safe (especially because of the existing protective measures) and tended to express confidence and strength, but others stated that they were afraid or at least had a bad feeling. The inhabitants were generally concerned about the effects of climate change in their valleys (EM):

> "We feel safe in principle. I have already said that we are not afraid at all because of the protective structures."

> "I do not feel threatened myself in my life or anything, not at all."

> "The terrible thing is to think how vulnerable you actually are. Or that some forces of nature—I mean, maybe you can mitigate it a little bit, but you are totally exposed to these forces of nature. There's very little you can do."

Exposure

The exposure category measures the risk of being personally harmed by a natural hazard event in one's home region as well as one's property. In general, people are very well informed about their hazard exposure—with the exception of the ignorant, i.e., people who do not know if they are living in a hazard zone or not. There is a strong awareness of being affected by a hazardous event. Furthermore, a majority of people living in hazard zones see their own property threatened by natural hazards (see Table 4).

Table 3. Emotions category

Item number	Fully agree	Rather agree	Neither	Rather disagree	Completely disagree
EM1		I am worried because of possible future natural hazards events.			
Total pop. (%)	22.5	36.3	17.3	17.6	6.3
HZ pop. (%)	28.4	24.8	18.4	14.9	3.5
EM2		I am afraid of a possible natural hazard event.			
Total pop. (%)	25.9	33.6	16.4	17.1	7.0
HZ pop. (%)	33.3	34.0	16.3	13.5	2.8
EM3		I am very concerned about how climate change affects me.			
Total pop. (%)	32.4	42.9	12.9	8.0	3.8
HZ pop. (%)	38.0	39.4	14.1	4.9	3.5

Table 4. Exposure category

Item number	Fully agree	Rather agree	Neither	Rather disagree	Completely disagree
EX1		The risk of being affected by a natural hazard event in my region is very high.			
Total pop. (%)	30.2	37.2	13.2	15.6	3.8
HZ pop. (%)	40.1	35.2	13.4	9.2	2.1
EX2		Natural hazards threaten my property.			
Total pop. (%)	23.9	32.7	9.9	22.9	10.6
HZ pop. (%)	37.6	24.8	9.9	13.5	4.3
EX3		I am well aware of my exposure to natural hazards.			
Total pop. (%)	43.7	40.5	8.1	7.4	0.4
HZ pop. (%)	50.7	38.9	4.9	5.6	0.0
Ignorant pop. (%)	17.1	43.9	17.1	19.5	2.4

The persons interviewed indicated that they know their exposure to natural hazards very well, with literally everyone reporting that they were informed about the hazard plan and the respective status of their property. Views varied about whether their private property was at risk or not, depending on existing protective measures. Some agreed, while others disagreed. Most respondents stated that their region is neither more nor less affected than other valleys in the area (EX):

> "Well, natural hazards are, I would say, to be expected at any time of the year, always and everywhere. Nowhere is there a 100% guarantee. And we have also become aware, well, we also know that we have danger spots."

> "Of course, we already have a lot of risk factors where you can really say 'you don't know [what can happen].'"

> "Basically, natural hazards are omnipresent in such extreme terrain as we live in."

Protection

The three items in the protection category assess the safety feeling of the local population as well as their opinion regarding protective measures in the region. Overall, people feel well prepared for upcoming hazardous events and there is a high level of safety feeling and trust in the existing protection measures. People who do not know if they are living in hazard zone (the ignorant) feel much less prepared and safe, and their trust in the protection measures is by far the least compared to inhabitants who do know if their property is located in a hazard zone or not (see Table 5).

In the interviews the respondents indicated that their feeling of security has increased over time, especially after the implementation of protective measures. Nevertheless, from their perspective, further dangerous events can never be ruled out. Moreover, there is awareness that not everything can be protected. The respondents also mentioned that after hazardous events the public authorities invested more in protective structures (PR):

> "The protective measures that have been built are located where something has happened. But protective measures have not been taken where nothing has happened yet. And we still have potential there."

> "I think the risk has been reduced by the protective measures."

> "Of course, there was also the corresponding pressure from the population, e.g., when the public authorities took money to set up protective measures."

Consequences

This category analyses the perception of possible consequences of an increased natural hazard risk. There is concern that future hazard events may threaten the community life. This expectation is recognizably higher among people living in a hazard zone. The majority of people cannot imagine a situation where parts of the valley have to be permanently abandoned due to an increase in natural hazard risk, although some see a possibility of resettlement (see Table 6).

In the course of the interviews the topic of a possible relocation of (parts of) the valley was discussed, with the result that the majority could not imagine such a situation, although some inhabitants shared the view that this may be an option, at least for discussion. While risks may increase, at the time of the interviews, hardly any of the respondents considered moving away from their valley (CO):

> "Such a valley is no longer relevant to us and we close it off in favor of other areas? I do not think so!"

Table 5. Protection category

Item number	Fully agree	Rather agree	Neither	Rather disagree	Completely disagree
PR1		I feel well prepared regarding the next natural hazard event.			
Total pop. (%)	8.3	32.7	30.9	21.9	6.1
HZ pop. (%)	8.5	36.9	26.2	22.7	5.7
Ignorant pop. (%)	11.9	14.3	21.4	38.1	14.3
PR2		The existing natural hazards protection measures give me a feeling of safety.			
Total pop. (%)	18.1	46.8	16.3	12.8	6.0
HZ pop. (%)	19.7	48.6	11.3	12.0	8.5
Ignorant pop. (%)	21.4	28.6	23.8	21.4	4.8
PR3		I can fully rely on the protection measures in my place.			
Total pop. (%)	18.9	51.2	15.8	11.7	2.4
HZ pop. (%)	18.4	50.4	15.9	12.1	4.3
Ignorant pop. (%)	15.2	43.5	17.4	23.9	0.0

Table 6. Consequences category

Item number	Fully agree	Rather agree	Neither	Rather disagree	Completely disagree
CO1		An increase of natural hazard events may threaten the village community.			
Total pop. (%)	13.3	42.0	15.4	23.1	6.3
HZ pop. (%)	15.7	43.6	15.0	20.0	5.7
CO2		An increase in natural hazard risk may lead to a situation where parts of the valley have to be permanently abandoned.			
Total pop. (%)	5.3	20.2	19.5	33.3	21.6
HZ pop. (%)	7.0	22.4	20.3	30.8	19.6
CO3		The next natural hazard event will cause much less damage than currently expected.			
Total pop. (%)	6.1	21.5	38.4	27.2	6.8
HZ pop. (%)	9.3	27.9	33.6	20.0	9.3

"No. It won't be that bad, no. No, I can't imagine anything like that. No. I don't think that's possible either. Well, I just can't imagine it."

"Yes, I can imagine. If there are too few inhabitants, I can well imagine that at some point the state will say: 'We don't see that we are building here.'"

Responsibility

The responsibility category addresses the topic of who the survey participants see as responsible for different matters regarding the natural hazard situation and protection. Most participants see society as responsible for the protection against natural hazards. Opinions were more divided when it comes to the prevention of these hazards and the immediate relief and reconstruction period, with most participants regarding society as at least co-responsible. Responsibility for the protection of life, health, and private property was more likely to be attributed to the inhabitants themselves (see Table 7).

The results of the interviews show a differentiated view among the population. In principle, there is a general perspective of shared responsibility. Most of the respondents highlight individual responsibility, especially when it comes to protection of private property, but they also see it as an obligation of public authorities to build protective measures, maintain them, and help the population in the case of natural hazard events (RE):

"The community is responsible. Obviously, it is responsible but if you blame everything on the public authorities and have no personal responsibility, it's also bad. And when do you take over most personal responsibility? When you pay for it!"

"[. . .] the public authorities do have an obligation to protect the population. They cannot completely absolve themselves of this responsibility."

"I think that the responsibility increases from level to level. The personal responsibility, then the small communities, the municipalities, and the state. And the measures taken by the communities, the municipalities, and the state interlock."

Further Results

Besides using empirical data to test our main hypothesis -namely that many residents of our study areas share Expectation E-, in the philosophical part of our paper we will use and expand on some other findings from the interviews as well, which mainly pertain to four questions. In the following for each of these questions a brief synopsis of the interview analysis is given including some exemplary quotations.

[Q1] To What Extent Is There Awareness of Climate Change among Residents?

As has already been suggested by the questionnaire responses (see AS4, EM3), residents are well aware of climate change. All respondents, except two, describe climate change as "noticeable" and a large proportion of them as "intensifying," especially in comparison to the past:

"Climate change, you can feel it anyway. I mean that everything is just going to get more extreme."

"[. . .] as far as I can tell, heavy rain events or thunderstorms have simply become more frequent or stronger."

[Q2] To What Extent Are Residents Aware That Climate Change Will Increase the Frequency and Intensity of Natural Hazard Events?

Also in line with our questionnaire results (see AS4, EM3), most of the interviewees (80%) implicitly or explicitly see a connection between climate change and the natural hazard situation. In their view, climate change will lead or has already led to an increase in the frequency and intensity of natural hazard events. For the majority, climate change is a key factor:

Table 7. Responsibility category

Item number	Fully agree	Rather agree	Neither	Rather disagree	Completely disagree
RE1		The society is responsible for the protection against natural hazards.			
Total pop. (%)	31.4	45.4	12.1	8.9	2.1
HZ pop. (%)	36.4	40.7	14.3	7.9	0.7
RE2		I am coresponsible for the natural hazard situation in my region.			
Total pop. (%)	15.4	27.3	20.3	24.8	12.2
HZ pop. (%)	12.1	25.7	17.1	32.1	12.9
Item number	The society	Mainly the society	The society and I equally	Mainly I am	Only I am
RE3		Who is responsible for the prevention of natural hazards? (prevention)			
Total pop. (%)	3.5	27.3	56.6	11.5	1.0
HZ pop. (%)	2.8	29.6	59.9	9.2	1.4
RE4		Who is responsible for emergency measures during natural hazards event? (immediate relief and disaster response)			
Total pop. (%)	3.8	22.2	54.2	16.7	3.1
HZ pop. (%)	3.5	21.7	56.6	13.3	4.9
RE5		Who is responsible for cleanup and reconstruction after a natural hazard? (postdisaster response, rehabilitation, and recovery)			
Total pop. (%)	4.5	13.1	62.3	17.6	2.4
HZ pop. (%)	4.9	9.9	62.7	19.0	3.5
RE6		Who is responsible to protect life and health against natural hazards?			
Total pop. (%)	1.7	9.8	34.5	40.1	13.9
HZ pop. (%)	1.4	10.8	31.7	38.8	17.3
RE7		Who is responsible for to protect property against natural hazards?			
Total pop. (%)	1.4	3.5	38.3	47.4	4.9
HZ pop. (%)	1.4	2.1	40.4	43.3	12.8

"In my opinion, extreme events are still getting more extreme or intense. I think so, yes, that it is more likely that this develops into a negative direction and that protective measures are absolutely necessary."

"Global warming certainly makes a difference. [...] The intensive rain has already increased. [...] If it rains 150 or more liters per square meter, then you have to imagine what's going on."

Only three respondents did not argue that climate change may lead to an increase in frequency or magnitude of natural hazard events.

[Q3] Do the Residents Consider It Fair that They Should Continue to Be Protected against Natural Hazards in the Future (At Higher Cost) in the Same Way As Before? Why/Why Not?

The overwhelming majority consider it fair that they will be protected (also in the future; without addressing possible rising costs in each case), but also claim that a risk-free life doesn't exist anywhere. The interviewees consider society, i.e., the public sector, to be liable for the protection; although some argue that there is also personal responsibility (in line with the RE category of our questionnaires):

"In principle, it is a joint responsibility of all. [...] not to leave the small towns unprotected, because we have it hard enough as it is."

"[The society has the responsibility that] through all the taxes that are paid, protective measures can be financed. [...] We will always have to use our tax money for things that not everyone needs, but the public does need them."

Regarding the question why (or why not) the inhabitants see future protection as fair, they appeal to the equality of all people within a state:

"Yes, I see equality in the sense that a certain infrastructure must be available everywhere. [...] In my opinion in principle, this [protection] is a state task."

"Basically, everything must be protected and treated equally."

Moreover, there is the perception that residents of the valleys co-finance investments outside their region by the taxes they pay. Additionally, tourism plays a noteworthy role, i.e., people from other regions, especially the city of Graz, visiting the valleys for vacation. A further argument is that protection measures in small valleys in turn also protect other places and areas downstream.

[Q4] Would the Inhabitants Also Grant Such Protection to the Inhabitants of Other Endangered Regions, Or Do They Think Primarily of Themselves and Their Families/Friends?

In the course of all interviews and the statements made, none of the respondents has expressed a selfish way of thinking. It can therefore be assumed that they would grant inhabitants of other endangered regions equal protection. In fact, equality was often appealed to by some of the respondents:

"Basically, everything must be protected and treated as such [...] equally: the [...] valley is not less important than others and should not necessarily be neglected. [...] But in a certain sense, it is also a form of sustainability [...] to not only protect this valley, but that all valleys are protected."

"I understand equality as requiring that a certain infrastructure is available everywhere, and that there will be differences is clear; yet for me it is the same everywhere... or is it not the task of a state organization to weigh up how much what costs... because then certain measures in the urban area will also be extremely expensive or much more complex than in rural regions."

Discussion

As said, the results previously presented will mainly become relevant in later parts of the paper. In this section, we focus on the evaluation of the previously presented data (section "Results Regarding Expectation E") and argue that parts of this data suggest that most residents share Expectation E: "We accept that in the next decades the state will provide us with a level of natural hazards protection, aid, and relief that allows us to continue to live in our valley, and we plan our lives accordingly."

In general, it can be stated that the awareness among residents regarding natural hazards is high and they expect an increase of hazardous events in the future, especially due to climate change. To a noticeable degree, people are worried or even afraid about these events and see their private property at risk. This can be observed to an even higher degree among people who reported living in a hazard zone, which we consider as generally more endangered and at higher risk. Informed inhabitants feel well prepared, they feel safe due to the existing protection measures, and highly rely on them, which can be interpreted as trust in natural hazard management, including the society's responsibility. There is concern that future hazard events may threaten the community life, but the majority of people cannot image a situation where parts of the valley have to be permanently abandoned. We conclude that people believe in living in their regions for many years to come. Furthermore, the population of alpine valleys assigns some responsibility for the protection against natural hazards to society, while personal responsibility is deemed equally important. Overall, it is shown that people are very committed to their plans, expect that natural hazard events will occur, but also expect that they will be living in their valleys for the years to come.

Considering more specific aspects of our data, do residents of our study areas expect that in the next decades the state will provide them with a level of natural hazards protection, aid, and relief that allows them to continue to live in these areas?

The questionnaire item that is most relevant to assessing the prevalence and strength of Expectation E in residents of our study areas is CO2: "An increase in natural hazard risk may lead to a situation where parts of the valley have to be permanently abandoned." In response to this item the majority of participants disagreed (54.9%), which supports that they expect to be able to continue to live in their valleys. At the same time there were also participants who were indifferent (19.5%) or even agreed with CO2 (25.5%). One explanation for responses of these latter kinds is that these participants simply did not share the expectation of continued residency. However, it is also possible that some of the "indifferent" or "agree" responses rather reflect differing interpretations of the time horizon and kind of possibility implicit in CO2: participants may have wanted to express that while permanent abandonment is highly unlikely in the short run or even within their lifetimes it is at least possible, given unprecedented and highly unlikely natural hazard events or in the very far future.

The previous somewhat mixed result is also supported by our interviews regarding the CO category, which again suggest that most—but (at least on some interpretation) not all or close to all—residents share Expectation E. Interview responses in this

category furthermore suggest that for those residents who do hold Expectation E it is often held rather strongly, i.e., it forms an important part of their identities or lives that is highly emotionally loaded. For example, as suggested in the section "Results Regarding Expectation E," some interviewees stated that they "cannot imagine" relocation scenarios or that these scenarios are not "possible"; and to further support this claim, when we started our research in these areas local officials got so upset about the mere investigation of relocation scenarios that they considered withdrawing their support (see Pölzler and Ortner 2017).

Results from some other categories at first sight seem to contradict the hypothesis that most people in our study areas expect that the state will provide them with a level of natural hazards protection, aid, and relief that will allow continued residency. Most importantly, participants generally assigned high likelihoods to an increase in the intensity and frequency of natural hazard events, especially as a result of climate change (see AS, CO), and they expressed significant worries about such events (see EM). This suggests that an outlook according to which continued residency is possible is not so likely after all. Yet, at the same time—and somewhat paradoxically—the majority of participants also stated that in view of existing protection measures they feel safe (64.9%) (see PR2) and that they can fully rely on these measures (70.1%) (see PR3).

There are various ways of making sense of this apparently inconsistent pattern of results. Combined also with participants' partial attribution of responsibility to the state (see RE), it seems to us that one plausible hypothesis is that most residents of our study areas expect the state to protect and assist them even in the face of increasing risks from natural hazards. That is, they feel safe despite worsening conditions and despite also being worried because they trust that the state will continue to fund protection, and that even when this protection will not (fully) suffice aid and relief will be provided to an extent that allows continued residency.

The discrepancy between participants being pessimistic and afraid on the one hand (AS, CO, EM) and feeling safe on the other hand (PR2) may also be partly explained by the way in which our items were formulated. Items in the PR category explicitly mention protective measures and involve terms such as "safety." PR2, for example, states that "[t]he existing natural hazards protection measures give me a feeling of safety." Thinking of these measures and being confronted with this positive framing may have decreased feelings of anxiety compared with items in the other categories, which tended to be formulated in a more abstract and negative way.

Finally, it seems plausible that participants' pattern of responses (worry, yet also feelings of safety) is again partly explained by differences in assumed time horizons. They may feel relatively safe today (see PR2). But as they are aware of the increasing intensity and frequency of natural hazard events, especially as a result of climate change (see AS, CO), they are worried about these events in the long run (see EM).

There are also explanations that are less consistent with residents widely holding Expectation E. Most importantly, what people are mainly afraid of may not be the natural hazards events as such; they may rather worry that, in the face of increasing costs, the state will not be able or willing to uphold protection mechanisms that are safe at present into the farther future. We take this explanation to be slightly less plausible than the first one, as the items that reflect residents' worries (EM1 and EM2) are formulated in ways that rather tend to prompt thinking about natural hazard events' immediate physical implications (they do not refer to politics, protection measures, etc.), and these physical implications also seem to have been on many participants' minds in the interviews.

In sum, our rich set of quantitative and qualitative data suggests that residents' attitudes with regard to natural hazards are complex and show both intrapersonal tensions (whether these tensions are real or can be explained away) as well as interpersonal differences. We have tried to show that the hypothesis that many residents share Expectation E explains large parts of this data and is thus supported by it.

Expectations in Current Austrian Public Law

The geographical part of our study suggests that many residents of our study areas expect that they will be able to continue to live in these areas. The first question that we ask with regard to the potential frustration of this expectation (Expectation E) is whether it can support a legal claim for the residents not being resettled, or for their being compensated in case they are resettled (irrespective of other legal claims to not being resettled or to being compensated that they may have).

There is no general protection of expectations in the continuity of present law. Otherwise a legal system could not be adapted to new conditions and challenges, be made more just, or reformed for other reasons (Bezemek 2009, pp. 258–259). But expectations can receive (limited) legal protection in two kinds of cases. First, legal changes that interfere seriously with existing individual rights might demand a specific justification and qualification in order to comply with constitutional requirements [e.g., VfSlg 15.269/1998 (Constitutional Court 1998)]. This standard of protection for existing rights also extends to the associated expectations. The existence of a legitimate expectation can hence influence balancing decisions in favor of the continued existence of a legal right. Second, in specific exceptional cases, legitimate expectations can be directly protected by constitutional law. This applies first and foremost to cases in which the state itself has caused the expectation to arise (Grabenwarter and Frank 2020, pp. 20–23).

The question of climate change-related relocation measures and the legal relevance of frustrating expectations in this context has not yet been addressed directly by Austrian courts. However, in what follows we will show that there are some indications in previous decisions that suggest that a (limited) relevance of such expectations (1) cannot be derived from the principle of protection of "legitimate expectations," but (2) can in fact be derived from their association with fundamental rights.

Principle of Protection of "Legitimate Expectations" in Austrian Constitutional Law

As mentioned previously, a specific form of legal protection for expectations can sometimes be directly derived from constitutional law; in particular, under the principle of protection of legitimate expectations, which can be derived from the constitutional principle of equality [according to which the legislator must not advantage or disadvantage particular (groups of) persons without proper justification] (Federal Constitutional Law 1930, Article 7). This principle applies especially to expectations, which are not directly linked to an existing right, but to certain other factual circumstances that gave rise to the creation of an expectation. In these cases, legal protection is directly linked to a specific expectation itself. The existence of a legitimate expectation hence constitutes a necessary precondition for the creation of a corresponding legal right.

That said, expectations as such enjoy direct legal protection only in exceptional cases, especially when the state has directly given rise to the creation of an expectation and the making of corresponding financial investments. The mere expectation of being able to continue to live in an area in the future is not in itself protected in this respect. It would only be protected if the state had set specific

incentives in order to promote settlement in this region in the past, for example, in the form of direct financial subsidies or other indirect legal benefits such as tax reliefs or specific beneficial legal exceptions (e.g., Constitutional Court 1991, 1993, 2000).

However, with regard to our study areas, the state has not in fact set strong incentives to promote settlement specifically in the affected areas. The mere fact that the same building subsidies were granted for new buildings in the affected regions as in the rest of the province and the classification as a (mere) yellow hazard zone are probably not/hardly sufficient to assume the (legal) incentivization of a specific element of confidence by the state in the present case. Moreover, even assuming residents' expectation of continued residency was legally protected in this respect, resettlement policies could still be justified under certain conditions (e.g., if they involve long transition periods or adequate compensation).

Protection by Association with Fundamental Rights

Our previous considerations have shown that residents' expectations of continued residency are unlikely to enjoy direct legal protection under the principle of protection of legitimate expectations (Federal Constitutional Law 1930, Article 7). However, they do receive some limited protection if they can be associated with fundamental rights.

As an example, take residents' expectations associated with the legal ownership of a house, for instance, the expectation to be able to live in it. These expectations are protected to a certain extent because the ownership of a house enjoys legal protection under the constitutional right to property [Austrian Basic Law on the General Rights of Nationals 1867, Article 5; Article 1 of Protocol 1 European Convention on Human Rights (ECHR)]. Legal infringements of this right (i.e., all measures that significantly restrict the usability of the property, therefore encompassing also forms of relocation) require a special justification and must comply with the principle of proportionality in order to be permissible (Korinek 2005, pp. 9–12).

One factor that could influence the balancing of interests to be carried out in this context is the question of whether a person (objectively considered) could legitimately trust in the continued existence of a right that is now to be restricted [e.g., in the context of restricting the buildability of land (Stegmayer 2018, pp. 45–52)]. For example, in its case law, the Austrian Constitutional Court stated that a prohibition of the use of dwellings as a holiday home may prove to be inadmissible for those dwellings that were acquired in the trust of the continuing possibility of use as a holiday home. However, if the purchase would have taken place at a time when the use as a holiday home was still permitted, but a corresponding change in the law affecting the flat in question was already being planned and published, such an expectation worthy of protection can no longer be assumed (Constitutional Court 2002). The purchaser's expectation, as long as it could be considered legitimate due to the circumstances given in the individual case, thus led to the inadmissibility of the regulation in this case.

Similarly, the Constitutional Court declared that if the state prohibits the exercise of a certain business pro futuro, it must provide for longer transitional periods for those who were previously granted a corresponding business license by the authority. In contrast, for those who were only planning to apply for a licence to carry out the business in the future, the prohibition can take effect immediately—their corresponding expectation is not legally qualified as equally worthy of protection (Constitutional Court 2015).

This suggests that in the case of legal measures that restrict existing rights such as the right to property or the right to operate a business, the expectations of the persons concerned must be taken into account in the weighing process and can, if considered legitimate, even lead to the unconstitutionality of a regulation. Hence, legitimate expectations of affected property owners and resident entrepreneurs would have to be taken into account when balancing interests in the context of a relocation measure.

Legal protection against resettlement measures that harm legitimate expectations can be derived not only from the right to property or the right to operate a business, but also from other fundamental rights, in particular the right to respect for private and family life (ECHR Article 8), the principle of equality (Federal Constitutional Law 1930, Article 7), and the right to freedom of movement (Austrian Basic Law on the General Rights of Nationals 1867, Articles 4 and 6; ECHR Article 2 Protocol 4) (Scharler 2021, p. 99). In its case law, the Constitutional Court qualified, for example, the objectively justified expectation of being allowed to retain a residence that has already existed for a long time as a factor influencing the balancing of interests with regard to the admissibility of a measure terminating residency in the context of the right to private and family life (Constitutional Court 2020).

To sum up, legally binding resettlement measures potentially interfere with several fundamental rights and therefore could only be permissible if the public interest of the state outweighs the individual interests of the population in the context of a balancing of interests. Correspondingly, all expectations associated with being able to continue to live in the affected areas also enjoy a certain level of legal protection. The objectively legitimate confidence in the continued existence of legal rights might influence the constitutionally required balancing decision in favor of the expectation to be able to continue to live in the affected areas.

At the same time, this does not mean that a relocation measure would therefore generally be inadmissible; on the contrary, fundamental rights can even give rise to their necessity. Pursuing relocation measures may prove necessary according to constitutional standards if the protection of fundamental rights of the residents, including the protection of the life and health of the local population, can no longer be guaranteed otherwise (Scharler 2021, p. 132). In this case the state is obliged to provide effective measures to protect the life or health of its citizens. This may include offering possibilities for resettlement (which does not imply a right to free housing) (e.g., ECtHR 2005).

Therefore, if a relocation measure proves to be permissible, the associated rights-based expectations no longer enjoy any specific standard of protection (as the interference with the underlying rights is also legally legitimate). Furthermore, while (legitimate) encroachments on existing property rights can at least result in claims for compensation under specific circumstances, there is no such claim for other legal positions. For example, if a person is forced to leave her house or hotel business, she might have a claim for financial compensation (Korinek 2005, pp. 14–15). But if she has to quit her profitable job or loses an inexpensive rented flat due to the relocation measure, she is not entitled to compensation for the financial loss suffered as a result. So even if certain expectations are in principle protected under constitutional law, this does not mean that there is always a right to compensation in the event of frustration.

The Moral Significance of Expectations

Suppose the state decided to resettle the residents of the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys. In the section "Expectations in Current Austrian Public Law" we argued that these residents' expectations to be able to continue to live in the valleys would receive some legal protection, but likely only to the extent to which they are associated with

fundamental legal rights. However, the law may fail to be morally justified as both so-called positivist (e.g., Hart 1961; Raz 1979) and nonpositivists (e.g., Finnis 1980; Dworkin 1986) acknowledge. If law is fallible in that sense, even though Expectation E might only be of limited legal significance, it could still be highly significant in a moral sense, i.e., in that it ought to be considered in assessing the moral rightness or justness of relocation policies.

Determining the extent to which Expectation E is morally significant requires a general theory of the moral significance, or legitimacy, of expectations. Building on prior work by Meyer and Sanklecha (2011, 2014), in this paper we focus on the particular kind of expectations that we believe Expectation E belongs to: expectations that are (1) to some extent generated by the state (as will become clear soon, the state has influenced Expectation E both in behavioral and communicative terms); (2) whose fulfilment is (largely) under human control (it is the legislator who decides whether and how to relocate the residents of our study areas); and (3) whose content gives rise to much political disagreement, yet at some point a decision about the matter must be reached [for controversies about past or ongoing relocations in Austria see Ettinger (2015)].

We will propose that expectations of this kind are legitimate if and only if they fulfill certain epistemic conditions (they must be based on good epistemic reasons) and certain justice-related conditions (they must fulfill certain constraints of procedural justice). For each of these conditions we will argue that Expectation E likely fulfills them to at least some extent. Thus, the expectation is at least somewhat morally significant, i.e., it ought to be considered in assessing the moral rightness or justness of relocating the residents of the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys.

Epistemic Conditions

A first condition that any expectation must fulfill in order to be morally significant is that it is epistemically sound, i.e., based on good epistemic reasons (Meyer and Sanklecha 2011, p. 4; Meyer and Sanklecha 2014, pp. 453–454; Moore 2017). Suppose a person wakes up and for no good reason believes that he will be given EUR 50 million by the state of Austria. When he approaches officials, they decline to give him the money. Does the state owe this person an explanation, or an apology, or maybe even compensation for the frustration of his expectation? Quite obviously, the answer is no; for the person had no good reason to expect that he would be given the money (Meyer and Sanklecha 2014).

So when does a person have good epistemic reason to expect that her expectation will be fulfilled by the state? In our view, this mainly depends on (1) the state's behavior, and (2) the state's communication with regard to this expectation. In both of these ways states can generate reasons for or against having an expectation. Sometimes these reasons may conflict. In any case, what counts is their overall balance, i.e., in order for an expectation to be epistemically sound states must (behaviorally and communicatively) provide stronger reasons to have this expectation than reasons to not have it.

It also bears mentioning that certain communicative acts can defeat behavioral reasons (e.g., a state sincerely announcing the discontinuity of past behavior) and certain kinds of behaviors can defeat communicative reasons (e.g., a state continuously failing to live up to its promises). In actual practice there is hence a close evidentiary relation between the two conditions.

Behavioral Condition

The behavioral condition concerns extrapolations from states' past behavior into the future. Suppose a person has good reason to believe that the state realized some state of affairs in the past, and lacks good reason to believe that the circumstances will change in such a way that the state will cease to be motivated or able to realize this state of affairs in the future. Then the person has a pro tanto reason (i.e., a reason that can be overridden by opposing reasons) to expect that this state of affairs will actually be obtained (Meyer and Sanklecha 2011, p. 454).

Is this condition fulfilled in the case of Expectation E? That is, do residents of our study areas have good reason to believe that the state provided them with a level of natural hazards protection, aid, and relief that allowed them to continue to live in their valleys in the past, while at the same time lacking good reason to believe that the state will cease to be motivated or able to do so in the future?

The first part of this question admits of a relatively uncontroversial positive answer. As a matter of fact, the state has enabled continued residency in the past, at least for the overwhelming majority of residents (see PR). However, one might object that residents of our study areas do have reason to doubt that the state will do so in the future as well. As reported in the section "Results Regarding Expectation E" (see AS and CO), and as reemphasized in the section "Further Results" (Q1 and Q2), most residents are well aware of climate change, and of the fact that climate change will increase the frequency and intensity of certain kinds of natural hazards in our study areas. This increase will come along with increasing costs for natural hazards protection, aid, and relief—costs that at some point might become so high that the state no longer wants to or can bear them. Thus, it might seem that residents have good reason to regard extrapolations from the state's past natural hazard-related behavior into the future as invalid.

However, while we do not doubt the existence of such reasons, residents likely also have reasons to believe that (increasing natural hazards notwithstanding) the state will continue to be motivated and able to provide protection, aid and relief. These reasons might well be stronger than the former.

Costs for natural hazards protection, aid, and relief will not only increase in the future; they have already significantly increased in the past. For example, from 2002 to 2019 respective investments by the state of Austria, the province of Styria and various interest groups (communities, water cooperatives, road administrations, and the Austrian Federal Railway) increased from EUR 125.38 million to EUR 169.49 million (Fig. 7) (Bundesministerium 2020). These sharply increased investments have enabled residents to continue to live in our study areas; and as will be shown in the next section, state officials have not announced any future-related information that the state will not continue to provide the required

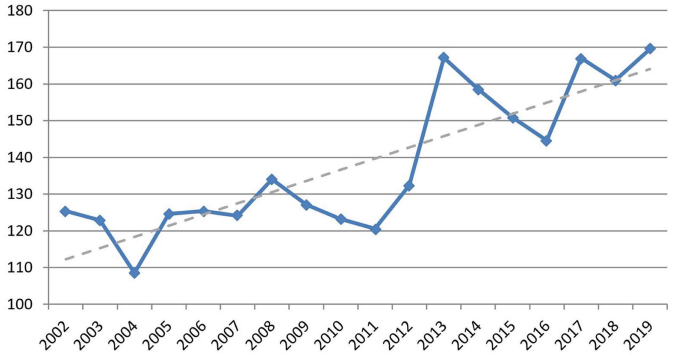

Fig. 7. State, federal, and interest group spending on natural hazards in million Euros per year. (Data from Bundesministerium 2020.)

measures. So why assume that further increases in costs will change the state's motivation?

Certainly, even in 50 or 100 years it will not be impossible for the state to fund adequate protection, aid, and relief in any strict fiscal sense of the term, given the low proportion that natural hazards make up in the overall Austrian gross domestic product (around 0.5‰ over the last two decades) (Statistics Austria 2020). A more reasonable concern is that at some point these measures will cease to be politically feasible, i.e., a majority of citizens would oppose respective legislation through voting behavior, protests, etc. However, so far there has been little public discussion of natural hazards budgets, and, again, it is likely to remain only a miniscule part of the state's overall budget. Thus, even in the more contentious upcoming post-Covid19-pandemic budget disputes it seems likely that these measures remain politically feasible despite their considerably higher costs.

As we will see subsequently, the state has also made statements to the effect that it will likely be motivated and able to continue to guarantee residency in the future, and it has not made any statements to the contrary.

Communicative Condition

A second potential source of the epistemic soundness of expectations is communicative. Sometimes states express (in a broad sense of the term) that they will ensure the fulfillment of an expectation, i.e., that they will (continue to) realize some state of affairs (Brown 2017). Suppose a person has good reason to believe that this is the case; and suppose further, that the person has good reason to believe that the state is sincere, i.e., that it will act in accordance with what it expresses, and that it is able to do so. On this basis the person would be given a pro tanto reason to expect that the state of affairs will obtain, and her expectation would be epistemically supported.

Again, we think that when it comes to Expectation E this condition is met to a large extent. In the last section we have already argued that the residents of our study areas have good reason to believe that the state is able and motivated to ensure continued residency. In addition, residents also have good reason to believe that the state, in some form or another, has expressed that it will do so. An important part of this communication is juridical. For example, current hazard zone plans still permit building new houses in various regions of our study areas; and even though it is generally understood that these plans are subject to changes, including abrupt changes, state officials have not yet (to our knowledge) suggested any comprehensive construction prohibitions for the foreseeable future.

Furthermore, state officials have sometimes stated or implied the very contrary, i.e., that the valleys will *not* be subject to relocation. This sentiment is most pronounced at the local level where, in our interviews and other conversations, we found it expressed by several municipality officials. Our research in local newspapers showed that even federal officials have made statements to this effect. For example, former federal governor Franz Voves stated that St. Lorenzen will remain a "permanent settlement area" and that resettling its residents is "not being considered"; former federal government member Gerhard Kurzmann is quoted as stressing that residents are generally helped very quickly following natural hazard events [October 31, 2013 (Kleine Zeitung 2013)]; and the federal government also stated that there "can be no question of" construction prohibitions or relocations from St. Lorenzen and other communities, and that instead further flood retention basins and dams against mudslides should be built [July 24, 2012 (Kleine Zeitung 2012)].

Conversely, we did not find any explicit statements of officials to the effect that relocations will in fact be necessary or likely, and hence Expectation E will have to be given up. In the past the state also has not acted in contradiction to its natural hazard related announcements, and generally speaking, announcements by Austrian officials have proven to be sincere.

Justice-Related Conditions

In the last two sections we have argued that the expectation to be able to continue to live in the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys shows a high degree of epistemic soundness. But, of course, not any epistemically sound expectation is morally significant. Suppose a person has cheated on her income taxes for many years. Before she files her tax return, she checks whether authorities have increased controls beyond their past low level, and is relieved to find that they have not. So she develops an expectation that she will get away with cheating on her income taxes this time too. This expectation is epistemically sound, i.e., the person has good reasons for holding it. Yet, we would still say that the expectation does not count in a moral sense. This is because the expectation lacks the right connection to justice.

Scholars widely disagree about which particular justice-related condition must be fulfilled for an expectation to potentially count as morally legitimate (e.g., Bentham 1931; Buchanan 1975; Rawls 1999). Here we assume a condition labeled the *complex justice view* (Meyer and Sanklecha 2014, pp. 11–19). On the complex justice view, only those epistemically sound expectations qualify as morally legitimate which meet substantive constraints of pure procedural justice (Rawls 1999)—constraints that involve, at the very least, (1) impartiality, and (2) consistency with one's general views about justice (Meyer and Sanklecha 2014, pp. 17–18).

Impartiality

First, the moral legitimacy of a person's expectation requires that this expectation is based on impartial considerations, i.e., it must not be the case that the person has the expectation because she gives her own (or her family's, friends', etc.) interests more weight than the interests of others. One likely reason for the fact that the previous person's expectation to not get caught in cheating on her income taxes is morally insignificant, for example, is that she would not want for all or most or at least some other people to cheat on their income taxes, even if these people were in similar circumstances. Rather, she makes an exception for herself.

In contrast to the previous person's expectation about cheating on her income taxes, it seems likely that residents' Expectation E is in fact held on impartial grounds. Residents of our study areas do not just think that they themselves ought to be enabled to continue to live in this area; they extend this demand to other people in similar circumstances too. This is particularly suggested by the interview data that was reported in response to Q3 and Q4, and especially by participants' appeal to the value of equality. To reemphasize, some participants explicitly stated that natural hazards protection, aid, and relief is to be distributed equally across endangered areas, and that not only rural infrastructure is to be guaranteed and maintained but urban one as well. Conversely, none of the interviews gave any indication that participants held their expectation of continued residency on grounds of partiality.

Needless to say, our study designs do not allow us to rule out that some participants were insincere in reporting their putatively impartial views about state funding. But in the absence of reasons to think so—and we do not see such reasons—we appear to be justified to conclude that with most residents, Expectation E fulfills the first of our justice-related conditions.

Consistency

In addition to the impartiality condition, in order for an expectation to be morally legitimate it must also be consistent with one's general views about justice. Suppose the person in the previous tax cheating example, expecting not to be caught in cheating on her income taxes, held that whatever else justice requires, first and foremost citizens are equally obliged to comply with legitimate legal regulations. Assuming that the tax regime in place is legitimate beyond reasonable doubt by cheating on her income tax the person actively acts contrary to what justice requires of her, according to her own understanding. Given this inconsistency, it again seems that the person's expectation cannot qualify as morally significant.

Residents of our study areas expect that the state provides a level of natural hazards protection, aid and relief to them that allows them to continue to live in these areas. As suggested by our data (in particular by RE and Q3), this expectation fits quite well with residents' beliefs about justice. Many of them think that providing these measures is (based, for example, on the value of equality) just—it is partly or mainly the state that is responsible, especially when it comes to prevention, aid, and relief. Yet, at the same time many participants acknowledged some degree of personal responsibility as well, especially when it comes to protecting one's health, life, and property.

Conclusion

The question of expectations' moral significance is complex and philosophically controversial. Starting from one plausible theory in this area [proposed by Meyer and Sanklecha (2011), (2014)] it is likely that residents' expectation to be able to continue to live in our study areas is morally significant when the moral rightness or justness of relocating them is being assessed. Their expectation gives the state a moral reason *not* to relocate them or, if relocation cannot be avoided, to compensate them to a larger extent than would otherwise have been morally required. This is the case, first, because residents' Expectation E is legitimate. They have good epistemic reasons to hold that expectation (the state has provided natural hazards protection, aid, and relief in the past with no signs of changes in motivation or ability, and it has sincerely expressed that it will do so in the future), and their Expectation E appears to fulfill certain justice-related conditions (it is based on impartial considerations and does not seem to be in obvious conflict with other justice claims that residents affirm). Second, the frustration of important legitimate expectations is seriously harmful. Expectation E clearly belongs to the important expectations as often people's very possibility of continuing with their way of life will depend on the fulfillment of the expectation.

Conclusion

This study addressed the possibility of relocating the residents of the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys in the context of these residents' expectations about such relocations. We found that (1) many residents expect that in the next decades the state will provide them with a level of natural hazards protection, aid, and relief that allows them to continue to live in these valleys; (2) this expectation receives some legal protection when it is associated with fundamental rights; and (3) the expectation is morally significant, i.e., it ought to be considered in assessing the moral rightness or justness of relocation policies.

The previous results first and foremost seem to have important legal policy implications. That a law fails to fully protect the moral claims of those who are subject to the law constitutes a pro tanto reason to change that law. So the finding that Expectation E is morally significant and at best partially protected by law suggests that this expectation deserves stronger legal protection than it has so far received. That said, all things considered, the state may still be morally justified in frustrating Expectation E, i.e., in relocating residents of our study areas. This would be the case if guaranteeing safe continued residency were impossible or economically feasible only at the cost of not fulfilling clearly more important moral claims of its residents or citizens. For example, the state of Upper Austria may have been justified to strongly incentivize relocations in the flood-prone Machland and Eferdinger Becken areas by offering residents 80% of the estimated value of their houses (see Rohrhofer 2012, 2015); and the Swiss municipality of Weggis may have been justified to enforce relocations of five households to save them from imminent rockslides (20 Minuten 2014).

Even under the plausible assumption that continued residency will remain possible and feasible (see Section "Behavioral Condition") and will not come at the prize of the state not fulfilling other important claims, states legitimately can make decisions which morally legitimate expectations or other ends should be given priority (under circumstances in which they cannot meet all of them fully).

However, one thing is for sure, if the state regards relocations as a highly likely option (even if only in the far future), then this needs to be communicated as clearly and as early as possible and with the aim of communicating the implication that people's Expectation E is no longer valid. If the state considered relocations as necessary (and legitimate) measures in the foreseeable future, the state should officially communicate this to those possibly affected, providing information on the risk of settlement in this area, and perhaps restrict general subsidies such as the existing general housing subsidy. By doing so it will decrease the legal and moral legitimacy of these people's expectations of continued residency. This will enable residents to adapt their long-term plans at lower costs than in the case of abrupt relocations. For example, residents may decide against opening a new rafting business and instead pursue a business or profession that is less locally fixed, and by having time to get used to the thought of relocating the resulting psychological harm may be significantly decreased as well.

Finally, let us also briefly discuss the generalizability of our findings. In our view, investigations into the nature and legitimacy of expectations are relevant to all contexts in which states generate these expectations (typically through laws). Such contexts can range from nighttime driving bans for certain kinds of trucks to safety regulations for corporations to cases such as ours, i.e., potential resettlements. In each case the question of whether expectations have in fact been generated in people is to be addressed by surveys, interviews or other empirical means that are suitable for the case. The expectations' legal significance will depend on the laws of the respective states as well as, potentially, on international law (such as, in our case, on the European Convention on Human Rights). Conversely, our criteria for the *moral* legitimacy of expectations purport to hold universally. For example, they would also be relevant to investigating expectations regarding nighttime driving bans for trucks in Italy. Only the question of whether the criteria in fact apply to a particular case (i.e., whether the expectations at issue are sufficiently epistemically justified and just) must again be answered on the basis of empirical evidence that is specific to the respective case.

In our study we did not gather empirical evidence about any expectations beyond Expectation E. We hence are not in a position to make judgements about the nature or legitimacy of other expectations. That said, we are fairly confident that our previous geographical, legal, and ethical results likely extend to resettlement questions with regard to many other (Austrian) alpine areas as well.

Many of these areas are more densely populated and stronger in tourism. Today many of them are less exposed to natural hazards than the Sölk valleys, the Johnsbach valley, and the St. Lorenzen/Schwarzenbach valleys. The expectations of residents to be able to continue to live in these areas are hence likely even more widespread, and at least equally morally significant. This will become relevant when the costs of providing the required protection against natural hazards in these areas increases (due to climate change) and the state is likely to face similar questions of weighing the fulfillment of legitimate expectations of continued residency and business activities and citizens' other justice claims.

Even more generally, we think that our study highlights that residents' expectations can matter in decisions about potential relocations, and that there is thus a need to investigate and consider these expectations—more so than has so far often been done.

Data Availability Statement

All data generated or used in this study are proprietary or confidential in nature and may only be provided with restrictions (e.g., anonymized data) upon reasonable request. These include interview data that may only be provided as anonymized to protect the confidentiality of the information shared.

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