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Authors: Joshi, Neelakshi, Wende, Wolfgang, and Tiwari, Prakash C.

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Urban Planning as an Instrument for Disaster Risk Reduction in the Uttarakhand Himalayas

***Neelakshi Joshi*[1]*, *Wolfgang Wende*[1,2], *and Prakash C. Tiwari*[3]**

** Corresponding author: n.joshi@ioer.de*

[1] *Leibniz Institute of Ecological Urban and Regional Development (IOER), Weberplatz 1, 01217 Dresden, Germany*
[2] *Faculty of Architecture, Technische Universität Dresden, Zellescher Weg 17, 01062 Dresden, Germany*
[3] *Department of Geography, Kumaun University, Nainital-263 001, Uttarakhand, India*

Because of its location in the Indian Himalayas, the mountainous state of Uttarakhand is prone to multiple natural hazards and climate change extremes. At the same time, Uttarakhand is experiencing unprecedented population growth and undergoing rapid urbanization. Urban planning instruments like land use plans and building regulations allow disaster risk measures to be integrated in the rapidly emerging urban form. However, resources for formulating and implementing planning instruments might be limited in mountain urban centers. This paper takes stock of the risk addressed in the urban planning instruments at state and local levels through an analysis of land use plans and interviews with urban planning and disaster risk professionals. Results indicate that planning instruments are largely absent and do not sufficiently address urban risks. Lack of urban planning capacity at state and local levels, absence of local-level risk knowledge, and public pushback against introducing developmental regulations are identified as the primary constraints to addressing risk. We underline the urgent need to address risk in the urban development process and recommend broader engagement with universities and nongovernmental organizations to supplement existing knowledge and capacities.

Keywords: *Himalayas; urbanization; urban planning; disaster; risk.*

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Risk and urbanization in the Uttarakhand Himalayas

Population growth and urbanization are recognized as demographic megatrends with major implications for economic, social, and environmental sustainability across the globe (UN 2019). Although urbanization is often associated with improving the socioeconomic wellbeing of people, its large concentration in low-income regions of the world is overwhelming local planning capacities. This results in problems of sprawl, pollution, and environmental degradation (Bicknell et al 2009; UN 2015). Urbanization is thus emerging as a key driver of disaster risk (Wisner et al 1994; Pelling 2003; UNISDR 2015; Oliver-Smith et al 2017). Furthermore, unplanned urbanization is unfolding as climate change is increasing the frequency and intensity of extreme weather events affecting urban centers (Revi et al 2014). In this paper, we discuss the urban growth unfolding in the Indian Himalayan state of Uttarakhand as a case in point.

Uttarakhand is 1 of the 12 constituent states of the Indian Himalayan region. It was carved out as a separate state in November 2000 with the aim of addressing the aspirations and developmental needs of the mountainous regions (Dikshit 2008). Table 1 compares the total and urban population growth in the Indian Himalayas and Uttarakhand over the last 2 decades. Furthermore, population projections for the coming decades indicate that the population in Uttarakhand will grow to 12.5 million by 2031, with 4.9 million urban residents (National Commission on Population 2011).

The rapid urban growth in Uttarakhand is a cause of concern because of its geographical location and susceptibility to multiple natural hazards, such as earthquakes and landslides (USDMA 2015). Climate change adds another level of complexity to the problem through a rise in mean temperatures and changes in precipitation patterns in the region (Kohler et al 2014). The state recorded extreme rainfall events in 2010, 2012, and 2013, followed by flash floods and cloudbursts, which resulted in loss of life and infrastructure (Kala 2014; Satendra et al 2015). These events prompted negotiations and discussions by the state government on disaster risk and climate change impacts in the state (Government of Uttarakhand 2012). Furthermore, they started the debate on the role of human agency in amplifying the magnitude of losses because of unplanned development (Sati et al 2011; Haigh and Rawat 2012).

Urban centers in Uttarakhand are highly vulnerable to socionatural hazards, because they have been built in an area predisposed to multiple natural hazards and do not adhere to building regulations prescribed for the region (Anbalagan 1993; Rautela 2005). Hazards become socionatural when existing hazards, such as earthquakes, are intensified because of anthropogenic factors, such as landscape modifications (UNISDR 2009; Oliver-Smith et al 2017). New development has extensively modified the mountainous terrain to create flat land for construction (Pushpa and Joshi 2016). Figures 1

TABLE 1 Population growth in the Indian Himalayas and the state of Uttarakhand, 2001–2011.

Area	Total population (in millions)		Urban population (in millions)		% Urban
	2001	2011	2001	2011	2011
Indian Himalayas	38	46	8.5	12	26
Uttarakhand	8.5	10.1	2.1	3	30

Source: Office of the Registrar General & Census Commissioner 2011.

and 2 illustrate the nature of urban development in the towns of Nainital and Almora in Uttarakhand. These developmental practices have, in turn, increased the disaster risk vulnerability of urban centers (Rautela 2005). Urban planning, and its realization through land use plans and building regulations, provides an opportunity to integrate long-term disaster reduction and climate adaptation goals at the local level (Pelling 2003; Wende et al 2010; UNISDR 2015). Municipalities are identified as key stakeholders in this process (Ministry of Urban Development India 2015). However, municipalities, particularly in the Himalayas, remain severely constrained in their financial and technical capacities to address urban risks (Dodman et al 2013; Masson 2015; Rumbach 2016; Rumbach and Németh 2018).

In this paper, we aim to provide a contextual overview of the possibilities and challenges of urban planning instruments in addressing disaster risk in Uttarakhand. Furthermore, we quantify the deficit in land use plans across mountain urban centers and identify the reasons for their absence. We conclude with suggestions of ways to address these deficits and improve land use urban planning processes. The state of Uttarakhand was purposively selected for detailed study because it has had a recorded high population, as well as urban growth, in the last decade (Office of the Registrar General & Census Commissioner 2011).

Urban planning and disaster risk reduction

Existing research to address risk in Himalayan urban centers through planning instruments calls for improving and contextualizing land use planning (Rautela 2005; Kumar and Pushplata 2013; Kala 2014). Land use plans are an opportunity to translate national- and regional-level guidelines into local-level action (Wende et al 2012), as well as to build resilience against climate change in the urban building stock and infrastructure (Hutter et al 2021). Land use plans coupled with context-specific building regulations can help address disaster risk (World Bank 2015; Zimmermann and Keiler 2015). Risk-sensitive land use planning is an instrument for prospective disaster risk reduction by avoiding the creation of new risk (UNISDR 2009). In India, national-level guidelines exist to ensure that urban development in mountain areas is responsive to the terrain and addresses disaster risk reduction (Ministry of Urban Development India 2015). Researchers have also attempted to include socioeconomic factors like the cost of land and road access, in addition to natural factors, to provide comprehensive land use plans (Kumar and Shaikh 2013). Building regulations are a second tool for municipalities to address disaster risk in the built form (World Bank 2015). At the national level, model building bylaws have been formulated by the Ministry of Urban Development, with a special section on hill areas (Ministry of Urban Development India 2016). These focus on mountain topography and hazards inherent to the region (eg earthquakes, landslides, and cloud bursts) and are intended to be guidelines for the municipalities.

Although land use plans and building regulations present an opportunity to integrate disaster risk knowledge into the urban planning process, drafting and implementing these requires human and financial resources that might be constrained in the Himalayan urban centers (Nüsser et al 2015; Rumbach and Németh 2018; Joshi 2021a, b). Where resources are available, they might be allocated to pressing needs like waste collection and water provision against preparing and implementing long-term planning documents (Dodman et al 2013). Furthermore, remote Himalayan municipalities might be low on the priority of state- and national-level planning bodies (Rumbach 2016; Wang et al 2019). Here, the size of the municipality plays a role in determining both its internal capacity to address risk

FIGURE 1 Mountain urban center of Nainital, Uttarakhand. (Photo by Neelakshi Joshi)

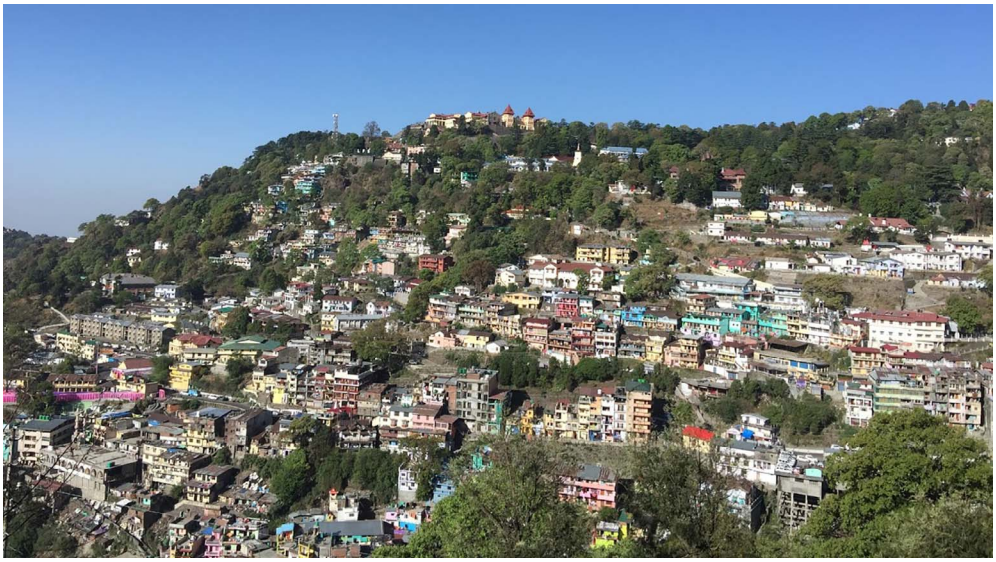


FIGURE 2 Mountain urban center of Almora, Uttarakhand. (Photo by Neelakshi Joshi)

through land use planning and its access to state and national resources (Rumbach 2016; Birkmann et al 2016). Besides the technical capacities needed to draft land use plans and building regulations, their implementation is inherently a political process that requires local consensus building (Tierney 2012; Masson 2015) and cooperation among multiple agencies and departments (Renn and Klinke 2013; Lavell and Maskrey 2014; Murray 2017).

Within the Indian urban development context, municipalities are responsible for land use planning in their constituent urban centers with assistance from state-level authorities. The 74th Amendment Act of 1992 brought about decentralization in urban planning in India by giving municipalities the power to collect their own taxes and make their own developmental plans (Hamid 2004). Of the 18 subjects delegated to the municipality, regulation of land use and construction of buildings is top of the list (Government of India 1992). However, implementation of the 74th Amendment Act has been criticized in India, because it has not been followed by efforts to bolster the financial and technical capacity of local bodies (Hamid 2004; Bardhan and Mookherjee 2006). The case of Uttarakhand is further complicated because the devolution of power has not been complete and most functions still lie with state-level authorities (Jha 2018). This presents a difficult situation in which the municipalities have the responsibility to govern without the necessary capacity to do so (Rumbach 2015). This is evidenced by an absence of land use plans, weak building regulations, and weak implementation, which is resulting in unplanned urban development unfolding in the Uttarakhand Himalayas (Sah and Pande 1987; Rautela 2005; Hewitt and Mehta 2012; Tiwari and Joshi 2012; Pushpa and Joshi 2016).

Although the municipalities have a central role in urban planning, disaster risk reduction agencies can be potential partners in integrating risk knowledge into the urban development process (Renn and Klinke 2013; Lavell and Maskrey 2014; Murray 2017). Furthermore, engaging local-level stakeholders like nongovernmental organizations (NGOs) and academic experts could help overcome some resource and knowledge challenges in the urban development process (Dame et al 2019; Kovács et al 2019; Joshi 2021a).

Building off existing research on urban planning as an instrument to address disaster risk in Uttarakhand in particular and the Himalayas in general, we quantify the deficit in urban planning instruments across mountain urban centers in Uttarakhand and explore the reasons for their absence. We conclude by providing some recommendations on how to address these deficits.

Methods

To quantify the deficit in land use plans across mountain urban centers in Uttarakhand and explore the reasons for their absence, we adopted a mixed methods approach. We first established the general characteristics of mountain urban centers based on Census of India data from 2011. Population and location were used to define and identify mountain urban centers. We then measured the quantitative availability of land use maps in mountain urban centers. For this, we used the land use maps available publicly on the Uttarakhand Housing and Urban Development Authority's website (UHUDA n.d.). Furthermore, we assessed the integration of disaster risk reduction measures in these plans against the national-level guidelines (Ministry of Urban Development India 2015). These include assessment of geology, soil, slope, and flora and fauna and an indication of climate and vulnerability to natural hazards for preparing land use plans.

To understand the reasons behind quantitative and qualitative deficits in land use planning, we conducted

TABLE 2 Classification of urban centers in Uttarakhand based on size.

Population range	Urban centers		Mountain urban centers	
	No.	% Population	No.	% Population
>50,000	12	57	1	12
5000–50,000	89	41.8	26	81.5
<5000	14	1.2	12	6.5
Total	115	100	39	100

Source: Based on Census of India 2011.

qualitative semistructured interviews at the state and local levels. At the state level, we interviewed 3 government town planners working at the Town and Country Planning Office (TCPO) and 1 administrative officer at the UHUDA regarding challenges in drafting land use plans. Because our research focused on disaster risk reduction, we also interviewed 1 disaster management expert at the Uttarakhand State Disaster Management Authority (USDMA). Here, the focus was on the availability of disaster risk knowledge and its integration in the urban planning process. Because municipalities are key actors in preparing and executing urban planning measures, we interviewed 2 municipal employees in the mountainous town of Almora in Uttarakhand.

Almora is a ridge town located at 1651 masl between 29°05′16″N to 29°17′28″N and 79°24′07″E to 79°37′05″E (Rawat et al 2013). It has an urban population of 34,122 people (Census of India 2011). Almora is experiencing rapid population growth and consequent urban development (Rawat et al 2013; Pushpa and Joshi 2016). This rapidly emerging urban development is highly vulnerable to disaster (Grainger et al 2021) and is taking place in the absence of land use planning (Joshi 2021b). Almora was selected as a typical case (Seawright and Gerring 2008; Yin 2015) because of its mountainous terrain, growing urban population, and absence of a land use plan. Furthermore, the willingness of municipal employees to participate in this research played a role in finalizing the case selection among urban centers in Uttarakhand. Municipal employees were asked about the challenges in drawing up land use plans, as well as in integrating disaster risk knowledge within these plans. Municipal employees in Almora further pointed us toward:

- The Centre of Excellence for Natural Resources Data Management System (COENRDMS), situated within the Geography Department of Almora University;
- Uttarakhand Environmental Education Centre (UEEC), a local NGO.

The municipality had collaborated with these organizations in creating spatial maps and communicating the impacts of unplanned urban development, respectively. We contacted these institutions regarding their experience of the process. Finally, we triangulated the qualitative information gathered in the interviews against existing developmental regulations at national and state levels (Ministry of Urban Development India 2015; Government of Uttarakhand 2016), as well as information available on the public websites of the interview partners.

We collected online data for the research from September to December 2016, and the in-person interviews took place between February and April 2017 in Almora and Dehradun. Because most mountain municipalities (with the exception of Nainital and Mussoorie) in Uttarakhand do not have public websites, it was challenging establish initial contact to determine the local planning instruments available, as well as to gauge the willingness of staff members to participate in the research before initiating fieldwork.

Findings and discussion

Number, location, and size of urban centers

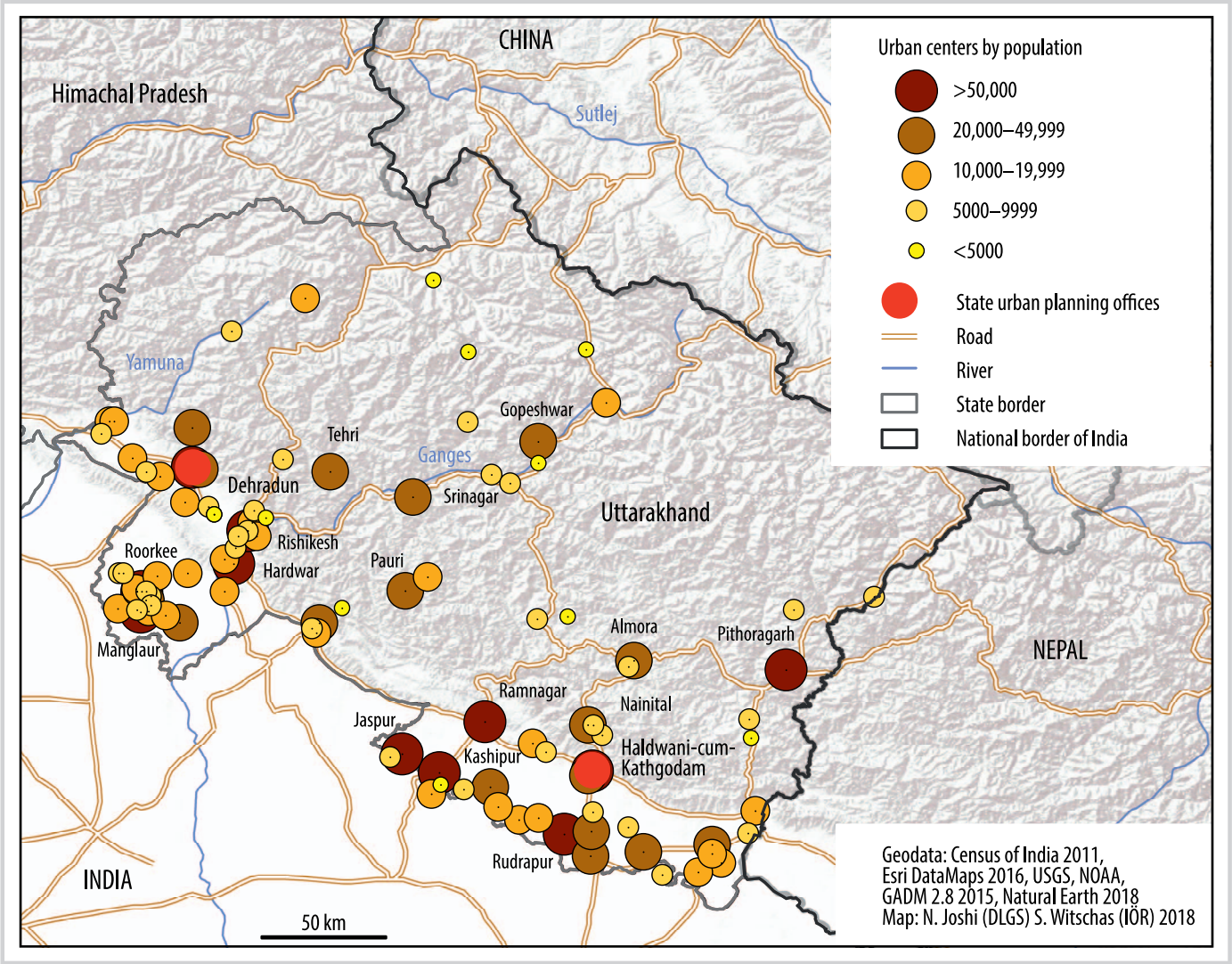
In Uttarakhand, an analysis of the number of urban centers, their location, and their size was performed based on Census of India 2011 data with the objective of establishing their basic characteristics. The census identified 115 urban centers (Office of the Registrar General & Census Commissioner 2011). These centers were spatially located, along with their sizes, on a map of Uttarakhand (Figure 3). The map shows that most urban centers (76 in total) are in plains areas (elevation <600 m: in the Indian planning context, areas above 600 m or with an average slope of more than 30° are defined as hilly and have special planning recommendations; Ministry of Urban Development India 2015). A total of 39 urban centers are in mountainous areas (indicated by the hilly terrain shading in Figure 3).

The state-level planning bodies—UHUDA and the TCPO—are located in Dehradun, the capital of Uttarakhand, whereas the regional-level TCPO is located in the city of Haldwani (the location of all these planning bodies is indicated by red dots in Figure 3). Neither of these cities is in a mountainous area, and they are spatially closer to the dominant urban development taking place in the plains areas of the state. This creates a problem of distance, both political and spatial (Rumbach 2016), for mountainous urban centers' visibility in the state-level urban planning discourse.

In terms of size, at the state level, there are more small cities (in the Indian planning context, urban centers with a population of fewer than 50,000 people are classified as small; Ministry of Urban Development India 2015), but a large share of the population still resides in cities with a population greater than 50,000 (Table 2). Mountainous urban centers display a different trend. Here, small cities dominate in both number and population. The literature suggests that small cities have additional challenges in addressing disaster risk reduction, because they are often limited by their financial and technical capacities (Dodman et al 2013; Birkmann et al 2016; Joshi 2021a). In the case of Uttarakhand, this is 81.5% of the total urban population, making small cities the dominant urban typology in mountain areas.

In the last decade, the national government has introduced 2 schemes to develop capacity through investment in basic services, namely, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT). This has meant additional municipal funding for 3 municipalities in Uttarakhand under JNNURM and 7 municipalities under AMRUT. Among the 39 mountain urban centers in Uttarakhand, only one town, Nainital, has benefited from both schemes (Urban Development

FIGURE 3 Uttarakhand urban centers: location and size. (Map by Neelakshi Joshi and Sabine Witschas)



Directorate 2019). Mountain urban centers thus appear to have low priority in the distribution of urban planning resources.

Missing land use maps

Land use maps available through UHUDA (n.d.) were analyzed based on the number of urban centers and population covered (Table 3). It was surprising to observe that of the 115 urban centers, only 18 had land use maps. Furthermore, land use maps are dynamic, are typically drawn for a period of 15–20 years, and require periodic updates (Ministry of Urban Development India 2015). Of these 18 land use maps, only 6 were updated and valid beyond 2020. In terms of population, this meant that only 32% of the state's urban population was covered by land use plans. This trend was then examined for mountain urban centers; of 39 urban centers, 9 had land use maps, of these 3 were updated and valid. As a share of the population, only 5% of the mountain urban population had land use plans.

Based on the low number of land use maps and their low population coverage, a large share of urban development, both at the state level in general and in mountain areas in particular, is happening without land use planning. This large absence of land use plans is indicative of a weak planning mechanism at the state level, as well as the local level. In mountain areas, this presents a worrying trend, because it indicates that urban development in risk-prone terrain is taking place without addressing the geophysical risks that are typically considered in land use planning. Furthermore, the existing land use maps have been drafted by the TCPO and transferred to the municipalities (UHUDA n.d.). This trend is indicative of the absence of municipal capacity to conduct local-level surveys and prepare land use maps. It is also an indication that the decentralization of the powers and functions of the municipality has not been coupled with increasing its capacity to address those functions.

In terms of addressing disaster risk in land use plans, national guidelines exist and provide a basic framework (Ministry of Urban Development India 2015). However, similar guidelines at the state level in Uttarakhand are conspicuous by their absence. This might be a lost opportunity, because the state is characterized by challenging mountainous terrain that calls for detailed guidelines to assist in the urban development process. Furthermore, an analysis of aspects addressed in the land use

TABLE 3 Number, status, and population covered by land use plans in Uttarakhand.

Urban centers	No. urban centers	Population size (% of total)	Land use maps	% Urban population covered	Valid land use maps[a)]	% Population covered with valid land use plans
Total urban centers	115	3,049,338 (100)	18	47	6	32
Plains urban centers	76	2,608,350 (85.5)	9	50	3	37
Mountain urban centers	39	440,988 (14.5)	9	32	3	5

Source: Based on UHUDA n.d.
[a)] Land use plans that are valid beyond 2020.

maps of the 3 hill centers valid beyond 2020—namely, Badrinathpuri, Bageshwar, and Gochar—provides classifications of residential, commercial, institutional, and green spaces (UHUDA n.d.). Land use maps divide residential areas into 3 density types of low, medium, and high. However, these land use maps fail to provide critical transparent information on microlevel hazard zonation, which is critical in driving the development choices of homeowners (World Bank 2015). Furthermore, they do not address the criteria set forth in the national-level guidelines in terms of geology, soil, slope, flora and fauna, and vulnerability to natural hazards (Ministry of Urban Development India 2015).

Based on an analysis of existing land use maps in Uttarakhand, there is a quantitative deficit of maps for mountain urban areas. Where these maps exist, there is a qualitative deficit in incorporating disaster risk information.

Challenges of land use planning in Uttarakhand: To understand why quantitative and qualitative deficits exist in land use planning in Uttarakhand, we draw from qualitative interviews with key informants. At the state level, urban planners pointed to the limited capacity for preparing land use plans, as well as limited local-level knowledge on risk.

In terms of capacity, key informants highlighted that for the 115 urban centers in Uttarakhand, the TCPO consisted of 1 chief town planner, 1 assistant, and 1 associate planner (Government of Uttarakhand 2021). Furthermore, there were 2 regional planners appointed for the Kumaon and Garhwal regions of Uttarakhand. In total, there were 5 designated urban planners at the state level for an urban population of 3,049,338 people. The urban planning guidelines in India (Ministry of Urban Development India 2015) provide a general outline for the constitution of the TCPO without indicating a ratio of planners to urban population in the state.

Speaking on the knowledge deficits regarding urban risks, one town planner pointed out:

> *For land use planning, not many studies are available. Landslide data for example. Whatever data was available we used it. We actually need microzonation maps and detailed geological surveys so we can propose land use plans accordingly.*
>
> (*TCPO employee, key informant interview, 17 April 2017*)

In addition to the TCPO, the USDMA is a nodal agency for disaster prevention and management. Speaking on the problem of integrating disaster risk information into land use plans, an employee pointed to the problems of coordination of different agencies:

> *Agencies have to work in tandem … it is ad hoc in nature at the moment. There are several other plans for drainage, sanitation* etc. *They should be synced with other departments.*
>
> (*USDMA employee, key informant interview, 17 April 2017*)

The town planning capacities at the state level are to be substituted by local capacities at the municipal level (Ministry of Urban Development India 2015). However, most mountain municipalities do not have designated town planners. The scale of this exact deficit is difficult to establish, because most municipalities do not have websites with publicly available information. Interviews with municipal officials in the town of Almora confirmed that the municipality did not have the in-house technical capacity to make a land use plan, because there were no urban planners or architects employed at the municipality at the time of this research. The local municipality, in turn, reached out to an already-stressed state planning department with little success:

> *We wrote several times to the (state) government for the newly developing areas. It is haphazard. There are no drains or proper roads. Town planners should come and survey the area.*
>
> (*Almora municipal employee, key informant interview, 20 February 2017*)

Some local-scale efforts to address gaps in risk knowledge do exist. COENRDMS, situated in the Geography Department of Almora University, was set up in 2003 with the primary objective of providing spatial support for local-level planning (Rawat 2013). COENRDMS has attempted to build the geospatial capacity of the Almora municipality by training its staff and setting up an in-house geographic information system (GIS) facility at the municipality. However, these foundered because the municipality did not have dedicated staff for this task and borrowing existing staff from the Building Development Department could not be sustained in the long run:

> *Training of GIS for employees began, but we could not spare our employees for long.*
>
> (*Almora municipal employee, key informant interview, 20 February 2017*)

The existence of resource centers like COENRDMS in Almora presents an opportunity to address the absence of a land use map at the local level. Land use maps can help to identify current risks, as well as predict future risk scenarios. However, land use maps were not integrated in the government process of land use planning, and the municipality did not participate proactively in the training process.

Besides the absence of local capacity and knowledge for land use planning at both the state and the local levels, a third aspect of public pushback to land use planning emerged in interviews at the local municipality in Almora. There have been multiple protests in Almora against previous attempts at land use planning and the creation of a district planning authority (Hindustan Team 2017; Amar Ujala 2019). Concerns include the increase in building regulations and taxes under the new land use plan. This adds a political dimension to the existing challenges of capacity and knowledge in introducing disaster-sensitive land use planning in mountain municipalities. Convincing citizens of the need for disaster-sensitive planning can potentially address some of these concerns. In the past, a local environment NGO, UEEC, has provided a public platform for municipal employees, citizens, and other local experts to discuss problems and solutions pertaining to urbanization in Almora (UEEC employee, key informant interview, 23 March 2017).

Weak implementation of building regulations: Alongside land use plans, building regulations play an important role in addressing disaster risk in the built environment. The state of Uttarakhand has building regulations that emphasize the peculiarities of the mountain terrain, as well as hazards (Government of Uttarakhand 2016). Again, these are intended to be guidelines for the local municipalities in formulating their own building regulations, drawing from state-level guidelines, as well as the local geological, climatic, and development contexts (Kumar and Pushplata 2013). However, as is the case for land use plans, municipalities have not been able to formulate building regulations and directly adopt the state-level regulations. The exact number of missing local bylaws was not available from the TCPO or the UHUDA at the time of this research. Missing local-level building regulations were attributed to capacity gaps:

> *There are several towns where there are no building regulations, so default state regulations prevail. Unfortunately, capacity does not exist in the local level to make these.*
>
> (*UHUDA employee, key informant interview, 25 February 2017*)

The mountain towns of Nainital and Mussoorie, whose building regulations are available on the Internet, are taken as a successful example of integrating local geographical challenges and natural hazards (Kumar and Pushplata 2013). However, smaller towns like Almora fall short of incorporating basic features, such as retaining walls to protect against landslides or earthquake safety measures (Joshi 2021b).

The second challenge of municipal governance related to building regulations is their implementation. Here again, the municipalities exhibit low capacity for implementation because of a gamut of issues from corruption to absence of legal mechanisms to enforce regulations (Rautela 2005; Kumar and Pushplata 2013). This is visible in height violations in the cities of Nainital and Mussoorie that have well-formulated regulations but struggle with their implementation (Rautela 2010). Weak implementation of building regulations was also highlighted by large-scale losses in the town of Kedarnath in 2013 when heavy rainfall washed away houses built on the riverbank, an area where permanent buildings were prohibited (Kala 2014). Studies from other parts of the Himalayan region share similar experiences of the vulnerability of built stock to natural hazards, where buildings have been constructed without adopting risk reduction measures prescribed for the built environment (Anhorn et al 2015; Rumbach and Follingstad 2019). Furthermore, the fines imposed for violation are typically as low as INR 1000 (~US$ 13.50; Joshi 2021b). The low level of building regulation implementation is a second indicator of low municipal capacity and is associated with increased vulnerability of the built environment to hazards or weather extremes.

Conclusion and future direction of research

This paper discusses the intersection of rapid urbanization and disaster risk in the mountainous state of Uttarakhand in the Indian Himalayas and its relevance for urban planning. We point to the absence of land use plans and the limited capacity at state and local levels to draft such plans. We also highlight some challenges in terms of limited risk knowledge and public pushback at the local level against land use planning and building regulations. With deficits in both top-down and bottom-up planning mechanisms, we highlight efforts made by a local university and an NGO to address some capacity and knowledge deficits.

Although urban planning provides tools on how to address urban risk, it misses out on who should do this and in what capacity. This question is especially relevant in the small-sized urban centers in Uttarakhand that are experiencing large-scale urbanization with little or no municipal capacity to address it and low priority on the state urban developmental agenda. In this developmental scenario, there is a need to explore alternative methods and actors that might help fill capacity and knowledge deficits around risk and urban development. Engagement with universities and NGOs to supplement existing local knowledge and capacities to address urban risks is recommended as a possible step in this regard. However, in some cases, nongovernment actors might find themselves constrained by similar capacity and financial considerations (Jones et al 2014; Rumbach 2016; Joshi 2021a).

A concurrent reflection on both the quantity and the quality of land use plans is needed at the state and local levels in Uttarakhand. There is an urgent need to develop land use planning guidelines for mountain areas at the state level upon which local-level knowledge inputs can build. There is also a need to raise public awareness about the risks associated with urban development and for citizens to demand reliable risk information and knowledge.

This paper draws from the Census of India data from 2011. With new decadal data projected to be released in early 2022, a comparative analysis of population trends versus developmental controls would be helpful in understanding the developmental trends in Uttarakhand, as well as in other Himalayan states. Furthermore, because most small-sized mountain municipalities in the Himalayas do not have publicly available information on their land use plans or building regulations, detailed case studies and fieldwork are needed to establish the magnitude of knowledge and capacity deficits to address risk in the rapidly emerging mountain built form.

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