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Vernacular Heritage as a Response to Climate: Lessons for Future Climate Resilience from Rize, Turkey

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Abstract: Vernacular heritage is undergoing rapid changes caused by the effects of the changing climate, such as loss of lands, biodiversity, building materials, integrity, traditional knowledge, and maladaptation. However, little is known about the causes of deterioration in vernacular heritage sites under changing climate and landscape conditions from a user perspective. This paper provides insights into the perceptions of local people on climate change and how it has changed the landscape in the Fındıklı district of Rize in the Eastern Black Sea area of Turkey. The study proposed analyzing vernacular architecture as a heritage category for localizing the management of climate change impacts using field survey, on-site observations, and unstructured interviews with local people. The results of the shared concerns regarding the changing climate and landscapes from a local perspective evoke the use of narratives as a tool for local authorities to include local communities in building resilience of cultural heritage to climate change.

Keywords: climate resilience; vernacular heritage; climate narratives; climate adaptation; climate stories

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1. Introduction

Though vernacular is a linguistic term, it represents the "architectural language of the people with its ethnic, regional, and local dialects"[1]. The simplicity of this folk, peasant, humble architecture is a product of local builders and artisans that extends beyond native construction materials, techniques, and details. Vernacular architecture responds to local conditions, particularly the climate, everyday living, crafts, and culture. Its legacy is represented by traditional houses from the pre-industrial period that were built by laypeople [2]. Although vernacular architecture is majorly prominent within its traditional building systems, the term "vernacular heritage" is used in this paper to describe its value as not only architectural heritage but also the value of its surrounding landscape and the intangible assets attached to it.

As a fundamental part of cultural landscapes, the vernacular efforts of buildings, bridges, countryside dwellings, farmhouses, cottages, mills, and kilns are recognized as vernacularly built heritage according to the ICOMOS Charter on Built Vernacular Heritage in 1999 [3]. Through this holistic approach, vernacular heritage helps us to understand traditional landscapes as a whole and encompasses buildings, land use and cover, vegetation, biodiversity, water sources, and artisanship.

Local climate has an inextricable role in forming vernacular heritage, as do other physical, social, economic, and cultural determinants. Rebuilt, restored, and adapted, vernacular settlements have evolved with the changing climate, cultural practices, community aspirations, and a gradual influx in modernization and urbanization. Reflecting our contemporary lifestyle in the construction technique hinders the preservation of local architectural identity and its valuable heritage [4]. As a result, successive generations have forgotten the symbiotic relationship between "people", "land", and "nature".

Vernacular heritage fosters a creative way for people to connect themselves with their culture, customs, and surroundings. The transmission of local knowledge, both formal and informal, helps generations to safeguard their vernacular heritage. Since the rise of industrialisation, the use of "modern" materials and techniques has become widespread in the maintenance of vernacular heritage [5]. Traditional construction systems were replaced by contemporary construction elements that are easier to access, quicker, and cheaper to build than vernacular buildings. Constructing vernacular buildings requires traditional knowledge, skills, and money to obtain once-surrounding materials such as timber and stone. Due to these constraints, local communities prefer the use of modern materials and techniques in the reconstruction of their vernacular buildings. However, these interventions are often poorly integrated into historic buildings [6] and cause rapid deterioration, including thermal discomfort [7]. In many cases, vernacular heritage is less energy-demanding and more environmental friendly than modern construction systems [8]. With today's environmental concerns, low-cost techniques and environmentally friendly and energy efficient solutions such as those used in vernacular buildings are in demand once again [9]. Although it is an underappreciated form of cultural heritage, it has been highly valued among local communities and local tourists. Recently, the return of people to their hometowns and the increasing interest in village and organic lifestyles has helped to boost local economies. Thus, the preservation of these buildings is significant for the flourishing of the local, city, and regional economies.

Vernacular heritage may have a role in responding to climate, but it is also vulnerable to its effects in a wider social, economic, and cultural context. Climate change multiplies the risks of disasters [10] on vernacular heritage [11] and its interdependencies on agriculture [12], infrastructure, livelihoods, forestry, and traditional knowledge with several other pressures from natural disasters [13] and anthropic interventions [2]. Abandonment [14], crop failures, desertification, maladaptation, and loss of knowledge and intangible values [15] are among the risks observed in vernacular landscapes [2]. Although local vernacular heritage may not be able to respond to present climatic conditions anymore, climate stories of various sites can disclose resilient places and communities for the future [16].

Scholars have covered vernacular architecture as a type of heritage under the concepts of sustainability and disaster-resiliency inspired by its construction in favor of the local context, e.g., [17]. However, the acceleration of climate change has increased the existing vulnerabilities of vernacular heritage. It has brought "climate resilience" of the existing settlements to the attention of practitioners and scholars. In this study, the term climate resilience is regarded as "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization and the capacity to adapt to stress and change"[18]. Vernacular heritage conveys traditional knowledge and practices to improve the resilience of local communities in the face of climate change-related disasters [19,20].

Local knowledge and skills are not only important sources for the proper maintenance of historic buildings [21], it is also important for building climate resiliency in both heritage sites and new settlements. It is argued that the climate resilience of heritage assets can foster both traditional preservation and transformation by allowing flexibility for the continuity of the place meaning and heritage values [22,23]. Furthermore, the integration of people's attitudes, behaviours, and values has been suggested as a more just and inclusive way to consider disaster risk management and climate resilience in local communities [24]. Systematic literature reviews focusing on climate change and cultural heritage reveal major gaps in facilitating "traditional knowledge for preservation and adaptation" and potentially for building climate resiliency [25,26]. Local knowledge and insights, which hold invaluable information regarding these low-cost adaptation strategies [27], are often underestimated in policy and practice [28]. In this regard, local environmental knowledge [29] together with scientific contributions such as climate modelling and predictions, may complement climate action and adaptation policies at the regional and national level.

The perceptions, insights, and statements of the locals living in these communities may highlight the know-how knowledge, failures, and success stories of vernacular heritage from past to present. Marcy Rockman stated that "Every place has a climate story" [30], emphasizing the importance of analyzing "narratives" and "stories" of local people. The place-based insights of local people can highlight how past societies interacted with their environment [30,31] to plan vernacular settlements and the present experiences of local communities due to changing climate and landscapes [32]. Communicating the local climate knowledge of the recent past and present impact of climate change on vernacular heritage can improve the response of local communities to future threats. However, there has been little research regarding the impacts of the changing climate and vernacular landscapes from a user perspective. Thus, there is a need to understand the local user perspective of how they emerged in relation to local climate, how they are changing due to changing climate, and the climate-resilient features of these settlements.

The case of Fındıklı in Rize, Turkey, illustrates vernacular heritage as the production of past climate knowledge as well as a legacy that is at risk due to climate change. The villages from major riverside areas are majorly prone to heavy rainfalls, floods, and landslides, among other risks. This study, using the field survey data from the selected site, aims to reveal the insights of local people to the localized impacts of climate change and their response to these changes in the vernacular heritage context. The results of the analysis of the narratives from local residents on climate change can be embedded into collaborative works by local stakeholder aiming to build climate resilience.

Literature: Local People's Knowledge and Perceptions on Changing Climate and Landscape

An overwhelming amount of literature focuses on the local perceptions of climate change and its associated risks as evidence for climate change vulnerability and impact assessments. The integration of this "insider knowledge" with climate modelling can further validate the results better during impact and adaptation studies [33]. The qualitative analysis of the perceptions that local people have regarding the changing climate in the case of the Peruvian Andes reveals that there is a conflict between local knowledge and scientific knowledge as well as the knowledge that is shared among the stakeholders involved [34]. The translation of local and indigenous knowledge is recognized as the "downscaling of climate adaptation" [34]. By uncovering their perceptions, insights, and experiences, indigenous and local communities reclaim their voice as it pertains to their heritage, landscape, and the global concern for the changing climate [35]. Uncovering local awareness of the effects of climate change and the analysis of these perceptions aims to bridge the gap between the stringent climate targets set by national policies and community-led local actions.

The analysis of local narratives [36] often brings up a complex relationship between climate change, landscape changes, and livelihoods [37], though it is not specifically mentioned. For instance, in the context of rural communities, the respondents of a survey in southeastern Zimbabwe reveal landscape changes occurring at the local scale due to forest and vegetation losses [38]. While heritage loss is inevitable and recognized by local communities [39], a great deal of local knowledge regarding the specific context of these heritage sites and their growing transformation may serve as an invaluable source for building climate resiliency [40]. Documentation covering changes in the clime in landscape are often published from the lens of local stakeholders [41] and should not be overlooked when generating knowledge on how to build climate resiliency [42]. Thus, it is particularly important to understand how heritage assets are managed, monitored, and interpreted along with their surroundings [43]. Embracing diverse voices, stories, memories, and narratives on the challenges that heritage assets face can activate local participation in terms of strengthening adaptation efforts [44].

2. Methodology

2.1. Case Study Area

The focus of the present study is Fındıklı, a small coastal town and district in the province of Rize in the Eastern Black Sea region of Turkey (Figure 1). This area is particularly relevant when considering the relationship between climate resilience and vernacular heritage for two reasons: (1) the province of Rize experiences frequent rainfall, severe floods, and landslides; (2) Fındıklı is rich in vernacular heritage [2].

Figure 1. The map produced using ArcGIS software shows the location of the Fındıklı district and boundaries of the city of Rize. Source: Aktürk, G., and Hauser, S. J. (2021).

The province of Rize has the highest annual total rainfall in Turkey, receiving over 2300 mm each year [45]. The annual relative humidity level in the province was higher than 78 percent in 2018, and therefore, there have no drought months reported (Figure 2). In the future, it is expected that the frequency of floods and landslides will increase following excessive rainfall events, some of which may exceed 250 mm, such as those that took place between 2016–2018 (Figure 3), due to the acceleration of the impacts of climate change.

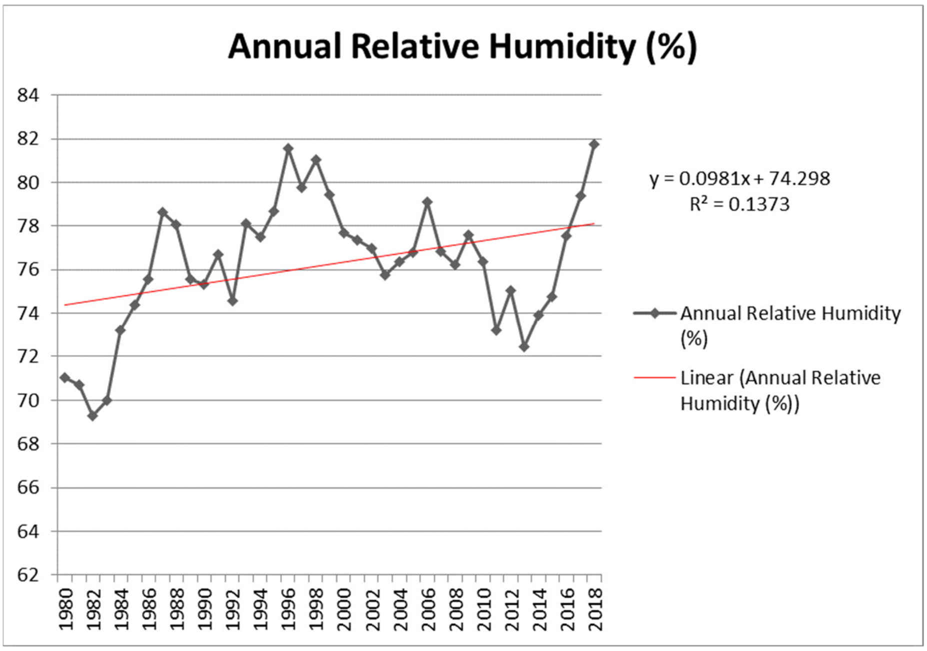

Figure 2. Annual relative humidity (%) in the city of Rize between 1980 and 2018 from 17,040 stations in the city centre, which is at latitude 41.0400, longitude 40.5013, and altitude 3 m. The monthly data were obtained from the 11th Regional Directorate of Meteorology in the province of Trabzon and were analyzed annually by the first author.

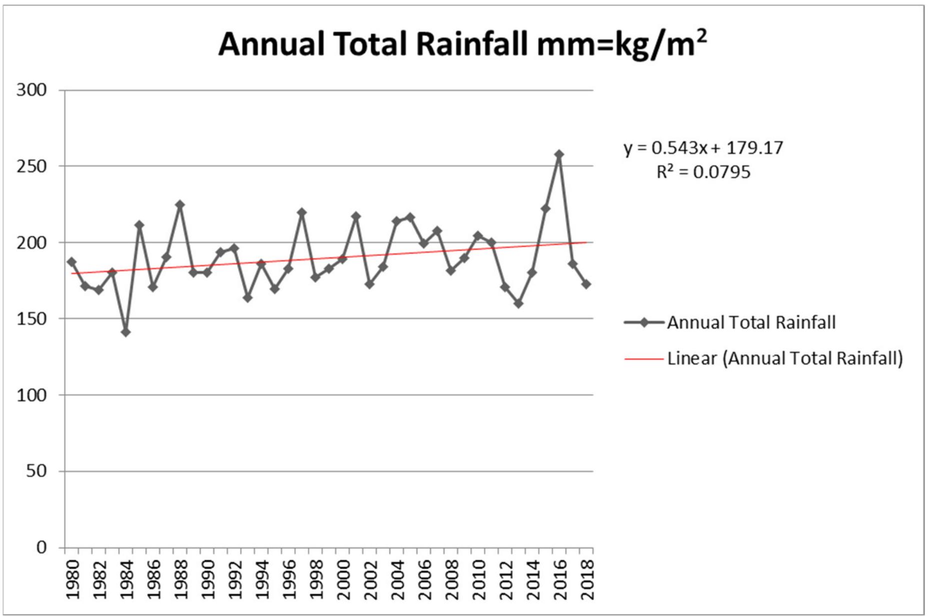

Figure 3. Annual total rainfall (mm = kg/m^2) in the city of Rize between 1980 and 2018 17,040 stations in the city centre, which is latitude 41.0400, longitude 40.5013, and altitude 3 m. The monthly data were obtained from the 11th Regional Directorate of Meteorology in the province of Trabzon and were analyzed annually by the first author.

The regional climate varies greatly from the coast to the inland areas of the region. The coast has a typical oceanic climate, with high humidity and rainfall. There area has a mild climate, with warm, humid summers and cool and damp winters. In contrast, there is a transition from an oceanic to continental climate in the hinterlands. Summers are warm and dry, whereas the winters are cold and humid.

The Fındıklı district in Rize has a population of 16,678 [46] and covers an area of 409 km^2 [47]. Due to its narrow coastal strip, settlements are widespread in the hinterlands as well as in the valleys and expand towards the Kaçkar mountains. Fındıklı has 23 villages and 8 neighbourhoods. The Sümer, Arılı, and Çağlayan rivers have shaped the plains and valleys. Most of the vernacular heritage is concentrated along the Çağlayan and Arılı valleys. The topography of the selected villages of Çağlayan, Beydere, Hara, and Gürsu varies (Figure 4). For instance, the altitude of Çağlayan village is 252 m, whereas the village of Beydere has the highest elevation, with an altitude of 508 m [48].

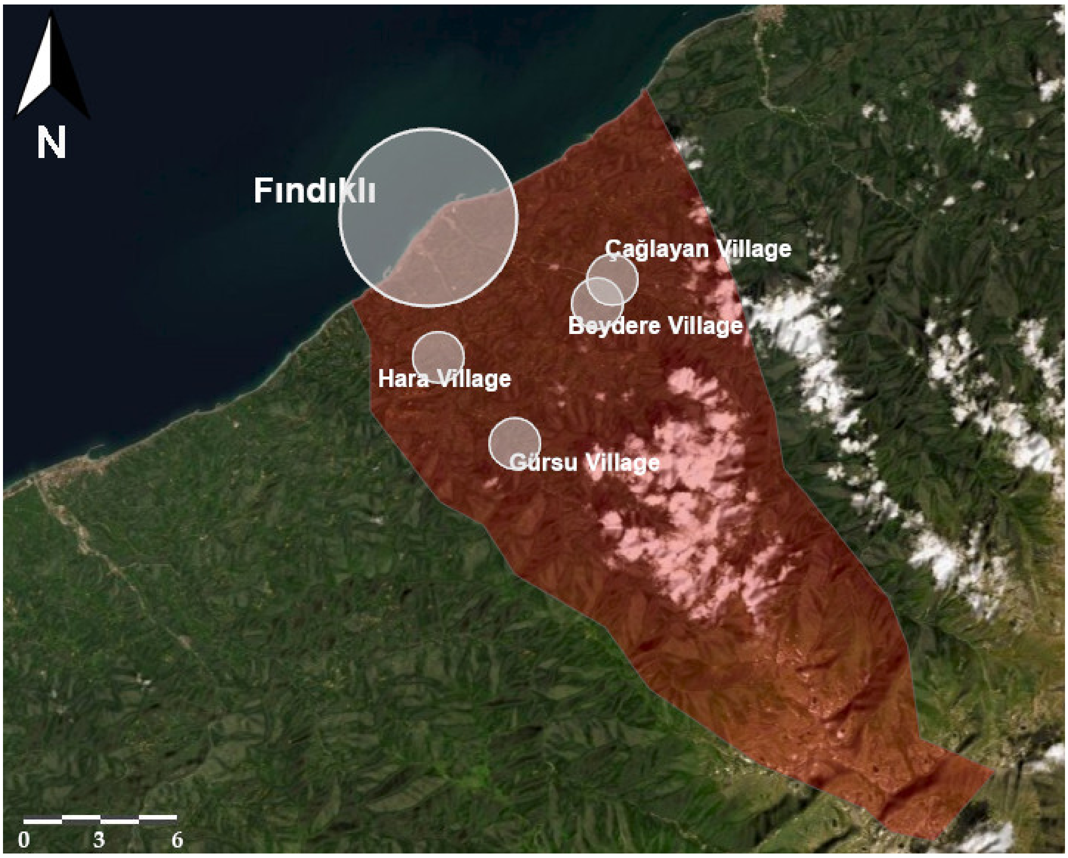

Figure 4. The boundaries of the Fındıklı district and the locations of the interviews conducted in Fındıklı created in ArcGIS software Source: Created by the first author.

Villagers have access to farmlands, with the local economy being dependent agriculture and animal husbandry. Recently, due to financial help from European Union projects, the locals in Fındıklı have switched to organic farming, which is also encouraged by local institutions for farmers and female workers for the development of sustainable farming practices. The main cultivation activities include tea, hazelnut, corn crops as well as fruit growing, fisheries, and beekeeping [49]. Villagers store nuts, corn, and grains in timber cupboards in their storage houses, which stand on four to six timber pillars. Locals often search for additional sources of income in addition to harvesting tea, such as the production of kiwi, citrus fruits, and Concord grapes [50], though the changing climate has forced them to find other sources of agricultural products.

Aside from the topographic setting, the rivers in the Fındıklı district have also played a significant role in the formation of forests that are rich in spruce and chestnut trees, which were used by locals for the construction of houses in the hinterlands. Wood carving and timber artisanship have become traditional in this region due to lumbering, timber trading, and the availability of rich forests in the area. Wood carving is used for making boats and for building storage houses, decorations, and furniture [51]. Along with agricultural activities, locals in this area have acquired ironworking skills for making reap hooks, slings, and knives in order to collect the crops. Coppersmithing, weaving, stonemasonry, wattle-making, and quilting are among other types of traditional knowledge that are at risk of being lost [2].

The vernacular landscapes in the area are shaped by the natural heritage of the region, e.g., Sarıçam [52] and Ihlamurlu [53] forestry; the tangible heritage of stone bridges, mills, fountains, mansions, and timber mosques [49]; and the intangible heritage of wooden carvings [51]. Site selection, the layout of pedestrian access, the location and orientation of houses, the design of building elements, and building typologies are closely connected to the local environmental context. In relation to the natural surroundings, the buildings were structured at a variety of scales, including grand mansions, village houses, and storage houses with fruit gardens and land holdings as a part of the cultural landscape. Privately owned small land holdings include building plots, arable land, and livestock as part of the rural landscapes.

Two main types of construction: stacking and framing, have emerged from the local needs applied to different contexts [54,55]. While timber and stone masonry systems are under the first category, the latter is the main focus of this article, which comprises four different types of construction systems, including (1) timber (Figure 5a), (2) stone-infilled timber-framed (Figure 5b), (3) amulet filling (Figure 5d), and (4) mixed construction systems (Figure 5c) [56], though the stone-infilled timber-framed is the most common type of construction not only in this region, but also in Fındıklı. The main differences between these types are the filling system and frame warping [57].

Figure 5. (**a**) Timber buildings elevated on stone in Hara village; (**b**) stone-infilled building in Çağlayan village; and (**c**) mixed construction on a building in Hara village. The stone and stone-infilled technique on the ground floor and the plastered façade of the first floor is an example of the çakatura technique. Source: Photograph by the first author taken in July 2019. (**d**) Amulet-filled building in the district of Pazar in Rize. Source: https://karadeniz.gov.tr//konut-ahmet-sakir-efendi-konagi/#prettyPhoto (accessed on 8 February 2022).

Timber and masonry construction systems that do not use studs are common in the region in forested areas at high altitudes, providing flexibility for building disassembly and relocating to another location [58]. However, the overexploitation of timber in nearby forests has led locals to prefer stone-infilled timber-framed construction systems, also known as eye-filling [59], over timber buildings. A system that emerged after cell-filling houses, "muskali dolma", also known as amulet filling, is a timber-framed construction technique where houses are built with triangular-shaped timber frames filled with small pieces of stone and mortar. It is more durable to side forces compared to cell-filled buildings [60].

A more recent construction technique known as "çakatura" differs from "muskali dolma", as the façade is plastered when this technique is used [58]. This type of construction system begins to decay faster than other systems. The facade is plastered with lime to prevent the timber from being exposed to the air [61], but the plaster wears away due to rainfall, meaning that it can no longer protect the timber. When at least two of four systems are used in one building, it is known as mixed construction [59].Although there are rare examples of buildings combing all of these construction methods, stone-infilled timber buildings are the most preferable.

Stone-infilled timber buildings are built with stones that are 5–6 cm in width and 23–25 cm in length that are then placed in timber frames. Mortar covers the spaces in between the frames and stones to weatherproof them and to prevent rain and wind from penetrating the building [62]. They are generally built as two floors, in which the ground is used as barn and the first floor is dedicated to the living space. The ground floor is located partially under the slope that covers half of the surface of the upper floor. However, Çaglayan village is an exception, as the topography is rather flat, meaning that the ground floor usually covers the entire area of the first floor. In some cases, there is a walking path between the slope and the rear façade of the building.

Due to thick snow cover in the past, the roofs of these buildings are supported with timber thrusts and beams. Although the roofs are not high-pitched, the roofs were built in a way to bear the weight of snow. "Hartama"—a type of traditional roof cladding—is often used, and this material is made of 1 cm thick timber from fir, spruce (Picea orientalis in Latin), or oak or trees 2 cm thick timber from chestnut trees [63]. The board-on-board roof is installed vertically. During roof construction, the four-ridge structure is preferable to three-ridged roofs due to their resistance to wind and snow. The roof eaves extend to 150 cm, particularly in Çağlayan village, to prevent the decay of the façade because of the rainfall. Because of the substantial space between the roof and the windows, the risk of receiving rainwater in the interior is relatively low.

These traditional houses have two entrances: one main entrance that is elevated with quarter-circle stone steps and another located on the opposite side next to the toilet. The main entrance usually faces the north or north-east direction to avoid strong winds from northwest and west, which usually bring precipitation. Therefore, the façade facing the prevalent wind direction is usually built with stone [64]. The other entrace was traditionally used by the landlord to clean himself up after working on the land before presenting himself to the household or the guests.

There are several implications of climate-induced disasters on vernacular heritage. To provide an example, Turkey is facing climate migration, particularly among seasonal farm workers, due to the slow-onset effects of climate change [65]. Climate change puts pressure on the depopulation of rural areas; as a result, rural populations are forced to leave their lands, food sources, and houses. Scarcity and loss of lands, water resources, and crops may lead to abandonment and, following that, to the deterioration of vernacular landscapes. Anthropic influences such as changes in land-use and -cover in the hinterlands in Rize aggravate climate-induced risks on vernacular landscapes along with the rapid urbanization and planning of hydro-electrical power plants.

2.1.1. Data Collection

This paper draws on a series of unstructured interviews with local people and on-site observation notes undertaken by the first author during January and July 2019 [51]. The first fieldwork in the selected case area was conducted for a week in January 2019, while a second site visit was carried out for two weeks in July 2019 [51]. In total, 16 unstructured interviews were conducted face to face with 14 individuals from four different villages and with one person from the administrative centre of the district, Ref. [51] as shown in Figure 4. As emphasized earlier, the reason behind the selection of these villages is that the majority of the vernacular sites are located in these areas.

The interviewees were selected using the snowball sampling technique [66]. The sample size was defined by the saturation point [67], which is described as "the point in coding when you find that no new codes occur in the data" [68]. In-depth interviews were carried out on site, mostly at the historic houses, and by walking through the lands. During the fieldwork, observational notes were taken based on guided tours around the sites.

Table 1 demonstrates that the interviewees were mainly senior citizens and included five females and nine males who aged from 40 to 84 years old (Table 1) [51]. The majority of the sample consisted of historic homeowners, as the aim of the present paper is to analyze the resilience of these buildings from the perception of its end users. Due to the low number of skilled artisans, only two artisans were selected for the interview process. Eight were retirees, and four used to be teachers. Interviews were held conversationally (rather than semi-structured) and were based on the narratives of local people, including their perceptions, stories, and concerns [69]. This provided flexibility and spontaneity to the interviewees, as it allowed them to choose the order and nature of the narrative. It also allows a deeper understanding of the reality and the situation. This method enabled locals from different educational, cultural, and socio-cultural backgrounds to participate in the study. The aim of this method is to understand the effects of climate change on vernacular heritage from the statements of local users, mainly those who own vernacular buildings. As occupants of these buildings, they experience the challenges of the managing of their lands, buildings, and crops firsthand.

The interviews ranged from 45 min to two hours [51]. All interviews were audio and video recorded after receiving permission from the interviewees, and they were then transcribed [51]. The transcriptions were translated by the first author from Turkish to English while maintaining the meaning of local terms [51].

Table 1. Characteristics of interviewees. Source: adapted from "Remembering traditional craftsmanship: conserving a heritage of woodworking" by Gül Aktürk.

Interviewee	Gender	Relevancy	Profession	Villages	No. of Interviews	Date
C.K.	Male	Homeowner	Retired/teacher	Hara	3	3 July 2019
F.H.	Female	Homeowner	Retired	Çağlayan	1	12 January 2019
G.A.	Female	Homeowner	Retired	Hara	1	3 July 2019
H.Ş.	Male	Homeowner	Retired/teacher	Çağlayan	1	30 June 2019
M.A.	Male	Farmer	Retired	Çağlayan	1	12 January 2019
Ş.S.	Male	Stone mason	Constructor	Fındıklı centre	1	14 January 2019
S.T.	Female	Homeowner	Housewife	Gürsu	1	2 July 2019
Ş.Ö.	Male	Homeowner	Land registry	Çağlayan	1	6 July 2019
S.Ş.	Female	Homeowner	Retired	Çağlayan	1	11 January 2019
Y.G.	Male	Homeowner	Retired	Çağlayan	1	5 July 2019
Y.Y.	Male	Project Manager	Teacher	Fındıklı centre	1	11 January 2019
A.S.	Male	Stone mason	Constructor	Beydere	1	11 January 2019
B.U.	Female	Homeowner	Retired/teacher	Çağlayan	1	10 January 2019
T.H.	Male	Homeowner	Retired	Gürsu	1	2 July 2019

2.1.2. Data Analysis

Qualitative data analysis software (Atlas.ti version 8) was used to interpret the data after the coding of each interview. The verbatim interview transcripts and field notes were analyzed through inductive or "data-driven" thematic coding as the list of codes derived from the explanations provided by the locals. The six steps of this method include (a) familiarizing oneself with the data, (b) generating the initial codes, (c) searching for themes, (d) reviewing themes, (e) defining themes, and (f) writing-up the findings [70]. In the choice of coding, attention is given to the themes or concepts, practices, and context. Key themes and codes were generated to track some of the repeated notions, experiences, and patterns in understanding the effects of climate change and its associated risks to vernacular heritage sites. The initial coding revealed that the statements follow a chronological order of the events. This resulted in the emergence of three specific themes, including (1) past stories, (2) current problems, and (3) future threats.

Following that, six codes were created based on the inductive analysis of the recurring issues and patterns that could be observed in the content. The data from the interviews were qualitatively and quantitatively analyzed. The number of mentions were quantified and provided in numbers (n) and percentages (%). Drawing on field surveys undertaken by the first author, we explored the resilience of vernacularly built heritage to the changing climate and how communities are responding to the changes affecting vernacular heritage. While the local challenges regarding vernacular heritage preservation are not only limited to climate change effects, the interviews were analyzed through the themes of the impacts that climate change has on vernacular heritage and its resilience to the changing climate for the purposes of this paper.

3. Results

This section analyzes three major themes and six codes. The findings highlight that the current problems (n = 33, 49%) are the most frequently mentioned themes (Table 2), whereas past knowledge (n = 17, 25%) and future threats (n = 17, 25%) were equally quoted. This is due to the loss of past climate stories by the successive generation.

The knowledge of the past was equally phrased with climate-resilience (n = 17, 25%). Within the coding for the current problems, the least mentioned issue was rainfall (n = 3, 4%), whereas the code for climate resilience within future threats was mentioned the most (n = 17, 25%).

Table 2. The table shows the themes, codes, example quotations, and number of quotations. Note that the number of quotations shows the number of times the quotes were mentioned.

Themes	Codes	Example Quotations	No. of Quotes
Past Stories	Past climate	"It is snowing less now compared to the past. In the past, the rain was more excessive, but there is still rain otherwise the tea crops would not grow."	9
	Past settlements	"In the past, they used to build a house above the cornfield…"	8
Current Problems	Flooding	"When the rivers flooded, no one is around."	14
	Landslide	"Here is a landslide zone."	16
	Rainfall	"But what rain, I have not seen anything like. It again rained like this last year."	3
Future threats	Climate resilience	"The native tiles are water-resistant and durable."	17

3.1. Past Knowledge

Past knowledge shapes the life cycle of a building which starts by choosing a site, followed by construction, and finally, the reuse of the building. In the past, Fındıklı was not preferred for settlement, particularly the shoreline of the district. Despite of the marine culture at the coastline, residing at the seaside was not common. Regarding the coastal settlements, Y.Y.—the project manager for the EU-funded project "Training Masters for Rural Built Heritage in the Eastern Black Sea Region"— emphasized that "there was a risk of malaria due to a bite of a swamp mosquito as it was a wetland in the past." Referring to the 1600s, Y.G. reflected on that:

> *"Back then, Fındıklı was a swamp. In other words, no one would have settled in the city centre due to the mosquitoes and swamps…Our grandfather…came here… built his home there…on the hill across here..."*

The rural settlements and village houses along the river valleys are scattered and are mostly located on top of the slopes with long and narrow strips of land comprising tea plants. The new settlements, which have been built below the cornfields, are more prone to floods due to their proximity to the rivers. On the contrary, historic buildings, which are located along the river valleys, were built on one and a half metres of foundation walls to elevate the house. C.K. noticed the role of animal husbandry and farmland in the site selection, which was repeated by Ş.S.:

> *"Here the houses are distant...In the past, the mansions were built on top of the cornfield so that the rainwater carried the scat of animals down to the slope and fertilized the land."*

The reasons behind this settlement pattern are in close proximity to water sources, provide exposure to solar radiation in the morning, allow farmland to be manged easily, face the landscape. When dealing with the micro-climate, local communities were self-reliant when selecting building sites. Unlike today, strong attachment to the land indicated the management of private-owned lands at the time.

The past climatic conditions of the district according to the locals reveal that the snowfall and cover was greater than it is today. It appeared that the local climate also determined the land use, land tenure, and cropping pattern as well as the vernacular settlements, as T.H. noted:

> *"When I saw the first great snowfall in our village in 1948, there was three metres high snow cover. Two metres and a half. It did not snow in the last two years, including this year. When there is no snowfall, it does nothing good to agriculture."*

In terms of collective neighborhood relations, H.S. pointed out "1.5–2 m high snow would cover the village, and villagers would help each other out to shovel the snow on the roofs with the help of stairs." Because the roofs in this area are not high-pitched, it is questionable how the current three to four ridged low-pitched roof structures could carry the snow load. The timber beams are wide enough to carry the snow weight. Having experienced this firsthand, T.H. answered:

> *"Timber trusses hold the roof. In addition, there are timber beams that stand next to each other to hold the roof tiles. Poles under the trusses carry the full weight. I know with the help of the neighbor that the snow used to be cleared from the roof when the snow is very heavy. The neighbors would step in the clearance of snow from the rooftop."*

Past knowledge of the climate and settlements reveals a lot about the climate resilience of vernacular heritage to a changing landscape. However, the number of the statements on this theme indicates that the design of these buildings was not merely arbitrary. In response to the harsh climate, the locals managed their lands and settlements and worked as a community to deal with the challenges of it. Learning-by-doing and shared knowledge advanced the coping strategies of locals in the past.

3.2. Current Problems

More than half of the interviewees mentioned flooding, landslides, and extreme rainfall as major challenges induced by climate change, whereas the remaining interviewees linked these events to human intervention and natural disasters. Among the current problems (n = 33, 49%), landslides (n = 16, 24%) accounted for the most. Following that, flooding (n = 14, 21%) was mentioned. Issues related to rainfall were reported the least (n = 3, 4%).

3.2.1. Flooding

Flooding mostly happens in the months of March–April and May due to the melting of the snow on top of the hills and mountains. According to the statement of F.H., historic building owners do not stay in their houses when floods occur.

Ş.S. explained that deadliest flood occurred 20 years ago and destroyed a house in the village above, where a mother with two kids lived, was swept away. An 11-year-old boy who was dragged away in a flood in 2018 has still not been found. Ş.Ö. explained the life-threatening event:

> *"There was a flood 50 years or 45 years ago but the most serious one was in 2016... The damage in the Beydere village was more severe. A child was drowned."*

According to B.U., the Çağlayan river was similarly flooded, and the road to the village was closed. In the first visit to the field, the locals repeated that Beydere village was a landslide zone, but the observations during the second site trip revealed that even though the Çağlayan village was still at a relatively low risk, there is now a higher risk of the river flooding. Today, there is a flood defense constructed by the Hydraulic Works team along the Çağlayan river, although the area is relatively safer compared to the other villages. On the positioning of Caglayan village as a disaster area, H.Ş. described:

> *"The land facing the rear façade eroded twice. We were affected by it. It eroded two years ago, and the rear façade degraded twice. North facade… There are a lot of landslides happening here and this why this area of Caglayan village is announced as a landslide zone... An eanormous storage house has gone down below. There are a few storage houses that went as such, some houses in Aslandere and Beydere villages were damaged by floods... The upper villages were affected more severely."*

Aside from the mansions, the storage houses, which are made of a lighter material, drifted away in the floods and were destroyed by landslides. According to the statements of Y.G. and Ş.S., the floods caused the collapse of the biggest storage house in the village with a double door in the region. M.A. detected the loss of vernacular heritage:

> *"There was a beautiful old storage house on the side. It [referring to the flooding] damaged the storage house too...They came to us while they [referring to the owner of the storage house] escaped from the disaster, they sheltered here..."*

River flooding occurs frequently in these villages, thus putting rural vernacular buildings at high risk. It is also noted that the risk classification of the villages may change over time along with the severity of the events. The number of the areas that are at risk of flooding continues to increase and the homeowners are not prepared for the anticipated risks of flooding.

3.2.2. Landslides

Beydere village, which has a more elevated topography, concurrently appeared in the mentions of locals as the area that has been affected by floods and landslides the most, resulting it being named a disaster region due to the frequency of these events. There are very few original remnants of these historic buildings in this village, and the remaining ones have been extensively modified (Figure 6). Following statements on Beydere village, C.K. mentioned Karaali village as a landslide zone where historic buildings were damaged.

Figure 6. The hazard area of Beydere village with mostly new settlements. Source: Photograph by the first author.

Public places, such as the school in the village of Çağlayan, was eroded by the landslide in 2018 according to B.U., and the land was detached. Ş.Ö. recognized the damage of it on his site:

> *"The land there was eroded. It shook the storage house but didn't demolish it. However, this time, it destroyed the trees... There was a landslide at the back of my house, even though it is not a tea field..."*

However, even though most of the houses survived these disasters, the rear facades of some of the houses have become degraded due to landslides (Figure 7). Particularly, in the case of the house of Ş.Ö., the main door faces the rear façade, the location of the house that experiences the most damage during landslides. He reacted surprisingly:

> *"Couldn't these be thought of when these structures were built? The storage house is 250-200 years old why did they build it here? If I knew, I would dismantle it and rebuild it in another place... I sometimes think whether I should change the position of the main door this way?"*

Most of these buildings are not orientated to face the slopes where landslides pose a threat; however, the house of Ş.Ö. is an exception. This building was rebuilt with the remaining materials of a historic building that had been damaged by bombs during the Russian invasion of the region from 1916 to 1918. Afterwards, successive generations lost the original building knowledge and experiences of this house built 250 years before. The differences in generational construction practices present the future threats to local construction knowledge and experience with the local environment.

Among other changes, the locals observed that there are anthropic interventions to the landscape, which may have contributed to the frequency and occurrence and climate-risk disasters such as landslides. One major impact is deforestation for tea plantation, one of the favoured crops in the region. Forested areas with abundant trees prevent the risk of landslides and rockfalls. Rockfall is only referred to once by Y.H. Facing a slope of 70 degrees perpendicular to the rear façade of his house, this façade was built with stone to prevent the risk of rockfall rather than a landslide.

Figure 7. Site visit of a house in Çağlayan village in Fındıklı on 12th January in 2019. Maladaptation example of rebuilding the eradicated rear façade with briquette wall after the landslide in 2018. Source: Photograph by the first author.

Today, the rear façades of the village houses are surrounded by retaining walls. In the past, there was no need to construct a retaining wall behind these houses, as the walking pathway behind the buildings did not exceed 1 and a half metres. Together with the opening of the roads to vehicles between the houses and the slopes, villagers also cleared the slopes either for tea plantation or for the parking of personal vehicles through deforestation. This led to a gradual increase in the risk of landslides. In contrast, some locals have experienced landslides in the areas where there was no deforestation or tea plantations. M.A. recalled the event:

> *"Landslide happened this way. It is not because it rained a lot here. Here, a natural water discharge came and drained the water there. The excessive water maybe came from the sea as a hose…, so the rainwater damages something along the way. But in this case, there was no place to accumulate water."*

H.Ş. claimed that in the case of these events, the Disaster and Emergency Management Presidency (AFAD) helps communities to recover. They document and report the damage to the buildings. If the retaining wall is already built by the house owner, they do not receive reimbursement from them for it, meaning that they are not responsible for the construction of a retaining wall. This incentive is only for the preservation of historic buildings if they are damaged by landslides.

3.2.3. Rainfall

B.U. mentioned the local term of "rotten month" for the month of July, when the area receives excessive rainwater. This means that the area is rather damp; therefore, the month of July is known to be the rotten month. The dampness and changes in temperature also causes crop failures. As a part of this integrated historic environment, Y.G. noted that pears do not grow; similarly, H.Ş. mentioned that cherries used to grow in the past but that now only a few grow. Although some of the locals emphasized the effects of chemical fertilizers and the construction of dams as external factors, they could not deny the effects of the changing climate. In relation to the croplands, S.Ş. exemplified:

> *"Now even the crops are not growing. The environment is decaying. We do organic farming with pigeon manure, but the weather pattern has changed. For example, orange drops timelessly, but it should not fall from its tree so early. It has just matured. We produced the orange in 2017 but it is not ripening this year...But now the fruits do not mature enough and fall from the trees earlier."*

The locals who were born and raised in the area are well-aware of their local climate. However, incidents in the area have recently proven that climate change is showing its impacts more seriously. Ş.Ö. echoed the event:

> *"We took the car and waited inside the car in the school garden. Rain falls, then the rain level goes up to 25 cm as if a movie is directed…It was raining in the past too, but I have not seen anything like that. Now that we experienced it, we are afraid."*

C.K.'s house experienced degradation due to rainfall, and the eaves of the roof could not protect the façade from the rainwater. The roof eaves extend to 150 cm in the Çağlayan village, but his is house located in Hara village and has 100 cm eaves, which were hit by the rainwater, leading to the decay of the facades of the upper floor.

As it is closely related to the local climate conditions, the severity and frequency of rainfall are not observed closely by the locals. The locals emphasized the damage of extreme rainfall on the historic houses that had been abandoned. If historic buildings are neglected by the mansion owners, then a drop of water can destroy it according to C.K. Even though some of these historic buildings have been renovated, they are beginning to decay once again. He further suggested:

> *"Both this part of the façade and wooden windows are decayed... Çakatura type of construction technique could not survive."*

3.3. Future Threats

The stories from the individuals in these areas highlight the severity of the issue in cultural heritage context that are underscored by climate policies. For instance, the Minister of Environment, Urban Planning, and Climate Change in Turkey, Murat Kurum, announced the Regional Climate Action Plan for the Black Sea region on 12 July 2019 [71]. He explained the active role of NGO's and universities in mitigating the effects climate change. The 15 actions to be taken concerning the city of Rize inter alia include several practices in the building sector. The most relevant to cultural heritage is the 13th article on encouraging the use of local materials in construction for climate resiliency [71]. One important implication of the decision to use local materials and techniques is a legal exemption from any type of fees or taxes during house construction [71].

The eaves of the historic buildings extend between 80 cm to 180 cm to keep the facade secure from precipitation and rainfall. Local roofing tiles, known as Ottoman tiles, make a resilient roof covering. Y.Y. indicated that the native tiles are more water-resistant and durable than modern replacements. Sheet, ondulin, and European tiles are not accepted for the restoration of the listed historic buildings. The native tiles were made slightly wider so that they can cover the roof more efficiently than any other types of tiles. One major difficulty is renovating the roofs of the village houses, as it costs more money.

The main stakeholders of disaster management only focus on post-recovery, whereas pre-disaster management falls on the shoulders of the locals. Governmental institutions such as the Hydraulic Works team reveal issues related to anthropic activities, whereas the locals provide more insight into climate change. Engaging with local issues such as the mismanagement and maladaptation of vernacular heritage under climate change can teach us a lot about tackling climate change in a broader sense.

4. Discussion and Conclusions

This paper examines climate as a factor that shapes climate change as a challenge to vernacular heritage sites by assessing the perceptions of local people in Fındıklı, Rize. The results reveal that landslides pose the greatest risk to vernacular heritage as well as flooding. Locals are not well-prepared for the increased damage caused by flooding, landslides, and rainfall. The findings from this study overlap with the results from those reporting damages on the landscape scale but reveal more lost and damaged sites [2].

Climate narratives and stories of indigenous practices enable access to local knowledge regarding climate resilience and can be taken as a methodological approach to identify the risks and damages on vernacular heritage globally. Narratives of climate change and heritage through the landscape can link different temporalities, people, and places to encourage more ground-up approaches when managing these sites [44]. Therefore, there is a need for more ethnographic and storytelling methods to identify local narratives on the present challenges related vernacular heritage and to incorporate them in climate change policies [72]. Much of the data mentioned by the members of the local communities in heritage sites could be gathered, sorted, translated, and analyzed to support the disaster risk management database. While the method used in this paper is a traditional ethnographic method used to collect the field survey data, digital and visual ethnography methods in the form of video, film, and photography also contribute to the field significantly.

The preservation of cultural heritage sites prioritizes the documentation of single buildings, and inventories lack oral stories, small-scale structures, and landscapes. Although building risk assessment provides significant information on possible decay, the vulnerability of the cultural heritage sites should be perceived in a larger management context. Consequently, cultural heritage sites cannot be disentangled from their setting. Oral stories of climate perceptions from local communities were found to be complementary to the spatial analysis of vulnerable heritage sites [2]. According to the result of a ArcGIS analysis in a similar study which discusses disaster prone-sites in the context of the case area, only 3 out of 58 vernacular heritage sites were located in disaster-prone areas [2]. These interviews highlighted more sites that have been damaged and lost during the floods and landslides. Therefore, the use of oral stories can assist climate risk assessments.

While climate-induced disasters can extend to regional, national, and global borders, disasters become much more localized relatively sooner than the risks imposed by climate change [73]. The Localized impacts of climate change may differ in various other geographical locations; however, there are similar patterns, challenges, and concerns over the local implications of the impacts of climate change. Thus, it is important to understand the impacts on heritage assets and knowledge at the local scale and how people are responding to these disasters. The use of the narrative approach when considering heritage sites in changing climates is applicable and transferable to other geographical locations.

Through apprenticeship, vernacular buildings and the building knowledge that has been transformed through observation, information by word, and replication can be handed down. The construction knowledge from the past shows generational differences in vernacular practices. Every generation interprets its own vernacular heritage in its own time in response to technological advancements, financial, social, cultural, and individual needs. In today’s circumstances, changes in the local climate and environmental conditions should be systematically addressed for maintaining, preserving, and adapting the vernacular heritage.

Manufacturing and industrialisation made the traditional knowledge of vernacular landscapes less important even though it creates the strongest connection between nature and culture. Traditional craftsmanship and practical skills go hand in hand. When manufacturing imposes a threat on the availability of timber masters, the timber making skill will be lost. of the preferences that local people have for modern global practices over low-tech solutions in vernacular settlements degrade the authenticity of these buildings [74].

The knowledge of vernacular heritage goes beyond understanding the material, construction technique and extends to the culture and lifestyles of the users. The characteristics of these houses are their modularity, flexibility, adaptability, transformability, and reusability in an unfixed nature. The local knowledge of building-resilient constructions can reduce the effects of new exposures and disasters.

The documentation of vernacular heritage should not only focus on capturing the authentic state of the cultural asset but also the later interventions, which are essential in understanding the maladaptation or best practices of climate adaptation. Cultural heritage is not fixed; thus, heritage professionals should embrace constant change. The proactive (preventative) or anticipatory approaches in climate adaptation allows for more time to prepare for the effects of climate change. Reactive adaptation planning responses take place after disasters hit. Thus, it is often suggested that heritage professionals should move away from reactive to proactive planning during adaptation, increasing the climate-resiliency of historic buildings in the future [75].

Decision-making processes need a combination of top-down and bottom-up approaches. The cultural heritage knowledge network and its interdependencies relies on the engagement and inclusion of users, artisans, local administrators, and other beneficiaries. The investigation of indigenous practices from underrepresented communities will enable access to specific climate knowledge and adaptation practices. The value of this knowledge should not be undermined during the creation of climate policies, as they mention incentives for the use of local construction materials and techniques.

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