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RESEARCH ARTICLE

COMMUNITY-BASED CLIMATE RISK GOVERNANCE FOR HERITAGE: THE GUTHI MODEL IN KATHMANDU VALLEY

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Abstract

Climate change is increasing floods, heat waves, landslides, and water stress in South Asian cities and is testing formal climate and disaster governance. In Kathmandu Valley, these hazards affect dense ensembles of temples, courtyards, ponds, and ritual routes that form a living urban heritage landscape. This study examines how the Guthi system, a long-standing community institution, governs climate-related risks in these heritage spaces. The research draws on qualitative case studies of Guthi-managed complexes in inner city and peri-urban neighborhoods of Kathmandu Valley. It uses key informant interviews with Guthi leaders and members, priests, municipal officials, and heritage and disaster focal persons, focus group discussions with women and youth where feasible, field observation of physical conditions, and review of relevant policies and plans. Respondents report more intense short rainfall events, frequent waterlogging, longer dry spells, and higher heat stress. These changes appear as damp and eroding walls, cracked plinths and timber, silted and shrinking ponds, unstable slopes, and damaged paths and open grounds. Guthi responds through routine cleaning of drains and inlets, desilting of ponds, minor structural repairs, and care of trees and courtyards. These actions work as everyday climate risk reduction even when people do not describe them as adaptation.

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Governance strengths include clear membership and roles, strong local legitimacy, the ability to mobilize voluntary labor, and detailed knowledge of site histories and water flows. Constraints include declining income, weak engagement of younger members, and unequal voice for women and marginalized groups. Relations with municipal and disaster agencies are inconsistent, and Guthi has little access to digital risk tools. The findings show that Guthi already functions as community-based climate risk governance for heritage and support calls to recognize and strengthen them as core partners while addressing internal inequities and financial fragility.

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Introduction:-

Climate change is increasing floods, heat waves, landslides, and water stress in cities. In many developing countries, planned adaptation and disaster risk reduction do not always reduce vulnerability and can deepen it when they ignore local institutions, power, and knowledge (Eriksen et al., 2021). New work on urban ecological resilience views cities as metabolic systems that link biophysical flows, infrastructure, and governance across scales (Gao et al., 2025). At the same time, education and state capacity for disaster and climate risk management in South Asia are being reviewed, with concern that current systems still pay limited attention to social vulnerability and local actors (Rashid & Wang, 2025; Rofiyanti et al., 2024).

Environmental governance studies from the Himalayas show that forest change, wetlands, and river systems are shaped by markets, policies, migration, and local rules, with implications for livelihoods and ecosystem services (Verma et al., 2021; Shigaeva & Darr, 2020; Ghimire & Regmi, 2024; Rather et al., 2023; Shrestha B. B. et al., 2025). Urban and tourism-based research in the hill and mountain areas, including Shimla and Sagarmatha, highlights the issue of the increasing exposure to hazards and complexity of sustainable urban policies due to rapid land use changes, poor enforcement, and pressure from tourism (Byers et al., 2020; Thakur, 2025; Canh, 2023). Disaster studies in Nepal reveal that social inequalities are very much implicated in impacts and recovery following events such as earthquakes in 2015, and indigenous women and other marginalized groups are often excluded from formal decision processes, despite their central positions concerning everyday coping (Spoon et al., 2023; Bajracharya et al., 2022). Mapping of disaster risk reduction institutions in Kathmandu shows a fragmented mandate and poor horizontal coordination, which makes tying the national frameworks to local practice a difficult task (Poudel & Blackburn, 2020; Poudel, 2020).

Kathmandu Valley is known as the living urban heritage landscape, dense ensembles of temples, shrines, courtyards, ponds, and ritual routes are embedded in the daily life (Weise, 2013; Silva, 2016). Research on the indigenous safeguarding practices is showing that indigenous communities and their institutions carry much of the responsibility for the maintenance and ritual care towards heritage, but that they are strongly under pressure from urbanization, economic change, and demographics (Maharjan & Barata, 2021; Silva, 2016). Based on studies on buffer zones, tourism, and stakeholder engagement, one finds how demand for housing and informal construction and mass tourism are changing risk profiles and raising questions on who makes these decisions and who usually benefits (Shakya Bajracharya et al., 2025; Karki et al., 2024; Khadka, 2024). Water-related heritage, particularly ponds and traditional stone spouts, has degraded or become disconnected, which is very disturbing to water regulation, microclimate functions, and cultural practices (Shrestha A. et al., 2022; Ghimire & Regmi, 2024; Rather et al., 2023; Shrestha B. B. et al., 2025).

Within this landscape, the Guthi system is a foundational community institution. Historical and recent studies show that the Guthi organize rituals, maintain temples and rest houses, manage ponds and wells, and mediate community relations with deities and space (Shakya, 2018; Pradhananga & Shrestha, 2014; Silva, 2016; Maharjan & Barata, 2021). Guthi holds land, collects rents or contributions, and allocates responsibilities for repairs and festivals. Recent work describes Guthi as the backbone of cultural heritage conservation in Kathmandu Valley and documents its rules, finances, and roles in everyday governance, while also noting pressures from legal reforms, land loss, and social change (Subedi & Shrestha, 2024a, 2024b, 2024c). Post-earthquake reconstruction has further exposed tensions between structural safety and heritage conservation when projects are not negotiated with these institutions (Daly et al., 2023; Shakya, 2018; Silva, 2016; Weise, 2013).

Despite this rich literature, important gaps remain. Climate adaptation and disaster risk reduction studies rarely place urban heritage landscapes at the center of climate risk governance and focus instead on housing, infrastructure, agriculture, or water supply (Eriksen et al., 2021; Wang et al., 2021; Verma et al., 2021). Heritage studies recognize the importance of Guthi but have not yet examined in depth their role in anticipating, reducing, and managing climate-related risks. Technological work on digital twins, remote sensing, and urban resilience often operates separately from local institutions and community decision-making (Hlal et al., 2025; Khan et al., 2023; Gao et al., 2025).

This paper responds to these gaps by examining community-based climate risk governance for heritage through the Guthi model in Kathmandu Valley. It situates Guthi within wider debates on vulnerability, adaptation, and resilience in developing country cities and within the specific context of Kathmandu as a living urban heritage landscape (Eriksen et al., 2021; Gao et al., 2025; Weise, 2013; Silva, 2016; Maharjan & Barata, 2021). The study asks how

climate-related hazards are perceived and experienced in Guthi-managed heritage spaces, how Guthi rules and practices contribute to or constrain risk reduction, and how Guthi interacts with municipal and national institutions responsible for disaster and heritage governance. The aim is to clarify whether and how the Guthi model can support more effective and more equitable climate risk governance for heritage in Kathmandu Valley.

Literature Review:-

Research on climate change adaptation and disaster risk reduction in developing countries shows mixed outcomes. Planned interventions can reduce, shift, or even deepen vulnerability, depending on how they relate to local institutions, power, and knowledge (Eriksen et al., 2021). Reviews of disaster and climate education find that curricula and state institutions often treat risk as a technical issue and give limited attention to social vulnerability and local capacity (Rashid and Wang, 2025). Studies of government strategies for fire and other hazards in Asian cities report persistent gaps in coordination, resources, and enforcement even when plans exist (Rofiyanti et al., 2024). Household-level analyses of the 2015 Nepal earthquakes show that pre-existing vulnerabilities, adaptive capacity, and social change shape recovery, and that the most marginalized often receive the least support (Spoon et al., 2023). Indigenous women are exposed to specific forms of structural exclusion in disaster processes but play major roles in everyday coping and care (Bajracharya et al., 2022). This body of work emphasizes the need for adaptation and risk reduction work to address local institutions and social differences, and not to treat communities as uniform units.

In the case of mountain and river basin water pollution, environmental governance research makes an important contribution. Systematic review from the Himalaya shows that forest cover, land use, and ecosystems respond to linked drivers, such as markets, migration, policies, and local rules (Verma et al., 2021). Working with forests of walnut along the Silk Road, it can be demonstrated how long-standing local management systems support both livelihoods and conservation outcomes (Shigaeva and Darr, 2010). In Nepal, the network of wetlands and rivers has roles in providing biodiversity, regulating water, and cultural services, along with the increasing pressure of pollution, encroachment, and invasive species, as well as climate variability (Ghimire and Regmi, 2024; Rather et al., 2023; Shrestha B. B. et al., 2025). Studies of human wildlife conflict in mid-hill areas outside protected zones reveal how fragmented land use, limited institutional capacity, and insecure livelihoods shape social ecological outcomes and point to the need for governance that extends beyond formal park boundaries (Baral et al., 2021). Water and land management studies are highly relevant for urban and peri-urban heritage landscapes. Reviews of large water transfer projects have revealed how such schemes more frequently tend to redistribute benefits and risks unevenly and may create new vulnerabilities if they are not based on sound institutional analysis [Wang et al. 2021].

Reviews of spatial planning for groundwater recharge argue that planning tools are rarely adequate for the ecological complexity of recharge areas and tangible implementation is weak to undermine long-term water security (Riaz et al., 2025). Policy work on riparian buffer zones gives a particularly clear example of buffer degradation being a key contributor to flood risk and water quality deterioration, and asks for clear rules, incentives, and local engagement to restore these buffer zones (Majumdar and Avishek, 2025). In Nepal, the framework of Asta Ja emphasizes the role of the participatory process in making peace, producing environmental security, and working inclusively, also because organized and coordinated management of water, land, forests, biological diversity, climate, and social systems is essential, and local institutions are identified as drivers in the process (Poudel, 2020). Urban and tourism-based research showing the interaction between land use change, governance, and risk in hill and mountain cities. A case study of Shimla documents that the rapid land use and land cover change, informal construction, poor infrastructure, and enforcement exacerbate their exposure to landslides, water stress, and other hazards while efforts to regenerate the ecosystem struggle to keep pace (Thakur, 2025).

Work from Sagarmatha National Park indicates that even iconic mountain destinations face serious solid waste and infrastructure challenges, and the need for effective management requires long-term planning, multi-stakeholder coordinated approaches, and attention to local livelihood issues (Byers et al., 2020). There are studies into tourism in hazard-prone regions that observe that risk exposure can influence travel choices in complex ways, sometimes causing people to make "last chance" travel choices and sometimes reinforcing safety-first behavior, complicating safety and development strategies locally (Canh, 2023). This research finds that risk and environmental change in the urban environment and environment is highly linked to wider economic and cultural dynamics such as tourism and mobility. Technological tools for risk assessment and monitoring are increasing. Reviews of digital twin technology and remote sensing have highlighted an increasing application in urban flood risk management, early warning, and scenario analysis, with an emphasis on near-real-time data and coupled models (Hlal et al., 2025). Remote sensing-

based analyses of the 2022 Pakistan floods indicate that satellite products can be used along with ground truthing to construct evidence of damage to cultural heritage and to recovery planning (Khan et al., 2023). Reviews of urban ecological resilience promote process-oriented perspectives that integrate biophysical flows, infrastructure, and governance across scales, and stress the need to connect these perspectives to planning practice (Gao et al., 2025). Studies of traditional villages show that vernacular architecture, local materials, settlement forms, and community institutions can support microclimate regulation, energy efficiency, and social cohesion in ways modern planning often overlooks (Zheng et al., 2024). Together, these strands suggest that advanced technologies and long-standing settlement systems both matter for resilience, yet they rarely meet within shared governance frameworks.

Disaster risk reduction governance studies bridge national policy and local practice. Mapping of institutions and actors involved in disaster risk reduction in Kathmandu shows a dense but fragmented field of ministries, municipal bodies, NGOs, and community groups, with overlapping mandates and weak horizontal coordination (Poudel and Blackburn, 2020). Reviews of disaster and climate education in Pakistan and of fire risk strategies in Indonesia report similar problems in aligning policy, education, and practice, and call for stronger institutional integration and community engagement (Rashid and Wang, 2025; Rofiyanti et al., 2024). These results align with the reasoning that successful urban risk governance requires role definition, inter-scaled coordination, and an appropriate acknowledgment of the local institutions as active contributors.

Cultural heritage and landscape studies represent one part of this broader field that deals with the issues of historic places experiencing and managing change. The article Work on cultural landscapes in South Asia, Bhaktapur and other Nepalese towns explains the interactions between heritage values, social practices, and conservation arrangements and pressures of urbanization, tourism, and development (Silva, 2016). Surveys of both natural and planted forests in Silk Road nations reveal the interaction between the cultural and livelihood value and the management of forests and how policy changes can disrupt long-established management frameworks (Shigaeva and Darr, 2020). The shared roles of physical fabric and community institutions in mitigating environmental quality and social resilience are brought into the limelight of systematic work on sustainable traditional villages (Zheng et al., 2024). Surveys of water transfer projects and forest change also indicate that big interventions and transitions in land use may upset cultural landscapes and local government (Wang et al., 2021; Verma et al., 2021).

As a living urban heritage landscape, Kathmandu Valley holds a special place in this literature. It is full of architectural clusters of temples, shrines, courtyards, rest houses, ponds, and processional paths that are still integrated into everyday life (Weise, 2013; Silva, 2016). Research on local protective responses of indigenous people emphasizes the key role of local populations and ritual organizations in the management of local physical and intangible heritage and documents increased strains of urbanization, economic transformation, and demographic changes (Maharjan and Barata, 2021). Studies of residential development in historic buffer zones, including Nagbahal in Patan, indicate that housing demand, unauthorized changes, and loopholes in regulation change the traditional fabric pattern and threat levels (Shakya Bajracharya et al., 2025). Tourism and tradition in the Valley records conflicts between mass tourism, traditional values, and community priorities and an unbalanced distribution of benefits and burdens (Karki et al., 2024).

The social ecological system in the Valley is very much concerned with water-related heritage. Stone spouts and ponds have long served as sources of drinking water, to support rituals, and moderate microclimates, but most of them have been degraded, disconnected, or encroached by urban development and changes in the water supply systems (Shrestha A. et al., 2022; Ghimire and Regmi, 2024). Similar studies of wetlands, rivers, and protected areas indicate that pollution, invasive species, and changes in land use make ecological states less resilient and less culturally and potentially interact with fluctuations in climatic conditions, exposing them to increased risk (Rather et al., 2023; Shrestha B. B. et al., 2025; Verma et al., 2021). The trends put heritage buildings and urban spaces under a variety of stressors, such as heavy rainfall, dry seasons, and heat stress.

The Guthi system is one of the institutions of the community that can be described as a cornerstone throughout this heritage landscape. Researchers of the past and present reveal that the Guthi arrange rituals, have temples and common rest houses, operate ponds and wells, and moderate relations among people, deities, and space (Shakya, 2018; Pradhananga and Shrestha, 2014; Silva, 2016; Maharjan and Barata, 2021). Guthi's own land, a collector of rents or contributions and delegates duties of repairs and festivals. Recent publications introduce Guthi as the institution of heritage conservation and management in Kathmandu Valley and records regulations, funds, and functions in the daily governance (Subedi and Shrestha, 2024a, 2024b, 2024c). Stakeholder-oriented analysis

requires broader identification and involvement of actors, such as Guthi, municipal authorities, professionals, and even individual stakeholders, and emphasizes the importance of improving communication and joint decisions (Khadka, 2024; Karki et al., 2024).

The post-earthquake rebuilding has brought out tension between disaster risk reduction and heritage conservation. A comparison between rebuilding in historic districts and neighborhoods after 2015 has revealed that without negotiations with local institutions and residents, the structural safety measures may contradict the traditional forms, social uses, and meanings (Daly et al., 2023; Shakya, 2018; Silva, 2016; Weise, 2013). Recovery patterns analyses reveal that the current inequalities affect the rebuilding to code and those who stay in precarious situations (Spoon et al., 2023). Disaster governance mapping in Kathmandu shows that community-based arrangements like Guthi are hardly formal partners, despite controlling the primary spaces and infrastructures (Poudel and Blackburn, 2020; Maharjan and Barata, 2021).

This literature has provided a solid foundation for the comprehension of climate risk, environmental governance, and heritage in Kathmandu Valley, though there are still gaps. Urban heritage landscapes are rarely a focus of climate adaptation and disaster studies as an important part of risk governance. They pay attention to housing, overall infrastructure, agriculture, or water distribution, instead of temples, ponds, courtyards, and ritual paths (Eriksen et al., 2021; Wang et al., 2021; Verma et al., 2021). The study of heritage acknowledges the value of Guthi, yet it only starts exploring its institutional dynamics and is not yet able to analyze its contribution to anticipate, reduce, and manage climate-related risks (Pradhananga and Shrestha, 2014; Subedi and Shrestha, 2024a, 2024c). Resilience, remote sensing, and work on digital twins often pay little or no attention to the interpretation of risk information and how local institutions organize action (Hlal et al., 2025; Khan et al., 2023; Gao et al., 2025). Little focus is also given to the role of gender, caste, and class in determining participation and influence in Guthi, although there is high evidence that these dimensions determine the vulnerability and adaptation (Bajracharya et al., 2022; Spoon et al., 2023). The current paper tries to fill these gaps by discussing the Guthi model as a community-based model of climate risk governance in Kathmandu Valley as well as discussing the ways Guthi rules, practices, and state relations attempt to inform the governance of climate related risks of living urban heritage.

Materials and Methods:-

Research design:

This study uses a qualitative case study design. The aim is to understand how Guthi institutions govern climate risks that affect cultural heritage in Kathmandu Valley. The study focuses on local meanings, rules, and practices rather than on large-scale statistical patterns.

The study considers each Guthi-owned heritage complex to be a case. A complex may consist of temples, pati and sattal, ponds, wells and ritual routes. Comparison of a few cases assists in observing the general patterns in addition to local differences.

Study area and case selection:-

The study area entails a few neighborhoods within Kathmandu Valley where Guthi are still active and heritage assets where stress is evident on the environment and climatic conditions. These consist of inner city settlements that have high densities of traditional fabrics and some peri-urban locations with high velocities of land use change.

Cases were also selected purposely. The criteria were:

1. Existence of an active Guthi who has either land or a heritage complex.
2. Heritages that are known to have problems like waterlogging, dampness, cracks, or reduced water level.
3. Social and cultural significance of the site to the local communities.

The final list of Guthi cases was determined and narrowed down through consultation with the municipal officers, heritage specialists, and local leadership.

Data collection:-

The study uses three main data collection methods:

First, the key informant interviews. These interviews were aimed at the Guthi leaders, elders, priests, municipal officials, heritage practitioners, and disaster risk focal persons. The interview guide encompassed climate changes that have been experienced in the site, maintenance procedures, decision-making regulations, source of funds, government associations, as well as any repair or reconstruction activities.

Second, discussions in the focus group. When possible, these discussions included Guthi members, women in the user households, and the youth. They helped to capture diverse views on risk, work sharing, and changes in participation. Separate groups for women or youth were used when mixed groups could limit open discussion.

Third, field observation and document review. Field visits recorded the physical condition of temples, courtyards, ponds, wells, and drainage. Simple sketch maps and photographs documented the layout, water flows, visible damage, and nearby land use. The study also reviewed municipal plans, heritage inventories, legal documents on Guthi, and national policies on climate change and disaster risk reduction that mention community or heritage governance. Interviews and focus groups followed a flexible guide. This allowed new issues to emerge. Conversations were conducted in Nepali or local languages and later translated into English where needed. With consent, the researcher took notes and, when acceptable, used an audio recording.

Data analysis:-

The study used thematic analysis. Transcripts, notes, and field observations were read several times to gain an overall sense of the material. The researcher then coded segments of text with labels such as perceived climate risks, maintenance routines, funding and land, participation and exclusion, relations with municipality, and post-earthquake changes. Codes were grouped into broader themes. For example, everyday risk management, institutional strengths, institutional constraints, and state community interaction. Comparison across cases helped to identify patterns and contrasts. Field observation data were used to check how reported practices matched the visible condition of sites. Policy and legal documents were used to clarify formal roles and to see where Guthi appear or remain invisible in official frameworks.

Reliability, validity and limitations:

The study improved reliability through triangulation. It combined different methods and sources. The researcher compared statements from Guthi leaders, ordinary members, women, youth, and municipal staff. Observations on site helped to confirm or question verbal accounts. Still, there are limitations. The number of Guthi cases is small. Results cannot represent all Guthi in Kathmandu Valley. Some respondents may understate conflicts or problems because of social norms of respect. Others may exaggerate their contribution to attract support. The study does not include detailed engineering assessments of structural risk. It focuses on governance and perceived climate-related impacts.

Results and Discussion:

Profile of Guthi cases:

The study covered several Guthi-managed heritage complexes in inner city and peri urban parts of Kathmandu Valley. All cases combined religious, social, and physical functions. Each complex included at least one temple or shrine, a courtyard space, and a water related element such as a pond or stone spout. Peri urban cases showed faster land use change and more fragmented open space.

Table 1. Profile of Guthi managed heritage complexes and income sources in Kathmandu Valley

Case ID	Location type	Main heritage elements	Main income sources
G1	Inner city	Temple, pati, courtyard, hiti	Land rent, house rent, user fees
G2	Inner city	Temple cluster, ponds, processional route	Land rent, donations, festival funds
G3	Inner city	Temple, sattal, courtyard	Land rent, shop rent
G4	Peri urban	Temple, pond, open ground	Land rent, agriculture, user donations
G5	Peri urban	Temple, hiti, small forest patch	Agriculture, user donations

In most cases, land rent and house or shop rent still provided core income, but these streams had declined over time due to land sales, fragmentation, or legal disputes. This finding supports earlier work that notes the growing pressure on community-based resource and heritage institutions under market and policy change (Shigaeva and Darr et.al, 2020; Verma et al., 2021; Maharjan and Barata, 2021).

Perceived climate risks and observed impacts:

Respondents in all cases reported more intense short-duration rainfall, more frequent waterlogging in lanes and courtyards, and longer dry spells in the pre-monsoon and winter periods. Inner city Guthi emphasized waterlogging,

dampness, and bio growth on walls. Peri-urban Guthi emphasized declining pond and well levels and heat stress in open grounds.

Table 2: Perceived climate risks and observed impacts on Guthi-managed heritage in Kathmandu Valley

Case ID	Main perceived climate risks	Key observed impacts on heritage
G1	Intense rainfall, waterlogging, and heat	Damp walls, moss, brick erosion, slippery steps
G2	Intense rainfall, flash runoff	Plinth cracking, courtyard flooding, pond siltation
G3	Heat waves, irregular rainfall	Drying of hiti, cracking of wooden elements
G4	Prolonged dry spells, heavy storms	Lower pond levels, bank erosion, and tree fall
G5	Irregular monsoon, local landslides	Slope instability near the temple, path damage

A simple column chart can show perceived risk intensity (low, medium, high) for each hazard across cases.

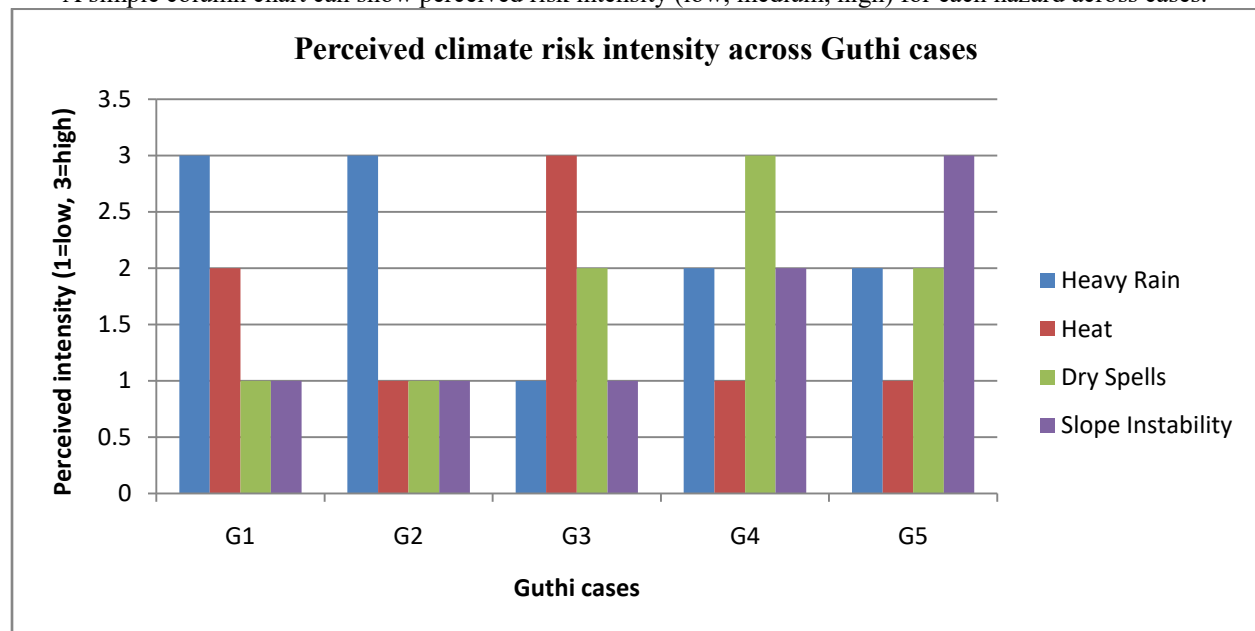


Figure 1. Suggested chart

Column chart with cases on the x axis and perceived intensity scores (for example 1 to 3) for hazards such as heavy rain, heat, dry spells, and slope instability on the y axis. These reports show broader evidence that climate variability in mountain and hill cities interacts with land use change to increase pluvial flooding, heat stress, and water scarcity (Thakur, 2025; Ghimire and Regmi, 2024; Riaz et al., 2025). They also show that water-related heritage, such as ponds and spouts, is particularly sensitive to both rainfall extremes and structural changes in supply and drainage (Shrestha A. et al., 2022; Ghimire and Regmi, 2024).

Everyday maintenance as climate risk management:-

In all cases, Guthi organized regular maintenance work. This included cleaning drains and inlets before the monsoon, desilting ponds, repairing minor cracks in plinths and steps, re-pointing bricks, and cutting or pruning trees near structures. Many of these tasks were embedded in ritual calendars linked to specific festivals.

Table 3. Guthi maintenance practices and their contribution to climate risk reduction

Practice	Frequency	Risk relevance
Drain and inlet cleaning	Pre monsoon	Reduces waterlogging and pluvial flooding
Pond Desilting and bank repair	Every 1–3 years	Maintains storage and reduces erosion
Brick and plinth maintenance	Annual or as needed	Reduces moisture penetration and structural stress
Tree pruning near structures	Seasonal	Lowers storm-related branch fall risk

Courtyard cleaning and minor levelling	Weekly or festival	Improves drainage and surface safety
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Drain and inlet cleaning Pre pre-monsoon, reduces waterlogging and pluvial flooding Pond desilting and bank repair every 1–3 years. Maintains storage and reduces erosion Brick and plinth maintenance, Annual or as needed, reduces moisture penetration and structural stress Tree pruning near structures, Seasonal Lowers storm-related branch fall risk Courtyard cleaning and minor levelling, Weekly or festival, improves drainage and surface safety These activities function as everyday risk reduction, even if participants do not label them as climate adaptation. This supports arguments that much adaptation happens through routine practices and that formal projects often overlook such work (Eriksen et al., 2021). The finding also fits with studies that highlight the practical and symbolic roles of traditional settlements and institutions for environmental performance and microclimate regulation (Zheng et al., 2024; Weise, 2013; Silva, 2016). A stacked bar chart can summarize how Guthi allocates effort across maintenance categories, for example percentage of collective workdays spent on water, structures, and greenery.

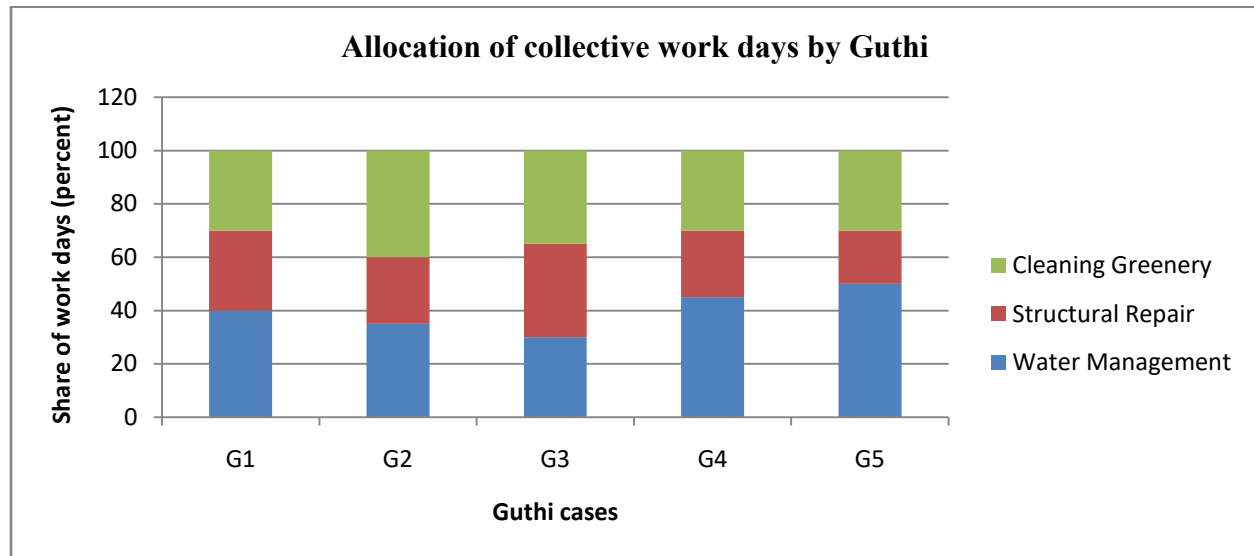


Figure 2. Allocation of collective workdays across maintenance categories by Guthi

Stacked bar chart with each Guthi on the x-axis and shares of workdays allocated to water management, structural repair, and cleaning or greenery on the y-axis.

Governance strengths and internal constraints:-

The analysis identified several governance strengths. All Guthi had clear membership rules and role allocation. Ritual obligations reinforced long-term commitment. Most had basic record keeping for income and expenditure, and internal sanctioning for nonpayment of dues or failure to perform duties. These features align with design principles for robust community institutions found in the commons and forest governance literature (Shigaeva and Darr, 2020; Verma et al., 2021; Subedi and Shrestha, 2024a). Key strengths included the stable social recognition and legitimacy of Guthi within the neighborhood, which gives decisions strong local acceptance. Guthi would be able to mobilize a voluntary workforce on short notice to do cleaning, repair and emergency works. They also knew the site history, water flows and traditional materials deeply and were used to make practical decisions. In several instances, Guthi related to the representatives of the diaspora and other external sponsors, who supplied some additional money to make significant repairs and climate-related damage.

However, the study also found significant constraints. Younger members often had limited interest or time, due to education, employment, or migration. Women participated actively in cleaning and daily care, but were underrepresented in formal decision roles, which reflects wider patterns of gendered labor and exclusion in disaster and heritage contexts (Bajracharya et al., 2022; Spoon et al., 2023). Income from Guthi land declined due to past sales, disputes, and changes in legal status, which reduced the ability to finance major structural works. Disagreements over priorities and transparency sometimes created tension inside Guthi and between Guthi and neighboring residents.

These mixed findings support the view that local institutions are neither perfect nor static. They have capacities that external actors can build on, but they also reproduce social hierarchies and can be weakened by market and policy shifts (Eriksen et al., 2021; Maharjan and Barata, 2021; Subedi and Shrestha, 2024c).

Relations with state actors and risk technologies:-

Relations between Guthi and municipalities, heritage authorities, and disaster risk agencies were uneven. In some cases, municipalities provided small grants or technical advice for structural repairs or pond restoration. In the rest, Guthi sensed forgotten, or pushed to the margin, in the road, drainage, or housing works which immediately impinged upon the front of the temple, or its courtyard, or pond. Examples given by the respondents were new roads or new drains crossing ancient water channels or open spaces required by processions. This experience reflects broader findings that disaster risk reduction and urban regeneration projects can conflict with heritage values and local practices when they are not co-designed with communities (Daly et al., 2023; Shakya, 2018; Silva, 2016). It also echoes mapping work from Kathmandu that shows fragmented and weakly coordinated risk governance across institutions (Poudel and Blackburn, 2020).

Most Guthi had little direct interaction with advanced risk technologies. They were aware of weather forecasts and sometimes of early warning messages distributed by municipalities or media but had not been involved in digital twin or remote sensing-based planning projects (Hlal et al., 2025; Khan et al., 2023). This confirms that technological innovations often operate in parallel to, rather than in partnership with community institutions. As Gao et al. (2025) argue for urban ecological resilience, real progress requires linking data and models to decision-making arenas where local actors have a voice.

Synthesis: Guthi as community-based climate risk governance:-

The results show that Guthi already performs key functions of community-based climate risk governance for heritage in Kathmandu Valley. They identify and monitor climate-related changes in their immediate environment, coordinate collective maintenance, mobilize funds, and negotiate with state actors. Their practices protect structures, water bodies, and public spaces that are central to both heritage and everyday life. At the same time, Guthi faces growing pressure from shrinking income, social change, increased climate variability, and often uncoordinated state and market interventions. Gender and other social differences shape who decides, who works, and who benefits. This reinforces insights from disaster and adaptation research that warn against romanticizing “communities” and call for attention to internal power relations (Eriksen et al., 2021; Bajracharya et al., 2022; Spoon et al., 2023).

From a governance perspective, Guthi can be seen as a hybrid institution that bridge religious, social, and practical domains. They share features with community forestry user groups, traditional village councils, and water user associations discussed in wider environmental governance literature (Poudel, 2020; Shigaeva and Darr, 2020; Verma et al., 2021). In Kathmandu Valley, they offer an existing platform through which climate and disaster risk agencies, heritage authorities, and planners can engage with local realities. The discussion, therefore, supports three main points. First, climate risk governance for urban heritage should recognize and strengthen existing community institutions such as Guthi, instead of creating parallel committees. Second, integration should come with attention to inclusion, transparency, and long-term financial viability, so that Guthi can adapt to new risks without losing its social base. Third, linkages between community-based governance and technological tools for risk assessment and monitoring need deliberate design, so that digital information supports, rather than bypasses, local knowledge and decision processes (Hlal et al., 2025; Khan et al., 2023; Gao et al., 2025).

Conclusion and Recommendations:-**Conclusion:-**

This study examined the Guthi system as a form of community-based climate risk governance for heritage in Kathmandu Valley. The findings show that Guthi remain central to the care of temples, courtyards, ponds, stone spouts, and ritual routes that define the living urban heritage landscape of the Valley (Weise, 2013; Silva, 2016; Maharjan and Barata, 2021). Guthi organizes regular maintenance, mobilizes voluntary labor, manages funds, and negotiates with municipal and other authorities. These everyday practices already reduce climate-related risks, even if people do not describe them as adaptation. Respondents reported more intense short-duration rainfall, more frequent waterlogging, longer dry spells, and greater heat stress. These signals match broader evidence on climate variability and urban environmental stress in hill and mountain cities (Thakur, 2025; Ghimire and Regmi, 2024). In Guthi-managed spaces, such changes appear as damp walls, faster erosion of brick and timber, pond siltation,

declining spring and spout flows, slope instability, and changes in the use of open grounds. Regular cleaning of drains and inlets, desilting of ponds, small structural repairs, and care for trees and greenery act as low-cost risk reduction measures that protect both structures and everyday activities (Eriksen et al., 2021; Zheng et al., 2024).

The governance features of Guthi explain much of this capacity. Clear membership, role allocation, ritual obligations, and shared norms support long-term commitment and collective action. These features are consistent with design principles for robust community institutions in forest and resource governance (Shigaeva and Darr, 2020; Verma et al., 2021; Subedi and Shrestha, 2024a). At the same time, the study found important constraints. Income from Guthi land and properties has declined. Younger members often have limited time or interest. The daily care of women and the underrepresented population is most of the work, but there are no formal decisions that reveal the broader aspects of gendered and social inequities in the disaster and heritage context (Bajracharya et al., 2022; Spoon et al., 2023).

Relations between Guthi and state actors are uneven. Some municipalities provide grants or technical advice for repairs and pond rehabilitation. Others implement road or drainage projects that disrupt traditional water flows, reduce open space, or overlook ritual requirements. These findings support existing work that highlights fragmented disaster risk reduction governance in Kathmandu and tensions between reconstruction, safety, and heritage values after the 2015 earthquakes (Poudel and Blackburn, 2020; Daly et al., 2023; Shakya, 2018; Silva, 2016). The study also confirms the gap between technological risk assessment tools and community institutions. Digital twins, remote sensing, and urban resilience models are expanding in flood risk management and heritage monitoring (Hlal et al., 2025; Khan et al., 2023; Gao et al., 2025). However, Guthi has had little direct engagement with these tools. Risk information often stays in expert or government domains rather than entering community decision processes.

Overall, the results show that Guthi functions as an existing form of community-based climate risk governance for heritage. They contribute to monitoring, prevention, response, and recovery around climate-related impacts in Guthi-managed spaces. They also carry internal tensions and face external pressures that can limit or distort their role. The main contribution of this study is to connect climate risk governance, environmental and water governance, and heritage literature with detailed evidence on how Guthi operates in practice in Kathmandu Valley (Eriksen et al., 2021; Poudel, 2020; Maharjan and Barata, 2021; Subedi and Shrestha, 2024c).

Recommendations:-

The study recommends that Guthi be treated as core partners in climate risk governance for heritage in Kathmandu Valley, not as peripheral actors. National and provincial policies on climate change, disaster risk reduction, and heritage should explicitly recognize Guthi where they remain active and legitimate, and legal or administrative reforms of Guthi land and finances should protect the income that funds public heritage maintenance and risk reduction (Poudel and Blackburn, 2020; Subedi and Shrestha, 2024a, 2024c; Maharjan and Barata, 2021). Municipalities should map Guthi-managed complexes, consult Guthi in planning for roads, drainage, water supply, housing, and tourism, and support them through joint working groups, technical advice, small matching grants, and practical risk information such as early warning messages and simple hazard maps (Daly et al., 2023; Silva, 2016; Karki et al., 2024; Hlal et al., 2025; Khan et al., 2023).

Inside Guthi, rules and practices should be adjusted to improve inclusion of women, Dalits, poorer households, and youth, strengthen financial transparency, and prepare simple risk and maintenance plans that set out routine tasks and responses for key hazards (Bajracharya et al., 2022; Spoon et al., 2023; Subedi and Shrestha, 2024a). Future work should extend research to more diverse Guthi, combine qualitative analysis with basic structural and hydrological assessments, and pilot digital tools that can support community-based monitoring and decision making, while tracking effects on trust, participation, and outcomes (Eriksen et al., 2021; Ghimire and Regmi, 2024; Verma et al., 2021; Gao et al., 2025; Hlal et al., 2025). Taken together, these steps can strengthen everyday maintenance that already reduces risk, improve coordination between community institutions and formal agencies, and support more inclusive and resilient management of living urban heritage in a changing climate.

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