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Towards a Regenerative Role of Cultural Heritage in Climate Resilience; the Case of the Indian Water Infrastructure Heritage

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Abstract: Despite great efforts in facing climate change challenges—especially by the UN Paris Agreement, the 2030 Agenda for Sustainable Development, and companion documents (Sendai Framework for Disaster Risk Reduction and the New Urban Agenda)—generally speaking, current policies on climate change and Disaster Risk Reduction at both national and international levels have not yet been centrally positioned in respective plans for heritage, and cultural heritage still does not have a central role in such policies. The main aim of this paper is to explore the culture/cultural heritage’s complex interrelationship with climate change by delving into critical issues/gaps and recommendatory encounters of heritage framework in climate change framework and vice versa at the international level and an example in India. Accordingly, this paper showcases a type of Indian Water Infrastructure Heritage; Stepwells, traditional underground water management systems in arid western India which, unfortunately, with modernization, lost their original function and hence, nowadays, most are abandoned. Thus, by the situational analysis of such an Indian urban-scale type of heritage, this paper concludes with critical reflections on the necessity of the systemic relationship among sustainability, conservation, and development, especially in practice and the need to recall the notion of sustainability again.

Keywords: climate resilience; Water Infrastructure Heritage (WIH); India



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1. Introduction

The 2018 UN Intergovernmental Panel on Climate Change (IPCC) confirmed that the changing climate is pursuing “rapid and far-reaching” transitions globally. That is essentially due to human activities that, principally through emissions of Greenhouse Gases (GHGs), have already made the climate approximately 1 degree Celsius (a likely range of 0.8 °C to 1.2 °C. Global Warming) warmer than in pre-industrial times. It is estimated that Global Warming could reach 1.5 °C around 2040 and 2 °C by 2065 if emissions continue to increase at the current rate [1]. The 2022 IPCC also confirmed that human activities “unequivocally” caused Global Warming, with the “global surface temperature reaching 1.1 °C above 1850–1900 in 2011–2020”. It stated that the increase in GHGs emissions has continued with “unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individual”. And, that has led to “widespread adverse impacts and related losses and damages” to the natural and cultural built environment and human systems [2].

Moreover, the 2022 IPCC report stated that multiple (climate-related) risks will be increased with every increment of Global Warming across sectors and regions, especially in India. It has been confirmed that “India’s average temperature has risen by around 0.7 °C during 1901–2018”, and by the end of the 21st century, it is projected to rise “by approximately 4.4 °C relative to the recent past (1976–2005 average)”. Furthermore, since the middle of the 20th century, India has witnessed “a decrease in monsoon precipitation; a rise in extreme temperature and rainfall events, droughts, and sea levels; an increase

in the intensity of severe cyclones, alongside other changes in the monsoon system” [3] (pp. xiii–xvi). In such a scenario, the contemporary impact of climate change on water resources in India more than ever seems crucial. For instance, the analysis carried out from Indian satellite and local well data spanning the past decade confirmed that “long-term changes in monsoon precipitation are driving groundwater storage variability in most parts of India either directly by changing recharge or indirectly by changing abstraction” [4] (p. 109). That reasonably makes us wonder about the contemporary role of Indian well-rooted and culturally feasible pre-industrial water (underground) infrastructures ignored for the last decades.

Among them, the Indian stepwells (*Vavs*) were the unique national forms of subterranean water storage systems, especially in the western states with a high level of scarcity of water resources, having the primary functional role of water supply, both for inhabitants, households and their personal means, animal watering or agricultural purposes, and being community centers and religious places. They were designed and constructed as a combination of utilitarian and social manifestations, where the water resource became a meeting point for social and cultural interactions. However, with the arrival of modernization to India, the lack of water resources for industrial agriculture, the dramatic shift from a traditional hydraulic system to piped system, and the impact of climate change on water resources, almost all those stepwells lost their original function. Nowadays, they are either drastically ignored, severely damaged, or abandoned. Only a few are protected nationally or by the states, and just one of them, Rani ki *Vav* (the Queen’s Stepwell), was inscribed on UNESCO World Heritage List in 2014 as a cultural heritage site. Nevertheless, such heritage as complex water-sensitive structures in the state of transition is still functioning as the cluster of urban/pre-urban/rural phenomena containing several functions/programs/buildings, with a local participation and engagement level and still having the capacity to ‘regenerate’ local resilience.

The climate and non-climate change-driven challenges reasonably highlight the necessity of reevaluating the longstanding existing interrelationship between water, culture, and built cultural heritage. Generally speaking, unfortunately, historic water (infrastructure) systems/water management systems are not frequently recognized as ‘heritage’. That could be due to the fact that ‘water’ and ‘heritage’ are largely considered as two separate fields, and each of them is “approached from siloed perspectives”; water-related concerns are the subject of different disciplinary lines, whereas (cultural) heritage is often examined as isolated structures in their territorial context and separated from the larger systems, especially by the fields of science, engineering, and economics, as well as by policymakers and managers [5] (pp. 1, 3); consequently, leading to a lack of dialogue and collaboration between the water and heritage fields.

At the international level, the interrelationship between (cultural) heritage and water (management) was primarily addressed by the International Council on Monuments and Sites (ICOMOS), especially since the early 1990s, by the ICOMOS Netherlands in both their scientific research and research-based policymaking. In specific, the formation of the new ICOMOS International Scientific Group on Water and Heritage (ISC Water)—following the nineteenth ICOMOS General Assembly in Delhi, 2017 and subsequently, the ‘Water as Heritage’ International Conference in Taiwan in 2019 was the result of the extensive work of ICOMOS Netherlands on such synergy, especially between 2013 and 2018, conducting several expert meetings, workshops, and conferences, and books published to develop its water and heritage agenda, aligned with the UN Sustainable Development Goals (SDGs) [5]. The new ISC Water aims to raise awareness about the significance of water-related heritage, to progress the knowledge and experience about them, and to promote their conservation for current and future water-related challenges, especially within the challenges of climate change [6]. Interestingly, ICOMOS India was one of the first to mobilize such an endeavor.

To connect different fields of water, culture, heritage, and sustainable development, very recently, in March 2023, in New York, several side events were organized at the UN Conference on the Midterm Comprehensive Review of the Implementation of the Objectives

of the International Decade for Action ‘Water for Sustainable Development’ [7], thanks to collaboration among the United Nations, UNESCO, ICOMOS ISC Water, ICOMOS Sustainable Development Goals Working Group (SDGWG), and co-hosting of the Governments of Tajikistan and the Netherlands. For instance, the conference, ‘Water and Heritage: Connecting Past, Present and Future’ was an opportunity to initiate multi-stakeholder dialogues by water professionals and culture and heritage experts at different levels to bridge disciplinary and institutional divides by creating “an international platform on water, culture and heritage to connect knowledge and practices through time and space” to contribute to climate change “mitigation and adaptation and water-related challenges in support of sustainable development” [8] (p. 2). It is worth mentioning the role of India in the 2023 UN conference—its significant commitments in the water sector to take measures for the restoration of groundwater levels and to enhance rural drinking water services—as well as its cooperation with the Netherlands on better water management, especially by working with local authorities on the restoration of the Water Infrastructure Heritage (WIH), such as water reservoirs, to make urban areas more resilient to flooding, drought, and pollution [9].

However, within a challenging context of planning and policy-making for WIH in India, at least within recent two decades, some important proactive programs have been introduced, on the one hand, to clarify the problems more comprehensively and, on the other hand, to try to find solutions or raise awareness, develop advocacy, and recommend better actions for proper management and future plans, which could provide sustainability and climate resilience for their contexts and communities. This paper critically reviews some of those programs to explore not only their significance in the national and local planning and management systems across India but also the practical level of their effectiveness in the actual systemic conservation of those WIH, their valorization, the revitalization of water management, and water use culture and regeneration of their context.

The paper delves deeper into one WIH, Rudabai stepwell (*Vav*), at Adalaj village, Gujarat, to explore the effecting lacks on the planning of its heritage management system and gives some recommendatory encounters to deal with the climate resilience of its context and communities. The stepwell is selected due to its composition of different management and action bodies, promoters, and actors, making it a good example of upfronting the different interests and programs/approaches to cultural heritage, as in recent years, it has been the main target for both the tourism sector and smart growth programs.

2. Research Methodology

This paper’s original content is based on analytical research on the relationship between heritage framework and contemporary challenges such as climate change, risk reduction, and mass tourism at the international level and in India. The original research dealt with built cultural heritage management-related concerns and the role that such heritage can play in Global Goals (e.g., SDGs and climate resilience), confronting contemporary challenges. The general aim was to explore the gaps, needs, and requirements for planning a contemporary heritage management system dealing with those goals and challenges in a more comprehensive way.

The original research had a mixed type of descriptive, explanatory, and correlational methods to identify, describe, and establish the new and dynamic interrelationship and systemic synergies between heritage and its related fields/concerns. It had a qualitative approach in data collection and analyzing phases regarding heritage-related concerns, and it eventually clarified the gaps and causes behind international/national difficulties in having a stable strategy for the contemporary heritage management system. It employed a holistic, systemic perspective in which different directions and points of view toward cultural heritage protection, conservation, and valorization have been analyzed in different scales of interrelationships and among disciplinary systems.

In that regard, the original research analytically reviewed and compared the policies, directives, conventions, reports, and strategies of the international organizations of different fields, such as the United Nations, UNESCO, ICOMOS, International Centre for

the Study of the Preservation and Restoration of Cultural Property (ICCROM), United Nations Development Programme (UNDP), United Nations World Tourism Organization (UNWTO), United Nations Office for Disaster Risk Reduction (UNDRR), IPCC and European Commission, and scholarly debates, as well as their Indian counterparts, to reveal and understand sharper the gaps/potentials and advances of such bodies of information.

Thus, it investigated the effect of one system on the other and vice versa by detecting the gaps and then looked critically into the recommendatory encounters to reveal the nature of reactions necessary for the future integration of each pair of frameworks. It explored five frameworks of sustainability, resilience, climate change, tourism, and management in relation to the heritage framework.

For this paper, only one, the synergies between heritage framework and climate change challenges, will be discussed by way of reviewing and analyzing the Indian revitalization of water use culture programs and conservation and development programs, as well as showcasing the problematics and strategic recommendations regarding the case of the Indian stepwell (Figure 1).

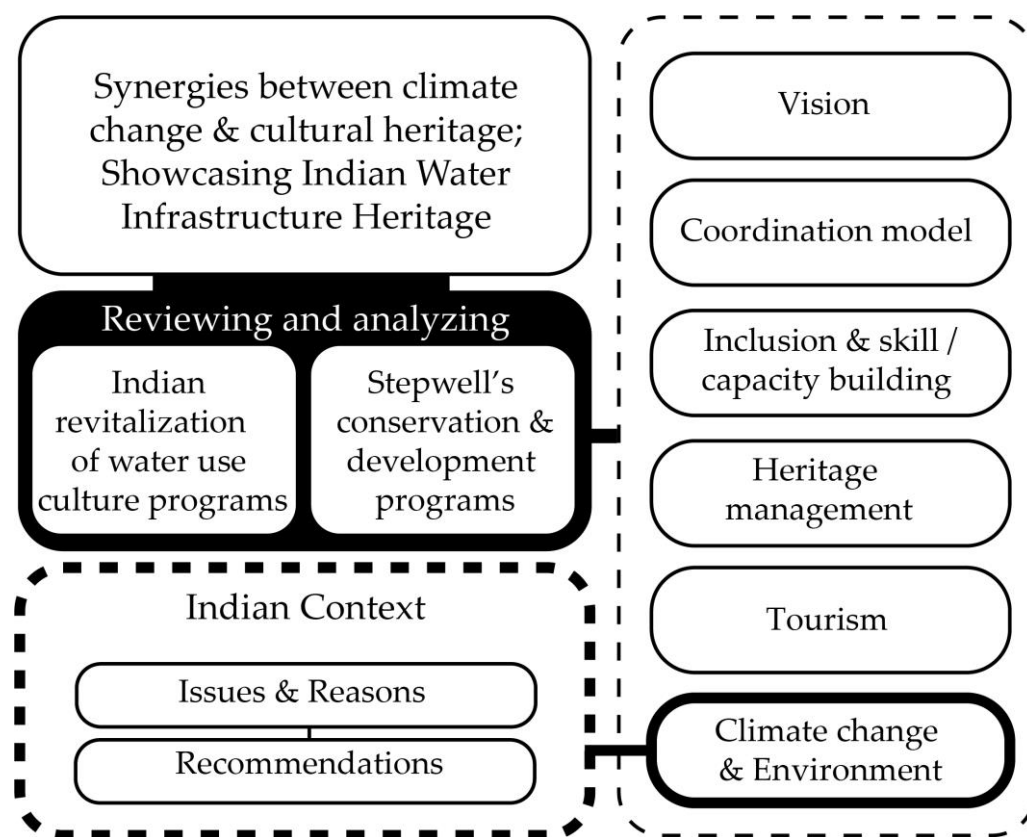


Figure 1. General steps to the underlying research/the depiction of a specific topic for this article.

3. Indian Revitalization of Water Management/Water Use Culture

3.1. National Level

At the national level, to provide safe and affordable drinking water for all by 2022, in 2019, the Indian Government constituted the new Ministry of Jal Shakti “to ensure effective water governance and comprehensively address water management challenges”. It aimed broadly at “improving water conservation, rainwater harvesting, renovation of traditional and other water bodies, reuse of water and recharging of structures, watershed development, and intensive afforestation through broader community mobilization and participation to achieve a water-secure future” for India. Implementing the National River Conservation Plan for cleaning rivers; employing traditional techniques like *taanka* for rainwater harvesting and water conservation; constructing subsurface dams for proper

utilization of groundwater resources and controlling the undesired fluctuations in groundwater level [10] (pp. 65–68) were some examples of the measurements taken by the Ministry, all inspired by the National Water Mission under the 2008 National Action Plan on Climate Change (NAPCC) [11].

On a more comprehensive side, one can find the programs initiated by the World Monuments Fund (WMF) and ICOMOS India, which approach such heritage similarly. By 2020, WMF started a new program dealing with the water crisis for “communities across India through the revitalization of traditional water management systems and the reinforcement of Indigenous knowledge”. The program: the Historic Water Bodies of India, can be considered one of the most recent long-term projects to list and conserve such heritage. This project’s first objective is to produce “a comprehensive repository of information on traditional water systems and associated structures in India” for further steps, such as a feasibility study, survey, and analysis for possible conservation plans. However, one of the main obstacles to the first and primary onsite step of such programs is the uneven distribution and improper use of modern techniques and knowledge on documentation and surveys across India. Nowadays, the ICOMOS National Scientific Committee of Heritage Documentation (NCHD) is the main body that attempts to bridge such a gap by promoting and employing new technologies through education and capacity-building activities.

Alongside ICOMOS’s NCHD, its Water Heritage Working Group (WH-WG) plays a crucial role in leveraging the potential of traditional knowledge and management systems on water heritage. Compared to NCHD, WH-WG’s vision is more comprehensively cultural and, to some extent, much nearer to the contemporary notion and sustainability goals of being inclusively public knowledge, policy, and practice-oriented [12]. With its primary role of highlighting “the ‘intrinsic’ values of water heritage alongside its value to the future of sustainable development, as a means of improved safeguarding, conservation, and management of this heritage in all its tangible and intangible forms,” it aims to create “an inventory with a framework for documenting and assessing water heritage” and establish “a national repository of typologies of water heritage through a geo-tagged map”. Interestingly, WH-WG’s mission is compatible with WMF’s program, relating itself to the sustainable goals in the long-term within the Indian social/cultural notion of traditional water management systems, the “collective responsibility for their maintenance and upkeep” and the limitation of their “supply of water to the natural rate at which it replenishes” to change public’s “water consciousness by promoting a new ethic of care” [13].

In case of relatively successful implementation, the two bodies of ICOMOS can result in the identification and listing of WIH and then their proper documentation and monitoring. They can also contribute to re-negotiating/re-generating social-cultural public knowledge and ethics of water management and conservation, which in turn foster conservation and management of such heritage. However, such initiatives still are young, uneven, and marginalized in national and local planning and management systems across India, and their repositories require more onsite investigations, data collections, better accuracy and reliability control, and more multi-phase digital tools and methods of data identification and analysis for their new sources such as crowdsourcing. And still, there is practical doubt on the level of their effectiveness and success in the actual systemic conservation of WIH, its valorization, and revitalization of water management and water use culture.

3.2. State and Local Levels

Very few Indian states are on the front line of intensive work on water management and conservation as well as management and conservation of WIH. Now, Indian states like Gujarat and Rajasthan are prominent in that regard, both for the governmental concentration of activities/programs/initiatives and the active role of other non-governmental bodies such as ICOMOS. Their climatic conditions and the intensity of their WIH, especially stepwells, in those states, reveal a long history of water preservation and resilience in arid

and semi-arid climates, and as such, heritage and societal values of those stepwells can be “far more climatically ethical and culturally proactive” [14] (p. 1260).

In particular, the historical capital of Gujarat, Ahmedabad City, and its governmental capital, Gandhinagar City host a concentration of government projects such as smart growth-based infrastructural projects, active tourism promotion within theme park constructions, and relatively advanced level of conservation of cultural heritage, with Ahmedabad Municipal Cooperation (AMC), ICOMOS, and local actors like Urban Management Centre (UMC) involvements and both public and academic participation, such as the Center for Heritage Conservation (CHC) at CEPT University in Ahmedabad. Those make Ahmedabad city/region a dynamic laboratory of different interests’ programs and approaches to cultural heritage in which, in recent years, their stepwells have been the main target both for the tourism sector and for the promotion of water conservation and management programs as icons of traditional water resources/systems.

One of the relatively dynamic approaches to WIH in Gujarat comes from the objective of revitalizing traditional water resources, specifically in the Heritage Department of AMC, within its sustainable development agenda. Their project tackles the contemporary issue of scarcity of water resources by promoting the “conservation of traditional architectural and urban elements” as well as “water conservation”. The project started in 2015 with a feasibility study and then the selection of a pilot project for five wells to restore for “rainwater harvesting, groundwater recharge, and supplementary water sources in case of emergencies”, including the restoration of the Amritvarshini stepwell in the historic city of Ahmedabad, which was inscribed on the UNESCO World Heritage List in 2017 [15] (Appendix 7).

Moreover, several similar initiatives began about the unprotected and lesser-known WIH. For example, through a series of heritage listing projects inside and outside Ahmedabad Walled City, under AMC in collaboration with UMC, several unprotected and lesser-known stepwells of Ahmedabad–Gandhinagar region have been identified and documented to “understand the societal needs of the congregation or support infrastructure on trade routes and the traditional knowledge of water management systems”, conserve and “encourage a sensitive adaptive reuse” of those structures, economic and social potential of new uses and their context, and create policies supporting new uses [16] (pp. viii, IX, 79). One of the consequences of such initiatives was the feasibility study of Gujarat’s unknown stepwells for ten sites by CHC under the commission of Tourism Corporation of Gujarat Limited to propose for each site “a plan for restoration, conservation, and development as a tourist destination”. It is noteworthy that earlier, several Indian national/state-protected WIH, like Rudabai Stepwell, were pilot projects for tourism development.

4. Rudabai Stepwell Conservation and Development Programs

Rudabai stepwell in the historic village of Adalaj, outskirts of Ahmedabad city, Gandhinagar District, was constructed around 1499, as a linear WIH, with a plain structure, three main entrances on the ground floor, and a linear stepped corridor to the underground well shaft at the end of the structure. At present, the stepwell complex (stepwell, its temple, and its small garden) is protected by ASI and categorized as a monument of National Importance by the Indian Government under the provision of the Ancient Monuments and Archaeological Sites and Remains (AMASR) Act of 1958 (amended and revalidated in 2010), while the edges of its protected boundary and surrounding areas of the historic village have been dramatically transformed. The stepwell’s hinterland, water basin and agriculture fields that were once one of the main sources of income for the Adalaj villagers, currently are being sold away and transformed into suburban housings, warehouses and small factories, and their occupations from farmers are being shifted to shopkeeping and business start-ups.

Such transformations were due to separate development plans (City Development Plan Ahmedabad, 2006–2012, Comprehensive Development Plan of 2021; Gandhinagar Development Plan, 2011–2031), as the result of the Jawaharlal Nehru National Urban

Renewal Mission (JNNURM) (2005–06) and the tourism promotions in India initiated by the National Tourism Policy 2002, followed by the 2015 Gujarat Tourism Policy, and accompanied by the regional smart development plan (Integrated Mobility Plan for Greater Ahmedabad Region, 2031; Gandhinagar and Ahmedabad Smart Cities Missions).

The main focus of the JNNURM was on “efficiency in urban infrastructure and service delivery mechanisms, community participation, and accountability of [Urban Local Bodies] ULBs/Parastatal agencies towards citizens” [17] (p. 5). Under the mission, Ahmedabad city was eventually declared a megacity of several municipalities by initiating the City Development Plan Ahmedabad, 2006–2012; Ahmedabad city was formed into the sixth largest city in India, with a 5,633,927 population (according to the Census of 2011) and several new urban projects, such as the Sabarmati Riverfront development, Bus Rapid Transit System (BRTS), and the Ahmedabad metro, were conducted. Alongside the development of Ahmedabad city initiating several further projects under the Ahmedabad Comprehensive Development Plan of 2021, Gandhinagar city and its surrounding villages, such as Adalaj village, have undergone infrastructural developments by the Gandhinagar Development Plan of 2011–2031, resulting in the mass sale of agricultural lands and occupation transformation of villagers. Controversially, the new significant technological developments in the agricultural sector and the growth of the Agro-based industries also opened opportunities for new private-sector investments, such as the ITeS sector, and a particular focus on financial services. Plus, significant research institutes, colleges, and schools were provided by the Gandhinagar district.

Furthermore, based on the National Tourism Policy 2002, the Government of Gujarat decided in 2005 to redefine the Adalaj Stepwell as the gate to North Gujarat for any further development. Accordingly, the new tourist facilities near Adalaj Stepwell (covering an area of 120,000 Sq.mt) were built under the assumption of beautification for mass tourism, which mainly changed the existing natural lake of Adalaj village to the artificial water reservoir. And the construction of a new northern highway (Sarkhej–Gandhinagar highway reached out from Ahmedabad), without having any proper exit or entrance toward either the tourist facilities or the village, as well as the additional construction of the paved road between the historic core of the village and the stepwell’s boundary, all, have transformed the village’s social, economic, and spatial structures [18] (Figures 2–4).

Thus, the insufficient interrelationship between Indian organizations at different levels, from national to local, several degrees of malfunctioning in the systems, from the national infrastructural design level to the social economy of local groups, lack of profitability of the investment in physical tourist facilities due to not only errors in planning and project but also for losing critical time between the conclusion of the construction phase and opening for public use, and lack of daily integration of the cycle of local activities with the management and maintenance program of tourist facilities resulted in the separation of the village and local people from the stepwell, incoming tourists, and any possible future programs of under-used tourist facilities.

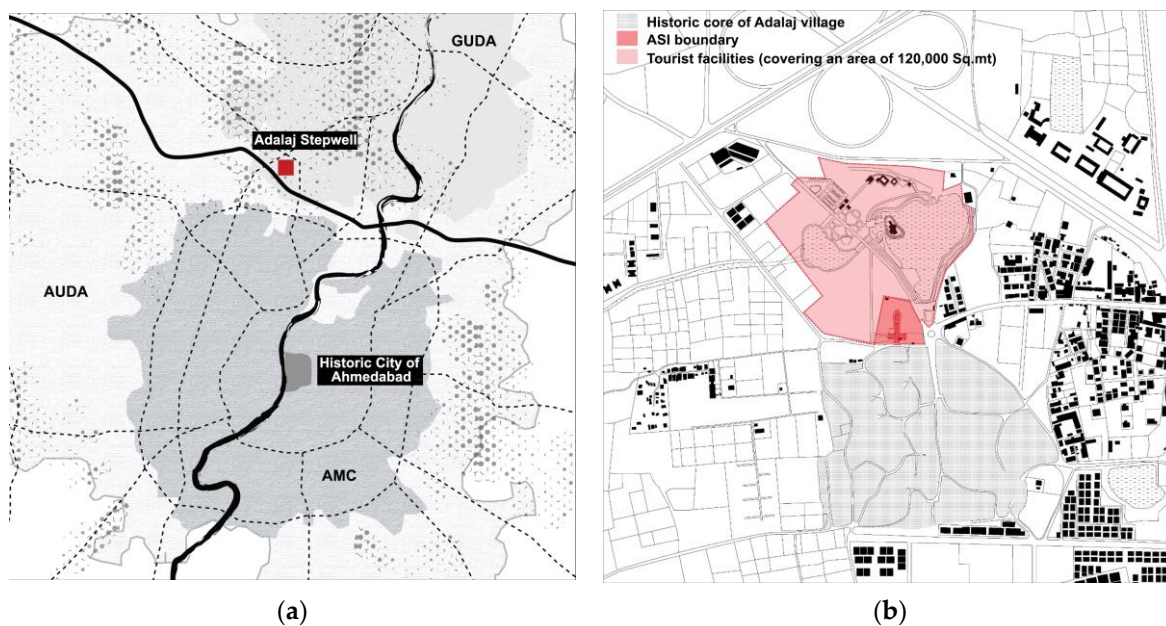


Figure 2. (a) The location of Rudabai Stepwell in relation to Ahmedabad Municipal Cooperation (AMC), Ahmedabad Urban Development Authority (AUDA), Gandhinagar Urban Development Authority (GUDA) and Historic City of Ahmedabad. (b) Rudabai Stepwell and its context by 2018. Source: Author 2023.

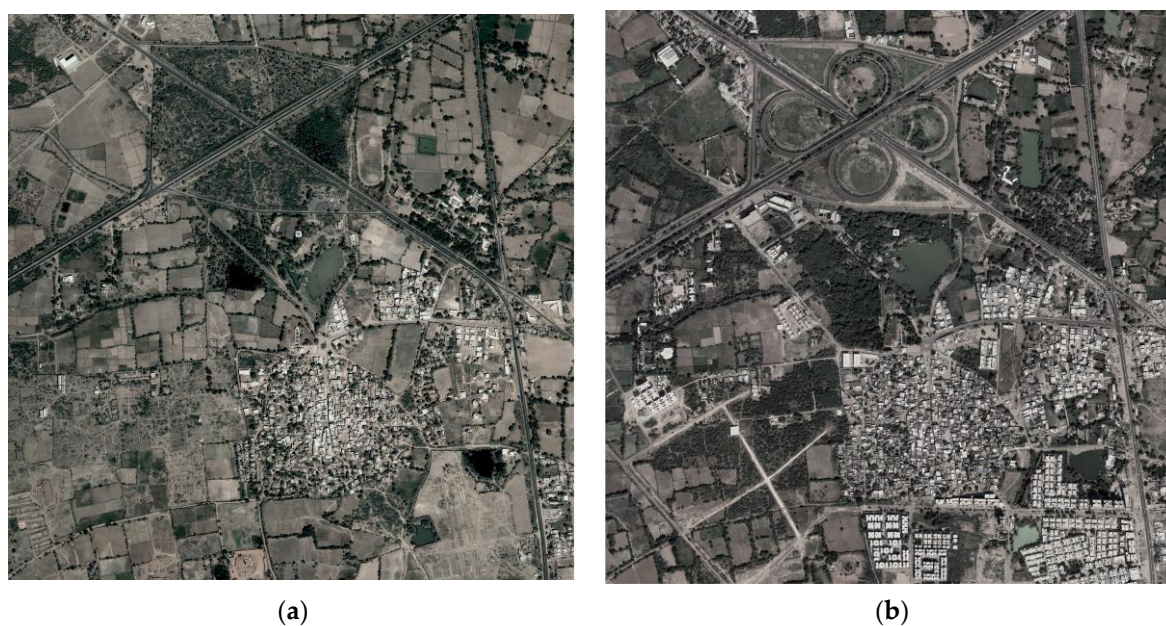


Figure 3. Transformation of Rudabai Stepwell's surrounding areas between 2003 and 2023. (a) 2003; (b) 2023. Source: Google Earth.

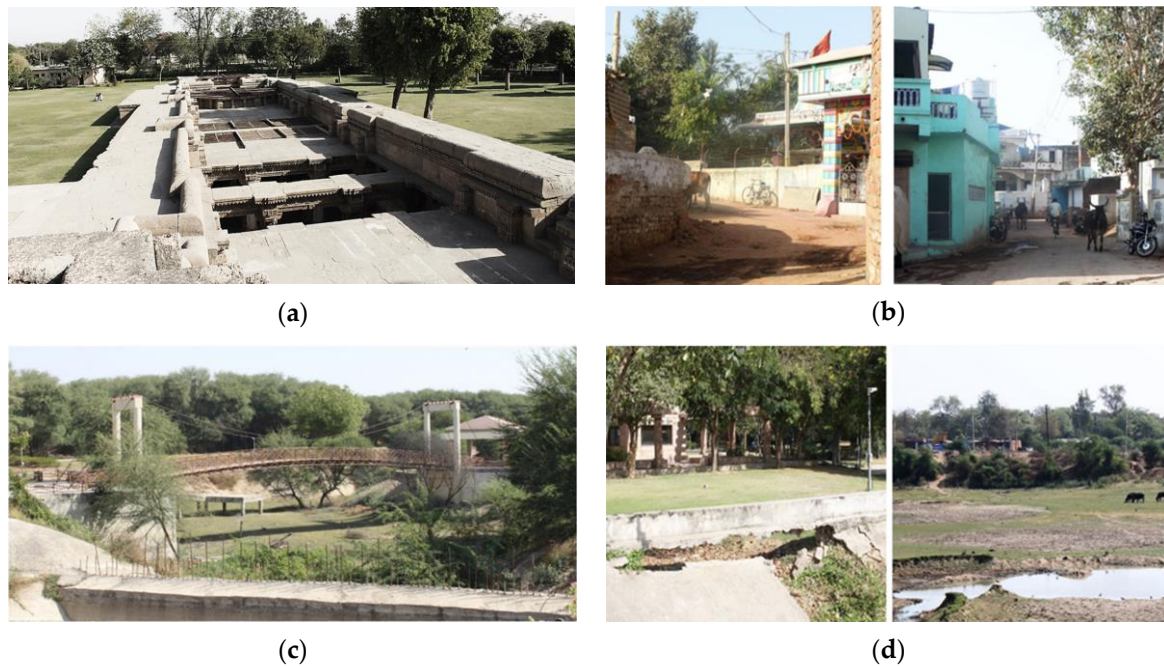


Figure 4. (a) Rudabai stepwell within its Archaeological Survey of India (ASI) boundary; (b) Historic core of Adalaj village; (c,d) Tourist facilities and their state of decay. Source: Author 2016.

On a more comprehensive side, bearing the regional smart development idea in mind to shape the future vision of the Ahmedabad and Gandhinagar region, the Integrated Mobility Plan for Greater Ahmedabad Region for 2031 desired to adapt both transportation plans and Development Plans together, envisioning covering the developments in the area in a span of 20 years, arriving from 8.1 million habitants in 2011 to about 12.5 million in 2031, and increasing employment by 70% in 2031. Covering an area under the Ahmedabad Urban Development Authority (AUDA), Gandhinagar Urban Development Authority (GUDA), and urban centers and villages outside authorities, the region took into account significant industrial developments, Special Investment Regions, major financial centers, and areas to be under development for residential purposes as well as the integration of transportation system with the region's areas, e.g., new freight corridors for such developed zones, regional rail and buses traveling among main cities, and a metro along with BRT. It is worth mentioning that the new infrastructural network was designed to reach the external boundary of Adalaj village [19]. On the other hand, under the objectives of the Smart Cities Mission [20], the main goal of Gandhinagar Smart City was a reflection on SDG11, with a strategic focus on creating and augmenting “physical infrastructure that is resilient, sustainable and of best quality”; providing “social infrastructure that is accessible, affordable and of the best quality to all citizens of Gandhinagar”; making “Gandhinagar future-ready city while making environmental sustainability a cornerstone of development” [21]. Considering Gujarat's performance over the SDGs, the state operates over SDG11 as a ‘Front Runner’ (65–99) from 2019, presenting a considerable improvement from 2018, scoring 77 and 87 in 2019 and 2020, respectively [22].

In specific, having reviewed the Gandhinagar Draft Development Plan for 2024, the main acts outside of its Municipal Corporation, which affected the area surrounding Adalaj village, are briefly categorized: 1. Improving “land-use efficiency to improve affordability”; 2. “Creation of east Gandhinagar an Institutional city”; 3. “Regulations for sustainable development” (a. Rainwater harvesting, grey-water recycling, and solar water heating system; b. “Planning for solid-waste management, water treatment plant and sewage treatment plant”; c. “Lake development beautification projects”; d. “Hi-Tech agricultural cluster” at the eastern side of Sabarmati river; e. Road network development).

Comparing those main above acts with the dominant enforced regional policies in the area of Greater Ahmedabad region, the following characteristics are evident: Point 1. presents the urban development policy, particularly on facilitating land-use transformation toward affordable housing development, which is compatible with the Gujarat adaptation criteria of SDG11; Points 3.a. and 3.b. are mainly regarded the physical water and waste infrastructure, being compatible with pan-city smart solutions of Gandhinagar Smart City Mission; Point 3.c., after being the target of physical water storage/infrastructure, it is compatible with the theme of amusement parks within Gandhinagar Smart City Mission; Point 3.d. is about importing agricultural infrastructure: again is compatible with creating an Industrial city district or science park in the area of Gandhinagar Urban Development Authority; Point 3.e. is physical infrastructure on a territorial scale, compatible with Gandhinagar Smart City Mission and Integrated Mobility Plan for Greater Ahmedabad Region; in a comprehensive way, Point 3. is compatible with the 2008 National Action Plan on Climate Change (NAPCC).

All above analyses reveal the alignment of the Plan with the adaptation of SDG11 by India and then Gujarat state; unfortunately, in comparison to the global complexity and comprehensiveness of SDG11, their adaptation was only focused on affordable housing, water/waste management, and smart physical infrastructure. That means the acts, first and foremost, have physical manifestations that are heavy, top-down, centralized, and then financed mostly by central and state governments. Most of those projects were either managed and financed by the Ministry of Infrastructure, Ministry of Urban Development, or Ministry of Health or were tendered and commissioned by them. And, the Ministry of Tourism's direct involvement and investment take shape in physical constructions, which in turn, both in its promotion, expression, and plans and in its management, excludes the role and capability of local communities and their economic contributions.

One of the main disadvantages of this way of managing the priorities for the so-called smart development is the centralized actions and projects in a parallel way ('silo model') without having proper coordination or local control and with a lack of active local communities' involvement in decision making, planning, and projecting process. That is also visible in the regulation for heritage conservation in the Gandhinagar Draft Development Plan for 2024, where even if the stepwell was recognized as heritage Grade I, together with the historic core of the village are protected within the defined boundaries, the same regulation excludes the hinterlands of the village, water basin of stepwell, and its related cultural/natural landscapes from similar protection and allows the transfer of land use from agriculture to housing, industry and smart road projects for facilitating the efficiency of accessibility, and inclusivity of public transportation. That is compatible with the Gandhinagar Smart City goals, even if the context is a village/hinterland.

Looking into the real results of such developments around Rudabai Stepwell puts into question the actual level of protection of heritage in favor of economic and political benefits by decision-makers and developers. And, the question is whether there is a consensus among the decision-makers and local people on Stepwell's significant heritage and societal values [18]. Although the 2010 AMASR Act obligated the 100 m around the protected boundary of the monument as Prohibited Area or Buffer Zone, and further beyond the prohibition area, up to 200 m in all directions, as the Regulated Area, to prevent encroachments and unregulated constructions near the ASI protected monuments, such further restrictions designated for the monuments, including Adalaj stepwell, have not been successfully implemented. Moreover, alongside the Indian Heritage Acts, the first National Policy for the Conservation of the Ancient Monuments, Archaeological Sites and Remains (NPC—AMASR) of 2014 deliberated more contemporary aspects of dealing with cultural heritage, including Community Participation in Conservation, Public–Private Partnership in Heritage Conservation, and Management and Disaster Management, underpinning the role of local communities. Although the attempts carried out by the ASI have manifested a shift in policymakers' attitudes toward "values-based and people-based" approaches to heritage conservation, in practice, they have not yet been implemented by the ASI.

Thus, having reviewed and analyzed the Indian revitalization of water management/water use culture as well as stepwell's conservation and development programs, the main lacks affecting Adalaj stepwell, and its surrounding context can be characterized within six categories: Vision; Coordination model; Inclusion and skill/capacity building; Heritage management; Tourism; Climate change and environment.

In the following sections, this paper explores only the lacks under the category of Climate Change and Environment in more detail in relation to the stepwell, showcasing reasons, doubts, and so, the main recommendations for more significant lacks. It then concludes with a few reflections on the synergies among conservation, sustainability, and development in facing climate change.

5. Discussion

5.1. Issues Regarding Climate Change Challenges in India

One can argue that in recent decades, India, like many other countries in Global South, has suffered considerably from the lack of comprehensive vision and commitment of different fields (e.g., climate science, heritage, and economics) to climate and environmental changes issues regarding cultural heritage. It could be due to the mix of institutional, technical, socio-cultural, and financial issues local to India or common internationally (Table 1). For instance, regarding institutional issues, there is a twofold concern. On the one hand, there is a lack of culture and cultural heritage roles in climate change national discourses (climate action methodologies/policy frameworks/financing mechanisms and networks) as they are absent in the National Action/Adaptation Plans; there is a lack of recognition of cultural dimension of climate change and cultural understanding of risks on resources, especially cultural heritage, by policy-makers, scientists, and economists, and one can observe a lack of cultural and heritage sectors/institutions/organizations in climate action-related efforts. On the other hand, India faces a lack of integration of climate action concerns into heritage management plans and processes, site development plans, conservation practices, heritage policies, strategies, and decision-making. Hence, one can argue for the significant lack of dialogue between the heritage/culture and climate science fields and the need for a new holistic approach to managing climate-driven disasters.

It is worth noting that at the international level, “only Italy, France, [the United Kingdom and Ireland] have included cultural heritage in their respective National Adaptation Plan to Climate Change” [23] (p. 15). The Indian NAPCC in 2008 encompassed long-term, integrated climate action strategies in eight missions in specific areas of solar energy, energy efficiency, water, sustainable agriculture, the Himalayan ecosystem, sustainable habitat, green India, health, and strategic knowledge for climate change. Being that comprehensive and inclusive, it has yet to include culture/cultural heritage concerns into sectors, or it has not identified them as a separate sectoral section in the Plan. That is unfortunate because, by nature, local societies in India have a considerably high level of traditional holistic perspectives about climate change.

Regarding technical issues, India needs to cope with knowledge gaps on climate impacts, adaptation, and resilience; a significant lack of information and analysis on the current and projected impacts of climate change on heritage; a lack of effective data collection mechanisms for climate and environmental change impact, and a lack of (climate-related) risk and losses data and methodologies reinforcing decision making are some of the main issues to be reckoned with. Also, the urgent need for research on existing and new national adaptation and mitigation strategies/measures to manage risks on cultural heritage is vital for today's India. Moreover, some socio-cultural and financial issues like insufficient awareness of climate change adaptation and mitigation, risk, vulnerability, and resilience; valuable and easily accessible climate knowledge platforms at local and regional levels; lack of engagement of local and indigenous communities and their traditional knowledge; significant lack of funds and poor public and private-sector investment are practically visible. Consequently, India faces a lack of assessment of climate change's impact on heritage and improper use of existing and new tools and methodologies to

respond effectively to such impact. It lacks local adaptation efforts in favor of engaging local actors such as local authorities, civil societies, and communities to achieve resiliency in its regions and communities.

Regarding the Rudabai stepwell, the way Indian Government approached the development plan around it was mainly focused on safeguarding and preventing flooding in monsoon, and the lack of proper understanding of ways and means of the use of water in a rural context is observable; instead of preserving and optimizing agricultural lands surrounding the stepwell and the village, the lands have been transformed to residential and industrial, promoted by Development Plan. Such a plan was envisioned and managed without looking into any resilient scenarios. The idea of picturesque beautification around the monument and in tourist facilities causes a considerable amount of green space (non-local species) around the stepwell without sufficient study on their compatibility with the local and regional species. Also, such outdated concept of grass-dominated landscaping around heritage sites for (world-class) tourists—the “British legacy of ‘lawnification’” approach [24] (p. 281), which has been continuously promoted and practiced by ASI—imposes constant unsustainable daily maintenance and wasteful use of water resource. It seems that even inspiring proactive programs at different levels focusing on documenting and revitalizing the WIH require to be explored and reviewed by the development policymakers of Gujarat (even in competition for excellence, it can be useful to learn from such programs) and by ASI itself.

The following table outlines the main climate change and non-climate change-related issues regarding the Indian context and Rudabai Stepwell as well as their main effecting reasons under the five categories of (a) Planning and management, (b) Institutional, (c) Technical, (d) Socio-Cultural, and (e) Financial (Table 1).

Table 1. Summary of Rudabai Stepwell’s main issues and the main effecting reasons. (While the first category—Planning and Management outlines the issues and reasons recalled from Section 4, others are related to this section.).

Category of Issues	Main Issues	Main Reasons
Planning and management	Insufficient adaptation of SDG11 in a comprehensive way in India; Scarcity of heritage regulations; Lack of proper implementation of existing heritage regulations; Failure to implement the NPC—AMASR by ASI; One-dimensional concentration on preservation of water bodies for flood prevention; Lack of profitability of the investment in physical tourist facilities; Lack of daily integration of local activities with the maintenance program of tourist facilities.	Lack of recognition of systemic synergies among conservation, sustainability, and development in facing climate change in practice; Profit-oriented tourism destination management models, with a tendency toward traditional interpretation of sustainable development concept; Concentration on designing the deterministic development plans, with no priority for appropriate heritage protection, conservation, and management; Concentration of national/regional/urban smart development and tourism programs on physical planning, with top-down/centralized actions.
Institutional	Absent of culture/cultural heritage in Indian National Action Plan on Climate Change (NAPCC); Lack of integration of climate action concerns into heritage management processes, conservation practices and heritage decision-making; Lack of dialogue and collaboration between the heritage/culture and climate science fields.	Lack of comprehensive vision/commitment to climate changes issues for cultural heritage; Insufficient recognition of the cultural dimension of climate change/cultural understanding of risks on resources by actors such as policy-makers; Lack of understanding/awareness of (climate-related) risks/their impacts on cultural heritage; Lack of skills, knowledge, and competencies in the heritage field to cope with climate change issues.

Table 1. Cont.

Category of Issues	Main Issues	Main Reasons
Technical	Significant lack of information and analysis on current/projected impacts of climate change on cultural heritage/WIH; Lack of effective data collection mechanisms for climate/environmental change impact on WIH; Lack of (climate-related) risks and losses methodologies reinforcing decision making.	Uneven and marginalized initiatives of Indian revitalization of water management vs. Prioritized centralized smart development programs; Lack of skills, knowledge, and competencies in the heritage field to collect data and information; Lack of even distribution and properly use of modern techniques and knowledge on documentation and surveys across India.
Socio-Cultural	Insufficient awareness of climate change adaptation and mitigation, risk, vulnerability, and resilience regarding cultural heritage/WIH; Insufficient valuable and easily accessible climate knowledge platforms; Lack of engagement of local and Indigenous communities, and their traditional knowledge.	Concentration on physical planning/policy with short-term political benefits, excluding local communities' needs, capabilities, and involvements.
Financial	Significant lack of funds and poor public and private-sector investment on the climate-related issues on cultural heritage/culture.	Priority on short-term political benefits; Absent of culture/cultural heritage in the national/regional plans dealing with climate change.

5.2. Recommendations for Climate Change and Heritage Synergies in India

Having explored the above issues and reasons regarding the Indian context and Rudabai Stepwell, this section provides leading recommendations for dealing with climate-related challenges. The recommendations will be discussed in two main categories: (a) Vision and commitment, collaborations, and actions and (b) Bridging knowledge gaps, while their summary can be found in Table 2.

Table 2. Summary of recommendations for climate change and heritage synergies for Indian contexts/WIH.

Recommendations	
Vision and commitment; collaborations and actions	Integrating culture/cultural heritage as a separate sector into the Indian NAPCC; Benefiting from India's ICOMOS working groups and INTACH in mobilizing the cultural heritage sector for climate action efforts and in successfully implementing existing proactive programs focusing on the revitalization of WIH; Comprehensive research and detailed systemwide information gathering/analysis of the current/projected impacts of climate change on cultural heritage/WIH; Promoting/establishing research for investigating cost-effective strategies for (climate-related) risk reduction on cultural heritage/WIH; Advocating/promoting programs/frameworks for knowledge dissemination, innovation, raising awareness and capacity building on resilient cultural heritage/WIH; Developing pilot projects with the support of international/national, public and private funding institutions, NGOs, universities, and international experts; Recognizing the WIH as climate change observatories and source of the resilience of its local communities against climate change by climate science, heritage, and development-policy makers/practitioners; Recognizing the existing theorized sustainability principles with critical perspective.
Bridging knowledge gaps	Benefiting from the new EU Strategy on Adaptation to Climate Change for India; Assessing the impact of climate change on heritage: using mitigation and adaptation strategies and tools of European projects; Integrating the Earth Observation data into daily cultural heritage-related activities; Conducting cultural significance assessment, community impact evaluation and cultural impact assessment alongside other assessments; Integrating effectively and consistently Indigenous/local/traditional knowledge systems in existing adaptation and mitigation processes.

5.2.1. Vision and Commitment; Collaborations and Actions

At the national level, regarding the integration of culture/cultural heritage concerns into NAPCC, the National Mission on Sustainable Habitat seeks to improve the “ability of habitats to adapt to climate change by improving the resilience of infrastructure, community-based disaster management and measures for improving advance warning systems for extreme weather events”. The implementation of the mission happens “through appropriate changes in the legal and regulatory framework, viz. Building Byelaws, Development Control and Regulation”; “mainstreaming of climate change and sustainable development concerns in city planning through City Development Plans, including those related to adaptation, promotion of modal shift in public transport through Comprehensive Mobility Plans, capacity building and outreach; and implementation of pilot projects” [25] (pp. 3, 6). We cannot ignore their implementation impacts on culture, cultural heritage, and communities, but they cannot be considered sufficient, and there is a need to integrate culture/cultural heritage as a separate sector into the NAPCC. In that regard, the well-developed cultural heritage sectoral plan of the National Adaptation Plan of Italy and Ireland can be inspiring.

Internationally speaking, ICOMOS Climate Change and Heritage Working Group (CCH-WG) and Climate Heritage Network have played an effective role in mobilizing the cultural heritage sector for climate action across the globe. For instance, with the slogan “Cultural Heritage is a Climate Action Issue. Climate Action is a Cultural Heritage Issue”, the Network aimed to respond to the cultural dimension of climate action. Focusing on “advocacy and study,” it underlined the role of cultural heritage in delivering climate-resilient development pathways through developing “culture-based strategies”. Indian National Trust for Art and Cultural Heritage (INTACH) is one of the effective members of the Network in leveraging such strategies. Thus, India’s ICOMOS CCH-WG and INTACH can play an essential role in the existing proactive programs focusing on documenting and revitalizing traditional WIH, and it seems that the success of such a process needs proper coordination and dialogue between the two fields.

The December 2021 collaboration of heritage and climate science fields—the first-ever meeting on culture, heritage, and climate change—was organized by IPCC, UNESCO, and ICOMOS to “advance heritage and culture-based actions for climate change adaptation and carbon mitigation”. Respectively, the last publications of the IPCC have considered culture, heritage, and climate change linkage concerns. Also, the fresh initiative of the Government of Greece in partnership with UNESCO and the World Meteorological Organization to support cultural/natural heritage protection from the impact of climate change can be a mechanism for bridging “scientific knowledge and climate mitigation and adaptation tools with informed decision making” by countries to facilitate their efforts in that regard.

Regarding WIH, especially Rudabai Stepwell, the impact of climate change and (disaster) risks on such heritage, its wider context, and communities should be carefully assessed. In this sense, comprehensive research, accurate data, and detailed systemwide information gathering, analysis, and interpretation of the current and projected potential impacts of climate change on national or local levels in relation to heritage are necessary. Also, promoting, mobilizing, and establishing several bodies of research for investigating cost-effective strategies for risk reduction and collecting reliable and accurate scientific data and information on heritage and hazards (from heritage and disaster field and also other related private and public sectors); promoting and conducting local training and assistance programs, and designing guidelines from good practice for staff, site managers, experts, and authorities involved in protection and management of cultural heritage; Advocating and promoting programs and frameworks for knowledge dissemination, innovation, raising awareness, and capacity building on resilient cultural heritage; developing pilot projects with the support of international and national, public, and private funding institutions, NGOs, universities and research centers (especially in Gandhinagar-Ahmedabad Region), and international experts are fundamental concerns. ICOMOS, INTACH, its Heritage Academy

in Ahmedabad, and CHC, among others, in collaboration with international academic bodies and heritage centers, can positively respond to those concerns.

5.2.2. Bridging Knowledge Gaps

The proper use of existing and new tools and methodologies to effectively understand, measure, and respond to climate change impact should be a fundamental concern, at least for national governments. At the international level, the ICOMOS CCH-WG and several European projects, which have been playing a significant role in investigating and assessing the impact of climate change on heritage, can be inspiring for a better understanding of the complexity of the process and, if understood and implemented correctly by central and Gujarat governments as well as heritage practitioners, they can be a great help for modeling some possible responses to climate change impact. ICOMOS provided us with a list of key climate factors and mechanisms of impact on heritage materials, sites, and landscapes, as well as a list of the types of climate impacts which can be expected to affect heritage and some examples of those effects. By bridging knowledge gaps on climate impacts and resilience, European projects, such as Noah's Ark and Climate for Culture, used "a combination of climate modeling and building simulation tools" [26] (p. 4), employed new technologies for the assessment of the climatic condition of historic buildings and their projection of future challenging demand, and developed some mitigation and adaptation strategies using several tools (e.g., Climate for Culture Decision Making Support System) which are accessible to all [27].

Moreover, the 2021 EU Strategy on Adaptation to Climate Change (despite the very rare presence of culture/cultural heritage), aiming at making adaptation "smarter, more systemic, and swifter," can be a stimulating strategy for countries like India in mainstreaming climate adaptation into its policies and long-term budgeting. Also, the Climate ADAPT platform—a valuable and easily accessible for knowledge on adaptation—and several tools, the latest digital technologies, and instruments of EU (e.g., Destination Earth and Digital Twins), which have a significant role in decision making, can be a valuable reference for heritage policy makers/practitioners. Furthermore, the need for better and scientific climate-related risk data and information for an accurate risk assessment and efficient decision-making, especially regarding heritage protection, conservation, and management, should be considered fundamental in "smarter" adaptation to climate change [28]. Integrating the Earth Observation (EO) data into daily cultural heritage-related activities is necessary. The free and open data and information delivered by the Copernicus program of the EU can be considered one of the rare, valuable resources for cultural heritage monitoring, conservation, and management at European and global levels, as the program benefits from different effective tools to integrate Copernicus EO data into daily cultural heritage activities.

Finally, as the existing bodies of research and adaptation and mitigation strategies to manage the climate-related risks for cultural heritage mostly focus on bridging knowledge gaps and material aspects, a need for recognizing and considering cultural dimensions in climate change-related evaluations is crucial. On the one hand, alongside heritage impact assessment, risk assessment, risk modeling, early warning systems, vulnerability assessment, cultural significance assessments ("both relative significance and impacts to significance from adaptation actions") [29] (p. 35), community impact evaluation—both impacts from climate change and social, cultural, economic, political, societal, and environmental changes and impacts on the community by implementing adaptation/mitigation strategies—and cultural impact assessment should be integrated into the cultural heritage management system. On the other hand, Indigenous, local, and traditional knowledge systems need to be considered effectively and consistently in existing adaptation and mitigation policies/planning/processes. Formal involvement of local and Indigenous communities in decision-making processes facing contemporary challenges, and their perception of risk to arrive at collective responses by a collaborative, participatory, and inclusive approach, is crucial [30]. And, participatory cultural mapping, as a place-based

narrative tool, produces data and new forms of knowledge about the built heritage, intangible contents, and resources by engaging communities directly in dialogue [31] to respond to climate change issues.

6. Conclusions and Reflections

The situational analysis of Indian urban-scale heritage like the Rudabai stepwell and its surrounding context reveals the issues of the Indian contemporary planning system integrated with economic agendas, following the “predict and provide” approach and “excessively deterministic” [32] development plans with the strong intention to achieve stable planned urban development in Indian cities led to more controversial and confusing short/medium-term visions. Moreover, the tourism promotions stemmed from the national tourism policies—even the recent adoption/implementation of heritage tourism schemes and programs—detects that decision-making still refers more to profit-oriented tourism destination management models searching for every site development, with a tendency toward traditional interpretation of the sustainable development concept in the goal-setting process as primarily economic issues, having a payoff in social terms, rather than employing good practices in the heritage field [33]. That itself reveals that there is a kind of (tourism) development without a proper understanding of sustainability in which development and conservation of resources (esp. cultural) do not function within a shared perspective. Therefore, “an appropriate and equitable balance among conservation, sustainability, and development” to ensure heritage protection is more vital than ever for today’s India. Such a situation requires behavioral changes at all levels and brings to light the responsibility of all involved bodies to the development processes. Interestingly, that was stated in the 1987 Brundtland report, but unfortunately, in 2023, India, like many other countries, is still in a struggle.

The WIH in India, like Rudabai stepwell, being urban-scale heritage, needs to be recognized by climate science, heritage, and development-policy makers/practitioners, as climate change observatories [34] and sources of the resilience of its local communities against climate change. They should be understood as significant sources in gathering and sharing information on the impacts of climate change and on applied and tested monitoring, mitigation, and adaptation practices, as well as raising public awareness and capacity building. That probability could be enhanced by better conservation, valorization, and management: toward GHG mitigation and climate adaptation and delivering “climate-resilient pathways”; to reinforce sustainable development/SDGs, hopefully including holistically all sustainability dimensions (social, economic, environmental, and cultural), as well as the possibility of aiming for “peace, justice, and partnerships” [35] (p. 2).

Finally, reflecting upon current international debates, the insufficient recognition of such systemic synergies among conservation, sustainability, and development in facing climate change in practice calls for critically reconsidering the already theorized sustainability principles. We should then, recall the notion of sustainability once again, and I argue that if sustainability ought to be understood as the notion concerned “with producing self-generating or self-perpetuating characteristics in systems” [36] then we must consider cultural heritage as a system fundamentally, including the monument, its site and context, associated shared values (heritage and societal), its attributes, and the specific characteristics of its “local territorial capital” [37]. Therefore, such sustainability is obligated to deal with the dynamic process in which the system co-evolves, regenerates, and self-perpetuates toward local resilience.

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