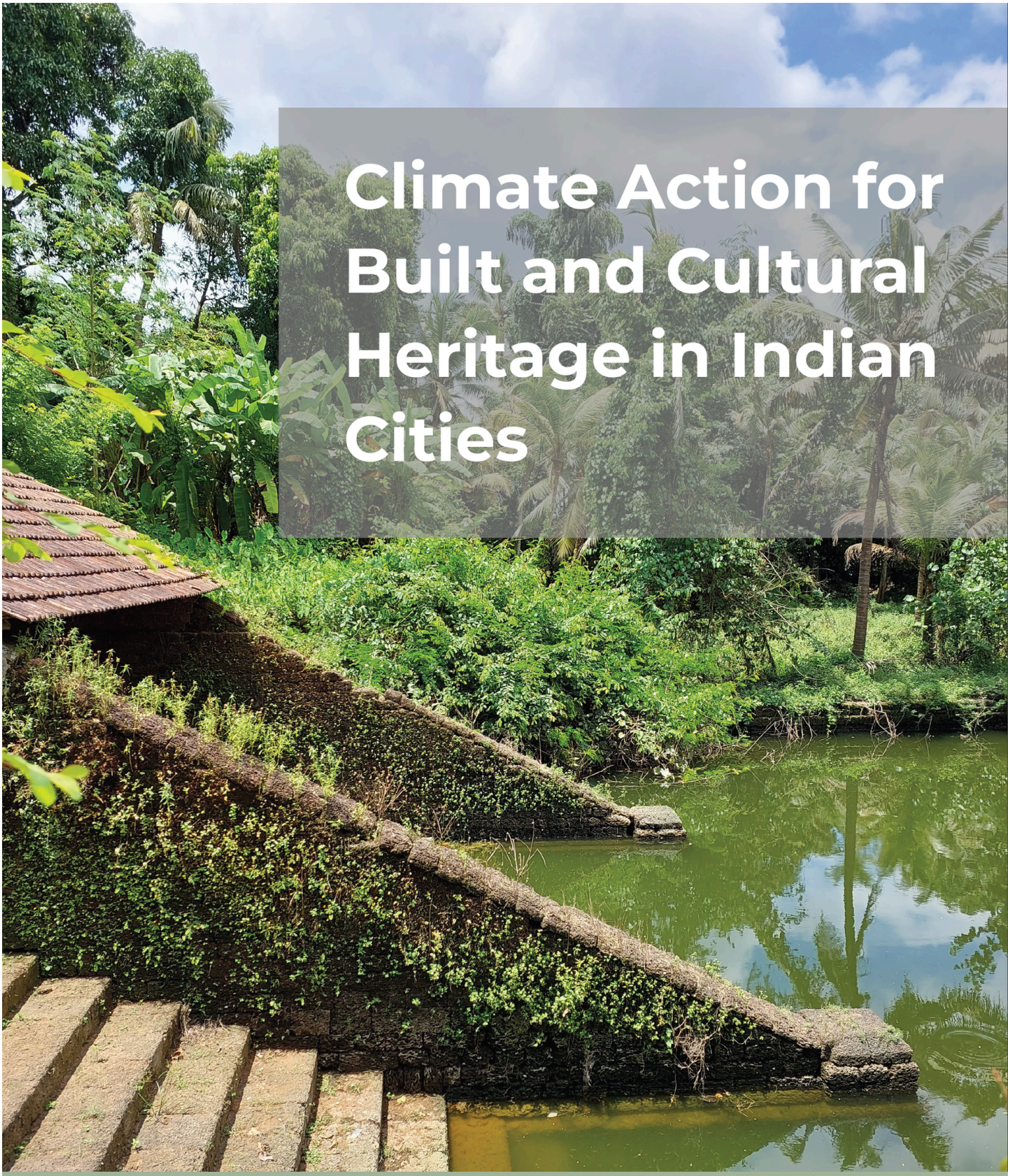

Climate Action for Built and Cultural Heritage in Indian Cities

Toolkit for climate-conscious preservation and management of urban built and cultural heritage

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Abbreviations

AC- Adaptive Capacity
AFP- Agence Française de Développement
AMC- Ahmedabad Municipal Corporation
APA- American Psychological Association
ASI- Archaeological Survey of India
AUDA- Ahmedabad Urban Development Authority
CCCAR- Centre for Climate Change and Adaptation Research
CCI- Crafts Council of India
CCRP- Climate Change and Resilience Platform
CEPT- Centre for Environmental Planning and Technology
CE- Common Era
CHC- Center for Heritage Conservation
CHN- Climate Heritage Network
CHP- Combined Heat and Power
CITIIS- City Investments to Innovate, Integrate and Sustain
CMDA- Chennai Metropolitan Development Authority
CMWSSB- Chennai Water Supply and Sewerage Board
CPF- Cultural Protection Fund
CRCI- Cultural Resource Conservation Initiative
CRDF- CEPT Research and Development Foundation
CRZ- Coastal Regulation Zone
CSB- Central Silk Board
CSIM- Centre for Social Initiative and Management
CTNC- Conservation Trust for North Carolina
cum- Cubic meter
CVI- Climate Vulnerability Index
DCH- Development Commissioner for Handicrafts
DE- Decentralized Energy
DTCP- Chennai Directorate of Town and Country Planning
ENSO- El Niño - Southern Oscillation
Envis- Environmental Information System
EOH- Enhancing Our Heritage
EU- European Union
FSM- Federated States of Micronesia
GDP- Gross Domestic Product
GEMI- Gujarat Environment Management Institute
GHG- Green House Gas
GIDM- Gujarat Institute of Disaster Management
GIS- Geographic Information System
GLOF- Glacial Lake Outburst floods
GPCB - Gujarat Pollution Control Board
GSDMA- Gujarat State Disaster Management Authority
HAP- Heat Action Plan
ha- hectare
HCARA- Heritage Climate Action Readiness Assessment
HCA- Heritage Climate Action
HCC- Heritage Conservation Committee
HHEC- Handicrafts and Hand-looms Export Corporation of India
HMP- Heritage Management Plan
HR- Human Resources
HVAC- Heating, Ventilation and Air Conditioning
ICCC- Integrated Command Control Centre

ICOMOS- International Council on Monuments and Sites
IICD- Indian Institute of Crafts and Design
IIT- Indian Institute of Technology
IMD- Indian Meteorological Department
INR- Indian Rupee
INTACH- Indian National Trust for Art and Cultural Heritage
IT- Information Technology
JC- Joint Commissioner
LAP- Local Area Plans
LIDAR- Light Detection and Ranging
MC- Municipal Corporation
MIDS- Madras Institute of Development Studies
MLA- Modern Language Association
MLS- Madras Literary Society
MoHUA- Ministry of Housing and Urban Affairs
MOOC- Massive Open Online Course
MSL- Mean Sea Level
MSSRF- M.S. Swaminathan Research Foundation
NC- North Carolina
NGO- Non-governmental organization
NH- National Highway
NHDC- National Handloom Development Corporation
NIOT- National Institute of Ocean Technology
NIUA- National Institute of Urban Affairs
OUV- Outstanding Universal Value
PhD- Doctor of Philosophy
PLF- Project Logical Framework
PMC- Project Management Consultants
PRL- Physical Research Laboratory
PSIEC- Small Industries and Export Corporation
PWD- Public Works Department
RCP- Representative Concentration Pathways
RFP- Request for Proposal
RKK- Ruins of Kilwa Kisiwani
RMRL- Roja Muthiah Research Library
RSM- Ruins of Songo Mnara
SaaS- Software as a Service
SAPCC- State Action Plan on Climate Change
SAP- Sector Adaptation Plan
SC- Steering Committee
SEP- Stakeholder Engagement Plan
SE- Superintending Engineer
SOLEZ- Smart Solutions supporting Low Emission Zones
SWD- Storm Water Drainage
TMRP- Typhoon Maysak Reconstruction Project
TNAHRI- Tamil Nadu Archives and Historical Research Institute
TNCZMA- Tamil Nadu Coastal Zone Management Authority
TNPCB- Tamil Nadu State Pollution Control Board
TNSDMA- Tamil Nadu State Disaster Management Authority
ToR- Terms of Reference
UCCN- UNESCO Creative Cities Network
UCD- User Centred Design
UDC- Urban Design Collective
UK- United Kingdom
ULB- Urban Local Body
UNESCO- United Nations Educational, Scientific and Cultural Organization
USD- United States Dollar
WH- World Heritage

Introduction

In India, State and City Climate Action Plans are prepared by different authorities such as Municipal Corporation/ Municipality of the city/ town, development or planning authorities etc. as per the specific state and cities. The use of the toolkit should be a part of the process of preparation of State and City Climate Action Plans.

'Climate Action and Built Heritage in Indian Cities Toolkit' is a resource designed to integrate climate conscious strategies into the city's plan for preservation and management of built and cultural heritage. The toolkit is a step-by-step guide to prepare proactive measures to safeguard heritage assets in Indian cities against the impacts of climate change. Recognizing the vulnerability of historical structures to climate change, this toolkit assists professionals, authorities and local communities to create climate-resilient strategies that safeguard historic architectural and cultural significance of the cities. The toolkit is also based on the recognition that cultural heritage may have embodied lessons of resilience which must be acknowledged and adapted as part of these strategies.

Through a combination of best practices, practical tools, templates, guidelines and examples, the toolkit integrates climate considerations into heritage conservation and management strategies. The toolkit serves as a catalyst for collaboration, encouraging stakeholders to engage in interdisciplinary dialogue and collective action in the cities with mitigation and adaptation measures.

Stage 0

Toolkit Guide

Which City Will Use this Toolkit?

Who Will Prepare the Data for the Toolkit?

When to Prepare/ Apply the Toolkit?

How to Use the Toolkit?

How Much Time Would It Take?

What Resources Will Be Needed?

Which City Will Use this Toolkit?

The toolkit is designed for the cities that have national, state or regional level of heritage significance. Cities having heritage assets including: World Heritage sites; Nationally Protected sites, protected by Archaeological Survey of India; State Protected sites, protected by State Archaeology Department; cities with Listed Buildings/ Graded Buildings (notified or not); Master Plans with Heritage Zones, Heritage Tourism Zones; Cities linked to UNESCO's lists and designations such as - Creative Cities Network, Intangible Cultural Heritage, etc.; cities with Museums, Libraries, Archives (Institutions with Moveable Heritage/ Collections), Archaeological Sites, Creative Industries; cities with Ritual Practice/ Pilgrimage Centres/ Sacred Routes.

If there are any identified heritage sites in the city from the above-mentioned categories, climate action also needs to be considered from a heritage perspective. By recognizing the interconnectedness of heritage and climate action, cities can strive for a balance between environmental responsibility and the preservation of built and cultural heritage.

Who Will Prepare the Data for the Toolkit?

The toolkit is available to all, who are concerned with the protection of cultural and natural heritage because of climate change, although it has been designed especially for government authorities/ organisations, professionals, institutions who are responsible for managing built and cultural heritage assets. It offers a strategy-based approach that can be adapted to different needs and contexts, allowing it to be used across the country and for various categories of heritage sites.

In house nodal-person from departments such as Municipal Corporation/ Municipality of the city/ town, development or planning authorities, etc. as per the specific state and cities should head the whole procedure of use and application of the toolkit. The preparation process must be curated by: experts from Built Heritage Conservation, Material, Culture, Intangible Heritage, Museology, History, Liberal Science, Climate Science, Urban Planning, etc. Short term and long-term capacity building programs should be included in the preparatory exercises to develop the knowledge, skills and resources for the strategies. Knowledge partnerships should be established with institutions of higher education, civil societies, research organisations, especially with the Department of Science and Technology to strengthen the research abilities, create innovative solutions and to encourage social responsibility toward climate change's impact on historic assets.

When To Prepare/ Apply the Toolkit?

The toolkit should be applied during preparation of State and City Climate Action Plans (CAPs), Master Plans, Local Area Plans (LAPs), Tourism Plans, Heritage Management Plans, Infrastructure Development Plans/ Schemes. During the development of these state and city level plans/ schemes, introducing climate change concerns using the toolkit, initiating the discussion of addressing the evolving challenges posed by climate change on heritage assets. Emphasis should be given on how to include proactive measures in these plans or schemes as per the particular region's biogeographic zone, primary hazards and its vulnerability level to ensure resilience and sustainability of these heritage assets in the changing environmental conditions.

How to Use the Toolkit?

'Climate Action for Built and Cultural Heritage in Indian Cities Toolkit' is the result of efforts to design an assessment and devise strategies of heritage-based climate action. The toolkit framework is to understand the impacts of climate change on heritage and plan for mitigation and adaptation strategies. It will lead the user through a practical process to assess climate-related risks in order to reduce the risks. The steps of this toolkit are explained in stages, including templates for the work process and examples for reference. The process provides opportunities for engagement with stakeholders through workshops, which allows an effective means of communicating to them on how our changing climate will affect heritage assets and have a constructive dialogue on how communities/ individuals can contribute to protect it.

The whole process consists of the five stages:

Stage I: Preparing/ Readiness Assessment

The first stage includes the preliminary identification of heritage, preliminary assessment of current capacities (risks/ impacts), government processes and systems, role of cultural institutions and organisations and current involvement of communities in processes and data management capacity.

Stage II: Baseline Study

The second stage incorporates the profiles of the city, heritage, climate and community into the preparation of a baseline report.

Stage III: Climate Impact Assessment

The third stage covers impact on heritage sites/ precincts/ urban heritage and on communities and detailed assessment of current capacities.

Stage IV: Implementation Plan

The fourth stage involves strategies for mitigation, adaptation and planned losses, phasing and transition plan.

Stage V: Operationalising

The fifth stage is to appoint a team for execution and for that establish linkages to other departments.

As preliminary work, state/ city level inventories are required to be made for the identification of built and cultural heritage. Mapping of the different built forms can be divided into built form typologies, heritage zones, etc. The inventories can be made in different phases according to the values and significance of the particular built forms/ built form typologies. Once the tabulation of heritage is done, a detailed toolkit application should be done for the specific city/ area.

The regions in India lie within these varied bio-geographic zones: Trans Himalayas, Greater Himalayas, Lesser/ Middle Himalayas, Siwalik Hills /Outer Himalayas, Northeast Hills, Indo-Gangetic Plains, Desert / Arid Zone, Semi-Arid Zone, Central Highlands, Deccan Plateau and Southern Peninsular Plains, Western Ghats, Eastern Ghats, Coasts and Islands. (Khan, 2020) Also, each region has varied characteristics and materiality of its built heritage. So, as per the location, setting and type of vulnerability on heritage, the state/ city will need to adjust and adapt the use of the toolkit. The scale of heritage and timeline to consider for each stage of the toolkit may vary for different cities as per its typology of heritage, vulnerability level, complexities of the site and the management system and will also primarily be dependent on the availability of data, capacity and resources.

How Much Time Would It Take?

Stage I: Preparing/ Readiness Assessment

4 to 6 weeks + procurement process for expert team and team mobilisation

Stage II: Baseline Study

3 months after appointment of expert team

Stage III: Climate Impact Assessment

4 months + report reviews

Stage IV: Implementation Plan

4 months

Stage V: Operationalising

To be decided as per the plan proposed and priorities for action decided (depending on the kind of action planned)

This time period is subject to change depending on the officials' approvals, in-house capacities and available resources, etc. It does not include any preparatory and review time, which is required before/ after any of the stages.

What Resources Will Be Needed?

The toolkit elaborates on the financial resources, human resources and networks, facilities, and infrastructure required at each stage.

Note: The financial resources are contingent to change due to inflation, increase in costs due to increase in number of studies needed, etc. Resources needed for each city will vary depending on the available studies, readiness, project logical framework, plans finalised, etc.

Stage	Time	Resources
I	4 to 6 weeks + procurement process for expert team and team mobilisation	a. Financial Resources: Approximately 10 to 25 lakhs (in INR) • Human Resources: Nodal person, expert team (individuals, organisations, consortium) • Other Costs: Workshop cost: cost for honorariums, venue, consumables, outreach b. Facilities and Infrastructure: Office with needed equipment, support staff c. Networks: Academic and research organisations in the city; Governmental and Non-governmental organisations working in the area of climate action or heritage conservation.
II	3 months after appointment of expert team	a. Financial Resources: Approximately 15 to 25 lakhs (in INR) • Human Resources: Honorarium for HCA-SC, nodal person, expert team (individuals, organisations, consortium) • Other Costs: Cost incurred by ULB: data storage, 1 support staff b. Facilities and Infrastructure: data storage c. Networks: To be arrived at by HCA-SC
III	4 months + report reviews	a. Financial Resources: Approximately 20 to 35 lakhs (in INR) • Human Resources: HCA-SC, expert team, sector specialists (transversal experts), nodal person + 1 support staff • Other Costs: Cost incurred by ULB: data storage, workshop costs b. Facilities and Infrastructure: Data storage, space to conduct workshops c. Networks: As identified by the experts through community studies
IV	4 months	a. Financial Resources: Approximately 15 to 25 lakhs (in INR) • Human Resources: HCA-SC, expert team, sector specialists (transversal experts), nodal person + 1 support staff • Other Costs: Cost incurred by ULB: data storage b. Facilities and Infrastructure: data storage c. Networks: Consultations with communities
V	To be decided as per the plan proposed and priorities for action decided (depending on the kind of action planned)	a. Financial Resources: approximately 20 lakhs (in INR) in year 1 with a recurring 15 lakh budget • Human Resources: A separate department needs to be set up • Other Costs: A recurring budget will be required for execution, workshop costs b. Facilities and Infrastructure: Office space, data storage c. Networks: Academic institutions for continuous learning, research and documentation; Cultural institutions for continuous feedback

Stage I

Preparing/ Readiness Assessment

Step 1.1: Identify The Nodal Person

Step 1.2: Identify Potential Knowledge Partners

Step 1.3: Conduct A Workshop for Readiness Assessment

Step 1.4: Consolidate Knowledge Partnership and Create The Heritage Climate Action Steering Committee (HCA-SC)

Step 1.5: Adapt the Toolkit

Step 1.6: Prepare an RFP to Appoint Experts

Step 1.7: Expert Appointment

In the first stage, users of the toolkit will initiate and formalise the process of preparation of a heritage climate action plan for their city and assess the city's readiness in preparing the plan. This stage will assist the users of the toolkit to build a functional, well thought out and effective framework to prepare the heritage climate action plan. It will also assist in organising and specifying the capacity building programs needed for the various stages.

This stage consists of 6 main steps. A step-by-step guide for the stage is provided here. Specific actions or key pointers for each step have also been provided.

Key information:

Key Deliverable
Heritage Climate Action Readiness Assessment (HCARA) report

Primary Responsibility
Urban Local Body (ULB) + Nodal Person

Resources Needed
a. Financial Resources: Approximately 10 to 12 lakhs (in INR)

- Human Resources: Nodal person, expert team (individuals, organisations, consortium)
- Other Costs: Workshop cost: cost for honorariums, venue, consumables, outreach

b. Facilities and Infrastructure: Office with needed equipment, support staff.

c. Networks: Academic and Research organisations in the city; Governmental and Non-governmental organisations working in the area of climate action or heritage conservation.

Time Needed
4 to 6 weeks + procurement process for expert team and team mobilisation

Step 1.1: Identify the Nodal Person

The first step for the Urban Local Body (ULB) within this stage is to identify the nodal person within ULB, who will lead and coordinate the preparation and management of the Heritage Climate Action Plan for the city.

The profile of the nodal person needs to be the following:

a. Qualification:
The nodal person needs to have completed a degree, preferably a postgraduate in a relevant field (fields of 1. Heritage/ Architectural Conservation; 2. Environment / Climate science; 3. Structural/ Civil Engineering with a background in heritage related projects; 4. Management with a background in management of heritage related projects), and must have an experience of at least 15 years, 5 years of which must be in the position of a project lead or coordinator.

b. Agency/ Power:
The nodal person needs to have the designation of Superintending Engineer (SE) or Joint Commissioner (JC) or an equivalent designation within the organisational structure of the ULB.

Step 1.2: Identify Potential Knowledge Partners

The second step for the ULB within this stage is to identify potential knowledge partners for preparation of the Heritage Climate Action Plan for the city. Identification of knowledge partners is a crucial step as they will provide their expertise for the various components of the Heritage Climate Action Plan for the city. Therefore, experts with known proficiency in the relevant subject areas need to be identified.

Knowledge partners need to be identified from:

a. Academic disciplines of built environment, climate science, liberal arts and sciences, disaster management, heritage management.

b. NGO's/ City-based organisations from the heritage and conservation sector.

c. Relevant academic institutions and research organisations.

This can be done by mapping out relevant partners within the city's ecosystem or also by putting out an open call for entities to express their interest in participating in the endeavour or to nominate potential knowledge partners as well.

Step 1.3: Conduct a Workshop for Readiness Assessment

As the third step within this stage, the ULB needs to organise and conduct a collaborative workshop to assess the existing readiness of the city and its heritage to address climate change.

The expected outcomes of the workshop are:

a. A Project Logical Framework (PLF) document highlighting the long-term goals, outcomes, outputs and activities for climate action for the city (Refer to framework of PLF on pages 13-15, refer to sample PLF in Annexure 1).

b. A Heritage Climate Action Readiness Assessment Report of the city.

c. Formation of the Heritage Climate Action Steering Committee (HCA-SC).

The details of the workshop are recommended to be as follows:
(Refer to guidance of the workshop on pages 15-16, refer to useful templates for the workshop in Annexure 2)

a. The workshop needs to be coordinated by the nodal person from the ULB, who will appoint the content leader from the city's network.

b. The workshop should involve all relevant stakeholders such as from the ULB, Disaster Management Authority, Climate Change Department (or equivalent), identified experts or expert organisations, relevant heritage managers, etc.

c. The nodal person needs to clearly and transparently communicate the purpose and deliverables expected of the workshop.

d. Feedback from all the identified stakeholders needs to be recorded .

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(Refer to guidance of the workshop on pages 15-16, refer to useful templates for the workshop in Annexure 2)

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c. The nodal person needs to clearly and transparently communicate the purpose and deliverables expected of the workshop.

d. Feedback from all the identified stakeholders needs to be recorded .

The workshop will have the following areas of discussion and recording:

a. Preliminary identification of heritage - To provide a quick snapshot of the nature of heritage.

b. Stakeholder Mapping - To understand who are the relevant stakeholders including their role, level of interest and level of influence in the project. Stakeholders should cover a range of profiles including but not limited to government sector, academia, NGOs, experts, private sector and community-based organisations.

c. Preliminary assessment of current capacities - To understand risks and impacts.

d. Assess government processes and systems with regard to Heritage Management and Climate Action.

e. Assess role of cultural institutions and organisations with regard to Heritage Management and Climate Action.

f. Current involvement of communities in processes with regard to Heritage Management and Climate Action.

g. Assessment of data management capacity to gauge the level of integration with other projects/ initiatives/ agencies in the city.

The compilation of the results of this workshop will provide the ULB and the nodal person with an overview of the readiness of the city for preparing a Heritage Climate Action plan with a vision for the city's heritage to address climate change, the existing strengths and capacities, challenges and gaps, and identification of areas for further action.

Project Logical Framework

What is a Project Logical Framework (PLF)?

Project Logical Framework (PLF) - Adopted from CITIIS program

The Project Logical Framework matrix is a standardised compilation of the cause-and-effect relationships to provide a clear roadmap for project implementation and measurement of success. It collaboratively defines the problem, collectively agrees on project vision, its stakeholders and the necessary activities to achieve that goal, identifies our risks and challenges our assumptions.

This process has the potential to:

- Consistently enhance the alignment of the project interventions with the goals agreed on with the stakeholders.
- Raise awareness on the risks and assumptions in the project interventions.
- Facilitate the identification of best-fit indicators for the measurement of project success.

Project Logical Framework Matrix

	Project Chain Summary (Explaining the objectives)	**Means of Verification** (How you will collect the information for the indicators)	**Indicators and Targets** (How you will measure the achievements)	**Risk and Assumptions** (External conditions needed to get results)
Long-term Vision (Overall aim)				
Outcomes (What will be achieved, who will benefit and by whom)				
Outputs (Specific results the project will generate)				
Activities (What tasks need to be done in order for the output to be achieved)				

Reference - (NIUA, 2019)

Steps While Preparing a Project Logical Framework (PLF)

Where are we right now?

- This step involves identifying the core problem to be solved, what causes the problem, and how it will manifest as an effect. This can be done using the problem tree analysis- at the top of your page write down the problem your project will tackle, and then develop an overall cause and effect narrative for the identified problem. The next step to enrich the understanding of cause and effect entails mapping stakeholders and their nature of influence on the project (which could be either positive or negative).

Where do we want to go?

- This step helps the project implementer to formulate a long-term vision for the project. It starts by stating the underlying problem to be solved as a positive affirmation or a core belief. This core belief is framed as WHAT? Because of/due to WHY? If affecting/enabling WHOM? At/in WHEN? (The 4 W's). Drafting this vision statement may take multiple iterations. The tool deployed here is called "envisioning."

How do we get there?

- This step helps the project implementer to graphically depict how change should come about by creating a logical sequence of outcomes, outputs, and activities while also assessing risks and outcomes. Referred as the Results Chain Analysis, it helps bring together everything done so far in the process - problem tree, stakeholder analysis, and envisioning.

How do we know we are going in the right direction?

- From time to time during the implementation, the project implementer might need to verify whether their actions or activities are leading to the intended result and impact or not. They can do so by pre- deciding what the measure of impact is, where the measurement can be extracted from and identifying various points in our project time line when they should look at these measurements-which is also called as the monitoring and evaluation process in a project.

Note: The PLF provides an initial list of indicators that are to be monitored in the project. Having this information helps in identification of the type of baseline information that is required.

Reference- (NIUA, 2019)

Explanation of the Individual Components of the Project Logical Framework Matrix

Long-term Vision: **Overall aim**

- Ensure that the long-term vision is ambitious yet realistic.
- Articulate the desired future state or impact that the project aims to achieve in the long term.

Outcomes: **What will be achieved, who will benefit and by whom**

- Identify the specific changes or benefits that the project intends to bring about in the medium to long term.
- Ensure that outcomes are clearly specified, measurable and aligned with the long-term vision of the project.

Outputs: **Specific results the project will generate**

- Define the tangible deliverables that will be produced as a result of project activities.
- Outputs are the immediate results of project interventions and serve as indicators of progress towards achieving outcomes.

Activities: What tasks need to be done in order for the output to be achieved

- Outline the specific actions and interventions that will be undertaken to produce the desired outputs and outcomes.
- Activities should be logically linked to outputs and outcomes, demonstrating how they contribute to achieving the project's long-term goals.

Project Chain Summary: Explaining the objectives

- Provide a clear and concise overview of how objectives are transformed into tangible results.
- Use the project chain summary to communicate the project's rationale to facilitate understanding of its intended result.

Means of Verification: How you will collect the information for the indicators

- Identify the sources of data, information and evidence that will be used.
- Ensure that means of verification are reliable, valid and cost-effective, allowing for accurate measurement and assessment of project progress and effectiveness.

Indicators and Targets: How you will measure the achievements

- Set targets for each indicator, representing the desired level of achievement.
- Indicators should be specific, measurable, achievable, relevant, time bound and aligned with project goals and objectives.

Risk and Assumptions: External conditions needed to get results

- Identify potential risks, uncertainties and assumptions that could affect the success of the project.
- Develop strategies to address risk and assumptions, ensuring that the project remains on track to achieve its goals.

Guidance for the Workshop

Workshop schedule with sessions needs to be prepared

Mode of conducting workshop: Offline/ Online (If offline mention the venue)

Date & Day	Time	Sessions (e.g., Welcome Note, Introduction to the project, Question and Answer, Breaks, Breakout Sessions, Exercises, Summary, Feedback, Conclusions)	Conducted by (Name, Designation, Expertise)	Session Details

Participant's list needs to be prepared

Sr. No.	Name	Affiliation/ Organisation	Designation	Contact Detail (If required)	
				Email Id	Contact No.

How to conduct the sessions?
Guidance on how to effectively record the discussions, observations, viewpoints and results of the workshop.

Prepare Recording Methods/ Tools
- Prepare detailed notes on key points, ideas, opinions, questions raised, responses provided and areas of consensus or disagreement discussed during the workshop.
- Ensure the necessary recording tools, such as, notebooks, pens, digital note-taking tools/ soft wares, audio and/ or video recording equipment are arranged at the workshop venue.
- Keep the relevant base documents, leaflets, reference materials, surveys, presentations etc. handy for the participants.
- Ensure relevant templates/ forms are ready for structured data collection.

Summarise Results and Outcomes
- Compile a summary of the workshop outcomes, including key findings, decisions made and action points identified.
- Highlight any recommendations or strategies formulated for addressing climate challenges and built heritage.
- Document any agreements reached or next steps planned for follow-up actions.

Organise and Store Documentation
- Organise recorded information in a systematic method using headings, subheadings or categories as needed.
- Store the documentation in a secure and accessible location for future reference and sharing.

Share the Findings
- Share the recorded discussions, observations, viewpoints and results with relevant experts, stakeholders, workshop participants and interested groups/ individuals.
- Prepare a comprehensive report summarising the workshop proceedings and outcomes for wider dissemination.

Step 1.4: Consolidate Knowledge Partnership and Create the Heritage Climate Action Steering Committee (HCA-SC)

As the fourth step of this stage, the ULB through the nodal person needs to consolidate the knowledge partnerships and create a Heritage Climate Action Steering Committee (HCA-SC).

The steering committee will comprise of:

a. Representative experts from the identified pool of experts from the relevant academic disciplines.

b. Representative from the Climate Change Department (or equivalent department mandated to address prepare state climate action plans) of the State Government.

c. Community representatives.

The responsibilities and tasks of this steering committee are explained here:

What will the Heritage Climate Action Steering Committee (HCA-SC) do?

a. Adapt the toolkit based on the readiness assessment report prepared by the ULB

b. Participate in HCA-SC meetings and/ or workshops for adaptation

c. Prepare a Request for Proposal (RFP) to appoint experts in consultation with the nodal person

d. Review and select the received proposals in consultation with the nodal person

e. Endorse appointment of the expert team selected for preparation of the Heritage Climate Action Plan for the City

f. Monitor, review and endorse the Heritage Climate Action Readiness Assessment Report

g. Monitor and review the varied steps and activities planned for the Heritage Climate Action for the city

h. Attend review meetings planned periodically

i. Endorse the Heritage Climate Action Plan for the city

Step 1.5: Adapt the Toolkit

The fifth step within this stage is the adaptation of the toolkit by HCA-SC based on the readiness assessment report and project logical framework prepared by the ULB. The HCA-SC will comprise of all the relevant expertise areas identified and needed for various sections of the toolkit. The adaptation of the toolkit will therefore rely on their specific domain expertise.

Some examples of the nature of adaptation of toolkit needed are provided here:

Example 1:
The varied pointers within the steps of the toolkit may need to be adapted based on when the toolkit is being used. The nature of the toolkit may need to alter in the following use contexts:

- If the toolkit is being used to prepare a city/ state climate action plan.
- If the toolkit is being used during preparation of a city master plan.
- If the toolkit is being used during preparation of a local area plan for a historic city.
- If the toolkit is being used during preparation of a tourism plan.
- If the toolkit is being used during preparation of a Heritage Management Plan (HMP).
- If the toolkit is being used during preparation of infrastructure development plans or schemes.

Example 2:
The varied pointers within the steps of the toolkit may need to be adapted based on the Heritage Climate Action Readiness Assessment Report of the city. For instance, if a city/ ULB has a well-established heritage inventory, then the expert team can move on to the next steps of the toolkit. If the city/ ULB does not have an inventory of heritage assets, then an expert team first needs to be tasked to make a heritage inventory.

Example 3:
The varied pointers within the steps of the toolkit may need to be adapted based on the Project Logical Framework (PLF) document prepared by the ULB and its nodal person. The vision for the city highlighted through the agreed long-term goals, outcomes, outputs and activities for climate action for the city will provide priorities for action, based on which the pointers within the varied steps of the toolkit will need to be adapted. The nature of heritage, the vulnerabilities identified, the key climate stressors identified will all impact the adaptation of the steps needed.

Step 1.6: Prepare an RFP to Appoint Experts

The sixth step within this stage is the preparation of an RFP to appoint experts. The following factors need to be considered while preparing the RFP.

a. The RFP will need to consider a curation of experts required for the specific goals of the PLF.

b. Eligibility criteria such as experience of the experts required, financial prerequisites if any, mode of engagement in the task such as whether as an individual expert, organisation, consortium, etc. need to be determined and must be clearly stated in the RFP.

c. Scope of work of the experts must be clearly stated. For example, if the RFP is to appoint architects for condition assessment of the built fabric of the city, the typology of buildings, number of buildings, nature of documentation, etc. need to be stated clearly. The deliverables expected from the experts must be clearly stated as a part of the scope of work.

d. Time given to the expert for each of the stages and steps must be clearly stated.

e. Team composition for the expert team must be stated based on the scope of work.

f. Infrastructure that the experts are expected to have must be clearly stated. This would include hardware, softwares available for work, etc.

g. Consultancy fees for the experts and stages of fee payment must be clearly stated.

h. Client responsibilities must be stated.

Step 1.7: Expert Appointment

The seventh step within this stage is expert appointments. A team of experts with a diverse nature of expertise will be needed to be appointed for conducting the task. Appointment may be of individual experts, organisations or consortiums.

The experts must be provided a detailed Terms of Reference (ToR) which will include specific outcomes of Stage II, II and IV, arrived at based on the PLF of the city after which the experts will hand over the activities to the ULB. *(Refer to Annexure 3 for Sample ToR)*

Stage II

Baseline Study

Step 2.1: City Profile

2.1.1 Collect contextual data about the city
2.1.2 Collect geographical and geological data
2.1.3 Create a profile of Infrastructure and services around heritage areas
2.1.4 Collect data on socio-economic condition and recent trends

Step 2.2: Heritage Profile

2.2.1 List heritage assets and places
2.2.2 Record intangible narratives
2.2.3 Document heritage significance, values and attributes conveying the significance
2.2.4 Record condition of heritage structures and places

Step 2.3: Climate Profile

2.3.1 Collect information on current climate, observed climate change trends, climate change projections
2.3.2 Collect information on pollution, emissions and other drivers of climate change for the city and the heritage areas
2.3.3 Collect information on extreme trends, events and predictions
2.3.4 Collect information on organisational/ governance/ institutional responses to trends and events for mitigation (if any)

Step 2.4: Community Profile

2.4.1 Identify interdependencies of the varied communities and the identified heritage
2.4.2 Identify the vulnerable communities of the community to climate change
2.4.3 Identify cultural resources, local knowledge and practices that could help in climate change mitigation
2.4.4 Collect information on known or observed community responses to trends and events for adaptation

In the second stage, users of the toolkit (in most probability, the appointed experts) will prepare baseline data on the city, its heritage, its climate and the communities linked to the heritage. To adequately assess the impacts of climate change on heritage and the ability of heritage to act as a source of resilience, it is important to locate the assessment within existing, well-documented information. Creating a baseline of this existing data, collected through various information sources, is the purpose of this stage.

(Through the process of collection of the data, the users may realise that there are important gaps that cannot be addressed immediately. These gaps need to be recorded with a plan on how they can be addressed and submitted to HCA-SC.)

This stage consists of 4 main steps. A step-by-step guide for the stage is provided here. Specific actions or key pointers for each step have also been provided.

Key Information:

Key Deliverable
Baseline Study report

Primary Responsibility
Expert Team

Responsibility for Monitoring, Review and Endorsement of Report
Heritage Climate Action - Steering Committee (HCA-SC)

Responsibility for Approval of Report
Nodal Person from ULB

Resources Needed
a. Financial Resources: Approximately 15 to 25 lakhs (in INR)

- Human Resources: Honorarium for HCA-SC, nodal person, expert team (individuals, organisations, consortium)
- Other Costs: Cost incurred by ULB: data storage, 1 support staff

b. Facilities and Infrastructure: data storage (to be decided)

c. Networks: To be arrived at by HCA-SC

Time Needed
3 months after appointment of expert team

Suggested Types of Data to be Collected

a. Quantitative Data

Trends and patterns may be in the form of graphical representations of quantitative data such as graphs, charts, etc. Quantitative data may be collected through desk-based research as well as through first-hand information collection methods such as questionnaires, interviews, focus group discussions, etc. of appropriate and representative sample sizes. Quantitative data would include demographic surveys, land management numbers, climatic/ weather-related information, economic and social survey numbers, building use/ condition numbers, etc.

b. Qualitative Data

Information representing observations, viewpoints, behavioural patterns, characteristics, concepts, memories, etc. that cannot be represented in numbers may be in the form of texts. Such data may be collected through desk-based research or through empirical research using tools such as questionnaires, interviews, focus group discussions, etc. of appropriate and representative sample sizes. A large quantity of qualitative data may be synthesised through mapping tools such as historic timelines, inventories, maps, etc.

c. Drawings

Documentation of the built environment may be based on first hand observations recorded in the form of drawings such as plans, sections, elevations, details, 3D visualisations, etc. The drawings may be of various scales such as at the scale of the city, settlement, neighbourhood, cluster, building, building elements and material details to visualise varied types of information. Drawings sourced from reliable and existing records may also be used to provide historical evidence.

d. Photographs

Visual material in the form of photographs can be collected from reliable archival sources and popular media such as newspaper clippings. First hand documentation of visual information can be recorded in the form of photographs. Photographs must be dated and recorded for better data management and analysis.

e. Audio Visual Records

Archival as well as first-hand audio-visual records may be useful to provide information on people, place, events, processes, etc. Popular audio-visual media such as documentaries, movies etc. may also be useful to provide past information. Sources of such information must be provided/ recorded along with the date of access for better records and analysis.

Establishing the Methodology for Data Collection

The methods of data collection include both primary and secondary sources.

Primary Sources:

Some methods of collecting primary data are,

- Structured Field Surveys
- Key Informant Interviews
- Semi-structured Interviews (Conversational/ Consultation)
- Focused Group Discussions
- Public Meetings/ Community Engagement

Secondary Sources:

- Review of past survey data available to verify/ update information from the departments/ officials (From official Climate Change Department, State Disaster Management Authority, India Meteorological Department, Institute of Disaster Management, Action Plans, etc.
- Data collected indirectly from published records or documents from internet sources, etc.

Integrated Command Control Centre (ICCC): For data collection and management

- The heralded rise of Smart Cities has pervaded in bringing data-centric solutions to urban challenges. The use of ICCC has been encouraged to improvise urban challenges and improve municipal service delivery. They facilitate effective management of city operations, exceptional scenarios and disaster mitigation using information and communication technologies.

- They help cities achieve more with less using real-time data, centralised monitoring and informed decision making which is driving cities towards inclusion, efficiency and innovation.
- More than 100 cities in India have Integrated Command Control Centres.

Base Reference: (Ministry of Housing and Urban Affairs, n.d.)

Note: For cities that do not have such systems in place, data collection, storage and management ethics must be followed.

Data Collection, Storage and Management Ethics

a. What are the reliable sources for data collection?

Data collected may be based on desk-based research as well as through first hand observations. Reliable sources for documentary evidence and visual material may be official records and reports, scholarly articles, information from archival collections, etc. First hand observations could be through recorded in the form of photographs, architectural drawings, records of interviews, etc.

b. How to triangulate information between different sources of information?

The different sources of information would offer varied nature of insights. Documentary evidence may range from general description to facts and figures of various kinds. Architectural information may include plans, sections, details, etc. Documentary evidence, drawings documented and approved by experts, scholarly and literary evidence, official records and reports are usually used to triangulate opinions and data collected from interviews, newspaper articles, survey results, etc.

c. How to cite information sources?

Citing the information sources is important for credibility of the information. It allows the user of the information to access the source of the information. Use of commonly accepted academic referencing styles such as APA, Harvard, Chicago, MLA, etc. may be selected at the beginning of information collection stage and used consistently by the entire team, throughout.

d. How to conduct ethical stakeholder interviews and consultations?

For collection of oral narratives, interviews and any other stakeholder consultations the principles of free, prior and informed consent must be adhered to.

e. How to store the collected information?

A standard procedure to store the collected information needs to be maintained. Information needs to be stored in soft as well as hard copy formats, with at least one back up in soft copy format.

f. How to access or retrieve collected information?

A standard procedure to access or retrieve the collected information needs to be maintained. Terms of access and use need to be formulated.

g. How to update information periodically?

The baseline data needs to be built upon as well as updated periodically to maintain a record of the latest and relevant information and trends. The periodic cycles for updating the city profile, heritage profile and climate profile needs to be predetermined. While the most recent data is added and updated, an archive of the previously recorded information needs to be maintained.

Step 2.1: City Profile

(Refer to Annexure 4 for sample of a 'City Profile')

2.1.1 Collect contextual data about the city

The first step of creating the city profile is to collect contextual data about the city. This includes data on:

a. Brief history of the city

b. Area, population and demography of the city

c. Regional settings explaining connectivity of the city to the region and rest of India

d. Identification of heritage areas within the city

e. Area, population and demography of the heritage areas

f. Tourist footfall in the city and heritage areas (Mention seasonal tourist flow also, if that is applicable for the particular site. For example, pilgrimage towns have higher number of visitors during festivals and its impact a lot on the resources of the place.)

g. List of institutions with whom collaboration for data collection can be done for: creating the city profile, climate profile and community profile

It is preferred to spatialise and/ or visualise as much of the information collected as possible in the form of maps, photographs, diagrams, info-graphics, etc.

2.1.2 Collect geographical and geological data

The second step of creating the city profile is to collect geographical and geological data about the city. This includes data on:

a. Bio-geographic zone

b. Natural features in and around the city such as forest cover, biodiversity, topography, natural water bodies, desert, mangrove, coastline, ecologically sensitive zones, etc.

c. Natural contour, soil character, height from the mean sea level (MSL), water table, mining or quarrying sites, etc.

d. Maps of the city

e. Information on probability of extreme events other than hydro-met events such as earthquake zones, industrial and chemical hazards, fire hazards, health hazards, nuclear or radiological hazards, etc.

2.1.3 Create a profile of Infrastructure and services around heritage areas

In this step information about infrastructure and services around heritage areas, such as urban infrastructure, tourism infrastructure and local climate resilient infrastructure has to be collected. This includes data on:

Urban Infrastructure

a. Roads, Transportation, Accessibility and Parking

b. Solid Waste Management

c. Sewerage and Drainage

d. Water Supply

e. Electricity, Wiring, Air Conditioning

f. Fire Fighting

g. Health

h. Education

i. Shops, Markets and Creative Industries

j. Green Areas such as Parks, Gardens, etc.

k. Other Public Amenities

etc.

Tourism/ Heritage Interpretation Infrastructure

a. Accommodation Facilities

b. Tourist Information Centre

c. Way-finding

d. Availability of Transportation and Parking

e. Walkability and Pedestrian Access

f. Availability of Tour Guides

g. Creative Industries/ Souvenir Shops

h. Eateries

i. Heritage Interpretation Centre/ Other facilities

etc.

Traditional/ Local/ Indigenous climate resilient infrastructure/ blue-green infrastructure

a. Water infrastructure and water management practices

b. Green spaces or practices

c. Climate responsive building typology

d. Festivals/ events/ practices/ rituals

2.1.4 Collect data on socio-economic condition and recent trends

The fourth step of creating the city profile is to collect information about the socio-economic condition and recent trends. This includes data on:

a. Social profile of the city (religions, languages, indigenous people, etc.)

b. Primary economy generating activities, sectors of economy, income pattern of the city and the heritage areas

c. Socio-economic condition of people in the heritage areas/ zones (religions, community groups, etc., average household incomes, occupation pattern, permanent residents or migrant population, etc.)

d. Recent trends in people living in heritage zones (percentage increase in population of migrant workers living in heritage areas, percentage increase in particular community groups, shifts in occupation, changes in livelihood patterns, etc.)

Step 2.2: Heritage Profile

(Refer to Annexure 5 for Guide for 'Heritage Profile')

Based on the preliminary identification of heritage areas or zones in the Heritage Climate Action Readiness Assessment Report of the city, the current stage of heritage documentation and mapping of the heritage areas needs to be identified. If there is existing heritage documentation and mapping as well as an established heritage significance, then the gaps in the data need to be filled. If no heritage documentation and mapping exist, then the city has to begin from documenting and mapping the heritage assets and places. Different cities may be at different stages of preparedness of baseline data.

2.2.1 List heritage assets and places

An inventory or list of all the heritage assets and places of the city needs to be made. The inventory needs to include:

a. The name of the heritage asset

b. Legal protective designations (if any)

c. Use

d. Ownership details

e. Description of special features or characteristics

f. Some photographs for identification

The heritage assets could be tangible as well as intangible. The exact location of the heritage assets needs to be provided in a common map of a suitable and legible scale with standard referencing system or legend prepared through ground verification. It is ideal to geo-locate these assets and places on a GIS platform. The following format may be used.

2.2.2 Record intangible narratives

Intangible narratives of people, community groups, various rights-holders and other stakeholders need to be recorded through ethical stakeholder consultation methods. For the purpose of heritage climate action, the following information can be recorded through intangible narratives:

a. Narratives such as oral traditions, performing arts, social practices, craft practices, festivals and events (Local Fairs, Melas, Yatras, Parikramas, etc.), festive calendars, local, traditional and indigenous knowledge systems, culinary practices or cuisine, customary management mechanisms and networks, etc.

b. Migration history, family history, community history, personal or collective memories

c. Specific ways of land or building use patterns and their reasons

d. Aspects of the heritage or heritage place that people associate with

e. Issues with the place

f. Reasons for transformation or specific actions

g. Narratives and stories of how local people maintain, conserve or repair their buildings (houses, community institutions, community infrastructure, etc.)

h. Future needs

etc.

Intangible narratives can be documented through spatial mapping techniques, participatory or collaborative mapping techniques, audio-visual or audio recordings, texts, etc.

2.2.3 Document heritage significance, values and attributes conveying the significance

The heritage of the city could be of varied levels of significance such as: heritage with identified significance representing Outstanding Universal Value (inscribed in UNESCO's World Heritage List), heritage in UNESCO's World Heritage Tentative List, heritage of national significance, regional (state) significance, or local significance. In this step, already established values, significance and attributes representing them need to be listed. Data gaps in the various levels of significance need to be filled. If there are data gaps, a separate significance assessment exercise will be needed. For a value to be recognized to be of Outstanding Universal Value (OUV), it must have first been recognized as significant at local and national levels. Therefore, values are not necessary to be repeated at every level of recognition. Other heritage/ conservation values can be inserted in national or local values. The combined significance of the values of the heritage area can be formulated in the form of a significance statement. Level of significance, values and attributes conveying the significance can be documented in the following format:

Level of recognition		Values	Attributes (a detailed listing of attributes)	Sources of information
OUV	**Criteria**			
National				
State				
Local (City or Community) Listed				
Local (City or Community) Unlisted				

Base Reference: (UNESCO, n.d)

2.2.4 Record condition of heritage structures and places

A detailed condition assessment of the heritage structures and places will be needed. An inventory of all the buildings, structures and places, with photographs can be made based on an initial rapid visual assessment of the exteriors. Then detailed condition assessments of each building, structure and place can be done in the form of drawings. Current condition of the attributes and their values can be recorded as per the following criteria:

	Good	The attributes and their values are in good condition and are likely to be maintained for the foreseeable future, provided that current conservation measures are maintained
	Good with some concerns	While some concerns exist, with minor additional conservation measures, the attributes and their values are likely to be essentially maintained over the long-term.
	Significant concerns	The attributes and their values are threatened and/or may be showing signs of deterioration. Significant additional conservation measures are needed to maintain and/or restore values over the medium to long-term.
	Critical	The attributes and their values are severely threatened and/ or deteriorating. Immediate large-scale additional conservation measures are needed to maintain and/ or restore the property's values over the short to medium-term or the values may be lost.

Reference: (Bruce, Grandgirard, et al, 2023, p. 18)

Data regarding the condition of heritage structures and buildings needs to be collected periodically and a system of maintaining the records of periodic collection needs to be devised. This system of maintaining the periodic records is very important to compare new data collected with existing records to determine whether the conditions have altered in any way, further deteriorated, etc.

Step 2.3: Climate Profile

(Refer to Annexure 6 for sample of a 'Climate Profile')

For this step, desk-based research and analysis from reliable data sources will be needed. Preparation of specific climate models will also be needed. In addition to desk-based research, there will be a need for empirical data collection, research, and analysis as well. In addition to data for the city, data of local climatic conditions of specific areas, precincts and sites will also be needed. For example, climate data for the city may be available but specific data and analysis related to heritage sites may not be readily available, requiring new data collection and analysis. Collaboration with organisations that have specific types of data or do specific types of data collection and research may be useful for this step. For example, for the Historic City of Ahmedabad collaboration with Gujarat Pollution Control Board (GPCB), Gujarat Environment Management Institute (GEMI), Physical Research Laboratory (PRL), etc. may be useful.

2.3.1 Collect information on current climate, observed climate change trends, climate change projections

This step consists of three kinds of information. In the information on the current climate of the city, seasonal characteristics of the city need to be provided. Temperature, rainfall and snowfall, wind and thunderstorms, etc. need to be described. For example, for temperature, highest and lowest temperature in summer and winter months, average summer and winter temperatures, highest and lowest daily temperatures in summer and winter months, duration of summer and winter months need to be provided. In the information on observed climate trends, observed and recorded variations or deviations in the above-mentioned seasonal characteristics of the city needs to be provided. The deviations may be in factors such as temperature, rainfall, snowfall, wind, humidity patterns, etc. In the information on climate change projections, future projections regarding the seasonal characteristics of the city need to be provided. For example, expected increase in rainfall or temperature by a specified year at a specific rate of change or emission scenario. The data needs to be in the form of written information and texts which may be supplemented with charts, diagrams, etc. as needed for clarity of information.

2.3.2 Collect information on pollution, emissions and other drivers of climate change for the city and the heritage areas

In this step, information on the various drivers of climate change needs to be provided for the city and the heritage areas. The historic areas need to be positioned in context of the city and its regional links. This can include factors such as various types of pollution (such as air, water, soil) and their causes, sectoral greenhouse gas emissions (GHG) along with their observed trends and future projections. Drivers of climate change may also include factors such as a list of anthropogenic activities leading to impact on climate and heritage such as impacts of intensive mining, farming, development and infrastructure projects, increased use of vehicles, waste disposal patterns, deforestation, agricultural practices near cities such as burning of vegetation, etc.

The purpose of the data will determine the nature of data to be collected and the geographical extent for data collection. For example, if the impact of air pollution due to certain anthropogenic activities on historic areas needs to be assessed, the following datasets might be needed: land use and land cover changes, sources of the pollution, direction and speed of wind in different seasons or months, data on carbon emissions, etc. Not only current data, but past data may also be needed for comparative analysis.

2.3.3 Collect information on extreme trends, events and predictions

In this step information on trends in current and predicted extreme hydro-meteorological events due to varied climate change phenomena need to be provided for the city. This will include extreme events such as extreme heat, rains, droughts, cyclones, floods, etc.

2.3.4 Collect information on organisational/ governance/ institutional responses to trends and events for mitigation (if any)

In this step the existing governance and management frameworks and responses to climate related trends and events that are applicable for the identified heritage areas/ zones/ assets need to be provided. The information of this step can be collected through 3 different matrices. The matrices are based on various worksheets of EOH 2.0 Toolkit (UNESCO et al, 2023).

The immediate observations or knowledge regarding key issues/ comments regarding the existing governance, protection and management frameworks can be recorded in the 'key issues/ comments. For example, there may be gaps in the regulation of existing protective frameworks for World Heritage Sites, such as no building by-laws and guidelines to regulate the nature of building construction (or climate resilient planning) within boundaries and buffer zones of World Heritage Sites. A detailed assessment of such issues and gaps listed here can be done in Stage III.

Agency/ Organisation/ Institution/ Group	Climate Stressors/ Extreme Weather Events/ Other Risk Multipliers	Specific Role/ Mandate/ Responsibility/ Response Mechanism	Key Instruments and powers to implement mandate	Key Issues/ Gaps/ Comments on:

Governance Arrangements

Legal, regulatory, customary and policy instruments applicable

Instruments	Name of instrument	Brief description of instrument	Main actor responsible for implementation	Key Issues/ Gaps/ Comments
International Conventions, recommendations and other treaties				
National legislation and other legal provisions				
Traditional and customary rules and practices				
Policies, strategies and related plans				
Financial mechanisms				
Instruments affecting rights-holders' engagement in management				

Management Planning Framework/ Process

Name of the Plan	Territorial Scope/ Scale/ Level of Intervention	Level of Approval and related details *	Description	Key Issues/ Comments
e.g., Heat Action Plan				

*

L- Plan has force of law

G- Plan has been approved by government but is not a legal instrument

O- Plan has been approved but is not recognized as an official instrument by government

SA- Plan has been finalised but has not been formally approved or is not being implemented

D- plan is a draft

E- plan has officially expired but it is still used

Step 2.4: Community Profile

(Refer to Annexure 7 for Guide for 'Community Profile')

The various socio-economic conditions and recent trends of the city and its heritage areas need to be identified in step 1.4 of the city profile. The tangible as well as intangible attributes and their values contributing to the significance of the heritage areas have been identified in step 2.2.3. This step, 2.4. includes a detailed community profiling of the communities living in, working in, and/ associated with the heritage areas and attributes in various ways.

2.4.1 Identify interdependencies of the varied communities and the identified heritage

In this step, the varied cultural interdependencies (including social, economic and environmental interdependencies) of the communities with the identified heritage assets and their values need to be identified and recorded. The recording of the interdependency can be done in the following format. Wherever needed maps, drawings and photographs to visually and spatially represent the interdependency need to be provided. This information can be collected either from literature/ archival records or through direct consultation with the stakeholders.

Communities and their cultural interdependencies:

Community/ Group	**Heritage/ Attribute that the community is linked to**	**Nature of interdependence** (Direct/ Indirect)

Interdependencies can be of various kinds such as:

a. Communities who are knowledge bearers or participants of craft practices, building practices, rituals, etc.

b. Communities contributing to or benefiting from the cultural economy of the place

c. The heritage area could be dependent on the temporal population or vice versa such as tourists and visitors, migrant workers, seasonal residents, people dependent on the social infrastructure of the place, etc.

d. Communities' dependant on or impacting the natural resources of the heritage areas, such as land, water, vegetation, etc.

e. Communities with other direct and indirect interests, concerns and influence over the heritage place

2.4.2 Identify the vulnerable communities of the community to climate change

In this step, the communities and their cultural interdependencies with the identified heritage that are most vulnerable to the climate stressors of the city need to be identified. The reasons for their vulnerabilities need to be stated. For this, their exposure, sensitivity to the climate stressors and their adaptive capacity to the trends and events need to be discussed through stakeholder consultations and on ground documentation.

2.4.3 Identify cultural resources, local knowledge and practices that could help in climate change mitigation

In this step, climate resilient resources, knowledge systems, networks and practices need to be stated, that could contribute to mitigating (avoiding, reducing and minimising) the trends of climate change and in case of extreme events. This step will derive significantly from the previous steps of baseline data collection.

2.4.4 Collect information on known or observed community responses to trends and events for adaptation

In this step, information on known or observed community responses to climate trends and extreme events that can be utilised for climate adaptation need to be collected. This data needs to be collected through stakeholder interviews, consultations and focus group discussions. Information can also be collected through reliable scholarly literature which needs to be verified on ground. Examples of such known or observed community responses to climate trends and extreme events are stated here from examples presented in the webinar 'Climate Action, Built and Cultural Heritage in Indian cities' organised on 26th August 2023.

Baseline Report Format

Executive Summary
- Brief overview of the report's objectives, methodology, key findings, and recommendations.

Background of the project
- Detailed description of the project, project components and project sites.

Objectives of the Baseline study

Methodology
- Description of the research approach, data sources and analytical methods used in the assessment.
- Explanation of how data was collected, analysed, and synthesised to assess climate risks and heritage vulnerabilities.

Findings
- Section-specific information (Data consolidation of various surveys and investigations as a part of the study); Information about City, Heritage, Climate, Community, Socio-economic, etc. For example:

Climate Maps (along with built and cultural heritage): Climate change is mapped in terms of the traditional climate parameters relevant to built cultural heritage.

Damage Maps: Based on damage functions, which quantitatively express the damage induced by climate parameters on building materials in future scenarios.

Multiple-risk Maps: Areas of increasing/decreasing risk for one (risk maps) or more (multi-risk maps) deterioration process of materials.

Thematic Pages: Use in cases where production of maps is not possible and alternative methods are required to investigate future change of a particular type of damage.

- Identify and estimate the extent and quality of available data, key data gaps and uncertainties associated with predictions.
- Consolidation of survey results through appropriate presentation tools.

Information Synthesis: Assessment of Data to Identify

- Core problem areas
- Available local resource and opportunities
- Constraints or threats

Conclusions and Way Forward

- Summary of key findings and conclusions from the baseline assessment.
- Recommendations for future actions, including priority areas for further research, policy development, and adaptation planning.

Annexures

- Additional supporting information, data sources, maps and technical details related to the baseline assessment.

Stage III

Climate Impact Assessment

Step 3.1: Conduct a Workshop on Tools and Methods for Climate Impact Assessment

Step 3.2: Impacts on Heritage Site/ Precinct/ Urban Heritage

3.2.1 Assess impacts and risks of changes in temperature, humidity and precipitation on heritage structures, places and practices

3.2.2 Assess impacts and risks of extreme events on heritage structures, places and practices

3.2.3 Conduct scientific studies to project future scenarios for the heritage

Step 3.3: Impacts on Communities

3.3.1 Assess risks on life in historic cities

3.3.2 Assess socio-economic vulnerabilities

3.3.3 Identify trends in demographic changes due to climate change

3.3.4 Assess behaviour of infrastructure at the time of extreme events

Step 3.4: Assessing Current Capacities

3.4.1 Assess processes of the governing bodies/ agencies

3.4.2 Assess role of cultural institutions

3.4.3 Assess community processes and local knowledge

In the third stage, users of the toolkit will assess the impact of climate change on the identified heritage. For an assessment of impact on the heritage, impacts on the heritage (attributes and their values), impacts on the communities linked to or dependent on the heritage and current capacities to address the possible impacts need to be assessed.

Identifying and predicting impacts is a technical step at the heart of any heritage impact assessment process. Additionally, assessing the specific impacts of climate change on the heritage requires specific domain expertise. Therefore, specialist contributions from relevant disciplines will be needed for this stage.

This assessment consists of 4 main steps. A step-by-step guide for the stage is provided here. Specific actions or key pointers for each step have also been provided.

Key Information:

Key deliverable
Climate Impact Assessment report

Primary Responsibility
Expert Team

Responsibility for Conducting Workshop, Monitoring, Review and Endorsement of Report
Heritage Climate Action - Steering Committee (HCA-SC)

Responsibility for Approval of Report
Nodal Person from ULB

Primary Responsibility of the Workshop
ULB +HCA-SC
Participants of the Workshop: HCA-SC, expert team, invited experts, transversal experts, nodal person from ULB, other members of ULB

Resources Needed
a. Financial Resources: Approximately 20 to 35 lakhs (in INR)

- Human Resources: HCA-SC, expert team, sector specialists (transversal experts), nodal person + 1 support staff
- Other Costs: Cost incurred by ULB: data storage, workshop costs

c. Facilities and Infrastructure: data storage, space to conduct workshops

d. Networks: As identified by the experts through community studies

Time Needed
4 months + report reviews
Workshop will be conducted in the first month of the four months

Step 3.1: Conduct a Workshop on Tools and Methods for Climate Impact Assessment

The purpose of this workshop is to build the capacities of the entire team carrying out the various sections of the assessment in best practices, tools and methods for climate impact assessment. This workshop to be conducted over a period of one month will include the following:

a. Capacity building of the team on the methodology to conduct the study

b. Capacity building on how to conduct stakeholder consultations and use participatory processes for the various steps of the study

c. Preparing a detailed schedule for the remaining 3 months of this stage within which the study needs to be completed

The expected outcomes of the workshop are:

a. A team prepared to carry out climate impact assessment of the identified heritage area

b. A well-coordinated work schedule

The details of the workshop are recommended to be as follows:

a. The workshop should involve all relevant subject experts required for the various steps of the study.

b. A detailed schedule of the one month to be utilised for the workshop needs to be meticulously planned.

c. The steps of the workshop need to be well-recorded.

d. Sample exercises that will contribute to the study should be done during the workshop using the recommended method. *(Refer to Annexure 9)*

Points to consider for participatory processes and stakeholder consultations

(Sample activity available in Annexure 8)

How to select participatory activities?

- What are the activities that may achieve the desired outcome?
- What activities in which format will work best in selected participants/ group/ community's context?

How to design participatory activities?

- What is the suitable time and venue for the activities? Ensure it is easy for the participants/ group/ community to attend?
- Who will run/ lead the event?
- How much time does participatory activities require in total?
- How much time will each activity take? / Any suggested duration for each activity?
- What are the required materials for each activity? (Seating arrangements- tables and chairs, projector setup with laptop, diaries, different papers, pencils, pens, coloured markers, post it notes, white/ black boards, folders)

- How are the activities being conducted, independently, in pairs or in smaller/ larger groups?
- What are their desires, goals, needs, capabilities and limitations?

How to conduct participatory activities?

- Introducing the activity with instructions
- Prepare participants for the activity- Details and doubt solving
- Communicate findings of climate change and environmental impacts through reports, presentations and/ or visualisations (Frequency, duration and intensity of extreme events and their impacts on the environment and society)
- Having time for people to ask questions and clarify about the activities
- Sharing and discussing any ideas that are generated (All possible options to avoid, reduce and minimise losses and damages to heritage assets)

How to capture the participatory activities?

- Recording the session with audio or video, with participants' consent
- Documenting the sessions and feedback materials
- Keeping detailed notes

Stakeholder consultation

Stakeholder consultation involves identifying, engaging and managing stakeholders in a transparent, respectful and responsible manner.

- Identifying all individuals, groups, communities, departments/ agencies/ organisations/ firms/ institutes and categorising them (as Primary/ Secondary/ Tertiary, Active/ Passive, Rights- holders/ Duty- bearers).
- Understand the interests, concerns, priorities and values of each stakeholder group.
- Identify the relationships and interactions among stakeholders. Understand how different stakeholders are connected and how their interests may intersect or conflict. Implement mechanisms to resolve conflicts in a fair and impartial manner so that feedback from any specific stakeholder is not missed.
- Respect the rights and privacy of stakeholders, including their right to informed consent and confidentiality. Obtain consent before collecting or sharing any information.
- Maintain transparent communication with stakeholders. Clearly communicate the purpose, objectives and expectations of the stakeholder consultation process, as well as any potential risks or benefits involved.
- Be respectful and sensitive to cultural differences and restrictions while engaging with stakeholders from diverse cultural backgrounds.
- Monitor if there are any changes in stakeholder relationships, attitudes and behaviours over the period of time.

Refer to Annexure 9: Samples of Best Practices, Tools and Methods for Climate Impact Assessment & Socio-economic Vulnerability

Step 3.2: Impacts on Heritage Site/ Precinct/ Urban Heritage

In this step impacts of the observed climate change trends, climate drivers and extreme events on the heritage site/ precinct/ urban heritage will be assessed along with a scientific study of identified climate action projects on the heritage.

3.2.1 Assess impacts and risks of changes in temperature, humidity and precipitation on heritage structures, places and practices

This step includes an assessment of impacts of the climate stressors such as changes in temperature, humidity and precipitation on heritage, places and practices, to identify the risk of the climate stressors on the heritage assets/ attributes.

Preliminary data collected in the heritage profile and climate profile needs to be reorganised and categorised into:

a. Categorising heritage assets/ attributes (tangible as well as intangible) identified in 2.2.3 based on high, moderate and low value.

b. Identifying which climate stressors/ climate change drivers/ hydro-met hazards are impacting the heritage asset/ attribute.

c. Identifying if there are any sub hazards resulting from the primary hazard.

d. Identifying and predicting the affected/ impacted place element.

e. Identifying climate responsive heritage assets and attributes (that can utilised for climate action).

f. Identifying losses and alterations to climate responsive heritage assets and attributes (that need to be recovered, augmented, etc. for climate action).

3.2.2 Assess impacts and risks of extreme events on heritage structures, places and practices

This step includes an assessment of impacts of extreme weather events as well as other extreme events that may act as risk multipliers on heritage, places and practices, to identify the risk of the events on the heritage assets/ attributes.

Preliminary data collected in the heritage profile and climate profile needs to be reorganised and categorised into:

a. Categorising heritage assets/ attributes (tangible as well as intangible) identified in 2.2.3 based on high, moderate and low value.

b. Identifying which extreme weather events are impacting the heritage asset/ attribute.

c. Identifying which extreme weather events are predicted to impact the heritage asset/ attribute.

d. Identifying if there are any extreme events which act as or could act as risk multipliers.

e. Identify if there are any sub-hazards of the extreme weather events.

3.2.3 Conduct scientific studies to project future scenarios for the heritage

In this step scientific studies to project future scenarios for the heritage assets/ attributes need to be done. Some examples of such studies are:

a. In the World Heritage Property of the Historic City of Ahmedabad, scientific studies to project future scenarios of the impact of the predicted heat island effect on the various typologies of buildings and communities living and working on them will be needed.

b. For the historic areas in Kochi, studies to calculate future scenarios of the impact of rising sea level on the heritage assets/ attributes will be needed.

For any such study appointing sector specialists (transversal experts) is essential as they will bring in their domain expertise for scientific and technical calculations and predictions. The sector specialists will need to work with experts within the heritage domain.

Step 3.3: Impacts on Communities

This step identifies the impact of the climate stressors on communities that have varied cultural interdependencies (including social, economic and environmental interdependencies) with the identified heritage assets and their values as identified in 2.4.

3.3.1 Assess risks on life in historic cities

Assessing risks on human life is the first step of assessing impacts on communities. All the heritage assets/ attributes and associated communities that have high exposure and vulnerability to climate stressors and extreme weather events that could lead to potential loss of human life need to be identified. Addressing these risks becomes the first priority for action.

3.3.2 Assess socio-economic vulnerabilities

This step involves an assessment of socio-economic vulnerabilities of the communities/ groups identified in 2.4.1 and 2.4.2. Indicators and a grading scale to assess socio-economic vulnerability needs to be devised based on best practices. The grading scale can be utilised to assess whether the vulnerability is high, moderate or low for further decision-making and prioritising actions. An indicative table to record the grading is provided here:

Community/ Group	Heritage/ Attribute that the community is linked to	Description of nature and extent of socio-economic vulnerability	Grading of socio-economic vulnerability

3.3.3 Identify trends in demographic changes due to climate change

Here, observed and predicted trends in demographic changes that have occurred or are likely to occur in the heritage site/ precinct/ area due to climate change need to be identified. Some examples or possibilities of such changes are:

a. Due to acute heat stress in the traditional house types in the historic areas, people, families or communities who can afford better living conditions may have moved out of the area. The population of economically weaker communities may increase in the historic area who may be exposed to the heat stress and have very low adaptive capacity.

b. Increasing risks of flooding in historic urban areas in coastal regions, may have led to or lead to incremental out-migration.

c. Increasing salinity in drinking water due to climate induced hazards may lead to drinking water shortages. Fresh water needs may be enough for local residents but insufficient to cater to the needs of increasing tourists. This may lead to decline in tourist population in turn affecting communities dependent on heritage tourism.

3.3.4 Assess behaviour of infrastructure at the time of extreme events

This step assesses the behaviour of infrastructure and related services to respond to extreme events in the heritage areas identified. The step will identify the ability of the infrastructure to respond effectively and efficiently to provide relief and contribute to resilience, impact on the infrastructure due to the extreme event, gaps in the provisions. Infrastructure as well as related services will include:

Urban Infrastructure

a. Roads, Transportation, Accessibility and Parking

b. Solid Waste Management

c. Sewerage and Drainage

d. Water Supply

e. Electricity, Wiring, Air Conditioning

f. Fire Fighting and other emergency services

g. Health related infrastructure

h. Education

i. Shops, Markets and Creative Industries

j. Green Areas such as Parks, Gardens, etc.

k. Other Public Amenities

l. Open areas and community spaces

Traditional/ Local/ Indigenous climate resilient infrastructure/ blue-green infrastructure

a. Water infrastructure

b. Green spaces or practices

c. Climate responsive building typology

Buildings, Structures and Intangible community-based infrastructure

a. Buildings and structures being used for relief during emergencies

b. Human infrastructure such as networks and resources used for relief during emergencies

Step 3.4: Assessing Current Capacities

In this step, current capacities of governing bodies/ agencies, cultural institutions and the various local communities to address the observed and predicted impacts of climate change on the heritage assets/ attributes and their interlinked communities needs to be assessed. Gaps and challenges in the current capacities of each of these stakeholder groups are the vulnerabilities which need to be addressed to enhance the resilience of the heritage asset/ attribute and their associated communities. This step will derive information from baseline data collected in 2.3.4.

3.4.1 Assess processes of the governing bodies/ agencies

This step assesses whether the roles and responsibilities of the governing bodies/ agencies are clearly defined, whether the coordination is effective for climate related hazards impacting heritage assets and their interlinked communities and whether there is sufficient knowledge or capacity within the governing body/ agency in addressing issues related to the subject area. The assessment can be done through answering reflective questions such as:

	Questions	Gaps/ Challenges/ Vulnerabilities	Recommendations
a	Are the governance arrangements and varied legal, regulatory, customary and policy instruments applicable, streamlined and adequate to respond to impacts of climate related hazards on cultural and built heritage in the city?		
b	Is there adequate knowledge/ expertise of all the above-mentioned arrangements and instruments in local urban local bodies/ site managers and are they equipped to facilitate on-ground implementation with respect to climate related impacts?		
c	Do the current management planning frameworks meaningfully include the question of climate change and its impact on heritage and its interlinked communities?		
d	Is there sufficient expertise within the governing and managing bodies to address climate related impacts on heritage and their associated communities? What kinds of expertise are currently available and not available?		
e	What are the varied current sources of funding for the urban local body/ other governing bodies to address climate related impacts on heritage?		
f	What are the available processes through which communities affected by climate related impacts on the heritage assets can contact the governing/ managing bodies to address the issues? Are the processes effective?		

3.4.2 Assess role of cultural institutions

Linking the resources and expertise available within cultural institutions (local, regional, national as well as international) to the agencies responsible for managing climate related threats on heritage is extremely important. The role of local and regional cultural institutions is especially important. This step assesses current roles and responsibilities of cultural institutions with the question of climate related impacts on cultural heritage, mechanisms and effectiveness of their engagement, whether the engagement is adequate and whether other knowledge partners are needed to be engaged. This step is intended to reflect on the current technical and scientific knowledge that is accessible to and utilised to address the climate stressors impacting the heritage assets. The assessment can be done through answering reflective questions such as:

	Questions	Gaps/ Challenges/ Vulnerabilities	Recommendations
a	Which cultural institutions have been associated with the heritage of the city? What work have they been engaged in? What is their expertise area?		
b	Which cultural institutions are currently associated with the heritage of the city? What work are they doing? What is their expertise area?		
c	Do both the above-mentioned cultural institutions currently have formal collaborations with the local urban body or are they doing the work in individual capacity?		
d	Which cultural institutions have been associated with knowledge creation of climate related hazards in the city? Have they worked on climate related hazards on the heritage and the associated communities?		
e	Which cultural institutions in the city/ region can provide expertise related to climate related impacts on heritage?		
f	What are the existing mechanisms of collaboration of the urban local body/ other governing bodies with cultural institutions for a meaningful and continued engagement for technical and scientific support? Are the mechanisms effective and adequate?		
g	Are the current capacities of local cultural institutions adequate in provided expertise for the required subject areas		

3.4.3 Assess community processes and local knowledge

Some community processes and local knowledge systems can be assets for transformative climate action, some may be vulnerable to climate related hazards, while some may require adaptation. This step assesses the capacity of the community to address climate induced issues on heritage assets/ attributes, community processes in conserving and managing their heritage which could be structured towards addressing issues related to climate change, role in decision-making, effectiveness of local knowledge or systems to contribute to climate action, communities that are or are likely to be left behind or disproportionately affected due to climate change within existing processes, resulting socio-economic hierarchies, etc. The assessment can be done through answering reflective questions such as:

	Questions	Gaps/ Challenges/ Vulnerabilities	Recommendations
a	What are the current capacities of the communities/ groups/ rights holders associated with the heritage asset/ attribute impacted by or likely to be impacted by climate stressors to address the issues in terms of financial capacity, social capacity, access to local knowledge systems, legal provisions, awareness of rights, etc.		
b	What is the nature and extent of current involvement of the local communities mentioned above in decision-making processes regarding climate impacts on heritage?		
c	What is the current condition and extent of utilisation of local knowledge systems that could contribute to climate action?		
d	Which heritage assets are currently managed through customary or community-led management mechanisms? Which aspect of the management mechanism could be utilised for climate resilience of heritage assets?		

Stage IV

Implementation Plan

Step 4.1: Prepare an Implementation matrix

Step 4.2: Conduct a Co-design Workshop

- 4.2.1 Planning the workshop
- 4.2.2 Selecting the stakeholders to be invited
- 4.2.3 Conducting the workshop

Step 4.3: Prepare a Mitigation Plan

- 4.3.1 Appraisal of priorities
- 4.3.2 Design of mitigation pathways

Step 4.4: Prepare an Adaptation Plan

- 4.4.1 Appraisal of priorities
- 4.4.2 Design of adaptation pathways

Step 4.5: Prepare a Strategy for Planned Losses

- 4.5.1 Appraisal of priorities
- 4.5.2 Pathways for planned losses

Step 4.6: Phasing and Transition Plan

In the fourth stage, users of the toolkit will describe the terms and intentions of the climate action or innovation needed, followed by preparation of a comprehensive implementation plan for climate action for the identified heritage site/ precinct/ urban heritage. Three types of strategies will be considered for climate action and implementation:

a. Mitigation

b. Adaptation

c. Planned Losses

The purpose of the implementation plan is to prepare a roadmap for the various nature of actions needed for climate action. Therefore, it will also include a plan for phasing and transition from plan preparation stage to actual implementation stage.

This stage consists of 3 main steps. A step-by-step guide for the stage is provided here. Specific actions or key pointers for each step have also been provided.

Key Information:

Key deliverable
Heritage Climate Action Plan

Primary Responsibility
Expert Team

Responsibility for Monitoring, Review and Endorsement of Report
Heritage Climate Action - Steering Committee (HCA-SC)

Responsibility for Approval of Report
Nodal Person from ULB

Resources Needed
a. Financial Resources: Approximately 15 to 25 lakhs (in INR)

- Human Resources: HCA-SC, expert team, sector specialists (transversal experts), nodal person + 1 support staff

- Other Costs: Cost incurred by ULB: data storage

b. Facilities and Infrastructure: data storage

c. Networks: Consultations with communities

Time Needed
4 months

The Three Strategies for Climate Action

a. Mitigation

- Mitigation refers to human interventions to reduce emissions of Greenhouse Gases (GHGs) and factors that are causing or leading to climate change, or to enhance the sinks of GHGs. Culture is rooted in processes of production, consumption, use, lifestyles and social organisation of communities that lead to anthropogenic greenhouse gas emissions. Climate change as well as its impacts are not evenly distributed across different populations. Mitigation measures include all measures to avert, reduce or minimise all such factors causing climate change, or to enhance the sinks of GHGs.

b. Adaptation

- Adaptation in human systems, heritage assets/ attributes and the built environment refers to the process of adjustment to actual or expected climate change and its impacts, in order to moderate detrimental impacts. While cultural heritage will be impacted by factors leading to climate change, cultural heritage at the same time also is an asset that has significant potential to contribute to adaptation pathways to manage climate related risks. Adaptation actions should be guided by a combination of technical and scientific analysis and knowledge as well as appropriate traditional, indigenous and local knowledge systems.

c. Planned Losses

- Loss and damage refer to adverse impacts of climate change on human systems and heritage assets/ attributes, particularly where and when adaptation is no longer an option and the system or people's needs cannot be secured from intolerable risk through adaptive action. Every possible effort needs to be made to avert, reduce, and minimise the risk of loss and damage to heritage assets/ attributes and the communities and human systems linked to them. Planned loss refers to a well-informed plan to manage the irreversible losses of or damages to tangible or intangible heritage assets/ attributes and their links to the communities and human systems.

Base Reference- (Climate Heritage Network. 2022), (ICOMOS Climate Change and Heritage Working Group, 2019)

Step 4.1: Prepare an Implementation Matrix

The first step within this stage is to prepare an implementation matrix that identifies the nature of climate action needed based on an assessment of the value or significance of the heritage, nature of impact drivers or hazards as well as risk multipliers. The following format for preparation of the matrix can be utilised:

Heritage Assets/ Attributes of the site affected	**Significance** (High, Medium, Low)	**Impact because of climate stressor on Heritage attributes/ assets**	**Risk Rating** (Neutral/ Slight/ Moderate/ Large/ Very Large)	**Climate Action** (Mitigation/ Adaptation)

A separate section needs to be prepared for planned losses. Losses of and damages to heritage assets and their values refer to adverse effects of climate change on heritage, especially when or where mitigation and adaptation are no longer possible. Every possible effort to avoid, reduce and minimise losses should be made and only when absolutely unavoidable and determined that there is no alternative other than accepting that the heritage asset/ attributes and their values can no longer be conserved, a plan to prepare for the loss or damage needs to be made.

Heritage Assets/ Attributes of the site affected	**Significance** (High, Medium, Low)	**Impact because of climate stressor on Heritage attributes/ assets**	**Risk Rating** (Neutral/ Slight/ Moderate/ Large/ very Large)	**Reason for unavoidable loss/ damage**

Step 4.2: Conduct a Co-design Workshop

The second step within this stage is to conduct a co-design workshop to collaboratively identify mitigation measures and adaptation solutions and identify priorities for action. Each identified measure or solution should respond to the identified risk and impact. The primary responsibility of designing and conducting this workshop will be of the expert team. The workshop will also discuss and deliberate on all possible options to avoid, reduce and minimise losses and damages to heritage assets and communities linked to the heritage. At this stage, aligned interests and conflicting interests need to be identified, discussed and carefully considered to arrive at a shared vision. Heritage assets/ attributes and the values which can no longer be conserved, strategies to prepare for the unavoidable loss or damage will be collaboratively designed. Based on all the measures and solutions listed, a pool of possible projects for implementation will be identified based on priorities of action. The workshop will include all relevant stakeholders, rights holders and duty bearers that will be essential for the risk management process.

Refer to Annexure 10: Samples in Best Practices in Conducting Co-design Workshop

Refer to Annexure 10: Toolbox of Best Practices
For samples in best practices in mitigation and adaptation pathways as well as strategies for planned losses

4.2.1 Planning the workshop

A good co-design workshop requires preparation and a framework. The organisers should be clear about the aim, expected outputs and outcomes of the workshop. A time table/ schedule of the workshop needs to be made. Detailing how each step of the workshop would result in the desired output and outcome will be useful. It is important to be realistic of the time required, number of workshops required to include the target stakeholders and outcomes that can be achieved through the workshop. If needed, small focus group discussions should be designed for targeted discussions and desired outcomes. It is advisable to send prior information (purpose of the workshop and what the stakeholders are expected to contribute) regarding the workshop to the stakeholders selected for participation. If found necessary for the context or place, an information session can be held prior to the workshop.

4.2.2 Selecting the stakeholders to be invited

To select the stakeholders to be invited to the co-design workshop the following questions will need to be answered:

a. Who has the sector expertise to design the solutions? (This will include experts of various disciplines needed for technical and scientific inputs as well as bearers of local knowledge systems)

b. Who are the communities associated with or linked to the heritage asset/ attribute? (This would include groups such people who live or work there, people or groups who have associations with the heritage, people whose livelihoods or economic opportunities are linked to the heritage)

c. Who will be responsible for following up with the solutions designed? (This will include groups such as people within the governance mechanism of the heritage and climate change related action, formal and customary site/ heritage managers, experts or groups linked with implementing the solutions such as contractors, craftspeople, etc.)

4.2.3 Conducting the workshop

The workshop needs to begin with the purpose and framework of the workshop. The expected results must be clearly articulated and communicated. The workshop must be conducted in a place and set up where all stakeholders invited can contribute meaningfully to the stated purpose. For this provision needs to be made for communication in at least two languages in the Indian context - English for communication with a large audience and the local language. Tasks and people needed for the specific task should be structured such that discussions are streamlined, to-the-point and no-one has to spend more time for the task than what is planned for. When the workshop ends, a summary of what has been discussed, prioritised and decided in the workshop should be clearly communicated and recorded. The next steps of action should also be communicated.

Step 4.3: Prepare a Mitigation Plan

Based on the conceptual ideas and solutions listed in the co-design workshop and the projects prioritised for action, a detailed mitigation plan needs to be made. A Mitigation Plan will include the following:

4.3.1 Appraisal of priorities

This will include an appraisal of the priorities of action/ project identified in the co-design workshop and the mitigation strategies identified through an assessment of feasibility, viability, financing options, barriers and limits, alignment with targets set in PLF.

4.3.2 Design of mitigation pathways

Here, the mitigation pathway(s) selected to be implemented will be listed, each pathway will be described in detail, reasons for preference will be mentioned as well as actions and resources needed will be articulated. The pathway can be described in the form of architectural drawings, textual descriptions, photographs as well as projected future scenarios through scientific data analysis or 3D visualisations. This makes the decision regarding choice of mitigation pathway(s) an iterative process, where every reasonable effort will be made to design measures to avert, reduce or minimise the factors causing climate change leading to impacts on the

identified heritage asset/ attribute and the interlinked human systems/ communities, or to enhance the sinks of GHGs.:

Some examples of mitigation pathways for heritage sites/ precinct/ urban heritage are:

a. Promoting continued use and conservation of blue-green infrastructure (such as traditional water harvesting systems, historic green areas, etc.) in heritage areas

b. Green mobility through strategies such as reducing transport related emissions and creation of low emission zones in heritage areas

c. Use of renewable energy sources

Step 4.4: Prepare an Adaptation Plan

Based on the conceptual ideas and solutions listed in the co-design workshop and the projects prioritised for action, a detailed adaptation plan needs to be made. An adaptation plan will include the following:

4.4.1 Appraisal of priorities

This will include an appraisal of the priorities of action/ project identified in the co-design workshop and the mitigation strategies identified through an assessment of feasibility, viability, financing options, barriers and limits, alignment with targets set in PLF.

4.4.2 Design of adaptation pathways

Here, the adaptation pathway(s) selected to be implemented will be listed, each pathway will be described in detail, reasons for preference will be mentioned, expected impact of the pathway will be detailed as well as actions and resources needed will be articulated. The pathway can be described in the form of architectural drawings, textual descriptions, photographs as well as projected future scenarios through scientific data analysis or 3D visualisations. This makes the decision regarding choice of adaptation pathway(s) an iterative process. Adaptation pathways to manage climate related risks will include measures for heritage assets/ attributes as well as communities linked to the heritage. Enhancing adaptive capacity, strengthening resilience, reducing exposure and vulnerability to climate change are actions included in this.

Some examples of adaptation pathways for heritage sites/ precinct/ urban heritage are:

a. Adapting historic buildings and structures to increase their energy efficiency

b. Adapting creative industries in historic sites/ precincts/ urban areas for a low carbon footprint or for averting, reducing and minimising air, water and soil pollution

c. Adapting practices and livelihood patterns in historic sites/ precincts/ urban areas to create more comfortable microclimates

Step 4.5: Prepare a Strategy for Planned Losses

Based on the priorities listed in the co-design workshop and the projects prioritised for action, a detailed strategy for managing planned losses and damages needs to be made. A strategy for planned losses will include the following:

4.5.1 Appraisal of priorities

This will include an appraisal of the priorities of action/ project identified in the co-design workshop and the strategies identified through an assessment of feasibility, viability, barriers and limits, ethical concerns and alignment with targets set in PLF.

4.5.2 Pathways for planned losses

Irreversible losses or damages to heritage assets/ attributes can be expected to occur suddenly or gradually over a period of time of either the complete heritage asset/ attribute and its values or parts of it. Managing loss or damage is not merely concerned with the material fabric of the place but also about providing an opportunity to people to engage constructively with the loss and providing communities linked with the heritage that is to be lost with alternatives to retain their sense of identity, reconstruct their lives and live with dignity.

The pathways for irreversible losses/ damages selected to be implemented will be listed, each pathway will be described in detail, reasons for preference will be mentioned, expected impact of the pathway will be detailed as well as actions and resources needed will be articulated. The pathway can be described in the form of architectural drawings, textual descriptions, visual media such as charts, tables, graphs, photographs and projected future scenarios through scientific data analysis or 3D visualisations. This makes the decision regarding choice of pathways for managing losses and damages an iterative process. Pathways will include measures for heritage assets/ attributes and communities linked to the heritage. The final pathway selected will be detailed through a stepwise action plan.

Some examples of pathways for planned losses for heritage sites/ precinct/ urban heritage are:

a. Creating digital and/ or physical replicas through documentation of the heritage asset

b. Recording oral histories

c. Providing alternate livelihood opportunities that can retain the people/ community's sense of identity

d. Bereavement counselling for affected communities

e. Options for build-back-better

Step 4.6: Phasing and Transition Plan

Once the comprehensive strategy for mitigation, adaptation and planned losses has been prepared by the expert team, reviewed by the identified stakeholders of the co-design workshop and HCA-SC, and finally approved by the nodal person from the ULB, the expert team needs to prepare a phasing and transition plan. This plan will include the following:

a. Identifying phases of implementation and actions within each phase.

b. Identifying resources needed for each phase and actions within each phase. This will include financial resources, human resources as well as other resources such as facilities or infrastructure needed.

c. Identifying time required for completion of each phase and actions within it.

d. Preparing a budget for implementation of each phase and action.

e. Identifying agency/ organisation who will be responsible for implementation of each phase and/ or actions within each phase.

f. Protocols for appointing the agency for implementation.

g. Defining ethics of implementation and responsibilities of the identified agency/ organisation responsible for implementation.

h. Identifying protocols for transition of responsibilities of the mitigation plan, adaptation plan and strategy for planned losses from the expert team to the implementing agency/ organisation

i. Setting up indicators for successful implementation.

j. Setting up protocols for periodic monitoring of implementation.

k. Setting up protocols for monitoring and verifying targets set in PLF based on implementation of the projects.

Stage V

Operationalising

In the fifth stage users of the toolkit will operationalise/ execute the 3 plans prepared and approved for implementation in Stage IV:

a. Mitigation Plan

b. Adaptation Plan

c. Strategy for Planned Losses

The purpose of this stage is to build the capacities of the team implementing the plan approved in Stage IV within the ULB. It must be noted that the nodal person and the HCA-SC have the primary responsibility for operationalising the climate action plan for heritage.

This stage consists of 4 main steps. A step-by-step guide for the stage is provided here. Specific actions or key pointers for each step have also been provided.

Key Information:

Key deliverable
Operationalising/ Implementation plan

Primary Responsibility
Urban Local Body

Responsibility for Monitoring and Review
Heritage Climate Action - Steering Committee (HCA-SC)

Resources Needed

a. Financial Resources: Approximately 20 lakh in year one with a recurring 15 lakh budget

- Human Resources: A separate department needs to be set up
- Other Costs: A recurring budget will be required for execution, workshop costs

b. Facilities and Infrastructure: Office space, data storage

c. Networks: Academic institutions for continuous learning, research and documentation; Cultural institutions for continuous feedback

Time Needed
To be decided as per the plan proposed and priorities for action decided

Step 5.1: Appoint a Team for Execution

The first step within this stage is to appoint a team for executing the plans/ pilot projects prioritised in stage IV. Setting up a permanent Heritage Climate Action Office will be needed. The team will include:

a. Nodal Officer

b. Technical Experts

c. Project Management Consultants (PMC)

The technical experts will be empanelled based on disciplinary expertise required for the plan prioritised for execution.

The PMC will need to be hired based on a request for proposals aligned to the Heritage Climate Action Plan. The Heritage Climate Action steering committee will need to vet the technical proposals received in response to the RFP.

The Heritage Climate Action Office can be a **separate department of the urban local body or a subset of the existing heritage department of the urban local body.** The creation of the office needs to be mandated through statutory requirements.

Step 5.2: Establish Links with Other Departments

5.2.1 Establish links

Linkages need to be established with other departments such as departments concerned with fire, water, waste management, emergency/ disaster management, etc. to mainstream the priorities and actions of the Mitigation Plan, Adaptation Plan and Strategy for Planned Losses.

5.2.2 Conduct a stakeholder coordination workshop

A stakeholder consultation coordination workshop needs to be conducted with all the identified departments to mainstream priorities and actions approved in Stage IV. The aim of the workshop is to mainstream priorities and actions and coordinate responses and involvement of all agencies needed for successful operationalisation of the plan. A clear identification of roles and responsibilities of each department with respect to each of the phases and actions of implementation is the expected outcome of the workshop. One representative member from each department must be assigned to be the single point of contact for coordination. The compilation of the results of this workshop will provide the ULB with a coordination framework with other agencies.

a. Data management

b. Heritage conservation

c. Heritage management

d. Risk and impact assessment and mitigation

e. Project management

f. Documentation

g. Material studies

Step 5.3: Create Links with Academic and Cultural Institutions

The ULB needs to establish links with academic as well as other cultural institutions. The institutions identified and assessed in 3.4.2 will be useful for this. Collaborations with academic institutions will be needed for continuous learning, research and documentation. Collaborations with cultural institutions will be needed for continuous feedback regarding challenges, new areas of work needed, new work done in the relevant thematic areas, etc. The collaborations with academic institutions will be utilised to prepare a plan for continuous capacity building of the team working on implementation in climate action-based topics such as:

a. Data management
b. Heritage conservation
c. Heritage management
d. Risk and impact assessment and mitigation
e. Project management
f. Documentation
g. Material studies

Step 5.4: Set Up Monitoring and Reporting Program

A robust monitoring and reporting mechanism needs to be set up to continuously check on and receive feedback regarding the on-ground implementation of the plan/ pilot projects. Protocols for this need to be set up. This should include:

a. Protocol for day-to-day monitoring and reporting

b. Intermittent reporting such as action-based and phase-based monitoring and reporting

c. Mechanism for registering complaints

d. Emergency notifications

e. Mechanism of user-friendly digital tools for reporting and monitoring

f. Data management mechanism

Sr. No.	**Project Compo-nent**	**Expected Progress Level** (Daily/ Phase wise)	**Current Progress Level**	**Any Devia-tion**	**Reason behind Deviation**	**Any Com-plaints**	**Any Emergency Notification**	**Any Sugges-tions/ Instruc-tions**	**Person/ Agency/ Consult-ant Responsi-ble for it**

Step 5.5: Set up Periodic Review Protocol

The implementation plan and actions operationalised need to be reviewed every few years. This will require revisiting and reviewing the Project Logical Framework. A protocol and timeline for periodic review must be established. The toolkit needs to enable a cyclic process of climate action. Learnings from the previous cycle must feed into the new cycle of planning and implementation.

Note: At any stage of the working of the toolkit, the ULB, HCA-SC or the experts may connect with NIUA through the nodal person. NIUA may support the effort through capacity building initiatives.

Annexure 1

Sample PLF of the Historic City of Ahmedabad

Historic City of Ahmedabad - Cultural Heritage and Climate Action Plan

Long Term Goal

Description
- Making the World Heritage Property climate resilient against heat stress and drought to preserve the outstanding universal value of the property.

Means of Verification
- Reduced vulnerability as per climate vulnerability assessment
- Expenditure towards conservation/ sq m of built environment that has been conserved

Indicators
- Climate & Community Vulnerability Impact Assessment level (to be determined by undertaking the CVI assessment)
- Community Vulnerability Index Assessment
- Expenditure towards conservation/ sq m of built environment that has been conserved

Targets
- To drop one level on the vulnerability scale within a period of X years

Risks
- Organisational capacity is lacking
- Lack of financial commitment towards this goal
- Inadequate incentives/ regulations for private stakeholders not translating to desired action
- Non-Cooperation between multiple agencies

Assumptions
- There is commitment to address the climate action aspect of heritage

Outcomes

Description
- The varied attributes of the property will be conserved, attributes such as: monuments, pols, religious and other institutional buildings, timber-based domestic architecture, rainwater harvesting structures, settlement planning
- Reduced urban heat island effect and improved urban resilience through the conservation of the climate responsive timber-based courtyard house typology with underground rainwater harvesting structures known as tankas
- Reduced burden on the city's water infrastructure.
- Improved climate responsiveness of the settlement pattern through mutual shading and ventilation owing to its block structure, land parcelling and street layout
- Improved quality of life for vulnerable communities living within the property
- Improved social cohesion through conservation of public, community and other social infrastructure

Means of Verification
- Reduction in temperature and pollution in the urban areas with heritage assets.
- Water demand on the city
- Water table
- Energy performance of all building typologies

- Expenditure towards conservation/ sq m of built environment that has been conserved
- Current condition of the attributes and their values as per CVI
- Sense of pride, ownership and responsibility towards the public realm and the neighbourhood measured through perception surveys

Indicators
- Average air temperature
- Per capita water demand supplied by municipal supply connections in the historic city
- Criteria for current condition of the attributes and their values as per CVI

Targets
- To be decided by the Team

Risks
- Some activities are incomplete or not conclusive resulting in a compromise to the outcomes

Assumptions
- There is organisational capacity and other resources available to complete all activities envisioned in this toolkit

Outputs

Description
- Database created through the baseline studies
- Guidelines for homeowners for maintenance and repair
- Plan for adaptation, mitigation and planned losses for the historic city.

Means of Verification
- Whether database is live and active
- Whether guidelines have consensus and have been communicated to the homeowners after being published measured through feedback surveys
- Whether plans have been published and adopted by relevant agencies

Indicators
- Number of logins and queries on the database
- Findings from resident feedback surveys
- Budgetary allocations and spending by various agencies in line with the plans for adaptation, mitigation and planned losses for the historic city.

Targets
- To be decided by the Team

Risks
- Some activities are incomplete or not conclusive resulting in a compromise to the outputs

Assumptions
- There is organisational capacity and other resources available to complete all activities envisioned in this toolkit

Activities

Description
- Assembling team and other required resources to prepare the cultural heritage and climate action plan
- Conducting baseline studies and setting up dynamic and accessible data management system integrated with the ICCC
- Stakeholder engagements
- Conducting climate impact assessment
- Capacity building
- Preparing mitigation and adaptation/ Heritage restoration plans with a climate lens
- Prepare a monitoring and reporting framework
- Review of current incentives program for private stakeholders and gaps assessment with implementation/ translating incentives to desired actions

Means of Verification

- A Ease of access and use of the database by various city departments
- Training/ guidelines for using the database
- Number of stakeholders mapped
- Number of stakeholders engaged with
- Gaps assessment for data sets in the context of the climate impact assessment
- Capacity building plan with timeline and schedule
- Whether proposed plan preparation activities are completed as per schedule

Indicators
- Number of people trained in using the database
- % of stakeholders engaged and mapped
- Number of missing datasets in the context of the climate impact assessment
- No. of capacity building sessions conducted and whether these are conducted in a timely manner
- Compliance with proposed timelines for the proposed plan preparations

Targets
- To be decided by the Team

Risks
- Data gaps are significant in a way that it hampers the planning activities
- Capacity building is not scheduled as per plan
- Stakeholder engagement activities hit stalemate

Assumptions
- A predictive life cycle model will be possible for the project without any delays

Base Reference- (NIUA. 2019)

Annexure 2

Useful Templates for Workshop for Readiness Assessment - Step 1.3

A. Preliminary identification of heritage

Categories	Sites	Significance/ Values
World Heritage Sites		
Nationally Protected Sites		
State Protected Sites		
Archaeological sites		
Cities linked to UNESCO - Intangible Heritage/ Network of Learning Cities, etc.		
Creative Cities Network		
Cities with Listed Buildings (Notified or not)		
Regional Heritage Sites		
Heritage Zones (In Master Plans)		
Heritage Tourism Zone		
Museums, Libraries, Archives (Institutions with Moveable Heritage/ Collections)		
Creative Industries		
Ritual Practice/ Pilgrimage Centres		

B. Stakeholder Mapping

Categorisation of Stakeholders

Primary Stakeholders	Primary stakeholder can be a beneficiary or a target. Beneficiaries refer to individuals who stand to gain or lose something directly and personally. They are the most likely to be directly affected by the project or outcome at hand.
Secondary Stakeholders	Secondary stakeholders are intermediaries who have an interest in the project or outcome, although it is less significant and directly related than that of the primary stakeholders.
Tertiary Stakeholders	Tertiary stakeholders are referred to as external and play an advisory or advocacy role.
Active Stakeholders	Stakeholders that wish to participate in any conservation/ development/ management activities
Passive Stakeholders	Stakeholders that do not wish to participate conservation/ development/ management activities

Rights-holders	Rights-holders are all those who have statutory and customary rights related to a World Heritage site or other heritage site. They can be individuals, groups of different kinds, with different interests and/ or other characteristics and they can be organisations (including NGOs) with an interest in the place.
Duty-bearers	Duty-bearers are all those who represent the State Party's responsibilities and duties pursuant to the World Heritage Convention. In the case of other heritage sites, the State is commonly the designator of the heritage site with the overall duty/ responsibility for management. Other groups such as Indigenous Peoples may also identify their duty of responsibility for a heritage site.
Communities	Communities is a generic term and includes all groups of people who possess a direct connection to a heritage place. They include local, migrant, settler, fragile and host communities, and Indigenous Peoples or traditional peoples, who live or work in a heritage place and hold associations with it. That connection may be tangible as well as intangible or spiritual, and has often endured over time.

Base Reference: (ICOMOS, 2023, p. 10)

Stakeholder Mapping Matrix

Level of Influence	High	Monitor regularly Anticipate needs	Engage as needed	Actively engage Keep satisfied
	Medium	Inform and consult as needed		
	Low	Essential information Low contact	Inform	Inform completely Monitor closely
		Low	Medium	High
	Level of Interest			

Reference: (NIUA, 2021, p. 20)

Stakeholder Mapping

Stakeholder (Individual/ group/ organisation/ institute/ community)	**Contact Details**	**Preferred notification means**	**Strategy for engaging the stakeholder**	**Impact**	**Influence**	**What is Priority of the Stakeholders?**	**How could the stakeholder contribute to the project?**	**How may a stakeholder hinder a project from moving forward?**
Name and designation	Phone No., Email id	E-mail, phone, letter, visit, mediator, poster, leaflets, broadcast	How much does climate change impact the stakeholders? - Low, Medium, High	How much influence do they have over the project/ undertaken strategies? - Low, Medium, High				

Stakeholder Mapping

Engagement for information disclosure	Information about the project must be disclosed in the public domain. Various channels include: newspapers, posters, radio, television, information centres and exhibitions or other visual displays, brochure, official correspondence, meetings, website, social media
Engagement for collaboration activities	Focus group discussions, community meetings, surveys, web-based engagement, poll results
Engagement for decision making and implementation	Ensuring the engagement process is conducted with adequate technical and facilitative support and manifests in a structured, collaborative design processes where concerns and ideas are shared and the awareness of wider agendas exists

Base Reference: (NIUA, 2021, p. 40)

C. Preliminary assessment of current capacities (Risks/ Impacts)

Capacities	Description	Risk / Impacts
Technical readiness and capacity	Gauging technical capacity at the individual and organisational levels across verticals of project management, administration and the domain-specific knowledge and skills needed in project personnel in the team	
Institutional readiness	Gauging the readiness of the implementer to operate in the wider local institutional environment consisting of multiple departments	
Readiness of the support infrastructure	Checking that the necessary support infrastructure, including requisite software and hardware for a conducive working environment	
Project governance and decision-making	Assessing the level of leadership support to the project across levels of governance	
Ability to adapt to change	Assessing the ability of the organisation to adapt to sudden changes or transitions in the given social, economic, and political environments and by minimising risks and charting a new course of action	
Resources	Adequacy and availability of individual and organisational resources and its accessibility	
Quality	Quality of skill sets at individual and organisational levels, The accuracy of information gathering for assessing	
Commitment	Reasons for getting/ not getting involved	
Culture	Ready to move away from the ‘conventional’ approaches of doing things	

Base Reference: (National Institute of Urban Affairs- NIUA, 2021, p. 17, 18)

D. Identification of government processes and systems

Listing/ Identification	From the official websites, From the discussion/ consultation with government officials, From the previous/ ongoing projects reports and its operational structures
Identification of Policy and Regulatory Frameworks	
Identification of Departmental Arrangements	
Identification of Collaboration Processes	
Identification of Resources Management	
Identification of Data Management and Monitoring Systems	
Identification of Evaluate Funding Mechanisms	
Identification of Implementation Process	
Identification of Capacity Gaps	

E. Identification of role of cultural institutions and organisations

Process	From the official websites, From the discussion/ consultation with institutions and organisations' officials, From the previous/ ongoing work reports and its method of working
Identification of the Research and Innovation done for the climate change and built heritage	
Identification of Advocacy and Policy Influence	
Identification of the Educational and Awareness Activities	
Identification of the Community Engagement Activities	
Identification of the Work towards Climate Change Impacts on Heritage/ Communities, etc.	
Identification of Collaboration Processes	
Identification of Resources Management	
Identification of Data Management and Monitoring Systems	
Identification of Capacity Gaps	

F. Current involvement of communities in processes

Communities	Key Characteristics	Community-driven work	Channel of Communication	Roles and Responsibilities Follow	Engagement Activity/ Techniques	Outcome of Engagement Activity	Follow-up Strategies
Description	The nature of impact and level of influence on the project	Current initiative/ practices by community	How will you get access to the community	Who will anchor and support the engagement activity?	Description of the engagement activity planned	Description of the opinions/ feedbacks	Plans for continued involvement

G. Assessment of data management capacity

Data Inventory and Accessibility	Assess the availability, accessibility and completeness of existing data.
Data Quality and Standards	Assess the consistency, accuracy and reliability of data collected from different sources to ensure its suitability for analysis and decision making.
Data Infrastructure and Technology	Assess the database management systems.
Data Collection and Monitoring	Assess the effectiveness of data collection methods and monitoring protocols.
Data Security and Privacy	Assess measures in place to ensure data security, confidentiality and privacy in compliance with regulatory requirements.
Capacity Building and Training	Identify training needs and capacity building opportunities to enhance data management, analysis and security.

Staffing Plan

Project Core Team

Sr. No.	Position	Name	Education Qualifications	Years of Professional Experience	Area of Expertise/ Skill sets	Contact Details

Base Reference: (National Institute of Urban Affairs- NIUA, 2021, p. 22)

Support Team

Consultants individuals/ firms that have been/ will be on board and will provide support across functions of project operations and management and also prove sector specific expertise.

Sr. No.	Position	Name	Education Qualifications	Years of Professional Experience	Area of Expertise/ Skill sets	Duration	Contact details

Base Reference: (National Institute of Urban Affairs- NIUA, 2021, p. 22)

Capacity Building

Training

Trainings / topics considered	Mode of training	Members/ roles for identified training	Facilitated by	Status (Complete / in progress / pending)

Base Reference: (National Institute of Urban Affairs- NIUA, 2021, p. 74)

Institutional coordination

Departments/ Organization involved	Purpose of engagement	Mode of engagement	Frequency of engagement	Responsibility/ tasks shared	Outputs of engagement

Base Reference: (National Institute of Urban Affairs- NIUA, 2021, p. 75)

Annexure 3

Sample Terms of Reference (ToR) for Step 1.7

Annexure 4

Sample 'City Profile'

Example of Chennai City

Contextual data about the city

Chennai is located on the North-Eastern part of Tamil Nadu, on the east coast adjoining the Bay of Bengal. It lies between 12° 09' N and 13° 09' N of the latitudes and 80° 0' 12'' E and 80° 0' 19'' E of the longitudes, on a 'sandy shelving breaker swept beach'. It stretches for 25.6 km along the Bay coast, from Thiruvanmiyur on the south to Thiruvottiyur on the north. It is bound on the east by the Bay of Bengal and on the remaining three sides by Kanchipuram and Thiruvallur districts. (Joshua, V., 2016)

Brief history of the city
Chennai is an ancient city in South India. Iron ages, as well as ancient manuscripts and temple inscriptions from the Pallava and Chola periods. However, Chennai's journey to the city it is today began with the advent of colonisation: the Portuguese in 1522, the Dutch in 1612, and the British in 1639. By this description, the city is about 400 years old. (Resilient Chennai, 2019)

On August 22, 1639, a local Nayak (A Telugu speaking royalty who ruled a large part of South India, including current areas of North Tamil Nadu, between 1529 and 1736) ruler turned over a tract of land to the East India Company for building a factory and warehouse for trading purposes. The land consisted primarily of fishing settlements and was located near the northern Coromandel coast. In 1640, the British built Fort St. George which became the anchor of this growing colonial city. (Resilient Chennai, 2019)

Originally known as 'Madras patnam' this was located in the province of Tondaimandalam, an area lying between Pennar river of Nellore and the Pennar river of Cuddalore. The capital of the province was Kancheepuram. In the year 1646, the settlement had 19,000 persons with the Portuguese and Dutch populations. During the course of the late 17th century, both plague and genocidal warfare reduced the population of the colony dramatically. Later the neighbouring villages of Triplicane, Egmore, Purasawalkam and Chetput were annexed with the city to form the city of Chennapatnam. The English merchants and the planter families who, allied with their wealthy Indian counterparts, jointly controlled Chennapatnam under the supervision of White Town. Over a period of time and following administrative reforms, the area was fully incorporated into the new metropolitan charter of Madras. (Joshua, V., 2016)

The development of a harbour in Madras led the city to become an important centre for trade between India and Europe in the 18th century. In 1788, Thomas Parry came to Madras as a merchant and he set up the oldest company in the country (EID Parry). John Binny came to Madras in 1797 and he established the textile company Binny & Co in 1814. Spencer's started a small business in 1864 which later became the biggest department stores in Asia. The original building which housed Spencer & Co. was burnt down in a fire in 1983 and the present structure houses one of the largest shopping malls in India, Spencer Plaza. Other prominent companies in the city included Gordon Woodroffe, Best & Crompton, Higginbotham's, Hoe & Co and P. Orr & Sons. (Joshua, V., 2016)

In 1901 the city, covering an area of about 70 sq km, had a population of 5,40,000. In 1905 the Chennai Port Trust was formed. The Government Royapettah Hospital was established in 1911. Water mains and drainage were formed in 1914 and the Street lights were introduced. Kilpauk water works was inaugurated. The First aeroplane flew to Chennai in 1917 arranged by Simpson & Co. The city was expanded to an area of about 80 sq km in 1923.

The School of Indian Medicine was founded in 1924 and in 1925 the Loyola College was founded. Tambaram TB Sanatorium was established in 1928. The first broadcasting station was founded at Ripon buildings complex in 1930. Suburban electric train services started from Chennai Beach to Tambaram in 1931. Raja Sir Muthiah Chettiyar was appointed as the first mayor of the city in 1934. Government Stanley Hospital was established. In 1942 the Second World War resulted in the evacuation of Madras. Japanese fighter planes dropped bombs on the city in 1943. Population of the city crossed million persons. The Regional Meteorological Centre was established from the old Madras observatory in 1945. (Joshua, V., 2016)

Around 1946 Mambalam, Saidapet, Government farm Puliyur, Kodambakkam, Saligramam, Adayar and Alandur villages which were part of Saidapet Municipality; Sembiyam, Siruvallur, Peravallur, Small Sembarambakkam and Ayanavaram which were part of Sembium, Panchayat Board; Aminjikarai, Periyakudal, Maduvankarai villages which were part of Aminjikarai Panchayat Board and Part of Velacheri village, belonging to Velacheri Panchayat Board, were annexed to the city. (Joshua, V., 2016)

After India became independent in 1947, the city became the administrative and legislative capital of Madras State which was renamed as Tamil Nadu in 1968. (Joshua, V., 2016)

With the inclusion of 12 Panchayats around Chennai in 1978, the Chennai district area extended from 128.83 sq km to 175 sq km as per revenue authorities. From time to time, the Chennai 8 district was divided into a number of Divisions for administrative convenience and for rendering effective civic service. The total numbers of Divisions/ Wards increased from 150 in 1981 to 155 in 1991 with the inclusion of five areas such as Cherian Nagar, Dr. Radhakrishnan Nagar (South), Villivakkam (South), Virugambakkam (South) and Aminjikarai (Central). As per 2011 census, Chennai city has 155 Divisions distributed in 10 Zones. Chennai city with an area of 175 sq km and a population of 4646732. High degree of urbanisation and density resulted from immigration and sporadic development of industries on the outskirts. Although Chennai is the smallest of the entire district in the state, it has the highest population density. Chennai district is a city district which is the capital of the state of Tamil Nadu. Chennai district was divided into 5 taluks, namely: Egmore-Nungambakkam, Fort Tondiarpet, Mambalam-Guindy, Mylapore-Triplicane and Perambur-Purasawalkkam. (Joshua, V., 2016)

Today, Chennai's economy has expanded substantially into a service and knowledge economy, while continuing to support thriving automobile and Information Technology (IT) industries, which are complemented by the healthcare industry, financial services, post-secondary educational institutions and manufacturing of various types of hardware. The city's vibrant economy is qualified by a Gross Domestic Product (GDP) of United States Dollar (USD) 58 billion and 6 % growth rate. Chennai has successfully positioned itself as a key player in the state's and the country's economies by producing 60 % of India's automotive exports and by being the largest revenue generator in the 'software as a service' (SaaS) sector by already earning over USD 500 million in revenue so far. (Resilient Chennai, 2019)

Area, population and demography of the city

Chennai, the capital city of Tamil Nadu is a rapidly developing Metropolitan region. The Chennai Metropolitan Area (CMA) comprises the city of Chennai, 16 Municipalities, 20 Town Panchayats and 214 Village Panchayats in 10 Panchayat Unions. According to Census, 2011 the area of Chennai city is 176.00 sq km, total population is 46.47 lakhs, population density 264 per hect and decadal growth is 6.98 %. Based on the Second Master Plan, the current Metropolitan area is expected to have a population of 126 lakhs by 2026. (Chennai Metro Rail Limited, 2019)

Regional settings explaining connectivity of the city to the region and rest of India

Chennai is served by the Chennai International Airport, which is one of the busiest airports in India. It offers domestic and international flights, connecting the city to major destinations across the globe.

Chennai has a well-established railway network, with Chennai Central and Chennai Egmore being the primary railway stations. These stations are major hubs connecting Chennai to various cities and states across India through an extensive network of trains.

Chennai is well-connected by roadways with national and state highways linking it to neighbouring cities and states. The Chennai Metropolitan Area is served by an extensive network of roads and express ways, facilitating

both intra-city and inter-city travel. The city road network has a radial pattern depicting a finger-like plan, with five major roads (NH- 32, NH- 716, NH- 16, NH- 48 and TPP road) which connect various cities across India. (Chennai Metro Rail Limited, 2019)

The Chennai Port, one of the oldest ports in India, is a vital gateway for maritime trade in South India. It provides connectivity not only to other ports within India but also to international ports, enhancing Chennai's role as a trade hub.

Tourist footfall in the city and heritage areas
As per the Commissioner of Tourism, Chennai-2, Statistical Hand Book of Tamil Nadu- 2020-21, Chennai has 1,09,99,343 domestic tourists and 6,31,937 foreign tourists (Total- 1,16,31,280) in the year 2011.
(Commissioner of Tourism, Chennai-2, 2021)

List of institutions for collaboration to create city profile, climate profile and community profile

1. Tamil Nadu Tourism Development Corporation Limited
2. Chennai Smart City Limited
3. Greater Chennai Corporation
4. Chennai Metropolitan Development Authority (CMDA)
5. Chennai Directorate of Town and Country Planning (DTCP)
6. Public Works Department (PWD), Chennai
7. Archaeological Survey of India (ASI)
8. Tamil Nadu (State) Archaeology Department
9. Environmental Information System (Envis) Centre Department of Environment, Government of Tamilnadu
10. Institute for Ocean Management, Anna University, Chennai
11. Centre for Climate Change and Adaptation Research (CCCAR), Anna University, Chennai
12. Central Ground Water Board, South Eastern Coastal Region, Chennai
13. Indian Meteorological Department (IMD) Chennai
14. Tamil Nadu State Disaster Management Authority (TNSDMA)
15. Tamil Nadu Coastal Zone Management Authority (TNCZMA)
16. Madras Institute of Development Studies (MIDS)
17. National Institute of Ocean Technology (NIOT)
18. Chennai Metropolitan Development Authority (CMDA)
19. Tamil Nadu State Pollution Control Board (TNPCB)
20. Indian Institute of Technology (IIT) Madras
21. Madras University
22. Chennai Water Supply and Sewerage Board (CMWSSB)
23. Chennai Chapter of INTACH (Indian National Trust for Art and Cultural Heritage)
24. Chennai Heritage Foundation
25. Madras Literary Society (MLS)
26. Tamil Nadu Archives and Historical Research Institute (TNAHRI)
27. Chennai Museum
28. Kalakshetra Foundation, Chennai
29. Roja Muthiah Research Library (RMRL), Chennai
30. Mylapore Heritage Centre, Chennai
31. Centre for Social Initiative and Management (CSIM), Chennai
32. M.S. Swaminathan Research Foundation (MSSRF), Chennai
33. Heritage Conservation Organizations

    etc.

Note- For effective communication and analysis of data it is recommended that the data be presented in the form of maps, photographs, diagrams, info-graphics etc.

Geographical and geological data

The second step of creating the city profile is to collect geographical and geological data about the city:

Bio-geographic zone

Geographically, Chennai lies on the Coromandel Coast of the Bay of Bengal. The city falls within the larger biogeographic region known as the Eastern Coastal Plains. The Eastern Coastal Plains are characterised by flat terrain, sandy beaches, and fertile delta regions formed by rivers.

Natural features in and around the city such as forest cover, biodiversity, topography, natural water bodies, desert, mangrove, coastline, ecologically sensitive zones, etc.

The Chennai City is abound with lakes and rivers, providing a habitat for a wide variety of flora and fauna. Chennai City is drained by 3 east flowing rivers namely Kosasthalayar, Cooum and Adyar between its north and south boundaries. After meandering through the city, these rivers finally flow into the Bay of Bengal. A major canal, namely, Buckingham Canal traverses parallel to the coast and has considerable importance in shaping up the aquatic environment of the Chennai City.

Fishes constitute one of the major faunal groups and the next vertebrate group occurring in the Chennai coast is sea snakes and turtles. The marine fauna is rich and varied. The coastline encompasses almost all types of intertidal habitat from hypersaline, brackish lagoons, estuaries and coastal marsh and mudflats to sandy and rocky shores. Each local habitat reflects prevailing environmental factors and is further characterised by its biota. About 11 animal phyla are represented in the marine ecosystem of Chennai coast. This includes sponges, cnidarians, crustaceans, mollusks, echinoderms, fishes, reptiles and mammals. The benthic macro fauna comprises resident species such as scleractinian corals, molluscs and mud-burrowing fishes. Among invertebrates, sponges and echinoderms do not prefer estuarine ecosystems. In Chennai coast, the species diversity is the maximum in Mollusca with 273 species belonging to 151 genera under 72 families. Crustaceans are represented by 200 species belonging to 125 genera under 39 families.

Free swimmers or nektons are important components of marine biodiversity. The dominant taxa in the necton are fish, others being crustaceans, molluscs, reptiles and mammals. In Chennai, 200 species of crustaceans, 272 species of molluscs, 493 species of fishes, 19 species of reptiles and 6 species of mammals are reported.

The turtles and sea snakes are generally oceanic forms but majority of these often swim near to the shore and visit the shore during some part of their life. Twelve species of sea snakes and five species of turtles have been reported from Chennai coast. Olive Ridley turtles visit the shore during breeding season to lay their eggs. Some turtle hatcheries are available along the Neelankarai coast for the protection of these turtle eggs.

The Chennai coast offers a variable feeding and breeding ground for a number of birds. However, no systematic data is available on the coastal dependent shore birds of Chennai. Marine mammals belong to three orders i.e. Sirenia, Cetacea and Carnivora. The stranding of sperm whales and spinner dolphins are regularly reported. 61 India has a total number of 23,690 species (both terrestrial and marine), out of which only 12,244 species (51.10 %) are recorded from marine regions of India. Chennai coast has little over 10% of marine fauna recorded from India. The study conducted along the Chennai coast (from Ennore port to Thiruvanmiyur) revealed the occurrence of 1270 species belonging to 730 genera.

Siphonophores are the most abundant in the Chennai coast and constitute an important fauna in the marine plankton collected at the surface with a tow net and Nansen's net in the offshore collections.

(RAMESH, R., NAMMALWAR, P., GOWRI, V., 2008)

Land resources

The total geographical area of Chennai District is around 17,400 ha. The urban nature of the district indicates that there are no activities being carried out with respect to Agriculture and Horticulture. Therefore, data pertaining to agriculture, horticulture practices, soil types, soil problems; soil conservation works are not applicable to Chennai districts. (Chennai District, n.d.)

Natural contour, soil character, height from the mean sea level (MSL), water table, mining or quarrying sites, etc.

Geologically, the Chennai aquifer system comprises marine, estuarine and fluvial alluvium underlined by

Precambrian gneisses and Charnockites. The charnockites form the major rock types and constitute the residual hills around the southern part of the study area. Beds of upper Gondwanas are found in and around the central and northern portion (Figure.10). This Upper Gondwana formation with type area Sathyavedu comprises conglomerates, shale, and sandstone, and is covered by a thick cover of laterite. Tertiary sandstone is seen in small patches in the study area ie. in the northwest of Chennai city and upto Satyavedu, and is capped by lateritic soil. (Central Ground Water Board, 2017)

Physiography and Drainage

Major part of the area is characterised by a flat topography with gentle slope towards east. The altitude varies from 10 m MSL (Mean Sea Level) in the west to sea level in the east. Fluvial marine and fluvio marine landforms are noticed in the area. Marine transgression and regressions have resulted in the present day landforms.

Sandbars are scattered along the course of the Adyar river. Sharp and angular trends in the course of the river show the control of structural features. Further, the man made bunds and structures at the mouth of the river to control flood water and movement of seawater has altered the natural erosion processes. The sea erosion in the northern Chennai in Tiruvottiyur is very active and in recent years, the area affected is of the order of 4 km long and 200 m wide. (Central Ground Water Board- CGWB, 2011)

Adyar River of 42 km length flows through the city with a catchment area of 800 sq.km. The river has perennial flow with an average discharge of 89.43 mcm/yr. at Kattipara causeway and during high tides, the backwater from Bay of Bengal enters inland up to 3 – 4 km. (Central Ground Water Board- CGWB, 2011)

Cooum is the other river draining through the city. It originates from surplus flow from Cooum tank in Tiruvallur district and surplus flow from other tanks enroute adds to its flow. The flow of the river at Korattur is 40.2 Mcm/yr for a flow for 31 days in a year. However, due to discharge of sewage into it after the entry into the city, the river is highly polluted. (CGWB, 1993). Buckingham canal is a manmade navigation canal, not in use for the last four decades and presently acts as sewerage carrier within the city. (Central Ground Water Board, 2011)

Soil type

The major soil-types encountered in the metropolitan area are Alluvial, Clayey and loamy soils. Alluvial soils are commonly observed in the central part along the rivers and in coastal area and have high permeability. Clayey and clayey skeletal soils are seen in the northern part of the metropolitan area. These soils are alkaline in nature, have poor permeability and are highly calcareous and cracking. (Central Ground Water Board, 2011)

Water Profile (Surface and Groundwater)

- **Ground Water**

Ground water occurs in all geological formations in the city and is developed by means of dug wells, filter point wells, tube wells and bore-wells. Crystallines are a prominent aquifer in the southern part of the city. The groundwater is essentially limited to weathered mantle and fractures in the crystalline. Ground water occurs under unconfined conditions in weathered mantle and under semi confined to confined conditions in fractures. The yield also is moderate to poor yielding up to 3 lps. (Central Ground Water Board, 2011)

- **Surface Water**

Three rivers viz. Koratalaiyar, Cooum and Adyar pass through Chennai Metropolitan Area. These rivers are placid and meander on their way to the sea. Buckingham Canal, a man made canal, is another large waterway which runs north south through this Metropolis. The major surface water bodies in the metropolitan area form the main source of water supply to the city. The three lakes, viz., Redhills, Cholavaram and Poondi, having an aggregate storage capacity of 175 million cum. Since January 2000, Chembarambakkam has also been used as storage. Besides this two small lakes namely, Erattai Eri and Porur lake are also utilised as a source of supply. (Central Ground Water Board, 2011)

- **Ground Water Scenario**

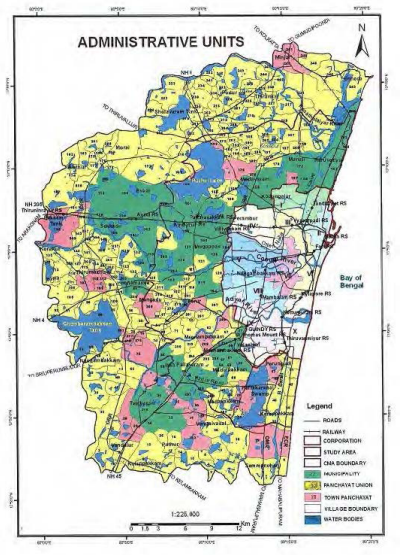
Chennai district is underlain by various geological formations from ancient Archaean crystalline to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely i) the Archaean crystalline rocks ii) consolidated Gondwana and Tertiary sediments and iii) the unconsolidated Recent

Alluvium. The Archaean crystalline rocks of the district comprise chiefly of charnockites, gneisses and the associated basic and ultra-basic intrusives. (Central Ground Water Board, 2011)

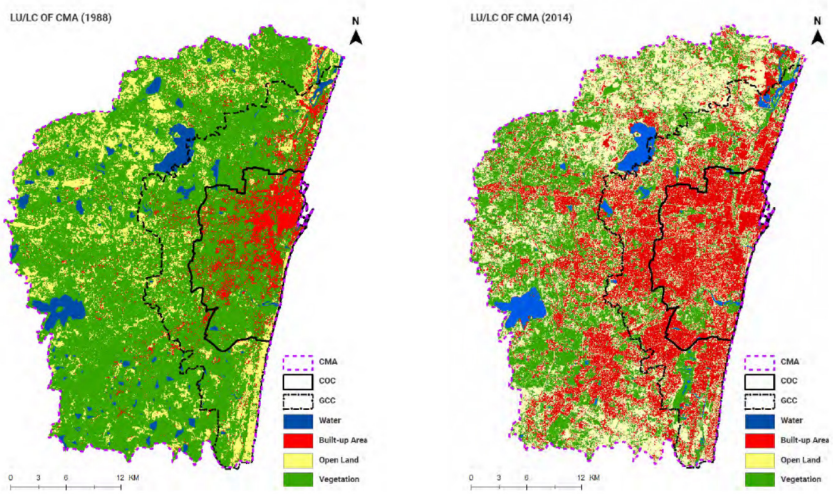
- **Ground Water Level**

Central Ground Water Board monitors water levels in Chennai city every month and on quarterly basis in the metropolitan area and for water quality once in a year (May). The analysis of water level data shows that during pre-monsoon, 62 % of wells recorded shallow water levels in the range of less than 5 m bgl (below ground level) and water level in 38 % of wells in the range of more than 5 m bgl observed in the southern part of the CMA. During post monsoon 91 % of wells have recorded shallow water level in the range of 0 to 5 and 9 % of wells have recorded deeper water levels in the range of more than 5 m bgl and noted in Vepery, Aminjikarai and Thiruneermalai area. (Central Ground Water Board, 2011)

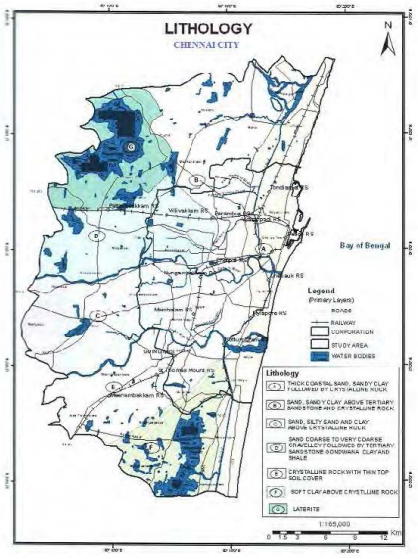
Maps of the city



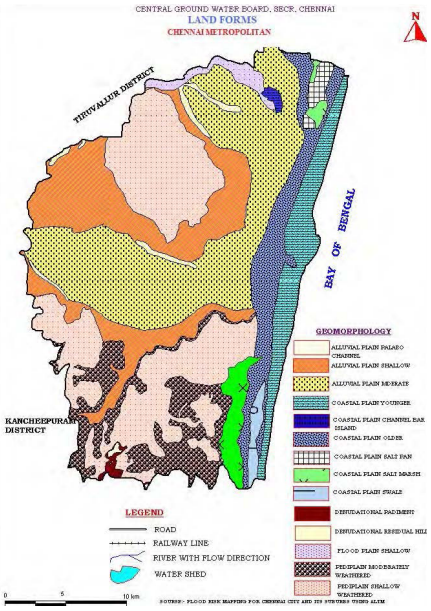
Chennai City- Administrative Unit
(Source: Central Ground Water Board. (2011). Ground Water Senario in major cities of India. Ministry of Water Resources. Retrieved on March 22, 2024 from https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/water/WRDM/CGWB_GW_Senario_in_Indian_cities_May_2011.pdf)



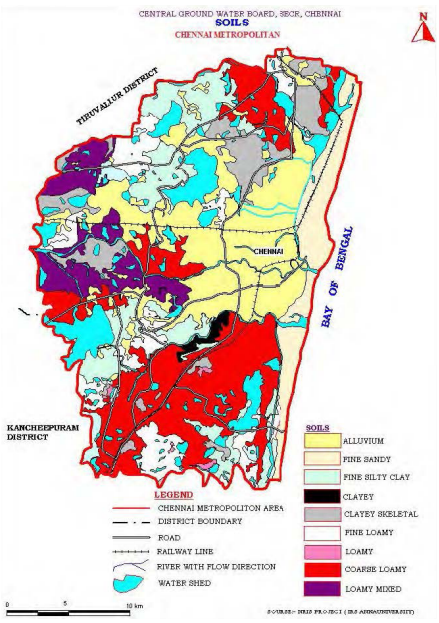
Land use change in the Chennai Metropolitan Area (Year 1988 and 2014)
(Source: Resilient Chennai (2019). *Chennai City Resilience Strategy. Kaleidoscope. My city through my eyes*. P. 34. Retrieved on March 20, 2024 from https://resilientchennai.com/wp-content/uploads/2019/07/Resilience-Strategy_20190703.pdf)



Chennai City- Lithology

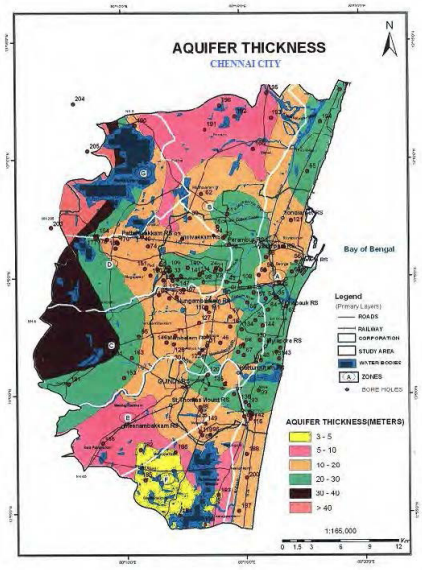


Chennai City- Land Forms

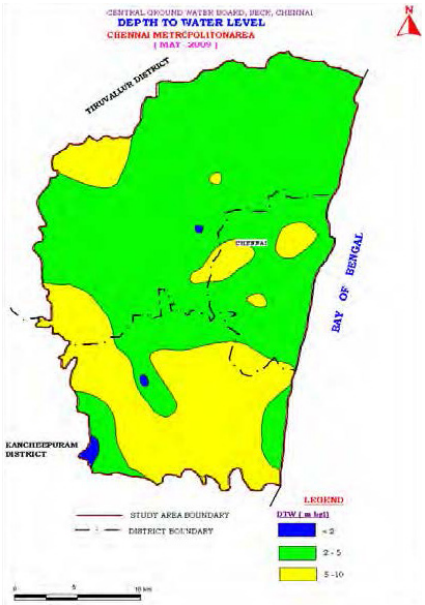


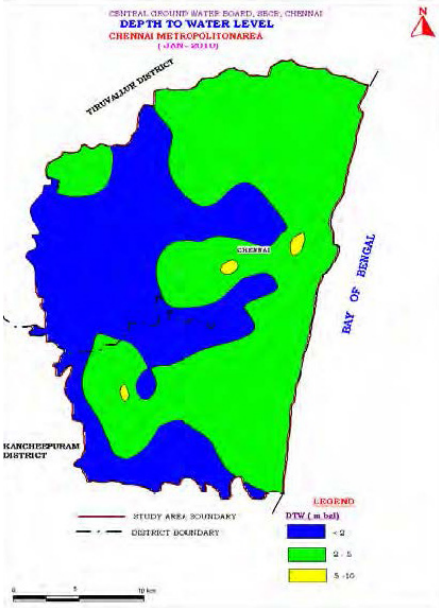
Chennai City- Soils

(Source: Central Ground Water Board. (2011). Ground Water Senario in major cities of India. Ministry of Water Resources. Retrieved on March 22, 2024 from https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/water/WRDM/CGWB_GW_Senario_in_Indian_cities_May_2011.pdf)



Chennai City- Aquifer Thickness





Chennai City- Depth to Water Level (Year 2009 and 2010)

(Source: Central Ground Water Board. (2011). Ground Water Senario in major cities of India. Ministry of Water Resources. Retrieved on March 22, 2024 from https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/water/WRDM/CGWB_GW_Senario_in_Indian_cities_May_2011.pdf)

Information on probability of extreme events other than hydro-met events such as earthquake zones, industrial and chemical hazards, fire hazards, health hazards, nuclear or radiological hazards, etc.

Chennai is subjected to flooding during the Northeast monsoon. Catastrophic flooding occurred in 1976 and 1985 causing enormous damage to property, infrastructure and the economy. Relief and rehabilitation measures had to be taken up by the government agencies. Settlements on the banks of the waterways and

in the flood plains are most vulnerable. Chennai is a low-lying area and the land surface is almost flat. The damage was severe during the 2004 Indian Ocean tsunami as it accounted for thousands of human lives and severe material damage. The even topography of the land throughout the district is prone to floods. It rises slightly as the distance from the sea-shore increases but the average elevation of the city is not more than 22' above mean sea-level, while most of the localities are just at sea-level and drainage in such areas remains a serious problem. (Chennai District, n.d.)

Chennai is not located in a high seismic zone, but still faces a moderate risk of earthquakes. The city falls under Seismic Zone III, indicating moderate vulnerability to seismic activity.

Chennai, being an industrial hub, faces risks associated with industrial accidents, chemical spills and hazardous material handling. Industrial areas in and around the city have facilities handling chemicals, petroleum products and other hazardous substances, posing risks to both human health and the environment.

Urban areas in Chennai are susceptible to fire hazards due to factors such as crowded living conditions, informal settlements, inadequate fire safety measures and industrial activities. Major fire incidents can occur in residential areas, commercial establishments, and industrial complexes, leading to property damage, injuries, and loss of life.

Chennai, like other metropolitan cities, faces health hazards such as air pollution, water contamination, vector-borne diseases, and outbreaks of infectious diseases. Overcrowding, inadequate sanitation and poor waste management contribute to health risks for the city's residents.

Profile of Infrastructure and services around heritage areas

Traditional/ Local/ Indigenous climate resilient infrastructure/ blue-green infrastructure

Water infrastructure and water management practices

- **Kattupalli Kuppam**

This village is situated north of Ennore Port and south of Pulicat lake. During the tsunami, water wall of height 3 m penetrated about 300 m into the land. As the Ennore port breakwaters are intercepting the net northerly littoral drift, there is slight erosion at this village. This erosion may be magnified if not tackled. Hence, measures like plantations and sand nourishment (dredged soil from Ennore port) is being carried out. (Chennai District, n.d.)

- **Ennore to Royapuram**

The stretch of about 15 km from Ennore towards its south upto Royapuram comprises a number of fishing hamlets. Most of the beaches have been protected by a seawall and combination of seawall and groynes. Even though the beach from Chinna Kuppam (about 3 km from South of Ennore creek mouth) to Ennore mouth has been protected by a seawall this stretch is liable to be eroded in future. Hence, this should be strengthened by a groynes field, by which additional beach width can be gained, thereby not only stabilizing the seawall but also to win additional beach. (Chennai District, n.d.)

- **Reach between the two groynes fields (Masthan Koil Kuppam to Popular Weigh Bridge)**

A portion of this stretch of the coast has been proposed to be protected by two groynes fields in addition to a seawall, out of which one stretch with six groynes is completed and the second stretch is to be taken up by Tamil Nadu Road Development Corporation (TNRDC). In between the two groynes fields, industries and fishing hamlets are located along this stretch. (Chennai District, n.d.)

- **Stretch between Savorit to Northern breakwater of fishing harbour**

The existing seawall at this stretch is in a depleted condition. The stretch of the coast from the North of Northern breakwater upto stretch II of the groynes field is to be constructed by Tamil Nadu Road Development Corporation (TNRDC). (Chennai District, n.d.)

- **Stretch between Chennai port to Foreshore estate**

The Marina beach is World's second longest beach formed due to the interception of the long-shore sediment

transport by the Chennai harbours Southern breakwater. This has resulted in the sand bar formation at the mouth of rivers Cooum and Adyar. Both the rivers run within the city of Chennai. (Chennai District, n.d.)

- **Awareness initiatives**

NGOs are mainly dealing with environmental issues like Environmental impact studies, Environmental awareness, Environmental Education etc. Around 45 NGOs have been identified in the District. Various awareness creation activities have been conducted among the fisher folk on tsunami and Coastal Regulation Zone (CRZ) issues. (Chennai District, n.d.)

The traditional 'ery' system has lost its relevance in today's urbanised Chennai. A growing population and economy, combined with a booming real estate market, mean that Chennai's water bodies including its erys have been encroached upon or reclassified for housing, and in some cases for commercial and industrial developments. Surviving erys are poorly maintained for a number of reasons: during the period of British rule, the communal resource management system broke down when a transition to centralised water management structures (such as dams and canals) and agencies (such as the Public Works Department-PWD) were made. The focus on large engineering interventions to manage city water flow is apparent in the prioritisation of artificial Storm Water Drainage (SWD) systems over traditional tanks. In addition, the eventual proliferation of unregulated private bore wells and a transition to a non-agricultural economy has rendered the ery less important as a source of water to citizens. (Resilient Chennai, 2019)

Green spaces or practices

- **Agriculture and horticulture**

Chennai city today is devoid of any typical agriculture areas but can still be proud of some of the well maintained green belts found in the Peoples park, the Napier park, the Horticulture-gardens, My Lady's Park, Children's Park Guindy, Snake Park, Nehru Park, Nageswara Rao Park, Independence Park, Anna Square Park, the Raj Bhavan, the Theosophical Society. Campus and a number of bungalows and newly developed colonies where provisions for public parks, etc. have been made. The indigenous trees found are Azadirachta indica, Mangifera indica, Tamarindus indica, Albizia saman, Albizia lebbeck, Ficus benghalensis, Cocos nucifera and Ficus religiosa. Stretches of casuarina plantations are available on the sea-coast beyond the mouth of the Adyar river in the South and Tondiarpet in the North. (Chennai District, n.d.)

- **Forest resources**

Chennai district is not endowed with many forest resources except the Guindy National Park with an area of 270.57 ha which is under Reserve Forest category. In terms of density of vegetation cover, the area falls under the sparse category. The Guindy National Park is classified under tropical dry evergreen forests of the Coromandal coast and is being used for recreational purposes. However, much of this park area represents dry deciduous scrub jungle of the Southern dry zone interspersed with more than 30 species of trees. The entire vegetation looks dry during summer months, but trees acquire a verdant look with the onset of monsoons. The forests are interspersed with open grassland, which is the ideal habitat for black bucks. Besides the terrestrial vegetation, different water plants are seen in the lakes and ponds inside the park. (Chennai District, n.d.)

- **Green Practices in the History**

150 BCE–200 CE- Records of Sangam literature of Tamil Nadu show that tank irrigation and river water was used for paddy cultivation.

9th century CE- Early mediaeval Chola and Pallava kingdoms in Tamil Nadu, continued to harvest rainwater through building of tanks. Rulers, such as King Rajendra Chola, (1012-1044) also laid down the basic principles of management of earthworks.

1011–1037 CE- Chola ruler Rajendra Chola is believed to have built the Veeranam tank, the largest in South Arcot district of Tamil Nadu, and a source of water for Madras.

(Resilient Chennai, 2019)

Festivals/ events/ practices/ rituals

The deep-rooted nature of Chennai culture and identity is the continued interest and importance placed on the arts (particularly the performing arts of music and dance). This includes classical art forms of Carnatic music and Bharathanatyam, as well as other forms of music such as, villupattu, gaana, Tamil sufi music, film music and folk dances such as, paraiattam and therukoothu (theatre). (Resilient Chennai, 2019)

Several temples in the city including the Thiyagarajaswamy temple in Thiruvottriyur, the Kapaleeshwarar temple in Mylapore and the Parthasarathy temple in Thiruvallikeni, were centres of music and dance, with numerous tevarams (verses on Lord Shiva), pasurams (verses on Lord Vishnu) and Carnatic music compositions on the presiding deities. (Resilient Chennai, 2019)

While music and dance have now largely moved out of temples to auditoria, they continue to be an intrinsic part of the Chennai city identity. The Margazhi Music and Dance Festival, which is held in the months of December and January, is one of the largest music festivals in the world with around 1500 performances spread across the city and only evening performances ticketed. Complementing this festival is the Chennai Kalai Theru Vizha, which showcases multiple art forms through performances across less explored and understood parts of the city (such as North Chennai) with the intent of "equalizing spaces, cultures, communities and the arts". In 2017, these efforts resulted in Chennai being included in UNESCO's list of 'creative cities' for its contribution to music. (Resilient Chennai, 2019)

Tied inexorably to Chennai's culture is the Madras tiffin. The triumvirate of Tamil Nadu fast food Idly, Dosa and Vadai— is available on every street at prices within the means of all citizens. Heaped around these is a host of dishes whose fragrances and flavours are uniquely South Indian, not the least of which is a frothy cup of hot filter Kaapi (coffee). (Resilient Chennai, 2019)

Jallikattu, a traditional bull-taming sport, has deep roots in Tamil Nadu's culture. However, Jallikattu has sparked controversy due to concerns about animal welfare, leading to occasional protests and regulatory measures. Despite this, the sport remains an integral part of Chennai's cultural fabric, attracting participants and spectators.

Socio-economic condition and recent trends

Social profile of the city (religions, languages, indigenous people, etc.)

Chennai is home to people from diverse religious backgrounds. The majority of the population practices Hinduism, followed by significant communities of Muslims, Christians and smaller numbers of Sikhs, Jains, Buddhists and others.

The primary language spoken in Chennai is Tamil, which is also the official language of Tamil Nadu. English is widely spoken and serves as the language of administration, education, and business. Additionally, various other Indian languages are also spoken by different communities in the city.

Note:

The data should be collected from the given list in 2.1 (g) of institutions/ organisation and other relevant sources. If the particular data is not recorded in the past by any institutes/ organisation or the recorded data are not recent or updated, the team has generated new data as on ground/ primary data collection.

Some of the following information can be extracted from available national/ state GIS databases.

Agriculture Data

- Soil Fertility

Census Data

- Population
  - Number of Households
  - Total Population, Total Male Population, Total Female Population
  - 0-6 Age Group Persons, 0-6 Age Group Males, 0-6 Age Group Females

- Total Workers
- Total Workers (Main + Marginal) Persons
- Total Workers (Main + Marginal) Males
- Total Workers (Main + Marginal) Females
- Main Workers
- Main Workers Cultivators- Persons, Males, Females
- Main Workers Agricultural Labourers- Persons, Males, Females
- Main Workers Household Industry- Persons, Males
- Main Workers Other- Persons, Males, Females
- Marginal Workers
- Marginal Workers- Persons, Males, Females
- Marginal Workers Cultivators- Persons, Males, Females
- Marginal Workers Agricultural Labourers- Persons, Males, Females
- Marginal Workers Household Industry- Persons
- Marginal Workers Other – Males, Females
- Non Workers
- Non Workers- Persons, Males, Females

Irrigation
- Water Resources
- Canals
- Lithology
- Micro Watershed

Topography
- Drainages

Tourism

Wetland

Base Reference- (Punjab GIS Dashboard, n.d)

Annexure 5

Guide for 'Heritage Profile'

List heritage assets and places

The name of the heritage asset

- **Present Name:** Mention the name of the Property by which it is known today.
- **Past Name:** Mention the previous name and/ or any other name by which it is known.

Note: If a few properties are popularly known by the name of the owner, then the regional nomenclature should be maintained - For example - Chaudhary Suraj Singh Haveli. In case of a precinct, the listing should be done for each structure/ building that is part of the complex separately.

Legal protective designation/s (if any)

- World Heritage, National Level Heritage, State Level Heritage, City Level Heritage (Listed or unlisted), Community Heritage (Listed or unlisted) or any other

Use

- **In use/ vacant:** Mention if the property is still in use, or is vacant
- **Present Use:** Mention the Present use of the building. In case of vacant structures, there will be no present use.
- **Past Use:** Mention the use for which it was being put to use in the past (if any). This could be historic use, or the original use for which the building was built.

Ownership details

- **Single/ Multiple:** If the property has a single owner, or has multiple owners. Multiple owners are usually present in case of a Trust.
- **Public/ Private:** Properties that are owned by the Central Government, the State Government, or by any local government are Public Properties. Sometimes, religious properties are owned by local bodies, and, hence are public properties. Private properties are either owned by an individual or a group of people, or even a Trust/ Company which is not a government organisation.
- **Name of the Owner & Addres**

Mention the name of the owner(s), the Trust, or the Government Department with their address/ contact details.

Description of special features or characteristics

- Materiality, Architectural/ structural elements, aesthetic qualities, including craftsmanship, artistic design and decorative elements/ embellishments, associational features, symbols of cultural identity, pride, and continuity for communities, etc.

Photographs for identification

- A high resolution cameras should be used. While preparing files for printing, a resolution of 300 dpi, with JPG/ JPEG format should be used.

Base Reference- (Listing Cell- INTACH, n.d.)

Note: These data can be gathered from World Heritage List, World Heritage Tentative List, Archaeological Survey of India (ASI), State department of Archaeology, INTACH Chapters, Local heritage organisations, etc. If the list or the details are not available or the recorded data are not recent or updated, the team has to generate new data generation as on ground/ primary data collection.

Record intangible narratives

- To document and analyse the impact of climate change on intangible cultural heritage interdisciplinary research and consultation with the local community is required. While documenting this, it is important to identify any changes that are observed from past/ recent years. Such as, climate change can disrupt traditional practices such as, agricultural rituals, seasonal/ spiritual ceremonies, water-related customs, etc. Changing ecological conditions may alter the timing, frequency and feasibility of these practices, leading to their decline or adaptation. Indigenous and local knowledge systems are often closely linked to the natural environment and its seasonal rhythms. Climate change-induced shifts in ecosystems, biodiversity loss may affect the traditional ecological knowledge and resource management practices which may impact community resilience and adaptive capacity.

Note: These data can be gathered from UNESCO Creative Cities Network (if he city is in the list of UCCN), Government of India institutions such as s, Central Silk Board (CSB), Development Commissioner for Handlooms and Development Commissioner for Handicrafts (DCH) under Ministry of Textiles, National Handloom Development Corporation (NHDC), Handicrafts and Handlooms Export Corporation of India (HHEC), Crafts Council of India (CCI), Indian Institute of Crafts and Design (IICD), Small Industries and Export Corporation; state government institutions such as state emporiums and small scale craft based industries, Art schools/ institutes, local institutes of crafts, heritage and cultural ecology, religious groups, other Non-Governmental Organisations (NGOs) working towards cultural heritage, etc. If the list or the details are not available or the recorded data are not recent or updated, new data would be required such as, on ground/ primary data collection.

Document heritage significance, values and attributes conveying the significance

OUV

- Outstanding Universal Value means cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. (UNESCO, n.d).

Values

- Age Value, Historical Value, Cultural Value, Social Value, Economic Value, Aesthetic Value, Associational Value, Symbolic Value, Artistic Value, Spiritual/ Religious Value, Existence Value, Political value, Educational and Academic Value, Economic Value, Scientific Value, Use Value, Intrinsic Values, Bequest Value, etc.

Base Reference- (The J. Paul Getty Trust, 2002)

Attributes

- Physical, cultural and intangible attributes of heritage resources, including architectural features, design elements, materials, craftsmanship, historical associations, cultural practices, social meanings, collective memory, traditions, cultural continuity, indigenous or local knowledge systems, skills and practices, ecological importance, biodiversity, natural features, etc.

Record condition of heritage structures and places

Documentation and mapping of condition of heritage structures and buildings such as, Measure drawing, Photographic documentation, Photogrammetry, Laser scanning (LIDAR), GIS, Thermographic Inspections, etc. Apply a range of documentation tools and techniques to document and monitor impact of climate change on the health of the fabric. Use advanced technology and combination of soft wares to achieve the accurate results.

Along with the condition of the buildings/ structures, it is important to analyse how the traditional structures are used in the different seasons and times of the day and who (Male, Female, Elderly, Young) occupy which part of the building/ structure . These studies will identify how the use of the spaces change over the period of time and reasons behind it and who are more vulnerable to the impacts of climate change .

Condition Assessment of heritage structures and places

Collate information on values of the various attributes of the building/ structure and condition of these attributes so as to determine the vulnerability of the attributes. This information can be organised in a vulnerability matrix so as to determine further action in the area of documentation, investigation and planning for intervention.

Condition of Elements	Description
Satisfactory- No Sign of Decay	The defect does not affect the structure and/ or structural components and/ or other building services Structurally stable, architectural/ ornamentation features are intact, minimal effects of weathering, reversible interventions
Slight - Showing Sign of Decay	A minor defect, which there is almost no impact to the structure and/ or structural components functionality but still should be maintained Structurally stable, architectural features mostly intact, some effect of weathering, incompatible interventions
Moderate- Medium state of deterioration	The functionality of structure and/ or structural components is affected, the functionality as a whole does not affected But it may cause injury to the occupants Structural challenges- cracks, sagging structural elements, broken/ missing architectural features, effects of weathering- seepage, missing plaster, vegetation broken growth, rising dampness, incompatible interventions
Severe- Danger of Disappearance	The defect may cause structural failure and/ or services failure if not repaired or maintained Structural challenges- cracks. broken/ stressed structural elements, out of plumb, broken/ architectural features missing, weathering- missing effects broken of seepage, plaster, vegetation growth, rising dampness, Incompatible interventions

Base Reference- (CRCI Pvt. Ltd., 2016)

Annexure 6

Sample 'Climate Profile'

Example of Ahmedabad City

Information on current climate, observed climate change trends, climate change projections

Current Climate

The climate of Ahmedabad is hot and semiarid with marginally moderate rainfall. The climate is extremely dry except for the monsoon months. The weather is hot and extremely dry during the months of March to June. (India Meteorological Department, 2022, p. 2)

Temperature

- The average summer maximum temperature is 39°C and average minimum is 24°C (from 2010 to 2019). As reported in the climatology of Ahmedabad based on the data from 1971 to 2010, it was 41°C and 27°C respectively. The average maximum temperature from the period between November to February is 30°C and average minimum is 15 ˚C (from 2010 to 2019). (India Meteorological Department, 2022, p. 2)

It is also observed that maximum temperature varies from 19°C (December) to 48°C (May) and minimum temperature varies from 5.2°C (February) to 31.5°C (June) during the study period of 2010 to 2019. Average maximum temperature is highest in May and average minimum temperature is lowest in January. (India Meteorological Department, 2022, p. 33)

Note- The monthly average maximum/ minimum is the average of the highest temperature recorded every day during that month. The mean maximum/ minimum is the average of the highest temperature recorded during the month.

Month	Maximum Temperature(°C)			Minimum Temperature(°C)		
	Mean	Highest	Date and year	Mean	Lowest	Date andyear
January	27.9	34.8	25 Jan 2017	12.3	6.6	17 Jan 2011
February	31.1	37.8	24 Feb 2015	15.2	5.2	09 Feb 2012
March	35.9	43	21 Mar 2010	19.6	10.2	12 Mar 2017
April	39.8	44.6	18 Apr 2010	24.5	16.2	8 Apr 2017
May	42.2	48	20 May 2016	27.5	23.4	3 May 2018
June	39.4	45	5 Jun 2014	28.1	22.6	24 Jun 2019
July	34.1	41	21 Jul 2019	26.2	22.2	5 Jul 2013
August	32.5	36.2	30 Aug 2015	25.4	22.3	5 Aug 2010
September	33.4	38.7	22 Sep 2018	24.9	22.2	27 Sep 2018
October	35.6	39.4	6 Oct 2017	22.2	15.8	29 Oct 2012
November	32.9	37.4	3 Nov 2017	17.9	11.3	29 Nov 2012
December	29.1	35.6	31 Dec 2015	13.7	7.4	15 Dec 2014

Average and Extremes of rainfall over Ahmedabad (2010 to 2019)
(Source- India Meteorological Department (2022). *Climate of Ahmedabad*. p. 31. Retrieved on January 2, 2024 from https://mausam.imd.gov.in/ahmedabad/mcdata/climate.pdf)

Wind

- In the winter season, during December and January, wind is mostly northerly to easterly. In February, wind is from north-westerly to easterly (p. 8). In the summer season, wind is mostly north-westerly in March and April, north-westerly to south westerly during May and mainly south-westerly in May (India Meteorological Department, 2022, p. 15). In the monsoon months of June, July, August and September, predominant wind direction is south-westerly.

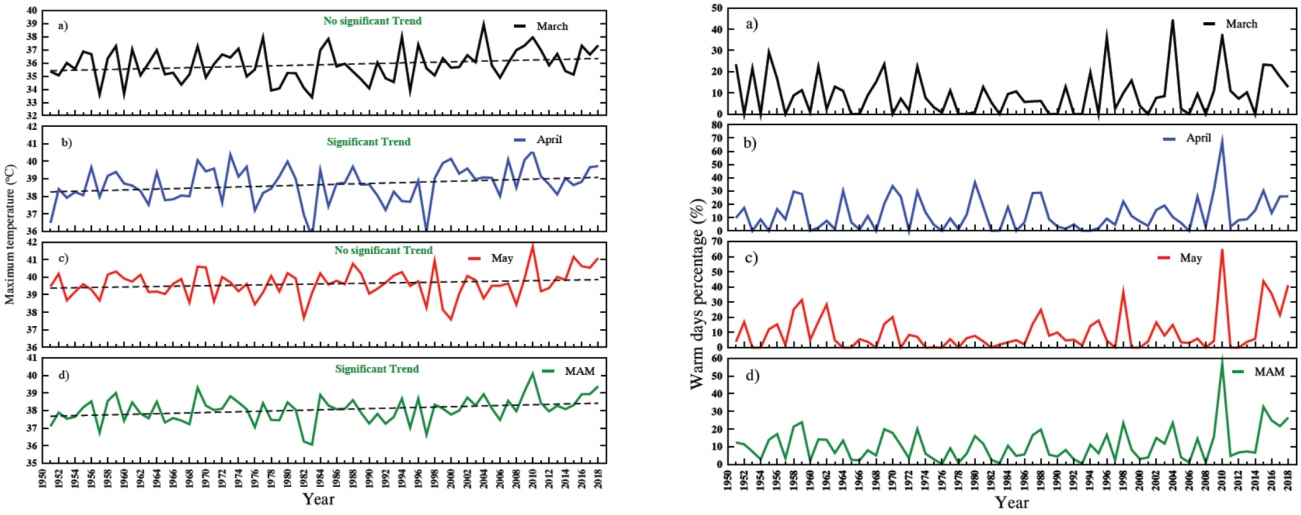
Thunderstorms

- Thunderstorms occur mostly during Monsoon season over Ahmedabad. The average number of thunderstorms is 4.8 in June, 7.1 in July, 5.1 in August and 5.8 for September during the years of 2010 to 2019.

Observed climate trends

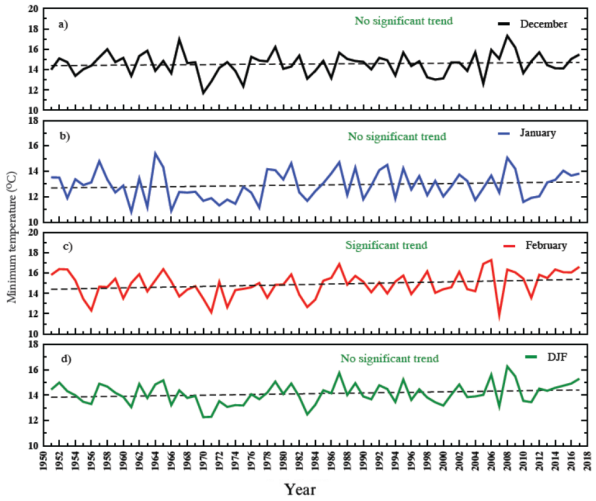
Temperature Variability

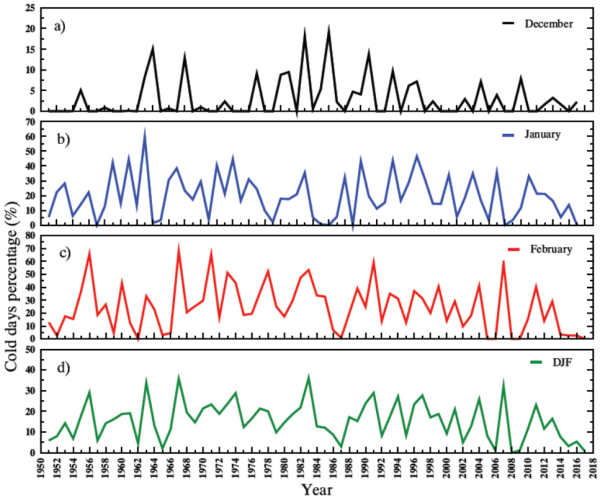
- The mean temperature in Ahmedabad district varies from 35°C to 40°C during the summer months of March, April and May, with May being the hottest. The maximum temperature in these summer months indicates an upward trend, which shows acceleration in the last decade. The mean percentage of warm days also shows an increasing trend, ranging from 8 to 10 percent from teh period between 1986 to 2005. (Vasudha Foundation, 2022, p. 6)



Inter-annual variability of maximum temperature (°C) over Ahmedabad for 1951-2018 &
Inter-annual variability of warm days over Ahmedabad for 1951-2018
(Source- Vasudha Foundation (2022). *Climate Change and Environment Action Plan of Ahmedabad District*. P. 13 & 14. Retrieved on January 2, 2024 from https://www.vasudha-foundation.org/wp-content/uploads/Full-Action-Plan-Ahmedabad.pdf)

In winter months of December, January and February, temperatures range from 12.1°C to 14.5°C with January being the coldest. The year-to-year variability of minimum temperature (figure) shows an increase in the mean minimum temperature during the last few decades. The mean percentage of cold days indicates a decreasing trend in recent decades. A steady warming trend in minimum as well as maximum temperatures of the district is also observed. (Vasudha Foundation, 2022, p. 7).



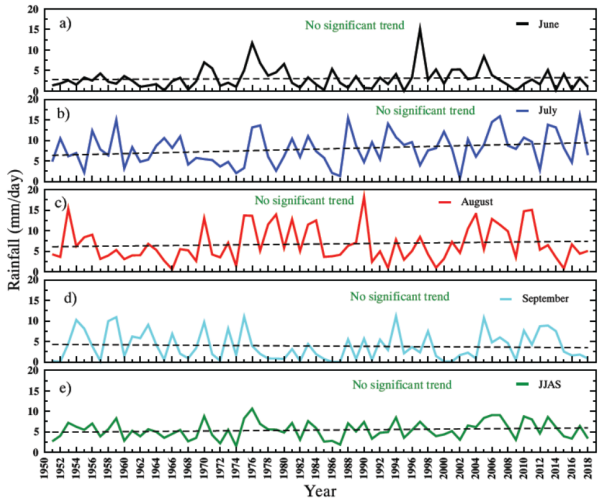


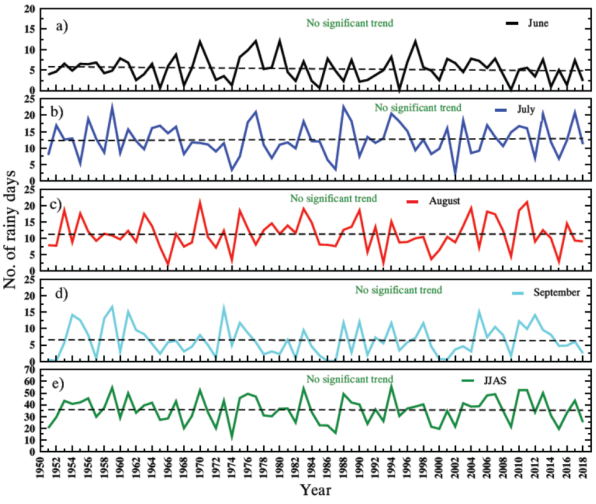
Inter-annual variability of minimum temperature (°C) over Ahmedabad for 1951-2018 &
Inter-annual variability of cold days over Ahmedabad for 1951-2018

(Source- Vasudha Foundation (2022). *Climate Change and Environment Action Plan of Ahmedabad District*. P. 14 & 15. Retrieved on January 2, 2024 from https://www.vasudha-foundation.org/wp-content/uploads/Full-Action-Plan-Ahmedabad.pdf)

Precipitation Variability

- The year-to-year rainfall variability during the monsoon season along with the seasonal mean for the period of 1951 to 2018 over Ahmedabad district (for area averaged) are depicted in the graph. There is no significant trend observed in either rainfall or rainy days during the period. However, the primary rainy months of July and August show higher variability in rainy days. (Vasudha Foundation, 2022, p. 7).





Inter-annual variability of rainfall (mm/day) over Ahmedabad for 1951-2018 &
Inter-annual variability of rainy days (days) over Ahmedabad for 1951-2018

(Source- Vasudha Foundation (2022). *Climate Change and Environment Action Plan of Ahmedabad District*. P. 12 & 13. Retrieved on January 2, 2024 from https://www.vasudha-foundation.org/wp-content/uploads/Full-Action-Plan-Ahmedabad.pdf)

Rising Wet Bulb Temperature/ Humidity

- In the webinar 'Climate Action, Built and Cultural Heritage in Indian Cities', Prof Rajan Rawal, based on research, indicated that in addition to rising heat and heat waves, the wet bulb temperature of Ahmedabad is nearing the threshold of human comfort.

Information on pollution, emissions and other drivers of climate change for the city and the heritage areas

The document 'Climate Change and Environment Action Plan of Ahmedabad District' (Vasudha Foundation, 2022, ii) mentions that the total Greenhouse Gas Emissions (GHG) for Ahmedabad district has risen by 78% between 2005 and 2019. The estimate indicates GHG emissions of 13 categories from 3 sectors, energy, AFOLU (agriculture, forestry and other land use) and waste. The energy sector (such as direct fuel consumption in transport, electricity generation, residential, etc.) contributes the highest to this estimate with about 77% of total emissions of Ahmedabad district. Of these, public electricity generation and transport are the maximum contributors towards energy emissions. This is followed by residential, captive power plants, agriculture and industries. Waste sector has witnessed the highest growth between 2005 and 2019, though it has the smallest contribution in economy-wide emissions. Total waste emissions have increased by 159.85% in this period. The document states that if no action is taken to mitigate these trends, the total emissions of Ahmedabad district indicate the probability of increasing by 96% till 2030 with respect to the baseline levels of 2015.

Information on extreme trends, events and predictions

The following climate projections are as per the 'Climate Change and Environment Action Plan of Ahmedabad District'. (Vasudha Foundation, 2022, p. ii)

Expected hotter summer months

- Ahmedabad district is witnessing a significant trend of increase in maximum temperatures during summer months, which has accelerated in the last decade. The mean percentage of warm days has witnessed an increasing trend of approximately 8 to 10 percent. Minimum temperatures have witnessed an increasing trend in the summer months, while cold days show a decreasing trend in the recent decade.

Expected increase in warm days

- Projections of maximum temperatures indicate an increase of about 1.2°C to 2.4°C under RCP 4.5 and 1.4°C to 3.5°C under RCP 8.5 emission scenarios. Percentage of warm days is projected to increase by over 45 percent of present climatic conditions. Minimum temperatures indicate an increasing trend wherein there may be a decrease in the percent of cold days in all epochs.

Note- Representative Concentration Pathways- RCP portray possible future greenhouse gas and aerosol emissions scenarios. RCP 8.5 is the highest baseline emissions scenario in which emissions continue to rise throughout the twenty-first century. Therefore, climate change is projected under RCP 8.5.

Years- 2030s (2021- 2040), 2050s (2041- 2060), 2070s (2061-2080), 2090s (2081-2100)

Temp. max (ºC)	Mar	Apr	May	MAM (average of Mar, Apr and May)
Observed	35.8	38.7	39.6	38
Simulated	35.4	39	40.8	38.4
RCP 4.5				
2030s	36.8	40.2	41.8	39.6
2050s	37.4	40.8	42.5	40.7
2070s	37.7	41.3	42.9	40.6
2090s	38.1	41.5	43	40.8
RCP 8.5				
2030s	36.9	40.3	42.1	39.8
2050s	37.9	41.3	42.8	40.9
2070s	39.2	42.3	43.9	41.8
2090s	40.2	43.6	44.9	42.9

Warm days (%)	Mar	Apr	May	MAM (average of Mar, Apr and May)
Observed	9	10	10	10
Simulated	10	10	9	10
RCP 4.5				
2030s	34	40	42	39
2050s	48	56	62	56
2070s	55	68	69	65
2090s	64	71	75	70
RCP 8.5				
2030s	39	85	52	42
2050s	60	69	75	68
2070s	80	87	91	86
2090s	90	95	97	93

Characteristics of simulated monthly and seasonal maximum temperature (°C) for Ahmedabad district (baseline and RCP 4.5 and RCP 8.5 emission scenarios) &
Characteristics of simulated monthly and seasonal warm days (%) with respect to baseline for Ahmedabad district (baseline and RCP 4.5 and RCP 8.5 emission scenarios

(Source- Vasudha Foundation (2022). *Climate Change and Environment Action Plan of Ahmedabad District*. P. 17 & 13. Retrieved on January 2, 2024 from https://www.vasudha-foundation.org/wp-content/uploads/Full-Action-Plan-Ahmedabad.pdf)

Temp. min (°C)	Dec	Jan	Feb	DJF (average of Dec, Jan and Feb)
Observed	14.5	12.9	14.9	14.1
Simulated	13.1	11.9	13.9	12.9
RCP 4.5				
2030s	14.4	13.2	15.1	14.2
2050s	15.2	13.9	15.8	14.9
2070s	15.7	14.5	16.3	15.5
2090s	15.8	14.7	16.5	15.6
RCP 8.5				
2030s	14.8	13.4	15.4	14.5
2050s	15.7	14.6	16.5	15.5
2070s	17.3	15.9	17.9	17.0
2090s	18.6	17.3	19.0	18.3

Cold days (%)	Dec	Jan	Feb	DJF (average of Dec, Jan and Feb)
Observed	4	22	24	16
Simulated	5	16	36	19
RCP 4.5				
2030s	1	2	17	7
2050s	0	2	11	14
2070s	0	1	7	3
2090s	0	1	5	2
RCP 8.5				
2030s	1	5	15	7
2050s	0	2	6	3
2070s	0	0	2	1
2090s	0	0	1	0

Characteristics of simulated monthly and seasonal minimum temperature (°C) for Ahmedabad district (baseline and RCP 4.5 and RCP 8.5 emission scenarios) &
Characteristics of simulated monthly and seasonal cold days (%) with respect to baseline for Ahmedabad district (baseline and RCP 4.5 and RCP 8.5 emission scenarios)

(Source- Vasudha Foundation (2022). *Climate Change and Environment Action Plan of Ahmedabad District*. P. 17 & 13. Retrieved on January 2, 2024 from https://www.vasudha-foundation.org/wp-content/uploads/Full-Action-Plan-Ahmedabad.pdf)

Expected increase in rainfall

- Seasonal rainfall in Ahmedabad district is projected to increase by 8 to 17 % under RCP 4.5 and 13 to 40 per cent under RCP 8.5 emission scenarios. The document also mentions that the number of rainy days is predicted to increase during monsoon, especially in July and August.

Rainfall (mm)	Jun	Jul	Aug	Sep	JJAS (average of Jun, Jul, Aug and Sep)
Observed	114	234	184	98	629
Simulated	74	224	178	124	602
RCP 4.5					
2030s	86	223	187	155	651
2050s	76	217	195	164	653
2070s	80	236	216	182	713
2090s	82	236	224	173	714
RCP 8.5					
2030s	88	231	216	146	682
2050s	83	242	232	177	734
2070s	85	275	224	183	767
2090s	90	262	274	220	852

Rainfall (mm)	Jun	Jul	Aug	Sep	JJAS (average of Jun, Jul, Aug and Sep)
Observed	5	12	10	6	33
Simulated	5	13	12	7	36
RCP 4.5					
2030s	6	13	12	7	38
2050s	5	12	12	8	37
2070s	5	13	12	8	38
2090s	5	13	12	8	38
RCP 8.5					
2030s	5	13	12	7	37
2050s	5	13	12	8	38
2070s	5	13	13	8	39
2090s	6	12	13	9	40

Observed (1986-2005), simulated (1986-2005) and projected mean monthly and seasonal rainfall (mm) for Ahmedabad district &
Observed (1986-2005), simulated (1986-2005) and projected mean monthly and seasonal rainy days (rainfall >2.5 mm) for Ahmedabad district

(Source- Vasudha Foundation (2022). *Climate Change and Environment Action Plan of Ahmedabad District*. P. 16 & 13. Retrieved on January 2, 2024 from https://www.vasudha-foundation.org/wp-content/uploads/Full-Action-Plan-Ahmedabad.pdf)

Heat Stress, Heat Wave and Urban Heat Island Effect

- Due to rapid climate change, urbanization and rapid effects of industrialization, Gujarat has been experiencing the effects of heat waves almost every year with high intensity and frequent episodes (GSDMA, 2020, p. 10). Ahmedabad experiences heat stress almost every year especially from the period between March to May which are the pre-monsoon summer months, when maximum temperatures average to 45°C (Vasudha Foundation, 2022, p.18). Heat stress leads to water stress and deteriorating water quality. Ahmedabad faced a severe heat wave period in May 2010 with peak temperatures of over 46°C causing a spike in all-cause illnesses and deaths (GSDMA, 2020, p. 10; AMC, 2019, p. 1). As per IPCC (2022, p.2) Sixth Assessment Report, Ahmedabad has a high risk evidence of urban heat island effect. All the direct and indirect climatic variables and possibilities of extreme weather events resulting from urban heat island effect and its impacts on urban heritage need to be studied.

Extreme Rain, Floods, Flash Floods, Urban Flooding

- The climate vulnerability index map and extreme event hotspot map in the report on 'Mapping India's Climate Vulnerability. A District Level Assessment' (Mohanty & Wadhwan, 2021, p. v, 3) indicate Ahmedabad to have high vulnerability to extreme hydro-met disasters of flood events and its compounded impacts. Rainfall over Gujarat experienced diversions from the actual yearly rainfall during the summer monsoon period of 2022, in turn creating flood-like situations over several regions in Gujarat, as it recorded 400 to 550 mm of rain in 24 hours (GIDM, 2022, p. 14). Ahmedabad was one of the districts amongst many others such as Chhota Udaipur, Tapi, Navsari, Narmada, Ahmedabad, Panchmahal, and Valsad districts, where flooding was reported (GIDM, 2022, p. 14). The long-term trends over Gujarat indicate crucial factors about temporal and spatial variability patterns of rainfall over Gujarat wherein heavy rainfall days are increasing and creating flood-like situations, at the same time, triggering an increase in dry days at an annual level (Ibid, p. 18). The conditions that Gujarat is facing now are indicators of extreme situations that may occur in the future. These climatic variabilities and their impacts on the historic city of Ahmedabad need to be studied in detail.

Drought

- In Gujarat, droughts have occurred regularly with longer periods of droughts affecting groundwater and river flows. (Vasudha Foundation, 2022, p. 19) The north Gujarat agro climatic zone, which includes the district of Ahmedabad, experiences a high frequency of extreme droughts. The climate vulnerability index map and extreme event hotspot map in the report on 'Mapping India's Climate Vulnerability. A District Level Assessment' (Mohanty & Wadhwan, 2021, p. v, 3) indicate Ahmedabad to have high vulnerability to extreme hydro-met disasters of drought and its compounded impacts. Trends in rainfall irregularities and dry spells resulting in drought-like situations and its impacts on the historic city of Ahmedabad need to be studied in detail.

Citing data from the Revenue Department and Urban Development Department, the document 'Climate Change and Environment Action Plan of Ahmedabad District' (Vasudha Foundation, 2022, p. 8) states that Ahmedabad district has 60 lakes, including Kankaria and Vastrapur lakes, of which seventeen lakes have been turned into eco-recreational spaces by AMC and AUDA. Most of the lakes however, have gone dry due to lack of maintenance. The document also mentions that with respect to groundwater availability and use, the majority of the district (72 %) can be categorised as semi-critical.

Collect information on organisational/ governance/ institutional responses to trends and events for mitigation (if any)

Management Planning Framework/ Process

Name of the Plan	Territorial Scope/ Scale/ Level of Intervention	Level of Approval and related details	Description	Key Issues/ Comments
Ahmedabad Heat Action Plan (HAP)	It is a framework for the implementation, coordination and evaluation of extreme heat response activities in Ahmedabad. The Plan's primary objective is to alert those populations most at risk of heat-related illness that extreme heat conditions either exist or are imminent, and to take appropriate precautions. The HAP also includes longer term measures, such as the Ahmedabad Cool Roofs Program.	Plan has been approved by government but is not a legal instrument	It guide to extreme heat planning in Ahmedabad and includes an early warning system for extreme heat. Key strategies of the plans are Building Public Awareness and Community Outreach, Initiating an Early Warning System and Inter-Agency Coordination, Capacity Building Among Health Care Professionals, Reducing Heat Exposure and Promoting Adaptive Measures. The AMC releases an updated version of the HAP periodically.	It is just an awareness plan and apart from the Cool Roofs Program, there no mitigation or adaptation measures has been prepared or suggested.
...	...	...	...	...

Base Reference- (AMC, 2019)

Note: If the data is not available or the recorded data are not recent or updated, the team have to generate new data generation such as, on ground/ primary data collection.

Annexure 7

Guide for 'Community Profile'

Interdependencies of the varied communities and the identified heritage

Type of interdependencies

Social Interdependencies

- Communities who have intricate social connections around heritage structures/ areas. These connections may include shared traditions, rituals, and memories associated with the heritage. These assets serve as focal points for community identity and cohesion, bringing people together and fostering a sense of belonging. Heritage sites can serve as spaces for social interaction, cultural exchange and education. It serves as a living repository of intergenerational knowledge, where elders pass down oral histories, cultural traditions and artisanal techniques to younger generations. Example- Local residents around the heritage site/ precincts, tenants, regular visitors, floating population in religious towns etc.

Economic Interdependencies

- Communities who generate revenue around heritage structures/ areas. Heritage sites often serve as tourist attractions and support local businesses. Traditional crafts/ practices associated also provide income-generating opportunities for local craft workers. Cultural events, religious practices, festivals and heritage celebrations play a significant role in driving economic activity within the heritage area. Example- craft workers, artisans, shop owners, vendors, migrant workers, seasonal residents, organisers, performers, etc. benefits the local economy.

Environmental Interdependencies

- Communities within a heritage area often share access to common natural resources such as water, land and forests. They rely on these resources for drinking water, agriculture, fishing and other livelihood activities. Communities may have traditional ecological knowledge, cultural practices, and spiritual connections to the land. To maintain the area's visual integrity, ecological balance and sense of place, local practices contribute to ecosystem services. Example- Communities who depend on or have an impact on the natural resources around heritage structures/ areas.

Identification of communities vulnerable to climate change

Conduct vulnerability assessments using methodologies determining indicators to quantitatively measure vulnerability of communities due to climate change. Assess vulnerability across multiple dimensions, including exposure, sensitivity, adaptive capacity and resilience. This is necessary to provide a holistic understanding of vulnerability. Recognize that vulnerability to climate change is often inter sectional, meaning it is influenced by the interaction of multiple social, economic and environmental factors. Consider how intersecting dimensions of vulnerability, such as gender, age, ethnicity and socioeconomic status, income levels, access to resources and services, demographic characteristics, cultural practices, traditional knowledge are dependent on natural resources for livelihoods that shape communities.

This data should be gathered from the people with different backgrounds, experiences, their nature of dependency and how it is affected. Example- The impact will vary between insiders (local residents, permanent shop owners, etc.) and outsiders (visitors, tourists, etc.) as per their dependency (Impact on dependency-

slow/ moderate/ immediate) and time duration in/ around heritage sites/ precincts are different. Such as, the climate change impact is cumulative increasing and therefore the residents are shifting/ moving out from heritage areas. Tourists also visit the site in particular months of the year, which affects the local economy. Loss of land, displacement of communities and degradation of sacred sites, due to climate change can disrupt cultural continuity and traditional ways of life. Furthermore, it is also important to observe how much time they take for any adaptation/ mitigation measures and any factors affecting this time period, such as, proper knowledge to take such measures, available resources, financial condition, etc.

Cultural resources, local knowledge and practices that could help in climate change mitigation

Example, Rajasthan region has a long tradition of building water harvesting structures such as 'Baoris' (Stepwells), 'Johads' (Small earthen dams) and 'Talabs' (Reservoirs). These structures help capture and store rainwater during the monsoon season, recharge the groundwater levels and provide a reliable source of water for drinking, agriculture and livestock during dry periods. This is indigenous knowledge of community cooperation and adaptation to the region's arid climate conditions. These traditional water harvesting structures are not only functional but also hold cultural significance for local communities. Reviving these traditional water harvesting techniques can help mitigate water scarcity and droughts exacerbated by climate change.

Information on known or observed community responses to trends and events for adaptation

Example 1

- This example is from Dr. Sanjay Chikermane's presentation in the webinar. Kath-kuni houses, are a vernacular housing typology commonly used in the Himalayan regions of Uttarakhand and Himachal Pradesh. Wood and stone are the primary building materials used for this building typology. Deodar is the preferred wood to be used for this structural system. The construction technique and structural system of the typology is known to be resilient to seismic action and also provides a long life to the building typology. However, this construction technique requires a large quantity of wood, continued use of which may lead to increase in deforestation. Deforestation is a significant driver of climate change. Dr. Chikermane presented IIT Roorkee's research and scientific analysis on a resource conscious adaptation of the structural system, that the new houses being built in the region as well as the houses requiring retrofitting for continued use can adapt to, for addressing the issue of excessive consumption of wood as a building resource. The reinterpretation of the structural system was done through designing details that ensured an approximately 25 to 30 % reduction in the quantity of wood used in the structural system.

Example 2

- This example is from Mr. Vishwanath Srikantaiah's presentation in the webinar. The region of Bangalore and its surrounding areas, a rich cultural landscape of interconnected tanks and wells. The tank ecosystem, rooted in traditional practices, involves catchments, dams and intricate social systems for water distribution. The water tanks lost their prominence because they were no longer needed for water. The river started supplying water to the urban areas along with the culture of constructing bore wells. Due to the high density of population in urban areas, there could be droughts followed by famine.

One of the ways in which currently Bangalore is reimagining itself is as a water and fertiliser factory. A set of more than 35 decentralised sewage treatment plants (existing and planned) are spread all across the city of Bangalore. These sewage treatment plants plan to eventually pump treated water to a distance of about 100 km to fill about 500 lakes in the surrounding drought prone, climate change affected districts of Kolar and Chikkaballapura. An example of this can be seen through a project with an existing network of lakes filled with treated wastewater in Bangalore rural. One of these lakes is next to Devanahalli fort. Water supply at present in Devanahalli town (population of about 40,000 people) is through about 120 bore wells which have gone to 1200 feet depth. Water is saline and non-potable, forcing people to rely on RO plants for drinking water. In this project, secondary treated domestic water from the sewage treatment plant is brought to the lake (Sihineeru Kere) and utilised for ground water recharge. Before utilisation of the lake, it was desilted. From the existing

open well, debris was cleaned and rejuvenated through the traditional community of well diggers. Metres were fixed to the well, a water treatment plant was set up, thereby integrating the shallow aquifer to the water supply system which is used for drinking purposes.

This system integrates the historic water management system of the lake, well and the community-held knowledge system of well digging and construction with modern technology. Water quality testing is done to ensure the quality of water is fit for drinking purposes as this is one of the first wastewater to drinking water projects of India. Bangalore's Water Supply and Sewerage Board, Biome Trust along with different community groups are agents of change in this project.

Annexure 8

Guide for Participatory Activity

Before designing the participatory activities it is essential to know that what social groups are involved in targeted actions (large/ small group of participants, residential/ commercial user group, minorities, indigenous communities, gender, age group, migrants, disadvantaged groups of citizens, officials, community representatives, organisation/ institute heads, etc.). Certain level of sensitivity must exist with each group and this needs to be taken into account while engaging.

Here are the aspects required to be considered for the participatory activities.

General considerations

- Understand the geographical and linguistic variance during the participatory activities. The activities should be conducted by the team, who is familiar with the context, rules and/ or restrictions of the place/ community, religion and/ or personal beliefs, social hierarchy, gender roles, familiar and comfortable languages for the participants, etc. of the participants group/ community.
- Consider undergoing cultural sensitivity training to enhance the team's awareness and understanding of diverse cultural perspectives and practices.
- Find a connection between groups that would normally not collaborate and create a safe space for sharing.
- Be respectful and non-judgmental in the approach.
- Aware of power dynamics that may exist between you as the researcher and the community members or participants. Create an environment where all voices are heard and valued equally.
- Understand the type of consent is required for particular activities. (Such as, oral, written, official, just from the community/ organisation's head or from all the participants, etc.) Consent should be clear and detailed with explanations of privacy and confidentiality.
- Throughout the process, be prepared to adjust the activities or strategy as needed.
- The activity should allow all stakeholders to take an active part in the process to the full extent possible, viewed as being credible and meaningful by the stakeholders from a variety of perspectives, relates to the local situation, useful in terms of presenting new possibilities for social action and it should increase empathy among participants to safeguard their shared heritage.
- Make different questionnaires for the different groups as all the factors, issues and impacts are not applicable for everyone. For example, residents, tourists, people who are economically dependent on heritage craft workers, shop owners, vendors, etc. are differently affected by the climate change impacts as their type and time period of engagement with the historic structure/ precinct is not identical. Such as, flooding may directly impact the livelihood of shopkeepers while it indirectly affects the residents as flooding may damage their houses.

Participation of minorities, indigenous and local communities

- Encouraging participatory collaborations is the most effective way to preserve the traditional knowledge and intangible heritage of indigenous and rural communities.
- Re-activate local knowledge that would otherwise be lost or engage indigenous people in projects located in their own territory.

Participation and gender

- Women are not a minority. Yet their presence in participatory activities often remained in the shadows. Therefore, recognise gender as a central component in the participatory approach.
- For example, heat waves are more likely to affect women compared with men because many women usually stay at home doing household chores while men go out and work. Staying in houses with limited air circulation, spending more time for indoor cooking put women at a greater risk of heat extremes. In some cases, women face cultural restrictions on wearing clothing that is suitable for extreme heat. Traditional clothing makes it harder for women to cope with extreme heat compared with men. Such issues are important to bring out while discussing. Women also have some basic solutions which they have used in day to day life to adapt to climate change. These kinds of smaller actions should be also considered.

The role of the arts in participatory approaches

- In order to expand the reach of participatory actions include the arts such as, theatre, street and public art and creative sessions in the participatory approaches.
- It illuminates the social function the arts can successfully perform in heritage projects, as catalysts of public interest. The arts are usefully deployed in a variety of initiatives, as strategic tools to enhance people's participation and involvement.
- For example, India has many crafts and performance arts of storytelling, such as, folk-theatre, street plays, Kavad, Tholu Bommalata- puppetry performance, Pattachittra, Cheriyal scroll paintings, Thangka storytelling art, Tholppavakkoothu leather puppet show, etc. These need to be used as an engaging tool by involving heritage professionals, researchers, curators, crafts workers and artists to prepare creative engagement activities and to spread awareness. Local form of art in the specific region is the most effective tool for participation.

Participation and digital platforms

- Digital technology is also instrumental in enabling people to act as skilled storytellers and curators, to share the knowledge, ideas, memories, personal stories/ experiences and other data among others.
- In addition to the promotion and dissemination of existing heritage knowledge to wider audiences, digital platforms also allow people to create their own shared heritage.
- For example, a digital platform can be created to gather data (in the form of write ups, audio or/ and video) on climate change impacts happening on/ in heritage structures/ precincts and the kind of mitigation/ adaptation measures are taken for the specific cases by the experts/ communities. These databases will help others to know the kind of actions which have been taken and if the issues are similar then one can follow the same/ similar mitigation/ adaptation measures or can evolve from that base solution. Features like chats, online meets can be added to such digital platforms where experts and communities can discuss the issues and ideas.

Participatory framework

1. Type of Participatory Approach

- Workshop, Individual/ group/ focus group discussion/ interviews, common field activity, joint visit to heritage site, etc.

2. Day and Date

3. Location

4. General Description of the Participatory Approach

5. Describe the key themes with special regard to built/ cultural heritage impacted because of climate change that relate specifically to the local context.

6. Organiser(s)

- List all associates, institutions/ organisations, networks who are part of these activities.

7. Ethical Considerations

- Type of Consents, Confidentiality, Ethics and Legal Frameworks.

8. Number of Participants

9. Age Groups

- 10 to 17, 18 to 30, 31 to 45, 45 to 60, 61 to 75, 76 & up

10. Gender

- Male/ Female/ Other

11. Affiliation

- Are they affiliated to an institution, network or social organisation?
- What are the roles of the participants in the community?

12. Type of Participation

- Top-Down (authority- traditional cultural heritage institution, releases power and empowers various social actors) and/ or Bottom-Up (communities start initiatives, responsibilities are shared, and decisions are taken by communities rather than by individuals) Approach.

13. Relationship with Local, Regional, National Authorities

- How do the participants relate to the local, regional, national authorities?
- Are the authorities cooperative, supportive, passive, adverse, etc.?

14. Relationship with NGOs and the Private Sector related to Built and Cultural Heritage, Climate Action

- Have NGOs and/or private companies promoted/ participated in these activities?

15. Stakeholders' Capacities, Influence, Importance and Power Relationships

- Identify any dominant group that has used participation as a means to forward their own interest?
- Classify stakeholders according to their influence?
- Do all participants have the same base knowledge about built/ cultural heritage and climate change? If not, categories their opinion/ feedback accordingly or first create a common understanding.

16. Targets, Objectives, Estimated Results

- What are the targets, objectives and estimated results of these activities?

17. Methods and Techniques

- Please describe the participatory methods to be used. Such as, discussions, questionnaires, group works, collaborative mapping, co-creative sessions, co-management, role-playing, storytelling, games inclusion of any art form like theatre, etc.

18. Issues

- Have the participants identified the cause and issues occurred because of climate change? What are these?

19. Impacts

- Discuss details about estimated, measurable, unmeasurable short- and long-term impacts of climate change

20. Initiatives

- Any initiatives have been taken in the past for mitigation and adaptation measures? If yes, what were those and are these measures applicable in the current scenario or how that can be used further.

21. Outcome

22. Identified any difficulties and good solutions in the course of the local encounter?

Base Reference- (Forbes, N., Colella, S., 2019)

Annexure 9

Samples of Best Practices, Tools and Methods for Climate Impact Assessment & Socio-economic Vulnerability

Guidelines for Climate Impact Assessment

Climate Impact Assessment Guidelines is a tool for assessment of impact of climate on heritage and communities which are dependent on the heritage of a place and are likely to be impacted due to impact of climate change on heritage. This assessment is foundational to develop strategies for mitigation, adaptation and planned losses for heritage and communities, a critical step towards the ethical outcome of climate justice.

Following are the guidelines to assess the impacts on heritage.

- An outline description of the climate stressors, climate change stresses/ drivers/ hydro-met hazards hence providing detailed information available at the time of assessment.
- Description of any sub hazards resulting from the primary hazard or any extreme events which act as or could act as risk multipliers.
- Correlate climate change impacts on built and cultural heritage. (See the reference tables given for the increased temperature, climate influenced wildfires, less precipitation/ drought, increased precipitation and more intense rainfall events, intensified storms- including hurricanes & cyclones and storm surge, rising water table, pollution as secondary stressor, risks from climate mitigation and adaptation actions and strategies as secondary stressor)
- A comprehensive text description of individual and/ or groups of heritage assets/ attributes and their values. Identify its significance on the basis of high, medium and low level.
- A summary of the impact of climate stressors on heritage assets/ attributes, their present condition as per the site inspection. Provide description of how the elements/ assets are impacted and its effect on the whole site.
- Categorise the impacts into: Direct/ Indirect, Temporary/ Permanent; Reversible/ Irreversible; Physical/ Social/ Cultural/ Economic, etc. (there can be others)
- Cumulative or Catastrophic effect of climate stressor should also be considered, separately as this nature of impact determines the rate of decay and hence strategy of response.
- A clear conclusion on evaluation of impact, which concludes the significance of the impacts/ predicted impacts of the climate stressors.
- Based upon the scale and severity of change (No Change/ Negligible Change/ Minor Change/ Moderate Change/ Major Change) with Significance of Heritage assets/ attributes (High/ Medium/ Low) evaluate the risk rating (Neutral/ Slight/ Moderate, Large/ Very Large).
- Impact assessment should provide the rationale and evidence on decisions taken in a clear, transparent and practicable way. (Evidence in the form of a detailed inventory of attributes of values and other heritage assets, impacts, survey or scientific studies, illustrations, photographs, etc.)

Climate change stressors	Climate change stresses/ drivers/ hydro-met hazards	Sub hazards/ Risk multipliers (e.g. earthquake prone area)	Heritage site (Moveable Heritage- Including Museums & Collections, Archaeological Resources, Buildings & Structures, Cultural Landscapes- Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens, Associated & Traditional Communities, Intangible Cultural Heritage)	Attributes/ assets of the site	Key values	Significance (High, Medium, Low)

Heritage attributes/ assets of the site affected	Impact because of climate stressor on Heritage attributes/ assets	Category of impact (Direct/ Indirect; Temporary/ Permanent; Reversible/ Irreversible; Physical/ Social/ Cultural/ Economic; Cumulative/ Catastrophic)- Can be multiple	Scale and severity of change (No Change/ Negligible Change/ Minor Change/ Moderate Change/ Major Change)	Risk Rating (Neutral/ Slight/ Moderate/ Large/ very Large)

Risk Rating

Significance of Heritage Assets/ Attributes	Scale and Severity of Change				
	No Change	Negligible Change	Minor Change	Moderate Change	Major Change
High	Neutral	Slight	Slight/ Moderate	Moderate/ Large	Large/ Very Large
Medium	Neutral	Neutral/ Slight	Slight	Slight/ Moderate	Moderate/ Large
Low	Neutral	Neutral	Neutral/ Slight	Slight	Slight/ Moderate

Risk Rating

High	Assets that contribute significantly to the values, Strong association
Medium	Assets that support the values, Moderate association
Low	Assets of limited value, but with potential to contribute, Limited association

Guide for assessing magnitude of impact

Scale and severity of change	**Moveable Heritage** (Including Museums & Collections) **Archaeological Resources**	**Buildings & Structures**	**Cultural Landscapes** (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)	**Associated & Traditional Communities Intangible Cultural Heritage**
No Change	No change.	No change to fabric or setting.	No physical changes in natural elements.	No change.
Negligible change	Very minor changes to key archaeological materials, artefacts or setting.	Slight changes to historic building elements or setting that hardly affect it.	Very minor changes to key historic landscape elements; very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.	Very minor changes to area that affect the intangible cultural heritage activities or associations or visual links and cultural appreciation.
Minor change	Changes to key Archaeological materials or artefacts such that the resource is slightly altered. Slight changes to setting.	Change to key historic building elements, such that the asset is slightly different. Change to setting of an historic building, such that it is noticeably changed.	Change to few key historic landscape elements; limited changes to noise levels or sound quality; slight changes to use or access; resulting in limited change to historic landscape character.	Changes to area that affect the intangible cultural heritage activities or associations or visual links and cultural appreciation.
Moderate change	Changes to many key archaeological Materials or artefacts, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.	Changes to many key historic building elements, such that the resource is significantly modified. Changes to the setting of an historic building, such that it is significantly modified.	Change to many key historic landscape elements; visual change to many key aspects of the historic landscape; noticeable differences in noise or sound quality; considerable changes to use or access; resulting in moderate changes to historic landscape character.	Considerable changes to area that affect the intangible cultural heritage activities or associations or visual links and cultural appreciation.

Major change	Changes to attributes that convey the important value of properties. Most or all key Archaeological materials or artefacts, such that the resource is totally altered. Comprehensive changes to setting.	Changes to attributes that convey the important value of properties. Change to key historic building elements that are totally altered. Comprehensive changes to the setting.	Change to most or all key historic landscape Elements; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character.	Major changes to area that affect the intangible cultural heritage activities or associations or visual links and cultural appreciation.

Base Reference- (ICOMOS, 2011)

Example of Pol houses of Ahmedabad- Impact because of increase in temperature

Pol houses are one of the significant cultural heritage resources in the World Heritage city of Ahmedabad (inscribed to the UNESCO list in 2017).

Ahmedabad is witnessing a rise in temperatures which is increasing the frequency and severity of heat waves. After the devastating 2010 heat wave with 1344 deaths, in the year 2013, Ahmedabad Municipal Corporation (AMC) prepared the first Heat Action Plan (HAP). The objective of the plan was to alert populations at risk of experiencing extreme heat conditions which either exist or are imminent and to take appropriate precautions. The Action Plan is to guide planning in response to extreme heat in Ahmedabad and includes an early warning system . Further, it provides a framework for the implementation, coordination and evaluation of extreme heat response activities in the city.

Base Reference- (AMC, 2019)

Increase in temperature poses a risk to the structural integrity and contributes to the damage and degradation of historic structures, with potential economic and social impact. High temperatures can also cause risk of fire. Neglect and absence of regular maintenance of the pol houses poses a risk of loss of the built heritage e g. Altered physical characteristics with additional modern interventions to adapt the building to temperature change in absence of determining the attributes of value of the buildings can cause loss of integrity and authenticity of the built fabric and further induce decay. Additionally, there are multiple owners of the pol houses, which creates conditions for inadequate actions for restoration, periodic maintenance of these buildings, any mitigation and adaptation efforts.

The existing policy guidelines and financial tools provided by the Ahmedabad Municipal Corporation for conservation of the graded buildings in the old city of Ahmedabad are inadequate for rehabilitation and repurposing of graded buildings to address changes in temperature responsive to the architectural significance of the buildings.

Climate change stressors	Climate change stresses/ drivers/ hydro-met hazards	Sub hazards/ Risk multipliers (e.g. earthquake prone area)	Heritage site Resources, Buildings & Structures	Attributes/ assets of the site	Key values	Significance (High, Medium, Low)
Increase in temperature	Heat waves, Heat island effect	Ahmedabad is in the earthquake Zone 3	Pol houses of Walled city of Ahmedabad	House form of domestic architecture	Historic, Architectural, Existential, Use	High
				Timber-based structure, carvings and decorative elements	Historic, Architectural (Structural, Aesthetic)	High
...	...	...	...	...	...	...

Heritage attributes/ assets of the site affected	Impact because of climate stressor on Heritage attributes/ assets	Category of impact (Direct/ Indirect;, Temporary/ Permanent; Reversible/ Irreversible; Physical/ Social/ Cultural/ Economic; Cumulative/ Catastrophic)- Can be multiple	Scale and severity of change (No Change/ Negligible Change/ Minor Change/ Moderate Change/, Major Change)	Risk Rating (Neutral/ Slight/ Moderate/ Large/ very Large)
Timber of the Pol houses	Structural deterioration or degradation (Decay in timber beams, etc.)	Direct, Permanent, Irreversible, Physical, Cumulative	Moderate Change	Moderate/ Large
	Degradation of carvings and loss decorative elements	Direct, Permanent, Irreversible, Physical, Cumulative	Moderate Change	Moderate
	Increased risk of insect pests damaging building fabric utility infrastructure	Direct, Permanent, Irreversible, Physical, Cumulative	Minor Change	Slight
	Decay in timber roof causes water leakages	Direct, Permanent, Irreversible, Physical, Cumulative	Moderate Change	Moderate
	Change in roofing material (From timber to asbestos/ aluminium/ plastic sheets	Direct, Reversible, Physical	Moderate Change	Large
Traditional house form	Change in dwelling characteristics that would differ from the traditional ones	Direct, Permanent, Reversible, Physical	Moderate Change	Moderate
	Increased demand for complex air conditioning systems that can add stress to the building envelope	Direct, Permanent, Reversible	Major Change	Large

Traditional house form	Air conditioning systems requires significant alterations to a structure (including insulation, outdoor units and pipes, sealing of windows) change external and internal appearance	Direct, Permanent, Reversible, Physical	Major Change	Large
	Collapse of the structure due to overloading of the structure (Because of change in materials and function of the spaces)	Direct, Permanent, Irreversible, Physical	Major Change	Very Large
...	...	...	...	...

Risk Rating

Significance of Heritage Assets/ Attributes	Scale and Severity of Change				
	No Change	**Negligible Change**	**Minor Change**	**Moderate Change**	**Major Change**
High	...	...	Eg. Loss of timber elements due to increased risk of insect pests due to change in environmental factors of the house. ...	Eg. Loss of Structural integrity due to degradation of decorative elements and further replaced by elements of other materials and details ...	Eg. Altered form of the house due to changes in the form and spatial characteristics of the building to adapt for installation of AC systems/ or other cooling systems Overloading of the structure due to changes in the form ...
Medium	...	...	...	...	...
Low	...	...	...	...	...

Guidelines for Climate Impact Assessment

Determine the Community Vulnerability Index (Community Vulnerability- based on the economic, social and cultural dependencies upon the built heritage or/and cultural heritage)

The local population (such as, craft workers, shop owners, vendors, tourist guides, etc.) can be dependent on built or/ and cultural heritage - for livelihood. Loss of heritage can lead to migration due to impact on public health, livelihood activities and quality of social life. This can be on account of change in cultural values of a place, loss of traditional knowledge, customs and beliefs, food and nutrition, health, water (loss or excessive in the case of flooding, etc.) , loss in shelter, education and personal safety (due to deterioration of built fabric).

Guideline to extract the data on communities impacted and how they are impacted: (These can quantified,

qualitative, primary, secondary, based on surveys and consultations)

- Climatic occurrences experienced by the community that captures climate variability and extremes over the years.
- Effect of climate change on daily routine during any particular season or through the year to be captured spatially, with sensors and interviews of the occupants/ stakeholders. (Study of gender-specific roles and responsibilities also and how that is affected by climate change indoors/ outdoors.)
- Any alterations/ changes in the tasks/activities/ uses in recent years, link the data capture with climate variability.
- Tasks/ activities / uses that take more time or less time due to climate variability.
- The impacts of these hazards on the socio-economic well-being of local communities. (Such as, housing, income, food, education, health, availability of water)
- Identify and document different groups and their livelihood affected by climate variability and extremes. (Such as, agriculture, fisheries, tourism, manufacturing, vendors, etc.)
- Identify and document any cultural practices/ rituals/ traditions that have been affected because of climate change impacts.
- Identify and document socio cultural events in the communities. It enables analysis of hazard trends and any effect seen on the community.
- Identify important livelihood activities through the year for a complete calendar year and determine seasonal changes observed by communities due to climate change.
- Determine impact on the quality of life due to any changes because of direct and / or indirect impact of climate change.
- Determine dependency of Individual/ groups / communities direct/ indirectly on the heritage assets, if yes then how. (Based on 2.4.1)
- Techno financial capacity: Determine and document in detail the economic and technological capacity of the community to do mitigation and adaptation measures (with the use of indigenous knowledge/ traditional practice/ collective action).
- Determine access to legal and regulatory knowledge available to the individuals/ groups/ communities. Determine if the community is able to easily contact the urban local body or other related authorities to get access to related information Determine current capacity of the local communities on matters of mitigation and adaptation activities.
- Assess the kind of guidance/ assistance the community requires to undertake necessary actions related to the effect of climate change.
- Existing social norms and functioning for determining risks and vulnerabilities and way forward for climate action. Are the marginalised groups including women, youth and elderly included in the decision making processes.

Climate Parameters	**Climate Change Risk**	**Who are impacted** (Individual/ Group/ Community)	**How are they impacted** (Economically, Socially, Culturally)	**Vulnerability level** (High/ Medium/ Low)			**Any initiative taken**	**Resilience capacity- if any** (Anticipatory, Absorptive, Adaptive, Transformative, None)
				Economic	**Social**	**Cultural**		

Consider how factors such as age, gender, disability, locality, social units, occupation, ethnicity and other dimensions affect the vulnerability differently.

Resilience Capacities

Anticipatory Capacity
- People to foresee risks and prepare for hazards, therefore reducing the impacts

Absorptive Capacity:
- People absorb/ respond to shocks with minimum impact on their lives and livelihoods

Adaptive Capacity:
- People's capacity to adjust to changing conditions and evolving risks

Transformative Capacity:
- Promotes systemic changes to create an enabling environment for community adaptation and resilience building

Base Reference- (CARE Climate Change and Resilience Platform- CCRP, 2019)

Example

Heat island effect in the historic areas discourages tourist visitations and hence adversely impacts tourism-related livelihoods. People have a change in their working hours due to heat stress, along with the loss of income due to heat-associated illness and leaves. Vulnerability for particularly women, children and elderly is high within the houses because of factors of poor ventilation, congestion and building material used and all trap heat and can cause heat strokes. It also led to migration (Seasonal/ permanent) of the people. Also, changes in temperature causes change in social events causing cancellation/ modification of cultural activities, practices and rituals.

Evaluate the vulnerability of the heritage structures and precincts to climate change impacts.

Heritage Sites	**Component of Vulnerability**		
	Exposure (People, livelihood, assets, etc. that could be adversely affected)- High/ Medium/ Low	**Sensitivity** (The degree to which a system is affected)- High/ Medium/ Low	**Adaptive Capacity** (The ability of a system to adjust to climate change or to cope with the consequences)- High/ Medium/ Low

High: (0.41-1)
Medium: (0.21-0.40)
Low: (0.00-0.20)
For cities see the map in compendium, Map of India Showing Climate Vulnerability Index Zones Page No. 9

Vulnerability= Exposure (E) x Sensitivity (S) / Adaptive Capacity (AC)

Base Reference- Mohanty, A., Wadhawan, S. (2021)

Definitions

Exposure

- Exposure is the presence of people, livelihoods, species or ecosystems, environmental functions, services, resources, infrastructure, or economic, social or cultural assets in places and settings that could be adversely affected. (IPCC, 2014)

Sensitivity

- Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise). (IPCC, 2001)

Adaptive capacity

- Adaptive capacity is the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. (IPCC, 2001)

Base Reference- (Mohanty, A., Wadhawan, S., 2021), (IPCC. 2014). (IPCC, 2001)

Reference tables- Correlate Climate Change Impacts to Build and Cultural Heritage

- Increased Temperature
- Climate Influenced Wildfires
- Less Precipitation/ Drought
- Increased Precipitation and more intense Rainfall Events
- Intensified Storms, (Including Hurricanes & Cyclones) and Storm Surge
- Rising Water Table
- Pollution (Secondary Stressor)
- Risks from climate mitigation actions Mitigation & Adaptation Strategies (Secondary Stressor)

Base reference- (Climate Change and Heritage Working Group of ICOMOS, 2019)

Increased Temperature

Moveable Heritage (Including Museums & Collections)

Facilities

- Increased stress on HVAC systems in storage facilities
- Increased space constraints due to more items requiring protection in storage facilities
- Increased need for environmental controls in facilities/ house collections
- Increased insect pest problems
- Collections (Without appropriate climate controls)
- Increased rate of chemical decay
- Increased stress due to fluctuations in environmental conditions

Archaeological Resources (Including Underwater Archaeology)

- Micro-cracking of site contexts from thermal stress
- Faster deterioration of newly exposed artefacts and sites
- More rapid decay of organic materials below and above ground
- Damage from increased biological activity at shallow (~<100m) underwater sites
- Increased risk of damage due to decline/ loss of protective sea grass or nearby coral reefs
- Increased tree and vegetation growth with associated root or other damage

Buildings & Structures

- Structural deterioration or degradation
- Increased crystallization of efflorescent salts due to increased evaporation rates, leading to increased rates of structural cracking and deterioration
- Change in dwelling characteristics that would differ from the traditional ones
- Increased risk of fire
- Increased risk of insect pests damaging building fabric utility infrastructure
- Increased demand for complex air conditioning systems that can add stress to the building envelope and often requires significant alterations to a structure (including insulation, routing of extensive ducts and pipes, etc.). (NB. Increased demand for cooling systems increases energy demand and potentially increases CO_2 emissions)
- Inadequacy of current guidelines for rehabilitation of monuments for addressing temperature changes
- Increase of A/C equipment on buildings resulting in changed external appearance

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

- Heat stress on culturally significant plants
- Changes in the capacity to grow traditional crop varieties
- Loss of specimen plantings in designed landscapes, parks and gardens
- Change of behaviour in using public spaces, parks and gardens, housing and facilities due to heat waves
- Change hours of visitation (seasonal shift, daily shift)

Associated & Traditional Communities

- Loss of food security leading to increased migration
- Increased heat leading to decreased agricultural and economic productivity
- Increased impacts of heat leading to migration to more temperate areas
- Increased impacts of heat leading to loss of population (death) and weakening of health
- Increased stress, loss of population leading to fewer resources to expend on maintaining cultural resources
- Disrupt tourism activities/ regular outdoor selling activities, leading to economic losses and affecting community livelihoods

Intangible Cultural Heritage

- Loss of ecosystem for the support of culturally significant species
- Potential loss of culturally significant species due to increased disease threat, or loss of local climatic range
- Changes in prevalence of culturally relevant plant
- Cancellation of traditional cultural activities, practices and rituals
- Inability to engage in traditional practices to store food frozen communities
- Altered place meaning due to loss of significant vegetation such as heritage trees, spatial definition due to loss of tree stands, etc.
- Impediment to the development or practice of traditions (e.g. wearing traditional costumes, performing dances, etc.)
- Migration resulting in lost, altered or forgotten cultural practices

Climate Influenced Wildfires

Moveable Heritage (Including Museums & Collections)

Facilities

- Damage to storage facilities
- Increased strain on existing museum facility and staff due to increased advance preparation
- Smoke damage, strain on HVAC systems
- Risk to staff health
- Loss of collections and records to fire
- Smoke damage
- Damage from water or fire retardant

Archaeological Resources (Including Underwater Archaeology)

During Fire

- Damage or destruction of associated structure
- Heat alteration of artefacts
- Heat fracturing of stone artefacts
- Discoloration, exfoliation, spalling, and smudging of culturally significant rock images
- Paint oxidation, colour change
- Decreased accuracy of carbon-14 dating due to carbon contamination
- Burning tree roots damaging below-ground structures and artefacts

Post-Fire

- Soil toxicity and chemical changes (e.g. ash) impacting subsurface resources

Buildings & Structures

During Fire

- Damage or loss of whole structures or combustible components
- Damage to building component materials and contents (e.g. roof, mortar, windows, doors, glass, furniture)
- Cracking, physical damage of masonry components from extreme thermal stress
- Discoloration caused by smoke and/ or heat
- Damage from fire-killed tree fall
- Damage to structure and/ or associated cultural landscape from fire retardants
- Damage from water for suppression, fire retardants

Post-Fire

- Buildings may shift or settle due to associated erosion
- Pressure to change character-defining features such as wood shake roofing to fire resistant alternatives

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

During Fire
- Damage to structure and/ or associated cultural landscape from fire retardants
- Loss or damage of associated structures
- Loss of towns, neighbourhoods, parks and gardens

Post-Fire
- Change in vegetation density and composition
- Increased susceptibility to erosion and flooding
- Loss of soil fertility due to high heat

Associated & Traditional Communities

During Fire
- Loss of life leading to lowered population and reduced community resources dedicated to maintenance of cultural resources
- Increased particulates in the air lead to higher incidence of respiratory illness and death
- Displacement and dispersion of communities

Post-Fire
- Loss of food security
- Short-term loss and/ or long-term impairment of water and air quality, including soil erosion, ash and smoke contamination
- Post-fire social and psychological impact on humans

Intangible Cultural Heritage

Local Knowledge, Practices and Rituals
- Loss of sacred groves and culturally important plants such as food and medicinal plants
- Loss of Culturally Significant species due to decreased soil fertility from high heat and ash/ soil toxicity leading to changes in traditional practices and rituals
- Change in traditional food systems

Place Attachment / Sense of Place
- Significant alteration of landscape features critical for navigating during foraging, hunting or other necessary movements
- Loss of local knowledge due to change/ loss of culturally significant resources

Less Precipitation/ Drought

Moveable Heritage (Including Museums & Collections)

Facilities
- Limited water supply for cooling, landscaping

Collections (Without appropriate climate controls)
- Damage to wooden, paper, textile and organic objects from drying due to increased water loss from materials

Archaeological Resources (Including Underwater Archaeology)

- Loss of stratigraphic integrity due to crack/ heave damage in drier soils
- Destabilization of wetland or water logged sites
- Increased decay of organic materials
- Possible damage to foundations on wooden pilings

Buildings & Structures

- Increase in dry salt deposits near masonry and porous stone causing cracks
- Cracking and splitting of wooden/ organic features due to complete drying
- Loss of water supply for water dependent buildings and traditional water management systems
- Changes in growth, properties and performance of timber used for building and maintenance

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

- Limited water supply inhibits established maintenance practices
- Increased soil erosion
- Challenges to current irrigation practices
- Drought stress on trees and landscape appearance
- Loss of specimen plantings in designed landscapes, parks and gardens
- Increased risk of fire

Associated & Traditional Communities

- Limitation on travel due to loss of water sources
- Stress of food and water insecurity leading to higher levels of illness and disease
- Increased sand storms leading to higher incidence of respiratory illness and death
- Loss of Livelihood due to loss of crop or livestock
- Disrupt tourism activities, leading to economic losses and affecting community livelihoods

Intangible Cultural Heritage

Culturally Relevant Species

- Stress on culturally significant species impacts traditional subsistence practices

Local Knowledge, Practices and Rituals

- Indirect effects on ceremonial cycles and religious practices involving weather control
- Loss of traditional sources of water for drinking, medicine, ceremony, etc.
- Loss of local languages/ words specific to elements and interactions in the natural and cultural environments
- Drought damage to streams, rivers and lakes may be tied to loss of indigenous sacredness and/ or impact a sentient personhood of waterways

Increased Precipitation and more intense Rainfall Events

Moveable Heritage (Including Museums & Collections)

Facilities

- Potential leaks in collection storage areas and potential wetting of museum objects
- Basements or underground storage sites at increased risk of flooding
- Increased rusting/ corrosion of metals
- Humidity damage to paintings
- Warping and cracking damage to wood
- Humidity damage to archival, paper, book and photo collections

Archaeological Resources (Including Underwater Archaeology)

- Site erosion from overflow and new Flood channels
- Soil destabilization/ shifting
- Damage to unexcavated artefact and site integrity from direct force of water
- Increasing risk of underwater site degradation

Buildings & Structures

- ASwelling/ distortion of wooden building materials and architecture features due to wetness and damp
- Increased risk of rot and fungal/ insect attack
- Historic building drainage systems unable to cope with downpours
- Erosion of supporting ground around structure
- Dampness rise in the building
- Damage to roofs, windows and decorative elements
- Overflowing gutters and drains back- flowing into buildings, leaking roofs and chimneys
- Accelerated decay of masonry units, mortars and plasters due to increased extremes of wetting and drying
- Destabilization of buildings and sometime collapse of the building
- Severe damage and loss of historic structures made of adobe and other earthen structures
- Change in rainfall patterns could affect cyclical traditions of maintaining earth buildings
- Spalling, weathering of wood, brick and stone materials due to salt infiltration during drying
- Increased pressure to relocate or elevate structures, and/ or surrounding structures
- Landslides causing loss of buildings on slopes or burial and damage of structures under rocks, mud and debris

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

- Increased tree-fall due to water logging
- Limited ability to plant in water logged soil
- Loss of historical Integrity with improved drainage systems
- Decreased soil fertility from erosion, water logging
- Loss of landscape features
- Disruption or delay of traditional maintenance practices
- Loss of various types of towns, especially those built in earthen materials
- Decline/ disappearance/ loss of specimen plantings in designed landscapes, parks and gardens

Associated & Traditional Communities

- Loss of life, homes and critical infrastructure
- Displacement of inhabitants and communities
- Altered harvest times
- Creates unhealthy environment
- Disrupt tourism activities, leading to economic losses and affecting community livelihoods

Intangible Cultural Heritage

Local Knowledge, Practices and Rituals

- Indirect impacts to ceremonial cycles and religious practices involving weather control
- Delays in planting cycles, shifting whole agricultural calendar
- Impact on participative activities such as festivals
- Loss of traditional language/ words specific to elements and interactions in the natural and cultural environments

Intensified Storms, (Including Hurricanes & Cyclones) and Storm Surge

Moveable Heritage (Including Museums & Collections)

Facilities

- Structural collapse from moving force of storm surge
- Changes to surrounding landforms or vegetation, which may affect future drainage

Collections

- Damage to items and disassociation of materials and records during emergency evacuations
- Risk of rot, fungal/ insect attack, mould and mildew
- Rusting/ corrosion of metals

Archaeological Resources (Including Underwater Archaeology)

During Surge

- Destruction - total site loss
- Erosion of coastal sites due to higher, stronger storm surges
- Erosion from wave action
- Disturbance/ exposure/ burial due to stronger wave action

After Surge

- Disturbance or removal during response and clean- up

Buildings & Structures

During Surge

- Structural damage or collapse from moving force of storm surge
- Damage to infrastructure including access roads, utilities, generators, electrical systems and sewage treatment plants

Post-Surge

- Destabilization of buildings and pipes due
- Erosion of supporting ground around structures
- Changes to surrounding landforms, which may affect future drainage
- Increased pressure to relocate or elevate structures, and/ or surrounding structures
- Water damage to building materials including wood, adobe, plaster, brick, etc.

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

During Surge

- Immediate alteration/ destruction of historic landscape
- Soil infertility from soil erosion
- Loss of landscape features
- Decline/ disappearance/ loss of specimen plantings in designed landscapes, parks and gardens

Associated & Traditional Communities

During surge

- Displacement of people and livestock
- Pollution from overflow of waste water, sewage, etc.
- Salt contamination of water supplies
- Flooding of roads, railways and airports- Impact on tourism and livelihood of the locals
- Failure of critical infrastructure including electricity supply and communications networks
- Disrupt tourism activities, leading to economic losses and affecting community livelihoods

Post-Surge

- Abandonment of communities and agricultural lands

Intangible Cultural Heritage

- Loss of local knowledge associated with natural and cultural resources
- Changed relationships with places lost, damaged or re- shaped

Rising Water Table

Moveable Heritage (Including Museums & Collections)

Facilities
- Potential for higher water vapour in air surrounding collections in storage areas
- Increased risk of rising damp

Collections
- Damage to statuary (from capillary action and rising damp), organic materials, etc. in basements

Archaeological Resources (Including Underwater Archaeology)

- Damage to artefacts, stratigraphy, soil features from saturation of sitefrom below

Buildings & Structures

- Rising damp, often marked by efflorescence/ salt deposits
- Flooding damage in basements

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

- Decline/ disappearance of important vegetation species, or other species favoured
- Soil infertility due to waterlogged conditions
- Decrease in productivity of agricultural land
- Decline/ disappearance/ loss of specimen plantings in designed landscapes, parks and gardens

Associated & Traditional Communities

- Salinization of shrinking water supplies
- Waterlogging or salinization of agricultural lands

Intangible Cultural Heritage

- Loss of or limited access to culturally important sites (e.g. burial grounds)

Pollution (Secondary Stressor)

Moveable Heritage (Including Museums & Collections)

Facilities
- Increased need for special air filtration for repositories

Collections
- Corrosion of metal objects
- Degradation of polymers, papers, films and artworks
- Increased deterioration of stone

Archaeological Resources (Including Underwater Archaeology)

- Damage due to increased acidity resulting from fossil fuel combustion
- Artefacts threatened by pesticides used

Buildings & Structures

- Erosion of stone due to increased acidity resulting from fossil fuel combustion
- Effects of pollution and changing patterns of precipitation on erosion and colour of facades of monuments (Including biological growth)

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

- Damage from increased acidity resulting from fossil fuel combustion
- Decline/ disappearance of some vegetation species including favoured
- Soil infertility due to toxicity and depletion of nutrients
- Loss of landscape features, especially plantings, buildings

Associated & Traditional Communities

- Health risks from contaminated air, soils and water especially for children and old age people

Intangible Cultural Heritage

- Increased difficulty for young and elderly people to perform outdoor tasks
- Indigenous considerations of pollution as the killing of the life force of a place which is considered to be a natural sentient being

Risks from climate mitigation actions Mitigation & Adaptation Strategies (Secondary Stressor)

Moveable Heritage (Including Museums & Collections)

- Seawalls built in one place may expose other nearby localities to increased flood risk
- Facilities may have to be moved in order to accommodate coastal engineering structures such as seawalls and drainage channels
- Investment in staff expertise to decrease on site and supply chain emissions
- Costs associated with transition away from plastic for services associated with visitor experience
- Adaptation to protect one area redirects excess water toward museum and collections

Archaeological Resources (Including Underwater Archaeology)

- Flooding or loss of river flow and lake level changes due to hydroelectric dam projects
- Damage to archaeological sites from construction of renewable energy facilities
- Damage to archaeological sites from construction of coastal or riverine flood defences

Buildings & Structures

- A Flooding or loss of river flow and lake level changes due to hydroelectric dam projects
- Pressure to change defining features (materials maintenance, foundations etc.) to fire or flood resistant alternatives

Cultural Landscapes (Including Submerged Cultural, Landscapes & Historic Urban Landscapes, Parks and Gardens)

- Hydroelectric dam projects leading to flooding or loss of traditional lands
- Changed view-sheds as a result of construction of renewable energy projects, such as wind turbines
- Land Use and Forest species changes e.g. biomass production and afforestation
- Inappropriate changes to historic buildings and sites

Associated & Traditional Communities

- Hydroelectric dam projects causing displacement from traditional lands or loss of hunting/ fishing grounds
- Migration from and depopulation of communities due to changed property insurance policies in at risk areas

Intangible Cultural Heritage

- Changes in estuarine, river or lake ecology in traditional hunting and subsistence areas as a result of tidal power or hydroelectric projects

Annexure 10

Guide for Conducting Co-design Workshop and User Centric Design

Creating a user profile and problem statement

- Who are the key users?
- What are their goals, interests and day-to-day activities?
- What are the current problems and how do they comprehend them?
- What are their perceived probable solutions to stated problems?

Facilitate co-design exercises where participants work together to develop adaptation strategies and design solutions for making the built heritage climate-resilient. All the below listed stages of design thinking should be undertaken and it is important to note these stages are not always sequential and can be cyclical in nature.

Step 1: Empathise- research users' needs

The initial phase of the design thinking process focuses on developing empathy through user research, enabling a deep understanding of the problem.

Step 2: Define- state users' needs and problems

Analysing and synthesising observations to define the core problems. Frame the problem statement in a user-centric manner, ensuring a focus on addressing the needs and experiences of users.

Step 3: Ideate- challenge assumptions and create ideas

Look for alternative ways to view the problem and identify innovative solutions to the problem statement.

Step 4: Prototype- start to create solutions

This is an experimental phase and the aim is to identify the best possible solution for each of the problems.

Step 5: Test- try your solutions out

Test the complete product using the best solutions identified.

Base Reference- NIUA. (2020a), NIUA. (2020b)

Collective, Connective, Collaborative, Cooperative

To share and generate

- To share experiences, provide information, knowledge and/or generate ideas for responding to key co-design questions.

To debate and evaluate

- To provide feedback or comments on existing responses to the key co-design questions.

To collect and organise

- To collect, analyse and synthesise information, knowledge or ideas related to the core co-design questions.

To enable and facilitate

- To shape, enable or facilitate the processes and tools of engagement in design.

Base Reference- (Zamenopoulos, T., Alexiou, K., 2018)

Informing, Consulting, Involving, Collaborating, Empowering

Ensure everyone who has participated gets an opportunity to contribute. Define project challenges and opportunities and convey it to the participants. Use a variety of formats, including brainstorms, mind maps, group discussions, focus group discussions, list making, role plays, games, short presentations, individual reflection and note-taking, voting, drawings and graphics, one to one interviews, focus group interviews, structured/ semi structured interviews, questionnaires forms, etc.

Base Reference- (Giolitto, L., n.d.)

Be open, inclusive & diverse

- Ensure all relevant stakeholders have been engaged.

Share goals & vision

- Discuss and try to align possibly differing expectations and ideas in a joint vision.

Be transparent

- Make relevant information available to all stakeholders.

Be experimental & reflective

- Iterative learning and reflectivity form an integral part of experimentation processes and the consolidation of outputs.

Be flexible

A successful co-design process requires processes, plans, and activities within the project to allow for flexibility and to adaptively respond to changing needs and priorities of stakeholders.

Base Reference- (Wilk, B., 2020)

Annexure 11

Toolbox of Best Practices

Heritage Sites	Nature of Responses	Initiative related to Mitigation/ Adaptation	Opportunities, recommendations for Mitigation/ Adaptation	Issues related to Mitigation/ Adaptation measures	Solutions and follow-up actions for Mitigation/ Adaptation	Person/ Agencies/ Organisations responsible for implementation
	Information and Advocacy (Data Sharing, Technical assistant, Guideline reports, etc.)					
	Demonstration projects/ Proving by doing (Action/ management plan, preservation/ conservation/ restoration efforts, etc.)					
	Innovation and social enterprises (Awareness, community based initiatives- indigenous knowledge/ traditional practice, etc.)					
	Policy regulations and Statutory measures (Policy Advocacy, Sustainable Development, Climate Resilience Planning, etc.)					

Mitigation and Adaptation measures

- If impacts are neutral, they may need no mitigation. In all other cases, mitigation should be considered to avoid or minimise the impacts.
- The findings of the impact assessment to inform the decisions for interventions and the process to be followed.
- Ensure that the mitigation and adaptation measures are consistent with existing policies.
- Mitigation and adaptation measures should be shared with stakeholders including both rights holders and duty bearers for feedback.
- Review that given mitigation/ adaptation measures will assist in achieving optimum and resilient solutions.
- Explain the process and required resources for implementation of the mitigation/ adaptation measures.
- Describe monitoring and evaluation systems for the interventions and describe the agency that will take the actions and decision making protocols.
- Continuously update the assessment to incorporate new data, information and insights.

Case Study General Profile

Case Study No.	Name	Climate Action Strategies
1	Tsho Rolpa glacial lake project	Adaptation, Mitigation
2	Jungfrau-Aletsch-Bietschhorn Glacier	Mitigation
3	Great Barrier Reef	Adaptation, Mitigation, Planned Losses
4	Sagar Island	Adaptation
5	Chan Chan Archeological zone	Adaptation, Mitigation
6	Historic Centre of Prague	Adaptation
7	Timbuktu	Adaptation, Mitigation, Planned Losses
8	Cape Floral region , Protected areas	Adaptation, Mitigation, Planned Losses
9	WHC Climate Change Adaptation and Mitigation: Paris Climate Protection Plan	Adaptation, Mitigation, Planned Losses
10	WHC Climate Change Adaptation and Mitigation: Tunisa	Adaptation, Planned Losses
11	WHC Climate Change Adaptation and Mitigation: Edinburgh	Adaptation, Mitigation, Planned Losses
12	WHC Climate Change Adaptation and Mitigation: Plan Verde	Adaptation, Mitigation
13	WHC Climate Change Adaptation and Mitigation: Hué	Adaptation, Mitigation
14	WHC Climate Change Adaptation and Mitigation: Quito's Climate Change Strategy	Adaptation, Planned Losses
15	Knowledge of spatial and temporal patterns of floods, droughts, and rainfall within local communities	Planned Losses
16	Traditional wooden building techniques of Japan	Adaptation
17	The Role of Culture and Tradition in International Aid: An analysis of the Typhoon Maysak Reconstruction Project in Chuuk, FSM	Adaptation, Mitigation
18	Two communities in Alaska climate induced relocation – preventing displacement	Adaptation, Planned Losses

19	Seismic Performance of Traditional Urban Architecture in Morocco	Adaptation
20	Khazan - Coastal Zone Management	Adaptation, Mitigation
21	The Chauka System of Rajasthan	Adaptation, Mitigation
22	Phumdis and Ataphums of Manipur	Adaptation, Mitigation
23	Oran System of Thar Desert	Adaptation, Mitigation
24	Pakho Khet of Sikkim	Adaptation, Mitigation
25	Sedentary Pastoralism across Kangayam	Adaptation, Mitigation
26	Dong Bundhs System of Assam	Adaptation, Planned Losses
27	Ahar Pynes System of South Bihar	Adaptation, Mitigation
28	Jheels - Virdas of Banni Grasslands	Adaptation, Mitigation
29	Kuhls of Kangra Valley	Adaptation
30	Pat System of Bhitada	Adaptation, Mitigation
31	Surangams of Western Ghats	Adaptation
32	Bamboo Drip System of Meghalaya	Adaptation
33	Kuttanad Kayalnilam Farming System	Adaptation
34	Apatani Cultural Landscape of Ziro	Adaptation, Planned Losses
35	Zabo Farming System of Nagaland	Adaptation
36	Floating Gardens of Kashmir	Adaptation
37	Parambu System of Kerala	Adaptation
38	Wastewater Bheris of Kolkata	Adaptation
39	Akkadi Saalu of Karnataka	Adaptation
40	Melting Snow and Rivers in Flood	Adaptation
41	Golconda Fort	Adaptation
42	Denso Hall Rahguzar (Walking Street) Eco Enclave	Adaptation
43	Netherland's flood management is a climate adaption model for the world	Adaptation, Planned Losses
44	Ark for Iraq: What can the Vernacular Maritime and Craft Heritage of Iraq Teach Us about the Climate Crisis?	Adaptation
45	Vernacular Infrastructure Heritage as a Key to Building Climate-Resilient and Liveable Countryside	Adaptation, Planned Losses
46	Green Heritage: Culture and Climate in the Sahel (Sudan)	Adaptation
47	Climate change adaptation and mitigation in Lamu Old Town (Kenya)	Adaptation, Mitigation
48	Sukur cultural Landscape	Adaptation, Planned Losses
49	Zai pit system	Adaptation
50	Vineyards of Lanzarote	Adaptation
51	Application of the Climate Vulnerability Index for the Ruins of Kilwa Kisiwani and the Ruins of Songo Mnara, Tanzania	Mitigation
52	Traditional Oases agriculture in M'Zab Valley	Adaptation

53	A Citadel Against the Wind: The Possible Solutions to Rescue Qaitbay Citadel from the Impacts of Climate Change	Adaptation
54	The MOVIDA Project Towards a Better Evaluation of Flood Risk Mitigation Strategies	Adaptation, Planned Losses
55	CARBICA-CHEN, Empowering the Caribbean Cultural Heritage	Planned Losses
56	Community Engagement with Climate and Culture in an Area of Multiple Deprivation	Adaptation
57	George Town, Penang	Adaptation, Planned Losses
58	Ancient town walls of Tuscany	Adaptation, Planned Losses
59	Rotterdam	Adaptation, Planned Losses
60	Santo Domingo Tehuantepec	Adaptation, Planned Losses
61	Stepwells, Rajasthan	Adaptation, Planned Losses
62	Budj Bim Cultural Landscape	Adaptation, Planned Losses
63	Venice	Adaptation
64	Rock Art	Adaptation, Planned Losses
65	Princeville	Adaptation
66	Fransworth House	Adaptation
67	Puerto Rico's Cultural Heritage	Adaptation, Planned Losses
68	Paddy Cultivation, Kandy	Adaptation, Planned Losses
69	Heritage Sites of Wales	Adaptation, Mitigation, Planned Losses
70	Ayutthaya City	Adaptation, Planned Losses
71	Santo Domingo	Adaptation
72	Cartagena	Adaptation
73	Dubrovnik (iDEALProject)	Adaptation, Mitigation, Planned Losses

Examples for Nature of Response

Mitigation

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
01	Tsho Rolpa glacial lake project	Nepal	Glacial Lake Outburst Floods (GLOF)

To mitigate the risk, lowering the lake three meters by cutting an open channel in the moraine was proposed

A gate was constructed to allow water to be released as necessary

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
02	Jungfrau-Aletsch-Bietschhorn Glacier	Switzerland	Retreat of glacier

The Tortin ice field has been covered with a protective 2500 m2 light-blue insulated sheet to reduce glacier melting in summer. This kind of measure can help in stabilizing the glacier in the short term, but this option is not relevant for the Jungfrau-Aletsch-Bietschhorn World Heritage site and it cannot ensure an appropriate conservation in the long term to guarantee that glaciers will be saved for future generations.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
03	Great Barrier Reef	Australia	Coral bleaching

Reef Water Quality Protection Plan, fisheries management plans & Representative Areas Programme
To maximize the resilience and to prevent the weakening of the reef by other stresses such as water quality, abundance of herbivores and connectivity to sources of coral larvae which may be more susceptible to bleaching.

Great Barrier Reef Marine Park Authority
Increased the percentage of no-take areas from 5% to 33% to improve the resilience of the Great Barrier Reef Marine Park by protecting regions of unique biodiversity, including areas crucial to fish and other organisms.

Australian Government is working with the Queensland Government on the Reef Water Quality Protection Plan, which aims to halt and reverse the decline in water quality entering the Marine Park by 2013.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
05	Chan Chan Archaeological zone	Peru	El Niño - Southern Oscillation (ENSO) phenomenon

Treatment of runoff and prosecution to channel the water that comes down from the hills through its natural conduit and, thus, avoid affecting the archaeological sites.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
07	Timbuktu	Mali	Desertification

Restoration of the mosques and damaged houses

Removal of the sand in the vicinity of the mosques

Creation of buffer zones to protect the mosques from sand encroachment

Improvement of the drainage systems of rainwater

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
08	Cape Floral region , Protected areas	South Africa	Increase in temperature

Increasing resilience:
Reducing external stress on the Cape Floral Region can help cope with climate change's potential adverse impacts, similar to protecting the Great Barrier Reef.

Design of protected areas:
By comparing current and projected ranges of species, and assuming that they will adapt fast enough to shift ranges, it is possible to suggest modifications that would allow the conservation of these fragile species by-

- Moving or extending the boundaries of the protected area and of buffer zones.
- Increasing the habitat heterogeneity and topographic diversity.
- Increasing landscape connectivity of current and future protected areas in the design of migratory corridors, if the overlap of current and future boundaries cannot be ensured.

Translocation of exceptionally threatened species:
Translocation strategies for species facing threats include wild habitats, genetic resource storage, and protected ex-situ conservatories, but their sensitive impacts must be carefully assessed.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
09	WHC Climate Change Adaptation and Mitigation: Paris Climate Protection Plan	Paris	High energy consumption, Heat wave, Flooding

The Paris Climate Protection Plan, published in 2004, aims for a 30 % reduction in emissions, 30 % reduction in energy consumption in buildings and street lighting, and 30% renewable energy procurement for 2004-2020.

Energy audit and renovation of Paris' building stock:
Paris implements a pilot program for three years to enhance private buildings' thermal and acoustic efficiency, offering financial assistance for energy efficiency measurements and a 20% subsidy in energy audit costs. Additionally, the city has launched a program called the "100,000 buildings plan" for renovation of all the buildings in Paris.

Energy distribution:
These measures include air quality and reduction of GHG emissions, optimal management of natural resources, controls over energy demand, and sound energy choices for the future.

Waste Management:
The city of Paris will build a new incineration plant to consolidate heat recovery from waste.

Transport:
The city's new travel plan targets a 60% reduction in emissions from inner city traffic by 2020.

Green Jobs:
France aims to create 75,000+ jobs in renewable and wood-energy sectors by 2015, including historic building renovations.

Adaptive measure:
Heat wave plan, Planting trees, Flood risk protection plan, Carbon offsetting

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
11	WHC Climate Change Adaptation and Mitigation: Edinburgh	Edinburgh, Scotland	Fire, Flooding

Edinburgh has developed a comprehensive management plan for the World Heritage site, focusing on climate change and reducing carbon emissions by 26.7% by 2050. The plan acknowledges the connection between natural and cultural heritage, highlighting the importance of Edinburgh's architectural spaces, gardens, and waterways. Edinburgh Biodiversity Action Plan aims to conserve Edinburgh's World Heritage city's integrity.

Nature of Response
Demonstration Projects

"Powering Edinburgh into the 21st century" - Edinburgh should adopt the Decentralized Energy (DE) scenario, focusing on gas-engine combined heat and power (CHP) for emissions reduction. The plan suggests a community heating system to encourage CHP usage, despite potential barriers in historic areas. The operation can be less invasive than establishing pipe utilities or communication networks.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
12	WHC Climate Change Adaptation and Mitigation: Plan Verde	Mexico City	Temperature increase, Heat waves, Droughts, Flooding, Storms, Landslides

Plan Verde aims to reduce CO_2 emissions by seven million tons and implement an integrated climate change adaptation program by 2012. The expected emissions reductions have been allocated to different sectors: 12% to the water sector, 10% to the energy sector, 35% in the waste sector, and 42% in the transportation sector.

Nature of Response
Information and Advocacy

Energy Sector:
Mexico City plans to invest in sustainable multi-family housing, including solar power plants, energy and water saving systems, rainwater collection, waste treatment, and absorption walls. The plan promotes renewable energy sources and encourages energy-efficient lighting in public buildings and transport.

Nature of Response
Demonstration Projects

Water Sector:
Mexico City's water action plan focuses on reducing sludge emissions, implementing a home water savings program, improving infrastructure, and improving the sewage system to reduce septic emissions. Additionally, the city has installed low-flow toilets and accessories.

Transport sector:
The plan aims to reduce emissions in the transport sector through 10 actions, including a compulsory school transport system, an additional metro line, and the replacement of taxis with energy-efficient vehicles. Additionally, nine BRT corridors will replace microbuses, and a vehicle inspection program will be established to replace vehicles with energy-efficient cars by 2012.

Waste Sector:
City plans to build gas-fired power plant and compost production plant to capture biogas from landfill, while modernizing recycling system and waste transfer stations.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
13	WHC Climate Change Adaptation and Mitigation: Hué	Hué, Vietnam	A Typhoons and tropical cyclones, Landslide, Flooding, Soil erosion and degradation, Salt water intrusion, Drought

Vietnam's development plans incorporate environmental concerns and GHG mitigation strategies, focusing on renewable energy and sustainable use of existing resources. Urban mitigation measures include improving lighting efficiency in households, commercial facilities, and public areas, and achieving methane recovery from large landfills. These plans are still in the process of development and serve as guidelines.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
17	The Role of Culture and Tradition in International Aid: An analysis of the Typhoon Maysak Reconstruction Project in Chuuk, FSM	Chuuk, Federated States of Micronesia	Typhoons, Coastal flooding, Decreasing coral health, Declining fish, Seagrass bed populations

Pacific Islanders have adapted traditional fishery management systems to address declining coral health and fish and seagrass bed populations. They built villages based on their local knowledge of tides, wind directions, waves, and storms. Architecture varies between islands, with stilt techniques used in flood-prone areas. Typhoon frequency dictates building styles, while protection from high winds and storms is achieved through unique building styles and planting local trees along the shore.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
20	Khazan - Coastal Zone Management	Goa, India	Flooding, Heat waves, Drought

Khazan ecosystems, engineered intricately with dykes, sluice gates, and water channels, have the potential to withstand sea-level rise or flooding and other related coastal risks from climate change. Currently, events such as tides and heavy daily rainfall occur simultaneously, resulting in a 3 m rise in water levels. Khazan ecosystems and their potential to defend against coastal hazards can provide a base map to authorities for disaster management in Goa. Khazans protect from high tides and monsoons by using backwaters and overflow barriers. They serve as temporary storm water storage and recharge aquifers. Khazans support high-density plantations, intercropping, salt pan design, and small-scale pond-fisheries.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
21	The Chauka System of Rajasthan	Lapodiya, Jaipur, Rajasthan	Heat waves, Drought

The Chauka system is an irrigation practice in arid regions that uses rectangular fields arranged in a checkerboard pattern on a slope, connected by canals. This system ensures equitable water distribution and efficient management of water scarcity, promoting better seepage into the ground. Chaukas collect water, replenishing underground aquifers, feeding ponds and wells, maintaining natural vegetation cover, and improving water security during droughts, enhancing food security and economic sustainability for farming communities.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
22	Phumdis and Ataphums of Manipur	Loktak Lake, Manipur, India	Soil erosion, Flooding, Heat waves

Phumdis, natural floating mats in Loktak Lake, Manipur, are formed by aquatic plants growing in shallow areas, accumulating organic material. Phumdis formation can be triggered by anthropogenic inferences, similar to ataphums, which are artificial floating gardens created by locals. These gardens consist of bamboo or ropes as base frames, layering vegetation and soil, and allowing crops to grow. Phumdis and ataphums play crucial ecological roles in the lake ecosystem. Natural carbon sequestration reduces greenhouse gas emissions, prevents soil erosion, filters pollutants, and retains water during high rainfall or flooding. It also provides fertile beds for crop cultivation, reducing land clearing and preserving natural habitats.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
23	Oran System of Thar Desert	Thar Desert, Rajasthan, India	Heat waves, Drought

The Thar Desert's Oran system involves community identification and protection of forest patches called orans based on tree cover and growth potential. They collectively own and manage these areas, implementing rules to control access and harmful activities. Conservation efforts include protecting tree species, grazing restrictions, and tree planting. However, electric lines have passed through oran areas, causing species contamination. It is crucial to ensure electric line installation and maintenance do not negatively impact the oran system and surrounding ecosystem. The local communities consider the forest patches as community-owned and have established customary laws, regulations, and social norms to govern them. This strong

Nature of Response
Innovation and Social Enterprise

sense of ownership and collective communal responsibility contributes to the management and protection of the orans. Microclimate regulators enhance climate resilience, conserve keystone and native species, and boost community spirit for nature conservation.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
24	Pakho Khet of Sikkim	Sikkim, India	Flooding, Heat waves, Drought

Farmers in the watershed use levelled terraces to stabilize irrigation water for paddy cultivation. The most common type is the outward sloping terrace, found on higher slopes and supported by retaining walls. Bunds, made of homogenous clay, are popular for terrace construction. To mitigate soil loss, farmers grow vegetative barriers like grasses and pulses on the terraced land. Building terrace walls correctly is crucial. Lower gradient slopes experience intensive agricultural usage, so farmers terrace their lands independently using bundling, stone walls, and vegetative barriers. Terraced fields serve as natural barriers, slowing water flow during heavy rainfall, stabilizing soil, preventing erosion, and reducing sedimentation. Women manage water resources by channeling water from natural sources and constructing irrigation systems.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
25	Sedentary Pastoralism across Kangayam	Tamilnadu, India	Drought

Local farmers implemented a rotational livestock grazing system in paddocks, requiring minimal labour input. They withheld animals for a month after rain to promote grass crop growth and maintain Acacia trees. Supplementary feeding is practiced during the lean period between March and June. The enclosed land allowed farmers to experiment with selective breeding and foreign crops. Re-seeding of grassland is done once in 4 to 6 years for better grass growth and higher biomass for livestock feeding. Wastelands can be utilized for livestock grazing, ensuring sustainable forage supply and grassland resilience. Rotational approaches maintain productivity and ecosystem health, while promoting social inclusivity with a female-to-male health ratio.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
27	Ahar Pynes System of South Bihar	Magadh, South Bihar, India	Soil Erosion, Flooding, Drought

Recommendations:
Pilot testing is underway at Nalanda University in Rajgir, Bihar, to evaluate the integration of detention and retention basins with streetscape design. Modular versions can be adopted in smaller-scale integration with rain gardens and bio swale systems.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
28	Jheels - Virdas of Banni Grasslands	Banni grasslands, Gujarat, India	Heat waves, Drought

Recommendations:
Official capacity building and mapping shallow aquifer depressions within the city are crucial for successful construction of a system. Minimal concrete enhancement and traditional system concepts are key to success.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
30	Pat System of Bhitada	Bhitada, Madhya Pradesh, India	Soil, Erosion, Flooding, Heat waves Drought

Jhabua tribals use hill streams to create irrigation channels called pats, which are passed through deep ditches and stone aqueducts. This system is used by local communities, who irrigate their fields by turns. The channel requires constant maintenance, as some parts may be destroyed during floods. The family is responsible for irrigating the fields, which takes about two weeks. The winter crop is sown in early November. Eco-friendly water harvesting infrastructure, regulated aquatic fauna passage, and sustainable indigenous technology conservation are essential for preserving the environment.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
47	Climate change adaptation and mitigation in Lamu Old Town	Kenya	Sea level rise

Plastic waste:
Local communities are implementing recycling programs using plastic and discarded metal objects, reducing waste volume and reducing harmful emissions like carbon monoxide. State and non-state institutions support these efforts, while the Municipal Authority invests in mechanical rubbish removal from the Old Town.

New street-lights:

Nature of Response
Demonstration Projects

The Lamu Municipality has introduced solar-powered streetlights as a sustainable means for capitalising on renewable energy.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
51	Application of the Climate Vulnerability Index for the Ruins of Kilwa Kisiwani and the Ruins of Songo Mnara	Tanzania, East Africa	Intense precipitation events, Sea level rise, Coastal erosion

The RKK (Ruins of Kilwa Kisiwani) and RSM (Ruins of Songo Mnara) property has a long conservation history, addressing coastal erosion and building maintenance issues. In 2004, it was listed as a WH in Danger due to a lack of conservation efforts. In 2014, the property was removed, implementing protective walls, consolidating structures, and planting mangroves to protect against wave action. The CVI Consult found a moderate level of OUV vulnerability, but this depends on the implementation of adaptive capacity strategies. The property's economic benefits from conservation and research projects are a positive example of climate adaptation contributing to site preservation and community sustainable development. The conservation experience, institutional knowledge, inclusive community engagement, and capacities at RKK and RSM are valuable to other sites facing similar climate-related stressors in Africa and internationally.

Nature of Response
Demonstration Projects

Recommendations:
Climate change is a pressing issue that requires planning and appropriate responses at regional and national scales. The CVI methodology, which was applied to the Sukur Cultural Landscape in Nigeria, is now being considered for other African World Heritage properties. The Covid-19 pandemic has led to remote workshops and hybrid in-person/ remote elements, which have both benefits and pitfalls. The lessons learned from the CVI Consult are valuable for considering the wider application of CVI in Africa. Accessibility issues and challenges experienced during the workshops are not unique to the RKK and RSM, but are also applicable to many World Heritage properties in developing countries. Strengthening capacities within African heritage sectors is crucial for conducting values-based and science-led vulnerability assessments. The CVI Africa project provided foundational training in climate change effects on heritage and the CVI methodology to six African professionals from Cabo Verde, Kenya, Nigeria, Tanzania, Tunisia and Uganda.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
69	Heritage Sites of Wales	United Kingdom	Warmer temperature, Rising sea level, Changing rainfall patterns

Climate Action Wales (Welsh Government) suggests:
1. Green Energy Choices (air dying washing, draught proofing windows)
2. Green transport choices (more walking, wheeling)
3. Green daily choices (borrowing more, buying little less)
4. Green food choices (food planning, composting, recycling)

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
73	Dubrovnik (iDEAL Project)	Croatia	Rising air temperatures, Changes in rainfall, Rising average sea level and ocean temperatures

Parking Lots Alteration:
The action refers to the existing parking lot of Dubrovnik General Hospital that will be altered into an underground garage. On the area of the existing parking lot there will be a park area. Realization of this measure will mitigate the phenomenon of the urban heat island and will create a new green oasis that will provide the shade and a place of relaxation and socialization to all citizens, patients and employees of Dubrovnik General Hospital. Furthermore, by removing the existing asphalt surface and placing green areas soil permeability will increase, which has a direct impact on reducing the risk of flooding.

Nature of Response
Demonstration Projects

A seawall:
It is a form of coastal defence constructed where the sea, and associated coastal processes, impact directly upon the landforms of the coast. The purpose of a sea wall is to protect areas of human habitation, conservation and leisure activities from the action of tides, waves, or tsunamis. As a seawall is a static feature it will conflict with the dynamic nature of the coast and impede the exchange of sediment between land and sea.

Natural Shading:
In the vicinity of the existing bus station plant a non-invasive tree species (eg. plane trees, magnolia) to provide Sun protection to citizens and visitors of Dubrovnik.

SOLEZ project:
Smart Solutions supporting Low Emission Zones and other low-carbon mobility policies in EU cities. The SOLEZ project brings together cities which endeavour to implement measures to support low emission zones or other low-carbon mobility policies

Nature of Response
Policy Regulations and Statutory Measures

Adaptation

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
01	Tsho Rolpa glacial lake project	Nepal	Glacial Lake outburst floods (GLOF)

An early warning system was simultaneously established in 19 villages downstream of the Rolwaling Khola on the Bhote/ Tama Koshi River to give warning in the event of a Tsho Rolpa GLOF.

Nature of Response
Information and Advocacy

Local villagers have been actively involved in the design of this system, and drills are carried out periodically.

- The goal of lowering the lake level reduced the risk of a GLOF by 20% in 2002.
- The complete prevention of a GLOF at Tsho Rolpa necessitates further reducing the lake water, perhaps by as much as 17 m.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
03	Great Barrier Reef	Australia	Coral bleaching

Climate Change Response Programme (2004-2008)
The Coral Bleaching Response Plan - Detecting and measuring bleaching and other impacts through satellite imagery, underwater surveys and monitoring.
The Climate Change Action Plan aims at sustaining ecosystems, industries, and communities by identifying and implementing relevant management actions, adapting policy and fostering collaborations.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
04	Sagar Island	India	Recurring storms, Rising sea water and salt-water flooding in the island

Six ponds constructed in 5 villages - Radhakrishnapur, Rudranagar, Purusottompur, Dakshin Haradhanpur and Sumatinagar.

Pond committees:

- Ponds managed by Pond committee made of user families.
- Money from member families collected for the upkeep of the water structure.
- These pond committees also use the community pond's water supply and the land space on the embankment for

Nature of Response
Demonstration Projects

fruit and vegetable cultivation, as well as sweet water fish culture.

- The high-raised barrier also protects the sweet pond water from salty water pollution during a flood.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
05	Chan Chan Archeological zone	Peru	El Niño - Southern Oscillation (ENSO) phenomenon

Adaptation of foundations and structures for the main buildings and the architecture surrounding the Huachaque of the Tschudi Palace, using traditional materials and skills as well as modern engineering techniques.

Preventive conservation actions:
Participation of 400 workers, which has also allowed the awareness of the inhabitants of the surrounding areas General cleaning of the intervened sites Protection and stabilisation of walls, Installation of a roof (4,270 m2) in Chan Chan and information panels of the heritage assets for their identification and protection.

Nature of Response
Innovation and Social Enterprise

Management Plan of Action:
Maintenance of drains that control the water table level, Stabilisation of perimeter walls of palaces and funerary platforms, control of vegetation, Maintenance of public use areas, Architectural documentation for conservation and management, capacity building for local craftsmen and awareness building measures for students and the local community.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
06	Historic Centre of Prague	Czech Republic	Flooding

Fixed barriers:
Levees, dykes, earth mounds, solid concrete walls constructed along the Vltava River. For instance, closure at Čertovka (Old Town), which is a steel sliding door, 23.5 m length, 4.9 meters height, and weighting 45 tonnes. Measures like closures, pumping systems and safety valves in the canalisation network along the Vltava River Mobile barriers which are mainly used in the old historical centre, are stored in a central storage area in Dubeč and for smaller parts in Zbraslav. The transport and installation of mobile barriers to the areas potentially affected by flooding is based on the Flood Management Plan of the Prague City. In Dubeč, a training area for training of mobile barriers installation is built.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
07	Timbuktu	Mali	Desertification

Community engagement:
These activities were conducted by ensuring collaboration and active participation of all stakeholders (Imams, City of Timbuktu, Cultural Mission of Timbuktu, etc.). An important aspect of this project included the involvement of local craftsmen in the restoration process.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
08	Cape Floral region, Protected areas	South Africa	Increase in temperature

Risk preparedness:
Strengthen risk preparedness for natural and anthropogenic wildfires by improving detection and prevention networks and re-evaluating fire management strategies by national and provincial agencies.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
09	WHC Climate Change Adaptation and Mitigation: Paris Climate Protection Plan	Paris	High energy consumption, Heatwave, Flooding

Energy audit and renovation of Paris' building stock:
"1,00,000 buildings plan" for renovation of all the buildings in Paris. However, since the majority of Paris' buildings are co-owned, finding consensus to work on common areas of buildings has been challenging; these areas are usually where substantial energy saving measures can be implemented. The plan, therefore focuses on awareness-raising and advocacy to achieve consensus within co-owners' associations.

Nature of Response
Information and Advocacy

Heat wave plan:
Partner with groups of doctors and chemists and younger volunteer population willing to provide support and services to the vulnerable groups during heat waves.

Urban Planning:
The city published a sustainable development guide to advice municipalities on environmental and social sustainability measures on every step of carbon neutral urban development, from decision making to the construction process.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
10	WHC Climate Change Adaptation and Mitigation: Tunis	Tunis, Tunisia, North Africa	Ground instability/ seismicity, Tsunami marine submersion, Coastal erosion, Flooding, Water Scarcity

Most of the strategies for dealing with climate change in Tunis are focused on adaptation rather than mitigation. These strategies discussed in the World Bank study have been organized into three groups: infrastructure and technical measures, urban planning and institutional preparedness, training and awareness-raising.

Earthquake risk management:
Establishment of a national seismic map and zoning; Development of the network of seismic monitoring and recording; Vulnerability analysis of existing buildings.
Risk control of erosion and marine flooding:
Changes in legislative framework for maritime public domain; Development of a tsunami warning system.

Flood protection:
System monitoring and flood warning systems; Hydraulic Management of urbanized areas exposed to flood risk.
Management of water resources:
Monitor and optimize water consumption

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
11	WHC Climate Change Adaptation and Mitigation: Edinburgh	Edinburgh, Scotland	Fire, Flooding

The ‘water of Leith’ management plan acknowledges the role of the river, not only as a natural resource but also as an integral part of the World Heritage of Edinburgh.

- Emphasises building flood protection walls, sound reservoir management and maintenance of flood plains by restricting development where necessary.
- Includes a rain retention section, which suggest contour ploughing, tree planting, urban agriculture, and creation of wetlands.
- Limitation against additional development

World Heritage Management Plan establishes relationship between natural and cultural heritage of Edinburgh. (Architectural spaces and gardens)

Edinburgh Biodiversity Action Plan - conserve the integrity of Edinburgh as a whole.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
12	WHC Climate Change Adaptation and Mitigation: Plan Verde	Mexico City	Temperature increase, Heat waves, Droughts, Flooding, Storms, Landslides

The plan outlines six adaptation measures, including an early alert system for the Valley of Mexico, a micro-basin management component for urban rivers, assistance for vulnerable groups, remote forest fire detection and monitoring, and epidemiological monitoring. It also aims to protect and recover native crops and herbs to maintain agro-system diversity and resilience. The second group of adaptation measures targets medium-term goals in Mexico City's rural zone, focusing on micro-basin management, organic agricultural production, soil recovery, and rooftop greening. These actions address genetically modified foods and promote organic agriculture.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
13	WHC Climate Change Adaptation and Mitigation: Hué	Hué, Vietnam	Typhoons and tropical cyclones, Landslide, Flooding, Soil erosion and degradation, Saltwater intrusion, Drought

The plan focuses on adaptation actions in water resources, agriculture, forestry, fisheries, coastal zones, energy and transport, and human health. It addresses urban environment activities, such as building reservoirs, upgrading dykes, and conducting long-term water resource predictions. The coastal zone management sector suggests protection measures and relocating settlements and infrastructure. The energy sector emphasizes rational and efficient energy use.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
14	WHC Climate Change Adaptation and Mitigation: Quito's Climate Change Strategy	Quito, Ecuador, North America	Water shortage, Flooding, Landslide, Soil erosion

Quito aims to involve citizens in climate change adaptation through education and communication. The municipality, with World Bank support, has developed "Quito's Youth Action on Climate Change" to educate marginalized youth about climate change effects. The city also collaborates with local universities, establishes a social forestry initiative, and offers an inclusive informal recycling program.

Nature of Response
Information and Advocacy

Quito's Water Master Plan, from 2010 to 2040, aims to reduce water loss, increase water supply, and invest in storm water drainage systems. The city has established the Water Protection Financial Fund (FONAG) for watershed conservation through a trust, which has been contributing to the water company's billing since January 2000. Quito Municipality has prepared a Fire Plan, contingency plan, and relocated families in risk-prone areas. Climate change considerations are integrated in land use planning, watershed management, and efficient water and energy use campaigns. Eco-neighbourhoods program focuses on water conservation through innovative residential management and wastewater separation. Quito's Control and Reduction of Unaccounted Water (ANC) Program, initiated in 2007, aims to reduce unaccounted water by installing meters and implementing a Telemetry and Control System. Quito's Hillside Management Program, launched in 1997, aims to manage northern and central Quito slopes, reducing threats and reducing risks.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
16	Traditional wooden building techniques of Japan	Japan	Earthquake

Ryo Tanahatashi discussed the earthquake resistance of traditional Japanese wooden structures at the 1960 Second World Conference on Earthquake Engineering. He attributed the high seismic resistance to factors like high damping capacity, longer natural periods, and large potential energy due to horizontal resistance and deformation capacity.

Nature of Response
Information and Advocacy

Seismic rooms at Palace's:
In 1915, architect Yoshikuni Okuma introduced seismic rooms, built before the modern era. These rooms were designed with earthfast pillars, beams connected underground, and shingle roofs to reduce weight and lower gravity during earthquakes.

Nature of Response
Demonstration Projects

Resistance for Temples and shrines:
In 1930, Kenzaburo Majima's book "Earthquake and building construction" explained earthquake resistance in traditional wooden buildings. He suggested using inclination of columns for thick columns, installing steel caps and shoes, and avoiding bracings or shear walls at the lowest level.

Experiments on Horyuji temple:
Shizuo Ban experimented with earthquake resistance in the Kondo of Horyuji temple from the 1930s to 1940s. He studied columns, bracket complexes, and frame structures to determine the impact of deformation on thick columns. He concluded that the Kondo's long natural period and high damping prevented collapse, ensuring the temple's wall paintings remained intact.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
17	The Role of Culture and Tradition in International Aid: An analysis of the Typhoon Maysak Reconstruction Project in Chuuk, FSM	Chuuk, Federated States of Micronesia	Typhoons, Coastal flooding, Decreasing coral health, Declining fish and seagrass bed populations

Typhoon Maysak Reconstruction Project (TMRP): Taylor Hayda's masters' thesis at the International University of Catalonia (2021) aimed to explore how PICTs and international aid organizations can collaborate on solutions to integrate traditional knowledge and coping mechanisms. The study surveyed TMRP local beneficiaries and international staff to evaluate the success of TMRP in meeting community needs and providing culturally relevant recovery solutions. The results showed that international staff ranked TMRP community participation and cultural integration as important, while local beneficiaries scored 3 out of 10 and 2.5 out of 10. The study also suggested that empowering locals and culture through education can enhance resilience against future hazards. By adapting to local context and cultural identity, international aid can provide more efficient and culturally relevant projects that better match the needs of at-risk populations.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
18	Two communities in Alaska climate induced relocation – preventing displacement	Network and Shishmaref, Alaska	Permafrost degradation, Sea level rise, Flooding, Erosion

The Community of Network took decades to relocate across the river to Mertarvik, some 10 miles (16 kilometres) away. There, new homes and infrastructure are being constructed so that the whole village can move together.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
19	Seismic Performance of Traditional Urban Architecture in Morocco	Morocco	Earthquake, Drought, Increase of average temperatures, Heat waves, Changing rainfall patterns, Extreme rainfalls, Floods, Sea level rise

Morocco's earthquake-resistant adobe building regulations neglected traditional aseismic technologies, reducing their value and reducing technical expertise. El Harrouni and colleagues suggest that seismic measurements from the old frame for cultural heritage explain the buildings' earthquake resistance. To ensure adequate reinforcement intervention,

Nature of Response
Innovation and Social Enterprise

a sound culture of protection, an intervention methodology, an exhaustive catalogue of traditional preventive techniques, training qualified workers, and focusing on cost-effective and social impacts of preservation actions are essential.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
20	Khazan - Coastal Zone Management	Goa, India	Flooding, Heat waves, Drought

Recommendations:
Identify coastal areas, including tidal flats and wetlands, and involve local communities, stakeholders, and authorities in Khazan practices. Integrate coastal zones into city spatial planning and development frameworks.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
21	The Chauka System of Rajasthan	Lapodiya, Jaipur, Rajasthan	Heat waves, Drought

Recommendations:
Analyse urban rainwater potential by analysing patterns, catchment areas, and open spaces. Pilot water collection practices in integrated spaces, and establish an interdisciplinary local community for accountability and capacity building.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
22	Phumdis and Ataphums of Manipur	Loktak Lake, Manipur, India	Soil erosion, Flooding, Heatwaves

Recommendations:
Pilot testing modular small-scale ataphums in seasonal waterbodies, exploring integration into riverine islands, and engaging with local stakeholders for accountability and indigenous innovations.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
23	Oran System of Thar Desert	Thar Desert, Rajasthan, India	Heat waves, Drought

Recommendations:
Integrating the concept of orans with religious institution grounds as part of conservation. Adopting eco-friendly approaches for integrating orans with green energy sites within the city. Collaboration with local stakeholders and communities for accountability.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
24	Pakho Khet of Sikkim	Sikkim, India	Flooding, Heat waves, Drought

Recommendations:
Pilot testing along waterfronts can integrate with riparian buffers. Support urban farming initiatives with policies and regulations, such as zoning regulations and incentives. Collaborate with communities, planners, experts, and government agencies for successful implementation.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
25	Sedentary Pastoralism across Kangayam	Tamilnadu, India	Drought

Recommendations:
Introducing 'grasslands' land use category at master plan level, including natural grasslands and riverine islands. Converting derelict lands and wastelands into formal grazing grounds and developing training programs for small-scale urban livestock enterprises.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
26	Dong Bundhs System of Assam	Baksa, Assam, India	Soil erosion, Flooding, Drought

The system involves building a network of dongs, which are canals from perennial water sources like rivers to cultivation fields. Small dams (bundhs) are built under the dongs, and water is routed through canals to paddy fields and household ponds. The dongs eventually dry out or meet larger water bodies like rivers. Bundhs are demolished when inundation levels are reached. Villages are granted access to the dongs for irrigation and storage in backyard ponds. Dongs are constructed annually as rainwater from mountain rivers washes them off. Improved soil erosion and flood resilience by ensuring water availability, sand mining impacts resilience, and reduced vulnerability of local communities to climate change.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
27	Ahar Pynes System of South Bihar	Magadh, South Bihar, India	Soil erosion, Flooding, Drought

Ahars are soil-drained channels with raised embankments, interspersed with ponds to collect excess water. They serve a dual purpose of draining water during floods and retaining it during droughts. During the early 20th century, the average area irrigated by an Ahar was 57 ha. Ahar beds were also used to grow rabi (winter) crops after draining excess water from kharif (summer) cultivation. Although the boundaries of Ahars and Pynes were fixed, the exact amount of water or water rights was not defined, and water allocation was managed independently by farmers. Improved resilience to floods, droughts, erosion through cost-effective zero waste practices, reduced vulnerability to climate change, and increased food security through paddy cultivation in South Bihar.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
28	Jheels - Virdas of Banni Grasslands	Banni grasslands, Gujarat, India	Heatwaves Drought

Virdas are shallow wells at the interface of surface and sub-surface, while Jheels are shallow depressions excavated to depths of 2-5 meters. Monsoon flow determines the formation of Jheels, which accumulate rainfall runoff and infiltrate into shallow aquifers. After monsoons, Jheels are desilted, and Virdas are dug to tap the shallow aquifers. The infiltrated water is stored above the saline one due to differences in densities. The water from Virdas is extracted using a rubber container called Chades, which is connected to interconnected small channels within Jheels. This water is then fed to livestock tanks called awada. Multipurpose, climate-adaptable infrastructure, eco-friendly filtration system, high-quality potable water, and conservation of indigenous sustainable technology are essential.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
29	Kuhls of Kangra Valley	Kangra valley, Himachal Pradesh, India	Soil erosion, Flooding, Drought

Recommendations:
Establishing an interdisciplinary committee for accountability, gaining local site knowledge, and improving the system's integration with hydel projects within the city or influence range.

Nature of Response
Demonstration Projects

A danga diverts natural stream flow to a channel along gravity path for distribution to landowners downstream. The Kuhl leads to a circular tank, where water is allocated to farmers in turns, with higher elevations given priority. Water is collected at night, released in the morning, and empty by evening. Kohlis, traditional water masters in Himachal, supervise irrigation and dispute resolution among farmers,

Nature of Response
Innovation and Social Enterprise

believed to possess miraculous powers as deities providing water. A unified community focuses on water conservation and management, fostering a natural ecosystem based on Kuhls flow, and addressing gender disparity in water allocations, even in women-headed households.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
30	Pat System of Bhitada	Bhitada, Madhya Pradesh, India	Soil erosion, Flooding, Heat waves, Drought

Recommendations:
Establishing an interdisciplinary committee for accountability, gaining local site knowledge and improvising. Exploring dam technology's potential for mainstreaming in the city.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
31	Surangams of Western Ghats	Karnataka and Kerala, India	Heat waves, Drought

Recommendations:
Prior to construction, conduct a hydrogeological assessment of the region and proposed site, forming an interdisciplinary committee for accountability, local site knowledge, and potential improvising opportunities.

Nature of Response
Demonstration Projects

Local labourers narrow down water sources based on factors like terrain slope, soil structure, catchment areas, and local flora and fauna. Tunnels are dug through laterite hillocks, where groundwater seeps out and flows through. This water is collected in ponds near houses or connected to irrigation networks for agiculture, drinking, and domestic purposes. Water wastage is avoided by draining surplus water to overflow ponds and irrigating backyard gardens, resulting in groundwater recharge. Overhead carbon sequestering vegetation reduces emissions, groundwater exploitation is efficient, and aquifer recharge and replenishment are achieved.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
32	Bamboo Drip System of Meghalaya	East Meghalaya, India	Heat waves, Drought

Recommendations:
Pilot testing the practice on formal campuses and formalizing it at a master plan level for irrigation in eco-sensitive zones. Preparing a database of open spaces for irrigation and exploring treated waste water from STP.

Nature of Response
Demonstration Projects

A system of holed bamboo shoots is used to divert natural stream and spring flow across terraced cropland. The process involves four or five stages, with water disseminating at a rate of 20-80 drops per minute. The installation process lasts three years, while maintenance is limited to cleaning and reinforcement after monsoons. The cost of the system is limited to labour, which can be carried out by farmers themselves. The required materials include a small dao, bamboo strands, forked branches, smaller bamboo shoots, and two willing labourers. Reduced infrastructure using eco-friendly bamboo, controlled natural water resource exploitation, and sustainable indigenous technology conservation.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
33	Kuttanad Kayalnilam Farming System	Kuttanad, Kerala, India	Soil erosion, Flooding

Recommendations for implementation:

- Identify suitable land areas for repurposing underutilized or vacant land.
- Formalizing land use master plans with guidelines for implementation and ensuring compliance with health and safety standards.
- Encouraging sustainable farming practices through economic incentives and education.

Nature of Response
Demonstration Projects

The Kayalnilam system consists of bio-bunds and canals, with dewatering technologies and temporary barriers to block salt. Pre-monsoon, when the area gets saline water from backwaters, due to reverse flow, fishing is practiced. During monsoons, when water flows from inland to the coast, rice cultivation is practiced, draining the excess water. Bunds separate canals for irrigation, while dewatering technologies periodically remove water. An exterior bund 2m above intertidal level acts as an area defence barrier. Traditionally, water wheels were used, but they were replaced by local blacksmiths' electric technology. The system aims to prevent excess water entering paddy fields and maintain a sustainable water supply system.

Process:

- A framework for the bio-bund is erected using coconut poles and bamboo mats, along the periphery of the shallow parts of the lake bed.
- The channels of the bund is filled with locally available materials.
- Maintaining precise water levels inside the Kayalnilam by periodically removing excess water through dewatering techniques.
- The Kayalnilams are used for cultivating paddy crops. During monsoon, it is converted into a seasonal waterscape for aquaculture and duck rearing.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
34	Apatani Cultural Landscape of Ziro	Ziro, Subansiri, Arunachal Pradesh, India	Soil erosion

Paady-cum-fish cultivation involves preparing fields, managing water, planting rice, integrating fish, and harvesting both crops. The Apatani people terrace fields to prevent erosion and ensure even water distribution. Rice seedlings are transplanted into flooded fields, benefiting from moisture and nutrients. Fish, like carp, control pests and weeds, providing income and protein. Fish feed on insects and organic matter, maintaining ecological balance.

Techniques for wet cultivation:

- Apatanis create a multipurpose water management system that integrates land, water, and farming, promoting soil and water conservation.
- Water from streams is trapped in a large channel and diverted to secondary channels, allowing water from adjacent slopes to flow easily into rice fields.
- Wooden sluice gates regulate channels, allowing water to flow and irrigate desired fields by opening and closing them.
- Bamboo pipes (hubur) are placed in plots to drain water from one terrace to another, covered with bamboo meshes.
- At least 10 to 15 cm of water is maintained in each plot by adjusting the height of the outlet.
- Organic manure, animal excreta, and kitchen waste are regularly applied to rice fields, with a gentle slope to maintain water levels. Villages are generally higher than agricultural fields, so organic waste and poultry refuse are drained into agricultural fields through irrigation channels eliminating the need for chemical fertilizers in the fields.

Outcomes:

Sustainable agriculture ensures food security, supports local economies, optimizes water management and improves land productivity. It also conserves biodiversity and preserves indigenous knowledge. Cultural identity and tourism raise awareness about preserving indigenous practices.

Nature of Response

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Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
35	Zabo Farming System of Nagaland	Kikruma village, Nagaland, India	Soil erosion, Wildfire, Drought

Recommendations for implementation:

- Training on sustainable agriculture, crop diversification, livestock/ vegetable integration.
- Implement policies and incentives to encourage farmers to adopt Zabo Farming System.
- Infrastructure facilities for irrigation, market access,

Nature of Response

Information and Advocacy

transportation, processing, and storage of agricultural produce.

Farming Techniques:

- The forest area commons of the villagers are located at the hilltop of the village with terraces being cut and used for farming, fish farms, etc.
- Ponds are manually dug to collect rainwater, which is channelled through concrete roads
- These reservoirs have compacted bottoms and sides to minimize seepage.
- The stored water is then directed to orchard plantations and livestock, carrying animal waste to the paddy fields below.
- The fields also serve as fish farms, yielding additional output. The bunds of the ponds support medicinal plants.
- The system is practiced on 2.0 to 2.5 ha land holdings, with a shallow pond of approximately 0.2 ha area and 1.5 to 2.5 m depth located below the catchment area with a silt trap.
- The harvested water, along with animal waste, is released into the paddy fields through outlets or bamboo poles.

Outcomes:

- Efficient water management, biodiversity conservation and sustainable agriculture.
- Integrated approach enables effective rainwater harvesting and promotes biodiversity through agroforestry.
- Conservation of intergenerational knowledge transfer and community collaboration.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
36	Floating Gardens of Kashmir	Dal Lake, Srinagar, Jammu and Kashmir, India	Flooding

Recommendations for implementation:

- Pilot testing modular version of floating wetlands in small artificial waterbodies.
- Investigating riverine island integration practice.
- Create support networks, platforms for knowledge exchange and offer technical assistance for successful implementation.

Nature of Response
Information and Advocacy

Floating gardens Farming Techniques:

- Introduction of Piyach Weed: Once the site for a raad (floating garden) is identified, a weed called piyach is introduced into the area. This weed serves as a foundation for the floating garden.
- Formation of the Raad: Over a period of 2-3 years, the piyach weed's stems grow and penetrate around 2-3 feet into the lake bed, which is typically 5-6 feet deep.
- Lowering of the Raad Liven: Large pincer made up of

Nature of Response
Innovation and Social Enterprise

two planks, each 3 feet in width, is lowered into the soft sediment to start the process of raising the floating garden.

- Severing and Floating of the Lake Bed: A 2 feet thick slab of soil held together by the piyach weed is manually severed from the bottom of the lake.

Outcomes:

- Unique opportunity for cultivating diverse plant species, including ornamental flowers and vegetables.
- Organic materials promote sustainability and minimize environmental impact.
- Conserving fragile ecosystems through natural filters, improving water quality and food security.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
37	Parambu System of Kerala	Kerala, India	Erosion, Heat waves

Recommendations for implementation:

- Formalizing land use planning initiative at master plan level for construction in floodplain zones, integrating with riparian buffer.
- Preparing a database of the built structures with backyards on area basis that may be utilised for this practice.

Nature of Response
Information and Advocacy

Parambu System:

- Dividing agricultural land into small, fragmented plots called “parambus” owned by farmers.
- They choose traditional paddy varieties adapted to local agro-climatic conditions and possess genetic diversity.
- Organic farming techniques are used, minimizing agrochemical use and promoting natural inputs like manure and compost.
- Controlled irrigation methods are employed to optimize water usage and maintain balance in the fields.

Nature of Response
Innovation and Social Enterprise

Parambu System types:

- Mature Parambu - a natural forest providing essential services like food, medicine, fuel, and timber.
- Smaller micro-Parambu - Found in urban households and shared open spaces. As agricultural, pastoral, and forestry activities are integrated, the system enhances, creating new niches and restarting the succession cycle.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
38	Wastewater Bheris of Kolkata	East Kolkata, West Bengal, India	Erosion, Heatwaves, Flooding

Recommendations for implementation:

- Preparing a spatial baseline and database of the natural hydrological connectivity and infrastructure in the city at a masterplan level.
- Identifying low lying depressions or wetland areas adjacent to sewage outflow points in the city.
- Involvement of local stakeholders and communities in planning, decision-making and M&E mechanism.

Nature of Response
Information and Advocacy

Waste recycling in the EKW involves three principal resource recovery practices, Sewage-fed fisheries:

- The wastewater of Kolkata flows through underground sewers to pumping stations in the eastern fringe of the city and is then pumped into open dry-weather-flow channel.
- Around 254 bheris receive the incoming sewage water that undergoes a process called bioremediation.
- Organic sewage matter along with sunlight cause the growth of planktons, which acts as fish feed while also helping to purify the water received.
- Sufficient oxygenation is produced to allow for natural elimination of pathogen/ fecal coliform.
- The output water is then utilised to grow vegetables in adjoining fields. Paddy-cultivation by utilizing fish pond effluents: Treated water from fish ponds are used as Irrigation water Farming of vegetables using organic waste as fertilizer : Bio-degradable solid waste is used as fertiliser for cultivation

Outputs:

- Kolkata saves ₹2.2 crores annually on sewage water purification by purifying 1,000 mm litres daily, reducing transportation costs and reducing costs by selling fish in local markets.
- Approx. 40% - 50% of the city's vegetables and 33% of fish requirements are met.
- Solace from pollution by acting as carbon sink; locking over 60% carbon from the input wastewater.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
39	Akkadi Saalu of Karnataka	Karnataka, India	Drought, Increasing temperature

Recommendations for implementation:

- Collaboration with the local farming communities and stakeholders to incorporate this practice within their lands.
- Preparing a database of the urban open spaces such as wastelands for exploring the efficiency and increase innovation of the practice.

Nature of Response
Information and Advocacy

Akkadi Saalu: Aims at water conservation and soil protection

- Promotes crops growing for two agricultural seasons – monsoon (kharif) and winter (rabi).
- Equal focus on food and fodder.
- Intercropping native seeds with crops with varying growing periods
- Using earthworms and other soil organisms to create preferential pathways.
- Selection of plants based on their rooting systems, filtration, and moisture distribution.
- Emphasis on high soil organic carbon and moisture.
- Preferred for 1 acre plots and is suitable for local conditions.
- Usage of trap crops and Bird attractors, to attract unwanted pests - reduce impact on main crops

Techniques to increase the organic matter in soil:

- Sowing variety of seeds before pre-monsoons, turning the soil post germination and eliminating weeds.
- Turning of soil, post-kharif, mulching the crop residue and sowing 4-5 types of seeds.
- Post kharif harvest, the soil is turned over, and the crop residue is mulched, and the field is sown again with four or five types of seeds thus ensuring that benefits accrue at different times.
- The field is covered with crops for almost 8 months of the year, relying entirely on soil moisture with no supplementary irrigation.
- The discarded crop residue is used as manure for the main crops grown in the next season.
- The constant soil mulching ensures that organic matter is conserved and soil is nutrient-rich

Nature of Response
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Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
40	Melting Snow and Rivers in Flood	Rwenzori and West Nile region of Uganda	Rapid glacial melt and extreme floods

The 'Melting Snow and Rivers in Flood' project aims to document cultural heritage of the Rwenzori glaciers, focusing on Wang Lei, a sacred site where Adamic figures Nyipir and Nyabongo formed the Alur and Acholi peoples. The project aims to preserve Wang Lei, a sacred site where Adamic figures Nyipir and Nyabongo parted ways, and to build bridges between the Alur and Acholi peoples. The ground-breaking ceremony saw Acholi chiefs and Alur leaders pledge to work together to protect this cultural site.

Impact:
Heritage sector training has led to community leaders adopting site management plans, highlighting the importance of heritage and climate change risks. Wang-Lei, a significant heritage site for Luo people, has been officially recognized and celebrated annually as Wang-Lei day. A Royal Announcement by the King of the Alur has also recognized Wang-Lei as a cultural site. A project-sharing event in

Nature of Response
Demonstration Projects

Kampala attracted policy-makers and influencers, with a government representative pledged to support cultural preservation and climate action.

The Cultural Protection Fund (CPF) promotes a people-centred approach to Cultural Protection, fostering institutional partnerships through a global network and cultural relations approach. UK organizations lead half of CPF projects, promoting international knowledge exchange, best practices sharing, and influence on heritage protection processes and policies. CPF is connected to a wider network of funders and agencies, utilizing research and intelligence to create better conditions for heritage protection and enhance understanding of its positive impact on individuals and societies.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
41	Golconda Fort	Hyderabad, India	Flooding

Game:

- A game by and for kids entitled 'Climate Action by Hyderabad Children.'
- Participants are encouraged to learn good 'green deeds,' and to get involved in climate action.
- The entire Game including the game board and cards are based on the local heritage.
- Gamers are encouraged to embrace sustainable building materials and to practice the 4 Rs (Reduce, reuse, recycle and repurpose) in daily life – including working to Save Built Heritage and to stand against demolition of existing buildings.
- The game helps to create awareness among different age groups about climate change and empowers kids to gear up for climate action.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
42	Denso Hall Rahguzar (Walking Street) Eco Enclave	Karachi city's historic core	Pollution

Denso Hall Rahguzar (Walking Street) Eco Enclave Greenhouse gas reduction and climate adaptation through women-led sustainable development using tangible and intangible heritage.

Techniques to reduce GHGs and promote conservation of heritage:

- 1,50,000 terracotta cobbles have been installed, reducing flooding through porous paving while promoting an appreciation of hand-crafted items as opposed to machine made concrete materials and serving as a

Nature of Response
Demonstration Projects

source of livelihoods that has spawned other low carbon terracotta and glazed tile creative industries.

- Over 600 trees have been planted, helping to reduce pollution, promote biodiversity (butterflies, birds, beehives) and prevention of urban heat island. 3. Use and reuse of existing urban landscapes, reducing vehicular traffic, and avoiding new cement and steel in favour of zero carbon lime, earth and bamboo.

Participatory measures:
Beggars, mostly women - trained at the nearby Historical Monuments at Makli, Thatta World Heritage Property in the ancient craft of fabricating low- carbon terracotta cobbles for pavements.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
43	Netherland's flood management is a climate adaption model for the world	Netherland	Increased rain, Sea level rise

A model coastal city for climate adaptation - De Starrt district is at a higher elevation than the rest of the city, which makes an ideal evacuation site. The city plan to build sustainable housing, flexible spaces, and a public transportation system to help evacuate people, especially the vulnerable members of the community. The Delta Program in Netherland focuses on flood risk management using dams, sluice gates, storm surge barriers and dikes in collaboration with experts and authorities. It reintroduces the 'wide green dike' as a nature-based flood prevention solution, integrating climate adaptation, nature conservation, and expert collaboration. 'wide green dike' is a historical design that only uses natural materials, such as clay covered with grass, and has a mildly sloping seaward face that merges smoothly into the adjacent salt marsh. In 2016, Netherland hosted the Adaptation Future 2016 event, featuring the Dordt flood management walking tour. The city built dikes and stop logs to manage water, ensuring proper functioning during floods.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
44	Ark for Iraq: What can the Vernacular Maritime and Craft Heritage of Iraq Teach Us about the Climate Crisis?	Iraq	Drought, Flooding

Safina Projects aims to address Iraq's crisis through an Ark-based gathering, focusing on re-connecting the Iraqi diaspora community, preserving cultural heritage, and addressing conflict, climate change, and water resource shortages. The project aims to gather remains of Iraqi culture for future generations, preserving the country's rich watercraft and maritime heritage.

Nature of Response
Information and Advocacy

Boats of the Tigris and Euphrates:
Boats, a craft tradition in the Tigris-Euphrates river system, have been around since ancient times. Made from locally harvested materials, they are shaped by their place of origin and are used in various activities. However, decades of conflict and trauma have threatened these ancient crafts. Recovering the art of making traditional boats can preserve Iraqi cultural heritage and promote sustainable tourism, leisure, and sporting uses.

Documenting and revitalising endangered watercraft:
Safina Projects is a project involving boat builders from the region to reconstruct four types of traditional boats. The project uses archival and archaeological sources, oral history interviews, and fieldwork opportunities to fill gaps in knowledge and explore the role of boats in the region's cultural and social life. The boat flotilla will travel down the Euphrates River from Hilla to Basra, reconnecting local people with their heritage and creating a unique fieldwork opportunity for academic specialists. The boat reconstructions, river expedition, and oral histories will be documented through video, audio, photographic, and written records, which will be shared locally and internationally through a virtual museum and digital archive.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
45	Vernacular Infrastructure Heritage as a Key to Building Climate-Resilient and Liveable Countryside	Laochi, Guanzhong region, Shaanxi Province, China	Drought, Flooding

Laochi is a practice that integrates vernacular infrastructure heritage and traditional construction and water management knowledge into climate action. This approach highlights the importance of rural knowledge and heritage in climate action, demonstrating the importance of culture-nature connections and fostering human-nature harmony. Laochi serves as a heritage public space for building a cohesive community for collective climate action.

Nature of Response
Information and Advocacy

Laochi revitalization in Meixian County has integrated traditional construction techniques with modern techniques, focusing on landscape regeneration, water management, ecological, and sociocultural functions. This approach improves rural living conditions and quality of life, generating both ecological and social benefits. The revitalization is a place-based solution that exemplifies how culture and nature can be integrated in a new form while serving new social needs. It also demonstrates the integration and complementarity between traditional and modern techniques, restoring the continuity of rural landscapes. This localized concept demonstrates the Beautiful Countryside Construction, focusing on the diversity, livability, and resilience of rapidly changing rural landscapes.

Nature of Response
Demonstration Projects

Shortcomings:
The reconstructed laochi has some shortcomings in revegetation, community involvement, and accessibility. The natural landscape is not robust, with small planting density of shade trees. Destructive construction, limited local participation in construction and planning, and asymmetry between construction content and actual needs may hinder the reconstructed laochi's sociocultural functions. Additionally, the accessibility of the laochi needs improvement, and strengthened protective measures may prevent villagers from becoming hydrophilic.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
46	Green Heritage: Culture and Climate in the Sahel (Sudan)	Sahel, Sudan	Flooding

The WSCM project has aimed to breathe new life into local museums in Western Sudan by transforming them into community hubs – for gathering, learning, sharing, and growing together.

Nature of Response
Information and Advocacy

Three museums from Sudan, linked to nomadic, trade, and pilgrimage routes, were revitalized through cooperation between local and international experts. The project restored historic buildings, conserved collections, improved education, and documented the living heritage of the area in 52 short films. The museums have become cultural and community hubs, offering facilities like libraries, children's centres, and cafeterias. These museums have also become popular celebration spaces. The project aims to build capacity at various levels, including historic building restoration, conservation management, new facilities, media archives, engagement with local communities, and sustainable management strategies. It involves hands-on training workshops and specialist support for capital aspects. The project reopened the abandoned Darfur museum after a decade of conflict with a major research project, showcasing the intangible heritage of all five Darfur states.

Nature of Response
Demonstration Projects

The project's success has led to three phases:

- Phase I, funded by the British Council, which funded a flood wall, an education centre, and a community tent in Nyala Museum.
- Phase II also involved Aliph Fund grants for security and exhibition works, funding 60 state-of-the-art museum cases and strengthening historic buildings.
- Phase III involved an innovative Green Heritage Programme for education, addressing climate change's impact on communities in Sudan and its tangible and intangible heritage.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
47	Climate change adaptation and mitigation in Lamu Old Town	Kenya	Sea level rise

Climate change adaptation:
Monitoring of the periodic flooding of the seafront street:
The site manager continues to monitor the volume of water annually.

Nature of Response
Information and Advocacy

Climate change adaptation :
Protection of native mangroves:
The mangrove forests provide natural protection for the town against advancing waves and possible tsunamis.

Nature of Response
Demonstration Projects

Climate change adaptation:
Engaging local communities in documentation and mapping of indigenous knowledge:
Traditional knowledge systems help build resilience towards disasters and also provides practical, effective solutions for identification, response, and recovery from the effects of adverse weather. In January 2022, the Kenyan National Commission for UNESCO conducted a community empowerment workshop with the support of the UNESCO Participation Programme. Enabling youth to identify and document this body of knowledge ensures its continuity and widespread use by current and future generations.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
48	Sukur cultural Landscape	Nigeria	Drought, Temperature trend (air and/ or water), Storm intensity and frequency

Climate vulnerability index Workshop:
CVI assesses climate change impacts on World Heritage properties, considering OUV and community, using a systematic and rapid assessment tool. Workshop results show potential changes in property values and Sukur community's values may not significantly impact the economy, society, or culture over the next 30 years.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
49	Zai pit system	Burkina Faso	Drought and Desertification Flood

Zai Pit system:

- Dug holes excavated in grids, with a diameter of 15-20 cm and a depth of 10-15 cm or more, filled with manure.
- They are spaced 70 to 80 cm apart, resulting in around 10,000 pits per ha.
- Staggered rows of holes are dug perpendicularly to the slope.
- The excavated earth is formed into a small ridge down slope of the pit for maximum back capture of rainfall and runoff.
- Manure is added to each pit, though its availability is sometimes a problem.
- The improved infiltration and increased nutrient availability brings degraded land into cultivation.
- This organic matter attracts termites, which play a crucial role in improving soil structure.
- Row crops are then planted in the pits which are able to hold water in excess of 500% of the water holding capacity of the soil.

Benefits:

- They guarantee soil upkeep, soil erosion control, and water preservation, their use has been found to reduce the consequences of droughts.
- This method has been utilized by farmers around the world to fight land degradation and restore soil fertility.
- Zai pits could improve nutrient usage efficiency, agronomic efficiency, and pearl millet crop output.
- Zai pit reduces runoff by increasing infiltration through creating and enhancing depressional water storage and reducing erosion.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
50	Vineyards of Lanzarote	Lanzarote	Volcanic activity

La Geria, a major player in the grape harvest in Lanzarote, is a national park located atop the lava flow from Timanfaya, where the black of the ash contrasts with the green of the vines. A protected natural landscape and a balanced ecosystem sustained by a family tradition of viticulture. Farmers discovered that volcanic rock, picon, effectively absorbs moisture, enabling a unique dry cultivation method called 'enarenado' in Lanzarote. However, this method requires handwork, making vine cultivation a laborious process. The charcoal layer is infertile, however impermeable, retains the ambient humidity, preventing evaporation during the day also trapping humidity from oceanic winds and insulating the roots of the vine.

Nature of Response
Demonstration Projects

Two Cultivation methods:

- Pit system - The viticulturist digs a pit in the surface of the charcoal (small volcanic rocks) to access the topsoil beneath, and plant one to three vines. These pits are protected from the wind by semi-circular stone walls.

Nature of Response
Innovation and Social Enterprise

- Trench system - Trenches are dug, the protective walls are linear, allowing for a higher density of planting Each single vine is planted at the base of a roughly three-foot-deep pit about four to five metres wide and surrounded by semi-circular stone-walls called ‘zocos’. The pit protects the plant from strong winds and retains moisture in volcanic soil, drawing dampness from occasional clouds, ensuring sufficient water for flourishing even without rainfall.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
52	Traditional Oases agriculture in M’Zab Valley	Algeria	Flooding, Drought

Workshops:
On-site workshops trained young artisans in historic building maintenance using local materials, collaborating with cultural associations and professional training programs.

Nature of Response
Information and Advocacy

Traditional water management systems include both tangible and intangible components:

- A community organisation manages the channels and infrastructure that control water flow.
- Every 25 years, traditional settlements were designed to prevent damage by flooding. floodable areas near the river were occupied only by temporary structures and not by dwellings.

Nature of Response
Innovation and Social Enterprise

The abandonment of this planning practice has led to increased vulnerability to flooding. The water circularity system:

- Collecting and then diverting the water from rare flash floods to the ancient oases through channels (seguia).
- Part of the derived water is used to irrigate the date palm gardens on the basis of water rights.
- These rights are proportional to the number of palm trees of each family.
- The other part of the water is routed to wells, which serve to artificially recharge the water table.
- These hydraulic structures play a dual function.
- During of the intense and ephemeral flood periods, they allow to recharge of the water table.
- During the dry period, the water stored in the underground aquifer is then pumped for irrigation.
- Storing floodwater in underground aquifers allows to ensure the availability of groundwater for about 3 years.

Office for the Protection and Promotion of the M’Zab Valley is a local management institution that, under the supervision of the Ministry of Culture - promotes heritage conservation, develop awareness-raising and education programmes, and promote local communities’ involvement in its preservation

Nature of Response
Policy Regulations and Statutory Measures

and management. The Office offers free online technical guides and educational materials in French and Arabic, aimed at raising cultural heritage values and guiding residents in building maintenance and restoration.

The educational materials produced include:

- Guides to façade maintenance and restoration for traditional buildings.
- Information material about heritage protection laws.
- Learning materials for traditional construction techniques such as stone paving and lime plastering.
- Guide to El-Orf, the traditional construction management system in the towns and palm groves in the M'Zab Valley which contributes to climate knowledge.
- Brochures on traditional water management systems and wells.
- Guides for stone and earthen construction and lime washing.
- Inventories of historic sites and monuments, tangible and intangible heritage.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
53	A Citadel Against the Wind: The Possible Solutions to Rescue Qaitbay Citadel from the Impacts of Climate Change	Alexandria Governorate, Egypt	Rising sea levels, Soil salinization, Heavy rains, Sand storrms

Tens of thousands of concrete blocks and reinforcements have been dropped into the sea to keep the waves at bay and prevent coastal erosion. The city is also widening its beaches by dropping hundreds of tonnes of sand into the sea in another bid to mitigate erosion. The authorities implemented massive concrete masses to prevent seawater from reaching the walls and breaking waves, causing deterioration of materials. This solution was applied in both the immediate vicinity and a wider circle around the site, providing double protection. However, it also created a negative visual impact, as the concrete masses changed the architectural perception of the façades due to their volume, colour, and height. This has resulted in a different look and feel on each side of the Citadel. Despite the negative impact, Quitbaiy Citadel remains standing, thanks to the engineering solution. Organized geometrical shape solutions and underwater solutions could be more suitable for reducing ugly masses above the water level.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
54	The MOVIDA Project Towards a Better Evaluation of Flood Risk Mitigation Strategies	Po river district, Italy	Flooding, Drought

The objective of the project is to provide an Information System able to perform an analytical evaluation and mapping of expected damage, overcoming the limitations of previous maps where the evaluation of risk remained highly qualitative and subjective.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
56	Community Engagement with Climate and Culture in an Area of Multiple Deprivation	Great Yarmouth, East England	Fluvial and coastal flooding, Erosion

In Great Yarmouth, children are the most affected by climate change, and disadvantaged urban coastal areas like Llanelli and Great Yarmouth may face tensions between economic regeneration and adaptation. The greatest economic opportunities are found in areas at the highest risk of sea level rise, storm surges, and coastal flooding. Some case-study participants' communications focused on mitigation, such as recycling, while others were unaware of the distinction between renewable energy mitigation and adaptation measures. Communication of climate change impacts is often dominated by negative messages. There was generally a poor level of awareness and understanding of climate change exhibited by interviewees and focus groups. Participants in the focus groups highlighted significant uncertainty about whether recent weather-related events could be attributed to climate change. They were also unaware of any ongoing adaptation activities in their local area. To date, the information they had received about climate change was in relation to mitigation activities, including information about home insulation and energy efficiency. Residents consulted identified challenges to adaptation, including apathy towards climate change, mistrust from mixed messages, low priority given to climate change compared to immediate concerns, and low understanding of the connection between mitigation measures like energy saving and renewable energy installations and climate change adaptation measures in their town.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
57	George Town, Penang	Malaysia	Heavy rainfall, High tides

Public Awareness Campaigns:
Public capacity to react calmly during a disaster, AED Training. Posters in 4 different languages to expand the awareness campaign.

Women and Girls Programme (part of PNBACP):
Aims to reduce gender vulnerability asymmetry and strengthen capacity within existing agencies. (Awareness, knowledge, building capacity, empowerment)

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
58	Ancient town walls of Tuscany	Tuscany, Italy	Heavy rainfall

- Agreement on the necessity to ensure systematic, condition and significance- based conservation, repair and maintenance.
- Creating decision support system for the Tuscan town walls based on multidisciplinary and cross - scalar knowledge of all regional assets.
- Transfer and sharing of data between different stakeholders (regional to local) - for conception and implementation of novel tools for conservation process
- Periodical monitoring, scheduled maintenance, integral condition assessment.
- Categorisation of hazards based on speed of onset helps to address short and long term effects of hazardous events

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
59	Rotterdam	Netherlands	Heat stress,Sea level rise, Heavy rainfall, Drought

Polder roof project proposes the transformation of the roof of the 'Katshoek' parking garage into an attractive green roof that stores and reuses rainwater from the nearby buildings in a controlled way for urban agriculture. It will also become a place for everyday recreation and outdoor events

Nature of Response
Demonstration Projects

- Combining urban transformation with innovative resiliency measures based on the Rotterdam Adaptation Strategy. The process included a deep analysis of the district climate conditions and a series of workshops where ZoHo citizens and professionals were working together to define specific strategies and a shared

Nature of Response
Innovation and Social Enterprise

perspective.

- ZoHo Rainbarel is a participative water storage system. It is designed by Studio Bas Sala to be an icon for ZoHo and a smart solution for rain water reuse and storage at the same time.

Water Storage capacity:
The 'sponge function' of the city will be restored by taking measures to capture and store rainwater where it falls and to delay drainage. These measures include green roofs and façades, less paving and more vegetation in public streets and neighbourhoods, water squares and infiltration zones as infrastructure.

Tidal park programme:
Wetland-related ecosystem services are being restored: water storage, water flow regulation, and water filtration

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
60	Santo Domingo Tehuantepec	Mexico	Earthquake, Frequent cyclones, Heavy rainfall

- Risk Mapping and vulnerability assessments.
- Collaboration with local stakeholders.
- Gathering of local information, threat and vulnerabilities. The data compared with quantitative data from official sources.
- Stakeholder map created - institutional, private and community. (Experienced architect in local heritage, local chronicler, elderly community members).
- Use of GIS files, from CENAPRED's Risk Atlas.
- Three day workshop on Participatory mapping of risks for cultural heritage. (Disaster Imagination Game Methodology)

Nature of Response
Innovation and Social Enterprise

- Pilot project to improve protection of heritage assets in 16th century convent building.
- 2017 - Participatory Disaster Risk Management Plan (DRM) - primary goal.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
61	Stepwells	Rajasthan, India	Overflowing, Flooding

Successful rehabilitation of wells encouraged similar projects and raising awareness about traditional water harvesting structures.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
62	Budj Bim Cultural Landscape	Australia	Bushfire

National Bushfire and Climate Summit 2020, the Australian Bushfire and Climate Plan

- Create an Indigenous-led National Cultural Fire Strategy to complement and inform fuel management by agencies
- Increase the affordability and uptake of insurance for properties in disaster prone areas, a key factor in community resilience
- Review and update Australian building standards in bushfire-prone areas

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
63	Venice	Italy	Flooding, Sea Level Rise

Promote public debates and awareness initiatives with different stakeholders to raise awareness of the danger of plastic pollution, encouraging the uptake of good practices along with individual and collective actions. (By Venice Lagoon Plastic Free)

Nature of Response
Information and Advocacy

- The dam system MOSE – short for Modulo Sperimentale Elettromeccanico, or Experimental Electromechanical Model. A series of retractable barriers have been placed along the entrances to the Venetian lagoon. When high tides and storm surges are forecast, the barriers can be closed, temporarily sealing off the lagoon from the Adriatic Sea. (Debated topic).
- Venice Water Authority and Venice Local Authority are raising quaysides and paving in the city in order to protect built-up areas in the lagoon from medium high tides.
- Operate decentralised large scale clean-ups in the city of Venice, its lagoon, including nearby mainland towns and cities.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
64	Rock Art	Australia	Sea level rise, Intense cyclone, Storm surges, Frequent rainfall

- Community outreach and awareness programs. Community outreach programs could include much better two - way documentation of the condition of and threat to rock art sites.
- Expanding programs to include climate change and ensuring even coverage of programs across communities

Nature of Response
Demonstration Projects

with good coordination.

- Coordinated training curriculum - active two way learning partnerships

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
65	Princeville	North Carolina, USA	Flooding

Princeville Elementary Water Management Project Based on this town-approved blueprint, CTNC began assembling stages of work that could be funded and implemented soon. A National Fish and Wildlife Foundation/ Wells Fargo Resilient Communities grant launched the first phase, focused on where its elementary school and adjacent housing form the town's hub. Hiring local youth, Conservation Corps NC crews created rain gardens around the school and then a nature trail from the school toward the town's history museum. CTNC also provided an AmeriCorps member to support the historical connections between the town's natural and cultural history.

Justice for Climate Project:
This project was centred at Heritage Park, where Conservation Corps NC youth built out trails, rain gardens, and plots for benches and exercise equipment. CTNC and our NC State partners are coordinating with the town on implementing this phase of the Flood print to include trees along the town's main street and additional wetlands and gardens in bought-out properties.

Nature of Response
Demonstration Projects

- Buoyant foundation retrofits of Princeville's important historic and cultural landmarks would provide visually-unobtrusive protection from flood damage, and prevent the forced relocation of this culturally vibrant and historically significant African-American community. After consultation with the community and town officials, the Buoyant Foundation Project has proposed that the Mt. Zion Primitive Baptist Church, several significant historic homes, and the Princeville Heritage Museum be retrofitted with amphibious foundations to prevent future flood damage to the town's important markers of cultural heritage.
- A retrofitted buoyant foundation has three basic components: the buoyancy elements that displace water to cause the building to float above the water's surface, the vertical guidance posts (VGPs) that restrict horizontal movement so that the building can move up and down but not float away, and a new structural sub frame installed beneath the existing floor framing system to support and stabilize the building while connecting it to the buoyancy elements and vertical guidance posts

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
66	Fransworth House	Illinois	Flooding

- The BFP design competition entry, “Fibious Farnsworth“, introduced an amphibious foundation system to allow the Farnsworth House to float in extreme flood scenarios, and then lower it to its original position as the water receded. This entirely passive strategy would require no human intervention during a flood.
- The amphibious design replaces the house’s conventional concrete footings with sleeves that accommodate sliding vertical guidance posts. These posts are extensions of the house’s existing wide-flange columns, reaching 13-15 feet (4.0-4.6m) below the surface of the ground. They allow the house to rise and fall during a flood while restricting its lateral movement

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
67	Puerto Rico’s Cultural Heritage	Unincorporated territory of the United States	Sea level rise, Sea surface temperature

The National Park Service (NPS) 2016 report, Cultural Resources Climate Change Strategy, listing recommended directions for actions to best preserve and learn from cultural resources in the context of climate change. By combining current technology with engineering from the 18th Century, the San Juan National Historic Site restored seven historical water cisterns in two fortifications. These cisterns have a combined total capacity of 9,32,000 gallons for rainwater storage, and are currently used to supply non-potable water for park utilities. This intervention reduces the Parks’ vulnerability to drought by reducing its dependency on the island-wide water service.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
68	Paddy Cultivation, Kandy	Sri Lanka	Rise in land and sea surface temperature, Sea level raising Changes and the amount and pattern of precipitation

The study suggests that it is essential to formulate communication strategies and conduct climate smart-extension and training programs to increase awareness, change attitudes and, motivate farmers towards important adaptation strategies, especially the promising technologies that have slow diffusion rates.

Nature of Response
Information and Advocacy

Changing the planting time Crop rotation Crop diversification Rain water harvesting Soil moisture conservation Use of drought resistant / flood resistant varieties

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
69	Heritage Sites of Wales	United Kingdom	Warmer temperature Rising sea level Changing rainfall patterns

- Peatland restoration can improve carbon sequestration, as well as protecting buried archaeology against the harmful effects of exposure, drying out and wildfires.
- Keeping historic assets in a good state of repair through proactive maintenance and sensitive modification, for example, improving drainage around a historic building, is a simple and cost-effective way of increasing their resilience to extreme weather events and increased precipitation

Nature of Response
Innovation and Social Enterprise

The Historic Environment and Climate Change in Wales Sector Adaptation Plan (SAP):

- Increase the knowledge and understanding of the threats and opportunities for the historic environment in Wales from changing weather and climate in the short, medium and long term
- Increase the capacity by developing the awareness, skills and tools to manage the impacts of climate change on the historic environment in Wales.
- Build the resilience of the historic environment in Wales by taking action to adapt and respond to the risks, reduce vulnerability and maximise the benefits.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
70	Ayutthaya City	Thailand	Extreme heat Rainfall

In Ayutthaya city, the government use the community based participatory. They educate and prepare the people to respond the flood. Water level information help in decision making for flood prevention

Nature of Response
Information and Advocacy

Community became the unit, and people can take care themselves and help other people. And the water supply continues work and transfer water to community. After flood, local government involved people to clean up their houses and community. Increase the community and stakeholders to participate in flood management.

Nature of Response
Innovation and Social Enterprise

Nature based solutions:
Implementation based on the analysis of current land

use, terrain elevations and features, drainage system characteristics, availability of open areas and preferences from local and regional stakeholders. From the analysis of such data the following surface areas were identified in GIS: flat roofs, parking lots, low traffic roads, parks and playfields, transportation corridors and other open green spaces. These surfaces provide suitable areas for a range of small-scale NBS (e.g., green roofs, bio-retention, pervious/ porous pavements, infiltration trenches, swales, etc.). Idea of constructing a network of ponds and/or enlarging some of the existing ponds in the south-west area of the island was separately presented and discussed with stakeholders. The goal would be to create the flood detention area as a multifunctional space with different purposes such as flood control, recreation, art and cultural activities, rice farms and floating markets.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
71	Santo Domingo	Dominican Republic	Sea level rise

Climate Adaptation Activity:
To build climate change resilience by promoting water security and sustainable livelihoods through reduced pressures on key water sources, enhanced watershed governance, and strengthened adaptation practices of vulnerable communities. This Activity will support locally-led development and catalyse private sector engagement to promote ownership and sustainability of climate adaptation actions, and their mitigation co-benefits, in the northern border region between the Dominican Republic and Haiti.

Climate Adaptation Measures Project:

- Promotion and consolidation of the National Coalition of Cities Resilient to Climate Change.
- Creation of municipal climate change adaptation policies and strategies that help cities become more resilient to the stress of climate change.
- Strengthened local Committees for Prevention, Mitigation and Response and Risk Reduction Plans developed with the participation of persons with disabilities and LGBTI communities.
- Implementation of small-scale green infrastructure and enhancement of water quality through the improvement of small-scale water supply and treatment systems.
- Community education programs for solid waste management, including recycling programs.
- Establish two certificate programs in Municipal Management for Climate Change Adaptation and Sustainable Climate Risk Reduction Strategies.
- Develop municipality-specific ordinances that increase resiliency to the effects of climate change within the communities.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
72	Cartagena	Columbia	Sea level rise

Communicate and share knowledge. A variety of communication tools are allowing knowledge to be shared to a number of key stakeholder groups, empowering them with the necessary information in a relevant format to tackle adaptation in their fields. Targeted communication tools are vital to the short-and long-term success of the project.

Nature of Response
Information and Advocacy

- Integrating adaptation to climate change into local planning and sectoral management in Catagena.
- Guidelines for adaptation to Climate Change in Cartagena de Indias' - prepared with extensive vulnerability assessment.
- Involvement of officials and experts, 4 entry points into local policy. Land-use and zoning policy offer innovative and cost-effective entry points for introducing results into municipal policy.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
73	Dubrovnik (Ideal Project)	Croatia	Rising air temperatures, Changes in rainfall, Rising average sea level and ocean temperatures

Mobile Barrier:
Under normal tidal conditions, the gates are full of water and rest in their housing structures. When a high tide is forecast, compressed air is introduced into the gates to empty them of water, causing them to rotate around the axis of the hinges and rise up until they emerge above the water to stop the tide from entering Port Gruž. When the tide drops, the gates are filled with water again and return to their housing.

Monitoring system:
Monitoring system allow us to consider how the environmental variables vary based on what has been achieved. Moreover, the monitoring phases allow evaluating, from a quantitative point of view, the effectiveness of the single-action concerning the chosen impacts, whose territory is to be adapted to the negative effects.

Nature of Response
Innovation and Social Enterprise

Planned Loss

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
03	Great Barrier Reef	Australia	Coral bleaching

A Great Barrier Reef Climate Change Vulnerability Assessment to provide a comprehensive analysis of the observed and projected impacts of climate change on all parts of the Great Barrier Reef's social and ecological system.

Great Barrier Reef Marine Park Authority and fisheries managers steps to ensure the ecologically sustainable use of resources within the Great Barrier Reef Marine Park.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
07	Timbuktu	Mali	Desertification

The site of Timbuktu has three fundamental management tools:

- Revitalization and Safeguarding Plan of the Old Town (2005)
- Strategic Sanitary Plan (2005)
- Conservation and Management Plan (2006-2010)

Management of the property:
Practical functioning modalities, initiated in consultation with the World Heritage Centre: the Town Planning Regulation and the Conservation Manual.

- Long-term objectives - extension of the buffer zone by approximately 500 m to assure the protection of the inscribed property
- Development of the historic square of Sankore to integrate corrective measures proposed by the Committee at its 33rd session and by the reactive monitoring mission of March 2010
- Extension of the inscribed property to include the entire Timbuktu Medina
- Development of an integrated conservation and sustainable and harmonious management project for the site, in the wider framework of development of the urban commune and in close cooperation with the elected members of the Territorial Communities of Timbuktu and the development partners
- Active conservation of the mausoleums

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
08	Cape Floral region , Protected areas	South Africa	Increase in temperature

Monitoring and risk assessment:
Bioclimatic modelling offers risk assessment, but knowledge gaps need to be addressed through experimental and observational studies, including monitoring. Screening invasive species and detecting absent ones could prevent future invasions in the Fynbos biome.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
09	WHC Climate Change Adaptation and Mitigation: Paris Climate Protection Plan	Paris	High energy consumption, Heat wave, Flooding

Sustainable Tourism:
The Paris Climate Protection Plan aims to reduce tourism's environmental impacts by improving inventories, raising awareness, promoting less polluting transport, reducing bus environmental impacts, extending public transport, incorporating the plan into city policies, and developing sustainable development measures.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
10	WHC Climate Change Adaptation and Mitigation: Tunis	Tunis, Tunisia, North Africa	Ground instability/ seismicity, Tsunami marine submersion, Coastal erosion, Flooding, Water Scarcity

Actions against multiple hazard risks:
Institutional coordination for reducing natural hazards and climate change adaptation, advanced planning, regulatory implementation, insurance, zoning, ecological framework, urban risk reduction, and environmental approach in large urban development projects.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
11	WHC Climate Change Adaptation and Mitigation: Edinburgh	Edinburgh, Scotland	Fire Flooding

- City of Edinburgh Council has prepared an information catalogue which outline the methods to reduce risk of fire, fire safety management and suppression and detection systems.
- Council works with Fire Rescue services to manage a database of historic buildings. Providing information on

Nature of Response
Information and Advocacy

the importance and value of the A listed building.

- Promoting awareness about the river
- Leith's natural, cultural and historical heritage. The "water of Leith" management plan acknowledges river's role as natural resource and World Heritage, promoting awareness of Leith's natural, cultural, and historical heritage, and identifying archaeological and cultural features.

The Old and New Towns of Edinburgh World Heritage Site Action Plan address the issue of fuel poverty and changes of energy behaviour.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
14	WHC Climate Change Adaptation and Mitigation: Quito's Climate Change Strategy	Quito, Ecuador, North America	Water shortage, Flooding, Landslide, Soil erosion

QCCS's adaptation plan focuses on ecosystems, biodiversity, drinking water, health, infrastructure, and risk management. The city is collecting data for a climate change database, vulnerability analysis, and a climate change information system.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
15	Knowledge of spatial and temporal patterns of floods, droughts, and rainfall within local communities	Cambodia	Droughts Flooding

Researchers analysed water movements and spatial impacts from Mekong's seasonal flooding, revealing that many communities' agricultural decisions were based on weather patterns. They used indicators to predict weather and harvest, linked to observations like shadows of water, lemongrass leaves, and animal behaviour. Researchers utilized data to identify additional pressure points and improve preparedness for weather-related hazards. Traditional knowledge made the analysis more relevant to communities, and crop types and varieties were adapted to fit local seasonal calendars and contribute to the regional economy. This comprehensive analysis improved understanding of how local knowledge can enhance measured data, enabling a more location-relevant narrative for risk reduction. However, this approach may be limited to sensitive areas of generic solutions.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
18	Two communities in Alaska climate induced relocation – preventing displacement	Network and Shishmaref, Alaska	Permafrost degradation, Sea level rise, Flooding, Erosion

The Shishmaref community aims to remain a rural village by relocating within traditional subsistence territory. However, federal studies and assessments have not led to any progress. A feasibility report for Ear Mountain is expected in Fall 2021, but the shrinking shoreline ice may lead to earlier hunting and gathering and reliance on imported food, increasing precarity and dependence. Indigenous peoples face obstacles in redesigning and rebuilding their communities, such as the Federal Emergency Management Agency's inability to qualify erosion as a natural hazard for funding. Relocation or migration prioritizes communal values, cultural heritage, collective goods, and the delicate balance between nature and society, preserving unity and community coherence. To engage with indigenous knowledge and communities, obstacles to adaptation must be removed, including limited capacity to implement adaptation strategies, limited access to traditional territory and resources, and limitations of existing policies, programs, and funding mechanisms.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
26	Dong Bundhs System of Assam	Baksa, Assam, India	Soil erosion, Flooding, Drought

Recommendations:
Mapping informal channels from rivers to agriculture fields to convert them into dongs, forming a Dong Bundh Committee for accountability and local knowledge. Key factors include terrain, access to water, efficient teamwork, and corporation.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
34	Apatani Cultural Landscape of Ziro	Ziro, Subansiri, Arunachal Pradesh, India	Soil erosion

Recommendations for implementation:
- Pilot testing the practice within formal campuses, building terraces situated at higher elevations across the city
- Exploring the possibility of promoting organic farming methods, maintaining traditional water management systems, and preserving native plant species
- Capacity building and cross sectoral R&D for efficient innovation of the practice.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
43	Netherland's flood management is a climate adaption model for the world	Netherland	Increased rain, Sea level rise

Valuing Water Initiative- Water to be prioritised in decision making through the application of the UN Valuing Water Principles in different water value chains and sectors.

- Principles were formulated based on this to implement Sustainable Development Goal 6, ensuring the availability of sustainable management of water and sanitation for all.
- Preparation of Valuing Water Initiative - entails having a plan on what to do when flooding occurs, among others, the city is developing an evacuation plan to move people to higher ground.

The 5 Valuing Water Principles:

- Recognize and embrace water's multiple values to different groups and interests in all decisions affecting water.
- Reconcile values and build trust – conduct all processes to reconcile values in ways that are equitable, transparent and inclusive
- Protect the sources, including watersheds, rivers, aquifers, associated ecosystems, and used water flows for current and future generations
- Educate to empower – promote education and awareness among all stakeholders about the intrinsic value of water and its essential role in all aspects of life
- Invest and innovate – ensure adequate investment in institutions, infrastructure, information and innovation to realize the many benefits derived from water and reduce risks.

Nature of Response

Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
45	Vernacular Infrastructure Heritage as a Key to Building Climate-Resilient and Liveable Countryside	Laochi, Guanzhong region, Shaanxi Province, China	Drought, Flooding

The National New Urbanization Plan (2014-2020) focuses on nature-based urbanization and differentiated urban and rural development. The "Sponge City" project in China aims to revitalize laochi in rural areas, reintroduce traditional knowledge and culture, and build public spaces based on local community needs. This approach promotes differentiated urban and rural development and provides empirical experience for the construction of "Sponge City."

Nature of Response

Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
48	Sukur cultural Landscape	Nigeria	Drought, Temperature trend (air and/or water), Storm intensity and frequency

Recommendations to Nigerian Climate Change Act from the workshop:

- Inclusion of climate change impacts and climate change adaption into heritage management planning.
- Continued engagement at state and national level to explore the intersections between local knowledge and adaptation strategies for climate change.
- The inclusion of assessments such as CVI into conservation management plans and periodic reporting at heritage sites.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
54	The MOVIDA Project Towards a Better Evaluation of Flood Risk Mitigation Strategies	Po river district, Italy	Flooding, Drought

MOVIDA uses appropriate damage assessment tools for exposed elements in the Floods Directive, addressing specific requirements such as validity, reliance on national-level standardized data, and calibration in the Italian context.

A QGIS plugin called ISYDE supports technicians in implementing tools and visualizing damage results. The tool is transferred to Regional Authorities for flood damage evaluation and mapping in Po District areas at significant risk.
MOVIDA demonstrated the balance between scientific rigor and technical improvement through close collaboration between researchers and practitioners. This led to feasible solutions and the transfer of scientific knowledge. The commitment of multiple research institutions and expertise sharing further enhanced the project. To bridge gaps between academia and technicians, an inclusive/ participatory approach in methodology definition and the transfer of methodologies into simple tools without specific expertise can be achieved through GIS technology.

The MOVIDA project, funded by the Po River District Authority, identifies cultural heritage exposed and vulnerable to floods in Italy's largest river catchment. The project increased the number of cultural heritage structures considered in the plan from 60 to 1,25,000, classifying objects based on flood hazard, exposure, and vulnerability. A spatial index of impact to cultural heritage was developed.

Nature of Response
Demonstration Projects

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
55	CARBICA-CHEN, Empowering the Caribbean Cultural Heritage	Caribbean region	Volcano eruption, Earthquake, Flooding

Strengthen members' professional competence in archival preservation, natural hazards, and information technology. Create professional solidarity between institutions and individual members through shared communication tools, exchanges of experience, and procedures. Contribute significantly to promoting archives and policymakers' consideration of archival institutions' roles and needs.

Nature of Response
Information and Advocacy

The purpose of this initiative is to strengthen relations between institutions and individuals involved in the custody, organization, and administration of archives in the Caribbean area. It aims to foster cooperation among all institutions, professional bodies, and individuals involved in these aspects. The initiative promotes measures for the preservation of documentary value and makes practical recommendations to authorities in Caribbean countries. It also studies problems related to archives preservation, encourages the description of archival material, facilitates information exchange, and promotes the public's awareness of Caribbean archives. The initiative encourages the establishment of archives and professional training for archivists in all Caribbean countries, promotes frequent use of archives, and promotes greater ease of access to archival material. Regular Caribbean Archives Conferences are held to promote mutual understanding and improve the quality and consistency of Caribbean archives. Additionally, the initiative promotes the implementation of records management programs in various media in Caribbean countries.

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
57	George Town, Penang	Malaysia	Heavy rainfall, High tides

Backup Copies of Cultural Heritage Inventory List:
Copies of heritage properties blueprint and inventory list of cultural heritage artefacts.

Emergency Response Team:
Theory and practical sessions for the community.

Urban Greening (part of PNBCAP):
Tree-lined Streets, Pocket Parks, Greening car parks, Greening built structures, Urban agriculture.

Storm water Management:
Blue-Green Corridors, Swales & Infiltration Wells, Upstream Retention Ponds.

Nature of Response
Demonstration Projects

Geographic Information System:
Map and identify the locations of fire hydrants

Effective Monitoring with technology:
952 units of CCTV cameras - monitor vehicle traffic, flash flood and public safety, 30 flood sensor devices , colour coded warming and alert system

Nature of Response
Information and Advocacy

UNESCO pilot project: Capacity Building for Disaster Risk Reduction of Heritage Cities in Southeast Asia and Small Island Developing States in the Pacific:
Workshop hosted to identify the efforts, challenges and gaps in the Disaster Risk Reduction Programme, fire and water identified as major hazards.

Disaster Risk Reduction Management Plan used during 2017 flood.

Disaster Risk Reduction Strategy of George Town:
Government and Public Sectors, wide coverage in newspaper and online media - strong branding, 10 action plans developed.

Nature-Based Climate Adaptation Programme For The Urban Area Of Penang Island (PNBCAP) - Institutional capacity will be built through a knowledge management platform, the creation of the Penang Climate Board and a public health programme.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
58	Ancient town walls of Tuscany	Tuscany, Italy	Heavy rainfall

- 140 ancient walled systems singled and mapped into regional GIS platform.
- Planned preventive conservation - identification of risk situation and systematic planning of minimally invasive intervention.
- Use of AI powered tools for semantic segmentation of 2D orthographic images.
- Ongoing research - use of remote sensing (satellite radar interferometry) for monument monitoring

Nature of Response
Innovation and Social Enterprise

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
59	Rotterdam	Netherlands	Heat stress, Sea level rise, Heavy rainfall, Drought

Rotterdam Climate Proof (2008) and the Rotterdam Climate Change Adaptation Strategy xix (2013).

- Strengthen a robust system of flood, storm water surge and sea-level rise defences.
- Adapt the urban space to combine its three functions:

Nature of Response
Innovation and Social Enterprise

'sponge' (water squares, infiltration zones and green spaces), protection (dykes and coastal protection) and damage control (evacuation routes, water- resistant buildings and floating structures).

- Increase city resilience through integrated planning.
- Foster the opportunities that climate change brings, such as strengthening the economy, improving the quality of life, and increasing biodiversity.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
60	Santo Domingo Tehuantepec	Mexico	Earthquake, Frequent cyclones, Heavy rainfall

Capacity building and training; Creation of local first response task force. Collaboration between Local authorities and community to designate public squares and evacuation areas.

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
61	Stepwells	Rajasthan, India	Overflowing, Flooding

- Groups of stepwells identified.
- Project Implementation and monitoring committees (PIMC) and Water Users Committee formed.
- Trained self-help groups (SHG) who also monitor and report to GBS.

Nature of Response
Innovation and Social Enterprise

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.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
62	Budj Bim Cultural Landscape	Australia	Bushfire

- Heritage professionals can point the need for communities to take responsibility for their cultural heritage in the face of unprecedented risk.
- Golden Rules by Climate Council of Australia. Talk about problems- local, immediate and relevant to people's lives, Outline positive vision for future- renewable energy and storage can transform electricity systems, cheap and clean power.
- Use of publications, multilingual social media graphics-

Nature of Response
Information and Advocacy

to assist people wanting to provide public advice or public statements about how climate change affects bushfires and floods.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
64	Rock Art	Australia	Sea level rise, Intense cyclone, Storm surges, Frequent rainfall

Ensuring standards are in place to record data relevant to climate change and rock art. A global approach that support local knowledge and agency.

Nature of Response
Innovation and Social Enterprise

Southern African Rock Art Project (SARAP), by Getty foundation - gathering of data for making the report.

- Getty Rock Art program identifies 8 principles that includes promotion of rock art as valuable heritage for everyone, managing and valuing heritage, safeguarding cultural rights and practices, priority to preventive and protective conservation.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
67	Puerto Rico's Cultural Heritage	Unincorporated territory of the United States	Sea level rise, Sea surface temperature

University of St Andrews/Scottish Coastal Archaeology and the Problem of Erosion (SCAPE):
A nine-step model to identify site vulnerability and develop a prioritization for intervention plan. The model collects physical data on threat parameters, such as erosion, and combines it with geographic data of cultural heritage site location, to assess which sites are most vulnerable. The model then categorizes the sites based on their type (e.g. historical, indigenous, etc.) and archaeological importance (e.g. culture, time- period, etc.). The vulnerability level, together with the group classification, determines priority levels for site intervention. This way, cultural heritage managers can begin to sort through their many at-risk sites and address them in a specific order. -Through the Scottish Coastal Heritage at Risk (SCHARP) project, SCAPE developed a mobile application for community monitoring of at-risk sites

Nature of Response
Demonstration Projects

2007 UNESCO report, Climate Change and World Heritage

- Development of vulnerability assessments that interpret climate change data for local site impacts.
- Assessing individual sites for vulnerabilities allows Puerto Rico's cultural resource managers to incorporate site-specific action into management strategies, including emergency preparedness planning, rigorous and

Nature of Response
Innovation and Social Enterprise

ongoing monitoring and maintenance and development and enhancement of traditional skills.

- Sharing knowledge on both local and regional scales. Interactions between community members of different generations are necessary to preserve cultural heritage from climate change threat.

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
68	Paddy Cultivation, Kandy	Sri Lanka	Rise in land and sea surface temperature, Sea level raising Changes and the amount and pattern of precipitation

The Food and Agricultural Organization has highlighted some important options for increasing the adaptive capacity of farming communities who face severe threats due to changing climate:

- Bear the loss – accept reductions in area or productivity.
- Share the loss – distribute the impacts of reduced water resources to share reductions in area and productivity.
- Modify the threat – at an individual level, expand farm size and benefit from economies of scale; improve water use efficiency through better technology and management.
- Prevent the effects – for example increase water and input use.
- Change use – crop change, land-use change, mix of rain fed and irrigated production.
- Research to find adaptations – improve crop productivity in higher temperatures and with greater moisture stress.
- Educate for behavioural change.

The Climate Smart Irrigated Agriculture Project (CSIAP) is implemented by the Ministry of Agriculture since 2019. The CSIAP is aiming at improving climate resilience of farmer families and productivity of irrigated agriculture in climatically vulnerable 11 districts in dry zone of Sri Lanka.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
69	Heritage Sites of Wales	United Kingdom	Warmer temperature Rising sea level Changing rainfall patterns

Sector Adaptation Plan Actions and Activities 2020
Improving baseline data. Develop standardised methodologies and assessment tools to both identify historic assets and prioritise those at risk. For example:

- Wales spatial mapping work including environment/ asset specific mapping and analysis.
- Data enhancement programmes.
- Use of soil moisture indexes to target aerial reconnaissance during dry periods

Nature of Response
Information and Advocacy

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
70	Ayutthaya City	Thailand	Extreme heat, Rainfall

- The agents provided the temporary accommodation, foods, and essential appliances to people.
- The trees or plants are responsible for holding an enormous amount of water when raining.
- Protect flood by dykes, Reduce the livelihood of flood hazard - Build water reservoir - Restore Forest and Ecosystem

Nature of Response
Demonstration Projects

Thai government has the master plan for water resources management (NESDB, 2012). This master plan provides the management of water in whole country.
Wat Chai Conservation Project:
Wat Chaiwatthanaram was deserted, looted, and damaged by floods when World Monuments Fund (WMF) began conservation work at the site in 2011, in partnership with the Fine Arts Department of Thailand. These efforts include the training and hiring of local technicians and conservators who restore and maintain this iconic structure.

Nature of Response
Policy Regulations and Statutory Measures

Case Study No.	Case Study Name	Location	Primary Hazards/ Extreme Weather Events
73	Dubrovnik (Ideal Project)	Croatia	Rising air temperatures, Changes in rainfall, Rising average sea level and ocean temperatures

Decision Support System (DSS):
It is a system that can support decision-making activities. It is an interactive system able to analyse through different criteria a set of information and support an administration in the governance process, based on the datasheets and parameters. Bus stations can also serve as information's posts with a purpose of raising public awareness of climate change and the importance of mitigation and adaptation to their consequences. Include forestry and traffic experts into the project.

Nature of Response
Information and Advocacy

Team and Organizations Profile

Team

Ms. Gurmeet S. Rai
Founder and Director, Cultural Resource Conservation Initiative (CRCI) India Pvt. Ltd.

Gurmeet S. Rai is a New Delhi-based conservation architect. She graduated from Chandigarh College of Architecture and pursued a master's in architectural conservation from SPA Delhi. Early in her career, she worked in the architectural heritage department of INTACH, gaining insights into the challenges of conservation in India. In 1996, she founded Cultural Resource Conservation Initiative (CRCI) India Pvt. Ltd., a consultancy specialising in cultural heritage conservation and management. CRCI's diverse projects encompass architectural documentation, historic building conservation planning, cultural heritage tourism, capacity building, and training. Their clientele includes government bodies, private foundations, UNESCO, Asian Development Bank and others. Gurmeet's notable projects include site management plans for Red Fort and Ellora Caves, management plans for Gobindgarh Fort, urban conservation strategies for Amritsar and Puri, conservation and urban regeneration in Kashmir, and collaboration on international projects like the visitor management plan for Lumbini, Nepal, and UNESCO's Cultural Heritage Policy for Punjab.

Prof. Jigna Desai
Center Head and Principal Researcher, Center for Heritage Conservation (CHC), CEPT Research and Development Foundation (CRDF)

Jigna Desai brings to her institute her experience in working with traditional urban environments and framing how traditional architecture may be understood, studied and transformed. Her current focus involves developing frameworks, tools, and methods to translate theoretical concepts of sustainability and conservation into practical applications while addressing the challenges of co-production of space and commodification of heritage. Jigna played a pivotal role in preparing the dossier that led to the inscription of Ahmedabad into UNESCO's World Heritage List in 2017. An advocate for community-based conservation, she has extensive experience in conservation research and collaborates with national and international institutions on initiatives across India. Jigna is a member of ICOMOS India, expert member of the ICOMOS' International Scientific Committee on Historic Towns and Villages, and director of JMA Design Co, that she co-founded in 1999. She holds a master's degree in sustainable architecture from Cardiff University and a PhD in conservation studies from CEPT University.

Ms. Jayashree Bardhan
Program Lead - Assessment and Training, Center for Heritage Conservation (CHC), CEPT Research and Development Foundation (CRDF)

Jayashree Bardhan holds a master's degree in world heritage studies from BTU, Germany and a bachelor's degree in architecture from CEPT University. She has extensive work experience in architectural projects in urban and rural settings along with cultural heritage mapping and assessment projects. In 2020, she received a research grant from ICOMOS International to investigate the 'Heritage at Risk' sector. Her master's thesis titled, 'Optimising ICOMOS' Heritage at Risk Initiatives: Towards a Comprehensive Framework for Cultural Heritage at Risk' was conducted through collaboration of ICOMOS' International Board and BTU, Germany. Through her master's studies, she gained experience of heritage sites in Germany, Poland and Bahrain. Jayashree is a member of ICOMOS and an associate member of ICORP. She is currently a Visiting Faculty at the Master's Program in Conservation and Regeneration at CEPT, teaching heritage-led urban regeneration focused on people-centred approaches. At CHC, she leads heritage assessments and capacity building programs.

Ms. Vidhya Mohankumar
Founder and Principal, Urban Design Collective (UDC)

Vidhya Mohankumar, an architect and urban designer with 18 years of global experience, is dedicated to creating people-centric cities with a focus on transit for sustainable development. Grounded in intersectional research, her work spans master plans for cities, towns, and various areas, including redevelopment plans for town centers and brownfield sites. Serving diverse clients from state governments to NGOs, her projects encompass strategic planning, regional plans, local area plans, campus master plans, and urban design studies worldwide. Appointed as a technical expert by the National Institute of Urban Affairs in 2019, she mentored Smart City Projects in Hubli-Dharwad and Agartala. A passionate advocate for sustainable development, Vidhya has been a guest faculty at Indian universities for over a decade. She holds a distinguished master's degree in urban design from the University of Michigan and a bachelor's degree in architecture from the National Institute of Technology, Tiruchirapalli, India.

Research Associate

Vaibhavi Bhojkar (From September- 2023 to April 2023)
Conservation Professional and Researcher, Cultural Resource Conservation Initiative (CRCI) India Pvt. Ltd.

Vaibhavi Bhojkar is an Conservation Professional and Interior Designer. She holds a Master's degree in Conservation and Regeneration from Faculty of Architecture, CEPT University, Ahmedabad, Post Graduation Diploma in Heritage Studies from INTACH Heritage Academy, New Delhi and Bachelor's degree in Interior Design from Faculty of Design, CEPT University. She has been selected for an Exchange Program as a part of Master's 4th Semester- Directed Research Project (DRP) at University of York, United Kingdom and received Merit Scholarship in all four semesters of her Master's degree. She is also a Teaching Associate in CEPT University. Research topics of thesis at different stages of her academics were, 'Assessing John Marshall's Conservation Approaches in India: Review of ASI' Acts, Policies and Guidelines' (During Masters), 'Cultural Mapping of Dwarka Region' (During PG Diploma) and 'Identifying the Concept of Overlay in the Palaces of Saurashtra' (During Bachelors).

Organizations

Cultural Resource Conservation Initiative (CRCI) India Pvt. Ltd.
CRCI India Pvt. Ltd. was founded as Cultural Resource Conservation Initiative (CRCI) in 1996 by conservation architect Gurmeet S. Rai. The vision of the organisation is to preserve and promote India's cultural heritage with active community participation. One of CRCI's early projects was a comprehensive listing program of historic buildings and sites across the state of Punjab. Over almost three decades of its inception, CRCI has enlarged its areas of expertise to encompass conservation of historic buildings and sites, preparation of conservation and heritage management plans for sites of significance, urban and area level development strategies integrating conservation, improved management and development of both cultural and natural heritage. CRCI has evolved culturally sensitive frameworks and mechanisms for project implementation by various government bodies. CRCI consistently tries to harmonise the imperatives of heritage conservation with the historic and current realities of the site. Towards this end, CRCI works in participation with communities to develop appropriate strategies for conservation in both rural and urban areas. CRCI's project on Conservation of Krishan Mandir, Kishankot, Punjab, India was awarded the UNESCO Asia- Pacific Heritage Award, 2001. In 2004, the firm was once again awarded the UNESCO Asia-Pacific Heritage Awards for the Conservation and Development of Gurudwara Darbar Guru Nanak Dev – Lakhpat, Kutch, Gujarat, India. CRCI's contribution to conservation was also acknowledged by the Government of Punjab through the Award for Excellence in the Field of Conservation Initiatives and Contributions to the State of Punjab, India, 2002. In December, 2023 the firm received UNESCO Asia Pacific award of excellence on Rambagh gate project and special recognition for sustainable development for Pipal Haveli project in Punjab.

Center for Heritage Conservation (CHC)
Center for Heritage Conservation (CHC) was established in 2019, under CEPT Research and Development Foundation (CRDF), which is the research and advisory arm of CEPT University, Ahmedabad. CHC focuses on

advancing the discourse of built heritage conservation through the lenses of sustainability and equity in the Indian context. The Center collaborates on the most pioneering international research projects on the one hand and engages with the government, city administration, and industry on the other to inform policies and practices on the ground. The team at CHC approaches conservation as a comprehensive process that is situated in an ever-changing environment and constantly engages with all actors and stakeholders that are a part of that change. The educational activities conducted by the CHC team are recognized as one of the best practices internationally. Some of CHC's key activities include - creating a repository of knowledge of heritage conservation in India; engaging in research projects; advisory on aspects of heritage conservation and conservation-led regeneration with solutions that are long-term, implementable and equitable; conducting heritage assessments and heritage impact assessments; developing training and capacity building courses for professionals; using the potential of advanced digital technologies in the field of heritage conservation; and CEPT Conservation Site School initiative.

Urban Design Collective (UDC)

Urban Design Collective (UDC) is a Chennai-based collaborative platform for architects, urban designers and planners to create livable cities through participatory planning. UDC was founded in 2011 as a platform to mobilize those who want to change the way our cities are built. By providing an open platform for young design professionals, who otherwise as individuals are excluded in the city building process, to create and disseminate content, UDC gives them a chance to voice themselves as change-makers for better cities. As a result, UDC has come to be a global community of architects, designers, engineers, artists, writers, photographers and many others who are passionate about cities. UDC's approach is best defined as a mix of storytelling, advocacy and demonstration through practice. The approach is people-centric and aims to bring many stakeholders involved in the city building process as equal partners to concur on what makes livable cities.

References

Introduction to the Toolkit

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