CHAPTER 1

Introduction: Aims and Objectives of the Research Work

1.1. Background

The word ‘Heritage’ refers to the legacy of the past, which exists in the present and which needs to be passed onto the future generations. The word Heritage could be better replaced by a Sanskrit term ‘aitihya’ (Chakravarti, 2008:8). It is we, on whom the existence of this Heritage for our future generations depends. The thrust area of the present research focuses on the preservation of Tangible Heritage which involves Built Cultural Heritage and Natural Heritage. The research aims to find the link between a cultural heritage site and a natural heritage site.

UNESCO’s World Heritage Convention is internationally recognized as a powerful legal instrument created to protect the world’s unique natural and cultural heritage of outstanding universal value on behalf of humankind. The General Conference of the United Nations Educational, Scientific and Cultural Organization meeting in Paris from 17th October to 21st November 1972, at its seventeenth session\(^2\) states that -

Noting that the cultural heritage and the natural heritage are increasingly threatened with destruction not only by the traditional causes of decay, but also by changing social, political and economic conditions which aggravate the situation with even more formidable phenomena of damage or destruction,

Considering that deterioration or disappearance of any item of the cultural or natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world,

Considering that protection of this heritage at the national level often remains incomplete because of the scale of the resources which it requires and of the insufficient economic, scientific, and technological resources of the country where the property to be protected is situated,
Recalling that the Constitution of the Organization provides that it will maintain, increase, and diffuse knowledge, by assuring the conservation and protection of the world's heritage, and recommending to the nations concerned the necessary international conventions,

Considering that the existing international conventions, recommendations and resolutions concerning cultural and natural property demonstrate the importance, for all the peoples of the world, of safeguarding this unique and irreplaceable property, to whatever people it may belong,

Considering that parts of the cultural or natural heritage are of outstanding interest and therefore need to be preserved as part of the world heritage of mankind as a whole,

Considering that, in view of the magnitude and gravity of the new dangers threatening them, it is incumbent on the international community as a whole to participate in the protection of the cultural and natural heritage of outstanding universal value, by the granting of collective assistance which, although not taking the place of action by the State concerned, will serve as an efficient complement thereto,

Considering that it is essential for this purpose to adopt new provisions in the form of a convention establishing an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organized on a permanent basis and in accordance with modern scientific methods,

Having decided, at its sixteenth session, that this question should be made the subject of an international convention,

Adopts this sixteenth day of November 1972 this Convention, i.e. the World Heritage Convention.

If we see the image of the World Heritage emblem, as designed by the Belgian artist Michel Olyff, we will see that it represents the interdependence of the world's natural and cultural diversity. It identifies the properties protected by the World Heritage Convention and inscribed on the official World Heritage List, representing the universal values for which the Convention stands. The central
square symbolizes the results of human skill and inspiration whereas the circle represents the gifts of nature. The emblem is round, like the world, a symbol of global protection for the heritage of all humankind. It was adopted as the official emblem of the World Heritage Convention in 1978. (Fig.1.1)

1.1.1. Criteria For A Cultural Heritage Site

We can now discuss about the criteria for a cultural heritage site.

According to Article 1 of the World Heritage Convention, the following shall be considered as "cultural heritage":

**monuments:** Architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science;

**groups of buildings:** Groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science;

**sites:** works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

1.1.2. Criteria For A Natural Heritage Site

Similarly, according to Article (2) of this World Heritage Convention, the following shall be considered as "natural heritage":

**natural features** consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;

**geological and physiographical formations** and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;
natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

The most significant feature of the 1972 World Heritage Convention is that it links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two.³

Cultural heritage forms the basis of our civilized world and represents the evolution of humanity. These unique cultural properties tell the story of past and present systems of human knowledge, major artistic achievements, behavior and beliefs. In some cases they also share a close relationship with their natural environment.

It is a fact that the Natural heritage consists of physical, biological and geological formations as well as natural areas of outstanding universal value from the point of view of science, conservation or natural beauty. Natural heritage sites are therefore, important sites for both human well-being and in situ biodiversity conservation.

1.1.3. Definition Of A Heritage Site:

Precisely, we can define Heritage site as follows:

A site on a list of properties maintained by the World Heritage Committee of UNESCO and called the World Heritage List "forming part of the cultural heritage and natural heritage...which it considers as having outstanding universal value in terms of such criteria as it shall have established". (UNESCO World Heritage Convention (1982), Article 11(2).⁴

The United States initiated and conceived the idea of combining cultural conservation with nature conservation. A White House conference in 1965 called for a World Heritage Trust to preserve the world's superb natural and scenic areas and historic sites for the present and the future of the entire world. The International Union for Conservation of Nature (IUCN) developed similar proposals in 1968, and they were presented in 1972 to the United Nations conference on Human Environment in Stockholm.
A single text was agreed on by all parties, and the Convention Concerning the Protection of the World Cultural and Natural Heritage was adopted by the General Conference of UNESCO on 16th November, 1972. Various criteria were laid down for assigning a World Heritage status to any forest, mountain, lake, desert, monument or building. Various Laws and Acts have been implemented for protection of the Heritage sites.

A **UNESCO World Heritage Site**, we know, is a site (such as a forest, mountain, lake, desert, monument, building, complex, or city) that is on the list maintained by the international World Heritage Programme administered by the UNESCO World Heritage Committee, composed of 21 state parties which are elected by their General Assembly for a four-year term. A World Heritage Site is a place of either cultural or physical significance.

The program catalogues, names, and conserves sites of outstanding cultural or natural importance to the common heritage of humanity. The programme was founded with the *Convention Concerning the Protection of World Cultural and Natural Heritage*, which was adopted by the General Conference of UNESCO on November 16, 1972. Since then, 186 state parties have ratified the convention.

Each World Heritage Site is the property of the state on whose territory the site is located, but it is considered in the interest of the international community to preserve each site.

### 1.1.4. Criteria Imposed By UNESCO For Cultural And Natural Heritage:

There are various criteria laid down by UNESCO which are as follows:

**Criteria for Cultural Heritage**

I. "to represent a masterpiece of human creative genius";

II. "to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design";
III. "to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared";

IV. "to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history";

V. "to be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change";

VI. "to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance".

Criteria for Natural Heritage

Similarly, criteria of natural heritage sites are as follows:

VII. "to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance";

VIII. "to be outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features";

IX. "to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals";

X. "to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation."
As of 2009, 890 sites are listed: 689 cultural, 176 natural, and 25 mixed properties, in 148 states. Italy is home to the greatest number of World Heritage Sites to date with 44 sites inscribed on the list. UNESCO references each World Heritage Site with an identification number; but new inscriptions often include previous sites now listed as part of larger descriptions. As a result, the identification numbers exceed 1200 even though there are fewer on the list.

Of the various countries in the world, India can boast for its Cultural and Natural Heritage. Presently, it possesses Twenty-five (25) Cultural heritage sites and Seven (7) Natural Heritage Sites.

It is evident that the State of West Bengal is rich with the heritage of old civilizations. It is the home of ancient civilizations and a glorious history of freedom struggle, and therefore has a rich cultural heritage. These cultures are reflected through historical monuments, palaces, ruins of ancient civilizations, remnants of past cultural heritage of the civilizations destroyed by the natural calamities. There are a large number of Heritage Buildings and Structures in this State. The State Government in Department of Information and Cultural Affairs has enacted the *West Bengal Heritage Commission Act, 2001* in order to constitute a Heritage Commission to take steps for preservation and conservation of heritage buildings and structures located in this state. The Municipalities have also being assigned a part in preservation and conservation of heritage of this State. Besides, it possesses unique biodiversity and thus internationally reputed for being home to a *Natural World Heritage Site*.

With the passage of time, these Heritage sites, whether Natural or Cultural are getting prone to deterioration and degradation by various agencies, i.e. environmental and anthropogenic factors and facing challenges to struggle and stand out overcoming the deteriorating effects. With the formulation of various Laws and Acts and attainment of National and International status, these Heritage sites are getting protection through conservation of the damaged and deteriorated parts as well as implementation of various preventive measures to avoid getting prone to deterioration as well as degradation.
However biotic entities of the environment surrounding the Heritage Sites (in case of Cultural Site) or forming a composite component of the Heritage Site (in case of Natural Site) themselves can have their individual roles in preventive conservation of the sites. The biotic components surrounding the Heritage Buildings / sites comprise the Biodiversity of that area.

Biological diversity or biodiversity refers to the variety of all life forms i.e. the different plants, animals and microorganisms, the genes they contain and the ecosystems of which they form a part. It is not static, but constantly changing and is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline and extinction.

We can refer to an explicit definition formulated in a paper by Bruce A. Wilcox commissioned by the International Union for the Conservation of Nature and Natural Resources (IUCN) for the 1982 World National Parks Conference (Wilcox, 1984). Wilcox’s definition was Biological diversity is the variety of life forms at all levels of biological systems (i.e., molecular, organism, population, species and ecosystem)... (Wilcox, 1984: 19)

It is very important to state here that a Natural Heritage Site, the survival of the entire site is dependent upon its biotic and abiotic components. For a Cultural heritage site, the adjoining entities of the biodiversity pattern do have their own roles in protection of the site.

The present research intensively and extensively deals with this aspect of heritage conservation through natural means or bio-monitoring with the help of surrounding entities.

In India, particularly in West Bengal, no commendable works have been so far undertaken taking the above mentioned aspect into consideration. So there is an ample scope of research to deal with the above aspects. Most of the culturally protected sites are enclosed by some greenery in form of a garden surrounding the monument. Visitors enjoy the beauty of the monuments as well as the gardens, without realizing the roles of the individual components of the garden. Similarly, in a Natural Heritage site, visitors or tourists enjoy the beauty
of the site without taking interest in knowing the value of each of the component without which the site would not have existed in its present form in the near future.

For a cultural Heritage site, various means could be undertaken to create awareness among the common people regarding the significance of the surrounding gardens. For a Natural Heritage Site, emphasis should be put forth regarding knowledge of the existing biodiversity status that is extremely important for preservation of the site.

Some measures have been undertaken by the Government, State and Central, Museums, N.G.Os and different bodies, to create awareness regarding biodiversity on a large scale. For example, the year 2010 has been recognized internationally as the *International year of Biodiversity* according to United Nations General Assembly (Fig.1.2). The main goals of the International Year of Biodiversity were to: Enhance public awareness of the importance of conserving biodiversity and of the underlying threats to biodiversity; Raise awareness of the accomplishments to save biodiversity that have already been realized by communities and governments; Promote innovative solutions to reduce the threats to biodiversity and to encourage individuals, organizations and governments to take immediate steps to halt biodiversity loss. The year 2011 was declared the *International Year of Forests* by the United Nations to raise awareness and strengthen the sustainable management and conservation of all types of forests which helps in conservation of Biodiversity, for the benefit of current and future generations.

Since the survival of the Heritage site depends upon its surrounding biotic entities, protection of the bio-components also needs to be looked. For the survival and existence of these protective biological entities, the abiotic components of the ecosystem also require to be monitored. We know there are various parameters, which include existing water bodies, soil, temperature, etc.

Several Laws and Acts have been implemented globally for protection of Natural Heritage sites namely, MAB of UNESCO (1971), Ramsar Convention on Conservation of Wetlands of International importance, Iran(1971), World

Taking into consideration the salient features of some of the laws, the present research stresses on the point that the management of all the resources should be made in such a way that economic, social and aesthetic needs of people could be fulfilled while maintaining essential ecological processes, biological diversity and life support systems.

UNESCO has given recognition to the following places within India as cultural and natural heritage site according to the respective criteria fulfilled by them. The sites have been listed in the following tables: (Map: 1.1 - 1.2)

Table 1.1
List of World Heritage sites in India (Cultural) as recognized by UNESCO (2014)\(^6\)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Site</th>
<th>Year of Nomination by UNESCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agra Fort</td>
<td>1983</td>
</tr>
<tr>
<td>2</td>
<td>Ajanta Caves</td>
<td>1983</td>
</tr>
<tr>
<td>3</td>
<td>Buddhist Monuments at Sanchi</td>
<td>1989</td>
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<tr>
<td>4</td>
<td>Champaner-Pavagadh Archaeological Park</td>
<td>2004</td>
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<tr>
<td>5</td>
<td>Chhatrapati Shivaji Terminus (formerly Victoria Terminus)</td>
<td>2004</td>
</tr>
<tr>
<td>6</td>
<td>Churches and Convents of Goa</td>
<td>1986</td>
</tr>
<tr>
<td>7</td>
<td>Elephanta Caves</td>
<td>1987</td>
</tr>
<tr>
<td>8</td>
<td>Ellora Caves</td>
<td>1983</td>
</tr>
<tr>
<td>9</td>
<td>Fatehpur Sikri</td>
<td>1986</td>
</tr>
<tr>
<td>10</td>
<td>Great Living Chola Temples</td>
<td>1987</td>
</tr>
<tr>
<td>11</td>
<td>Group of Monuments at Hampi</td>
<td>1986</td>
</tr>
<tr>
<td>12</td>
<td>Group of Monuments at Mahabalipuram</td>
<td>1984</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Name of Site</td>
<td>Year of Nomination by UNESCO</td>
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<td>--------</td>
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<tr>
<td>13</td>
<td>Group of Monuments at Pattadakal</td>
<td>1987</td>
</tr>
<tr>
<td>14</td>
<td>Humayun’s Tomb, Delhi</td>
<td>1993</td>
</tr>
<tr>
<td>15</td>
<td>Khajuraho Group of Monuments</td>
<td>1986</td>
</tr>
<tr>
<td>16</td>
<td>Mahabodhi Temple Complex at Bodh Gaya</td>
<td>2002</td>
</tr>
<tr>
<td>17</td>
<td>Mountain Railways of India</td>
<td>1999</td>
</tr>
<tr>
<td>18</td>
<td>Qutb Minar and its Monuments, Delhi</td>
<td>1993</td>
</tr>
<tr>
<td>19</td>
<td>Red Fort Complex</td>
<td>2007</td>
</tr>
<tr>
<td>20</td>
<td>Rock Shelters of Bhimbetka</td>
<td>2003</td>
</tr>
<tr>
<td>21</td>
<td>Sun Temple, Konârak</td>
<td>1984</td>
</tr>
<tr>
<td>22</td>
<td>Taj Mahal, Agra</td>
<td>1983</td>
</tr>
<tr>
<td>23</td>
<td>Hill Forts of Rajasthan</td>
<td>2013</td>
</tr>
<tr>
<td>24</td>
<td>The Jantar Mantar, Jaipur</td>
<td>2010</td>
</tr>
<tr>
<td>25</td>
<td>Rani-ki-Vav (the Queen’s Stepwell) at Patan, Gijarat</td>
<td>2014</td>
</tr>
</tbody>
</table>

Table 1.2
List of World Heritage Sites in India (Natural) as recognized by UNESCO (2014)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Site</th>
<th>Year of Nomination by UNESCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kaziranga National Park</td>
<td>1985</td>
</tr>
<tr>
<td>2</td>
<td>Keoladeo National Park</td>
<td>1985</td>
</tr>
<tr>
<td>3</td>
<td>Manas Wildlife Sanctuary</td>
<td>1985</td>
</tr>
<tr>
<td>4</td>
<td>Nanda Devi and Valley of Flowers National Parks</td>
<td>1988</td>
</tr>
<tr>
<td>5</td>
<td>Sundarbans National Park</td>
<td>1987</td>
</tr>
<tr>
<td>6</td>
<td>Western Ghats</td>
<td>2012</td>
</tr>
<tr>
<td>7</td>
<td>Great Himalayan National Park Conservation Area</td>
<td>2014</td>
</tr>
</tbody>
</table>

Besides these, there are various sites within India, which has been nominated for gaining future recognition from UNESCO. Lists of properties within India which are under the tentative list of UNESCO are:

Table 1.3
Properties Submitted on the Tentative List of UNESCO (2014)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Site</th>
<th>Year of submission to the tentative list</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temples at Bishnupur, West Bengal</td>
<td>03.07.1998</td>
</tr>
<tr>
<td>2</td>
<td>Mattanchery Palace, Ernakulam, Kerala</td>
<td>1998</td>
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<tr>
<td>Sl. No.</td>
<td>Name of Site</td>
<td>Year of submission to the tentative list</td>
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<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>3</td>
<td>Group of Monuments at Mandu, Madhya Pradesh</td>
<td>1998</td>
</tr>
<tr>
<td>4</td>
<td>Ancient Buddhist Site, Sarnath, Varanasi, Uttar Pradesh</td>
<td>1998</td>
</tr>
<tr>
<td>5</td>
<td>Sri Harimandir Sahib, Amritsar, Punjab</td>
<td>2004</td>
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<tr>
<td>6</td>
<td>River Island of Majuli in midstream of Brahmaputra River in Assam</td>
<td>2004</td>
</tr>
<tr>
<td>7</td>
<td>Namdapha National Park</td>
<td>2006</td>
</tr>
<tr>
<td>8</td>
<td>Ancient Buddhist Site, Sarnath, Varanasi, Uttar Pradesh</td>
<td>1998</td>
</tr>
<tr>
<td>9</td>
<td>Kangchendzonga National Park</td>
<td>2006</td>
</tr>
<tr>
<td>10</td>
<td>Urban and Architectural Work of Le Corbusier in Chandigarh</td>
<td>2006</td>
</tr>
<tr>
<td>11</td>
<td>Excavated Remains at Nalanda</td>
<td>2009</td>
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<tr>
<td>12</td>
<td>Bhitarkanika Conservation Area</td>
<td>2009</td>
</tr>
<tr>
<td>13</td>
<td>Neora Valley National Park</td>
<td>2009</td>
</tr>
<tr>
<td>14</td>
<td>Desert National Park</td>
<td>2009</td>
</tr>
<tr>
<td>15</td>
<td>Silk Road Sites in India</td>
<td>2010</td>
</tr>
<tr>
<td>16</td>
<td>Santiniketan</td>
<td>2010</td>
</tr>
<tr>
<td>17</td>
<td>The Qutb Shahi Monuments of Hyderabad Golconda Fort, Qutb Shahi Tombs, Charminar</td>
<td>2010</td>
</tr>
<tr>
<td>18</td>
<td>Mughal Gardens in Kashmir</td>
<td>2010</td>
</tr>
<tr>
<td>19</td>
<td>Historic city of Ahmedabad</td>
<td>2011</td>
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<tr>
<td>20</td>
<td>The Victorian &amp; Art Deco Ensemble of Mumbai</td>
<td>2012</td>
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<tr>
<td>21</td>
<td>Delhi - Heritage City</td>
<td>2012</td>
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<tr>
<td>22</td>
<td>Monuments and Forts of the Deccan Sultanate</td>
<td>2014</td>
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<tr>
<td>23</td>
<td>Cellular Jail, Andaman Island</td>
<td>2014</td>
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<tr>
<td>24</td>
<td>The Glorious Kakatiya Temples and Gateways</td>
<td>2014</td>
</tr>
<tr>
<td>25</td>
<td>Iconic Saree Weaving Clusters of India</td>
<td>2014</td>
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<tr>
<td>26</td>
<td>Dholavira: a Harappan City</td>
<td>2014</td>
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<tr>
<td>27</td>
<td>Apatani Cultural Landscape</td>
<td>2014</td>
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<tr>
<td>28</td>
<td>Sri Ranganathaswamy Temple, Srirangam</td>
<td>2014</td>
</tr>
<tr>
<td>29</td>
<td>Monuments of Srirangapatna Island Town</td>
<td>2014</td>
</tr>
<tr>
<td>30</td>
<td>Chilika Lake, Orissa</td>
<td>2014</td>
</tr>
<tr>
<td>31</td>
<td>Padmanabhapuram Palace, Tamil Nadu</td>
<td>2014</td>
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<tr>
<td>32</td>
<td>Sacred Ensembles of the Hoysala, Karnataka</td>
<td>2014</td>
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<tr>
<td>33</td>
<td>Sites of Sayyagrah, India’s non-violent freedom movement</td>
<td>2014</td>
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<tr>
<td>35</td>
<td>Thembang Fortified Village</td>
<td>2014</td>
</tr>
<tr>
<td>36</td>
<td>Narcondam Island</td>
<td>2014</td>
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<tr>
<td>38</td>
<td>Moidams – the Mound-Burial system of the Ahom Dynasty</td>
<td>2014</td>
</tr>
<tr>
<td>39</td>
<td>Ekamra Kshetra – The Temple City, Bhubaneswar</td>
<td>2014</td>
</tr>
<tr>
<td>40</td>
<td>The Neolithic Settlement of Burzahom</td>
<td>2014</td>
</tr>
<tr>
<td>41</td>
<td>Archaeological remains of a Harappa Port- Town, Lothal</td>
<td>2014</td>
</tr>
<tr>
<td>42</td>
<td>Chettinad, Village clusters of the Tamil merchants</td>
<td>2014</td>
</tr>
<tr>
<td>43</td>
<td>Bahá’í House of Worship, New Delhi</td>
<td>2014</td>
</tr>
</tbody>
</table>
1.2. Rationale Of Study

In this study, the researcher has intensively studied the capability of bio-components in preservation of and cultural heritage sites and the resultant problems of the threats to the greenery as well as the sites due to different factors bringing about deterioration and degradation. The study aims to suggest the protection of heritage sites by Bio-monitoring.

This study attempts to bring forth an understanding in this important subject, thereby hoping to benefit administrative bodies related to proper biomonitoring and all such other aspects as a model project. Learning from this study may also benefit other heritage sites of different states of India for upkeeping the heritage sites.

1.3. Location And Selection Of Study Area

The researcher has selected three extremely important heritage sites as a model project located in various biodiversity patterns and also located in different geographical locations in her research work based on the following criteria:

1. Site of National importance for being a Heritage Building- Victoria Memorial Hall, Kolkata, West Bengal, India

2. Sites nominated for the World Heritage Status by UNESCO in the tentative list- Bishnupur Group of Temples, West Bengal, India

3. UNESCO recognized World Heritage site - Sundarbans National Park, West Bengal, India. (Map: 1.3 - 1.4)

1. *Victoria Memorial Hall* (Kolkata, West Bengal) – A heritage monument of National importance, Victoria Memorial Hall is a unique structure of marble stone located in the heart of Kolkata (metropolitan in India latitude of 22°32’ N and longitude at 88°20’ E). It is one of the finest architectural grandeur of 20th
Century which became an Institution of National importance since the Act of 1935. One of the most flamboyant of edifices, the Victoria Memorial has become, over time, an integral feature of Calcutta’s topography, clearly the most visible and monumental of her historic structures. The museum is of international significance. The idea was conceived by Lord Curzon, Viceroy of British India in 1901, to commemorate memory of the Queen Empress. The H.R.H. Prince of Wales laid the foundation stone in 1906. Sir William Emerson, president of British Institute of architect made the architectural design and the construction was entrusted to Martin & Company of Calcutta. The entire building, 77064 square feet, is spread upon an extensive Garden of 64 acres, with greenery and four small lakes. There are some ornamental groups of statues over the entrance porches. The Memorial is the largest repository of India for a visual history of Calcutta. It has a major collection of paintings, sculptures and manuscripts. Being the place for housing materials of organic and inorganic origin, the rare collections are subject to various agents of deterioration and degradation. The white marble of this splendid monument is also prone to environmental deterioration. The study area includes the 60 acres (approx.) garden surrounding the Victoria Memorial Hall premises including the water bodies. The extensive garden consists of trees, shrubs, green lawns, Canna beds, nursery for growing new plants and experimentation, gravel pathways and historical busts. The garden is an attraction by itself and attracts nearly 2.5 million visitors annually. The study area includes the biological entities of the Garden and water-bodies and analyzing the biodiversity status and how they could play a significant role in preservation of the unique monument. (Map: 1.5 - 1.6) (Plate: 1a-e)

2. **Bishnupur Group of Temples** (Bankura, West Bengal) that falls under the tentative list submitted to UNESCO for World Heritage status. Bishnupur Group of Temples (Latitude 23°N, Longitude 87°19′E) in the district of Bankura with its diversified terracotta temples of 15th and 18th century (Map 1.7). This includes both the terracotta temples as well as laterite built temples protected under Archaeological Survey of India. The temples are generally located at different locations at a small distance from each other. Some temples are clustered together in the same compound (Fig.1.3). The area of my study consists of the following temples: (Plate: 2a-p)
4. *Jor-Mandir* (Lat: 23° 03’ 36" N, Long: 87°19’ 18” E)
5. *Jor-Bangla / Keshta Raya Temple* (Lat: 23° 04’ 18” N, Long: 87°19’36” E)
11. *Nandalala Temple* (Lat: 23° 03’ 40” N, Long: 87°19’ 22” E)

3. **Sundarbans National Park** (South 24-Parganas District, West Bengal) (Latitude: 22°31’-22°30’ N, Longitude: 88°10’-89°51’ E) is internationally reputed for being the only Natural World Heritage Site from West Bengal. The Indian Sundarbans covers a total area of 9,630 km² of which 5,363 km² area is inhabited by human population and remaining 4,266.6 km² is the area of present day mangals. The Indian Sundarbans is bestowed with the highest floral diversity in the form of mangroves, coastal wetland flora, beach flora and marsh and swamp flora (Naskar & Mandal, 1999 & Naskar, 1993). In 1973, about 2.585 km² area of South-eastern part of Sundarbans Mangals was declared as Sundarbans Tiger Reserve (STR). Of this, about 1,330 km² area of intertidal mangrove forest was demarcated as Core area and the rest as buffer zone. ([Maps: 1.8-1.10] (Plate: 3a-b)).

There are three wildlife sanctuaries viz.

1. *Sajnekhali* - area of 304 km² within STR
2. *Lothian Island* - area of 38 km² outside STR
3. *Holiday Island* with an area of 5.85 km² also outside of STR.
The largest delta in the world is located at the mouth of Bay of Bengal consisting of 4200 km$^2$ of Reserved Forest and the largest Mangrove forest in India. Study area of the researcher includes mainly Sundarbans National Park-the area designated as the Natural Heritage site of West Bengal, India. This includes Sundarbans Tiger Reserve and a Wildlife Sanctuary - Sajnekhali Wildlife Sanctuary. Since a natural site cannot be demarcated from research point of view, biodiversity survey has been also done in the Sundarbans Biosphere Reserve, keeping in mind the protocol and monitoring and bio-management of the flora and fauna for proper preservation and conservation of the Natural Heritage Sites.

Intensive survey and analysis and present status of biodiversity pattern as well as methods of their preventive conservation form the part of this research work. Comparative studies has been undertaken with a few Cultural and Natural heritage sites of India and abroad with respect to preventive conservation and to suggest and adopt further various management strategies for the protection of the sites.

1.4. **Research - Aims And Objectives (Fig.1.4 & 1.5)**

1) Inventerization of the biotic components of selected heritage sites that directly or indirectly contributes to protection of the site. A comparative study is made between the present and past existence of the components.

2) Characterization of ecological factors governing the growth of flora and fauna.

3) Study of the ecological implications of biodiversity in and around heritage sites, i.e. floristic pattern of gardens in case of cultural heritage Buildings.

4) Identifying the mechanisms and factors of deterioration of natural and cultural heritage, both Natural and Anthropogenic.

5) To study the visitor impact on the heritage site in totality, i.e: site in general for Natural Heritage Site and garden and monument in case of cultural heritage site.
6) To find whether material (viz. marble / terracotta / brick), in terms of cultural heritage has any relation with the biological diversity, i.e. act as a host for bio organisms.

7) Development of models for projecting biodiversity in-situ through natural reserves as well as ex-situ through Museums.

8) To suggest methods of preventive conservation of the site by enhancing the biological diversity of the surrounding region.

1.5. Research Questions

The research objectives have operationalized into the following set of research questions:

1. How important is biodiversity in the perspective of heritage preservation?
2. What are the primary and secondary threats to heritage sites/buildings?
3. What are the primary/secondary threats to surrounding bio-entities?
4. What are the visible symptoms of damage to both the site and surrounding biodiversity pattern?
5. What are the strong points as well as flaws in maintenance and management of heritage sites?
6. How strong is the connection between visitors and gardens?
7. What strategies can be adapted to enhance biodiversity conservation around heritage sites?

1.6. Hypothesis

The Floral components are an integral part of ecosystem, having significant roles in preservation of a site, either direct or indirect. Such natural means of preservation are mostly overlooked by the dominance of Acts, Laws and other means of imposing restrictions. The components enrich the biodiversity of the zone alongwith providing protection to the site (or monument, in case of Cultural Heritage Site) by reducing or lowering the impact of various deteriorating agents. Therefore, it was felt pertinent to evaluate the past and existing biodiversity around selected Heritage sites of West Bengal and identify the need for preserving them as part of management of both cultural and natural sites.
1.7. Research Limitations

- West Bengal is home to a number of natural and cultural heritage sites. Conducting intensive studies on each of these Heritage Sites is not possible within the limited time frame. So the researcher has limited her selection of the study sites based on:
  a) status of Natural World Heritage Site- Sundarbans National Park, West Bengal, India
  b) those on the Tentative list of World Heritage Site of UNESCO- Bishnupur Group of Temples, Bankura, West Bengal, India
  c) a Heritage Site of National Importance- Victoria Memorial Hall, Kolkata, West Bengal, India

This is expected to be a role model for management of biodiversity in and around other Heritage Sites to keep safe the heritage within India.

- The natural Heritage Site-Sundarbans National Park is not accessible wholly due to the hostile terrain and fear of getting encountered with the Bengal Tigers. Considering that there is no demarcation in nature as Core zone and Buffer zone, study has mostly been conducted around those zones which have been found accessible.

- Inspite of the title of the topic being Study of Biodiversity Status of Some Important Heritage Sites in West Bengal - A Museological Study, only those bio-entities have been studied that have a direct or indirect effect on preservation of the Sites. This involves mostly vegetation, i.e., herbs, shrubs, trees and related faunal species. Study has been conducted only at Macro-level.

- Certain data on Ambient Air Quality Monitoring at Victoria Memorial Hall, Kolkata was unavailable and hence two or three years have been omitted during comparative analysis.

- Regarding the images of leaves obtained by Scanning Electron Microscopy (SEM), images of only one leaf from each species have
been represented in thesis, though studies have been conducted with three leaves from each species.

- Climatic diversity plays an important determining factor of ecology of a region. Since the selected sites are from different climatic parameters, no single study can justify the analyses holistically. However, attempt has been made to identify the common parameters from each of the selected sites for a comparative analysis.

1.8. Chapters In Brief

The contents of this thesis have been arranged in seven sections followed by some appendices.

Chapter 1 of the thesis deals with the introduction to the research project, background of research work, the research problem, rationale of study, location and selection of study area, research aims and objectives.

Chapter 2 provides an overall review of the existing published and unpublished Literature or records in connection with my research work.

Chapter 3 highlights the sites undertaken for research work and the research methods and methodologies followed in conducting the surveys, field collections, laboratory analyses and datasheet evaluation.

Chapter 4 discusses the impact of biodiversity of a region on heritage sites. The different sections under this chapter discuss the preliminary roles of biodiversity surrounding each and every heritage.

Chapter 5 discusses the meaning and significance of preventive conservation, its need and the measures to be adopted for protection of the biodiversity around the heritage sites selected for this study. It identifies the deteriorating factors from each of the studied sites before dealing with the methods for preservation of the sites.

The different sections of Chapter 6 discusses the positive and negative impacts of tourism on the study areas and how the concept of Ecotourism be applied to
minimize the adverse effects. It deals with importance of these heritage sites for visiting tourists, the visitor statistics, effects of human interventions both good and destructive, management procedures and their impact on the surrounding garden.

Chapter 7: Conclusion- In this chapter, the researcher tries to sum up the work based on scientific facts and humbly suggest some measures for proper preservation management and upkeeping of heritage sites as a model project.

An exhaustive Bibliography has been given at the end of the thesis.

Datasheets and Survey sheets are given separately in the respective Chapter and the Appendix.
REFERENCES:


4. www.Unesco.org accessed on 19.05.13 at 9:00 pm.


Fig. 1.1: World Heritage Emblem

Fig. 1.2: Logo of International Biodiversity Day 2010

Fig. 1.3: Sketch of a Roadmap of Bishnupur showing the location of the different Temples
RESEARCH OBJECTIVES

Documenting Biotic and abiotic components, historical and architectural features of the site

Preventive Conservation by enhancing Biodiversity

MAJOR OBJECTIVES

Identifying deteriorating factors to site & Monument

RESEARCH GAP after Literature Review

Identify potentiality of bio-component in preservation

Specific bio-components directly helping in arresting deteriorating agents of a site with special reference to West Bengal NOT POINTED OUT

Fig.1.4: Schematic Representation of Research Aims and Objectives

Underlying Concept of the Study

Influences factors for deterioration

Environment

Creates

Macroclimate

Modifies

Microclimate

Biotic + Abiotic entities of THE SITE form an ecosystem.

Historic Monument forms a part of abiotic component of the ecosystem in which it is located.

Zonation of a Heritage site STUDY-focuses all 3 zones

Fig 1.5: Schematic Representation of the Underlying Concept of the Research Study
Map 1.1: Map of India depicting the World Heritage Sites as recognized by UNESCO

Map 1.2: Map of India showing Cultural and Natural Heritage Sites of India

Map 1.3: Map of India highlighting West Bengal

Map 1.4: District Map of West Bengal with Red circles denoting regions of study
Chapter 1

Map 1.5: Map of Kolkata highlighting location of Victoria Memorial Hall

Map 1.6: Enlarged View showing location of Victoria Memorial Hall, Kolkata

Map 1.7: Map of Bankura district highlighting Bishnupur
Chapter 1

Map 1.8: Map of South 24-Parganas District

Map 1.9: Satellite Map showing the different islands encompassing Indian Sundarbans

Map 1.10: Map of Sundarbans highlighting the Core area of the Tiger Reserve
Plate 1: Victoria Memorial Hall, Kolkata – View of Monument and Garden from Different Directions

1a: Victoria Memorial Hall, Kolkata
   The magnificent Marble edifice from North East corner

1b: Portion of Victoria Memorial Garden - Eastern View

1c: Part of Water Body within the Victoria Memorial Hall premises from North Western side

1d: Victoria Memorial Hall with its sprawling Garden and Waterbody from Southern side

1e: Part of Circular Water Body inside Victoria Memorial Hall from the Eastern side
Plate 2: General View of Temples of Bishnupur – Cultural Heritage of West Bengal

2a: Rasa Mancha

2b: Syama Raya

2c: Madana Mohana

2d: Jor Mandir Group of Temples

2e: Jor Bangla / Keshta - Raya

2f: Kalachand
Chapter 1

2g: Lalji

2h: Madana Gopala

2i: Mallesvara

2j: Murali Mohana

2k: Nandalala

2l: Patpur
Plate 3: Sundarbans Tiger Reserve: Gateway to the Natural Heritage
Site of West Bengal

3a: Notification of entry to the Sundarbans Tiger Reserve
3b: A Tidal Creek defining Sundarbans