



# VISTA INTERNATIONAL JOURNAL ON ENERGY, ENVIRONMENT & ENGINEERING



## A sustainable approach to conserve buildings through adaptive reuse

Jaikishor Pandit<sup>1,\*</sup> and Poorva Deshpande<sup>2</sup>

<sup>1</sup> PG Student, Department of Architecture,

<sup>2</sup> Assistant Professor, Department of Architecture,

Jawaharlal Nehru Engg. College, MGM University, Aurangabad, India

\* Corresponding author email : ar.jaypandit@gmail.com, Mob. +91-9891277664

### ABSTRACT

India has a rich architectural heritage where in each element finds its root in abstract beliefs. There are many heritage structures which are abandoned and need careful attention to transform into a second life for the building. Factories have been converted into office and warehouses have been converted into shopping malls. Among various building typologies, monuments are traditional style of structures and were strongly influenced by political, social, cultural and historical context. These are mostly abandoned structures found either in old part of the cities or in the suburbs with a strong historical background. These heritage structures are losing their importance and value. Reusing existing buildings has sustainable, cultural, social and economic advantages. This paper discusses the potential of reusing existing heritage buildings for the same or different function it is designed for considering environmental, economic, social aspects and the role of different stakeholders in decision making.

**Keywords :** *adaptive reuse, heritage buildings, built environment, conservation, stakeholder.*

### 1. Introduction:

All are surrounded by the natural as well as built environments. The natural environment consists of all the natural resources and physical phenomena such as air, water, soil, vegetation, climate and energy. Built environment consists of man-made structures created by humans manipulating natural environments causing several negative impacts like greenhouse gas emissions, pollution, deforestation, emission of toxic chemicals etc. However a balance between the natural and built environments can protect the people and planet to cater the needs of all living beings [1].

#### 1.1 Impact of building construction on carbon emissions:

The building and construction industries are responsible for 39% of all carbon emissions [2]. The operation and maintenance including heating and cooling account for 28 % and the remaining 11% from embodied carbon emissions associated with building materials and construction processes over the lifecycle of a building. Therefore the potential for reusing the existing building with different activities or purpose it is designed for is tremendous.

### 1.2 Extraction of building materials:

Significant extraction of natural resources and overuse of the same is required for the construction of a new building. Therefore developed countries are investing more capital on adaptive reuse including maintenance, retrofit, reuse and repairs than any new construction. This is because the awareness for protecting natural resources and extraction of raw materials is high considering its impacts on people, planet and profit of triple bottom line [3].

## 2. Theoretical discussion:

According to Ruskin "it is impossible, as impossible as to raise the dead, to restore anything that has ever been great or beautiful in architecture" [4]. Brooker and Stone has defined the term adaptive reuse as remodeling, retrofitting, conversion, adaptation, reworking, rehabilitation or refurbishment [5]. Repairing and restoring an existing building for the same or different function in second life is becoming extremely important in contemporary style of architectural practice [6].

During the period of 1970s, a pioneer researcher Sherban Cantacuzino, the author of 'New uses for old buildings' published a special issue book of Architectural Review which introduced the history of adaptive reuse and role of conservation practice at that time [7]. Cantacuzino discusses eleven different typologies to formulate possible functions as 1) churches and chapels, 2) monastics and religious establishments, 3) fortifications, gates and barracks, 4) town houses, country houses, outhouses and other ancillaries, 5) schools, 6) corn exchanges, 7) barns and granaries, 8) mills, 9) maltings and breweries, 10) warehouses and other industrial buildings, 11) pumping stations.

## 3. Methodology:

A detailed literature review was performed to understand environmental, economic, social aspects for the adaptive reuse of buildings. A case study of a heritage palace was undertaken to explore

the possibilities for sustainable development into another function.

## 4. Sustainable development:

The adaptive reuse of buildings play a significant role in the sustainable development of built environment. A fine balance between environmental, economic and social aspects throughout the building life should be carefully considered.

### 4.1 Environmental Value:

The conservation of heritage buildings consume less energy and water than a new construction. These buildings are highly valued in terms of green credentials. It contributes less CO2 emissions as extraction of natural materials or resources is less from the Earth. The life cycle analysis helps to evaluate the environmental impact of materials during different phases of its life to site execution. The short term perspective could be harmful to the environment during selection of materials without consideration of life cycle analysis. The embodied energy of an existing building is evidently low than a new building construction as less material is extracted for adaptive reuse. This makes the approach environmentally sustainable.

### 4.2 Economic Value:

As far as returns on investment and financial savings are concerned, the existing buildings are economical as it includes the process of retrofitting than demolishing an existing structure and constructing a new one. Adaptive reuse of buildings reduce the cost of maintenance and operation after the occupancy phase. The quantity of material and labour charges associated with retrofitting is minimum and thus it is economically sustainable. If the existing building can accommodate the user's required functions adequately, then the economic return on the investment is faster [8].

### 4.3 Social Value:

The preservation of heritage buildings provide a

sense of belonging to the people and retain the significance of local architecture of the city. This also includes the quality and comfort of people [8]. These initiatives make it socially sustainable. The reuse of such buildings in residential area provides newer property opportunities to the society.

## 5. The case study:

The study only related to environmental architecture and heritage conservation is considered, but adaptive reuse has been studied in different fields like urban regeneration, engineering, sustainability and economy. The selected case study is a residential building – Farah Bakhsh Palace through its unique character and intent of design through architectural expression. It illustrates in detail the processes, applications and implications as a museum.

### 5.1 History:

This case study is based in Ahmednagar in Maharashtra state, India, in between Pune and Aurangabad. The city is named after Ahmed Nizam Shah I, who founded the city in 1494 on the battlefield. The city has numerous buildings and sites from Nizam Shahi period. The foundation stone for Farah Bakhsh Palace was laid by Chenghiz Khan under the supervision of Nyamat Khan (1574-1575) and then rebuilt by Salabat Khan II (1583-1584).

### 5.2 Location:

The site is located in desirable residential suburb, rich with amenities within community and retails within proximity. It is connected to public and private transportation with State Highway within a distance of one kilometer from the site. The direct connectivity to the site is with arterial road that is 3 meter wide.

### 5.3 Architecture:

The site is listed as a protected monumental site by Archeological Survey of India. This structure has rich characteristics of Persian Architecture since last 430 years but has been ignored by the neighborhood. It can be developed as a part of new life through

conservation and adaptive reuse [9]. The unique feature of this project includes application of abundant symbolic geometry, use of pure forms like squares and circles, symmetrical plans with rectangular courtyard at the center. Moulded mud, brick, lime mortar, unique techniques of casting metal, carving stone and paintings have been observed.

### 5.4 The development potential for reuse:

The chambers in this structure can be used to exhibit various events during Nizam period in the form of books, images and artifacts. The central hall can be used as seating area with library. The surroundings can be used for parking space, beautifully landscaped space and an amphitheater for recreational activities [10].

## 6. Stakeholder Analysis:

There is a conflict of beliefs, opinions, interests and resources among the stakeholders. The stakeholders with diverse interests through collaborative approach participate in different stages of decision making and help to achieve expectations and needs of the user [11].

The stakeholders are classified into three categories namely public, private and civil. They have a strong influence in the initiatives taken for redevelopment of a project. [12]

### 6.1 Public stakeholder:

The public stakeholders include Ahmednagar Municipal Corporation, Maharashtra Tourism Development Corporation (MTDC) and Indian National Trust for Art and Cultural Heritage (INTACH). They are responsible for urban redevelopment policies, building permissions, tender documents, operation and maintenance and conserving the heritage value of the city.

### 6.2 Private stakeholder:

The private stakeholders include owners, investors, consultancy firms and builders. They are

responsible to create a community space, development of real estate market, inviting investors, proposal for construction or renovation and may include maintenance of the property.

### 6.3 Civic stakeholder:

The civil stakeholders include the residents of the city and tourists as the ultimate benefit is given to them. The requirements of the civil stakeholders are carefully considered by the public and private stakeholders in order to come up with a proposal to the end users.

### 7. Conclusion:

The detailed literature review and case study through reuse of buildings indicates the potential for sustainable development. The adaptive reuse explores the potential contribution for abandoned structures and gives a new life with new function. The findings include the benefits of adaptive reuse towards achieving sustainable built environment considering environmental, economic and social aspects. The adaptive reuse has a lot to do with livability, workability and sustainability of the communities with the involvement of stakeholders right at the beginning of adaptive reuse proposal.

### References :

- [1] Megan Barber, What's old is new again, 2017. <https://www.curbed.com/2017/11/2/16598172/adaptive-reuse-architecture-united-states>
- [2] Global Status Report 2017, 10th annual World Green Building Week, the World Green Building Council (WorldGBC), 23 September 2019.
- [3] Elkington, John. 1998, *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*, CT: New Society Publishers.
- [4] Ruskin, John. 1969, *The Seven Lamps of Architecture*. London: Dent.
- [5] Brooker, G. and Stone S. 2004, *Re-readings: interior architecture and the design principles of remodelling existing buildings*. London, UK: RIBA Enterprises. pp. 275
- [6] Plevoets, B. and Van Cleempoel, K. 2013, *Adaptive reuse as an emerging discipline: a historic survey*. In G. Cairns (Ed.), *Reinventing architecture and interiors: a socio-political view on building adaptation*, London: Libri Publishers, pp. 13-32.
- [7] Cantacuzino, Sherban. 1975, *New Uses for Old Buildings*. London: Architectural Press.
- [8] Manewa, Anupa. and Siriwardena, Mohan. and Ross, Andrew. and Madanayake, Upeksha. 2016, *Adaptable buildings for sustainable built environment*. Built environment project and asset management.
- [9] Bullen, Peter A. and Peter E. D. Love. 2010, *The rhetoric of adaptive reuse or reality of demolition: Views from the field*. *Cities* 27 : 215-224
- [10] Lewis, Ramola. *Adaptive Reuse of Farah Bakhsh Palace, India*. 2016 [https://issuu.com/ramolalewis/docs/adaptive\\_final](https://issuu.com/ramolalewis/docs/adaptive_final)
- [11] Aigwi, Esther. and Egbelakin, Temitope. and Ingham, Jason. 2018, *Efficacy of adaptive reuse for the redevelopment of underutilised historical buildings: Towards the regeneration of New Zealand's provincial town centres*. *Structural Survey*. 36.
- [12] Delft University of Technology, 2020, *Managing Building Adaptation: A Sustainable Approach*, Reader Module 2, pp.7.