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# Preservation of Traditional Library and Archive Material: Physical, Chemical, & Biological Aspect

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**Abstract**

*Preservation is one of the important issues in the library. Many valuable documents can obsolete or affected by different type of factors like biological factors; chemical factors; environmental factors & natural Disasters. Different factors deteriorate differently on the library documents. In this paper various type of deteriorating factor, their mechanism of action & preventive measure for those factors have discussed.*

**Keywords:** Preservation; Biological Factors; Chemical Factors; Environmental Factors; Natural Disasters

## 1.Introduction:

Traditionally libraries and archives have played a significant role in the preservation of human intellectual effort. All libraries, large or small should have a well-defined programme for preserving the materials which it houses. No one library can preserve everything. In scheduling for preventive preservation, users and staff should be conscious of their roles in the preservation programme. S.R. Ranganathan in one of his five law of library science postulates that, "books are for use". if the materials are not well kept, they cannot provide that function because the most effective way to ascertain durability of books/ materials is to prevent or retard deterioration. It is no gainsaying that information is as getting on as the age of humanity, hence it is highly very important that information sources should be adequately preserved and conserved for all spheres of human development- intellectual, political, social, cultural development, etc, and for posterity.

Library is social institution where documents are selected, collected & organized to offer service to its user. The library's different kinds of resources/items/component such as books, journals, magazines, serials, audiovisual items, houses, furniture and fittings, library staff and users support each other in making service delivery a reality. The library will be well equipped for providing services when all of these components are available. Most important work of the library is to provide service to its user. To provide service various type of housekeeping operation run behind the screen. There is various type of maintenance work in the library. Preservation and conservation are one of the important tasks/woks of the library.

- **Collections Care** refers to the general maintenance and preventive care of a collection as a whole. This can include activities such as security, environmental monitoring, preservation surveys and more specialized activities such as mass deacidification.
- **Digital Preservation** refers to the maintenance of digitally stored information. This should not be confused with digitization, which is a process of creating digital information which must, in turn, be digitally preserved. Means of digital preservation include refreshing, migration, replication and emulation.
- **Reformatting** refers to the practice of creating copies of an object in another type of data storage device. Reformatting processes include microfilming and digitization.
- **Preservation & Conservation**
  **Preservation** refers to the set of activities that aims to prolong the life of a record and relevant metadata, or enhance its value, or improve access to it. This includes actions taken to influence records creators prior to selection and acquisition. It should be distinguished from **conservation**, which refers to the treatment and repair of individual items to slow decay or restore them to a usable state. Conservation is occasionally used interchangeably with preservation, particularly outside the professional literature.

## 2. Literature Review:

The literature review reveals that the available literature in this field is varied and scattered. It was not possible to record all the literature for this review. So few related studies have been observed before conducting this appraisal.

- **Clements (1987)** has conducted a survey and presented in detail about problems such as environmental, building, biological, change in preservation condition, handling / use by the general public. The resources available in the institution for preserving material, preservation of special documents, different properties of different documents, education and training, policy development and implementation measures, treatment options available etc.
- **Edhebe (2004)** stated that much avoidable damage is done to books by well-meaning but uniformed librarians through the following: 1. Use of pressure sensitive tapes. 2. Indeterminate use of polyvinyl acetate and other synthetic adhesives. 3. Use of highly acid paper for protective wrappers. 4. Use of wood backing in print, picture and map frames. 5. Amateur lamination. 6. Improper storage.
- **Sahoo, Jyotshna (2005),** stated in detail about different factors responsible for deterioration of library material such as environmental, biological, chemical, human factors, disasters and also provided preventive measures against all these factors.
- **Kneale, (2000); Ovowoh and Iwhiwhu, (2010)** carried out the fundamental factor in minimizing unnecessary damage to the library material also depends on the careful handling of the materials on the part of both staff and reader. Books should never be pulled off the shelves by head caps. When more than four to five books have to be carried within the library, care should be taken to reduce the possibility of dropping off the books. Over- sized books should be handled with great care.

Books should not be jammed on overcrowded shelves that may cause damage to binding.

- **Adekannbi and Wahab (2015)** have conducted a survey in selected libraries of Nigeria to identify diverse types and frequencies of deterioration of library material, causes of deterioration of library material, preservation and conservation techniques adopted for print and non- print material from by dissimilar libraries and use of ICT in preservation and conservation of library material.

## 3. Main Threats to Library Material:

- The nature of the material itself
- Natural and man-made disasters
- The environment in which it is kept
- The way material is handled

## 4. Preservation through Digitization:

A comprehensive preservation approach intended, choosing the most appropriate method of preservation opponent every point. This is skillful from beginning to end storage of materials in paper conditions, careful handling and housing, use of security systems designed to eliminate mutilation and theft, repair or replacement of damaged materials and from first to last stimulant and migration of electronic files. The preservation guidelines described are used by the libraries in the mind of its collections and are slow proper by the library as described. Nowadays many large libraries are delightful pains to preserve and conserve library materials, but more hard work are required by other small libraries in the humankind. It is the responsibility of the chief of the institution and management to draft an appropriate policy to preserve or conserve rare or old material in diverse ways.

Digitations means convert printed document, image document, analog document & other format document in to digital format by the help of different type of equipment, machine & software. It is also called make digital document. Digital content refers to information available for download or distribution through computer resident networked and it is not tangible to its user but can be use seamlessly. Preservation in the form digital data has many advantages than other format. It can easily copy, distribute, and require low space so damages by any factor are very low.

## 5. Factors of Deterioration:

Deterioration is a symptom of reduced quality or strength and process of changing to an inferior state. It can occur by the interaction between material and its surrounding or causative agent.

### 5.1 Physical Factor:

- Temperature
- Relative Humidity
- Light

When paper exposed on the light cellulose in presence of oxygen some portion of cellulose oxidized to oxy-cellulose. Paper contains the long cellulose chains. When oxy-cellulose formed long chain is broken down and as a result paper becomes weak and brittle. Formation of Oxy-cellulose may also cause of ink fading and dye of the colored paper and yellowing of white paper.

*Equation 1*

Cellulose + Light + oxygen ⟶ Weak and Brittle paper.

*Equation 2*

Cellulose + Light + oxygen ⟶ yellowing paper.

*Equation 3*

Cellulose + Light + oxygen ⟶ Fading of ink on colored paper.

Deterioration depends on intensity, composition of light and duration of exposure time.

**Heat:**

Cellulose + $H_2O$ ⟶ Cellulose fiber

Cellulose fiber + heat ⟶ Brittle non flexible paper + $H_2O$

Temperature causes release of water molecule as result (cellulose fibers) paper becomes brittle and it loses its flexibility.

### Humidity and Moisture:

A quantity representing the amount of water vapor in the atmosphere or in a gas. Relative humidity means the amount of water vapor present in air expressed as a percentage of the amount needed for saturation at the same temperature. Paper as a organic objects have a property i.e. absorbency property that means absorbs water to a greater or lower extent and the water goes inside the object through surrounding. When paper absorbs more moisture when there is high humidity. Certain amount of humidity is necessary for the flexibility of paper but in high humid condition, paper becomes soggy and the moisture weakens the fibers of paper. Moisture can weaken the binding agent and makes the book binding loose. Moisture also causes spreading of ink and influence the growth of microorganism on paper, which damage the paper.

## 5.2 Chemical Factors or Chemical Agents

- Dust and dirt
- Internal acidity of paper and ink
- Air pollution and atmospheric gases

### Dust and Dirt:

Dust means dry fine powdery particles of earth, soil & other things. It is harmful for library materials because it settled down on the surface of the document. It is hygroscopic in nature, is the ability of a substance to attract and hold water molecules from the surrounding environment. This is achieved through either absorption or adsorption with the absorbing or adsorbing substance becoming physically changed somewhat. When it absorbed moisture from air, dust particle sticks on the surface of the document permanently. Dust & dirt can also the cause of microorganism growth discoloration of paper and ink.

### Internal Acidity of Paper and Ink

Preparation of paper and ink acid treatment is there. But if acid is present in the paper or in the ink, paper will be deteriorated.

### Air Pollution and Atmospheric Gases

Carbon, nitrogen, nitrogen dioxide, sulphur, sulphur dioxide, ozone hazards cellulose materials of the paper & cloths. The atmospheric pollution makes harmful effect on the paper & cloths. Chemical reaction also happened when atmospheric pollution upon library materials gets moisture from environment. Chemical material like carbon, nitrogen,

nitrogen dioxide, sulphur, sulphur dioxide is very dangerous for library material. Many dusts particle permanently attached to the paper.

## 5.3 Biological Factors

### 5.3.1 Macro Organisms

- Silver fish
- Book lice
- Book worm
- Cockroaches
- White ants (Termites)
- Rodents
- Human factors

### 5.3.2 Microorganisms

- Fungus
- Mould

- **Macro organisms** like silver fish, Book lice, Book worm, Cockroaches, White ants (Termites), Rodents, Human factors are generally known as bio-deterioration. These are generally attack on whole book and its component like paper, leather, textiles, straw board, adhesive agent etc. Biological deterioration is grater in tropical region (e.g. India) where hot and humid climate which helps to grow various insects.
- **Human Factors**
  Improper storage, careless handling, deliberate abuse, book page cutting, folding the fore-edges of pages as a mark of reading, marking by ball pen or pencil, improper way of Xerox are all examples of deterioration of books by human beings.
- **Microorganism (**Fungus, Mould &Bacteria)
  Microorganism like fungus, mould & bacteria deteriorate books materials & responsible for different type of spot on the paper material. Bacteria can grow on the paper where nutrient (adhesive material, binding agent) & moisture available. Microorganism can consume cellulose, glue, pastes, binding threads etc.

## 5.4 Disasters

According to IFLA principles for the care and handling of library material disaster are given below

***Natural***

- Hurricanes
- Floods
- Earthquakes
- Volcanic eruptions
- Sandstorms

***Man-made***

- Acts of war and terrorism
- Fires
- Water (broken pipes, leaking roofs, etc.)
- Explosions

Fire, floods, high winds, cyclones, earth quakes are also factors of destruction / deterioration of the library collections. Flood & cyclones lead documents to absorb water, swell, warp and become extremely vulnerable to physical damage. Dyes and ink may bleed and book pages stick together. Leather bindings seriously warp and change shape. Effects of disasters on library collections are too obvious to comprehend.

### 6.1 Preventive Measures for Physical & Climatic Factor

- Damage can be minimized by providing ultraviolet screening film on windows.
- The windows must be provided with colored curtains.
- The UV rays of fluorescent tubes should be filtered by covering the tubes.
- Storage of library and archive collections.
  - Room temperature should be maintained 15 °C to 25 °C
  - And relative humidity should be maintaining 35% RH to 60% RH
- Air conditioning system cans maintain optimum temperature & humidity for the storage of documents in the library.
- High humidity could also be minimized by the use of de-hydrating agents like silica gel.

### 6.2 Preventive Measures for Chemical Factors or Chemical Agents

- Controlling air quality is difficult and complex and depends upon several inter-related factors. Gaseous contaminants and dust can be removed by filters.
- Acid free paper high quality of paper and ink should be used for printing.

### 6.3 Preventive Measures for Biological Factors

- Biological agent can be prevented by use of two type material one is static means which inhibit the growth of organism and another is cidal means which kill the organism.
- Pesticides like (DDT; Pyrethrum; Para dichloro benzene etc.) are the agent that can kills the pest. These pesticides may be sprayed periodically to protect the library material.
- Use of tag, RFID technology can stop the book theft. Wooden selves may coat with creoste oil and solignum.
- The use of toxic fumigants in the library community has been popular for many years. The use of ethylene oxide for the fumigation of library materials soon became the standard in the library community.
- Fungus deteroration can be protected by use of fungicide material like formaldehyde (200 - 280 gms/cubic area), Thymol (100 - 150 gms = $1m^2$ for one week), ethelene oxide, Mercuric chloride in spirit, Para nitro phenol 3% in, Methyl Bromide etc.

### 6.4 Preventive Measures for Disasters:

- It is very difficult to predict the natural disasters. Location of the library is the main factor for loss by natural disasters.
- Beside this fire protection fire alarm fire extinguisher should be present in the library.
- To avoid flood disaster, it is preferable library position in the 2nd floor.

## 7. Conclusion:

Preservation of library material is an important issue since many years ago. At present preservation can be done by traditional way as well as it can be converted to digital form by the help of different type of scanner, camera & helpful software. Different type of preventive measure prolongs the life of a record or library document. Every library should continue practice of preservation process. Libraries should be air-conditioned as its significance to library materials cannot be over-emphasized. While damage to library materials is sometimes obvious, but with careful preventive measures, deterioration of the materials may be pointed or prevented as the old adage says "prevention is better than cure".

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