MLIS/1/CT/02
Unit 3:
ENVIRONMENTAL FACTORS

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VIRONMENTAL FACTORS

Essentially the library is a repository of books and other materials to be used by the users.

e total collection of library materials is stored and preserved as long as the library exists. Books and other per-based materials are the major constituents of the library. It is the social responsibility of the Librarian to p all the books and other library materials physically fit to be used by the readers. In this unit, we are cerned with each library document as a physical entity. The basic materials and constituents of the physical ity of library materials are mostly organic and these are susceptible to natural decay and deterioration. If the vironmental condition is adverse, the process of decay and deterioration is accelerated.

The environmental factors are mainly temperature, humidity, water, light, air-pollution, smoke dust and such other damaging agents. All these factors exceeding the optimum value continuously, affect the, physical composition of the library materials. It has been problem for the librarians through the centuries to preserve the library materials against these enemies and to take measures against all types of decay and deterioration.

In a modem library there are many printed or non-printed non-book materials which are paper based such as, journals, newspapers, theses, conference and seminar papers, pamphlets, reports, and the like. Special materials are also there in the libraries such as, maps, graphic materials, audio materials, audio-visual materials and various other types. The different types of materials and the characteristics of the substances used for the physical composition of such library materials pose different kinds of preservation problems. All these materials are acquired and kept in the library for a long time. Although, the

climatic condition is not the same in all the regions, our country is basically a tropical country. A tropical country has its own climatic problems particularly the humidity. Industrialization, especially heavy industries, growth of urban areas, combustion of natural oil for transport, cooking elements in urban areas, and such other situations are continuously affecting the atmospheric condition. These atmospheric and climatic conditions have great impact over the physical condition of the library materials which are kept in the libraries for a long period. Such conditions are hazardous to library materials.

MPERATURE

Being a tropical country, India is in the high temperature zone and the relative humidity is also very high. Except for a few months in winter, the longer period of the year experiences high temperature almost all over the country. Extreme variation in temperature such as 5° C in winter and 45° C in summer is experienced in many places in India. Such fluctuation of temperature affects the physical condition of the library materials. Increase in temperature causes an increase in the rate of deterioration.

Temperature is always considered along with relative humidity. High temperature or heat with low humidity causes dehydration of cellulose fibres and the paper becomes brittle and yellowish. On the other hand, high temperature with high humidity, if continued for a considerable time makes the paper soggy and creates the condition for the growth of moulds. In both the conditions paper loses its mechanical strength and the cellulose fibres disintegrate and degenerate.

Temperature over 35° C causes brittleness and dryness of paper. It also causes physical deterioration of paper, cloth, linen and leather. The adhesives also lose their binding strength. High temperature or heat accelerates photolysis, hydrolysis and oxidation. It also causes buckling of edges on films and tapes, as well as their embrittlement and curling. If these are kept in such a condition for a long time it will be difficult to use such materials. Usually the source of heat is the high atmospheric temperature. If electric bulbs are used for lighting purpose they increase the room temperature abnormally. High powerful bulbs generate more heat. The natural deterioration of ageing is accelerated by heat and increase of temperature in storage areas.

GHT AND DARKNESS

Light may be natural or artificial. Natural light is the sun light and artificial light may be fluorescent tube light or electric bulbs. In the natural light several kinds of rays are present. These are visible rays of light, Cosmic rays, gamma rays, X-Rays, far ultra-violet rays, near ultraviolet rays and infra-red rays. All rays are not harmful to library materials. The ultra-violet rays coming directly from the sun art harmful to library materials. Therefore, library materials should never be exposed to direct sun rays. The cellulose fibres of paper lose their mechanical strength and paper becomes brittle and yellowish under direct sun rays.

Both the natural and artificial light cause deterioration to bleaching ink, dyes and colour in illustration and maps. Ordinarily light does not affect cellulose molecules of paper but reacts photo chemically on the other ingredients and impurities in paper content such as lignin, acid, resins, glue, starch, dyes, etc. The effects of these reactions then attack the cellulose by breaking the molecular chain and weakening the paper. Cellulose fibres are bleached by light but lignin and other non-cellulose ingredients in paper become yellowish. Prolonged exposure to light results in photosensitised oxidization of paper which is vulnerable to other forms of deterioration. The presence of rosin, glue, lignin, iron, alum and other sizing and loading substances have a strong bearing on deterioration by light.

Like sunlight; artificial light also contains ultra violet rays. The florescent tube light radiates a high percentage of ultra-violet rays but the light is rather cool. The electric bulbs radiate minimum ultra-violet rays but are sources of much heat. They cause deterioration by yellowing the paper and embrittlement. Heat and light cause deterioration simultaneously, and long exposure to both natural and artificial light is destructive to library materials.

UMIDITY AND MOISTURE

Like heat and .light, humidity acts both in favour of and against the preservation of library materials. A certain amount of humidity is necessary for keeping the flexibility of paper. But in prolonged humid condition where humidity is very high, particularly at the period of summer and monsoon, moisture is caused by high humidity. Such climatic conditions with moisture is a most dangerous and destructive factor for all kinds of library materials. Moisture itself causes physical deterioration but the worst situation is that it is the root cause for various types of chemical deterioration and biological damage and destruction.

Moisture makes the paper soggy and thus weakens the tissues of paper. The cellulose fibres lose their strength become disintegrated and make the document unworthy for handling. Moisture weakens the adhesives and makes the book binding loose. It also weakens the sizing elements and loading materials of paper. It causes spreading of ink. It causes stickiness in art paper, glazed paper with the help of sticky ink, dyes, colours and pigments. Moisturised pages of book-often stick together particularly with illustration which may not be restored to their original condition. Moisture causes softening of gelatin on film and sound tape. Rolled films tapes and microfiches can stick together while they are in contact under conditions of moisture.

Moisture accelerates various types of chemical deterioration. Because of chemical reaction paper becomes yellow and stained with coloured spots. The impurities in the ingredients of paper, the contaminants, usually the oxides of carbon, nitrogen and particularly of sulpher, the acidic residue in paper, under condition of moisture cause deterioration to documents. Moisture promotes the growth of micro-organisms like mildew and fungus which cause deterioration and damage to paper and book binding materials. Spores of micro-organisms which are present in the atmosphere in dormant stage, starts growing under favourable conditions of high humidity. They cause enormous damage by destroying the sizing elements, cellulose fibres, adhesives and other binding materials and make the documents unreadable. Dust in contact with moisture causes physical and chemical degradation.

VATER

Water causing destruction to library materials may come from various sources. These may be due to human negligence, accidents or a natural calamity. Water may get into storage areas from leaking roofs, defective plumbing and clogged drains. If the rainwater pipes are broken, water may come in through open windows. If the windows are not closed rain water may come into rooms freely in the rainy season. Water running on the walls, over the floors, spilling on the shelf ranges, book cases or other furniture and equipment can cause enormous damage to the library materials, furniture, equipment, and even the library building. All these may be caused by human negligence. Water may come by accident if proper caution is not taken in time. It may also come by water-logging of roads under heavy rain and overflowing of water into the basement or ground floor of the library building. Natural calamities may be in the nature, of floods, cyclones and atmospheric depressions for a long time.

IOKE

Smoke is another destructive enemy to library materials. Visible or invisible, smoke exists in the air suspended in the lower strata of the atmosphere particularly in urban areas, densely populated habitations and industrial locations. Smoke contains unburnt particles of burning coal, carbon particles, burnt fuel, industrial coal smoke, fibre particles and any other particles suspended in the air. All these suspended particles make the air heavy, so smoke settles at the lower part of the air. When such particles are diffused and distributed in the air, smoke may not be visible, but traces of smoke are there. Atmospheric smoke is visible particularly in the mornings and evenings in winter when smoke mixed with mist or fog hinders even the visibility and looks like a solid object.

Smoke is responsible particularly for chemical degradation and damage to library materials. A large amount of smoke is released in our country combustion of coal and fuel of oil gas. These things are used in urban areas, slum areas and densely populated areas for cooking purposes. A large amount of natural gas particularly diesel is burnt everyday for vehicular transport. The exhausts of transports produce enormous quantities of smoke. Industrial furnaces produce an alarming amount of coal and other types of smoke with chemical impurities. The chemical contents of smoke, as a whole, contain various oxides of carbon nitrogen and particularly sulphur. Sulphur dioxide is absorbed by porous elements of library materials. Sulphur dioxide, a by-product of the combustion of coal and fuel oil, is not initself harmful to library materials. But under high humidity and moisture it reacts with metallic impurities in paper, particularly iron and copper, and forms sulphuric acid which is highlydestructive to paper. The metallic impurities are found in all kinds of modern paper. The oxides of carbon and nitrogen also act for chemical degeneration of cellulose molecules by causing oxidation. The physical deterioration is caused also by smoke while the suspended smoke particles of the air settle down on the surfaces of library materials as dust.

ST AND DIRT

Dust is a mass of suspended particles carried over by air coming from any source. It settles down on any surface of library materials which is exposed to air. Since this is airborne it can settle down even in closed files and boxes and closed areas where air can flow freely. Ordinarily dust cannot be seen but one can see it when it has settled down as a mass usually by discolouring the surface. When dust which is hygroscopic in nature is mixed with high humidity and moisture, it is transformed into dirt, a sticky substance over the surface which cannot be eliminated completely.

Dust and dirt substances aggravate the harmful action of sulphur compounds. These are sources of both chemical and physical deterioration. Dust hastens atmospheric acid reaction by attracting moisture to cause chemical degradation. Dust and dirt disco lour the pages of books and help to grow micro organisms. Dust and moisture combined loosen the cellulose fibres of paper. The deterioration caused by dust and dirt is visible on the exposed part of the books. Dust is very harmful to audio-visual materials. It is particularly responsible for sound degradation of tapes and discs. Dust and dirt also damage the equipment meant for using the audio-visual materials.

R-POLLUTION

Clean and pure air is essential for any living being, so also for any organic material. Air is a mixture of Nitrogen, Oxygen, Argon, Water Vapour and Carbon Dioxide along with small quantities of Neon, Krypton, Xenon and Hydrogen. Some impurities like oxides of sulphur, carbon, etc. and suspended particulates in the form of soot, smoke and dust also exist in the air. When any of these impurities exceed the permissible level, it results in air pollution. But it is a fact that even clean air causes deterioration to some extent to organic materials kept in the library. The oxygen mixed with water vapour existing in the air causes hydrolysis and auto oxidation. Library materials cannot be preserved in the library for a longer time without clean air. The real enemy of the library materials is the impurities present in the air and the contamination of the air. All these create air pollution which is more or less a permanent affair in this modern age particularly for urbanisation, industrialisation, increase of slum areas, deforestation etc.

The impurities of air and the sources of air pollution causing damage to library materials are mainly sulphur dioxide, hydrogen sulphide, ammonia, nitrogen dioxide, carbon dioxide, ozone and aerosols.

The hydrogen sulphide in contaminated air is produced by industrial activities, industrial gases and wastage, activities in cities and biological activities. It causes deterioration, though the rate is not high, in comparison to sulphur dioxide. It affects paper, binding materials and metals. Ammonia released into air from many sources is harmful to cellulose fibres. Ozone is generated by the action of ultra-violet rays on oxygen in the upper atmosphere. Most of the nitrogen dioxide, carbon dioxide and carbon monoxide in polluted air come from automobile exhausts. The action of sunlight on nitrogen dioxide generates more ozone and in connection with smoke it causes more damage. Ozone destroys organic materials by breaking the bonds between carbon atoms. Moisturised cellulose is particularly vulnerable to ozone found in polluted air. If it is exposed for a longer time paper and textiles lose their strength, Ozone makes the colours of fabric book covers fade. The book binding materials such as, leather, gelatin, glue, paste are susceptible to deteriorationby ozone in humid atmosphere.

VIRONMENTAL CONTROL

Adequate measures should be taken so that the deterioration and decay of the library materials can be checked, retarded and not accelerated. Usually physical and chemical factors cause such deterioration. These causes of deterioration can be controlled to a great extent by the environmental control.

There are two aspects of preservation of library materials: the preventive measures and the curative measures. The preventive measures comprise all the methods of good housekeeping, adequate caretaking, dusting, cleaning, periodical supervision of the storage, prevention of any possibility of damage by physical, chemical, biological and other factors, use of repelling agents, chemicals and insecticides to drive away the biological factors, and, on the whole, the control of deterioration and damage of library materials. The curative measures are taken when it is found that the preventive measures have failed for some reasons and the, materials are affected and damaged by the causes of deterioration and the enemies of the materials. The curative measures include mending, repairing, strengthening, rehabilitation, deacidification, fumigation, lamination and other jobs which are required, considering the physical condition of an individual document. The damaged document can be made physically usable after all curative measures have been taken to restore the physical condition of the document.

Building

Light

Temperature

Humidity and Moisture

Housekeeping

Reference

http://egyankosh.ac.in

THANKS