8-2014

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Damage to Libraries due to Water Related Disasters

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Abstract:
Flooding, leakage, heavy rains, hurricanes, activation of fire sprinklers due to fire are some of the reasons due to which water can enter library premises. It can damage library resources and infrastructure as well as disrupt services for a long time. The paper describes the ways libraries can be prepared for such disasters as well as how to treat resources damaged due to such disasters.

Keywords:
Disasters, Libraries, Flood, Water, Damaged resources

Introduction
While all types of disasters have the potential of damaging libraries, water is not only the most common but also the most potent factor. Damage can be caused through a tsunami or floods from a nearby water body such as an ocean or river. Heavy rains, or wind driven hurricanes, cyclones and tornados also destroy collections. Apart from these natural causes, water can come into a library from broken drainage pipes, or seep in through leakages from walls, broken windows, doors or even from the ground. Moreover, even when the chief disaster is a fire, activation of water sprinklers and fire-fighting equipment requires extensive use of water, which in turn causes damage to books. Vulnerability to water damage is higher when the library is located in the basement or the ground floor, or near a fire hazard prone area such as a canteen or a chemical laboratory.

Water damages almost all types of library resources: paper-based, photographs, films or digital. Water damage can range from dampness, or wetness at the edges, to completely soaked or submerged items. The extent of damage depends on the force with which the water comes in and also on how long it stays in the library. Thus it can range from minimal to completely destructive, depending on the materials involved and the amount of water, the circumstances and the purity of the water.

All components which make up a book are susceptible to water damage. The type of paper, quality and amount of sizing used, ink, glue and binding are all affected by water to different degrees. For example blotting paper absorbs water much more than art paper; newsprint which has very little sizing gets damaged faster than photographic paper which uses different sizing material. When exposed to water some prints and materials soften and stick to adjacent surfaces. Papers that get wet can become distorted or warped and some may even dissolve completely in water. Water can cause bleeding of inks and dyes causing the text or the pictures to appear blurry and streaked. Binding of books may be severely damaged due to water. When wet books of different sizes are placed on top of each other they get warped and lose their shape. Further wet paper is likely to attract mould and fungus thereby increasing the damage. If books are tightly packed on the shelf, the swelling of books with water makes it difficult to remove them without further damage.
Disasters caused by Water to Libraries in Past

There are numerous examples of library disasters caused by water. A few select examples follow. Floods in 1910 in Paris, France (Baryala, 2006) and in 1966, in Florence, Italy caused heavy damage to the respective national libraries. In the Florence floods, over two million rare and irreplaceable volumes and innumerable manuscripts were damaged. The basement of the Biblioteca Nazionale Centrale, Italy was filled by water and mud. Nearly 1,200,000 volumes and pamphlets were flooded, including 100,000 rare volumes of the Magliabecchi collection, 50,000 folios of the Palatina, a newspaper collection of 400,000 volumes. The card catalogue was damaged as well. Other collections in Florence suffered flood damage too, e.g. the 350,000 volume collection of the Vieuxsieux (including first editions and association copies). At the University Library in Florence, 200,000 volumes were under water. In the major libraries of the city, a total of 2 million volumes were submerged. (Lenzuni, 1987; van der Hoeven, & van Albada, 1996).

In 1975, the Case Western Reserve University Library, Cleveland, Ohio was flooded. Almost 40,000 books and 50,000 maps became wet and muddy; the cost of recovery was $540,000. (Buchanan, 1988) In 1985, heavy rains and overflowing of a river resulted in the flooding of the basement of the 450 years old Innsbruck Museum and Library in Austria. The ice cold water flowing with heavy force damaged 80% of the Museum collection and part of the library collection stored in the basement. (Tarmann, 2000) The Morgan Library at Colorado State University faced a catastrophic flood in 1997. The water damaged the power supply of the library building and completely submerged half of the library’s collection. About 500,000 bound journals, government documents, and microforms were damaged irreversibly. The entire collections of bound volumes and science monographs were damaged. The water also destroyed 81,000 linear feet of shelving, two staff offices, the Electronic Information Laboratory, and five study rooms; telecommunication closets, mechanical rooms, and three elevators; and more than 500 chairs and tables. (Lunde & Smith, 2009; Parker, 2007)

Floods struck in Prague city of Czech Republic in August 2002, destroying and damaging large collections in more than 40 libraries, including 14 major research libraries and the National Library of the Czech Republic and the Prague Municipal Library. More than 8,000,000 documents were damaged or destroyed. Damage to the National library was estimated at $11,000,000 where as for Prague Municipal Library it was $15,000,000. The worst damage occurred to special collections in the basement of the Holesovice Branch of the Prague Municipal Library where 20,000 rare and historical books, including a 1488 Prague Bible - the first in Czech language and one of only 12 copies worldwide - were soaked. (Ray, 2006; Floods..., 2002; Polisensky, 2002)

In June 2006, due to heavy rains, the Sidney Memorial Public Library, New York, USA was flooded with 5 feet of water in the basement area which housed a large storage room, staff members’ workspace, the boiler room, a storage room for two 500 gallon oil tanks and all of the phone and computer lines including the computer server. (Flaherty, 2009-2010) Iowa, USA had heavy floods due to two rivers overflowing in 2008. Museums and the University of Iowa were affected: Iowa City collections of the University of Iowa Libraries and Cedar Rapids collections of the National Czech and Slovak Museum and Library and the African American Museum of Iowa were affected. (Baum, 2009)

The tsunami in 2004 in South and Southeast Asia affected several libraries. The magnitude of the disaster was so great that libraries were almost wiped off from the map. In Sri Lanka about 170 school libraries, 55 public libraries and 68 libraries attached to religious
institutions were either destroyed or damaged. (Gamage, 2005; Amarasiri, 2005) Libraries in the Aceh Province of Indonesia were badly damaged. Two public libraries were destroyed. The Centre for Documentation and Information of Aceh with its manuscript collection was practically obliterated. Moreover there was human loss; 23 staff members of the Aceh Provincial Library including the Director of the Library perished in the tsunami. The collection and equipment on the ground floor of the library were completely destroyed. (Robertson, 2005)

Examples of hurricanes, cyclones and tornados damaging libraries are also common. One of the biggest hurricanes faced by Jamaica was hurricane ‘Gilbert’ in September 1988; it caused extensive damage to the library of the Norman Manley Law School, University of the West Indies, Kingston. The driving wind and the rain soaked a large part of the collection, scattering books and papers, damaging furniture and soaking the carpet. 50% to 75% of the collection was exposed to water damage. Hurricane ‘Gilbert’ hit Jamaica Library Service system and many of its branches were also damaged. Overall loss of over 150,000 books and periodicals was reported due to it. (Aarons, 2003) Hurricane ‘Hugo’ in 1989 in Montserrat Island damaged the Montserrat Public Library. The library was under approximately four inches of water. Materials from the newspaper and paperback racks and from the magazine display had ended up in the water gathering on the ground. Children’s books were lying in water. A cabinet of local history materials from the Montserrat National Trust was broken and the materials it held suffered water damage. The library lost some 6,000 books; broken window panes and furniture were strewn on the floor. The public library also had to be shifted and re-shifted due to volcano eruptions in August and December 1995, and April 1996 which again resulted in disruption of services. (Cassell, 2004)

Typhoons and hurricanes severely damaged libraries in 2005. In January of the year, a hurricane affected the archives in the city of Falkenberg, Sweden. It was flooded, as the strong winds pressed the sea-water up to a hitherto unseen level and due to a broken window uncontrolled water entered into the archives, which resulted in the damage of several hundred thousand archive boxes. (Cullhed, 2006)

Hurricane Katrina in August 2005 was one of the deadliest storms in the last 100 years and the costliest natural disaster ever to strike the United States. It assaulted the Gulf Coast with winds up to 140 miles per hour affecting Southeast Louisiana and two thirds of Mississippi. It affected a very large area and destroyed and damaged several libraries. Of the 188 public libraries in Louisiana, 23 were destroyed, 33 suffered severe damage and 37 more had moderate damage. In Mississippi 8 public libraries and 43 school libraries were destroyed. One of the libraries that the hurricane destroyed was the Howard-Tilton Memorial Library at Tulane University. The basement of the library was flooded for three weeks with 8 feet of water. A total of 700,000 items in the collection including print volumes, archival folders, recordings, microfilm reels and cards were damaged. More than 60% of the damaged collection was lost. (Eberhart, 2005; Clareson & Long, 2006; Topper, 2011) During a severe summer storm water collected outside the North Dakota State University Main Library, broke the window panes and entered the library. More than 4 feet of water mixed with sewage and petroleum products flooded the lower levels causing a damage of approximately $2,000,000 to the collection and $1,000,000 to furniture and equipment. (Flood..., 2000) Yongquan Monastery in China which had a rare collection of ancient books was damaged due to typhoon Longwang in October 2005. Many of the documents were already infested with mould and the typhoon made the situation worse. More than 5,000 volumes of Buddhist classics were immersed in the water. The paper of the documents was fragile and was
damaged by the muddy water. Particularly in the Blood Classics, a kind of Buddhist classics said to be written with the blood of the monks; the characters had faded. (Pinhong, 2006)

The Michel Orradre Library, the main campus library for Santa Clara University is only a few feet above sea level and is on top of an underground stream. A heavier than normal rainfall normally results in seepage from the ground. Standing water would cover the floor at the basement, and at the foot of the elevator shaft. The air would get mouldy and visible fungal growth would begin to appear on the walls. This continued for several years until four wells were dug at the four corners of the building and a de-watering system that pumped out the ground water automatically was installed. (Kim & Goodwater, 2003)

Flash floods sent a wall of water - up to 15 feet at its highest point - through the ground floor of the Hamilton Library of the University of Hawaii at Manoa in October 2004, ripping out office walls and soaking 230,000 rare maps and aerial photographs, thousands of government documents and books, more than 100 computers and the entire library and information science school. The water pushed through with the force of a tsunami resulting in materials turning up as far as five blocks away. The chairperson of the School, Rebecca Knuth commented, “It was an experience to see our files under cars, a computer smashed into a tree, a small table perfectly upright 50 yards away”. (Flash..., 2004, p. 16; Davis, 2006)

Negligence, lack of maintenance and human error can also cause water damage. In 1998 the basement of the Boston Public Library was flooded due to a break in a water pipe. (Fithian, 1999) The Library of the Culture Palace for Nationalities of China (LCPN) faced a minor flood in 2005, due to a broken heating pipe. Hot water damaged more than 20,000 newspapers and books including about 290 packs of the Tibetan Buddhist sutras, about 600 traditional-thread-binding Chinese ancient books. Many books became unrecognizable as ink spread. It also damaged the artifacts and objects kept in the Museum of the Culture Palace for Nationalities. Because of water, the paper became glutinous and groups of pages adhered together, several books were worn down to cotton fibers and some documents were blurred and the characters were unrecognizable. The paper fibers were degraded forming red marks on paper. The disaster reduced the lifetime of the collection for at least 100 years. (Zhiqing & Daying, 2007) Due to bursting of unwrapped fire suppression pipe, water flooded the Science and Technology Library of University of Akron in USA in 2010. (Calzonetti & Fleisher, 2011) The construction work going on in an adjacent building caused a steam pipe to burst, the fire sprinklers to discharge in the basement of Sterling Memorial Library at Yale University in January 2006. It damaged the special collection of Cambodian newspapers and 4,500 documents of Southeast Asian collection. It also created problems in the library’s computer networking system. The four servers in the library were damaged. (Kennedy, 2006)

In India, during 1993, Thapar University Library and Panjabi University Library were affected due to unprecedented floods on the night of 11 July 1993. Thapar Technology Campus was submerged under 1.4 meter to 2.4 meter of water for four to five days. The library on the campus had 63,000 items out of which 44,535 were destroyed completely. The library also lost computers, photocopying machines and CD’s. At Panjabi University Library, there was hardly any loss to the collection and equipment except that a voltage stabiliser was damaged. Only those books were damaged which were borrowed by the users who lived in areas that were flood affected. (Trishanjit Kaur, 2009)

Sundarayya Vignana Kendram, Hyderabad, India has two libraries. One is the main Research Library having a rich collection of rare books, journals, newspapers, reports, pamphlets,
manuscripts, private papers, and other materials in different languages from the 12th through 20th centuries. The other is the Urdu Research Centre Library having a valuable collection in Urdu language and literature. Both these libraries were affected due to unusual heavy rains during the week of 21 August 2000 which caused severe flooding in Hyderabad. The flood reached its peak on Thursday 24 August 2000 when a fifteen-foot wall of water inundated much of the city. Flooding ravaged the Sundarayya Vignana Kendram building which housed the two invaluable library collections. Within minutes both collections were completely submerged in water. (Sundarayya…., 2000)

In the unique experience of the devastating flood of the Barak Valley, Assam in India in the year 2004, all the major libraries in the downstream areas were completely flooded and damaged. (Satpathy, 2007)

A natural disaster in the form of very heavy rains leading to flash floods occurred in the state of Maharashtra, India on and around 26 July 2005 damaging many libraries in the State. Narratives of 16 librarians reflected that more than 2 lakh items which also included rare Sindhi language manuscripts in one college library were damaged. Library records and infrastructure of these libraries were also damaged. Similarly due to flash flood in the city of Surat, Gujarat, India resulted in loss of more than 2 lakh items in seven libraries. These libraries could not start their services as water did not recede for many days and staff could not reach the libraries. (Zaveri, 2014)

Water can damage all types of resources whether paper based or digital. Libraries must have strategies to prevent these resources from getting damaged due to water or if damaged, repair them.

**Treatment of water damaged resources**

**Paper Based Materials**

This will include books, bound volumes and unbound materials such as files, pamphlets, brochures etc.

- To clean water damaged paper material, so that fungus / mould do not grow, immediately spray the books with diluted Dettol solution, antifungal medicated powder, diluted ethanol, alcohol or acetone. The room may be fogged or fumigated with smoke of ajwain or caraway seeds which have antifungal property. These measures will also speed up the drying.
- Check for how many hours the paper has been wet. Is it partially or fully wet? Is dirt like mud, chemicals deposited on it?
- If possible sort out materials printed on art or coated paper. Also separate out books bound with leather and vellum. These may include art books, books with colour photographs, maps etc. These materials must be frozen immediately within six hours.
- Other books need to be treated within 48 hours of the damage. If not they will lose their shape, get swollen and pages may bend.
- The wet books if not handled properly, will get easily damaged and become unusable. Take following precautions while handling these books.
  - Do not open wet volumes, or close those that have fallen open
  - Do not separate covers from text blocks
  - Handle one item at a time
  - Do not press water out of wet books – the paper is too fragile when wet
- Use Air Drying for
- Damp books and books with wetness of one inch on the edges
- Small amounts of damp or partially wet unbound paper
- Very few wet books, but only if staff are available to dry them in a controlled environment
- Do not use Air Drying for:
  - Coated paper (unless just a few and they can be dried right away)
  - Leather or vellum binding (air drying should only be done by a conservator)
  - Large quantities of wet unbound paper
- Use Dehumidification for
- Moderately wet books
- Do not use Dehumidification for
  - Coated paper and Leather or vellum bindings
  - Unbound paper materials should be dried by spreading them on clean absorbent flat surfaces in areas where there is good air circulation.
  (Figure 1)
They should be covered with non-woven polyester web or plastic mosquito screening to keep them from blowing away, if needed. Do not attempt to flatten anything at this stage, simply try to get things dry as quickly as possible. Flattening can be done later if necessary. Damaged documents which have value only for their information need only be dried enough to be handled and photocopied. If the number of documents affected is too large to be handled within 24 hours, or of value which will require individual attention, the items should be frozen.

Figure 1: Drying Unbound Paper

Ludwig (2002)

Photographs

- Most photographs can be saved from water and smoke damage but not fire damage as the emulsion layer will melt from the heat.
- Remove photographs and negatives from water and separate them from their covers.
- Do not allow to dry as they are, as the photographs will stick to the covers.
- First rinse photographs and negatives with clean water without rubbing.
- Air drying is the preferred recovery method for all photographs. (Figure 2)
Photographs with stable images should be blotted with clean blotters or soft paper towels before air drying. Non-woven polyester fabric should be placed between the blotter and photograph to prevent sticking.

In a dry area, keep fans and dehumidifiers on and hang the photographs on a thin string by clipping them with plastic clothes pins or dry them on a flat surface by putting them upside down on blotting paper or old newspaper. Allow the photographs to dry for 48 hours. Then put back in new covers and re-label them. (Figure 3)

If photographs are sent outside for treatment, they should be sent in a plastic container filled with water.

Photographs and slides should not be frozen unless no other choice is available. Some damage to surface gloss may happen in the freezer. Glass plate negatives should never be frozen. If required use blast freezing.

Ludwig (2002)
Optical Disks - CDs and DVDs (Figure 4)

- Remove from water immediately.
- Do not rub or scratch or bend.
- Clean any dirt or mud with clean water.
- Disks should be dried by keeping them vertical in a tray and not flat on a surface. Rub gently with soft cloth by moving up and down or left and right but not in circular movement on the tracks.
- Do not use any cleaners on a CD/DVD.
- Do not use a hair dryer to remove moisture or blow off dirt.
- Place them in clean containers after drying.

Figure 4: Treating Damaged CD’s/DVD’s

(Toyonaga, 2010)
Microfilm and Microfiche

- First remove from its cover.
- If it is stuck to its cover, dip it in cold water in a plastic container (not a metal container) and send it for drying to a photograph company.
- Put rolls of microfilm into water-tight containers and fill with clean, cold water.
- Send to microfilm processor company within 72 hours for washing and drying.
- Microfiche should be hung out to dry. (Figure 5)

Figure 5: Treating Microfilm/Microfiche
Preventive Measures Libraries can take

Risk assessment- At regular intervals libraries should check the library premises for any chances of water leakage and take appropriate measures.

Location of the library- If library is located in heavy rainfall area, or low lying area, then library should be setup on upper floors of the building and not on the ground floor. If that is not possible, water pumps should be setup which will remove water in case of emergency from library premises. During monsoon, library resources from lower two racks should be shifted up to prevent any damage.

Library premises: The furniture in the library should be made water proof, water pipes and drinking water facilities should located away from the collection area.

(Toyonaga, 2010)
Insurance: Each and every library must have insurance against all types of disasters. The insurance must cover library premises, library furniture and library resources.

Emergency kit: To be prepared against damage due to water, a kit containing plastic sheets to cover stack areas, bucket to remove water etc. should be available in the library premises.

Contact details to be kept ready: In case water disaster happens libraries must have contact details of cold storage areas nearby, agencies which give dehumidifiers on hire, experts in salvaging of water damaged materials should be kept handy.

Conclusion:
When water enters library premises due to heavy rains, flood, leakage or use of water to stop fire, it can damage all types of resources. Many examples across the world shows that either due to natural disasters or human error, water damages library resources to various extent. It is necessary to take preventive measures and if damage happens, treat the damaged resources at earliest.

References:


Calzonetti, J., & Fleischer, V. 2011. Don’t Count on Luck, be Prepared: Ten Lessons Learned From the “great flood” at the University of Akron’s Science and Technology Library. College & Research Libraries News 72(2) (February), 82-85


Parker, S. E. 2007. Organizational Learning, Innovation, and Employees’ Mental Models of Change Following a Disaster: A Case Study of the Morgan Library at Colorado State University. Ph.D. diss., Capella University.


