DAMAGE ASSESSMENT AND MAPPING SURVEY FOR PRESERVATION ON LIBRARY COLLECTION

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Abstract

Indonesia as a tropical country are about 70% - 90% under high humidity range and surface temperature that reaches 23 °C - 28 °C. High degree fluctuation is making collection on Indonesian Library deteriorated fair rapidly towards unfavorable condition. It is found many damage collection occurs because of fungal growth, foxing, ink corrosion, vinegar syndrome, insects, fragility and regular use.

Rapid alteration collection in storage space of Indonesian Library create idea for making one asessment to appraise condition by mapping type and amount of physical and chemical damage. Survey was conducted to manuscripts, old newspapers, magazines-rare books, maps. Survey to collection room done as well, by measuring number and fluctuating levels of light intensity, humidity and temperature.

There are seven steps being taken in this survey, begin with inventory, sampling, form design, surveyor training, data entry, tabulation until discussion. Furthermore, survey result conducted by librarians and conservators showed that there are several proportional and reverse variable relation between damage items, types, total amount and human behavior to collection. Matrix was made to obtain four categories damage from good to very bad grade. By designed single system programs for data entry base on Microsoft Excel, will obtain statistical values and graphs tabulation. This method can be use as a benchmark evaluation to management and system how to keep collection well. It's also appreciate the importance of preservation in libraries. Results will count the number and type of collection damage, so it will recommend library to do preservation activities focus on prevention and recovery. Purposes of this survey are to get data of damage and establish action plans to restore and repair storage condition. The survey project will gather and analyze information on making policies and strategies in preservation.

Keywords: collection damages, survey method, mapping, preservation, Indonesian Library
1. Introduction

It cannot be denied that human civilization progressed and developed very rapidly in knowledge and technology era. Fruit of the human mind will outline in printed and recorded materials. Many archives and publications published by the authors has a lot of history and authentic information where is very valuable in course of human culture.

Since discovery of inscription on Egyptian era and China’s paper media to digital printing machines in Europe, people always perpetuate such information from oral to record. Indonesia also has a long history of civilization from Nusantara kingdom to colonial era. European that had once come to Indonesia, leave many literature sources on condition and public life at that time. Collections under that period can be seen until now at National Library of Indonesia in various forms of hundreds years old handwriting or printed collection.

In accordance to the Law No. 43 Year 2007 about Library, is LPND which serves as Deposit and Preservation Library. Indonesian National Library has been struggling for 34 years to preserve library materials both printed and recorded. Collection of National Library will continue to rise every year without any amount limitation received as deposit collection. Collection of deposits obtained by handing over printing paper from the publisher or personal records made by Indonesian people and or foreigners who make work containing about Indonesia (embodied in the Law No. 4 of 1990 on collection of deposit). Then library keep that record in their collection room.

Globally, environmental factors have a major role in determining condition of collections, in countries with tropical climates such as Indonesia, the level of fluctuation temperature and humidity cause accelerate deterioration and lead such visible damage as cockling paper, flaking ink, warped covers on books, and cracked emulsion on photographs. In some situations, however, materials may be protected from moderate fluctuations. Control of temperature and relative humidity is critical in the preservation of library and archival collections because unacceptable levels of these contribute significantly to the breakdown of materials (Sherelyn, 2014).

Emphasize to collection room, collection condition survey program is an important factor for preservation and restoration strategies. Information that received from survey results illustrates global current and treatment condition, furthermore it is an important step towards conservation required in preservation laboratory in the future.

Implementation of conservation must be based on preservation policy with reference to scale of priorities by consider value of usability and risk of damage. One method for achieving those policies is bring off preservation assessment in library materials. Conduct a survey condition due deposit and circulation collection then make a map in order to know the extent of damage. This map can be used as a basic reference determine preservation policy. This survey can be used as benchmark against necessity of preservation treatment in a library. Survey results will provide a library guide to repair installation storage, determine what activities should do, how much material is needed, estimate how long restoration process and methods which one is more efficient.

2. Objective

2.1. To obtain amount and types description of damage collections in national library, particularly in Indonesia

2.2. Analysis data for immediate restoration and digitizing action plans for poor condition of collection.

2.3. Determine direction on preservation policies related to storage and deposit-circulation collection.
3. Literature Review

3.1. Deterioration of paper

Further developments before the 1980s discovered paper that tend to be more acidic because of alum-rosin sizing agent addition. Actually this agent have advantages to reduce absorption and minimize spread of ink when writing. But when alum - rosin meet high humidity it will produce sulfuric acid to paper. Existing water content can also affect the level of acid hydrolysis and damage to paper. In the early 1980s paper mill began to add alkaline buffered agent to wood pulp intended for longer usage. Alkaline buffers can slow or prevent hydrolysis by neutralizing acid in cellulose chain.

However, seeing at today's changing times it is impossible to avoid occurrence of acidity in paper. The level of acidity or low pH can be accelerated with presence of bad neighborhood factors like pollutant and low air quality. When chain of cellulose fibers has lost, it will continuing to breakdown, it caused chain termination getting shorter and this hydrolysis reaction will continue to degraded. Air pollution sulfur oxides and nitrogen oxides will absorbed in paper so make paper brown and brittle. These symptoms may be noted in an exemplar of book, the edge is always going to be browned and brittle than in middle part because high level absorbton on the edge.

3.2. Biological factors

Biological factors can also cause damage to paper. Environments exposed directly to high humidity and condensation always created growth of biological organism such as mold and fungi, insects and rodents. Biological organism attack paper and other organic materials when temperature and humidity are not controlled. Mold spores will fall asleep in the air until they find suitable conditions for their growth. When mold or fungi use paper as organic material to live it will accelerate growth. The change of paper will be marked as color spots to hyphae on the surface. Large fungal attack will make the paper into a greenish, brown to black. One thing that is unique when the fungus has spread on paper it is usually follow with insects growth depend on the fungus.

3.3. Light

Apart from above causes, light is considered damage in direct even and cumulative, for example when the collection was damaged by 200 lux of light for 50 hours, it is as well as exposure to light of 250 lux for 40 hours. Damages incurred by light influence condition to paper pigments, dyestuffs, and ink. Pigments and dyes will fade when exposed to light with color gradation and widening. Unfortunately, selective fading colors change in different area of paper or spread randomly. Ultraviolet rays in sunlight and fluorescent lights can cause oxidation of cellulose.

3.4. Humidity and Temperature

Temperature and relative humidity have dependent mutually relationship and reversed. Almost all existing materials in collection has a hygroscopic behaviour (substance can easily absorb or remove moisture). Paper, parchment, papyrus, leather and adhesives used in bookbinding derived from organic materials. Fragility is not only caused by dry water content in the collection but also can occur in humid collection. High humidity causes rapid acid hydrolysis and breaks carbon chains in organic matter. Some evidence show regular changes in temperature and humidity can lead to weakening paper and other materials.

Utilization of collection into visitor’s hands or users will also conduct external damage. More utilize the collections repetably will broke faster. Therefore, it is necessary do maintenance and repair these collections in order to survive longer then become cultural heritage.
4. Methodology

The survey was conducted with six steps: The first step, documentation and data collection across the room and its collection unit, the second step, determine existing collection, how many copies will take as samples. The third step, training for surveyors among conservators and librarians, the fourth step, implementation on the survey. The fifth step, data collection and information entry into computer databases. The last stage is data assessment on survey results. Training done to get same perception on how they fill a survey form so that they can get equal thought of assessment through objects. Manners are very important in conducting surveys with intention that the collection does not damage more severe. Sequence steps are:

4.1. First step (documentation)

Documentation about collection types that shelf on collection room aimed to determine incidence of population and reveal what variable damage to collection. It will also required some interview to staff guards to gather information that is anomalous or non-regular occurrence. See a direct type of collection and environment storage in order to prepare necessary materials for surveyors.

4.2. Second step (determining amount of collection)

Determine sample amount from total number of existing collections that will be assessed. There are several notes should be written for making sample percentage to be determined.

4.3. Third step (Training)

Training conducted to aim same perceptions about how to fill in a survey form. It means different surveyor will assess same objects relative equal. Below several following explanations of terms and descriptions contained each column in survey form:

a. Paper stains
   - Brown spots (foxing), the spot that looks reddish, brown to black color in a separate paper from each other like raisins which appears on the surface of bread. There are two factor causes these spots which are fungal and oxidized iron.

   ![Figure 1: Foxing](image1)

b. Insects, there are two criteria of shaped happen when insect attacked which are large holes and small holes. By looking at the hole it will be known insects that exist in library.

   ![Figure 2: Damage by Silverfish](image2)
Every assessment column has significant meaning and relate to one another. It will influence among variables, for example when stain brown paper increase then it will surely parallel to high acidity level. The assessment survey form can be modified based on the purpose or research hypothesis. Measurements on humidity and temperature occurs during collection stored is really necessary. By putting and setting data logger at any given time during survey work it will show real condition of storage. Survey form will be different when it is used in two seasons’ countries but not as complete as like tropical countries. Below the example of monograph survey form:

Figure 3: Example of monograph survey form

4.4. Third step (survey implementation)

Implementation of survey carried out by predetermined amount of collection and must not exceed or reduce amount. The way to divide or partite each room collections which have certain amount of shelf and carpet is through this calculation:

The survey usually conducted higher than 6% of random sample planned of total amount deposit owned in order costs and long period work efficiency.

\[
\text{The number of collections surveyed} = \text{total number of spesific collection} \times \frac{6}{100}
\]

\[
\text{number of copies per rack} = \frac{\text{number of copies should done} \times \text{number surveyor set}}{\text{total number of shelves}}
\]

So that, surveyors determine the amount of shelf he gained then calculate how many copies he should take in a single shelf. The survey was also carried out several data logger in collection room that placed spreadly during the mapping.

4.5. Fifth step (collect all survey form)

Data will input on a database program after obtained from the survey. Format of database is created with MS Excel which has fixed variable of publication year versus relative variable of damage, consist of different values sub-field damage. First procedures to fill tabulation is entry publication year then put total number of annual raw collections surveyed, and then calculate total number of checked damage. One types of collection put in one tabulation database. When one sheet of survey form has been entered completely the next
form fill in with the same manner. Value of each column will change and grow based on the addition to subsequent form.

4.6. Sixth step (data processing)

Last step of survey is data processing, analysis and tabulation discussion. Data summed decrease in each column. Finally, separate columns will create a bar or pie diagram.

5. Research Discussion

There are four main points obtained in tabulation of data survey, first, mapping position of collection in shelving, second types and amount of each damage collection, third categories or damage levels (good, moderate, bad, very bad) collectionn, fourth trend of temperature and humidity room collections.

5.1. Data logger

Data logger will measures the level of humidity and temperature of storage space. HOBO data logger fitted with measurement settings per 30 minutes. Recorded data logger will results obtained reflected picture quality of actual storage for collection.

![Data logger sample result](image)

**Figure 5: Data logger sample result**

Graph plotted and obtained max and min temperature with average during time measurement, as well as moisture. Ideal preservation conditions for store collection has range temp. 20 - 25 °C and 45 – 55 % RH humidity. The importance of keeping humidity, temperature and light intensity parameters will determine the success of collection storage process.

5.2. Shelving

Focusing in four expected results of mapping can be determined all information about quantity and quality of convening collection. Each column, one to another is always interrelated in the form, complementary and mutually reinforcing. For examples, when collection placed on shelf near the window then sunlight will hit direct exposure so that value of brown stain on the edge (tanned) collection will certainly high. When high acidity level occurs it can be surely the level of fragility and ink corrosion is certainly high. Amount of fungi present on collection would also increase when the humidity and temperature is more volatile.

5.3. Persentage of Deterioration

By looking at the graph, can be seen the damage occurs as stain fungus, tears, foxing, tanned and ink corrosion in certain percentage. There are equivalence relations and mutual
influence to each other variables, for example acidity of paper will proportionally or decisive
to percentage of existing stains on paper. Paper with low pH can caused damage continues
drastically as brittleness. Level of acidity is also knows from sour smell wafted issued from
collection. This condition causes unhealthiness environment around librarian so that
librarians usually open the window on collection room to get good circulation, but such those
action will only increase damage by accelerating oxidation reaction on paper because of
direct pollution.

![Deterioration percentage](image)

Figure 6. Sample of damage percentage chart

Pie diagram can told damage of cover tear, loss, spines lost and release stitches. If
collection suffered from fragility damage, it can conclude that condition has reached peak
deterioration and no need prevented action anymore.

5.4. Grade of Deterioration

Grade or categorization of collection damage divide into four major assessments
which can be obtained by summed total amount of damage in each raw checked, following
details:

<table>
<thead>
<tr>
<th>Collection Grade</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>If there is a collection column marked : 0</td>
</tr>
<tr>
<td>Moderate</td>
<td>If there is a collection column marked : 1 – 3</td>
</tr>
<tr>
<td>Poor</td>
<td>If there is a collection column marked : 4 – 6</td>
</tr>
<tr>
<td>Very Poor</td>
<td>If there is a collection on fragility column</td>
</tr>
<tr>
<td></td>
<td>marked or number of checked reach 7 – 14</td>
</tr>
</tbody>
</table>

Every call number will conduct total percentage of particular category collection. Its
only need necessary preventive measurement and better room collection for good category
collection, while moderate and poor category need conservation measurement to prevent
occurrence very poor category in the future.

A collection with very poor category basically an event that said already damaged
(well done) so it is really need. Proportional evaluation of all variables taken from damage
level relationships. Making a histogram graph will show amount of good number to very
poor. Paper fragility level will bring very bad impact categories increasingly. Conservation
measuresment is necessary to very poor condition.
6. Conclusion

As it is known that objectivity of this assessment was to determine types and amount of damage collection after library run their management and keeping function. Mapping entire collection will obtain histogram graph accumulation on collections. The biggest contribution bringing collection in getting bad is low acidity level due unfavorable storage and handling conditions.

Survey to damage library material can be use as benchmark to see all conditions that run in library collection management and storage at any given time. Mapping or survey results can be utilized as well library management plans related to preventive action by conditioning collection in good environmental standards and repressive action through conservation and digitizing.

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