International Journal of Asia Digital Art and Design

Contents

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· **Original Article**　　A paper in this category has to be a logical and empirical report of the study, the review and the proposal by the author on the issue of digital art and design based on media technology. It also has to include the novelty and academic values which can be shared with ADADA members or the people who study digital art and design.
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· **Art Paper**　　A paper in this category has to consist of the author's practice, result and expository writing on the field of digital art and design. It also has to have the originality in its concepts, methods, expression techniques and making process, and the result should have some values which can be shared with ADADA members or the people who study digital art and design.
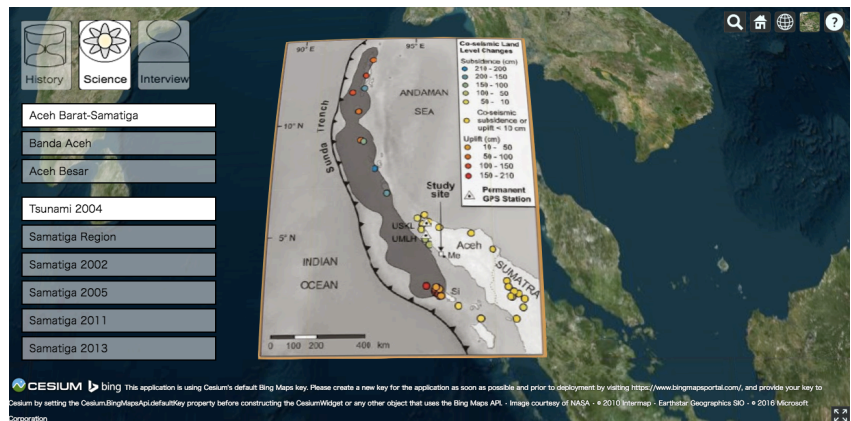Number of pages: 6 -10
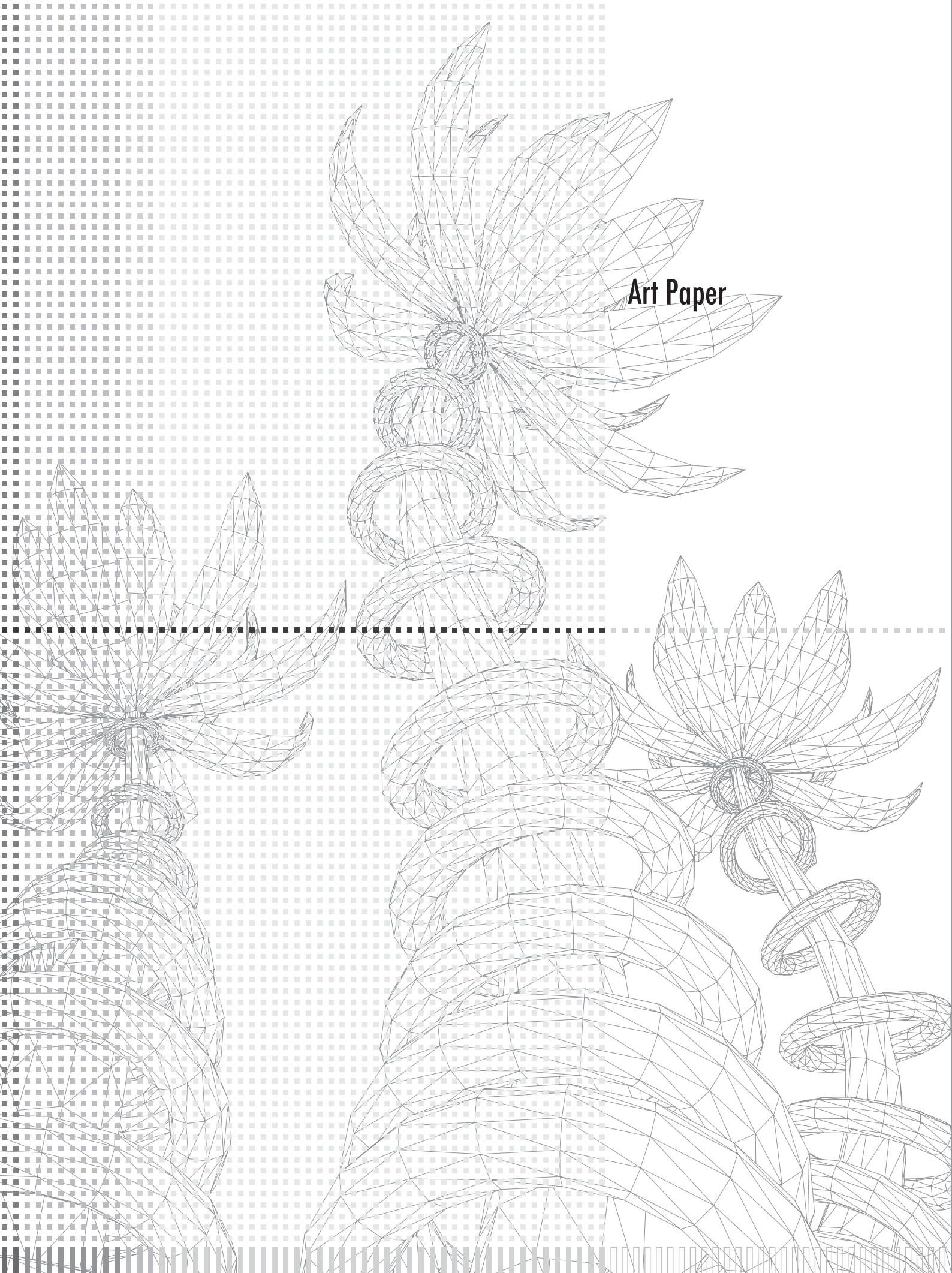
Art Paper

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Aceh Paleotsunami Archive Visualization for Sustainable Disaster Risk Reduction and Global Information

Abstract

To add to global disaster risk reduction information, the Aceh Paleotsunami digital archive was developed using visualization data from the historical Aceh tsunami. Geographical and digital materials such as maps and pictures were combined on an open data cesium and github platform to allow for the macro to micro content to be displayed on an attractive user interface. This archive can help fill the information gap about past disasters in Aceh as it is easy to access the knowledge. In the future, using open source data, it is hoped that the archive will be accessed and used by the local communities, the government, and research and teaching organizations.

Keywords: Digital archive, DRR, global information

1. Introduction

Devastating tsunamis in Aceh have been occurring for centuries. For example, two early records reported a tsunami in the Indian Ocean Basin in the 17th Century [1], Sumatra, however has been characterized as relatively aseismic because of the lack of any great earthquakes in the last century, [2]. Nonetheless, regardless of any lessons learned from past similar events, when the 2004 tsunami struck in this region, there was still devastating damage and many human casualties as it seems that most people in Aceh were un-ware of such disasters and did not know how to respond.

Many factors have contributed to this lack of awareness. First, tsunamis happen infrequently; perhaps only once every 50 to 600 years. Consequently, they are forgotten and any risk mitigation lessons learned are not passed down to younger generations. Local knowledge related to a tsunami disaster in

1907 on Simeulue Island reports a loss of eight tribes. This event encouraged people on the island to write a lullaby called "Smong," or "tsunami" in the local language. This lullaby has been sung from generation to generation to remind the Simeulue people to always be aware of the signs of tsunami; a tradition which proved effective in the 2004 tsunami with only seven victims on Simeulue island, [3]. Simeulue's oral history provided an extraordinarily powerful mitigation tool that saved countless lives when even a high-tech warning system with a 15-minute response time would have been of no help [4]. However, this local knowledge was not known in the other regions, even on the other side of the nearest island, Meulaboh, due to language differences.

Geological records of tsunami events in Aceh or Aceh paleotsunami have been traced back thousands of years; that is, the carbon dating of tsunami deposits, where the tsunami caused sea water to flood into the mainland creating typical horizontal white sand deposits, have been found as far back as the prehistoric period around 5000 years ago. Therefore,

carbon dating can determine the time tsunami events occurred in the past and gives clear geological evidence for analysis. Coastal geomorphology records can also detect past tsunami events in from the evolution of the beaches.

Second, Aceh underwent a period of prolonged war, which perhaps shifted the focus of Acehnese people to more imminent affairs than the inter-generational transfer of tsunami-history knowledge. War and a deteriorating political situation in Aceh resulted in the disappearance of some of the manuscripts and historical documents in Aceh. At its peak in the 16th century, at the instigation of Nuruddin al-Raniri (d. 1068 AH / 1658 AD) one of the most famous Sufi in Aceh, the then Sultan Iskandar Thani (1637–1641 AD) ordered the burning of books by Fansuri Hamzah and Shamsuddin Sumatrani (w .1630 M) in front of the Baiturrahman Mosque in Banda Aceh [5] from 1903 to 1946.

Third, during the Dutch colonial period, Indonesian was used as the working language within the government administration, which was strengthened by the "oath of youth" on October 28, 1928. These language changes affected the younger generation in Aceh, who were not concerned with studying manuscripts written in Jawi (Malay in Arabic script) and translated into Indonesian. This discontinuation of knowledge regarding the history of earthquakes and tsunamis in the area has led to a major information gap in Aceh that has increased the vulnerability to disaster.

The study areas in this research were several locations along the southwest coast of Aceh at the border of the Indian Ocean subduction zone that were particularly affected by the tsunami; Banda Aceh, Aceh Besar, Aceh Jaya, Aceh Barat, Simeulue, and Singkil.

2. About the Study

2.1 Objective

The objectives of the study were (1) to collect data related to tsunami events in Aceh based on science, historical records and interviews; (2) to visualize the data using attractive digital earth mapping, face icons, and pictures; (3) to develop the Aceh paleotsunami historical digital archive for disaster risk reduction (DRR) and global information using open source data to facilitate the transfer of information and knowledge about earthquake and tsunami experiences in Aceh.

2.2 Previous Study

[6,7], Information transfer and dissemination is needed, sustainability from generation to generation. Indian Ocean tsunami in 2004 was occur in Aceh. The tsunami was estimated to cause more than 200,000 dead. One of the big reasons is GAP information from the past disaster. Today, information could be delivered to the world as soon as possible by Internet. In this millennium era, used historical digital archive and display in Google earth contents is one of

solution to fill in the GAP information for Disaster Risk Reduction and spread it up to the world as a global information.

2.3 Related Study

Data visualization is both an art and a science. It is viewed as a branch of descriptive statistics by some, but also as a grounded theory development tool by others. Increased amounts of data created by Internet activity and an expanding number of sensors in the environment are referred to as "big data" or Internet of things. Processing, analyzing and communicating this data present ethical and analytical challenges for data visualization. The field of data science and practitioners called data scientists help address this challenge. Data visualization refers to the techniques used to communicate data or information by encoding it as visual objects. The goal is to communicate information clearly and efficiently to users. It is one of the steps in data analysis or data science. The "main goal of data visualization is to communicate information. It doesn't mean that data visualization needs to look boring to be functional or extremely sophisticated to look beautiful. To convey ideas effectively, both aesthetic form and functionality need to go hand in hand, providing insights into a rather sparse and complex data set by communicating its key-aspects in a more intuitive way. Yet designers often fail to achieve a balance between form and function, creating gorgeous data visualizations, which fail to serve their main purpose — to communicate information, [8].

Google Images [9] has display many photos data, that we search by some keyword provide for user. But all of data is in 2D only. The first impression of the digital archive for the user is the earth interface that gives geographical information from a macro global space perspective to the micro space of Aceh Indonesia.

Google Earth [10] has many data and can import multiple data, but all of data is in 2D only, and there is not Application Program Interface (API) for developing our own application. Also, because it is enterprise software, specifications may change depending on the intention of the developer. Actually, in 2015 API provision was terminated.

The Japan Disasters Archive [11] is an online portal to digital materials documenting the cascading series of natural and human-made disasters that began in Japan on March 11, 2011, designed and maintained by the Reischauer Institute of Japanese Studies at Harvard University. The JDA relies on the support of partner organizations around the world to supply digital contents including websites, tweets, video, audio, news articles, and much more. This portal provides information Great East Japan Disaster on how to use the archive interface for information retrieval. However, since it only supports list viewing and 2D maps, it does not provide a way to compare landscape and data as disadvantageous.

So far all advantages above can be solved by Cesium, which is open source digital earth software. Visualization data in the same ground, with the flat interface for all material such as testimonies, maps and pictures, is better for user. Especially perform 3D data including landscape is very impressive for user.

The pioneer of digital archives, Hidenori Watanabe, created data visualization products that have been implemented in many fields such as disaster and history studies and weather forecasting. A digital archive that provides a multipronged, overall understanding about an archived event can be achieved through a well-designed method [12,13]. Data visualization with 3D that utilizes an online virtual globe makes it easier for researchers to find new historical information and hand down knowledge to many people on the Internet [14,15].

Building a community base Disaster Risk Reduction for sustainability disaster education is needed in the disaster prone areas to improve the quality of life. Technical and design talents can be combined to transform government and impact lives and work on local matter. The portal shows how developers, designers, and product managers can work with governments to solve major challenges, such as disaster issues, Code for America [16].

In recent years, the number of computationally-based devices has grown rapidly, and with them the number of interfaces we encounter [17]. It is design technology for electronic devices such as computer, mobile phone etc. Combination User interface design and open-source data cesium to create a website to display a collection of interconnected archives, multimedia and social network services in the one ground as user center design.

3. Method & Discussion

There were two steps in this research: (1) Qualitative research to collect data; primary data collection from questionnaires and in depth interviews and observations using purposive random sampling and secondary data from previous research [18, 19, 20, 21, 22]. (2) Quantitative research to develop the archive; using cesium as the open source data and visualizing the data on the github platform [23].

3.1 Data Collection

Scientific Aceh tsunami records. Even some scientist argued that tsunami did not leave deposit [24], tsunami maped boulder and other coral fragment deposit along the cost [25]. Tsunami deposit are very characteristic for tsunami affected area [26]. In Sumatera [27], found that historic Indonesian seismic records revealed that no major earthquakes or tsunamis have affected the west coast of Aceh in the last 400 years [2]. Pre historical tsunami recorded since 5000 years ago [28, 29]. One exception was the 1907 AD earthquake that generated a tsunami that devastated the coastal areas of offshore Simeulue Island but reached only minimum

heights along the Acehnese mainland [4]. More recent studies of older historical documents point to a tsunami inundation in 1349 AD and around 1000 AD [30]. Geological evidence of past seismic activity is recorded in the growth patterns of the corals near northern Simeulue Island, which lies within the 2004 rupture area [31]. Here abrupt coseismic land level changes occurred during an earthquake cluster between 1390–1455 AD which cause a considerably greater uplift than in 2004. The sediments of a beach ridge plain 15 km northwest of Meulaboh in West Aceh yielded evidence of past tsunami inundation in buried sand sheets deposited soon after 780–990 and 1290–1400 AD [30]. The combined historical and geological records from Aceh suggest that the predecessor to the 2004 Sumatra Andaman earthquake and tsunami occurred about 600 years ago, which has been confirmed along other coastlines in the Indian Ocean [32]. Some reviews related to the tsunami research in Aceh in the past are outlined in Table 1.

Collecting Aceh tsunami records based on history: Aceh has been a large international trading port since the 14th century. [33], Mapping the Acehnese past [33], Chapter 11, the long history of war in Aceh began during the Dutch Colonial period from 1873 to 1904 AD, and continued with conflicts between religious leaders known as the "Sabil War" from 1903 to 1946 [5]. There are so many manuscripts have been destroyed [34]. Every manuscript that produced has its own purpose mainly to spread Islam to follow the atmosphere and a specific place to read to the public [35]. Unfortunately, however, the long period of war and conflict in Aceh over the last century has led to the destruction of many valuable manuscripts, [36 Herman].

The surviving manuscripts are preserved at institutions-Dayah (Islamic Boarding School) or by individuals. Such as Dayah Tanoh Abe in Aceh Besar, and Ali Hajsmy [37, 38]. As such, the information from the manuscripts has not yet been transferred from one generation to the next, which has resulted in a major information gap regarding past natural disasters. The reconstruction of Aceh *paleotsunami* based on a historical approach could be done using manuscripts and research. In the past, the Acehnese already had indigenous knowledge and local wisdom related to earthquakes and tsunamis in manuscripts and prose.

Table 1. Tsunami Record in Aceh

Research by	Contents
Monecke et al, 2008. Journal Nature: A 1000-year sediment record of tsunami recurrence in Northern Sumatra	Carbon dating of tsunami deposits: 780–990M, 1000–1170M, 1290–1400M, and 1510–1959M.
Meillianda, 2009. Dissertation: Past, Present, and Future of Morphological Development in Tsunami Affected Coast: Case Study of Banda Aceh	Tsunami events: 1907 validity 4, 1940 validity 4 and 1964 validity 3. *4:very valid*3: valid

As an international port, there are countless historical records related to the earthquake and tsunami history of the region. Akhbar al-Sin wa'l Hind quotes by Rammi [39], "This place is the most important trade center in Nan-wu-li [Aceh], big mountain like waves dash against it." The manuscripts are an invaluable record of Acehnese indigenous local wisdom and could be crucial in communicating the relevant lessons learned from generation to generation. Aceh earthquake and tsunami related manuscripts are listed in Table 2 [40, 41,42, 43, 44, 45, 46, 47, 48, 49, 50].

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Collecting interview based Aceh tsunami records: A purposive sample was selected from the southwest coastal areas of Aceh bordered by the Indian Ocean subduction zone that had been affected by the tsunami; Banda Aceh, Aceh Besar, Aceh Jaya, Aceh Barat, Simeulue, and Singkil District.

Table 2 Aceh earthquake and tsunami related Manuscripts

Sources	Aceh Paleotsunami – manuscripts records		
	Documents	**Time**	**Contents**
Hermansyah: Aceh National Museum	Earthquake & Eclipse manuscripts 07_00523	Wednesday, 31th January 1906 M (5th *Zulhijah* 1324 H) *Wa-Shahibul Kitab Ibrahim Lambunot Mukim Lam Krak* 1253 H (1906 M)	*"Rajab;* If earthquake moves in *dhuha*, it's sign that seawater was very hard and very much rainy."
Hermansyah: Ali Hasjmy Foundation	Earthquake manuscripts		*"Rajab:* Earthquake in *dhuha*, it's a sign that wind, sea water and waves are very hard in that year"
Book of Sultan, Pahlawan, Hakim	Van de Tuuk manuscripts	Tuesday, 12th February 1861 (28th *Jumadil akhir* 1253 H)	Tectonic earthquake in Singkil 1852 destroyed Dutch infrastructures
Book of Sultan, Pahlawan, Hakim	Dutch Document	Friday, 29th September 1837 (1st *Sya'ban* 1277 H)	Earthquake 7.3 SR in Sultan Muhammad Syah period (1824-1838)
Hermansyah: Aceh National Museum	Earthquake manuscript 07-01676	Monday, 24th November 1833 M (12th *Rajab* 1249H), at 10.20 Indonesian Time	*"Rajab;* Earthquake in *dhuha* time, it's a sign that sea water will be hard tides*"*
Hermansyah: Aceh National Museum	Earthquake manuscripts 07_00841	Monday 24 November 1833 M (12th *Rajab* 1249H), at 10.20 Indonesian Times	*"Rajab;* Earthquake in *dhuha* time its a sign that the sea will be very hard"
Dayah Tanoh Abee, Aceh Besar	Earthquake manuscripts	Thursday, 3th November 1832M (9th *Jumadil akhir,* 1248 H)	*"wa kanat al-zalzalah al-shadidah al-tsaniyah fajr yaum al-khamis tis'at ayyam min jumada al-akhir sanah1248 min hijriah al-nabawiyah…"* (2nd Earthquake has occurred in Thursday, 1 9th *Jumadil Akhir*)"
Hermansyah: Surau Lubuk Ipuh Padang	Teks, Colofon	Friday, 10th February 1797 M (12th *Sya'ban,* 1211 H)	*"Rajab:* Earthquake in dhuha time, it's a sign that the sea will be very hard"
Wang Ta Yuan in Mc Kinnon (1988) in Meilianda (2009)	Lambri Archeological Manuscripts	1349 AD (around 600-700 years ago)	"This place is the most important trade center in Nan-wu-li (Aceh), big mountains like waves dash against it."
Akhbar al-Sin wa'l Hind refer Rammi in Mc Kinnon (1988) in Meilianda (2009)	Lambri Archeological Manuscripts	1000 BP (around 9 Century)	"The island is washed by two seas . Harkand & that of Salahit" (Bay of Bengal and the Malacca Strait)
Leiden University	Doc. No. Or. 12.234 Supplement Catalogues by van Ronke		On chapter mention about earthquake treatise.

Interviews were held face-to-face with the selected respondents.

Aceh has several local languages, with some being widely used such as Aceh, Gayo, Alas, Tamieng, Aneuk Jamee [called as Baikol, Kluet, Singkil, Pakpak, Polopan, Haloban, and Simeulue [51].

These language variations have led to different forms of knowledge in Aceh. The interviews revealed that some of Aceh`s communities already had knowledge of earthquakes and tsunamis in their own local terminology such as *"Geloro"* in Singkil Language*, "Smong"* in Simeulue, *and "Ie Beuna"* in Aceh*,* all of which are the local words for "tsunami."

The following interviews were conducted in the six tsunami affected districts in Aceh which border the Indian Ocean subduction zone:

"The first *geloro* was around the 18th century which drowned Old Singkil Town, then around the 19th century, there was a second *geloro,* which forced people to move from Kayu Menang to Singkil," [Safrijal Amni, 49 years old, Head of Environmental Impact Management, Singkil Regional Planning and Development Agency].

"In 1907, an earthquake occurred before Friday prayer. I was a small child and did not know anything. The ground cracked open and my father took me and we fled to the mountains. After prayer, many people visited the low tide sea, then the *smong* arrived and the water entered the land and many people died. At that time we were eating sago and using bark cloth [*bairak*]. When the earthquake happened in the early morning in December 2004 and the river water [estuarine] receded quickly, I knew that the sea water would rise, because of the sound like *pandan* leaves burning. So, I shouted *"smong!"* and everyone ran to the mountains. When my grandson was born in the mountains, I called him *"Son of Smong."* [Rukiyah, 118 years old, Teupah Barat, Simeulue in [3, 52].

"According to a story from my grandmother, my grandfather was born at the time of the incident *Ie Beuna*. On that morning, the water in the sea looked very high. The religious leaders approached the coast and sounded the *Azan*. The sea water broke on the beach and a small proportion of water came onto the land. That's why my grandfather was named *Teuku Leupek Ie Beuna*. During the earthquake in the morning of December 2004, my grandmother said, "the sea water will rise soon!" We were thinking that my grandmother was very old and just senile. When the sea water came, we tried to reach her as she could not get out of bed. I lost my grandmother and my husband, but my son was saved." [Cut Dian Putri, 39 years old, Padang Village IV, Ujung Kala, Aceh Barat].

"When I was a girl, *Ie Beuna* has happened [reconstructed by the author, based on year of her birth, around 1907]. In the morning, the water in the Krueng Sabe river was spilling over, which was close to the Dragon Cave [Geni Village, around 7–

8 KM from the coastline]. I also experienced an earthquake for 7 days and 7 nights during the DI / TII war [reconstructed by the same authors based on the history of other parts, around 1964]; the earthquakes started in the morning, and consequently *Gunung Sawah* collapsed." [Hamidah, 120 years old, Bunta Village, Krueng Sabe, Aceh Jaya],

"According to a story from my mother, in the same year as my birth, there were *Ie Beuna* events; the sea level rose about 2 feet in 1936. I also experienced earthquakes in 1945 and morning earthquakes for 7 days and 7 nights in 1964." [Abdul Majid, 77 years old, Lambaro Nejid Village, Aceh Besar].

"My great-grandfather, my grandfather and my father were fishermen, brought up from childhood in the coastal environment, but I never heard stories from my parents or grandparents related to tsunamis before 2004. So, the tsunami event in 2004 was a new experience for us, especially when it happened. A lot of people died, nearly 80%, most of them were old people. So it is impossible to trace back information related to earthquakes and tsunamis from them." [Ayi, (45 years old), Community Sea Commander Lam Pulo, Banda Aceh].

3.2 Developing the archive

Making the archive started with design how to display the archive by User Interface Design [53]. It is design technology for electronic devices such as computer, mobile phone etc. Planning to create a website layout to display a collection of interconnected archives, multimedia and social network services in the one ground as user center design.

The next step is preparing the content for the website using term of engine library as technology consider. Preparing the data using google earth, save it in the kml data then change it into cesium by html CSS and Java – Script [JS] library. It is pluralistic data, many resources to one ground digital archive. Combination User interface design and open-source data cesium to create a website to display a collection of interconnected archives, multimedia and social network services in the one ground as user center design.

2D archive have border and separated files, by Cesium, which is open source digital globe software. Visualization data in the same ground, with the flat interface for all material such as testimonies, maps and pictures, is better for user. Especially perform 3D data including landscape, is very impressive and give artistic point and reality, user has the better feeling-connection.

The first impression of the digital archive for the user is the earth interface that gives geographical information from a macro global space perspective to the micro space of Aceh Indonesia. Digitalized materials such as maps and pictures using cesium as open source data in the github platform were used to provide more detailed information of the area shown in the Figure 1.

The digital earth mapping in the archive gives detailed information about the areas related to disasters and can identify important information such as how many countries, how big an impact area was affected, the disaster scale, and the epicenter of the earthquake. Figure 2 shown selected icons can be chosen by user to make easier to find the data. Other information shown tsunami Aceh 2004 was affected to along Andaman Sea and Indian Ocean neighborhood shows in the Figure 2.

Figure 3 shows the icons that can be chosen by the user to make finding data easier. Left, the Aceh 2004 tsunami affected areas along the Andaman Sea and in the Indian Ocean neighborhood. Right, 1000 years old tsunami deposit found by Monecke in the Samatiga region, West Aceh.

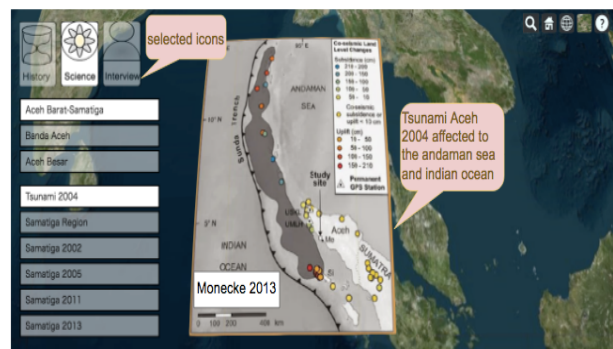**Figure 1** Earth interface by Cesium open data source,

github platform

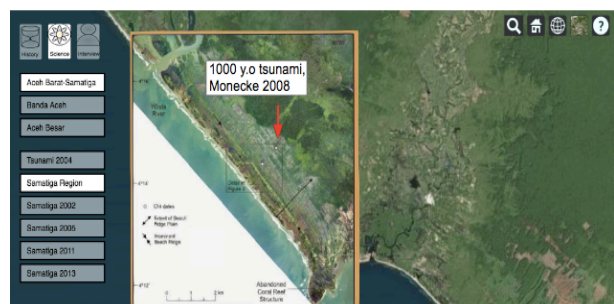**Figure 2 T**sunami Aceh 2004, affected to Andaman Sea

and Indian Ocean

Figure 4 100 years old tsunami deposit sediment in

Samatiga Region-West Aceh

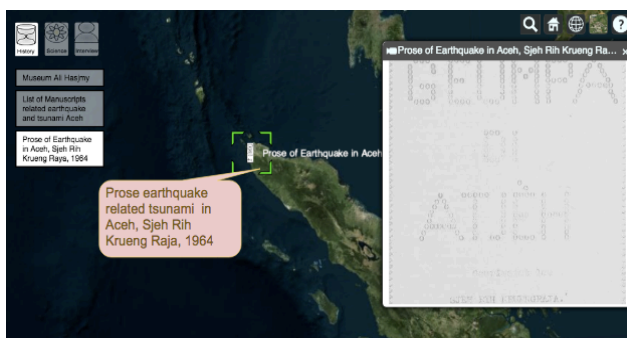**Figure 3** Digital Earth Mapping of Samatiga Region coastal area before and after tsunami 2004

Figure 5 Prose Earthquake and Tsunami in Aceh recorded in 1964 by Sjeh Rih Krueng Raja

Figure 6 Earthquake Manuscript by Ali Hajsmy Museum Collection

Figure 4 shows earthquake and tsunami 2004 affected to the significantly changing in the coastal area. In the last 6 years, Samatiga coastal area has a unique phenomenon, in 2002 it is normal condition, and in 2005, changed coastline loss due an earthquake and tsunami. But, in the case of Samatiga, the coastal develop quicker than other area that affected by earthquake and tsunami. In 2011 to 2013, the coastal developing by increasing coastline and wider sand dunes.

In the past, the Acehnese had indigenous earthquake and tsunami knowledge and local wisdom, as shown in the prose. The following prose is one of private Acehnese`s collection shows in the Figure 5:

" Ali Head Village trembling body, running and standing to the flat ground, boat in the sea is shaking tossed around here and there…" [54]. In this prose, Sjeh Rih Krueng Raja describes the earthquake and tsunami that occurred in 1964, with an explanation of boats tossed around and high surging sea water.

Other local wisdom are manuscripts written in Jawi, an Arabic script for the Malay language, one of which dated from the 17th century. Figure 6 can be translated as; *"Rajab**: if an earthquake occurs in *duha*** time, it will cause hard winds, and loud sea waves." This is mentioned in the yellow highlighted sentence in the last paragraph shown in the Figure 6.

*Rajab is the seventh month of the Islamic calendar. The lexical definition of Rajaba is "to respect," of which Rajab is derivative [55].

Duha is between the obligatory Islamic prayers, Fajr and Dhuhr. The time for the prayer begins when the sun has risen to the height of a spear, which is fifteen or twenty minutes after sunrise, until just before the sun passes its zenith [56].

Figure 7 shows that using 3D model display face icons is an impressive way to give information. There are many older people who have had earthquake and tsunami related experiences, especially along the western coastal areas of Aceh; however, the information has not been spread from generation to generation.

Banda Aceh, as the capital of Aceh Province and the Centre of the Aceh Government, has the largest information gap in relation to the past earthquake and tsunami events. Cultural changes have made the coastal communities forget to share information and knowledge about tsunamis with the next generation, which has resulted in less disaster awareness in Banda Aceh. This region suffered the largest number of casualties and the highest extent of damage compared to other parts of Aceh in the December 2004 earthquake and tsunami.
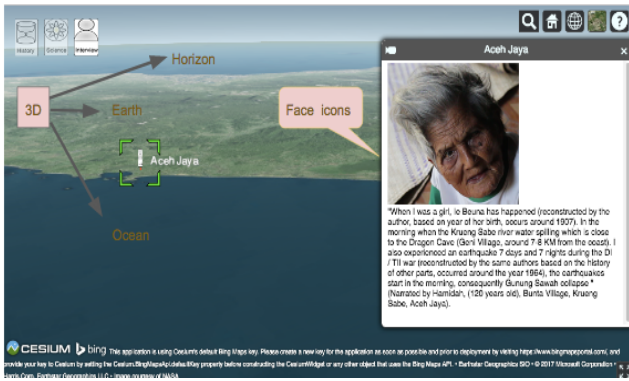
Figure 7 Hamidah had experience in the past earthquake and tsunami in Aceh in 1907

Figure 8 Workshop Aceh Paleotsunami Digital Archive,

Syiah Kuala University, Aceh

Aceh Paleotsunami Archive was initiative by an International collaboration divided in the two groups. The researcher group from Indonesia collecting materials, while researcher group from Japan developing the archive. Cesium is an open data source, using github platform which is easy to publish, then everyone can contributing in the archive, clone and folk open data source to make their own archive. Github guide people to build their own software, with more than six milliom project hosted [37]. This way is in line with Aceh Palotsunami Digital Archive, led an initiative of community to contribution in Aceh Paleotsunami Archive for global information in the future.

4. Result

This paper reviewed the establishment of the Aceh paleotsunami historical digital archive, which employs global information from open source data for DRR, and explained how this archive can contribute to the transfer of information and knowledge about earthquake and tsunami experiences to future generations.

The archive was presented in a one hour workshop in Aceh to fifty-two 1st year students from Syiah Kuala University to test its attractiveness and its ability to inform young people about the past shows in the Figure 8.

The workshop was divided into two parts.
[1] In the first 30 minutes the participants were asked to research the history of tsunamis in Aceh in a traditional way; that is, by consulting historical sources and other related literature and materials. The first 10 minutes was spent introducing the theme and the following 20 minutes were spent in manual research, with the last 5 minutes spent completing the first questionnaire.
[2] The second 30 minutes was spent learning about the history of tsunamis in Aceh using the digital archive on the Aceh paleotsunami open source platform. The first 10 minutes was spent on the introduction and then participants were asked to access the Aceh paleotsunami Archive on their mobile phones, with the last 5 minutes spent completing the second questionnaire;

Using key questions with descriptions, the participants were asked to comment on learning about historical disasters in Aceh using the manual method and using the digital archive on a scale with 5 possible responses: SA, Strongly Agree; A, Agree; NAD, Neither Agree or Disagree; D, Disagree; and SD, Strongly Disagree. Questions were focused on the ease of finding information, the lessons learned, and the value of the information in contributing to sustainable DRR and global information.

Figure 9 indicates that more than 55 of the participants felt that it was easier to learn about tsunami events in the past using the digital archive than using manual research.

Figure 10 shows that more than 53 of the participants felt that it was more interesting to learn about the history of Aceh tsunamis using the digital archive than using manual research.

Figure 11 shows that more than 59 of participants felt that it was easier to learn about the history of Aceh tsunamis using the digital archive than using manual research.
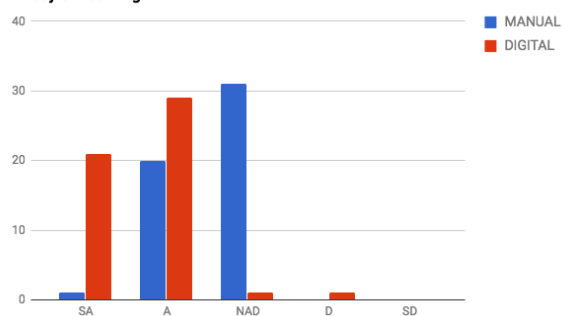
Figure 12 shows that more than 59 of participants felt that it was easier to learn about the history of Aceh tsunamis using the digital archive than using manual research.

Figure 9 It was easy to learn tsunami event in the past by digital archive

Figure 10 How interesting to learn historical tsunami in the past

Figure 11 How efficient to learn historical tsunami in the past

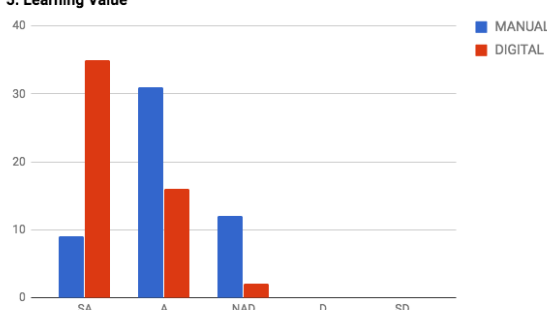**Figure 12** Learning Preference to learn historical tsunami in the past

Figure 13 Learning value about past tsunamis

Figure 13 shows that more than that 53 of participants felt that is was more helpful to learn about past tsunamis using the digital archive than doing manual research.
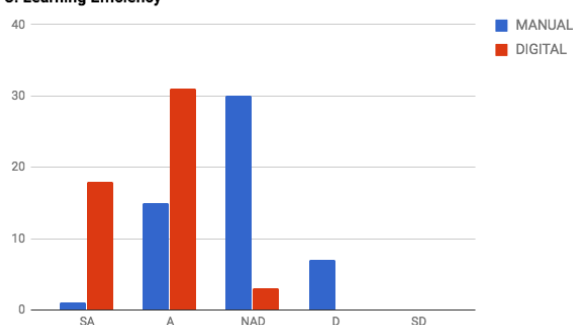
5. Conclusion

While this was a relatively small sample, overall, the responses were positive about the usefulness of the Aceh paleotsunami historical digital archive as an alternative media to gain knowledge about past earthquake and tsunami experiences in Aceh for DRR and Global Information.

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