PROCEEDINGS
GEOSEA XIV CONGRESS AND 45TH IAGI ANNUAL CONVENTION 2016 (GIC2016)
Trans Luxury Hotel, Bandung, October 10 – 13, 2016

Archeo-geological and geophysical studies of the Gunung Padang Megalith in Cianjur, Indonesia implies lost-advanced civilizations in Sundaland before Holocene

Danny Hilman Natawidjaja [1,7,8], Andang Bachtiar[5,6,7,8], Bagus Endar[2,7,8], Andri Subandrio[3,7,8], Ali Akbar[4,7,8]
[1]*LabEarth, Geoteknologi LIPI (Indonesian Institute of Sciences)*
[2]*Geophysics Lab-Phisics Department, Institute of Technology Bandung*
[3]*Dept.Geology, Institute of Technology Bandung*
[4]*Dept.Archeology, University of Indonesia*
[5]*Exploration Commitee of Indonesia (KEN)*
[6]*National Energy Council (DEN)*
[7]*National Team for Research and Developments in Gunung Padang (Kepmendikbud)*
[8]*Independent and Integrated Research Team (TTRM)*

Abstract

The megalithic site on top of the Gunung Padang mount has been reported since 1800's AD, but not until 2011, it attract public interest in Indonesia and world wide; after TTRM conducted integrated geological, geophysical, archeological studies, including 3-D aerial topographic, *Ground Penetration Radar (GPR), resistivity, seismic tomography, core-drillings* and *petrological* studies. The study concluded that the megalith is much larger and advanced, but most are burried underground. Radiocarbon-dating analysis yields that it have been built since *Late Pleistocene (Ice Age)* and rebuilt a couple times through the Holocene period. This challenges mainstraim knowledge that human life was thought to be still primitive as hunter gatherers before *Holocene*, therefore not capable of building advance, large structures. We propose an alternative concept that global catastrophic events could wipe out lives on earth many times in geological, thus human population and cultures may have been destroyed and re-started at the end of *Pleistocene*. Earth scientists shall further explore the possibility of a global catastrophic event around the *Pleistocene-Holocene* in *Younger Dryas*, well known as a period of extreme climate changes that was ended by an extreme rise of global temperature and associated with a sudden sea level rise around 11,6 Ka, the time just before the beginning of our known history.

Introduction

The existence of Gunung Padang archeological site has been reported by a geologist, Dr. Verbeek, since the mid-19 century (Veerbek, 1896). In 1914, it has been reported again by an archeologist, N.J. Krom (1915), to the Dutch-Collonial Government as an ancient cemetery structure on top of the mount. It appears that this report had not been followed by further investigations. In 1979, local people reported the presence of the site to the Indonesia Government (Bintarti, 1982; Sukendar, 1985). Since then, research activities started by archeologists from ARKENAS (National Archeological Institute) and Universities. These lead to the site reconstructions starting in 1985. In 1998, Gunung Padang was established as the Provincial-level Cultural Heritage Site based on the Decree of the Ministry of Education and Cultures No. 139/M/1998. Since then, Gunung Padang was known as the megalithic site of *terraces-structure mound of stones* ("struktur batu punden berundak") (Bintarti, 1982; Ramadina, 2010; Sukendar, 1985) consists of stacks of *columnar-joint rocks*. Gunung Padang megalith, acccording to this earlier research and the ministrial decree, only occupies area about 3000 m^2 on top of the hill in the Karya Mukti village, Kancana Sub-District, Cianjur District, West Java.

Post 1998, the research has been continued by ARKENAS and Balai Arkeologi Bandung until 2005. Many surveys and archeological excavations have been conducted, but did not dug more than 1 meter into the ground (Tim-Peneliti, 2003a, b). Even so, a few excavation pit exposed buried rock layer consisting stacks of very regular and compact arrangements columnar rocks, similar rocks used for the megalithic structure above ground. However, this burried rock structures were interpreted as the natural-rock sources for the megalith (Yondri, 2014). Hence, this is the reason why they have never dig more than 1 meter since it was assumed to have reached natural rocks already, nothing artificial beneath. Hence, Gunung Padang was previously considered not-so-extraordinary megalithic site, thus it did not get much attentions from public. Despite it is already established as one for tourist destination, it had only attract several tens of visitors to a hundred monthly. But after TTRM first conducted geological and geophysical surveys in October 2011 and published the results in mass media that Gunung Padang is not a simple megalithic site but much larger and far more sophisticated then Gunung Padang became one of a major tourist spot. The visitors increased dramatically from several tens to several thousands in a month. During the peak seasons the visitors could even go up to 15 thousands.

The provincial and central government gave positive responses by issuing policies to follow up the new findings in Gunung Padang. First, in late 2013, the Decree of Governor of the West Java Province No. 430.05/Kep.1578-Disparbud/2013 was issued to form a Research Team of Gunung Padang Cultural Site, in which the first author became a vice chief of the team. Second, in January 2014, the Ministry of Education and Culture issued the Decree No. 023/M/2014 (Kemendikbud) to promote the

status of Gunung Padang, from the provincial-level (Situs Cagar Budaya Propinsi) to National heritage site (i.e. Situs Cagar Budaya Nasional) and it dramatically enlarge the coverage area from only 900 m square (based on the Kemendikbud Decree No. 139/M/1998) became 29 hectares including the entire Gunung Padang Mound down to the encircling streams. Third, in August 2014, the Ministry of Education and Culture further followed up by issuing the Decree No.225/P/2014 to form the National Team for Conservation and Management of Gunung Padang; the first author became the vice chief of the team. Last, in October 2014, the Presiden Decree No.148, 2014 for Development, Conservations, Research, and Management of Gunung Padang was issued. However, these have not been implemented by the current Indonesian government yet.

Data and Method

We use IFSAR 5-m grid DSM (Digital Surface Map) and DTM (Digital Terrain Map) from Interamap (Web) for analysis of regional landscapes surounding the site. We also conducted 3D aerial photographs using Drone Technology and software to help visualize the mound at greater details, coupled with a standard geodetical mapping using Total Stations to further map in details including existing infrastructures, and documenting megalithic stone terraces and found artifacts as well as locations of excavation sites. We have also conducted surface geological mapping on Gunung Padang Mound and the surounding areas to study local geology in relation with the megalithic site.

We have conducted subsurface geological and geophysical exploration that have been commonly applied in earth sciences to probe the underground structures of Gunung Padang. We use non-destructive geophysical imaging methods, which are save and do not destroy environments and cultural artifacts. The methods include resistivity methods, GPR (Ground Penetration Radar), geomagnetic, seismic tomography, core-drillings and geo--archeological trenching (Fig.1). This kind of approach are now emerging worldwide but still barely applied for archeological studies in Indonesian.

Subsurface geophysical surveys is a method for imaging and mapping underground bodies both lateral and vertical continuities or discontinuities of layers or any features, particularly suspected man-made structures and their contact with surounding geology. In principle, all geophysical methods use certain sources that radiates and sensors that record returning waves at the surface. Then, based on the law of wave propagations in different media we model the subsurface structures by inversion methods. The GPR uses radar (electromagnetic) wave, commonly microwave band (UHF/VHF) of the high frequency radio spectrum in the range 10 MHz to 2 GHZ to image subsurface structures based on differences in *permittivities.* The resistivity method uses low-voltage electric currents to map subsurface structures based on resistivity contrasts. The seismic tomography uses seismic or acoustic waves to image subsurface structures based on the differences in seismic velocities of each media/layer. After data acquisition, we conduct inverse model of all raw subsurface geophysical data.

Result

Gunung Padang has a symetrical shape of the east and west side flanks and an appearance of very low degree of erosions of the the top half of the mound. This looks peculiar compare to the surounding hilly landscapes of the remnant of the Tertiary volcanic arc that have been highly-eroded with ubiquitous head-water erosions up to the tops. This pose the question, why Gunung Padang mound looks much younger then the surounding landscape, which is dominated by remnants of Tertiary volcanic complexes. The young landscapes of the active volcanic zone is located far to the north, which includes Gede- Pangrango volcano complex that is viewed magnificiently from the top of Gunung Padang to the north.

The 3D landscape photo that we created using Drone's aerial photography shows clearly that Gunung Padang mound is elongated in N12E (NNE-SSW). The east and west flanks are smooth and flat, and both has similar slope about 30 degree, so it is symetrical along E-W profile. The south flank is much steeper, and the north flank that face Gede-Pangrango Volcano has a peculiar rounded shape that begins from below the front face of the megalithic stone terraces. The top has been very regularly flat-truncated, which has been decorated by an artistic arrangements of rock terraces consists of columnar andesite-basaltic rocks. So, in general, the shape of the mound has a similarity with a truncated-pyramid shape but not quite since it is more elongated and has hemisperical-rounded shape on the north face and asymetrical steep slope on the south flank.

The bare east flank surface shows traces of iso-elevation lines of stone terraces that covers the ground. Visual inspection of their positions and geometry suggests that the terraces on the flank are an intergrated part of the megalithic structures on the top. Thus, what had been known as the megalithic features on the ground is not just sitting on the top but extended down to its flanks. So, it is a much bigger stone-terrace constructions.

This impression motivate us to conduct a trial survey using resistivity method. The first 2-D resistivity section along the long axis of the mound showed that the core of the mound is a large-tounge-shaped high resistivity body wrapped by about 10-m low to moderate resistivity layers. The tounge-shaped body is later confirmed by the core drilling as an old volcanic lava tounge. What is strikingly peculiar the shape of the top of lava surface is mimicked by the overlying layers, which is also parallel to the ground-surface. In other world, the mound is no doubt a constructive landscape profile that express the subsurface-layer structures, not a destructive form resulted from

intensive erosion processes. This feature is an anomaly since it is located in a million to tens of millions years old landscape of Tertiary-volcanic rock complex, where erosions generally cut layers of folded rocks. In short, it indicated that Gunung Padang mound is not a natural hill but an original lava-tounge rock mound that had been artificially modified and wrapped by artificial rock layers.

This preliminary assesment was immediately followed up by intensive and comprehensive geological and geophysical surveys until September 2014. Starting in the early 2012, in order to investigate types of subsurface lithology as well as calibrating the geophysical models, we conducted geological core drillings on the mound. In the mid of 2012, archeological study was introduced conducting topographic-geodetic mapping together with documentations of artefacts and features on the ground. The archeological team also conducted systematic excavations guided by geological and geophysical surveys.

In short, the summary of the results of the integrated multi-method surveys are as follows (Fig.2):

1) Lateral extent of megalithic site on the ground might continuos down the slope covering the entire mound, at least about 15 ha.

2) The existences of the burried artificial layers are proved by geophysical surveys, core drillings and excavations.

3) The clearest evidence: the second Layer (Layer 2), is more sophisticated man-made structures than the First layer on the round. It is mostly buried only 1 to 3 meters beneath the surface. The columnar rocks in Layer 2 are tightly arranged and stacked together parallel to the layer , filled with thin adhesive fillers or fine-grained matrix containing dominantly iron and silica minerals. Layer 3, which is also artificial rock layer, is found from 5 meter to about 10 or 15 meter depth

3) The Core of Mt.Gunung Padang, beneath layer 3, is a natural lava “tounge”. The outer part of the lava tounge has been carved before it was covered by artificial rock layers (Layer 2 and 3). Thus, the lava tounge is the remnant of the natural Tertiary volcano, aged milions of years, but had been modified.

3) Resistivity surveys, GPR, seismic tomography, and core drillings clearly indicate large underground cavities or chambers beneath the megalithic site.

4) Radiocarbon dating analysis of organic soils from near surface and within artificial layers yields that the structures have been built in several periods in the past. The carving of the lava tounge and the Layer 3 was built before 10,000 BP, possibly up to 26,000 BP even more. Layer 2 is constructed about 7,000 BP. Layer 1 is first constructed about 2,500 to 3,500 BP but it might have been modified in later periods.

Conclusions

Through comprehensif and integrated geological, geophysical, and archeological data, we show that Gunung Padang megalithic site is not an ordinary-simple ancient monument but a very large and complex artificial structures that portray a unigue and magnificient architectures of the pre-historic Nusantara anchestors, many thousands of years ago. The basic geometry of the structures can be classified as a pyramid, but not quite similar with the Eqypt or Mayan pyramids. The east-west section shows a truncated pyramid like Mayan but Gunung Padang has a long axis in north-south section, not symetrical in all direction. So, Gunung padang is a unique pyramid of Sundaland. Explorations has to be followed up; There are still big mistery to be solved. including the existence of large cavities or chambers.

Discussions

The real controversial arise since the story does not fit the mainstream knowledges of human history in Indonesia (Ardika, 1996) and even worldwide (Roberts, 2011). The Layer 2, which is constructed around 7,000 Cal.BP is older than the great civilization in Egypt that is believed to have constructed the Great Giza Pyramid in about 4,800 Cal.BP. It is as old as the known oldest advanced civilization in Mesopotamia (Roberts, 2011). The carbon dates of Layer 3 is even sound impossible since it predate the beginning of world-wide civilizations about 11-12 thousands years ago, marked by the earliest evidences of agricultures. (Riehl, 2013).

Hence, Gunung Padang studies imply a great challenge to the scientific world. it "endanger our established history and understanding". In fact, Gunung Padang case is not the only one. Many magnificient megalithic remains around the world might be as old as Gunung Padang and need to be dated rigorously. One that has been well established world wide is Gobekli Tepe in Turkey, the advanced mega structures that was constructed in 11,600 Cal.BP, known as the oldest temple of the world.

We propose an alternative concept to human population growth and cultural developments as follows. The population and cultures could rise and (totally) destroyed and rise again from the start because it is punctuated by global catastrophic events that wipe out the living things including human race. These can be super-volcano eruptions, extremely large earthquakes, huge tsunami or great flood, meteorite impacts or giant solar outburst or manmade.

In geological concept, sudden-catastrophic events have been well known working together or in competitionwith gradual geological processeses or so called uniformitarianism concept. A catastrophic events are frequently marked by mass extinctions of selected species. The most well known global catastrophic event is the meteorite impacts at the end of the Mesozoic Era, about 60 ma that wiped out the dinosaurus race to extinction. The well-known catastrophic event occured in human history is

the eruption of Toba supervolcano about 73-74 ka (Rampino, 1993; Rose and Chesner, 1987). This event is believed to have almost wiped out human race, causing a bottle neck population (Rampino, 1993).

After Toba eruption, we suspect there is another global catastrophic event in Pleistocene-Holocen boundary. The last glacial maximum (LGM) occured in about 18 Ka (Clark, 2012; Clark et al., 2002). Since then, the global temperature begun to rise causing the ice caps to have been melted, thus raising the Global sealevel. The transition from glacial to interglacial period was not going smooth and gradual but it was punctuated severaltimes by extreme climate changes. The one that is most interesting is so called a Younger Dryas (YD) period, which occured at the Pleistocene-Holocene boundary (Fiedel, 2011). The YD onset is marked by extreme sudden drop in global temperature in about 12,8-12,9Ka plunging the Earth back to the ice age for about 1300 years. Then at the end of YD, 11,600 BP, the global temperature rise again, extreme and sudden rising sea level about several tens of meters at instant geological time. This will make the present-day global warming, which rise global temperature about 2 C in 50 years, looks like a menicule.

There are still controversy regarding what is the driving force that cause YD and how lethal is YD for the living on earth. The most accepted hypothesis suggested that YD is related to the sudden termination of Oceanic thermohaline circulation that maintaining balance of the world climate (Broecker, 1988, 2006). Other studies indicated that the sudden YD onset is meteorite impact event like occured in the Cretaceous-Tertiary boundary (Firestone, 2007) and also in Europe (Wittke, 2013). Others proposed about the possibility of extra-large solar outburst at the end of YD (La Violette, 2011). Regardless the cause, YD seems to be associated with the late-Pleistocene mass extinctions of many large mammals, which have been well studied in North America (Faith, 2009; Gavin, 2010; Gibbons, 2004; Grayson, 1991; Haynes, 1984). It seems that the possibility of near human extinction associated with YD is still neglected. Perhaps, people do not really aware that the beginning of our history is right after the YD.

Last, but not least, Plato described in Timiaeus and Critias about the catastrophic earthquake and great flood event that wiped out a lost advanced civilization, called Atlantis right in 11,600 BP. Even more intriguing, Plato does not talk only about Atlantis but also described that in the distant past there were global catastrophic events that had wiped out human race, not just one time but few times. So, our concept of history is not new at all but the ancient one.

Recommendations

The Presient Decree No.148, 2014 about Development, Conservations, Research, Utilizations, and Management of Gunung Padang has to implemented as soon as possible. The current state of research achievements in Gunung padang should be openly evaluated and then followed up by further research and assessments to get satisfactory results. Then, if all things have been proved, clarified, and verified then the next step is to start a step-by-step systematical restoration. The restorations needs to be conducted very carefully since we are dealing with a buried complex multi-layer constructions. Multi-disciplinary research have to be put ahead in restoration processes to solve the mysteries step by step together with restoration processes.

Acknowledgements

We are indebted to Gen.Dr. Bambang Susilo Yudoyono and his cabinet, especially to the office of Special Staff for Social and Disaster Mitigations, Mr. Andi Arief and his staffs, who had facilitated and supported the team from the start. Gratitude and appreciations are also for West Java Provincial Government and for Cianjur District Government, particularly to the Vice governor of West java, Mr. Dedy Mizwar, who patiently hear our problems and always followed and supported the progress. Our proud and gratitude are also for the Top Army General Gatot Normantyo and his commanders, particularly for the Marine-troops General Ade Supandi who always giving inspirations, guidance and spirits. We thanks all commanders and army troops who helped us in the field in August - September 2014. We appreciates the Ministry of Culture and Educations, the Director General of Culture and the Director of Museum and Cultural Sites that have facilitated us. We are grateful to BPCB and all local-site workers at Gunung Padang that have been helped us with the fieldworks. Last but not least, we are indebted and thankful to all friends and colleagues as well as supporters that we cannot name it one by one here

References

Ardika, I. W. e. a., 1996, Indonesian Heritage: Ancient History, Grolier International, Inc.

Bintarti, D. D., 1982, Punden berundak di Gunung Padang, Berkala Arkeologi, Pusat Penelitian Arkeologi Nasional.

Broecker, W. S., et al., 1988, The chronology of the last deglaciation: Implications to the cause of the Younger Dryas event: Paleoceanography, v. 3, no. 1, p. 1-19.

-, 2006, Abrupt climate change revisited: Global and Planetary Change, v. 54, p. 211-215.

Clark, P. U., J.D. Shakun, P.A. Baker, et al, 2012, Global climate evolution during the last glaciation: PNAS, v. Early Edition.

Clark, P. U., Mitrovica, J. X., Milne, G. A., and Tamisiea, M. E., 2002, Sea-level fingerprinting as a direct test for the source of global meltwater pulse IA: Science, v. 295, p. 2438-2441.

Faith, J. T. a. T. A. S., 2009, Synchronous extinction of North America's Pleistocene mammals: PNAS, v. 106, no. 49, p. 20641-20645.

Fiedel, S. J., 2011, The mysterious onset of the Yunger Dryas: Quaternary International, v. 242, p. 262-266.

Firestone, R. B., A. West, J.P. Kennett, et al., 2007, Evidence for anextraterestrial impact 12,900 years ago that contributed to the megafaunal

extinctions and the Younger Dryas cooling: PNAS, v. 104, no. 41, p. 16016-16021.
Gavin, J. P., A.Grant, A.Gully, et al, 2010, Timing and dynamics of Late Pleistocene mammal extinctions in southwestern Australia: PNAS, v. 107, no. 51, p. 22157-22162.
Gibbons, R., 2004, Examining the extinction of the Pleistocene megafauna, Natural Science, Volume Spring, p. 22-24.
Grayson, D. K., 1991, Archeological associations with extinct Pleistocene mammals in North America: Journal of Archeological Science, v. 11, no. 3, p. 213-221.
Haynes, C. V., 1984, Stratigraphy and Late Pleistocene in United States, *in* Klein, P. S. M. a., ed., Quaternary Extinctions: A prehistoric revolution: Tuscon, University of Arizona Press, p. 345-353.
Krom, N. J., 1915, Rapporten van den Oudheidkundingen dients in Nederlandsch 1914.
La Violette, P., 2011, Evidence for solar flare cause of the Pleistocene mass extinction: Radiocarbon, v. 53, no. 2, p. 303-323.
Ramadina, S. P., 2010, Analisis perupaan situs megalitik Gunung Padang di Cianjur, Jawa Barat: J.Vis.Art & Des. ITB, v. 4, no. No.1, p. 51-66.
Rampino, M. R., S.Stephen, 1993, Bottleneck in the human evolution and the Toba Eruption: Science, v. 262, p. 5142.
Riehl, S., M.Zeidi, N.J. Conard, 2013, Emergence of agriculture in the foothills of the Zagros Mountains of Iran: Science, v. 341, no. 6141.
Roberts, A., M.J.Benton, C.Grooves, K.Robson-Brown, K.Harvati, S.Oppenheimer, J.McIntosh, 2011, Evolution: The Human Story, U.K., Dorling Kindersley Limited.
Rose, W. I., and Chesner, C. A., 1987, Dispersal of ash in the great Toba eruption, 75 ka: Geology, v. 15, p. 913-917.
Sukendar, H., 1985, Tinggalan tradisi megalitik di daerah Cianjur, jawa Barat: Pusat Penelitian Arkeologi Nasional.
Tim-Peneliti, 2003a, Laporan hasil penelitian arkeologi di Situs Megalitik Gunung Padang, Kab.Cianjur, Jawa Barat: Balai Arkeologi Bandung.
-, 2003b, Laporan hasil penelitian prasejarah: Penggalian arkeologi di Situs Megalitik Gunung Padang: Balai Arkeologi Bandung.
Veerbek, R. D. M. a. F., 1896, Geologische beschrijving van Java en Madoera, Amsterdam, Deel I en II.
Wittke, J. H., et al, 2013, Evidence for deposition of 10million tonnes of impact spherules accross four continents: Proc. Natl Acad Sci USA, v. 110, no. 23, p. E2088-E2097.
Yondri, L., 2014, Punden berundak Gunung Padang: Refleksi adaptasi lingkungan dari masyarakat megalitik: Jurnal Sosioteknologi, v. 13, no. No.1.

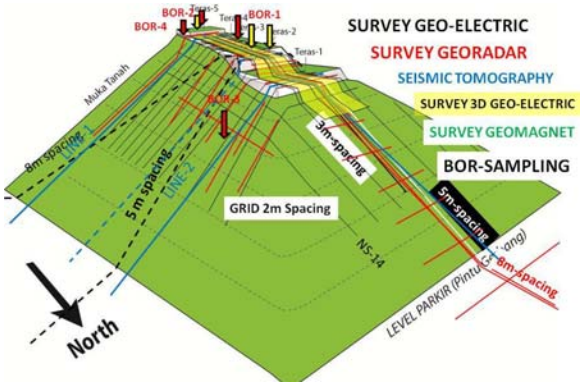

Figure 1 Comprehensive geological and geophysical subsurface explorations from October 2011 to September 2014, including: resistivity survey 2D and 3D, GPR, geomagnetic, seismic tomography survey, and seven sites of core drillings reaching the depth from 15 to 35 meters.

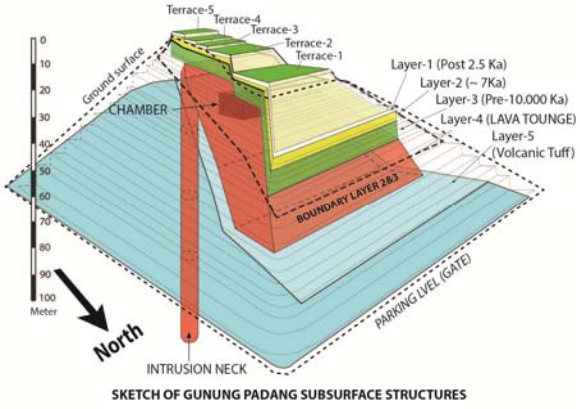

Figure 2 Archeo-geological reconstructions of Mt.Gunung Padang based on archeological excavations and subsurface geological and geophysical data.