S.N.Sukmi, C. Biets & A.-M. Sémah
Human Origins Heritage (HOH)

HUMAN ORIGINS HERITAGE International Participatory School

SANGIRAN TODAY
A NEW EXPERIENCE

2018-2019



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Graduated in Archaeology (Lyon 2 University), Corentin Biets worked as a rescue archaeologist on several excavations in France. He subsequently specialized in Quaternary and Prehistory (MNHN Paris & URV Tarragona, Erasmus Mundus) and attended the 2017 pre-HOH school organized in Salatiga. He is now preparing a PhD entitled "Preventive archaeology, excavations and surveys on the Island Southeast Asian prehistoric heritage – Building a participatory approach on Indonesian sites". He currently works in preventive archaeology for Éveha International, and leads several excavation campaigns, notably in Oman and in the Emirates.



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ISBN

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HOH
Human Origins Heritage

The HOH International Participatory Training School
is implemented by:

Acronyms used in the text

ASU : Alliance Sorbonne Université

BPSMPS : Balai Pelestarian Situs Manusia Purba Sangiran

DIKBUD Sr: Dinas Pendidikan dan Kebudayaan - Kabupaten Sragen

ÉVEHA international : Etudes et valorisations archéologiques

IFI : Institut Français d'Indonésie

IPT : Instituto Politecnico Tomar

IRD : Institut de Recherche pour le Développement

MEAE : Ministère de l'Europe et des Affaires Etrangères

MNHN : Muséum national d'Histoire naturelle

POKDARWIS: Kelompok Sadar Wisata "Wonderful Sangiran"

PREHISTROPIC: Préhistoire sous les Tropiques (Programme Emergences, ville de Paris)

PUSLIT ARKENAS: Pusat Penelitian Arkeologi Nasional

- Balai Arkeologi Denpasar
- Balai Arkeologi Jawa Barat
- Balai Arkeologi Yogyakarta
- Balai Arkeologi Palembang

RUFA: Royal University of Fine Arts – Phnom Penh

UKSW : Universitas Kristen Satya Wacana

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNIFE : Università degli Studi di Ferrara

URV : Universitat Rovira i Virgili - Tarragona

YGC : Young Guardian Club

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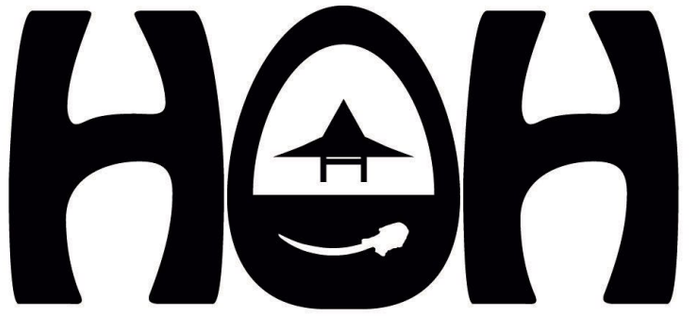
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PART A



Human Origins Heritage



Marthen Luther Ndoen (1954-2019)

CHAPTER I - Introduction

Preamble from the Editors:

Publishing the Results of a New Experience

in Sangiran Today

***A Volume Dedicated to Dr. Marthen Luther Ndoen*, in Memoriam**

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« Toute personne, aussi bien seule qu'en commun, a le droit de connaître et de voir respecter sa propre culture ainsi que les cultures qui, dans leurs diversités, constituent le patrimoine commun de l'humanité. » [1]

"Everyone, alone or in community with others, has the right:

> a. to choose and to have one's cultural identity respected, in the variety of its different means of expression. This right is exercised in interconnection with, in particular, the freedoms of thought, conscience, religion, opinion and expression;

1 Fribourg Declaration on Cultural Rights, May 2007, presented by the Observatory of Diversity and Cultural Rights with the Organisation Internationale de la Francophonie and UNESCO.

> b. to know and to have one's own culture respected as well as those cultures that, in their diversity, make up the common heritage of humanity. This implies in particular the right to knowledge about human rights and fundamental freedoms, as these are values essential to this heritage;
>
> c. to access, notably through the enjoyment of the rights to education and information, cultural heritages that constitute the expression of different values as well as resources for both present and future generations."

This statement constitutes a reminder for us to protect and develop our human capacity from the past until hitherto.

1- Reporting about the Human Origins Heritage (HOH) school: our goals

For decades, various teams have worked and excavated in Sangiran, including several authors in this volume, who also implemented many projects to develop participatory research in this site (such as the European-Asian HopSEA and PrehSEA actions[2]). All these programs constitute models and also the heritage of our predecessors, drives for thought and action, and also an idea of culture and patrimony. We subsequently took part in the implementation of the International participatory training school "Human Origins Heritage", which represents, under many aspects, a quite new experience needing to be analysed and reported.

As academics who commit to share knowledge, we have the responsibility to publish reflections from our new experiences after the program. This effort also answers our responsibility to broaden our results to the public after two years.

For the first HOH edition, we had expectations regarding the global behaviour of the students, attending the program in the framework of international study groups. In a pedagogical perspective we planned to have them, as well as the local participants, do a public presentation of their experience and results.

But because the different groups were gathering testimonies and doing observations that had never been made or published before in Sangiran, especially in the framework of Prehistoric Heritage, we proposed that they also write short papers reflecting their results[3] and thoughts about the topics they were assigned. We must keep in mind that such an essay is generally their first production. Therefore, such

2 cf. F. Sémah, this volume "Implementing a Program Regarding Human Origins Heritage in Indonesia"

3 Some titles of students' papers even show that the group dynamics and interest ended up with some distance from the initially assigned topic, e.g. Andrea Witjaksono et al., this volume.

papers must not be evaluated for the quality of their scientific questioning (which might sometimes appear poor[4]), but in the light of the training provided by a new experience for them in an international and interdisciplinary context.

Even if those reports, which did not undergo heavy editing in order to reflect the actual level reached by the students, cannot be considered as actual scientific papers, the data they present are relatively unique. Writing them down encouraged the students to develop in interdisciplinary group mode a scientific narrative starting with questions and following a red line towards the results. These papers can be used as a source of raw data, or an introduction to innovative scientific questions and interesting proposals towards the improvement of Sangiran World Heritage property management.

This is why we expect, with this publication, the further students from the future HOH programs to construct their approach from the previous experience. We hope it will be a support to reach more advanced scientific questions and to better deal with them.

Beyond the data, we expect this volume to picture the different aspects of the HOH program. This would allow any other similar program, anywhere, to be constructed from our experience.

In the framework of the HOH program, we try to also have a reflection about the way to communicate our results to the local communities. Because of the different nationalities of participants, this volume is written in English, although it might be followed by a shorter brochure in Indonesian. However, a strong involvement of the locals was always a priority during HOH, to have them better understand the scientific purpose of the program. They presented their experience in the Dayu Museum (Sangiran), to the members of their communities and several other stakeholders. Posters have also been exposed in the entrance of the Dayu Museum in order to communicate about the program.

2- **The contents**

The present volume contains two main parts devoted, respectively, to the contributions from the HOH coordinating team and from the students. The length of all texts was purposely strictly constrained, our goal being to produce a publication which is half way between a report and a handbook needed for future developments of our training and research effort.

4 cf. C. Biets, this volume, "Human Origins Heritage: Exploring the way toward a scientific participatory program in Sangiran", part 4.

The First Part includes three chapters:

- the **Introduction** which explains the framework of the project, from the nascent international collaboration to its development and the design of the Human Origins Heritage project.
- It is followed by the **context** which describes the object of study (the Sangiran dome), the participatory approach, the methods used for communication purposes, and provides details about the global and practical pedagogical process that was executed.
- This part is concluded by a short **analysis of the HOH project results** after its early editions.

The Second Part, i.e. papers directly prepared by the student groups, is also divided into three chapters:

- Seven contributions are related to heritage and society: different aspects of the natural and cultural heritage or living environment heritage that present challenges, including the impact of heritage and of the various Sangiran museums in the daily life.
- Four contributions are directly related to the scientific and conservatory approach of the prehistoric heritage.
- These contributions are complemented by a pioneer methodological approach undertaken with primary school pupils re. the collection and the management of data.

3- Acknowledgments

The editors would like express their gratitude to all contributors and participants who have helped to depict our collective reflections, experiences and learning from each activity as well as, beyond UKSW and MNHN, to institutions whose acronyms are explained at the beginning of the volume, those who supported directly the HOH project or any associated activity such as excavation campaigns and exhibition:

- *Research and conservation actors: Direktorat Jenderal Kebudayaan, Puslit Arkenas, BPSMPS (who kindly offered numerous facilities in Sangiran) in Indonesia;*
- *Ministère de l'Europe et des Affaires Etrangères (Commission Consultative des Fouilles archéologiques à l'étranger) ; Alliance Sorbonne Université (who co-financed the first edition of the school) in France ;*
- *The European Commission (including Erasmus + Program) who supported the HOH implementation and the PrehSEA exhibition.*
- *Local governments (Salatiga Mayor, Sragen Regency);*
- *Ambassade de France en Indonésie (IFI, Institut Français d'Indonésie, who*

helped to print this volume) ;
- *Local actors (Pokdarwis Wonderful Sangiran, YGC, Elementary school SDI Girimargo);*

Eventually, we want to thank François Sémah, initiator of the HOH project, who gave a hand in the editing phase, Chafika Falguères, Adhisti Raya Putri and Kezia Ayu Tekan Sari who kindly advised and helped the students during the preparation of the school and its implementation.

***



HOH session in UKSW auditorium

Human Origins Heritage (HOH) and Future Collaboration Universitas Kristen Satya Wacana (UKSW) & Muséum National d'Histoire Naturelle (MNHN)

A Brief Note in Memory of Marthen Luther Ndoen

Neil Semuel Rupidara, Ph.D.
Rector of Universitas Kristen Satya Wacana,
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Marthen Luther Ndoen, PhD., who we usually called Pak Marthen, had been a great friend for many people. Not only for some of us who were his closest friends or many colleagues at Universitas Kristen Satya Wacana (UKSW). According to stories told, he made friends with many and had very good relationships with his colleagues and friends during his studies abroad. He was a graduate of Cornell University in Ithaca, New York for his master degree and Tinbergen Institute in Amsterdam for his PhD. He did the same since his bachelor degree at UKSW in the 1970s. He made friends across groups of people. He had also been a favorite teacher for many of his students at UKSW since he joined as an academic in the early 1990s. He has been an inspiring and friendly teacher for students at the bachelor, master, and doctorate levels he taught or supervised. He was a thoughtful and enthusiast partner in discussions to many colleagues. Numerous warm personal relationships also he had built alongside institutional collaborations developed by UKSW that had him involved in as a member. Besides his warm personal style, he was a considerate free thinker with a highly intellectual curiosity who had stimulated many people to achieve higher academic standards. With those qualities, he had been loved by many.

I believe that Pak Marthen had also developed not only a professional but also close personal relationships with colleagues from Muséum National d'Histoire Naturelle (MNHN) Paris. I remember the day when I asked him to be in charge of the collaboration between UKSW and MNHN, after my short discussion with Prof. François Sémah about the way we would continue the collaboration in December

2017. I thought it would be something difficult enough for UKSW to develop the collaboration further, based on a research field that UKSW had no strong footing, that is on pre-historic studies, although UKSW had started this collaboration for a few years. On the other hand, the field is certainly a strong expertise of MNHN itself as a global player. I was concerned about the imbalance in relationship that would be taking place. I therefore asked Pak Marthen to relate that with our expertise in development studies that Pak Marthen and colleagues have built. I was also thinking to develop a new small team of archeologists and related expertise at the Department of Development Studies. Although I was worried enough, I knew Pak Marthen quite well and believed that with his creative ideas he could design that collaboration into a high level of quality standard. Until now I don't really know it in detail, but I know for sure that he must have had discussions with Dr. Titi Prabawa, his intellectual partner and wife, and Pak Andri Purnomo, then came back to me with the Human Origins Heritage project. This program was of course a result of constant discussions with Pak François and MNHN team. After an initial concept, a group of colleagues from UKSW was then invited to visit MNHN and a few sites in France to learn about the fieldwork project as a starting point to design the HOH project in Indonesia. Pak Marthen was not in the group. It was easy for me to understand that, as in some previous occasions he acted as and wanted to be a man behind the screen. Constant and on-going learning processes from early phases of implementation has now led to a better shape of the project. At the end of the second phase of HOH Project implementation, I realised that my little worry on how we could continue and develop the collaboration with MNHN has disappeared, although we all were saddened that Pak Marthen left us all in eternity very early in the project development.

I would like to take time to remind us all about Pak Marthen's intellectual pursuit in relation to HOH Project. He had urged us all that scientific publication should be one of the outcomes of project. I know Pak Marthen himself must have realised that is not easy. Such an expectation is something that we all must keep pursuing. This book publication should therefore be a good start to keep moving forward towards more and more scientific publications based on the HOH Project and UKSW – MNHN collaborative works. When someday in the future we can all achieve that, I hope we all agree to dedicate all the results also to commemorate all the ideas and efforts that Pak Marthen had put in laying down the foundation of the project. Thank you so much, Pak Marthen for all you had contributed to the current development of HOH and the collaboration of the two institutions.

With the aforementioned, let me close this brief note to remember Pak Marthen with an expectation of the enhancement of the collaboration between UKSW and MNHN. I hope that UKSW can extend its European and international network through MNHN as its core strategic partner. This certainly needs higher commitment from us at UKSW to develop our internal capacity and to tap into much stronger capacity and reputation of MNHN and its wider network. A constantly growing mutual

understanding between both institutions, I believe, can take the current state of collaboration into its more fruitful state in the future. May God bless us all for doing good things for both nations and for science and humanity.

Salatiga, 23 April 2020

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Address for the Opening of the International Participatory School "Human Origins Heritage" (HOH)

Salatiga, May 21, 2018

Joseph Ernest Mambu, Ph.D., Deputy Rector for Institutional Relations & Internationalization, Universitas Kristen Satya Wacana
joseph.mambu@uksw.edu

Honorable Rector of UKSW, fellow deputy rectors, distinguished guests from France, Bangladesh, Cambodia, Chili, China, Italy, Spain, and Belgium, Ladies and Gentlemen,

When it comes to discussing history, I always remember our first President's statement. President Soekarno in the mid-1960s once said: *"Jangan sekali-kali meninggalkan sejarah,"*[1] with the acronym being "Jas Merah"[2].

The history of humankind is always interesting to study. The challenge is when we do not know the history. We cannot always know what happened in the pre-historic times when human beings had yet to discover writing systems to document their life stories and achievements. It is when we have to rely on our modern skills to reconstruct the pre-historic times. But why do we bother learning the pre-historic times?

The International Participatory Training School "Human Origin Heritage", I believe, is where experts gather to delve into the complexities of pre-historic times. Sometimes the motive for understanding the history of humankind, including those in Human Origins Heritage, is driven by sincere curiosity about how we came about as human beings and how we have developed our cultures over time.

One of the classic debates is arguably creationist vs. evolutionist. Those who believe in the Christian Bible in a literal way usually are convinced that Adam and Eve were

1 "Do not ever abandon history".
2 http://sejarahri.com/isi-pidato-jasmerah-bung-karno. I am not endorsing Soekarno's political view here. I only remember his interesting acronym and find its literal meaning useful for my current purpose.

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I personally hate to learn that bad history (e.g., exploitation of the environment) repeats itself. Who knows, we can learn also how human beings at prehistoric times, presuming that we can learn anything from them, could preserve or conserve their environment, how they respect, or not simply exploit, other creatures, and their homes. In other words, please find if we can learn posthumanity from people in ancient, prehistoric times.

Ladies and gentlemen,

I thank Pak François and his team in France to welcome our delegates to your country some time ago. Dr. Wilson Therik shared with me his experience of visiting a historic site in France that even local French people do not always have the privilege to enter. I believe Dr. Wilson Therik and his colleagues from the Faculty of Interdisciplinary Studies have learned also how historic sites can be packaged really well for developing their tourism industry.

I do hope the delegates from France will also enjoy your sojourn in Indonesia, especially in Salatiga and Sangiran, and will learn something from your visit.

Last but not least, on behalf of UKSW and its management, not only do we welcome you, but we also hope that your visit here will be fruitful.

Thank you! Merci beaucoup!

***



May 2018 - Official ceremony - Balairung, UKSW

Implementing a Program Regarding Human Origins Heritage in Indonesia

François Sémah, Muséum national d'Histoire naturelle
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1- The grounds of a fruitful collaboration

Some twelve years ago, the World Heritage Centre launched, at the initiative of its Director Francesco Bandarin and of Nuria Sanz, a thematic program entitled "Human Evolution, Adaptations, Dispersals and Social developments". Basically intended to foster the representation of prehistoric sites in the World Heritage List, the program quickly became an outstanding opportunity to develop, on a large transnational scale, the dialogue among various actors, including researchers, university academic staff, site managers, museum curators and members of cultural authorities. Numerous international meetings were organized re. various periods and sites in Europe, Asia, Africa and Latin America, which led to important publications[1] reflecting the attention paid by these communities to the topic. The HEADS initiative directly helped the nomination of several major sites on the World Heritage list and tentative list such as "Caves and Ice Age Art in the Swabian Jura" in Germany and "Melka Kunture and Balchit" in Ethiopia. In addition, the global awareness stimulated among the above-mentioned professional groups led to many actions. The latter included the Erasmus Intensive Program "Prehistory at the crossroads of science and conservation" which trained in France students from numerous countries. At the same time, at the initiative of the HEADS scientific committee and of Muséum national d'Histoire naturelle (MNHN), the European-Asian project "Managing Prehistoric Heritage in Southeast Asia" (PrehSEA, with Filipino and Indonesian partners) developed international dialogue among local actors of the heritage.

In 2017, both activities were merged by the simultaneous organization in Universitas Kristen Satya Wacana (UKSW) of a training course and the final PREHsea exhibition, thanks to Dr. Ferry Karwur's initiative, the exhibition being displayed with the help of

1 See the HEADS publications following international meetings, coordinated by N. Sanz, in World Heritage Papers series, notably n° 29 (2011); 33 (2012); 39 (2014); 41 (2015); 42 (2016).

Sih Natalia Sukmi, co-editor of the present volume. The conjunction of both events and the interest it generated, among the academic community and beyond (the exhibition was open to public and attracted many school classes) was the start of a fruitful collaboration between UKSW and MNHN which dynamically developed since then with the support of Indonesian, French and European institutions and government.

The base of this collaboration was initially the biological and cultural history of humankind, in relation with the geological and climatic history of Earth (and especially Southeast Asian archipelagos) during the Quaternary period. However, the ultimate scope is the consideration of cultural and natural heritage in all its dimensions, including development issues such as tourism. It was therefore logical that UKSW's rector, Dr. Neil Rupidara, supported by his executive team (including Dr. Joseph Mambu, Dr. Iwan Setiawan, Dr Suryasatriya Trihandaru, Dr. Sri Sulandjari and Dr. Andeka Rocky Tanaamah) asked Dr Marthen Luther Ndoen and Dr Titi Susilowati Prabawa to have the Interdisciplinary Faculty and its Department of Development Studies (including the related Magister degree coordinated by Dr. Wilson Therik) to take lead for UKSW in this collaboration. Such common efforts, concretized by official conventions and co-supervision of PhD projects, quickly resulted into an acknowledgment by the European Commission, UKSW being associated to the International Master in Quaternary and Prehistory (Erasmus Mundus) and sharing with MNHN an Erasmus + International Credit Mobility training project.

Concerned docents and students coming from various disciplines, the actual challenge faced by the collaboration is to develop interdisciplinary research and training projects. It is also to cultivate the extra-academic dimension of the projects, taking into account the Mission and Vision of UKSW, which insist upon its impact on the society and also the deep involvement in participatory sciences of the MNHN.

The MNHN participants, including the author of this note, want to sincerely thank all the involved colleagues of UKSW who contributed to decide and to make such a collaboration possible, together with all institutions which support it, including the Institut Français d'Indonésie which helped to issue the present volume.

Above all, they want to express their deep gratitude to Pak Marthen, their learned mentor, colleague and friend whose continuous presence and support was invaluable: sadly, Pak Marthen left us much too early, but is vividly present in the following pages which picture part of the collaborative outcomes.

2- The Human Origins Heritage (HOH) international participatory school[2]

Dealing with a heritage property is interdisciplinary by essence as long as science

2 Owing to the pandemic situation, only two editions of the HOH school were implemented in 2018 and 2019 (whose data are included in the present volume), the courses held in 2020 and 2021 having been restricted to various online activities. As a pioneer international pedagogical experience, the 2018 edition was largely supported by Alliance Sorbonne Université and partly by UKSW, the second one being under the shared responsibility of UKSW and MNHN.

and conservation are concerned: numerous disciplines must work together in order to assess the value of the heritage itself, to preserve it and to disseminate related information to various publics. Moreover, a close relationship often exists between the tangible heritage itself (e.g. a landscape or a monument) and the extant living -often called 'intangible'- heritage, notably in relation with traditional beliefs, symbols and arts.

But dealing with heritage is also an inter-sectoral activity as a heritage property itself is not isolated but embedded in a landscape, a society, and a nation. Therefore, all the previously mentioned aspects must also take into account development challenges -such as economic and social ones- that are at stake in the specific considered context.

Such considerations were at the basis of the HOH project. Whatever their field of study and their professional future, the students were most likely to face situations needing to address a heritage-related challenge. From another viewpoint, the experience gathered from other projects such as PrehSEA clearly documented the importance and potential value of the direct involvement of local actors, at the first rank the local communities.

Designing the project was therefore intended to offer an original –and, as far as possible, useful- training opportunity to the students. A second objective was to include an international[3], trans-disciplinary group of students in a dialogue already including researchers and docents, curators and other heritage professionals, local communities and government actors. The efficiency of such a dialogue was already proven during the PrehSEA project. The adjunction of a such a diverse complementary group of master students, already tested on a smaller scale during excavation campaigns, was likely to improve it. Improvement was mostly expected from the diversity of the majors of the represented academic cursus, from archaeology to communication sciences, notably in terms of exchange with local communities: when it comes to a topic re. field research, conservation issues and constraints or local development, students are eager to ask and express opinions, and local people to share knowledge and concerns. Such a way of doing results in training the students to the growing importance of participatory sciences, and can positively improve the participatory dimension of connected research and conservation projects implemented in Sangiran.

Indeed, the challenges are many and important, regarding sites preservation (e.g. against erosion), mobile heritage conservation and access, infrastructures building and tourism development, sand and rock quarries, pollution of rivers and landscapes, traditional architecture preservation and even illicit fossil trade, etc.

Besides transmission of fundamental knowledge, the HOH project is therefore likely to deliver the following skills:

3 The involved participants (teachers and students) came from 8 to 15 countries, depending on the year.

- Open the students to topics at the crossroads of research, conservation and development.

- Allow the students to face scientific and natural / cultural heritage challenges in situations that they will meet during their career.

- Provide the students with international and intercultural opening, including close contacts with local communities / inhabitants of a Human Evolution World Heritage Property.

- Open new horizons in terms of participatory sciences.

The initial choice for HOH fieldwork focused on the Sangiran dome in central Java. Inscribed on the World Heritage list in 1996, the site experienced a growing importance since fossils -and subsequently human fossils- were unearthed in the 1930s. Numerous scientific issues were studied since, including from the geological and palaeoclimatic viewpoints. It still conceals much information concerning the early colonization of southeast Asian archipelagos, the biological and the cultural evolution of various human groups in the region during the Pleistocene period[4]. Moreover, Sangiran is certainly one of the most populated -if not the most- human origins related property of the World Heritage List, meaning that any question re. its development clearly impacts the local society. As such, it represents an excellent laboratory to deepen heritage related topics in the perspective of the so-called 5Cs that ground UNESCO World Heritage Convention's objectives[5]: Credibility, Conservation, Capacity building, Communication and Communities.

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4 cf. F. Sémah et al., this volume, "The Sangiran Dome Prehistoric Site: a Multifaceted Object"

5 https://whc.unesco.org/archive/2011/whc11-18ga-11-en.pdf



May 2019 - Neil S. Rupidara, UKSW rector, signing MOU



Dr. Hilmar Farid, General Director of Culture, opens the 2017 exhibition





Inauguration of the HepSea exhibition - Rumah Noto UKSW 2017

Development Studies in Universitas Kristen Satya Wacana Regarding Heritage, from Science and Conservation to Development and Tourism

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Development Studies department at Universitas Kristen Satya Wacana takes sustainable development as the underlying concept to build the framework of the curriculum and research conducted by researchers and students at the department. Exploring heritage conservation in the development context, particularly related to sustainable tourism development has been one of the scientific interests at the Department. Heritage conservation and tourism are closely related and potentially support each other to reach sustainable development. Heritage, both cultural and natural ones, are essential attractions in tourism industry. Meanwhile, income from well managed tourism can significantly support environmental and cultural heritage conservation. As it has been noted by the World Tourism Organization (UNWTO), environment, culture and heritage attract more than 50% of the world tourists and the market for those attractions steadily grow (Brooks, 2011).

The concept of sustainable development was first introduced in Brundtlandt Report in 1987[1]. Sustainable development was defined as "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission, 1987). Since the publication of the report, the concept has been embraced as the paradigm of development policy by a lot of

1 The World Commission on Environment and Development, also called "Brundtland Commission" (1983-87), sub-organization of the United Nations, prepared the report entitled "Our Common Future" where it introduced the concept.

governments around the world. Sustainable development encompasses different aspects of human lives, therefore interaction between development and community needs to be assessed holistically. In September 2015, world leaders agreed to adopt "Sustainable Development Goals", the first goal being to "end poverty in all its forms everywhere" (Sachs, 2012), as without eradicating poverty, other goals of development from clean environment to personal freedom are hard to achieve (Soubbotina, 2004). Indeed, fighting poverty has been the main challenge in development efforts. Poverty encompasses more than just economy. The history has shown that achievement of economic growth can lead to greater inequality, loss of cultural identity, weakened democracy, natural resources depletion and higher unemployment which gradually lead to unsustainability. Therefore, sustainable development objectives go beyond the economic growth.

Poverty has been regarded as an inability to maximize positive transformation of natural and cultural resources to reach quality of life. In order to alleviate poverty, community needs to be equipped to recognize both natural and cultural resources in their environment, to develop technical and managerial skills to utilize the resources, to facilitate equal distribution of social and economical benefits earned from the resources. With such efforts, it is expected that the growth of quality of life can be improved, protected, and recreated in a sustainable way (Babalola & Ajekigbe, 2007).

Motivated by the above mentioned discussions, the Development Studies department of UKSW intend to dive into the complexity of environmental, political and socio-economic issues of the local communities' wellbeing living in the surrounding of the heritage site development. Since 2018, we have been involved in international partnership with MNHN in Paris developing interdisciplinary participatory training on Human Origins Heritage program for both Indonesian and international students with different academic background. We introduce to the participants various topics from pre-historic heritage conservation, the involvement of communities living at the heritage sites in conservation and its challenges, to tourism development. However, despite the importance of the issues, researches and exploration are limited.

The fieldwork of HOH program has been designed to be conducted in Sangiran World Heritage Site. The site offers a complete case for the students to do an interdisciplinary exploration. The site is one of the most famous hominin bearing sites in the world and notably documents the dispersals, adaptation and evolution of *Homo erectus* during the Lower and Early Middle Pleistocene and has been studied for more than a century. Additionally, the World Heritage title has been crowned for more than two decades, four museums and a field museum have been established within the locality.

The international participatory training on Human Origins Heritage program employs a participatory approach involving not only students but also members of the local communities. During the program, they discussed archaeological, prehistorical and

cultural heritage conservation issues in order to reveal not only the complexities of conservation issues but also to build awareness to wider society about the value of archaeological sites as cultural resources.

From the exploration and observation in Sangiran, we also got the insights of the local inhabitants. We learned that the majority of the local inhabitants still view fossils from their monetary values despite the fact that they have been involved in archaeological excavations and interacted with archaeologists for decades. They do not view evidential values in the fossils. However, we cannot fully blame the locals on this issue. The current policy of giving compensation to fossil founders has encouraged intentional fossil searches by a small number of local inhabitants which certainly is contrary to the conservation objective.

Another issue raised during the program in Sangiran that we find challenging regards the impact of the museum establishment on the wellbeing of the local community. The opportunity to benefit from the museums is higher for those who live nearby, while for others the impact is rather small. The museums indeed employ more than 200 locals for positions that mostly do not require conservation of archaeological skills such as security staff, gardeners, janitors, etc. Even though these employments are very helpful for some people, the museums are still far from delivering equitable benefits to all local communities. In other words, the effective community involvement in archaeological research and cultural heritage conservation remains a challenge in Sangiran.

In the last decades, with the rise of current standards practice of 'community archaeology', archaeological research and cultural heritage conservation paradigm have shifted, requiring not only participation from various fields of natural and social science disciplines but also community. The involvement of local communities is undeniably vital in most archaeological projects. Archaeologists generally require the help of local representatives to guide them to potential archaeological sites or previous important discoveries. Later in the process of archaeological excavation, local communities are often involved mainly for the physical works.

A call to further facilitating effective community involvement in the study has expanded (Tully, 2007). While the scientific standard of archaeological methods cannot be compromised, an archaeological project is also by nature integrated into the society and required to accommodate diverse voices involved along the process (Chirikure and Pwity, 2008). Accommodating diverse voices is necessary as the social situation of the studied area can have major influences on the sustainability of the research and the future utilization of the heritage sites.

Furthermore, Timothy (2014) also noted that without economic rationale, transfer of knowledge about the aesthetic, scientific, or educative value of heritage can hardly be realized. Realizing the ability of tourism development to promote the economic

welfare of the local community, and the potential role of the industry to support heritage conservation, on one hand, and the growing potential market for cultural heritage, on the other hand, exploring tourism as a development tool to help with conservation promotion and expanding the benefits of archaeological sites to the wider community without compromising the sustainable development objectives may be potentially explored scientifically.

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May 2018, UKSW - HOH Plenary Session



Casual discussion (H. Widianto & F. Karwur)

CHAPTER 2 - Context

The Sangiran Dome Prehistoric Site:

a Multi-faceted Object

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1- **The Sangiran Dome in the context of Southeast Asian archipelagos** (Fig.I)

The geological situation of Java island makes it a privileged place for finding the remains of the oldest continental mammals and humans having reached the Southeast Asian archipelagos. The Sunda shelf, including the islands of the Java sea and the Southern China sea, was alternately emerged and flooded during the Quaternary major climatic cycles: during 'glacial periods', the ice sheets forming at high latitude implied a general drop of the sea level. Subsequently, land bridges that formed between narrow sea straits allowed the faunas and humans to reach the islands.

At the boundary of the Indian Ocean, Java Island is born within the Sunda inner volcanic arc, thanks to the subduction of the Australia-Indian Ocean plate beneath the Eurasian one (see for instance Hall & Smyth, 2008). During the last millions of years, Java underwent numerous geological events linked to tectonics, volcanism, subsidence and erosion, allowing the formation of emerged lands, the burial of fossils and the subsequent exposure of strata that disclose the history of oldest colonization

of the area. The island itself is a longitudinal succession of folded hill chains and basins whose axis shows giant volcanic cones.

This phenomenon, which led to the progressive emersion of Java Island, did not occur in a uniform of simultaneous way. Stratigraphical studies and palaeogeographical reconstructions document the complexity of the landscape evolution, with mountains uplifts, volcanoes building, formation of emerged tongues of land in lower altitude areas, fed by volcanic and erosional products (Djubiantono & Sémah, 1990). These lowlands were separated by straits and lagoons, and bordered by immense coastal and swampy areas.

To document this history for Central Java, the Sangiran dome represents a privileged site. It resembles an eroded 'bubble' within the central Solo depression (van Bemmelen, 1949; Fig. 2 & 3), whose formation is linked with the volcano-tectonic activity: in the central part of the dome can be found a smaller, still active 'mud volcano' bringing from quite deep layers salted water and mud to the surface (see for example Watanabe & Kadar, 1985). The dome was excavated by the erosion of the Brangkal river in the north, Cemoro river in its center, and Pohjajar river in the south, and therefore allows to witness hundreds of meters of stratigraphy covering a large part of the Pleistocene period, between c. 2 and 0.25 million years, and to recover the fossils from the exposed layers. Globally, the stratigraphical evolution pictures the geological evolution described above: Early Pleistocene shallow marine layers are interrupted c. 1.8 million years by lahars which partly dammed the lagoons, followed by marshy and swampy sediments. Around 1 million years ago, the uplift of neighboring hills and an important volcanic period produced huge amounts of erosional products, leading to a fluvio-volcanic sedimentation during the first part of the Middle Pleistocene (around 0.8 million years) which might have persisted until c. 0,25 million years, when it was abruptly interrupted by a new drastic volcanic period.

2- **A short insight in the Sangiran heritage value**

Sangiran represents one of the most important sites in Island Southeast Asia prehistory, documenting, since the first 'Out of Africa', the dispersal of humankind south of the equator and the colonization of islands. The most ancient species that reached the archipelagos were mostly mammals and reptiles able to cross shallow marine straits such as proboscids, hippos, crocodiles and giant terrestrial tortoises (de Vos et al., 1994; Ansyori, 2018). These were soon followed, around 1.6 million years, by the earliest *Homo erectus* found in the island (see for example Sémah, 2014 & Fig.4), some specimens showing quite archaic anatomical features, and also by the carnivores. These fossils are found in the so-called Pucangan (or Sangiran) layers, mostly constituted by black clays, which also yield the oldest stone implements (smaller siliceous flakes) found in Sangiran (Widianto, 2006).

At the dawn of the Middle Pleistocene, just after the previously mentioned change in sedimentation (conglomeratic layers called Grenzbank, c. 1 million years old, see von Koenigswald, 1949), glacial cycles resulted into severe sea-level drops (around 100 meters), hence opening large corridors on the Sunda shelf which favored the circulation and therefore the exchanges with the continent. It is also likely that the narrowing of sea straits bordering the Sunda shelf along the biogeographical boundary called Wallace line (see Wallace, 1869) made easier to cross eastward, and the oldest human presence in Flores dates back to this period (Brumm et al., 2006). Numerous human fossils are found in the associated layers in Sangiran, called Kabuh (or Bapang). New faunal immigrants, such as the *Elephas*, are also found there. The associated *Homo erectus* are certainly descending of the previous ones, but also of other groups having developed on the mainland, this period documenting also, around 0.8 million years ago, the dissemination towards the archipelagos of the Lower Palaeolithic Acheulean tradition (Fig. 5), e.g. stone cleavers (Sémah et al., 1992) that are found besides more classical smaller siliceous flakes (Simanjuntak & Sémah, 1995).

Numerous dating methods are applied by researchers in Sangiran (Falguères et al., 2016). The volcanic effluents allow to apply radiogenic argon and fission tracks methods, as well as electron spin resonance (ESR) on quartz crystals, either from volcanic origin or on alluvial gravels, the latter being dated also by cosmogenic nuclides method. The coupled uranium series / ESR method is implemented on fossils and associated sediment.

As presented before, the birth of Java Island involved complex geomorphological and geographical patterns. It implies that the earliest humans who arrived in Java must have adapted to a diversity of environments, some of them being new for them. During glacial periods in higher latitudes, the dry season in the region was much longer, and open areas existed, sometimes even actual savannas. But palaeoenvironmental reconstructions following the pollen record document (A.-M. Sémah et al., 2004; 2012) the dominance of various kinds of forest, often disturbed by volcanic eruptions. The tropical rainforest was everpresent on highlands, and developed on lowlands during interglacial cycles. It was replaced by a more open, deciduous forest during interglacial cycles, except along the rivers where it persisted as forest galleries. On coastal areas, mangrove, back mangrove, swampy and beach forests occupied immense areas.

Human adaptation in order to survive in such forested environments may have resulted into specific anatomical adaptation features, such as the robustness of the manducatory apparatus on the oldest, archaic *Homo erectus* specimens. However, these environments also influenced their cultural technical behavior, as they made simultaneous use of vegetal (e.g. bamboo) and lithic resources. Humans had sometimes to cover large territories, more than 20 km radius, in order to find convenient and valuable hard lithic raw material quite far from Sangiran in older

metamorphic outcrops.

3- The heritage of Sangiran and the dawn of a participatory approach

Natural landscapes, geological evolution, palaeontology, palaeoanthropology and cultural prehistory are therefore the keywords that ground the outstanding universal value (OUV) of the Sangiran dome World Heritage property.

No wonder then that the conspicuous features of the Sangiran dome easily entered the living heritage of the communities: fossils were related to the victims of big mythic battles, siliceous fine-grained compact stones ('Batu Sangir') were allegedly used by the hero Raden Bandung Bandawasa[1] to sharpen his nail before fighting, people used to collect salt from the mud volcano, to collect fossils and use them in pharmacopeia etc.

During the colonial period, the importance of Sangiran quickly attracted the attention of geologists and palaeontologists: E. Dubois, the founder of the *Pithecanthropus erectus* at Trinil (Dubois, 1894) visited the site, L.J.C. van Es (1931) described the statigraphy in his PhD before Ralph von Koenigswald found the first skull of *Homo erectus* at Sangiran (Sangiran 2) later in the 1930s (von Koenigswald, 1940), opening the way to the scientific future of the site.

Both sides, traditional and scientific, did join quite early in the perception of heritage by local inhabitants: Toto Marsono, who accompanied von Koenigswald during his surveys and learned some palaeontology and prehistory thanks to him, was among the first to collect fossils for display (Suratmo, 2013 & Fig.6). Quickly after the independence of Indonesia, he organized a collection at home first, then founded the early Sangiran site museum in the municipality office premises. He made use of this collection not only to allow dissemination of knowledge related to the site but also as an attractor allowing inhabitants to deposit fossils that were subsequently shown to researchers for study. Self-nicknamed "pioneer of Sangiran museum", he was in fact an early and efficient actor of participatory sciences in terms of research, conservation and dissemination.

4- Conclusion

The value of the Sangiran dome is not limited to the site itself, but beyond it is linked to a major chapter of human history, i.e. that of the earliest islanders who reached Java and other places in the archipelagos. Knowing this importance, the Indonesian government established there not only museums but also a center for research in relation with other national scientific institutions and universities. Much is hoped from these efforts that will help to decipher the complete history of the conquest

1 cf. Galih Agus Saputra et al., this volume, "Between Dongeng and Science: Studying Myths in Javanese Culture in Sangiran"

of islands, from the Lower Pleistocene *Homo erectus* to the most derived ones, who became extinct during the Upper Pleistocene (after 130,000 years, see Indriati et al., 2011) and might have crossed the path of the first representatives of our species who disseminated throughout the Sunda shelf before their dispersals east of Wallace Line and to Australia, long before the arrival of Austronesian people a couple of thousand years ago.

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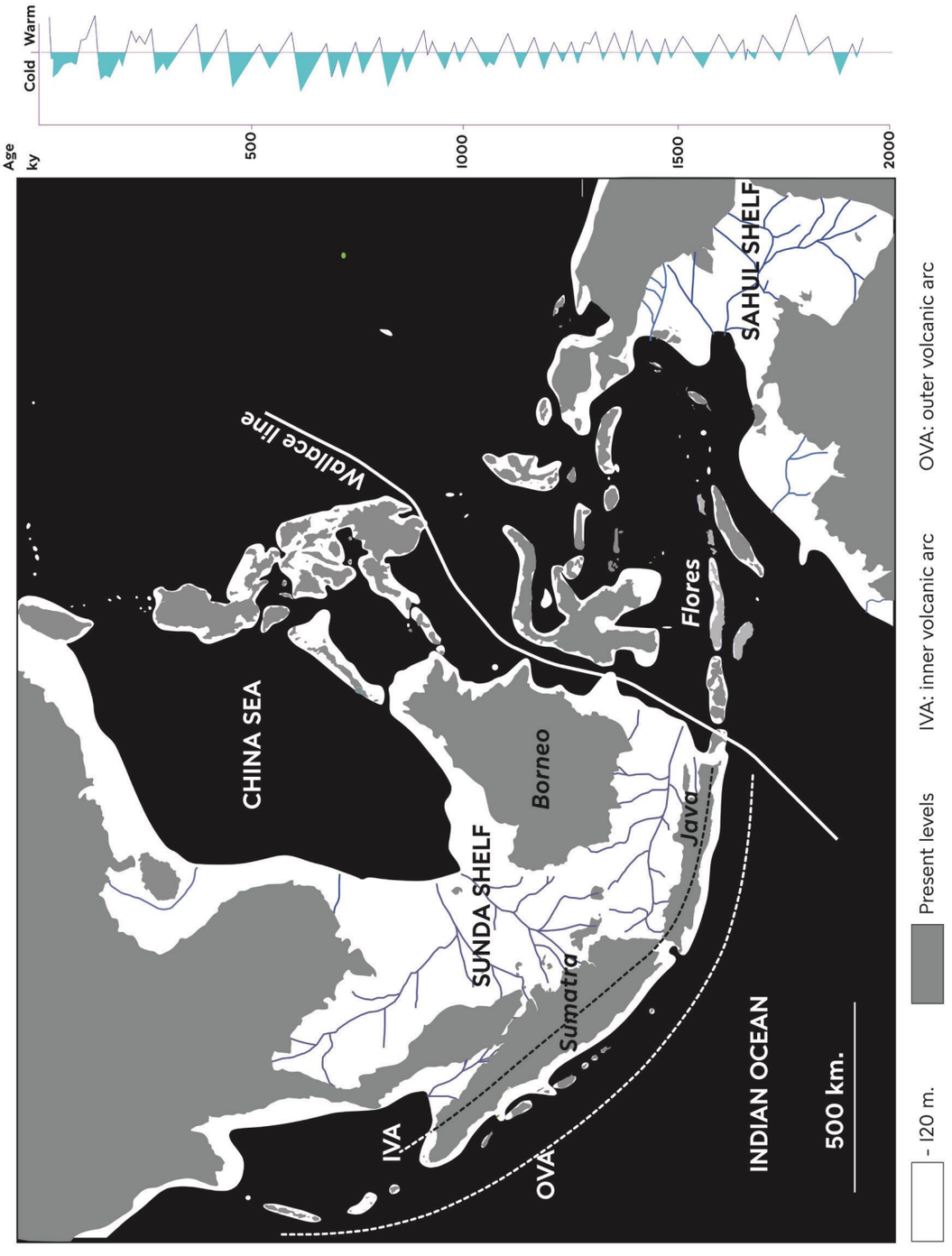


Fig.I Southeast asian archipelagos and biogeographical boundaries
(in white, emerged areas during most severe Pleistocene glacials)



Fig. 2 The Sangiran dome

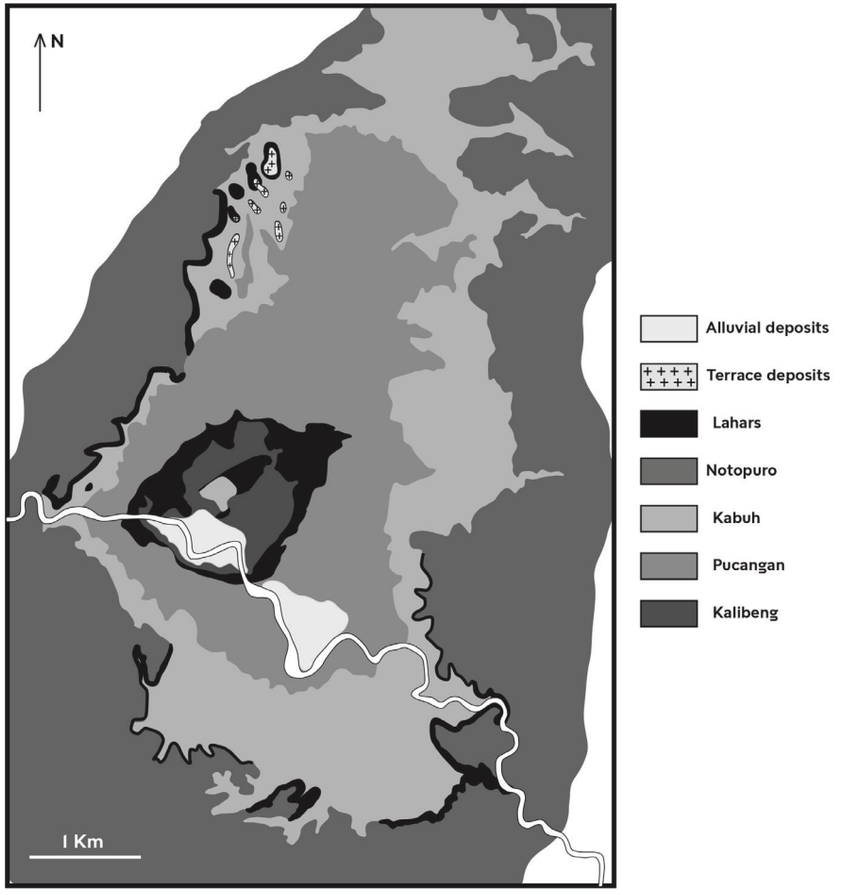


Fig. 3 Geological map of the Sangiran dome

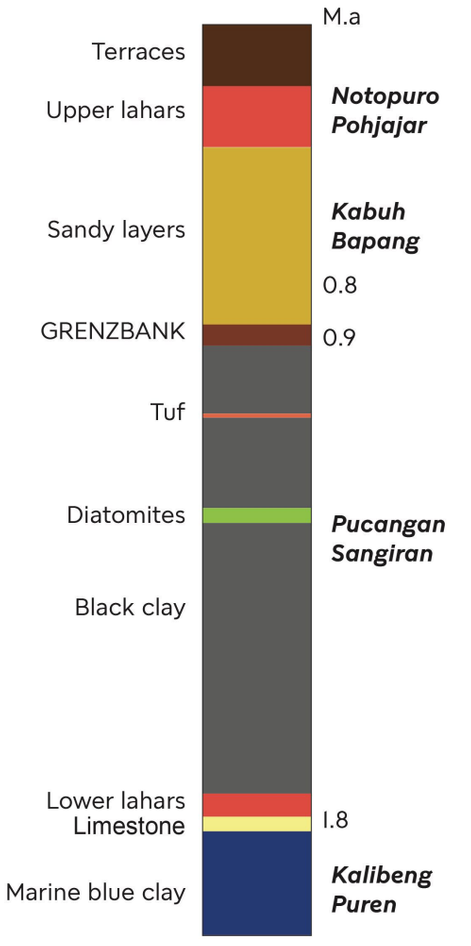


Fig. 4 Synthetic stratigraphy of the Sangiran dome



Fig. 5 Lithic and ivory (left) industry of the Ngebung site (Sangiran, 800,000 yrs ago)



Fig. 6 Bapak Toto Marsono in the 1990s

Pedagogical Approach and Students Networking in the Human Origins Heritage Program Framework: a First Feedback

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1- Introduction

The aim of the HOH program was to develop an academic networking in cultural heritage management on prehistoric sites, by mobilizing training capacities research, conservation and development studies through hands-on activity in the UNESCO World Heritage site of Sangiran. The students have been selected within the IMQP (International Master in Quaternary and Prehistory), UKSW curricula and other universities (e.g. Royal University of Fine Arts from Cambodia), irrespective of their academic backgrounds, mostly in Prehistory, Archaeology, Tourism, Communication and Development Studies.

A prerequisite for the success of this enterprise was therefore the levelling up of the knowledge to be shared by each of these groups of students. A unique online training course, developed for both parties, was set upon a Moodle platform prior to the gathering in UKSW campus and Sangiran vicinity, and each of the students had the responsibility to individually get access to its content and list the questions that would have thereafter raised from their reading of this material. For the professors, the evaluation of these filling-the-gap courses was made thanks to online exam questions the students have had to take within planned date and time, unique for European, Indonesian and other students. Then came the time of HOH training proper.

2- **Pedagogy**

After completion of the online course and exam[I], all participants gathered in Salatiga on UKSW campus.

Basically, the HOH program was built such that the international students first had a full week of both theoretical and participatory lectures on the UKSW campus, aimed at providing them with as many opportunities as possible of meetings and gatherings up as to consolidate the relationships. The students were further all housed in the same building on the campus, grouped by rooms such that the nationalities would be mixed in order to better facilitate discovery of each other's culture during this short period of time.

The first week of course work was organized in a versed way, in which professors provide simple ideas and key concepts on which the students have to react and from which they have to build the discourse, generating a global brainstorming resulting in some advanced concepts.

The students were already in touch with each other by groups of three to four, mixing nationalities and curricula, prior to the encounter in Indonesia. Each group of students was provided with one topic from which they were asked to highlight a scientific question to tackle through a series of activities (so called roadmap) to be designed by them under the control of their supervisors. Subsequently, the roadmaps were finalized after the arrival in the field in agreement with local stakeholders (high school pupils and natives from Sangiran area involved in heritage management under the communities named Pokdarwis and YGC). The topics were of two kinds: heritage topics on one hand, and science and prehistory topics on the other.

The philosophy of the pedagogical approach was to confront the theory to the practice. European students were all from the field of Prehistory, having excellent skills in this domain, some of them having a prior knowledge about the archaeology of the Sangiran area, but who were never confronted with another culture that different from their own and without any experience neither with heritage questions. The Indonesian students, on the contrary, were all fully aware of local specificities such as the tangled broad Indonesian culture and local Javanese culture which dominates the Sangiran area. They were furthermore all from disciplines related to heritage, e.g. development, communication or tourism, which was a real asset, but, in counterpart, were all confronted for the very first time to scientific questions in relation to prehistory. Both categories of students were then approaching the topics with some naivety.

The exchanges with the professors, the encounter with the guides of the Pokdarwis and members of the YGC, and the discrepancy between the planned roadmap when

I MNHN-UKSW collaboration and association of UKSW to the Erasmus Mundus Master IMQP includes a cross-validation grid of university credits.

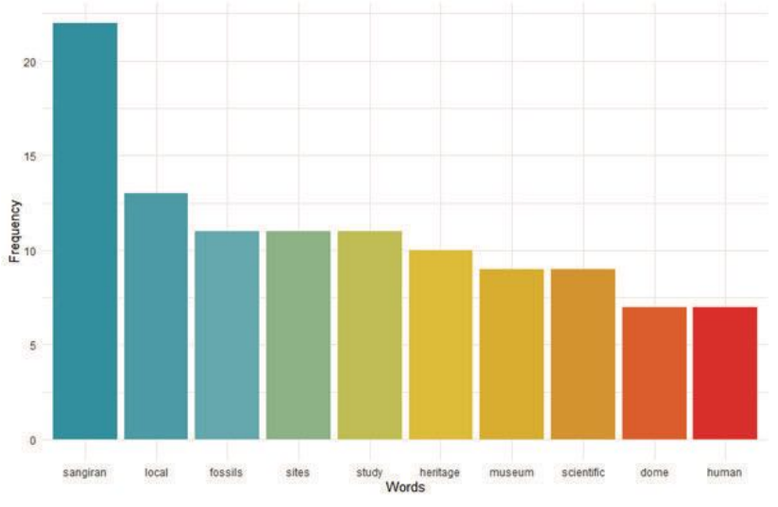
in UKSW campus and the realized roadmap once in Sangiran through the conduction of interviews for instance, all contributed to break this naivety off.

3- **Results**

The success of this pedagogical endeavor can be appreciated from the papers produced by the students and presented in the second part of this volume.

Each of the groups came out with a different perspective, to think about the intricate inter-relationship between the prehistoric site of Sangiran in its scientific dimension with the local inhabitants of the vicinity, their culture (traditions), the environment and the administrative organization (museums). This complex network of prehistoric heritage management was apprehended thanks to a fruitful exchange between the students and the local communities. It was particularly interesting in this aspect to observe, for several groups, that the Pokdarwis participants were often times taking the lead, even though the students actively and intensely prepared afore their roadmap and came to Sangiran with some confidence in their (scientific) knowledge. The students were all highly receptive to this new environment they were put in.

A networking between the students and the local stakeholders developed and the milestone of this was certainly the pre-final presentation made by each group in the Sangiran museum of Dayu, for which the students, granted with their technological skills, prepared the Powerpoint presentations for the YGC and Pokdarwis participants based on the discourses of those latter, formatted and illustrated by the students.



Textual analysis pointing to the ten most frequently used words in the Heritage papers abstracts (years I and 2)

The students not only came back to UKSW campus after this field trip with a totally different perspective on the archaeological site of Sangiran and the practice of their respective field of specialization, they also came back with new ideas inspired by the knowledge of the different parties. One good illustration of this is given by a quick and simple textual analysis of the abstracts they produced. The word "local", referring to local communities, appears first after the name of the site, highlighting the importance of contacts they developed in the field as mentioned in the paragraph above[2]. The words "fossils", "sites", "study" and "heritage" all count each ten to eleven occurrences, meaning that none of the students, whatever his discipline was, took over the other. Indeed, the expected archaeological terms (such as "humans" or "hominins" or tourism-related terms such as "visitors") do not appear in this pool of words. Therefore, the texts provided by the students after they came back from the field, were actually a collective production resulting from a true networking that developed within a few weeks only. In that sense, the pedagogical initiative set up with HOH program was a real success.

4- **Perspectives**

Not mentioned so far are the organizational differences set up between the two years of the HOH program considered in the present publication. The duration of field experience for instance has been increased between year I and 2 due to the success of this initiative on the first year. This asked for intense additional organizational efforts but appeared to be valuable when one considers the relationships developed within the communities of students, younger local participants and local people.

More could be possibly done in this direction. The YGC pupils and Pokdarwis people could attend to the seminar presentations made by the students, as a mirror of the presentations made by YGC and Pokdarwis participants at Sangiran attended and helped by the students. Although this is certainly no easy to setup, for language barrier reasons, it can be expected that such an initiative would help even better reinforce the relations within the groups and could result on some interesting feedback, for example if local participants were asked to react on the papers presented by the students, hence providing yet a new dimension to the exchanges.

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2 Most European students realized that HOH participation had been a unique opportunity to stay in a Javanese village and share the life of its inhabitants

Human Origins Heritage:

Exploring the Way Toward

a Scientific Participatory Program in Sangiran

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I- Introduction

Due to the high value of the Sangiran discoveries regarding what we know about *Homo erectus* and the Pleistocene of Southeast Asia, the site has been heavily investigated since the 1930's[1]. UNESCO therefore included Sangiran on the World Heritage List in 1996 (Unesco 1996). Ever since, it emphasizes the need to implement conservation policies that integrate the local society and the cultural heritage (Unesco, 2017).

Within a heavily populated area (c. 1000 inhabitants per sq. km), Sangiran is a vast and complex site to study. Weathering and erosion frequently bring fossils to the surface. When discovered, fossils are often handed to locals who can identify them, but not actively help collect new data, a task that is left to the museum / conservation office. Moreover, archaeological excavations are very localized and do not allow for a spatial analysis of the discoveries over the 56 km² of the Sangiran site. The identification of *in situ* sites often remains unlikely.

Yet locally, museum guides and tourists are interested in the Pleistocene archaeological heritage. Building on this interest as well as on the Pucung site excavation (Ferdianto *et al*. 2018), we experimented several participatory methods during the HOH activities. We wanted to assess whether scientific data could be more efficiently collected by collaborating with the local population. A variety of topics were developed to address the challenges faced by Sangiran and test different

1 cf. F. Sémah et al., this volume « The Sangiran Dome Prehistoric Site: a Multi-faceted Object", and Sémah (2014)

approaches with local people. This program, also involving students from several European, Indonesian and Southeast Asian countries, also has a pedagogical purpose, based on flexibility and innovation[2].

Considering the natural and anthropic erosion, mainly due to the tropical climatic events, rivers mismanagement and uncontrolled construction works, we suspect that a stronger involvement of the local society would participate in a better conservation of the site. In parallel to the implementation of the HOH program, the Pucung excavation campaigns are opportunities where the collaboration with the locals is gradually set in place. Making use of those events, our purpose is therefore to develop an approach that would allow to better integrate the Sangiran community in the local research.

The field work applies different experimental methods to collect data. These were carried out by international teams of students and members of the local communities, supervised by researchers. The local communities were represented by the Pokdarwis heritage guides, members of the Young Guardian Club, also caring about heritage dissemination, and a long-lasting relation with local workers. Results were heterogeneous, though helpful in order to better understand how to build collaboration between researchers and members of the local society.

2- Building on the Pucung site excavation experience

Field schools are organized yearly since 2011 on the Pucung site excavation in Sangiran. The site features a combination of various artifacts and remains of fauna. These include multiple small flakes of chalcedony, bolas (rounded lithic artefacts), faunal remains (herbivorous taxa, carnivores) and even human remains. The excavation is a place for future archaeologists to learn about many aspects of field research, from excavating to conserving the archaeological material. Supervised by experienced researchers, it also involves local workers.

From 2017 to 2019, the participation of the Pokdarwis heritage guides of Sangiran was integrated to the field work. The aim of this initiative was to show them a scientific approach to field discoveries and familiarize them with our team.

Relying on a preexisting network and relationships, the Pokdarwis guides were recruited because of their structured organization and their interest in heritage conservation. Being invited to participate in a field school, they were given basic training in field archaeology (excavation, recording, databases, etc.). Progressively,

2 cf. T. Ingicco et al., this volume "Pedagogical Approach and Students Networking in the Human Origins Heritage Program Framework: a First Feedback"

they were integrated in more various activities, such as geomorphological recordings, surveys, etc.

Every time possible, the local workers, the Pokdarwis guides and the YGC members were also invited to participate in side events, meetings, excursions, dinners etc. The objective was to multiply the opportunities to know each other, and foster confidence. Those contacts were successful in persuading the guides to participate in the Human Origins Heritage (HOH) program, in May 2018 and 2019.

3- **A link between community archaeology and a participatory program**

The fact that the Pokdarwis guides participated actively in the excavation allowed them to strengthen their relation with the local workers in Pucung. At first relatively shy, a three years long collaboration strengthened their self-confidence. They now actively participate in discussions concerning the results of the excavation. Their competence regarding public presentations also reflected improvement, even though they often need students' help when using a computer.

The excavation was also a place for improvement. Not only was there transfer of knowledge from the researchers to the Pokdarwis guides, but also from the local workers, who have a long-term field experience, to the guides. This tended to create a community among the participants and also fosters confidence. Based on those different aspects, the locals, including the Pokdarwis guides, are now able to assist and even share their experience with the students.

The Pucung excavation in Sangiran meets at least 17 of the 53 points suggested by G. Tully (2007) evaluating how an initiative can be more *community-based*. The connection between a Community-Based Archaeology activity in Pucung and the HOH program laid the foundation for a participatory science experiment and made all subsequent team activities possible.

The prior lectures and the topics allow the students to mobilize their theoretical knowledge on the field. The exchanges that were witnessed during the visits of the museums, for example, showed fluent transfer of knowledge among the groups. This result confirms that the timeline and structure of HOH are efficient. On the other hand, though their roadmaps were designed before the field trip, the students experienced difficulties in following a clear red line. This appeared during their final presentations and, later, in the papers they wrote before they were reviewed.

In quantitative terms, only for the 2018 HOH program, a total of 120 different activities were conducted by the groups in one week in Sangiran. It included 48 interviews, 17 visits (museums, excavation sites, heritage places, etc.), 39 scientific

activities (archaeological experimentations, surveys, sampling, imaging, etc.), and 16 diffusion activities (mostly communicating to the local communities), in addition to the mandatory presentations by the local members of the teams during the pre-final seminar held in Indonesian at the Dayu Museum. The Miri school team had a more specific approach, considering that they had to homogenize the children's knowledge about fossil finding, and identifying a fossil or stone tool. Moreover, they needed to explain their method to the children, the teachers and the curators.

4- **Perspectives from a new experience**

From 2017 to 2019, the Pokdarwis guides intensified their participation to the scientific research fieldwork. The agenda also made the campaigns evolve from a strict excavation to a geomorphological exploration of the area and a management of the archaeological material. As the Pokdarwis guides easily adapted to those various workshops, it pointed to a high plasticity in their confidence and adaptation capacities. They can now build from experience rather than theoretical knowledge only.

This confidence improvement could be linked to their participation in all the missions, from the Pucung excavation to the HOH participatory program. They tend to get closer to the researchers they know. If, at first, they could appear impressed by the students because of the difference of school background, they now experience the strength of their knowledge and are able to share it with the students.

Regarding the organization of the HOH program, after a two years experience, it seems more profitable to spend a maximum of time on the field. In order to preserve a relevant training prior to the field work and time for communicating the results as well, a total three weeks program seems to be the best: it allows more time for hypotheses testing and avoids fatigue.

During the 2018 HOH program final presentations by the students, Dr Edmond Dounias (Institut de Recherche pour le Développement, IRD), who was invited as an expert for the final seminar, pointed the relative weakness or even the absence of actual scientific questioning in the work of some groups of students. This could make their experience relatively unclear as it appeared, for example, in the initial versions of their reports presented in this volume. This problem reappeared in the second edition of the HOH project. Such an issue goes beyond the impact of HOH itself, and concerns all the cursus the students follow. Owing to the diversity of the latter, it is normal that this relative weakness shows up more conspicuously: learning interdisciplinarity in such an international and intercultural atmosphere is a actually a new experience for the students. However, this question is critical to fix if we want to not only improve the knowledge the groups can build concerning prehistory and

heritage, but also the way they can implement a scientific approach in general.

Some lectures and exercises should be adapted in the future occurrences of the program to fill that gap. It will especially be made through the study of scientific protocols in participatory sciences. This expression is used to define several types of methods using data gathered by non-scientist volunteers. Haklay (2013) has outlined four levels of participant involvement for this type of project. According to his analysis, HOH tends to fit with the definition of participatory sciences, where participants are active in defining the problem and collecting the data. Several other steps towards a participatory science program are also met by HOH. Among them, we may mention the use of mixed teams of locals and students[3] and the support from local institutions and initiatives in order to strengthen its roots (Houllier & Merilhou-Goudard 2016).

The Miri school recording method, for instance, obtained immediate results, tested under control and *in situ* [4]. One pupil even applied the method after the end of the project, as reported by one of the Miri teachers. However, we have not been able to address the issue of sustainability or the integration of this approach into an administrative dimension at the local level. All this can be an obstacle and will have to be further studied.

Therefore, the excavation would allow capacity building from the locals, competences that are used and improved during the HOH program. From the information gathered during HOH, for example through interviews with the different stakeholders, we can elaborate further workshops that would answer relevant local issues (Bœuf et al., 2012; Crosnier et al., 2013; Houllier & Merilhou-Goudard, *op.cit*.). From the field based experiences of HOH, such as the implementation of GIS, the surveys, or the monitoring of heritage, it could be possible to elaborate wider protocols and foster a large scale participatory sciences program, developing HOH in the landscape of Sangiran.

The Pokdarwis and YGC presentations during the pre-final seminar in Dayu attracted a large crowd of locals and researchers. YGC and Pokdarwis presented their experience, and if the students helped them, some made their presentation themselves. This is where they witness and feel the results of their work and their role in the community (Gosselin et al., 2010).

The implementation of a participatory program in Sangiran therefore requires structured support from communities, the ability to respond to many issues, and a capacity for openness to community needs (tourism, traditions or even beliefs). Because of the specificities of the local society, unequally educated and interested,

3 cf. T. Ingicco et al., this volume "Pedagogical Approach and Students Networking in the HOH Framework: a First Feedback"

4 cf. Anggraeni et al., this volume "Preserve the Heritage: a Case Study Based on Local Participation in Managing Prehistoric Collection at Miri Locality, Central Java"

it is initially somewhat "hierarchical." The role of heritage stakeholders (Pokdarwis, YGC) would be to be an intermediary and a buffer between discoveries and scientists. Eventually, the generational link must be (re-)established for program continuity, which would essentially go on in relative autonomy.

5- Conclusion

Sangiran being a place where heritage is part of the life of an important population, it appears relevant to better implicate the communities in its management. If implemented in a good way, this process can impact prehistoric heritage conservation. It appears that an excavation like Pucung is an opportunity for raising awareness, training, and possibly recruitment of motivated participants to further projects.

From our experience, we see that several steps are needed to develop the community participation in research: long term development of collaboration, training, working on the sense of belonging, increasing the diversity of activities, experimenting participatory approaches. HOH is a first step toward the implementation of a participatory program, which would amplify the implication of the locals in research. Such a program would aim at detecting practices that lack scientific protocols and reflections and propose solutions to such issues.

The results achieved in 2018 and 2019 help us to estimate the potential of setting up a participatory science program in Sangiran. The structure of local society, where, for various reasons (economic, patrimonial, spiritual) the inhabitants live in interaction with the site, meets the prerequisites identified by studies in participatory sciences (Houllier & Merilhou-Goudard, *op. cit*.).

From an archaeological point of view, two approaches yielded more obvious results. Conducting interviews with elders could help document and conserve currently unknown fossil-bearing layers. The Miri school approach has established an effective recording methodology. These are two ways to explore the site. This could also be part of a first step in establishing a local concept of preventive archaeology, where communities are aware of the impact of erosion and determine the urgency of a response.

Through the HOH program, the participatory approach to Sangiran has also, unexpectedly, highlighted how such an approach can bring together generations of a community. The older fossil hunters and Pokdarwis knew each other, but the YGC members didn't. The latter represent the sustainability of the participatory approach. Pokdarwis is clearly the science-community link, but YGC members are the generational link. The combination of the two, therefore, has the best potential to

anchor a participatory science approach. It needs to be strengthened through a more friendly approach to co-construct with them.

We are now able to move on to a certain diversification of HOH as it has become a visible banner in the landscape. It could therefore be easier to use it for further development of a participatory program on the side of the pedagogical module. This could take the form of workshops, deepening some of the questions and methods experienced by the groups during the pedagogical module. The next step would be to use the program as a complement to the ongoing research in Sangiran, mainly through a stronger collaboration with the conservation office (BPSMPS) and the local government, both important local stakeholders.

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Pokdarwis members at the Pucung excavation

Networking with Communities on Prehistoric Heritage

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1- Introduction

The relationship pattern between researchers and the local community in Sangiran intertwined since prehistoric value was revealed through the multitude of surveys and excavations. The Outstanding Universal Value affirmed by UNESCO regarding Sangiran Early Man Site is assessed by the continuous and consistent work in international collaboration, inter-disciplinary research, and involvement of local communities (Sémah, 2011; 2015). However, involving the latter in pedagogical activities constitutes a new challenge. Human Origins Heritage (HOH), as a multi- and especially interdisciplinary program provided space for interaction amongst students, the community, and academicians to delve into Sangiran from a systematic wider perspective.

Discussion of community archaeology has been evolving since the 1970s and 1980s. The crucial criticism emerged from the idea that contemporary approaches place the expert point of view as a focus (Holtorf, 2009; Merriman, 2004). Whilst, Smith (2006) concludes that "heritage is multilayered, embodying acts of remembrance and commemoration while constructing a sense of place". Moreover, the local story is considered to enrich the emotional, social, and intellectual of thinking heritage, its connection to the past relating with archaeological heritage.

2- The local communities and the Human Origins Heritage (HOH) project

The Humans Origins Heritage project engaged members of communities as a part

of group discussion and work. Each group collaborated with two local participants from Kelompok Sadar Wisata (Pokdarwis) "Wonderful Sangiran" and one or two high school students from the Young Guardian Club (YGC).

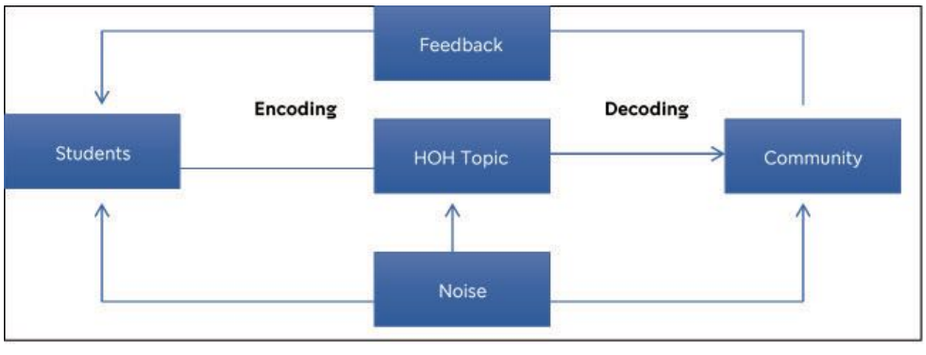
The Pokdwaris "Wonderful Sangiran" is a local community who concerns with prehistoric sites in Sangiran. Several members partly rely for their income on heritage tourism as guides for museums and sites in the Sangiran dome. They usually hold experiences working with Indonesian or foreign researchers in archaeological excavations. It means they also develop their scientific knowledge through interconnectivity with researchers.

The Young Guardian Club (YGC) groups young people who show genuine interest in prehistoric heritage and conservation. Their organization is partly coached by officers of the Sangiran museum and conservation office (BPSMPS). They foster their heritage knowledge through discussion, training and practice in museums. Furthermore, they also improve their awareness and knowledge by learning regarding local culture, either that which they witness in Sangiran or outside, for example in sites like Borobudur buddhist temples complex.

During the HOH activities, the master students could therefore approach issues re. nature, culture, society and conservation directly with the members of those two associations. The latter guided and helped the group to interact with other local inhabitants, building further relationships and collecting information. On the other hand, their integration in the master students group allowed them to learn the scientific aspect of the heritage value, getting introduced to various scientific methods, e.g. trying to use a microscope or other analytical devices and learning the conservation processes in mobile heritage storage and management.

3- **The communication processes**

During field activities, communication occurs among all participants according to a scheme pictured below.



Before meeting with the community members, the student groups prepared, with the help of their supervisors, a tentative roadmap grounded on the topic they were assigned to (there were twelve topics in two years addressing both natural and social themes), including any relevant issue according their interest and frame of references.

Subsequently, when they first met in Sangiran, the students delivered their thoughts to community members, based on secondary data that they gathered from online lectures and synthetic thematic debates held in the university. They received, crosschecked and negotiated their first assumption with the local members who joined their group and helped them to develop the contacts with other local inhabitants.

Thus, the encoding and decoding process transpired during the learning process. Encoding is the process in which the students decided their focus and formulated the message in order to transmit it to the receiver (community and local inhabitants), while decoding refers to the interpretation of the meaning of the message.

In the framework of the communication process, the HOH topics also became triggers for local community in order to rethink the prehistoric heritage they inherited. Their tacit knowledge and social sensitivity often prevent them to clearly understand and express their feeling concerning advantages and disadvantages of living in a World Heritage property, and what is their potential role in order to support heritage sustainability.

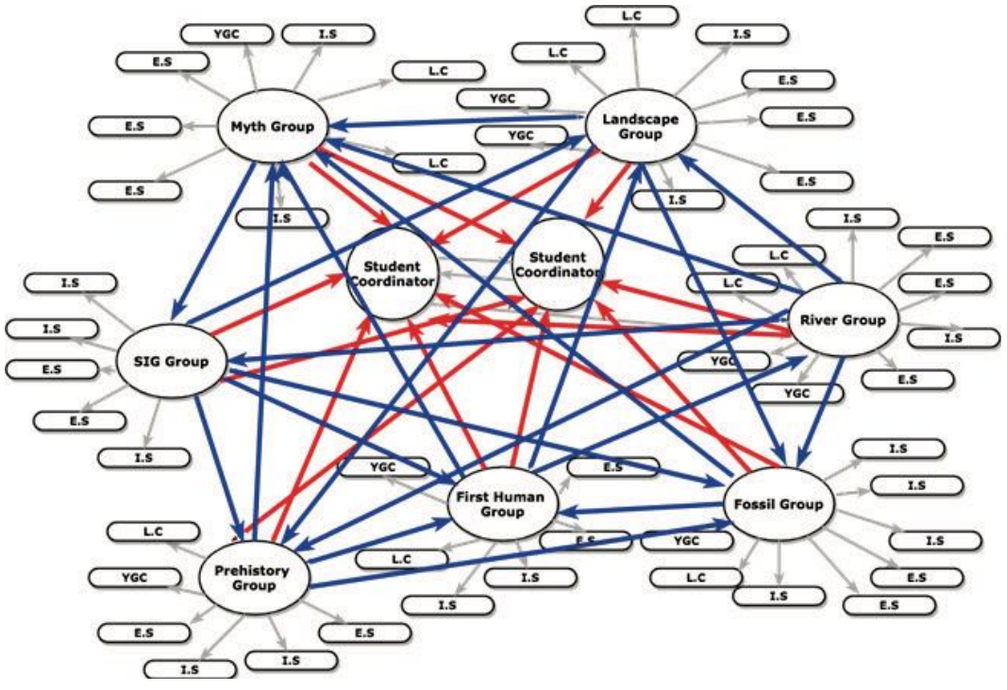
The encoding and decoding process also implicitly fosters their interpretation of heritage problem and values. Some of students' papers express the local feelings after interviews and observation. As usual in the Javanese society, such feelings reflect the way in in how the community views themselves, and are fully part of heritage awareness.

The encoding process will be successful if the communicator has communication skills, attitudes, and knowledge. Students, at the center of this pedagogical approach, built these requirements socially and culturally. The diversity of nations and languages actually represent a challenge (even a *noise*) in the communication process. They were forced to quickly adapt in formulating an appropriate relationship and respective roles in their groups. Therefore, the student's bonding was an important prerequisite before they collaborated with community. Hence, the intensity and time duration of the program are also considered as a key factor, including for the group communication before they physically meet.

4- **The communication networks**

The figure below is a visual example of the complex communication network amongst

students as it occurred during the 2018 edition of the HOH International participatory training school (I.S. means Indonesian student and E.S. means student from abroad, mostly Europe; L.C. means local member of the group).



A communication network can be described following three dimensions that are the mode of communication, the variety of frequency, and the content factors (Farace, 1973). The group dynamics in HOH was initiated amongst students before they met in Salatiga with mediated communication form. The student coordinators, both European and Indonesian, played a *liaison* role between all group members. The red lines represent the connectivity between the seven groups' members and them. They shared program information and encouraged active communication when contacting each other. As a peer, they could flow information formally and informally. However, active links were also built within a single group in order to bridge its members, since they met in UKSW in Salatiga and then in the field. Face-to-face communication was therefore much important in this program in which formal and informal communication occurred both during working hours and also during social occasions (rest hours, meals etc.).

The construction of the network between participants included local community participants on a daily basis in frequency of contact level. All participants worked eight days in field to develop their roadmap. Their daily workflow transformed a reciprocal content that was relevant with their topic and circumstances. However, we must note that the Pokdarwis members played a more active role to develop the frequency of contacts compared to the YGC members: the latter, being younger,

are often shy and sometimes tend to be passive, fearing to show up in presence of their elders. On the other hand, the Pokdarwis members had a stronger previous experience of international contacts, acquired during their participation to the excavation campaigns.

5- **Conclusion**

The HOH communication pattern is developed in a smaller context through pedagogical approach and group dynamics. Though representing a somewhat complex challenge, the experience shows that providing juxtaposition communication to share knowledge benefits to all participants, especially in positioning their respective role. Like in any communication model, the key action we try to emphasize in the perspective of an equal and sustainable networking is to accommodate each actor to become a communicator and not just as receiver.

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CHAPTER 3 - Analysis

Lessons from a New Experience

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As stated in the introductory part[1], The goal of this program is to provide to the students skills that open them to topics at the crossroads of research, conservation and development, and allow them to face heritage challenges in situations that they might meet during their career. On the other hand, the HOH project is also intended to open the way to help the development of actual scientific participatory protocols in Sangiran by the involved institutions.

After some considerations re. the basic process of work of the students' groups, we shall briefly present the topic they worked on before concluding on the impact of the HOH school and its perspectives.

I- The choice of the topics and the role of supervisors in fieldwork implementation

The students' groups, composed of different disciplines and nationalities, were therefore assigned topics likely to answer both above mentioned prerequisites. For the two HOH school editions reported here, twelve topics were proposed, in order to combine the scientific research and heritage management and development angles of reflection. These topics cover two main categories, i.e. **(i) heritage and society and (ii) science and prehistory**, and a complementary one is a pioneer methodological approach regards the **collection and management of data** (implemented with elementary school pupils). The diversity of backgrounds among

1 cf. François Sémah, this volume, «Implementing a Program Regarding Human Origins Heritage in Indonesia"

the students, the different generations of local participants, were expected to create an opportunity for much creativity and a higher quality of the exploration.

Each topic was designed after discussion among the multi-disciplinary teaching staff of UKSW and MNHN. Members of the teaching staff, curators from the Sangiran Conservation Office, young researchers from Pusat Penelitian Arkeologi Nasional, a French rescue archaeologist and an archaeologist from the local government of Sragen acted as group supervisors. Each group of students and local participants (members of the Pokdarwis Wonderful Sangiran and YGC, knowing that the group working with elementary school collaborated with local school pupils and teachers also) was assigned two supervisors, including one specialized in prehistory or archaeology.

The role played by supervisors is critical. The supervisors had to be able, before, during and after the fieldwork, not to instruct activities to be implemented, but to set up meetings with the group in order to control the quality of their roadmap and its evolution, to advise in case of dead end intended activity, and to enrich the group's reflection and knowledge when relevant. In such a perspective, each topic should be seen as a practical workshop to develop a scientific approach (from a social or natural perspective) in a real-life context, making use of the unique offered opportunity to work on a heritage property, in immersion in the local society and in collaboration with various local institutions. For pedagogical purposes, the groups must be free to design their questions, methods, orientations. The quality of the outcome (pre-final seminar in Dayu museum with members of the communities, collective final presentation and associated debate, written essays freedom) depends on such freedom and responsibility.

2- **The topics set**

a- **Heritage and society related topics**

A central topic concerned the relationship between the local communities and the **myths in Sangiran regarding the fossil discoveries**. Sangiran is a place where myths mingle a relation with the discovery of fossils[2]. Considered in its largest dimension, this topic extends to any symbolic, mystical or even therapeutic value attributed to the fossils and associated ownership. It is therefore an opportunity to investigate the parallel between beliefs, changes of the local society and the emergence of a scientific narrative.

2 cf. Agus Saputra et al., this volume "Between Dongeng and science: studying myths in Javanese culture in Sangiran"

Three other topics had to highlight how the local inhabitants deal with their environment, regarding heritage conservation issues.

The **river** and the **landscapes** topics aimed at documenting the critical importance of the use of the land and water by the locals, as well as the associated natural and anthropic threats and conservation related constraints. The groups conducted several interviews with members of local communities and local government. Field observations were also undertaken in the rivers (including water sampling for further analyses), fields, forests and villages. The groups also studied the potential development of ecotourism with regard to pollution issues[3]. This last concern was motivated by the abundance of waste disposals everywhere on the site, including recent drastic efforts to get rid of waste disposal from Solo city in the part of the property belonging to Karanganyar Regency.

Another topic took the reverse point: it dealt with the opportunities, restrictions and consequences occurring from **living on a World Heritage site**. The group focused on the local population rather than the conservation perspective. In line with the other heritage groups, they included the pollution issue and its consequences on the quality of life, testing the quality of the soil and water by observing the microorganisms.[4]

In the landscape of Sangiran, the modern museums contrast with the local architecture and urbanistic organization of the villages and hamlets (with the relative exception of the Manyarejo building). Their size and modernity highlight the importance of the local heritage, but also make them somewhat intriguing for local people to regularly patronize them. Topics were designed to cover the relation between such infrastructures and associated content and scenography with the local society and the visitors.

One group had to explore the **correlation between the museums and the sites** where excavations were undertaken. Visits of the museums and interviews of the different stakeholders allowed them to highlight what it takes to communicate about excavations[5]. It questions the importance of the sites regarding the knowledge of the local Pleistocene.

Those aspects were completed by the other group's work that dealt more closely

3 cf. Julia Cabanès et al., this volume, "Human Origins Heritage and Rivers in Sangiran, Java, Indonesia"
&
Fitri Ciptosari et al., this volume, "Heritage site conservation: the emergence of landscape value"

4 cf. Andrea Witjaksono et al., this volume, "Condition of the Living Environment Seen from the Quality of the Waters - Structure population of Poecilia reticulata in Pucung river, and local communities impression who live in the world heritage site of Sangiran"

5 cf. Guillermo Garcia Legidos et al., this volume "Current Development of the Sangiran Museums and Sites and the Way to Keep Improving"

with extensively interviewing **museum visitors as well as people living nearby** two clusters. They could gather a first insight regarding the integration of the museums into the local society[6].

A third group had to understand the **place of heritage in the everyday life** of the local inhabitants, being a crucial issue for heritage conservation purposes[7]. The local people, tending to develop tourism-related activities, generally remain attached to their farming traditions. Walking throughout the property shows lots of recent buildings appearing in some places, being a potential threat to preservation of the traditional model of Javanese villages. It also questions the place of the present cultural heritage, such as traditional activities and crafting.

b- **Prehistory related topics**

Three topics focused on science and archaeological objects in Sangiran. They dealt with all processes which affect a material discovery and make it becoming a scientific item, with the link between an object and a scientific narrative. Those topics discussed the connection between **faunal fossils and palaeoenvironments** (e.g. between a bovid tooth and the reconstruction of the palaeo-landscape where the animal lived), **hominin fossils and human evolution** (e.g. various types of *Homo erectus* along the chronology and evolutive / adaptative features), **lithic material and human technical and subsistence adaptive behaviors**.

The challenge was to discuss such issues, directly related to the Outstanding Universal Value of the property, not only from the perspective of researchers, but also from that of the local communities and also the local government. The outcomes of activities were much diversified. Among the raised questions were the accessibility of the material through visits of the museums and, among others, the potential of 3D scanning[8]. By interacting with the different stakeholders, the groups studied the place of stone tools in the past and present of Sangiran, organized training practical workshops in order to identify the characteristics of fortuitous discoveries (intentional flaking or breaking on stones and bones); discussions also took place re. the sensitive issue of studying human evolution in a religious society[9].The last topic concerned

6 cf. Dune Anduze et al., this volume, "Sangiran Museums in Citizen's Sight"

7 cf. Aurélie Manière et al., this volume, "Sangiran Heritage and its Perception: Relationship Between People and their Environment"

8 Very few human fossils are stored in the Sangiran Conservation Office, the large majority being in scientific institutions in Yogyakarta, Bandung, and also (for the earliest discoveries) in Europe. Accessibility of the master pieces is therefore a crucial issue.

9 cf. Istiake Manik et al., this volume, "Lithic Technology, Experimental Archaeology, and Public Archaeology: an Attempt of Chaîne Opératoire in Sangiran, Indonesia"
& Abdillah Irfan et al., this volume, "Perceptions of Fossil Discoveries in the Sangiran Dome"
& Pamela Gutierez et al., this volume, "Perception of Human Evolution in the Sangiran Dome"

the **place of science in Sangiran**, the history of research and the involvement of the local people in the conservation of the findings. The group observed the way the local inhabitants understand the heritage conservation issues, and their relation with scientific knowledge, compared to local traditions, wisdom and beliefs[10] (Mordekhai Sopacoly *et al*. in this volume).

c- Collecting and managing heritage data together

Another specific topic was more specifically focusing on the nearby Miri district[11]. In the 1980's, excavations were undertaken in the surrounding localities of Pancuran and Kedung Kancil. The Miri Girimargo School was used as a basecamp for the Ngebung and Bukuran excavations, for sieving, as well as for the reconstruction of a sub complete hippo (*Hexaprotodon sivalensis*). The researchers developed a strong association with the local Girimargo Elementary School and the Sragen Regency to create a community museum where local discoveries could be exhibited in the early 1990's. Further contacts with the elementary school were organized in 2017 in order to foresee an activity involving the pupils and schoolteachers.

Grounding on the development of the collection stored in the school, the group developed a simple Geographic Information System (GIS) to improve the quality of the data with the children[12]. They designed a protocol aiming at recording the contextual data from fortuitous discoveries. The teachers and a technician from the local government were also part of the process, as an intermediate control step was needed before validation of the data. The group took in this way the opportunity to work with the teachers using the laptop computer that was afterwards given to the school for pedagogical purpose.

3- Lessons from an experience

The impact of the first and second editions of the Human Origins Heritage international participatory training school must be considered altogether at several levels, individuals, institutions and also international collaboration.

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10 sf. Debora Novi Anggraeni et al., this volume, "Preserve the Heritage: A Case Study Based on Local Participation in Managing Prehistoric Collection at Miri Locality, Central Java"

11 See Djubiantono, 1992. Les derniers dépôts marins de la dépression de Solo (Java Central, Indonésie) : chronostratigraphie et paléogéographie. PhD thesis, Muséum national d'Histoire naturelle.

12 See Note 10

a- **The students**

We may consider that the intended goals of the program re. the students, as identified at its beginning[13], are reached.

The online lectures provided to every student basic knowledge beyond her/his major field of study. The thematic sessions organized (mostly following a constructivist approach) in UKSW campus during the first week in Indonesia helped them to realize the benefit of integrating 'new' knowledge to their more classical one, better understanding how to study a heritage object 'at the crossroads of research, conservation and development'. In other words, they learnt to address issues linked to heritage sites from various angles and endeavor to think about a solution.

HOH presented a unique learning form to accommodate students facing real challenges and real society. The module that encourages them to interact and collaborate with local institutions and local inhabitants in a World Heritage area, particularly Sangiran, provided advantages and challenges for participants. During the field school, the students could directly listen to local people's expressions who are living in the UNESCO site. This experience could not be received only by the textbook. The other benefit is that the students could practice their communication skills with local inhabitants.

Eventually, HOH represents a quite original experience in terms of international meetings and intercultural exchanges. Thanks to UKSW efforts (e.g. grouping all students in the same residence since the beginning, providing comfortable meeting rooms for sessions and working in project mode, organizing cultural and recreative visits, events, dinners) and to the organization of the life in Sangiran itself (including all the facilities kindly offered by BPSMPS in terms of accommodation and use of working premises), social and cultural life became actually attractive in Salatiga as well as in the field.

The limitations -and relative weaknesses- of the exercise have been highlighted in the previous chapters[14]. The curricula followed by the involved students seldom foresee the importance of interdisciplinarity (and inter-sector collaboration), and all the students do not immerse at the same pace within the expected working atmosphere. Language is sometimes a barrier also, even though the teaching staff provided linguistic help whenever a student was reluctant to speak in English. However, the increasing number of candidates who answer to the disseminated calls (especially from numerous cursus in UKSW) reflects the attractivity of the program for the students.

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13 cf. François Sémah, this volume "Implementing a Program Regarding Human Origins Heritage in Indonesia"

14 e.g. see Corentin Biets, this volume "Human Origins Heritage: Exploring the way toward a scientific participatory program in Sangiran".

Another important outcome is that several academic topics resulted from the HOH school, from the undergraduate (Sarjana) level and Master level until PhD topics (including two of the authors of this contribution).

b- The local communities

The benefit for the communities of the program and of any participatory initiative that might, at least in part, be an outcome of HOH, was already dealt with previously[15], even though transferring the pedagogical approach to local inhabitants was an actual challenge needing a specific strategy.

We shall only underline here the positive gain in self-confidence for the Pokdarwis members, and also the contribution of the HOH project to develop interest and awareness of the youngest members of communities (YGC).

Though, the latter's active participation was difficult to encourage, but is mandatory on the long term: Javanese shyness when confronting elders, exodus toward large urban centers in hope of a better life, sometimes fear of tight enforcement of law regarding cultural heritage may result into a loss in local knowledge and traditions which can be counterproductive for heritage conservation.

Much has still to be done beyond the timid HOH participatory steps in order to develop actual participatory protocols and the mandatory trans-generational transmission of local knowledge.

c- The teaching staff and the researchers

Besides the students, the teachers and supervisors also developed their pedagogical experience to cultivate and manage the topics and methods across disciplines, e.g. how to prepare tourism materials that attract students in prehistory or how to set appropriate ways to deliver archaeology lessons that include an inter- and multidisciplinary dimension, including organizing online lectures and online exam evaluation as a solution of bridging the international learning work.

The online lectures were conducted for equipping the students before they met in UKSW, while the online exams helped the supervisors to depict and examine the

15 cf. Corentin Biets, this volume "Human Origins Heritage: Exploring the way toward a scientific participatory program in Sangiran"
&
cf. Sih Natalia Sukmi, this volume "Networking with Communities on Prehistoric Heritage".

student's understanding of their materials. There was a challenge to ensure that students from different times and places participated in online exams in the 'same' time with the same electronic platform. In this process, thanks to MNHN which had the human resources and prepared the Museum Moodle for the effective and successful training and online exam.

Sharing daily life during three weeks and supervising the same students was clearly profitable to the involved scientists and heritage professionals. Much was discussed among them, in order to identify academic topics (see above) or draft future research or development projects, transgressing the disciplinary boundaries between faculties or specialization, and integrating actors such as curators, (high) school teachers, NGO members, private companies' employees or local government officers. The discussions were further fed by the participation of several external experts to the HOH final seminar organized every year in UKSW upon the opportunity of the final students' presentations.

Despite the pandemic, some of these trans-disciplinary projects could be launched after HOH. Allover, those exchanges were especially positive in order to think about the development of participatory scientific approach when dealing with cultural heritage in Indonesia.

d- **The institutions**

These relationships involving the teaching staff and other supervising participants positively concretized what is expected from the international collaboration that grounds the HOH program in spite of some structural difficulties to overcome[16]. However, their impact goes beyond the relations between UKSW and MNHN: the trans-disciplinary and inter-sectoral dimensions of the project helped to tie new links, e.g. directly between UKSW and the Sangiran Conservation Office BPSMPS. They also consolidate the collaborating network of European institutions (MNHN, but also other universities partners of the International Master in Quaternary and Prehistory) in Indonesia and ASEAN (thanks to the involvement of other ASEAN countries teachers and students).

However, we must not conceal the difficulty to build such a transversal collaboration, whatever its interest, transgressing language and cultural barriers. We are here grateful to UKSW and MNHN leaders, who trustfully embarked on such a pluri-annual challenge, supported by an Erasmus + International Credit Mobility project.

16 cf. Neil Rupidara, this volume "Human Origins Heritage (HOH) and Future Collaboration Universitas Kristen Satya Wacana (UKSW) & Muséum National d'Histoire Naturelle (MNHN)"

4- Conclusion

Owing to the pandemic, HOH further editions were interrupted as long as meeting in Salatiga and fieldwork was not possible in 2020 and 2021. Though, the ties were maintained thanks to purely online editions (including virtual visits of the site and dialogue with locals), which attracted numerous students.

We hope that the presently published report can be used as guidelines for teaching staff and as a handbook for students involved in the expected future editions of a project whose themes and goals are also in accordance with worldwide issues. Heritage conservation as a part of Sustainable Development Goals constitutes a vital consideration to think about, as the United Nations, in the framework of SDG II ("Make cities and human settlements inclusive, safe, resilient and sustainable", identify the Target II.4 which aims to "Strengthen efforts to protect and safeguard the world's cultural and natural heritage".

Embodying space to discuss, debate, and create a reflection that can be a trigger of a more comprehensive solution for heritage preservation, the Human Origins Heritage international participatory training school deserves future editions and, following the example of the exhibition held in 2017 in Salatiga, sustained dissemination to a large public.

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Pre-final seminar in Dayu Museum

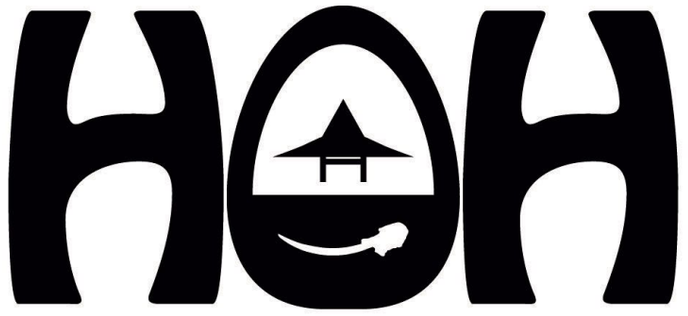


Atmosphere in BPSMPS mess accomodating the students



Meeting at Girimargo elementary school

PART B



CHAPTER 4 - Heritage

Between Dongeng and Science:

Studying Myths in Javanese Culture in Sangiran

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Mélie Louys, Quaternary and Prehistory, MNHN

Danu Pandu Saputra, Tourism, UKSW

Darmi, Pokdarwis Wonderful Sangiran

Suwarno, Pokdarwis Wonderful Sangiran

Lanix Atlasia Musa, Young Guardian Club

Supervisors:

Hedwi Prihatmoko, Balai Arkeologi Denpasar & Sih Natalia Sukmi, UKSW

I- Introduction

In the context of the Human Origins Heritage (HOH) program taking place in Central Java-Indonesia in 2018, Franco-Indonesian working groups were formed on transversal and primordial subjects of this region. It is in this context that we studied on the field, with the local inhabitants and their knowledge, the link and relation between the site and the myths.

Our objectives were to learn and to understand myths of the local inhabitants of Sangiran and to highlight correlations between myths and science, i.e. whether there is a real correlation between them and, If so, the way and reasons it express itself. The acquisition of data allowed us not only to emphasize the diversity of myths at Sangiran but also the multiplicity of the same myths. Otherwise, in view of all myths brought out in Sangiran, we decided to focus on one myth and one sacred place: Balung Buto and Punden Tingkir. The collection of data allowed us to understand some issues linked to the myth and sacred place we chose such as heritage issues, conservation issues and communication issues.

2- Material and method

Our fieldwork is based on discussions and interviews with local inhabitants, that were all recorded. We worked with the Pokdarwis members Mrs. Darmi and Mr. Suwarno, and with Lanix from YGC. We interviewed inhabitants of the village such as Mr. Sinyur, Mr. Witomo, Mr. Siswanto, Mr. Parmin, Mr. Tukiman, Mr. Darsono, and Mr. Suratmo, who are former fossils hunters, the head of Pablengan village Mr. Widodo, the head of Forum Remaja Sangiran[1] Mr. Aris, one of the museum's head in Krikilan Museum Mr. Iwan Setiawan. We also talked and exchanged with children of Manyarejo Elementary School.

To fulfil our investigation, we used three different perspectives: first, our main concern was to interview local inhabitants; we assumed the myth's knowledge was mainly oral; hence to learn about Sangiran folklore and heritage issues we had to meet people. Second, after the meeting with the Pokdarwis members we were able to list our visits. Our observations consisted in gathering testimonies of people who knew the best about Sangiran and its myths. Then, we adjusted our roadmap by prioritizing and supplementing our visits. Therefore, we visited these people at their homes to discuss with them regarding their knowledge concerning myths, fossils and traditions (like architectural choices), we visited Manyarejo museum, the sacred places and spring water. Seeing the places where traditions, myths, legends happened enables us to assess more information about the reality of the materials. Third, thanks to some people we met, we had the chance to witness by ourselves some traditional practices of Sangiran folklore. Thanks to these methods we were able to explore sacred places (Punden Tingkir, Sumber Tuk, Sumber Sendang, Punden Tapan, Punden Krendowahono, Dayu Museum well, visible on the roadmap), listened to traditional music related to the legends of Punden Tingkir (with a Gamelan orchestra) and shared the knowledge of some elders to children in Manyarejo Elementary School by broadcasting a Balung Buto animation movie.

3- Results

a- Balung Buto

We obtained information about the classic Balung Buto myth thanks to the stories and iconography at the Manyarejo Museum, and also thanks to an animated movie produced by the Sangiran museum. For having a comparison with the meaning and the transformation of this myth nowadays, we interviewed local inhabitants such as the Pokdarwis Members of our team, Mrs. Darmi and Mr. Suwarno, but also Mr. Sinyur, Mr. Parmin, Mr. Tukiman and Mr. Suratmo. Everybody had a different version of the story about Balung Buto. Moreover, Balung Buto itself comes from Javanese Language which means "The Bone of Giant". In the past, according to Mr Parmin, local people called bones in Sangiran Balung Buto because the size of bones is huge and there is a wayang (puppet theatre) story which tells about the prince Bandung Bandawasa fighting against giants. So, they correlated the story and every bone they found. Nowadays, most of the people seem to know that the bones in Sangiran are

1 Sangiran Youth Forum

fossils from prehistoric period, since researchers like von Koenigswald came to do research in the site, as Mr. Siswanto, Mr. Parmin and Mr. Suratmo told us in their interviews.

The legend of Balung Buto was started in a kingdom which lived peacefully. Raden Bandung Bandawasa was the prince of the kingdom (nowadays, this place is identified as Krajan hamlet, Krajan meaning kingdom in Javanese). One day, the peace was broken by thousands of giants who came to the kingdom. These giants were led by Tegopati (Tegapati in Javanese) and tried to conquer the kingdom. Bandung Bandawasa lost against the giants and stepped aside to the forest with an injured body to meditate (the place where he meditated is now known as Tapan hamlet, Tapa meaning meditation in Javanese). After eight years of meditation, he got an insight to swim in the lake surrounded by a Banyan tree. Down in the lake, he met Dewa Ruci (God of Water in puppet theatre story) who gave Bandung advice to sharpen (Sangir in Javanese) his nails with a stone (Rara Denok is the name of the stone, it's still exist and used now to sharpen knives in Sangiran) as weapon to beat the giants. Then he came back to his kingdom and Tegopati already built his kingdom in Glagahombo (Ngebung, Kalijambe District) with the entrance door in around Jagan (Bukuran, Kalijambe District). Bandung Bandawasa was mad and fought them with his nails. The giants got ripped, lost in a mess and the blood stagnated in a place that is now known as Saren (means blood) hamlet. Tegopati died with his body unfolding in a place which is now known as Bapang hamlet. Giant corpse was buried in the land of Sangiran, and the bones were found by local people.

Based on information from Mr. Sinyur, the giant body flew to the sky after Raden Bandung beat them and went down to the land in 35 days. The footprint of giant that fell from the sky could be found in Kedung (means deep part of river) Tulung and the parts of the body were spread on the land, which was the reason why a lot of big bones were found in Sangiran. There is Punden (meaning ''hill'') Tapan too in the Tapan hamlet. By information from the museum this place was that where Raden Bandung meditated. Nowadays people still use Punden Tapan to pray and meditate but they don't know the story of Raden Bandung.

b- **Punden Tingkir and the healing power of fossils**

Mr Widodo, the head of the Pablengan village told us about this sacred place. Long time ago, nine Moslem missionaries were spreading the religion and believes in Indonesia. One of them, Joko Tingkir, came around Sangiran with a lot of friends and especially around Punden Tingkir to meditate. It seems like Punden Tingkir was a cemetery which includes several tombs of the missionary Joko Tingkir's friends. Today it's a place of contemplation, meditation and pilgrimage for Moslems.

We met Mr. Witomo, who has a very close link to this sacred place. 17 years ago, Mr. Witomo's wife was very sick and he came to Punden Tingkir to meditate and obtain answers. He had an insight of the gods. They told him that he has to come and pray every night, which he did. The gods also told him that he had to cure people with spring water (sendang in Javanese) nearby. He said that he was just a messenger between them and our world, meaning that spirits decide to cure, not Mr. Witomo himself. He also told us that for him, the Punden Tingkir was a spiritual house, protected

by a white dragon. As it is a house, people have to take off their shoes before entering and washing their feet in the sendang in front of the door. It is even better if they entirely bath into it.

Even if it is a Moslem religious place, some myths more related to local legends still exist. Most of them concern stones and we learned all these from Mr. Witomo and Mr. Aris, Head of Forum Remaja Sangiran (Forsa): first, there was a big stone in front of the tombs, on the top of the Punden Tingkir, named Watu Gong (watu means stone). It played Gamelan (the traditional Indonesian orchestra composed of xylophones, gongs and drums, very popular in Java and Bali) on his set, and the inhabitants were allowed to borrow the instruments. One day, one of the local inhabitants forgot to give one back. Thus, spirits were very angry. It's been 80 years that the stone did not play the Gamelan anymore. Also, some people around the Punden Tingkir tried, in the past, to extend their field on the Punden territory. So, another big stone on the top of the hill fell and destroyed the cultivation to mark the sacred territory.

The second myth is also about a big stone, which used to wash itself once a year for the Ist of the Sura month (Javanese New Year's Day) in the river underneath. It was said that maybe the stone thought it was a Keris (weapon like knife or sword which comes from Java) because when a Keris belongs to someone, people have to wash it. So, because the stone does not belong to anyone it washes itself. Once, Mr Witomo said that his uncle saw the stone in the river and then back to his place. So, this is the reason why he decided to clean the bad trees and bushes around it. Seven spirits came and thanked him. Third, nearby the stones, down the hill, was the river Cemoro, and for many years, the government tried to build a canal but there were too many earthquakes and landslides. They decided to play the Gamelan in 1989 to appease the spirits of the stones and forest and subsequently the canal could be built. Mr. Aris also told us that he wants to make a touristic place of the Punden Tingkir, which related issues will be exposed in the discussion.

There was a belief about fossils that could heal some illness. For example, it was common to cure some disease with dentine powder from elephant tusks. We visited Mr. Parmin and he told us that he was recently healed from a toothache with some dentine powder. When we visited Mr Sinyur, he also explained us that he still heals some people with the fossils, as Mr Siswanto confirms.

We went to Mr. Tukimin's place, following Mr. Widodo's advice. Mr. Tukimin told us that he had an insight from spirits and he understood that he had to massage people with elephant bones. There is a very important link to make here between myth and science. The part of myth is obvious here, Mr. Tukimin had an insight and he believes in the power of healing with the fossils. But actually, he told us that he acquired knowledge about muscles and the human body by practicing, as the spirits told him to do so. Indeed, when he massaged us, he could guess, for example just by touching the muscles on Juliette's feet, that she was a vegetarian.

People we interviewed and who still believe in the power of fossils to cure, were quite old. So it seems that it is a disappearing practice. Besides, some of these healers acquired their abilities from an insight of the gods, like Mr. Tukimin and Mr. Witomo, so this cannot be transmitted to their posterity.

4- Discussion

a- Material and Immaterial Heritage

Based on the above description, there are two types of heritage in Sangiran if we classify into tangible and intangible heritage (or material and immaterial heritage).

Material Heritage

Punden Tingkir is a sacred place for meditation and pilgrimage. Mr. Aris wants to make this sacred place a touristic attraction. The good point of this idea is that they want to make some research about the place and communicate it to the people. For him it is a good idea because it may help to increase the economy of Sangiran society. Even if he told us that he really wants to keep this place sacred, it seems that increasing tourism may impact the sacredness of the Punden. Mr Witomo said that the people must behave correctly or the spirits will get mad. We think also that an increasing number of tourists may have a disadvantageous impact on the environment.

Immaterial Heritage

Today, there are two main versions of the myth of the Balung Buto. The first one is the main story, which people used to know from the shadow puppets theatre, the prince against the giant. The second one is about the discovery of the bones by Toto Marsono and the local people and the new myth about the bones of the giants. These stories are just related orally, there is no material heritage about them.

b- Conservation and Tourism

All kinds of heritage at Sangiran must be preserved. Today, the stories about Balung Buto are conserved by BPSMP Sangiran in the Manyarejo Museum. There are a lot of instruments that used to tell Balung Buto stories like batik, map, also short animation movies which were shown in several spots (Batik is a traditional handmade textile with figurative or abstract iconographic representations).

But the problem is, a lot of children still do not know about that story, and they also do not know about Toto Marsono stories. For example, almost all the pupils at Manyarejo Elementary school never heard stories about that. Many visitors to the Krikilan Museum that we asked also do not know about that, and it was very interesting as they almost all come from outside but not so far from Sangiran. Such observations taught us that these stories are only known by the inhabitants of the Sangiran site. So, to fix this problem, like Mr. Suwarno said, we must spread the stories about Balung Buto but also Toto Marsono stories to the local inhabitants and students in every school, by keeping telling them, maybe on special occasions. Besides that, we can manifest these stories in many events like annual festivals which include theatre, drama and dance.

Another problem for conservation was also seen for Punden Tingkir. If Balung Buto stories can be found in Manyarejo museum, we can't find any information about Pun-

den Tingkir in that place. The transfer of knowledge about that is just visible from Mr. Witomo, and several people by oral presentation. So, it can be a big problem if that place could be developed as an alternative tourism destination because people do not know all about Punden Tingkir including norms in it. We must make further research and then we can decide the rule that must be adhered to in that place. Mrs. Darmi said we also must build fences in this place to keep the sanctity of Punden Tingkir.

c- **Future Project and Further Studies**

In order to avoid the loss of Balung Buto stories, it can be interesting to ask the local authorities to make some regulations which make short animation movies of Balung Buto possible to broadcast in the school. We also can organise an annual festival in the Sangiran Site. This annual festival could be like Solo Batik Carnival, Solo 24 Hours Dance Festival and Worldwide Festival of Puppet Theater at Charleville-Mézières, France.

Concerning Punden Tingkir, organising some study tour in Bali Island for example can teach people on how to manage tourism in sacred places. Thanks to such a tour, it could be possible to adapt the method of conservation in Bali Island to Punden Tingkir future development. The stories about Punden Tingkir also must be noted like stories of Balung Buto in Manyarejo Museum. Without that, we cannot keep the sanctity of this place that would be built as alternative destination tourism.

5- **Conclusion**

At the end of our study, we can say that there is no clear link to be made between myth and science in Sangiran. In some way, science replaces the myth. Just as we saw with the myth Balung Buto, now the people only believe in the "giant bones'' being animal fossils. The young people understand better science than old stories. Moreover, the people that used to tell these stories are now old and their stories may be lost in a few years.

In some other way, a myth doesn't obviously have to be explained by science. Sometimes, it's just a story, told by the oldest people in order to educate the youngest one and to transmit them some values. And that is also why trying to keep the memories and stories in minds makes sense and should be something to work on. As Mr Suratmo said: *dongeng iku dipaido keneng* (in Javanese: "the fairy tale could have been denied").

Acknowledgments

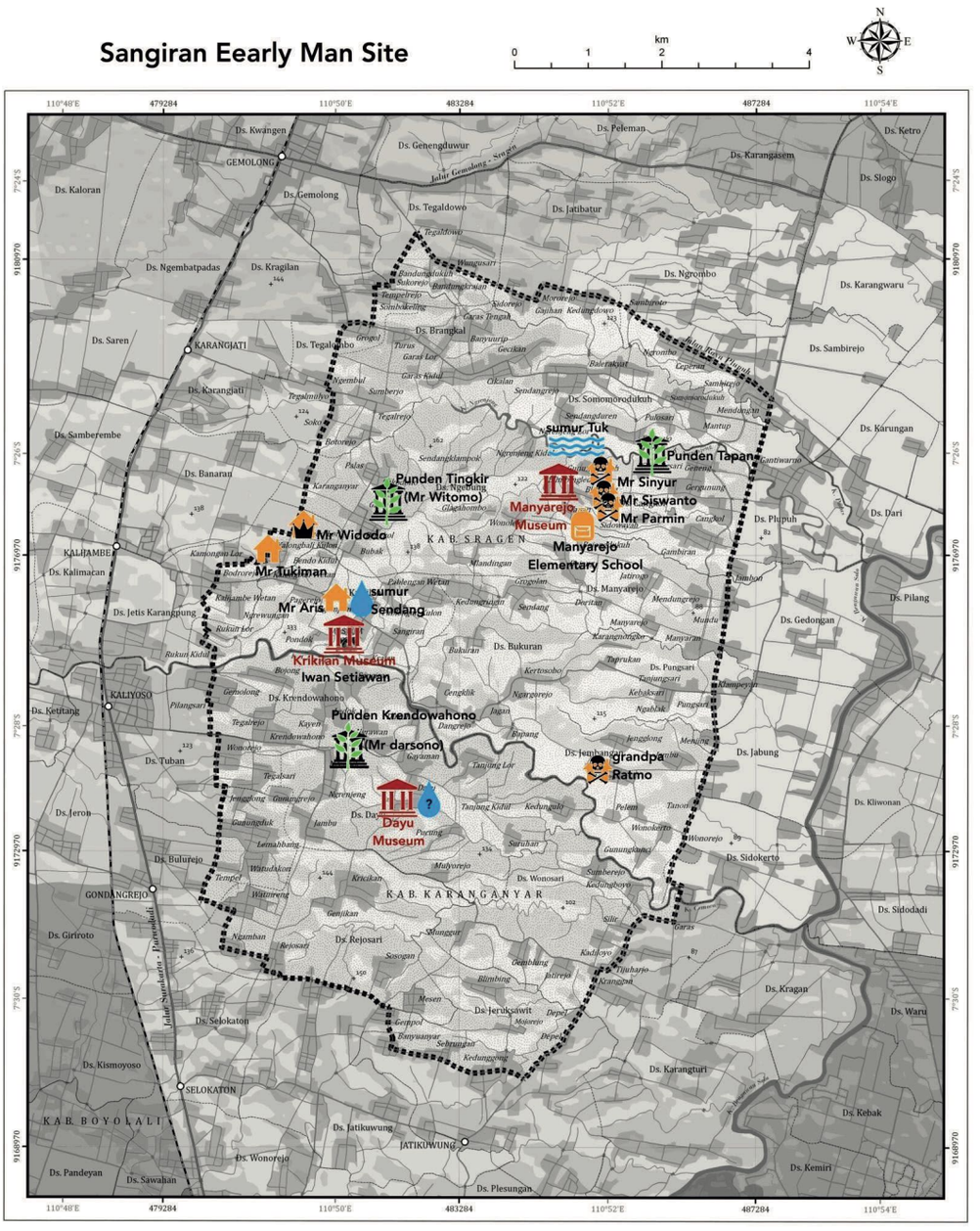
We would like to thank the Universitas Kristen Satya Wacana of Indonesia and the Muséum national d'Histoire naturelle of Paris for letting us the opportunity to be part

of this project.

We want to thank Hedwi Prihatmoko and Sih Natalia Sukmi for their advices, their supervision, and their good mood. Actually, we really appreciated all moments of work and fun we spent together during this incredible project. Of course, we thank Corentin Biets for his support and guidance.

We thank the local people for their hospitality, their sharing. We enjoyed meeting you, listening to you and discovering your stories, lives and Javanese myths.

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Ds. Kwangen
GEMOLONG
Ds. Genengduwur
Ds. Peleman
Ds. Ketro
Ds. Karangasem
Ds. Slogo
Ds. Kaloran
Ds. Gemolong
Ds. Tegaldowo
Ds. Jatibatur
Ds. Ngembatpadas
Ds. Kragilan
Ds. Ngrombo
Ds. Karangwaru
Ds. Saren
KARANGJATI
Ds. Tegalombo
Ds. Brangkal
Ds. Sambirejo
Ds. Karangjati
Ds. Samberembe
Ds. Sonomoroduku
Ds. Karungan
Ds. Banaran
sumur Tuk
Punden Tapan
Punden Tingkir
(Mr Witomo)
Mr Sinyur
Mr Siswanto
Mr Parmin
Manyarejo
Museum
Ds. Dari
Ds. Plupuh
KALIJAMBE
Mr Widodo
Mr Tukiman
KAB. SRAGEN
Manyarejo
Elementary School
Ds. Kalimacan
Ds. Jetis Karangpung
Mr Aris
sumur
Sendang
Ds. Pilang
Ds. Gedongan
Krikilan Museum
Iwan Setiawan
Ds. Bukuran
KALIYOSO
Ds. Krendowahono
Ds. Ketitang
Punden Krendowahono
(Mr darsono)
Ds. Jabung
Ds. Tuban
grandpa
Ratmo
Ds. Kliwonan
Ds. Jeron
Dayu
Museum
Ds. Sidokerto
Ds. Bulurejo
GONDANGREJO
Ds. Wonosari
KAB. KARANGANYAR
Ds. Sidodadi
Ds. Giriroto
Ds. Rejosari
Ds. Kragan
Ds. Waru
Ds. Selokaton
Ds. Jeruksawit
Ds. Kismoyoso
SELOKATON
Ds. Karangturi
KAB. BOYOLALI
Ds. Kebak
Ds. Jatikuwung
JATIKUWUNG
Ds. Wonorejo
Ds. Kemiri
Ds. Pandeyan
Ds. Sawahan
Ds. Plesungan
Jalur Sangiran - Purwodadi
Map Legend :
Interviews (among which : Fossil hunters)
Village Chef's house (Mr Widodo)
Manyarejo Elementary School
Museums
Sacred Place

Road map



Raden Bandung fighting the giant (founding myth of Sangiran)

Human Origins Heritage and Rivers in Sangiran, Java, Indonesia

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1- Introduction

The Sangiran Dome is known for its many Pleistocene hominids, animals and plants. Archaeological prehistoric discoveries are frequently said to happen around rivers. Therefore, they take a major part in the World Heritage regarding human evolution. The purpose of this study is primarily to investigate the link between archaeology and rivers in Sangiran. Besides, water is the most essential resource. It helps humans to fulfill their daily needs supporting almost all aspects such as agriculture, industry, consumption, sanitation, etc. In Sangiran, an important part of the freshwater is provided by rivers. We explore how people interact with natural water sources. For instance, we wonder how they use and manage it and what kind of beliefs could exist around them related to fossil discoveries. In addition, river surroundings are filled by many diverse organisms (animals, plants). They are relevant places to study and promote preservation of biodiversity. The general goal is to examine these aspects in order to investigate how to maintain and preserve the heritage of the rivers in Sangiran, supporting cultural, scientific and economic sustainability. This topic gathers scientific issues, community's involvement, ecological purposes, and communication between the different stakeholders.

2- Material and methods

This interdisciplinary approach benefits from the different backgrounds of the participants, students in archeology, chemistry and tourism and also members of local communities: Kelompok Sadar Wisata (Pokdarwis, who guide tourists on tours: museum, landscapes, villages, major cultural places, etc.) and high school students from YGC. The study was performed on three different rivers, Cemoro, Puren and Pucung, to compare each of them. Local members guided us toward the most relevant locations to collect data, thanks to their knowledge about Sangiran, archaeology and local communities.

Pucung was first selected because of its archaeological and touristic potential. Since 2011, excavations are ongoing next to the river (Ferdianto et al. 2018). Furthermore, a site museum is situated nearby. It presents the prehistoric archaeological site of Pucung and the history of the discoveries. As the biggest river of Sangiran, Cemoro was naturally studied for its importance in the local communities' daily life. Puren was especially selected for its geological potential. We identified three main approaches to study human origins heritage in the rivers in Sangiran: archaeology, anthropisation (human activities) and biodiversity. To question the link between archaeology and rivers, we first looked at the geological formations in Pucung and Puren. We recorded the successions of stratigraphic layers to better understand the history of the dome. Sediments, pebbles and gravels were also observed, categorized and described (size, material, shape, coarsening). Archaeologist and geologist supervisors and Pokdarwis explained us how to recognize them. We also surveyed archaeological remains.

We investigated how local people use rivers in their daily life. For this purpose, we collected and sampled anthropic waste, selecting the most representative one in each river. We tested the pH of the water with pH-paper to evaluate a potential link between waste and water acidity. The evidence of anthropisation concerning pollution, anthropogenic infrastructures on and along the river have been recorded. In addition, we interviewed people we met about both their interactions with the river and archaeological discoveries. We tried to figure out the existence of myths or rituals related to these places. Interviews were carried out by Indonesian members of our group because of the language and to support a climate of trust between us and local communities.

Fauna and flora were described along the river. Local members of our group, students, supervisors and Pokdarwis, helped us to identify the biodiversity. They especially provided us local names of the species. Thereafter, data were combined to develop a project that would match all the stakeholder's expectations and insights. We evaluated its viability and interest. We discussed it with local people: high school students (Fatekhah and some of her friends), Pokdarwis, local inhabitants.

3- Results

a- Archaeology

Major discovery happened around rivers (ie. *Homo erectus*: Sangiran I, 8, I7, etc.). Most of them lack context because of their accidental discoveries. In Sangiran, rivers (Bengawan Solo, Cemoro, Pucung, Puren, Grenjeng) are very important for archaeology. Rivers activity erodes the subsoil and reveals the geological formations and fossil remains (human and animal bones, stone tools). Water could exhibit and destroy archaeological sites. Observing the sediments in the Pucung and the Puren Rivers allowed us to identify the geological formations of the Sangiran dome (Fig.I, 2 & Tab.). We noticed that the general stratigraphic sequence was not visible everywhere. However, it can change locally. For instance, in Puren we observe Kalibeng and Pucangan with the lower lahar included in the Pucangan formation. The sequence observed in Puren also revealed lateral variations of the features due to local topography and paleogeography.

During our surveys, we have been able to collect different kinds of artifacts and objects out of their context. Some of them seemed to be archeological remains. We collected two bolas, which are considered as paleolithic anthropic objects, even though we are not able yet to clearly define their use. A naturally sharpened stone and a fossilized tortoise shell have also been found in Pucung by Indonesian members of our groups, not specialized in archeology.

b- Biodiversity

A large diversity of species and habitats occur around rivers, especially Pucung. Thanks to the knowledge of local people, especially Pokdarwis, we have been able to identify some of them. Along the river teaks and banana trees naturally grow. In addition, the surrounding of the rivers in Sangiran are mainly paddy fields, peanut or corn plantations since farmers use river water to irrigate their land. Because of the dependence between species and their environment, ecological changes could lead to perturbations. Pollutants in rivers (pesticides, fertilizers, potassium) are toxic at a biological level. For instance, the Kecapung merah (*Sympetrum fonscolombii*) is a very rare species and an important indicator of pollution. Odonates are rivers ecological integrity indicators (Golfieri et. al., 2016). Its presence implies that the air is not too polluted. Our purpose was to highlight the relationship between this diversity and pollution in order to raise awareness of local communities about ecosystems degradation.

c- Rivers anthropisation

Rivers are part of Sangiran inhabitants' everyday activities. People could hang out a lot around rivers in their daily routine. It leads to a modification of the natural landscapes. Sangiran inhabitants have modified the surrounding of the rivers to facilitate these daily activities. For instance, stones and bamboos embankments (Fig.3 & 4) are used as protection from floods and landslides. Indeed, the river flow can destroy the land and the paddy fields when the debit is increased, especially because of the monsoon. All these human modifications are called anthropisation of the environment.

We split into three categories the human activities that are linked to river areas.

- **Daily activities using waterflow**

According to testimonies, washing clothes and animals and bathing in the river is more convenient. Indeed, the water flow is fast, free and accessible. Besides, it provides food sources such as fish, shrimps, shells or freshwater crabs (Fig. 5 & 6). They are collected and sold by inhabitants for daily consumption. Moreover, a river provides an abundant water supply for irrigation. In Cemoro, a large dam has been built to facilitate agricultural activities, especially to irrigate the paddy fields. We also observed smaller individual systems, such as a pump in Pucung (Fig. 7) which brings water to the paddy field nearby. Furthermore, when farmers want to maximize their crops, they sometimes change the river stream by shrinking the stream with the soils to enhance irrigation. However, both pumping and drifting imply problems of drought and irrigation downstream in the rivers. We also wonder how Sangiran inhabitants are supplied in freshwater.

Most of the water of the rivers in Sangiran is non-drinkable. However, there is a fresh water source near Cemoro. Each house draws its water from a water table, but some are not drinkable. In a village, we observe that among a dozen neighboring houses only one could draw fresh water. For all the inhabitants who do not have access to fresh water in rivers or water tables, the government of Indonesia provides access to improved water and sanitation facilities. However, the Indonesian water supply company, Perusahaan Daerah Air Minum – PDAMs, faces financial and operational problems (Wijanto Hadipuro, 2010). More than 75 million people in Indonesia still lack access to fresh water and 60 million to sanitation. In rural Indonesia (including Sangiran) people are unable to draw their own fresh water. That could explain why many daily activities depend on rivers' water.

- **Myths and rivers in Sangiran**

Another significant part of the human activities around rivers in Sangiran are cultural. Myths are considered as a protection for the sustainability and the harmony between gods, humans, and nature. We observed places near rivers with a mythical dimension, such as the Watu Gong rock or a sacred well at Cemoro river. The water of this well comes directly from the Cemoro river. The legend tells that its water can heal the person who drinks it. This belief could lead to health issues because of the pollution of this water. Rituals could also take place on the riverbanks. For instance, we observed an offering along the Pucung river.

Pokdarwis members told us more about different myths around the rivers:

- In Tempuran (the meeting point of two rivers, Kali Cemoro and Kali Puren), during weddings, family of the bride and groom must drop off offerings on riverbanks to prevent something bad to happen during the ceremony.

- The flooding of the river: a conviction tells that the river flooding will not stop until there is a "human sacrifice", meaning someone dying dragged by the river. This myth matches with the reality especially for the Cemoro River where it usually happens, according to testimonies.

- The bathing rocks: people trust that one of the rocks near the irrigation system of Cemoro, can go by itself to the river to bathe and come back to its original place.

- The Watu Gong: Watu Gong is a big rock lying in the slope of the Bukit Tingkir. People believe it can produce sounds like Javanese gamelan, one of the main traditional music orchestra. During weddings ceremonies, when people need a set of Gamelan instruments, they usually ask it to the Watu Gong. They have to give an offering and have a simple ceremony in front of this rock. According to the legend, the Watu Gong will bring a set of Gamelan instrument out. When they have finished using it, Sangiran inhabitants have to return it completely to the Watu Gong. However, one day, the borrower did not return the set completely. That is the reason why nowadays, the Watu Gong never granted the request anymore.

- **Pollution**

Besides, the significant amount of rubbish surrounding these areas reveals that rivers are also used as natural wastes and effluents management disposal. We particularly noticed the amount of garbage in and in the surrounding of all the rivers we have been studying. We have mostly seen plastics (bags and paper). We also noticed clothes (shoes, underwear). Most of those wastes are stuck on trees' roots (Fig. 8) because of

the rise of the water level during the rainy season.

To solve this problem, inhabitants manage to cut roots in order to help the waste flow along the rivers.

People witnessed that pollution of the river and lack of sanitation can occasionally lead people to defecate in the river, making the water often not appropriate to be drunk and involving diseases such as diarrhea (World Health Organization, 2007). We also notice evacuation pipes from the different fields to the rivers (Fig. 9). We wonder whether or not mineral contents affect the chemical state of the water. Our pH results were almost base range. We should lead further chemical tests to understand better mineral composition of the water but also the impact of such contains in the rivers on people consuming the water.

4- Discussion

Rivers are part of the natural and cultural heritage of Sangiran. They gather prehistorical, biological and social heritage. The anthropisation, and more specifically the exploitation of the rivers leads to several issues. First of all, the most significant question is the impact of the pollution at different levels. Even though garbage are more easily remarkable, further chemical tests could be carried out to characterize the potential chemical or mineral pollution, especially because of the effluents and the agricultural activities. Moreover, it would be useful to study the impact of the consumption of this water, the fish and the shells on human health to assess public health risk. The survey should be done in all the rivers of Sangiran.

Then, testimonies mention several myths linked with natural water sources. Yet, only one offering has been observed. These customs are part of the cultural heritage of the rivers in Sangiran. The question is to know their importance in the Sangiran inhabitant's current life, either still part of their beliefs or old traditions, letting us wondering how this heritage is currently passed down. Besides, the anthropisation of the rivers spoils the landscapes (dried up water courses, pumps, wastes, etc.). The potential impact of this degradation on the whole beliefs and myths could be considered.

Finally, rivers yield fossils and many other prehistoric artefacts. Our field research has revealed that local people, not specialized into archeology, were able to find archeological remains. Thus, it has been shown that people (YGC students and Pokdarwis members) can recognize prehistorical features in the environment among other natural elements (stones, etc.). Archeological heritage in Sangiran could benefit from such skills. The quality of the random discoveries should be enhanced. A protocol could be established for further discovery by local inhabitants.

5- Perspectives

Based on the collected data, we come up with two different ways to present our results and the identified issues regarding rivers cultural and prehistorical heritage.

a- Documentary

To begin with, we propose a partnership between students of Java in communication and archaeology to develop a short documentary about river sites. It will present the importance of rivers in archaeology and the different kinds of artefacts likely to be found. It could also give information to recognize fossils. In addition, it will present these places as cultural, social and everyday life spaces. At last, it will present the pollution and public health risk issues. This project's main purpose would be to increase awareness regarding pollution and the preservation of the river's heritage. Moreover, it could improve the collection of archaeological data by including local communities. This short documentary could be presented in elementary schools. The main purpose is to involve locals in the preservation of the local heritage to increase its sustainability.

b- Managing a touristic path way

Sangiran contributes to the reconstruction of human evolution and our knowledge of the first islanders, increasing the touristic potential of the area. Sangiran sites have already contributed to local communities welfare thanks to five different museums. To present our data while implying social and scientific benefits, we imagine a touristic pathway between the Dayu museum and the Nano museum (Pucung). The aim is to use our recorded data on the Pucung river to produce didactic panels which guide visitors along Pucung river between the two museums. These panels would focus on different topics including scientific themes, preservation and sustainable development (Rivers of the dome, Pucung river, Pollution, Sangiran I7, Biodiversity, Geology/stratigraphy, Mythology, Relation between humans and rivers). It could encourage inhabitants to be actors of these issues and attract them and tourists to visit it. A prototype of the pathway with the geolocalisation of the places of the panels should be put in place with a more detailed map. The path way will potentially pass by a little village to include cultural architecture and traditional houses to the tour. To evaluate the interest of young local people in this project we carried out interviews of 3 high school students from the YGC. They showed interest but explained that the path-way should be attractive and accessible. We noticed several possible improvements to handle security and make the walk easiest, for instance by creating bridges in sustainable material like bamboo to cross the river. Furthermore,

the students highlighted that their interest is still limited by their lack of knowledge in archaeology. Besides, a more extended and thorough survey of the opinions and expectations of the inhabitants living along the river or having their fields on the banks of the river has to be done. Indeed, the path way will pass on their fields or nearby, so their agreement and insight are crucial.

The documentary and the path way are meant to be complementary. They present the same information but in different ways to increase the diffusion of the results. Hence it could raise awareness among local communities about the importance of the rivers in their cultural heritage and advise them about the behavior to adopt when they discover a fossil, and finally encourage them to limit pollution. It also could imply social benefits by creating employments such as guide and management officers of this pathway.

Furthermore, according to observations and testimonies, communication regarding the existence of the several museums is not guaranteed. Each Sangiran's museum doesn't warn people of the existence of the others. To increase the number of visitors, banners can be designed and made available in the different structures. The aim is to inform about the existence of the other museums and their specialities. In the Dayu museum it would also be important to propose and inform visitors about the pathway and the Nano-museum, for instance with flyers.

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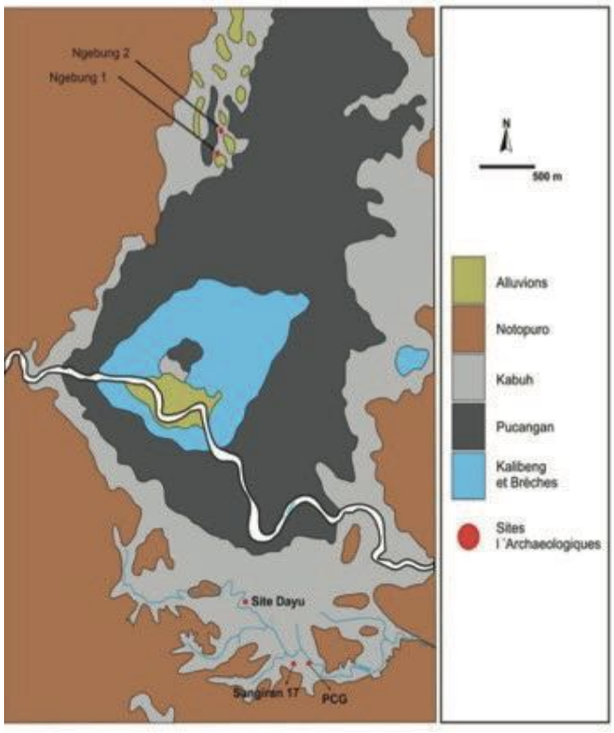


Fig. I Geological formation in the Sangiran dome and place of the archaeological sites (Sémah et al., 2010)

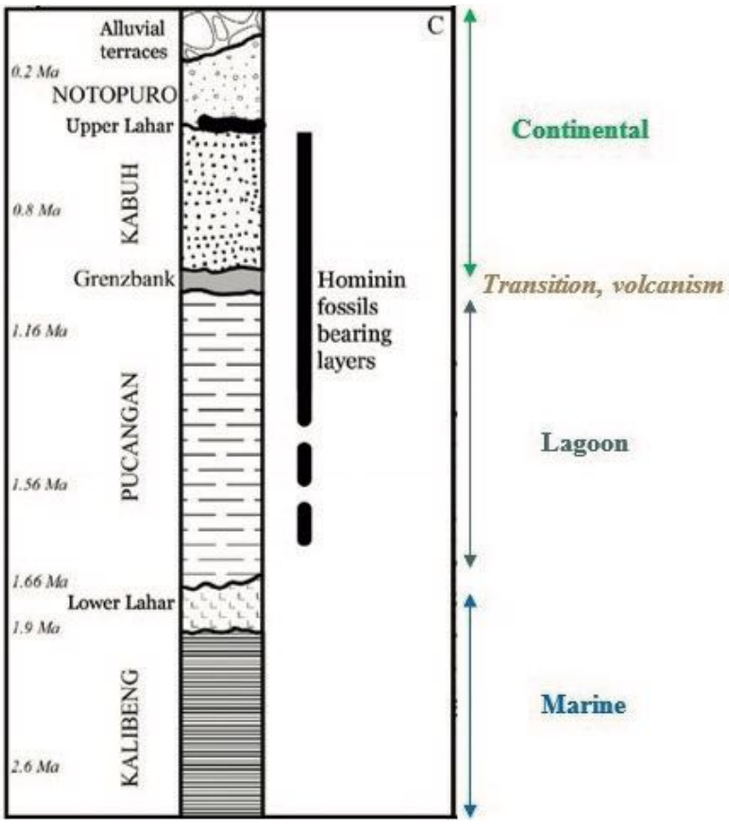


Fig. 2 General stratigraphy of the Sangiran dome (Brasseur et al., 2014)



Fig. 3 Stone embankment in kali Pucung



Fig. 4 Bamboo support in kali Pucung



Fig. 5 Washing clothes in the irrigation system of kali Cemoro



Fig. 6 Fishing shells in the irrigation system of kali Cemoro



Fig. 7 Private pump in Pucung to irrigate the fields



Fig. 8 Plastic waste stuck in trees' roots around Pucung



Fig. 9 Evacuation pipe from the field to Pucung River

RIVERS	Sediments	Geological formation
PUCUNG	Conglomerate	Grenzbank
	River deposit levels (pebble, gravel, sand stones) and eroded volcanic rock (principalement)	Kabuh
	Tuffs	
PUREN	Blue clay	Kalibean
	Limestone	
	Black clay	Pucangan
	→ Lower Lahar	
	Black clay	Pucangan
	Diatomite	
	Black clay/tuff	
	Black clay	

Table. Sediments and geological formations observed in Pucung and Puren Rivers

Heritage Site Conservation:

the Emergence of Landscape Value

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1- Introduction

Over the past few decades, the topics of landscape and heritage have been widely discussed in social sciences and humanities alike (Brumann & Berliner, 2016). In a broader way, landscape is no longer considered today as a merely geographic space as it has contents, nor as a merely human-modified environment, but rather as a holistic system in which nature and culture co-evolve. Thus, trying to preserve this or these landscapes means trying to conserve not only the environment, but also paying attention to its cultural management, surrounding customs and traditions, with the dimension of transmitting it to the next generation.

Landscape's dynamics and their possible effects on the existence of heritage sites have become an important area of many studies, since the heritage sites preservation is threatened by any kind of socio-economic over-exploitation and land-use problems that have emerged. In this study, we aim to understand the relationship between the local population of Sangiran and their landscape, with the purpose of conciliating the interests of the former with the heritage site conservation.

2- Material and Method

Most of our stay was spent on the field, collecting scientific data and interviewing local people during their working time and upon other opportunities of their daily life. This participative field work was carried out with observations of the global landscape from the 'Menara' tower, in the southwest of Sangiran, and through car field survey all over Sangiran region. Museums visits were the departure point to explore the surrounding by walking through villages, rivers, paddy fields (Fig I), and yards. We went to Krikilan, Bukuran and Dayu museums, walked along Pucung River as well as along the irrigation canal coming from a dam on Cemoro River (Fig. 2, 3). We examined the evolution of plant diversity in agricultural places, the level of vegetation and management of the land according to the distance with water sources in Sangiran locality. Interviews were conducted on 15 local informants, varying from different background such as student visiting museum, farmer, crafter, traditional house owner, theater owner Pak Jumadi, fossil expert Pak Asmarejo 'Sinyur', and restaurant 'warung' owner in front of the Krikilan Museum whom we met during explorations.

3- Results

The original vegetation formations of the Sangiran Basin during the Pleistocene included mangrove, lowland rainforests — including peat swamp and fresh swamp forests— and seasonal forests (Sémah et al., 2010). The present climacic vegetation has been strongly modified during the last centuries by periodical droughts and fires along with human activities such as excessive logging and reforestation (teak forests (Fig. 4)) or agriculture (paddy and maize cultivation (Fig. I, 5), irrigation), among others. The river flows of Brangkal and Cemoro cause erosion and slowly shapes the remaining dome into a hollow-shaped formation. However, this land vulnerability is not standing alone as an environmental issue. In the perspective of local people, land erosion is mostly correlated with fossil finds. Pak Sinyur, a local fossil expert, has conveyed that the incidence of erosion has been perceived as a 'good news' for local people and fossil hunters particularly. Indeed, landscape and its erosion possess valuable contents and advantages to improve their economic condition (Sulistiyanto, 2009) although this usually entails illicit practices.

Along with natural agents, landscape transformation is also affected by interactions between people and the natural environment. Increased demand on human settlement, agriculture as well as deforestation and connectivity infrastructure, are mainly driven by socioeconomic transformations. The Sangiran Dome is densely inhabited and the local population keeps growing, particularly in the vicinity of Krikilan and Manyarejo. Towns expand along the verges of the roads that cross the dome, structuring the landscape and articulating daily life around them. The need

of raw materials for creating houses, such as the teak wood, as well as the choice of the building place obviously impact both the environment and the landscape due to the weight on the ground and its composition. In addition, it is very likely that the building of a house on a soft, "spongy" clay from the Pucangan Formation will cause more damage on the environment than another building erected on the Grenzbank Formation which is made of robust conglomerate. The same goes for the roads. Furthermore, even if new buildings are built on unused surfaces, the increasing population brings along an ever-increasing pollution, damaging and contaminating the environment.

Surrounding the living places, the agricultural surfaces are mainly dedicated to the paddy fields. However, this species (*Oryza* sp.*)* requires a regular and important amount of water, which leads to design specific infrastructures. Since their construction in 1973, the irrigation channel and the dam (Fig. 2, 3) where it takes its source have completely changed the shape of Cemoro River. During the dry season, the part beyond the dam is no longer provided with water, offering temporary emerging landmasses that are used by the farmers for horticulture (Fig. 6) despite possible threats of flood or whatever risks in a short time. Furthermore, local women engage in shell-fishing along the canals (Fig. 7), using meshes to collect *bukur* (Pelecypodia) for consumption. This opportunistic strategy shapes not only the river, but the whole Sangiran agricultural landscape by intertwining other resource cultures and developing polycultures (Fig. 8). Cultivating maize (*Zea mays*) and peanuts (*Arachis hypogaea*) on dryer lands as well as growing taro (*Colocasia esculenta*) and *singkong* or cassava (*Manihota esculenta*) on the paddy fields borders are just a few examples that emphasize it. These phenomena are clearly visible when going towards the edge of the Sangiran Dome, farther from the course of the rivers.

Besides agriculture, the main anthropic activity of landscape transformation is forestry. It is evident that deforestation by excessive logging and slash-and-burn agriculture deeply transformed Sangiran woodland formations, featuring a quite open landscape (Fig. 9) until very recently. The last decades have witnessed an important anthropic process of reforestation. As a result, teak (*Tectona grandis*) forests represent the present main woodland formation. The choice of planting teak trees rather than favoring other local species are multiple: the most important ones are economic — due to its fast growth rate (30 cm diameter of wood circle per 10 years), teak cultivation yields more benefits than other tree species, even more than rice agriculture, and it requires less water and work investment. Other factors include their ability to slow down erosion processes associated with the formation of secondary teak forests along with numerous leguminosae (Fabaceae-Mimosoideae) and palms (Arecaceae) as well as species such as cemara (*Casuarina* sp.), cassava (*Manihot* sp.), mahogany (*Swietania* sp.), fig tree (*Ficus* sp.), banana tree (*Musa* sp.), orange tree (*Citrus* sp.), and bamboo (Bambusoideae). The latter is usually found along with pandan (*Pandanus* sp.) in association with water sources (Fig. 10). Most of these species are exploited by humans who benefit from both their fruits and

wood for subsistence and handicrafts. Bamboo crafts, for example, are made into various forms of usability such as house architecture, farmer hats, furniture, souvenirs etc. Other crafts include coconut skin work, charcoal production and woodworking. Overall, handicrafts provide important economic benefits for the Sangiran communities, but they also are an important part of their cultural landscapes.

4- Discussion

The definition of landscape provided by local people is mainly economy-oriented (farming, manufactory, etc.), also related with subsistence (crops, seasons, etc.), comfort issues (natural shelters, shadow, etc.) and so on. Our approach then became broadly experimental. It started to build up gradually on the field, relying on the accumulation of data provided by local people. Finally, we got the whole picture: from ecological context, landscape transformation relates to human activities, then to the cultural dimension of landscape. This framework is a starting point for a set design of different scenarios to identify the key areas of landscape.

Talking about landscape sets out on a journey to study the ever-changing landscape. The changing landscape is not merely about how it is formed from past to present, but also how it is utilized and its meaning through generations. We just have seen that the notion of landscape is a poly-semantic term which endorses as many interpretations as there are many people defining them, also depending on the disciplinary field in which it is used. We discovered not only the 'exploitive' relation between human and nature, but also culture as a spiritual agent in shaping human behavior towards nature.

However, the empirical evidence also indicates that socio-environmental dynamics increase the vulnerability of the landscapes to threats such as over-exploitation, pollution and careless practices that endanger heritage sites. In this regard, it is unavoidable to orientate more comprehensive and sustainable practices over the long-term. It comes to our mind that 'protection' must always depend to a degree on attributing a 'value'. In order to do so, values of landscape should be identified in order to create protection effort. By recognizing the landscapes we have, it gives ourselves the opportunity to recognize places that may well look ordinary but that can fill out in our appreciation to become extraordinary. Related to that, evidence demonstrated that Sangiran landscape assigns high values such as historical features, agricultural practices, local products, traditional arts and architecture.

This study takes a step toward understanding landscape as a significant value to preserve and protect. Nevertheless, landscape as well as cultural heritage conservation cannot be thought without a holistic view that integrates social, economic, cultural and political dimensions, in order to understand the interest

of vary stakeholders. Participatory approach as the learning method is a process that should be taken into account in the long run, to build the same understanding and commitment between stakeholders. In order to be more comprehensive to connect and protect the irreplaceable landscapes, we suggest that social or political dimension of landscape need to be taken into account for further field work and research as this is one missing aspect of landscape complexity that we didn't address.

5- Conclusion and Perspectives

In conclusion, landscapes are dynamic features. Challenges remain in order to find balance between exploitation and conservation of landscape. Sustainable development concern is probably the best attitude to develop good practices of conservation in densely populated heritage sites like Sangiran. In order to reach beyond the boundaries of protected sites, concertation for conservation must be engaged with local communities, whose interests often differ from those on which the scientist and the curator focus.

It should be noted that community's involvement can be viewed from at least two perspectives: in the decision-making process and in the benefits of the development (Tosun, 2000). In this regard, conservation policies must now be deployed to incorporate the views and requirements of local communities, and provide them benefits: by creating more options and economic opportunities, people will not only rely on fossil finds to increase their income. The ecotourism, emerging as a way to link the benefits of tourism to local communities, as well as to meet the needs of landscape development and conservation efforts, might be an interesting alternative to consider.

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Fig. I Paddy fields



Fig. 2 Irrigation canal



Fig. 3 Dam



Fig. 4 Teack plantation



Fig. 5 Maize cultivation



Fig. 6 Cultivated river banks



Fig. 7 Women collecting molluscs (Pelecypodia) in the canal



Fig. 8 Polyculture



Fig. 9 Open environment



Fig. 10 Pandanus in wet context

Condition of the Living Environment Seen from the Quality of the Waters, Structure Population of *Poecilia reticulata* in Pucung River, and Local Communities' Impression who Live in the World Heritage Site of Sangiran

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1- Introduction

The development of a World Heritage site is certainly inseparable from the involvement of the people who live around it.

This survey is an attempt to identify implications of living in a World heritage site according to different points of view (environmental, socio-cultural and tourism). Different animal or vegetal species live near these heritage sites. This survey focuses on human local communities but also on several animal species, invisible to the naked eye, living in soils and rivers. This study brings together the information we were able to collect through two complementary approaches: a socio-cultural survey based on interviews with local inhabitants and a survey based on environmental conditions measured *in situ*.

The main purpose of this study is to determine the consequences for different organisms to coexist in the vicinity of a World Heritage site, and especially look

for evidence whether the areas around excavation site are tainted or not. The problematic raised by this social and ecological study is the following: to which extent a site gathering and grouping together excavation sites, museums and tourists influences the organisms (mainly human but also more generally the ecosystem) in the surroundings.

2- Material and methods

a- Scientific survey

The study area are the Sangiran Dome rivers. The wide Cemoro river crosses Sangiran region from west to east, passing through the middle of a region that is dense in museums, touristic sites and dwellings. The Pucung river is smaller and winding, it passes near the Dayu excavation site. Sampling was made in the Pucung and Cemoro rivers at various locations of the stream: upstream, at excavation site level and downstream. Water and ground (from recent alluvial deposits) were sampled (Fig. I).

The methods used were:

- Chemical analysis (pH, Temperature, CO_2 dissolved)

- Benthic invertebrate organisms were collected by using a surber net, positioned on the bottom of flow with an opened part of net against water flow. Rocks in the bed of the river were scratched to catch species living on these rocks.

- Species from the soil (in recent alluvial deposits) were collected through the Tullgren bottle experiment (Fig.2) and then identified under microscope (x400) and binocular magnifying lens (x200). This experiment consists in installing a funnel in which a soil sample is placed, a lamp is positioned above the assembly. The microorganisms present are repelled by the light and heat released by the lamp and eventually fall into a container placed below the assembly containing an FAA (Formalin-Acetic Acid Alcohol) solution allowing the microorganisms to be fixed for observation. The description of the taxa collected was carried out using an identification key.

The distribution of a species along the river has been particularly studied (*Poecilia reticulata*, usually called guppy fish) because it represents an index of water pollution (Panjaitan et al. 2016). These fish were collected with nets during one hour long fishing sessions (with two fish nets) and then measured on a millimetric plate.

The equipment for sampling (nets, glassware, bottles) and analysis (millimetric plate,

thermometer, chemical reagents) has been lent by the UKSW Biology Laboratory. Also, we could have access to a binocular lens and a microscope in Sangiran museum thanks to BPSMPS.

b- Socio-cultural survey

The investigation method employed was a series of punctual interviews of people we could encounter during this survey. The purpose is to collect opinions and feelings of inhabitants that live close to the museum and site. We tried to characterize the way they live, the rules constraining their daily life, and their hopes for the future. That survey was not made on random people encountered around the site and different profiles were sought. We wanted points of view of people from various sex, age and occupation. This interview method is purposive sampling, that is a technique to obtain data by deciding the sample and determine the informant criteria. Interviews were conducted in several places in Sangiran: Krikilan museum, Krikilan hamlet, Sangiran hamlet, Pucung hamlet, BPSMP office, Pondok village, chief of village office, Manyarejo village. The total number of informants interviewed was of 19 people (Fig.3, 4 & 5).

We have tried to get an equal number of opinions from men and women. Of the 19 informants, the number of women interviewed was a little greater than that of men, namely women at 53 % or 10 people and men at 47 % or 9 people.

From the interviews that have been conducted, there are several age classifications of informants namely: 6-15 years (37 % of informants), 25 - 40 years (16 % of informants), 41 - 60 years (37 % of informants) and above 60 years (10 % of informants).

Of the total informants there are 4 different jobs categories, namely 7 students, 6 farmers, 2 salesmen and 3 government officers.

3- Results

a- Scientific survey

- Chemical survey - After the analysis, we observe differences in pH, CO_2 and temperature between the sampled locations (see Fig. 6).
- Microfaunal diversity - The soil samples were prepared and placed in the tullgreen bottle. Some of the collected organisms could be analyzed and identified (see table) under a microscope but unfortunately this study could not be completed due to lack of time to access the microscopes. The soil

samples and collected organisms were stored and brought to the UKSW Biology Laboratory. Some of the identified taxa are presented in Fig. 7.

- Distribution of *P. reticulata* population - The study of *P. reticulata* populations was carried out at different locations in the Pucung river. At the Dayu site level (see map), no specimens were found during fishing time (only three *Brachyura* specimens were detected). The populations fished upstream and downstream of the site are very different, the populations found have been classified by size category and their sex has been identified (for adult specimens). The results are presented in annex. The sizes (related to the age of individuals) and sex ratios are very different between the two sites. The sex ratio is defined as the number of males found divided by the number of females reported as a percentage. This ratio reflects the level of biochemical threat perceived by *P. reticulata* and by extension the biochemical parameters of the river water. This ratio is 200% upstream of the site and 300% downstream in the Pucung river (Fig. 8, 9 & 10).

b- **Socio-cultural survey**

From the interviews that have been conducted, the results are as follows:

- 5 informants (representing 25-40y, 41-60y and 60+y age groups) expressed mostly the negative impact to live by Sangiran sites. The local culture can be affected by the visitors from the outside. Money income from museums is not shared with the village. Local people have difficulties to build houses on their own land, due to government restrictions. These negative impacts were expressed by local government actor, Chief of Village and farmers.

- 8 informants (representing all age groups) expressed the positive impact in terms of economic aspects. They underlined also benefits for education and social relationships (local people can have interactions with visitors). They also highlight the improvement in infrastructure management. These positive impacts were expressed by salesmen, local government officer, chief of village, farmers, and students.

- 4 informants (representing the 6-15 and 25-40y age groups) felt neutral about living in Sangiran. They don't understand the interest people have in Sangiran. They do not want to engage in activities related to the fossils, and the discoveries do not influence them. This feeling of indifference was expressed by farmers and students

- 1 informant (an old farmer, 41 -60y) expressed that he was never interested in learning about geology or archeology.

- 1 Informant (a middle-aged farmer, 25-40y) expressed that he never went to

the museum.

4- Discussion

There are differences in the size of *P. reticulata* in along Pucung river. The length of this fish is used to approximate birth-rate. This difference can be the consequence of an ecological stress (in particular, the water parameters: oxygenation, pH, temperature, pollution).

In the river upstream, the ratio around 200% means more male than female fish population. This is due to environmental conditions that are quite supportive so that fish does not feel threatened by chemical conditions. On the other hand, downstream of the Pucung River, ratios largely above 200% seem to indicate that conditions in the environment are less supportive. One of the influencing factors is temperature. Temperature at the time of the study was 32 ° C, while the normal temperature for guppy fish growth is around 22-30 ° C (Susanto, 1990). The increasing temperature will increase the population of male fish, while the decrease will be favor the female population. However, due to the threatening environmental conditions for the fish population, guppy fish multiply their offspring in these aquatic environments (Arfah et al. 2005). *P. reticulata* can live well in pH range from 6,7 to 7,2. This ecological characteristic could be one of the factors explaining the absence of these fishes near Dayu site where the measured pH was close to 8. The other factor that determines the attendance of guppy fish is also the CO_2 level. In the location of sampling close to the Dayu site in Pucung River, there is the highest CO_2 level in comparison with the others location. Normal level of CO_2 is 0.00-12.00 ppm for the development of guppy fish (Ahmad, 2015).

Besides, the pollution in the Pucung River, especially plastic waste is also one of the causes of the ecological stress. Plastics do not completely decompose but will disintegrate into smaller pieces, called microplastics. These microplastics contain metals, PBDEs, PBCs, and various other chemical contents that are harmful to aquatic organisms (Grossman, 2016). This is the reason why guppy fish populations undergo ecological stress in terms of population structure. The presence of plastic not only impacts the chemical conditions in river waters but also affects negatively aquatic organisms such as oxygen-producing bacteria. This is one of the main threatening conditions faced by guppy fish populations that live in Pucung river.

Analyses of benthos and soil macro- and microfauna are incomplete and do not allow us to interpret them qualitatively and quantitatively in terms of biodiversity. These studies were also conducted to make people conscious of the existence of an invisible though no less valuable life in the soils and waters in their environment.

Concerning the social survey, opinions of the inhabitants of Sangiran vary according to the categories examined (age, occupation, and experience). But there are also differences of opinion between people in the same profession (e. g. farmers show a diversity of views about tourism, museums, environment).

Part of the residents can see the benefits of living near the site in terms of education, infrastructure, economy, culture and social relations. Other inhabitants are indifferent to the museum and do not feel concerned by the heritage represented by fossils and museums. Finally, other inhabitants prefer to express the negative effects of living near a heritage site such as Sangiran. In particular, they highlight the discomfort associated with the presence of foreign tourists. They also criticize the fact that they do not benefit from the economic spin-offs generated by museums. They point out the restrictions imposed by the government, particularly for the construction of dwellings. There is a real gap between the discourse of government actors and the inhabitants close to the sites. The former expresses the enthusiasm of the population while part of the latter denounces the problems of everyday life they encounter and the restrictions they suffer in the name of a heritage of which they do not always feel part.

5- Conclusion

Hopes and wishes of informants are that the government should be more attentive to local populations, not just through economy and tourism perspectives. There is a need for innovation in terms of tourism management in order to increase the interest of local populations in museums and also to foster the income that must be shared more equitably in the future. No data on how residents can communicate this dissatisfaction to the government has been collected.

Our environmental study presents a relatively worrying preliminary result. Further larger-scale analyses should be conducted in the future to obtain more accurate information. One thing we could not analyze and that was striking for us during our sampling sessions in the river was the pollution due to plastic waste. The amount of plastic waste attached to the branches and roots of trees on the river banks was sadly impressive. That kind of pollution has an impact on living organisms that live in the river for fish, for paddy that is cultivated using river water, but also for humans who eat them.

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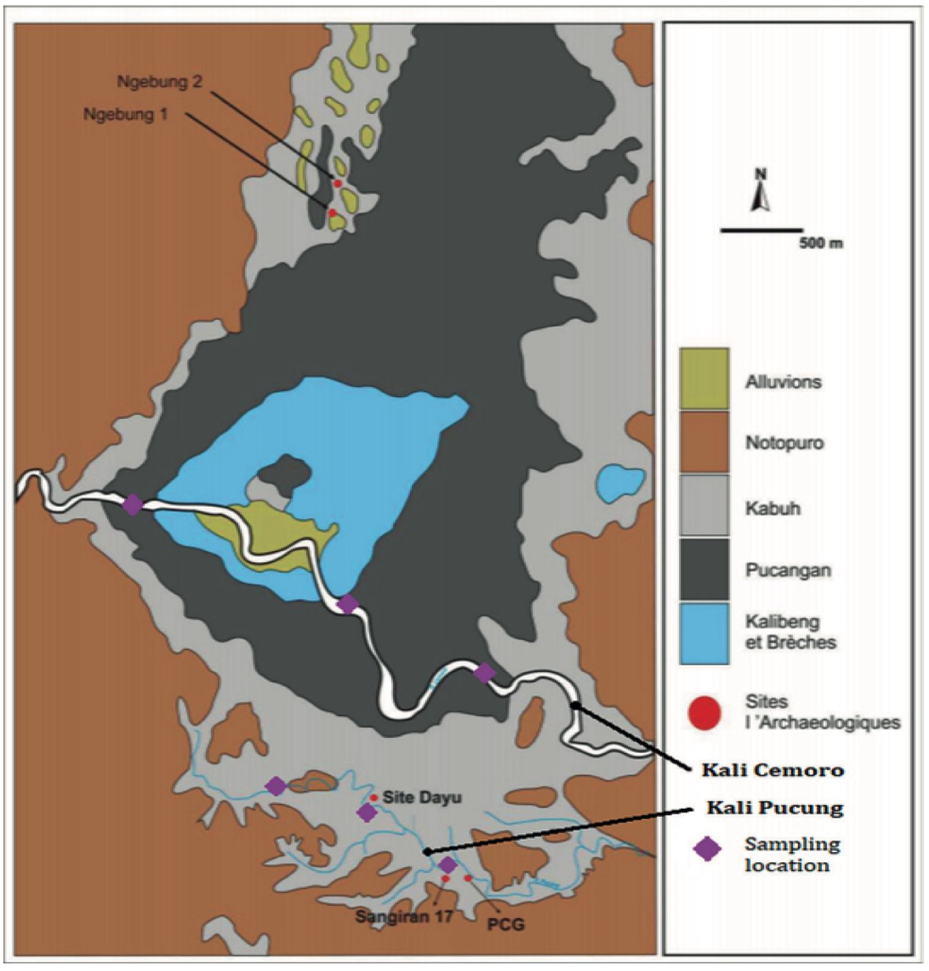


Fig. I Map showing the Sangiran dome, the river network and sampling

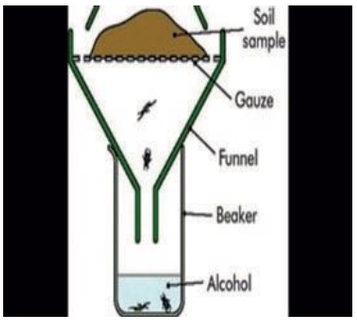


Fig. 2 Schema depicting the assembly of the Tullgreen bottle experiment

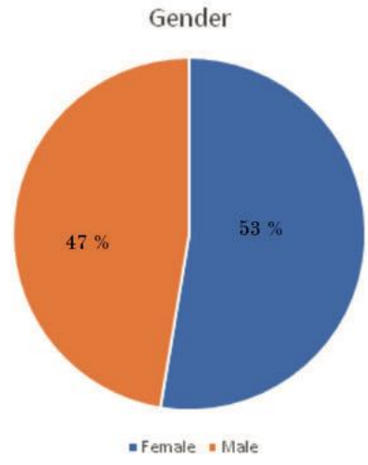


Fig. 3 Graph showing the gender distribution of the individual interviewed

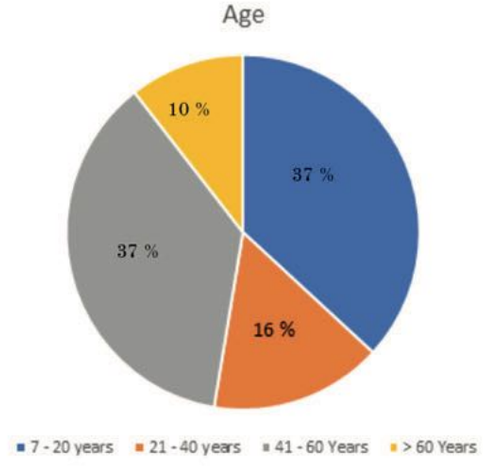


Fig. 4 Graph showing the distribution of interviewedi ndividuals by age category

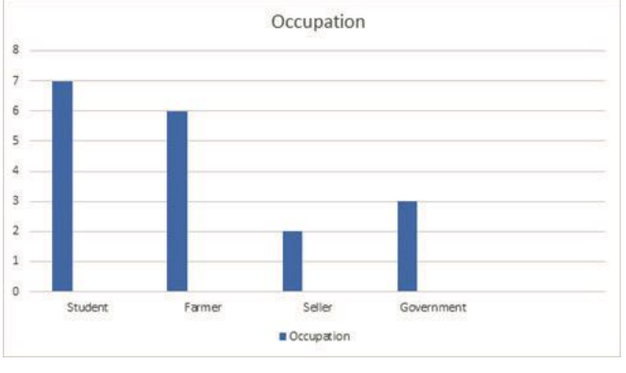


Fig. 5 Graph showing the distribution of interviewed individuals

River	Location	CO_2 (ppm)	pH	Temperature
Pucung	Upstream (amont)	8.875	Almost 7	27C
	Site	26.62	Almost 8	28C
	Downstream (aval)	17.75	7	32C
Cemoro	Reservoir (upstream)	8.875	7	-
	Under reservoir (upstream)	17,75	6	-
	Site	17,75	Almost 7	-
	(downstream)	17.75	8	-

Fig. 6 Table presenting the physico-chemical parameters of the water sampled from the Cemoro and Pucung rivers.

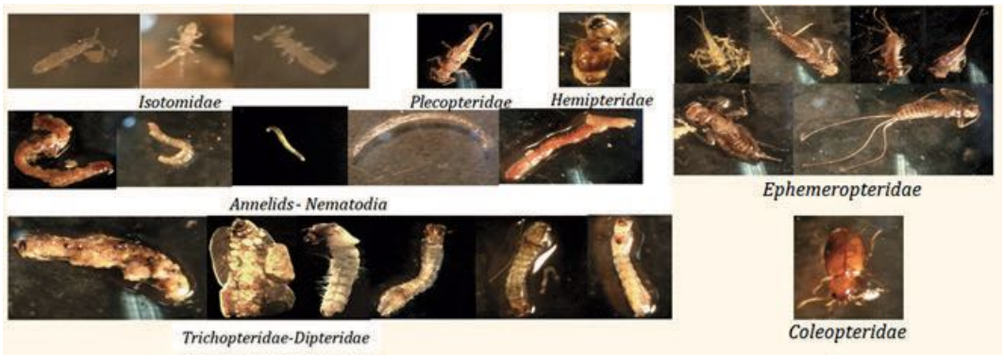


Fig. 7 Examples of micro and macro-organism taxa collected in benthos and soil

Range	Frequency		
	Male	Female	Juvenile
0,6-1,0	-	-	-
1,1-1,5	-	-	1
1,6-2,0	4	-	1
2,1-2,5	2	2	-
2,6-3,0	-	1	-

Fig. 8 Description of *P. reticulata* population of Pucung River (Kali Pucung) upstream

Range	Frequency		
	Male	Female	Juvenile
0,6-1,0	-	-	76
1,1-1,5	-	-	24
1,6-2,0	4	1	6
2,1-2,5	2	1	-
2,6-3,0	-	-	-

Fig. 9 Description of *P. reticulata* population in Pucung River downstream.upstream

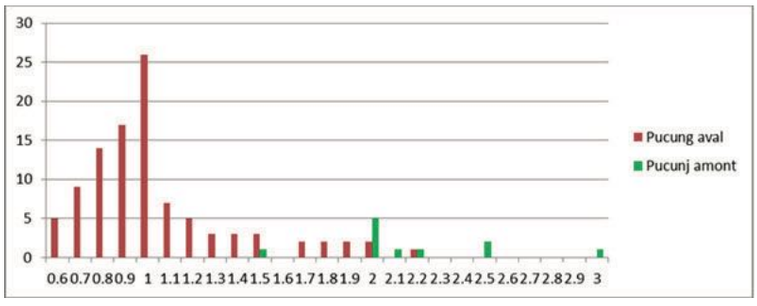


Fig. I0 Graph showing the size of individuals in *P. reticulata* populations collected from the Pucung River (upstream and downstreamupstream)

Current Development of the Sangiran Museums and Sites and the Way to Keep Improving

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1- Introduction

The Sangiran Dome area is located in Central Java and administered by two regencies of that Province: Sragen and Karanganyar. We can approach the site through several definitions depending on the field of study. From a geological point of view, it is a long stratigraphical window on respectively marine, swampy then fluvial sedimentation expanding through most of the Quaternary epoch. We could also get to know through interviews with its inhabitants that agriculture is the main activity for their livelihood and that touristic activities also provide an appreciated source of income. The Sangiran Dome entered the UNESCO World Heritage site list for its precious contribution to the understanding of early human behaviors and human evolution in 1996. Its archaeological value is known since the findings of Ralph von Koenigswald (1902-1982) in 1934 (von Koenigswald, 1936; 1940). Ever since, intensive archaeological surveying and excavations revealed that the Sangiran Dome holds the most abundant collection of *Homo erectus* remains worldwide and represents a unique and precious field to study the earliest islanders of human history. Toto Marsono was the pioneer of the Sangiran Ancient Human Museum. Archaeological material was kept in a municipal building until the construction of the first museum in 1980. A second museum was built on the current site of the Krikilan museum until the construction of the latter in 2013. The Sangiran Dome now counts five clusters museums (Krikilan, Dayu, Manyarejo, Bukuran, Ngebung) and a nano museum (Pucung). Our project was to analyze the structure of the clusters and their benefits, as well as

to evaluate how they highlight the sites and their value.

The first part will be dedicated to presenting the structure of the clusters and our method of investigation. Secondly, we will present the benefits of the structure -including its multi-cluster dimension- according to our experience. Finally, we will present the conclusion that we drew from our stay in the Sangiran Dome and some comments about our experience.

2- Method

The methods we used are observation and interview. We studied all five museums which are the clusters Krikilan, Bukuran, Dayu, and Ngebung, and the Manyarejo smaller one. This is done to find out the contents and information conveyed by the museums; also, to understand how the relationship between the museums in a museum clustered structure.

We also distinguish secondary places for visitors, such as sites, relevant landmarks and other smaller expositions. In this category we include Pucung site and its Nano museum, not far from the Sangiran I7 skull findspot, the place of discovery of the Sangiran 27/3I skull, the Menara Pandang panoramic view, the Triangulation Monument in Ngebung, stratigraphical profiles such as the Pucangan formation and places that reflect the culture and beliefs of the local people like in the sacred place known as Punden Tingkir.

The observation consisted in analytical recognition of the places mentioned before and the environment in which they are. After that we carried out several interviews using our capabilities to perform and translate them from English, Indonesian, Javanese and Japanese, recorded every kind of information in our field notebooks and took pictures to get all the data that we got to the results exposed next. The respondents were from diverse categories, such as Prof. Dr. Harry Widianto (who was the first director of the Sangiran Conservation Office BPSMPS), staff and curators of the museums, researchers working on Sangiran Dome, members of civil associations intended for dissemination of the heritage of Sangiran, visitors from different parts of Indonesia, international visitors, vendors from the shops at the museums, vendors from the surrounding populations and local people living in the Sangiran area, from people who had cooperated getting fossils to the clusters to regular visitors of the sacred places in the zone.

3- Results and discussion

a- The museums

There are five cluster museums in Sangiran, but only four include laboratories. All five clusters report to the Krikilan museum administratively which also provides supply and material for the conservation of the collections. Several sites are located near the museum.

Each museum has its own collection. Krikilan museum has the biggest exhibition and has a holistic approach of the Sangiran dome in its museography, explaining the general aspects of each site and field of study. At the Krikilan cluster museum there are souvenirs, food and beverage merchants. The museum provides stalls for free. The closest site for the Krikilan museum is the site of discovery of Sangiran 27/3I skull. Close to the site there is a sacred place. Local people refer to it as Punden Tingkir. In that place there is a tomb.

Museum Dayu is a cluster about stratigraphy. Visitors are invited into the time tunnel to see from the youngest layer of soil (Notopuro formation) to the layer of soil I.2 million years ago (Pucangan formation). At each layer of soil, a shelter or platform is provided which is a place of information about the relevant layer of land. At the end of the museum there is a collection of *Homo erectus* tools and animal fossils.

The closest site to the Dayu Museum is the Pucung site. At this site the SI7 skull fossil was found. The SI7 fossil is one of the most important fossils because its face is almost intact. To reach the site we have to pass through the village and down the Pucung river. On the Pucung site there is a small place that displays several photos and artifacts. This place is often called the "Nano Museum".

Ngebung is about the history of research, having its museographical speech assisted by different reconstructions and dioramas of archaeological sites and research related situations.

Museum Bukuran Cluster is a very educational museum about evolution. The museum displays information about the development of the theory of evolution, not only about humans but also about animals or plants. The museum also presents the development of ancient humans to modern humans. There are no sites that can be visited near this museum.

But the Museum Manyarejo is a small museum in typical javanese architecture dedicated to the preserved adjacent archaeological site. It is very synthetic and highlights all the essential aspects of an archaeological excavation. At the front of the museum there is an excavation box that provides information to visitors on how the excavation is carried out.

The main information presented at this museum is about the dynamics of the relationship between the Sangiran people and researchers who came to their area; also about how researchers work on the Sangiran site. The museum's narrative is conveyed from the perspective of the local community. Collection of this museum is memorabilia, photos, research tools, and others.

b- **The benefits of the structure**

- **Scientific benefits**

From the point of view of a researcher working on Sangiran, the clustered museums can offer a very good access to the materials that are distributed in the different clusters corresponding to the area where the items were found. There are several collection storage facilities, and also resources that allow working on them when doing research. These clusters also have accommodation for researchers, in case that they need somewhere to be hosted during their stay. Also, these clusters have facilities that allow exchange of knowledge between researchers, such as conference rooms that allow to celebrate scientific congresses with the ability to host international lecturers.

- **Conservation benefits**

Since 2013, every archaeological finds are brought to the nearest museum for registration and conservation. This provides the advantage of minimizing damage to the fossils that are brought from the site. Museums also have a role to educate the local people to preserve sites and heritage. The existence of museums in the site makes it easier to interact, educate the local people, encourage them to participate in protecting and preserving heritage around them.

- **Dissemination benefits**

The most relevant strong point of the museums in Sangiran is their multiple occurrence throughout the Sangiran dome area. They allow to have a quite thematic exhibition in each museum. As long as every museum gives a broad view of human evolution and the importance of Sangiran, the differences would be in which topic would be the focus of that museum.

The Krikilan museum is the most extensive one, and the one that explains each

topic of Sangiran and *Homo erectus* in the most exhaustive way. Bukuran museum is focused on explaining human evolution in an easier way, being quite oriented to children and people that have just started learning about it. Manyarejo is a very small museum that shows the relation between the local communities and their way of life with the Sangiran sites. Dayu is the second biggest museum, explaining meticulously the paleoenvironment of each period of time that you can find in the Sangiran dome. Ngebung, the last cluster museum, tells us the history of investigation in this area, and explains how working in archaeology is. Finally, there is another secondary 'museum', such as the Pucung site Nano museum, that explains more specifically the archaeological record of a certain site.

All these museums give a very solid background for knowledge dissemination, but we must notice that the role of local organizations is quite important and attractive for the people, e.g. the Pokdarwis Wonderful Sangiran guides association and the YGC (Young Guardian Club, Sangiran), getting local people involved with the sites and museums, and helping to disseminate the importance of a World Heritage UNESCO Site such as Sangiran.

- **Local development benefits**

The museums and sites in Sangiran certainly lead to a major impact on the economic development of the regencies. Local communities can thrive through the existence of community-owned lodging where they sell food, drinks and crafts out of local material. They may also have the opportunity to get a job in the museums. Following the increasing flow of tourists, the development of facilities and infrastructure was required to support the activities. This kind of benefit was specially found around Krikilan museum and also, but in a lesser way, around Dayu museum.

Locals also benefit from the UNESCO label to raise awareness about their lifestyle. The museum provides scientific knowledge to the local population, so that they can better understand the value of their homeland and of the data it contains. It also helps to create a shared identity taking the Sangiran dome as a symbol of togetherness.

c- **The disadvantages of clustered museums**

- **Scientific weaknesses**

The main disadvantage regarding the scientific development of the site is having the collections dispersed in several museums, making the researchers to move between

clusters if they need other material. It is also inconvenient for accessing laboratory equipment, because it will also make the research to move and also move the material, instead of having all the equipment concentrated, so it is not necessary to purchase the same material to different laboratories, and it could be shared between different researchers working in the same place.

- **Conservation weaknesses**

Conservation issues face the same problems as scientific ones. Krikilan being the main administrative institution in the Sangiran dome, every material or product used in the clusters depends on the provisioning of the Krikilan museum. Even the curators are usually located in Krikilan and go to the other clusters whenever necessary.

Not only the conservation equipment material, but also the archaeological material is parted into different expositions or collections, so the access becomes more difficult rather than if stored in just one place.

- **Dissemination weaknesses**

Having Krikilan as a center of provisioning and managing of the rest of the museums make it the most well-known, and explains (together with access facilities) why it is also the most visited one, between ten and twenty times more than the second one, Dayu, according to the data extracted from records and to interviews of members of civil organizations such as Pokdarwis. This means that very few of the visitors of Sangiran consider to visit other museum(s) but Krikilan one, and many of them even do not know about their existence.

Another handicap for some Sangiran museums is accessibility, because roads between cluster museums are not in a good condition, and it makes it more difficult for visitors to get there. Even there, people do not find facilities for people with disabilities or for elderlies. Reaching secondary sites such as Pucung becomes almost impossible for some people because they are quite far from the main ways of communication, being a reason why sites are not so visited by people interested in them.

This adds to the difficulties that foreigners meet when visiting Java, without having their own means of transport, being nearly impossible to get to Sangiran from the nearby touristic areas, such as Yogyakarta, Solo or Salatiga, while having another two World Heritage UNESCO Sites quite near: Borobudur and Prambanan. Even if these people get to the museum they would meet the handicap of language, because the

only museum with english explanations is Krikilan, leaving the other ones without any information in any of the UNESCO official languages, just in Indonesian.

- **Local development weaknesses**

The lack of equal distribution of infrastructure in secondary museums makes economic activity still concentrated around the Krikilan Museum or Ngampon Village. Krikilan also draws most of the visitors. This results into an economic gap between Ngampon Village and other villages in Sangiran. An example of an economic gap is that the souvenir shops can only be found at the Krikilan Museum. Another example is that the museum guidance incorporated by Pokdarwis is only available at the Krikilan Museum.

- **Environmental weaknesses**

As a touristic destination, Sangiran faces problems with pollution, especially waste from museum visitors. Visitors can throw away plastic that pollute the museum and maybe an archaeological site. On the Pucung River, there is a lot of plastic waste that may not be from visitors but also from local people, community's activities also affecting the environment around the sites. The lack of public or shared transportation could also maximize the quantity of their vehicles emissions, containing sulfur dioxide (SO_2) and nitrogen dioxide (NO_2). It will not only affect the atmosphere, but also increase the acidity of the soil and of the water. We can note that acid soil affect the conservation of mineralized bones (Nord et al., 2005).

4- Conclusion

Each museum in Sangiran has a certain theme exhibition and they complement each other. For most visitors, the museum helps explaining the Sangiran archaeological site without having to visit the field. The cluster structure benefits to various parties such as scientists, local residents, curators, and visitors. These benefits can be viewed from the aspect of scientific, conservation, dissemination of knowledge, and local development. But besides, the museum clusters model also shows several weaknesses.

Archaeological sites take a secondary role in this museum complex. We cannot tell if they really interest many people, but we can assess that there are people that really do, so making sites accessible and appealing should be a topic that could make more people interested in secondary places and sites. On the other hand, people who are interested in visiting sites would not mind getting there, even if there are some

difficulties, and keeping the visitor flow control is crucial to make it sustainable for the environment, especially in places located in a natural context, such as Pucung site.

Some suggestions will conclude our contribution, coming from the information that we have recorded from interviewed people and extracted from our observation of the Sangiran dome facilities.

First, it would be helpful to create a clear visitors' circuit of all the Sangiran dome museums and sites. For that purpose, it would be necessary to improve the local infrastructure on the roads between museums and their connection with the nearest relevant urban areas such as Yogyakarta, Solo and Salatiga. Once the roads are good enough to carry important numbers of visitors across the Sangiran area, it would be convenient to implement tourist transportation managed by the museum, to get people to Sangiran from the cities nearby and also to take them from one museum to another in this visitors' circuit. Doing this would also help to local development, creating employment in the museum context and increasing the economic activity around the circuit to the level witnessed in the surroundings of Krikilan museum by getting potential customers to the areas that are not so visited today. These actions (collective organized transportation) would also help to reduce pollution in the area and the impact of the museums in the environment.

The second suggestion should be to include secondary places and archaeological sites in this visitors' circuit. Once having increased the number of visitors on the main roads, it becomes possible to highlight some important spots between destinations. Taking the example of Pucung site Nano Museum, it is possible to build some other nano museums without needing too much resources, e.g. in Menara Pandang about the dome morphology, having the landscape views from the top as a reference, and downward at Punden Tingkir with the close finding of the Sangiran 27 skull, using the relation between them for the dissemination of local people beliefs as part of the Sangiran people's heritage, making them feel the rest of the clusters content part of their heritage as well.

Getting to these secondary places would not be as easy as reaching the cluster museums, but there is actually some interest in visiting them, especially sites, such as Pucung or the Pucangan formation. The inclusion in the visitors' circuit would be convenient to do it through hiking routes between cluster museums, secondary places and even relevant spots in the landscape such as the paddy fields of the Cemoro river, and would be as easy to implement as the creation of a map of the routes that visitors can follow. One example of this could be a route between Menara Pandang, Ngebung cluster and the triangulation monument, three relevant places quite near to each other. The creation of more Nano museums and these hiking routes could make sites and secondary places more appealing, and make the Sangiran rural area, its people, culture and landscape, a focus of interest, being

considered as part of the heritage of the area. One important point in all this process will be socializing visitors about their waste and impact in the environment and the sites, having clearer information about this and the sanctions they can face if they are not respectful with this natural area.

Another resource that is in the hands of these museums, because there is an infrastructure that allows it and knowing the archaeological importance of Sangiran all around the world, would be the celebration of relevant international scientific events, useful to make Sangiran heritage be known further in foreign countries, and to exchange scientific knowledge and perspectives between researchers from different nations and trends.

Finally, regarding the museums' exhibitions, it is very important to mention the lack of accessibility for the disability and the elderlies, that makes it impossible for these people to visit the museums. The language is another barrier that does not allow foreigners to understand all the knowledge the museums disseminate in at least one of the UNESCO official languages. It would be also convenient to implement workshops where the visitors can participate along the visit, making it easier to understand very relevant topics in prehistory such as stone knapping, hunting strategies or how to make fire, making younger visitors more connected with the museums' narrative. It could be an interesting option for institutions such as Pokdarwis or YGC to work on such issues. Last, the creation of a smartphone app in different languages could help to lessen the weaknesses that were exposed, such as the barrier for foreigners, the access to maps and hiking routes, and could even provide easy and complete explanations on certain topics in the exhibitions.

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Visiting the Krikilan Museum



Visiting the Pucung site

Sangiran Museums in Citizen's Sight

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1- Introduction

a- The emerging of museum institutions in Sangiran

After the patented process which led to the nomination, on December 5th, 1996 UNESCO inscribed Sangiran Early Man Site on the World Heritage List (Widianto, 1996). Since 2004, a lot of actions were undertaken mostly by the Directorate General of History and Archeology to enhance the development of the Sangiran site such as the creation of the Master Plan followed by the Detailed Engineering Design (DED) in 2007. After the end of the process in 2007, Sangiran Site's development had a clear direction, both in reference to the conservation concept and in respect to its status as a cultural and recreational destination.

On the other hand, the development of the museums in Sangiran site actually began when the head office of Krikilan Village was no longer able to accommodate fossil findings from the site in the main museum. In 1984, the regional government of Sragen District built a prehistoric Museum in the village of Krikilan that is located in Sragen District. After experiencing several improvements, the new museum was inaugurated in 2011 by the Indonesian Vice Minister of Education and Culture (Bimas & Hatmani, 2017). In the continuity of Sangiran Master Plan and DED process, the project of building a new museum was initiated in the village of Dayu Cluster

(Karanganyar Regency) and was followed by several similar projects such as Ngebung Cluster, Bukuran Cluster, and Manyarejo site (*ibid.*)

The Krikilan Museum is a visitor center that provides information about the life of the early hominins in Indonesia, and about Sangiran as the homeland of the Java Man. This museum acted as an umbrella for other clusters, and at the same time functioned as a hub for information that came from other sites in Java island, such as Trinil, Kedung Brubus, Ngandong, Sambungmacan, Mojokerto, Ngawi, Patiayam, Semedo, and Bringin.

Meanwhile, Dayu Cluster is developed as an information counter to provide the results of the latest research of Sangiran archaeological, geological and paleoenvironmental context. This cluster was founded in Dayu because of the discovery of the oldest flake tools in the region and probably even in Indonesia (Widianto & Simanjuntak, 2017). In addition, Dayu's management is almost ideal because of the cooperation between stakeholders such as the central government (Balai Pelestarian Situs Manusia Purba Sangiran), the regional government (Kabupaten Karanganyar), and the local people from Dayu Cluster.

b- Motivation and perception re. museums

Motivation can be interpreted as the strength (energy) of a person. It that can lead to the level of persistence and enthusiasm in carrying out an activity, both from within the individual itself as an extrinsic motivation (Hidayat, 2011). Meanwhile, in the tourism concept, tourist motivation can be conceptualized as the sum of biological and sociocultural forces which energize and generate people's behavior. Perception is defined as the process by which individuals manage and interpret their sensory impressions in order to give meaning to their environment (Robbins, 2006: 73). At the same time, in terms of business, customer's expectations are confirmed when the product or service perceptions exactly meet expectations (Darsono & Junaedi, 2006).

The main purpose of this work was to obtain a first insight of visitor's motivation and locals' perception of Dayu and Krikilan museums in order to gather a reference source for further research.

2- Material and Methods

a- Material

The sampling was conducted in Krikilan and Dayu Museums to determine if

differences in museum content and administrative system induce significant differences of perception. The data was collected on 18th-19th, May 2019 from the local people and visitors of the museums. These sampling was conducted in the morning and afternoon. To gather as much data as possible the group of samplers was divided in two. Each team was composed of one French student and two to four Bahasa Indonesia/Javanese speakers.

b- **Methods**

Since different kinds of information were needed from the locals and the visitors, two distinct approaches were chosen to gather the data: qualitative and quantitative. In fact, we considered that within our theoretical frame, only superficial information was required from the visitors. On the contrary, more subtlety was required in the answers from the local communities and the museum employees because they have a more exhaustive insight on the museum owing to their proximity with it (geographical or work related).

For that reason, a quantitative approach taking the form of a Google Form® filled by the sampler was used while interviewing the visitors. The questionnaire for the museum visitors was structured as follows:

- Profiling (age, sex, occupation, educational background, origin)
- Perception about the components of tourism such as attraction, accommodation, accessibility, and ancillary service
- Motivation to visit the museum
- Visitor's expectation before and after visit

On the other hand, an open discussion (qualitative approach) was favoured with the locals, encompassing:

- Profiling (age, sex, occupation, length of stay in the cluster)
- Things that changed after the museum was built (changes in personal situation, family or community)
- Things that changed in their environment (such as economic, social, infrastructural etc.)
- Their vision of changing their cluster if there is any chance
- Their motivation to preserve the Sangiran Site

For this latter approach, three age classes were determined: young (15-30), middle (31- 46), old (47-80). Occupation was also determined using the usual separation of professional activities between primary (raw material), secondary (transformation) and tertiary (diffusion activities). Each interview was recorded with a cellphone. In

order to avoid observer's bias, and the teams that had already sampled in Dayu and Krikilan districts were switched. In total, 85 samples were collected.

After the sampling, tables and graphs synthesizing the data were made with Google Sheets® in order to determine general trends for further interpretation.

3- Results: a museum can cover various realities

a- Quantitative approach: the visitors survey

We established that 40 and 24 persons participated respectively in our survey in Krikilan and Dayu Museum. The survey conducted on the visitors confirms that Krikilan museum has more visitors than Dayu cluster. We also found that most motivations for visiting the museums are self-fulfillment of knowledge and undertaking recreational activities. On the other hand, most of the visitors agreed that their perception towards the attraction of the museums achieved their desire, while most of the visitors also agreed that the accessibility to the museums is adequate.

A high number of visitors also agreed that the museums' amenities are adequate for them. The last perception aspect was that visitors agree about the service of the museums' employees to the visitors, complementing the feeling of expectation achievement after the visit.

b- Dayu and Krikilan locals' interviews

Concerning the profiling, in Krikilan most of the interviewed locals were from the higher oldest age class (47-80), most of them being male farmers. They mainly evoked the economic changes due to the presence of museums, such as economic growth, job creation or better way of life. From a social point of view, most of them highlighted community development and educational contribution. Some of them emphasized the environmental issues but often did not feel actually concerned.

Among their suggestions, they advised to build more infrastructures related to entertainment and leisure, especially for kids, such as a playground, and even pools. It appears that very few of them have any real knowledge about the museum. Only the employees of the museums seem to have an insight of its historical background, content and target. However, according to some museum employees, even if the locals do not know about these questions, they are able to distinguish fossils and even stratigraphic layers. Although young people are less represented, they seem to

have a better scientific background.

Only 6 people felt changes occurring in their environment, 5 felt changes in terms of infrastructure and 2 felt a social and economic improvement after the introduction of the museums.

Concerning the profiling, in Dayu, most sampled locals are men from the youngest age class, including inhabitants, tertiary museum workers and farmers. Only one of them did not feel concerned by the museum and its benefits. Their main motivation is economic purpose (job creation, general income improvement). All of them noticed a social development and one even mentioned innovation for teenagers. The museum workers insisted on the educational background and expressed a desire to spread knowledge from the museum. They know that Dayu has a potential that is not fully exploited; some changes in economic, social and infrastructure context have to be made in order to increase frequentation, also with the contribution of Karanganyar Regency Government who wants to improve the cluster near the museum, so it could bring better beneficial for the locals and attract visitors. Some of them are aware of the environmental issues (garbage management, plastics pollution, drinkable water) and want to change it.

Among Dayu locals, 3 persons evoked environmental awareness (two of them being personally involved in environmental issues). Besides, the museum seems to have also modified local lifestyle. For instance, 6 persons felt the social and economic change accompanying infrastructure evolutions. 2 persons also evoked the apparition of tourism in the region.

4- Discussion

a- Visitors' perception and motivation (quantitative)

The quantitative data allowed us to draw general trends. In fact, the visitors seem to be attracted by both the didactic and recreational aspects delivered by the museums. Most of them come from the same district as the museums. Thus, the motivation to go to the museums is limited for outsiders to people who really want to visit because of the scientific content. Concerning the way the museums are known around the region, most of the visitors got the information from their own social circles, often through word of mouth, which is still a significant aspect of Indonesian means to spread information. Though, the accessibility is an essential factor which tends to restrain the kind of visitors that could potentially go to the museums.

b- Limits (quantitative approach)

For different reasons our sample was limited (N = 85), making it non-statistically representative. Moreover, the data the museums collected about the categories of visitors cannot be compared with our own data. We did not use the same occupation classes (these data gathered workers, museum workers into the category of public but also detailed the different categories of students). Furthermore, the information provided by the book of management does not provide a lot of information concerning the visitors' demographic data and socio-economic background. The major limit of this approach lies in the fact that the questions we used were closed questions, which did not allow the visitors to express any subtlety. Consequently, the general tendencies that we determined are probably not that evident. Besides, most of the people interviewed were men, because we sampled on Friday, which is a day of prayer, thus women were less represented in our sample on that day. One solution to this bias would be to repeat the sampling another day at the same place.

Eventually, it was also impossible to approach young people and most especially children who were intimidated by our team approach. On the other side, some old people didn't want to answer the survey either.

c- Locals' perception (qualitative approach)

The qualitative data suggests that local people and workers perceive the museum as an economic instrument (utilitarianism). In fact, it may be linked with their own economic background as most of the people we interviewed were farmers, merchants, and museum workers.

They are generally not aware of the historical background of the museum and have limited knowledge about it. The younger people feel more involved and motivated to contribute to the museum, but this motivation is often driven by a personal benefit. In contrast, their elders pay less attention to the didactic, cultural and environmental aspects even though they do have a better insight on the museum's historical background.

Generally, they seem to have mostly an individualist interest and are really detached from the sense of belonging that heritage sites such as Sangiran ones tend to promote through their museography. Museums are seen more as a vector of entertainment for locals than a place that provides education and knowledge. For instance, lots of people suggested improving the infrastructure dedicated to leisure and not related to the didactic purpose of museum display. It seems that people are not just interested in a single purpose but promote an entire sensorial package including culinary, amusement and aesthetic pleasure.

On the other hand, the system itself urges people to behave in that way and the socio-economic system itself could be conditioning people's perception and behavior. Individualism could as well be a local interpretation of globalization, or an effect of the use of social networks. However, we have to take into account that it is probably a multifactorial issue which is linked with their lives and their past interactions with other individuals and institutions.

As an example, another frequent observation is that people needed tangible evidence of the benefits produced by the museums such as good infrastructure, improvement of accessibility and income increase. In fact, the locals' lack of interest could very well be is linked to a lack of emotional attachment and cultural awareness about Sangiran heritage. It appears that their own vision is not properly displayed, and they have their own way to perceive heritage that is not for the moment compatible with the Sangiran museums' concept of heritage. A striking example is the fact that several locals appreciated the modern architecture of the museums (even though such an architectural contrast with traditional buildings could have been disconcerting to them); this might be linked to our precedent interpretation of people needing a visible proof of the museum benefits. Thus, modern architecture might be seen as is an indicator of economic growth or globalization and is consequently perceived positively.

d- Limits (qualitative approach)

Attention must be paid to the representativity of our data. Different reasons urged us to focus our investigation on local communities and workers with a qualitative approach. Thus, we must take into account that our study is limited in time and space, that interviews were restricted to the village perimeter and not the area around.

Because of the time limitation, this study could not introduce quantitative data about local people and workers, an aspect that should be supplemented by further investigations with quantitative and objective approaches. In fact, during the Krikilan session, the sampling was oriented in the same social circle since the individuals sometimes guided us towards their acquaintances. Furthermore, since it was a dialogue, the samplers were asked closed and oriented questions according to a gratifying opinion about museums.

Eventually, we must also point out that the barrier of language somewhat limited the interactions of non-Bahasa Indonesian speakers with the interviewed individuals. Bahasa Indonesia speakers often did a synthesis of what was translated to the French students to be more efficient and not lose the course of the discussion. However, this restrains the data that a part of the team can interpret in English. A solution might be to rewrite entirely the interviews and to translate them in English without

summarizing.

5- Perspectives and conclusion

Further investigations must be conducted in order to sample in a more systematic approach. Sampling should also be repeated from the same cluster and at different moments or days. The methods used in this study should be improved by a complementary approach, which consists of combining qualitative and quantitative data and not doing separated interpretations. Furthermore, adding control questions would allow the samplers to assess the sincerity of the person interviewed (for instance if the person is angry at the museums and answers poorly).

To conclude, the data that we collected during the investigation tend to show that locals and visitors have a very distinct perspective when it comes to the museums. On the one hand, the locals have a utilitarian perception while the visitors tend to favor the leisure and educational aspects. However, on the other hand, locals working in the museums developed another kind of perception apart from the economical one: many feel a sense of belonging concerning this kind of heritage site, probably driven by their own perception of history (ancestors, culture). Thus, supplementary investigations combining quantitative and qualitative approaches for both visitors and locals seem necessary in order to draw general trends that would confirm or invalidate the ones proposed in this paper.

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Interviewing a local inhabitant

Quantitative approach: visitors survey

We established that 40 and 24 persons participated respectively to our survey in Krikilan and Dayu Museum. The survey conducted on the visitors [Fig I], confirms that Krikilan museum has more visitors than Dayu kluster based on the sampling that founded. Next, we found that most motivations of visiting the museums are self-fulfilment of knowledge and doing recreational things [Fig 2]. On the other hand, [Fig 3] most of the of visitors agreed about the perception towards the attraction in the museums is achieved their desire. While most of the visitors also agreed that the accessibility to the museums is adequate [Fig 4]. Meanwhile [Fig 5], high number of visitors also have agreement about the perception of the museums' amenities are adequate for them. The last perception about the service of the museums' employee to the visitors is also agreed with the most of the visitors [Fig 6]. Last, but not least, most visitors' expectation to the museums is also achieved after their visitation to the museum [Fig 7].

Museums	Total samples
Krikilan Museum	40
Dayu Museum	24

Fig. 1

Museums	The motivation to go to the museum			Total Samples
	Acquiring their knowledge	Relaxation	Self-improvement	
Krikilan Museum	28	11	1	40
Dayu Museum	11	13	-	24

Fig. 2

Museums	The perception of visitors to the museum attraction is achieved their desire		Total Samples
	Agree	Disagree	
Krikilan Museum	38	2	40
Dayu Museum	15	9	24

Fig. 3

Museums	The perception of visitors to the museum attraction is achieved their desire		Total Samples
	Agree	Disagree	
Krikilan Museum	31	9	40
Dayu Museum	20	4	24

Fig. 4

Museums	The perception of visitors to the museum attraction is achieved their desire		Total Samples
	Agree	Disagree	
Krikilan Museum	32	8	40
Dayu Museum	21	3	24

Fig. 5

Museums	The perception of visitors to the museum attraction is achieved their desire		Total Samples
	Agree	Disagree	
Krikilan Museum	37	3	40
Dayu Museum	22	2	24

Fig. 6

Museums	The perception of visitors to the museum attraction is achieved their desire		Total Samples
	Agree	Disagree	
Krikilan Museum	37	3	40
Dayu Museum	16	8	24

Fig. 7

Sangiran Heritage and its Perception:

Relationship Between People and Their Environment

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1- Introduction

Sangiran Dome is well-known for the many prehistoric remains it has delivered, especially for the remains of *Homo erectus* and associated artefacts. Inscribed on the UNESCO list since 1996, this site has seen its development and the promotion of its buried heritage through the construction of four museums opened in 2014 (Krikilan, Ngebung, Bukuran, Dayu). Thus, these structures located throughout the region focus their spaces mainly on prehistoric discoveries dating back about 1.5 million years for the oldest. The aim of this study would be to understand the place occupied by this prehistoric past in local traditions, its perception by Sangiran inhabitants, and to highlight the relation between them and their environment, or with a more recent local heritage whose material resources invested in its development are more discreet.

Therefore, this study was carried out with the help and the participation of local communities. It is conducted to understand the perspective of Sangiran's stakeholders (local inhabitants, local government, tourism community, and museum managers) sometimes involved in local development on different scales. Data is gathered through interviews in Sangiran, and the diversity of the interviewees makes it possible to highlight several points of view on the issues addressed, thus showing a wide range of perceptions of Sangiran heritage.

2- Methods

This study is carried out in the form of field surveys in contact with heritage sources: they are based on interviews, meetings with local people and heritage professionals, and direct *in situ* observations and multiple visits.

a- Observations in the field

In order to better perceive the relationship between people and their environment in Sangiran, observations of the studied territory were conducted, focusing on the landscape. All the places and activities are representative of the diversity of the region's activities because of the common character they occupy and their location.

- Agricultural uses
- Installation of houses
- Construction of modern buildings such as museums
- Commercial activities
- Religion and traditions

The purpose was to understand and observe the different modes used for these activities and the place they occupy in the landscape, as well as a way to observe the impacts of natural phenomena that continuously modify the landscape on the different sites.

b- Interviews

In a second step, the data collection is carried out in the form of interviews. This research method makes it possible to be in contact with living testimonies of the evolution of the city's customs and traditions. The respondents are chosen according to their professional profile, their location and their implications for local heritage. Before carrying out this investigation, a series of questions are prepared: general open questions serve as guidelines and are asked to obtain various opinions on the same issue. More specific questions are then submitted, according to the profile of the interviewees, which were previously divided into three categories according to the various information they can provide on this research topic:

- Heritage professionals and tourism officers
- Sangiran inhabitants

- Local government

Unlike local communities, the first category does not necessarily live in Sangiran and is defined by its professional activity linked with heritage. The diversity of testimonies is a way to highlight the perception of the regional heritage specific to the area, the interdependence of these different parts and their collaboration. Each group is able to highlight issues that are specific to their field of work and activities, so all these points of view can thus be confronted and analyzed in parallel with the material facts and policies of the city.

c- Visits of museums and heritage sites

Finally, visits to museums and heritage sites were carried out, which are privileged places where artefacts are visible and exhibited to enhance the cultural heritage.

- Ngebung Museum
- Krikilan Museum
- Bukuran Museum

They provide an overview of the resources invested in their conservation and make it possible to see the potential prevalence of one or more types of heritage in their organisation. Laboratories (Krikilan, Bukuran) and cultural sites were also surveyed in this study like Punden Tingkir. This diversity of places allows a comparison of the resources invested in their treatment and use.

3- Results

a- Diversity of heritage

From natural to cultural, the heritage besides the prehistoric sites in Sangiran appears in several facets according to UNESCO definitions. Natural heritage in Sangiran is known for its landscape, forest and geological heritage. Cultural heritage includes traditional houses and arts, legend stories, traditional tools, and ceremonies. The diversity of this heritage must be identified in order to develop it, and its potential assessed beyond the prehistoric sites.

b- Natural heritage

For millions of years, the movements of the Earth's plates and the successive evolution of geological periods is visible in the stratigraphic layers of Sangiran. These

natural phenomena allow the creation of a unique landscape characteristic of the region, which is considered a natural heritage. Thanks to observations, visits and interviews, it can be specified into several categories:

- The Sangiran dome overall landscape with forests (incl. teak), hills (Ngebung hill, Randu Alas hill)
- The geological heritage with volcanic landscape, the eroded dome itself, the salted water source and the strata of fluvial and marine origin that have been transformed over time.

The landscape in Sangiran doesn't much differ from other neighboring regions. Local people tend to change the natural heritage according to their needs. It can be seen from Sangiran Dome with numerous settlements and buildings. Semi-natural heritage (with human assistance) in several locations can be found such as paddy fields, farms, and various plantations. Apart from that, geological heritage (salty water source) is found in unstable formation, causing water sources that can't be seen.

The natural heritage in Sangiran can change rapidly when affected by natural phenomena (earthquakes, volcanic eruptions) and by human intervention. It will affect the diversity of the communities' cultural heritage in.

c- Cultural Heritage

The cultural heritage in Sangiran is affected, besides by the natural elements of the landscape, by tradition and history. It emerged from the community and some of them were adapted from other regions. It can be tangible or intangible, and every type of heritage has a meaning which has to be delivered. Some of these cultural traditions appear to be hereditary, as for example the recently disclosed Kubur Budho (Buddhist grave). In general, cultural heritage in Sangiran can be identified by several markers, such as traditional language, arts, houses, ceremonies and handicraft. Each part of this cultural heritage is related to and inherent in the daily life of the local community.

Sangiran is a representation of the wealth of traditional Javanese houses in Indonesia. Traditional houses (Joglo and Limasan) are one of the characteristic elements of this area. From the observation and interviews' results, it appears that some local people still live in these house models. In Javanese philosophy, Joglo house symbolizes harmony and is a tribute to "Sang Hyang Widi" (divine order), ast can be seen from the trapezoid-shaped roof with the upper end symbolizing the mountain and as a manifestation of the existence of God. Joglo house is built using complex and expensive materials and structures, so it requires a lot of energy and assistance from neighbors. The hardened clay or terracotta "Wuwungan" ornament above the roof

represents animals (dragon, chicken) or humans.

Such symbols of traditional Javanese houses were modified along with time, clay material for wuwungan is currently using tiles that are not from clay. Sangiran traditional Javanese houses also use wood, bamboo, boards and other combinations of materials. Each material is interrelated to create a strong home. Currently the Joglo and Limasan model house is still found, although the material is modified with more modern materials.

Sangiran also has traditional arts which consist of dance, music, martial arts and handicraft. These features are used by local people for entertainment, rituals and professional purposes. There are several traditional arts that still perpetuated:

- Traditional Dance: Tayub, Reog and Rodat
- Traditional Music: Hadrah, Karawitan (puppets), and Lesung Music
- Martial arts: Persaudaraan Setia Hati Teratai (PSHT)
- Handicraft: furniture, tenun gloyor, ceramic crafts (artefact)

Collaboration between traditional dance and traditional music takes place during some event practices and community rituals, which became a habit among the Sangiran community. They mean unity and harmony in achieving common goals. In terms of guarding, local people in Sangiran are quite enthusiastic in developing the organization which engages in the field of martial arts called "Persatuan Setia Hati Teratai". This is evident from the monuments, flags and symbols visible on local people's homes. Martial art has the potential to develop rapidly because of its attractivity for the youth. Handicraft is interpreted as a heritage of the activities and ways of life of some people in Sangiran.

Traditional art is inherent for some local people both in terms of delivering important messages and as a form of gratitude and happiness in community. As seen from observations in the field and from interviews, there is a need for special action and attention towards traditional art, which in Sangiran tends to be reduced along with the changing mindset of the younger generation. Modernity massively caused some of the traditional art to be left behind such as dance, music and rituals. But there are some local people who still maintain the martial arts and handicrafts, sometimes as an income source besides farming activities.

Traditional ceremony in the Sangiran community is a routine activity. It is related to traditional arts, especially music and dance. Based on the observations, traditional ceremonies that still remain in Sangiran are "bersih desa" (litt. "cleaning the village") and "mahesa lawung" (offerings). This traditional ritual is carried out as a form of gratitude and respect for the Almighty God, nature, and the ancestors of Sangiran. Until now, it's still carried out by some local people in Sangiran.

The other side of Sangiran besides being a conservation zone for prehistoric sites evidently has so much potential of both natural and cultural heritage that is still inherent in the local people's daily lives. It also has the potential to be developed and become the other side of the prehistoric sites in Sangiran heritage.

4- Discussion

a- Preservation vs. economical needs

Natural heritage and cultural heritage in Sangiran directly or indirectly affect the economic aspects. The sustainability of these elements creates a scheme of business activities in order to fulfill daily needs. Natural heritage plays both a traditional and subsistence role for the community. The exploitation of natural heritage in Sangiran follows the economic needs and grows, bigger hence needing special attention. Besides natural heritage, Sangiran inhabitants also work in the cultural heritage related domains of furniture, weaving, ceramic craft. The cultural heritage seems well preserved by such professions among the local people in Sangiran and helps to develop the economic aspect.

b- The heritage put forward

Natural heritage in the Sangiran community merges with the community daily life. The landscape of Sangiran dome is an important natural heritage that has power to build culture and daily habits of the local people. The dome is the main characteristic of Sangiran compared to other landscape features (hills, rivers, teak forests). The community has a positive assumption that the Sangiran dome that is able to foster the image of the local community in Sangiran. Aside from the natural heritage, cultural heritage also becomes an identity for the local community in order to create social behavior in daily life. Handicraft such as batik, weaving, furniture is economically directly related to the community besides farming activity. The most important part of the cultural heritage is also Javanese language as communication media. The traditional dance, music, martial arts and traditional ceremonies are the togetherness activities among the locals.

c- The need for a cultural affirmation

Local heritage needs to be preserved as a manifestation of the link between ancestors, elders and the next generation. There are needs to reinforce and confirm

the existence of the inheritance that people want to preserve. According to the results of interviews and observations, the stakeholders can actively participate, among other things, in maintaining this heritage, and people transmit traditions to the next generation through narrative, messages, and teaching so that they will have all the cards in hand to understand the cultural traditions of Sangiran. Most local people tend to think that the government must play a more active role in socializing, promoting and assisting, besided regulation and bureaucracy. However, globalization cannot be stopped, nor international involvement through the presence and pressure of UNESCO, thus threatening the existence of the Sangiran non-prehistorical heritage.

d- The current considered heritage of Sangiran

Heritage potential seems to be increasingly threatened owing to assimilation from globalization and current people's needs. We still find in Sangiran many features related to natural heritage, which were mentioned above, but whose authenticity is reduced due to communities' interference and activities (e.g. rivers and hills).

Cultural heritage culture can still be found, especially in handicraft, sacred sites and myths, or traditional arts, although some of its dimensions are starting to be difficult to find in Sangiran.

5- Conclusion

Despite the importance given to historical and traditional heritage, there are organizations which are active around prehistoric sites, showing an involvement between the authorities and the communities in this regard (e.g. Pokdarwis and Young Guardian Club). Sangiran's heritage is defined differently according to the people and their profession.

The current globalization nowadays affects heritage, due to modernization, it has led to the assimilation of other cultures into the site, so that it influences the preservation of heritage that still exists now. However, views on heritage issues and the importance given to each category are not fully shared by the locals and the government. The important budget investment for prehistoric sites is discussed and challenged by locals seeking to culturally affirm current traditions. They tend to privilege the traditions perpetuated now in order to assert a cultural identity of their own, dissociated from these prehistoric sites clearly put forward by world organizations. The museums' content is also a mean of showing the prevalence of these prehistoric sites on historical material heritage and current cultural traditions.

To conclude, the communication and coordination among the stakeholders must necessarily be done continuously, taking into account the needs of the population. It appears mandatory to progress in such a coordination, to merge modern and traditional culture in order to foster a joint evolution.

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Wayang kulit

a



Traditional house

CHAPTER 5 - Prehistoric Value

Lithic Technology, Experimental Archaeology and Public Archaeology

an attempt of chaîne opératoire *in Sangiran, Indonesia*

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1- Introduction

Sangiran (7°27′00′′S, 110°50′00′′E) is an area of 56 Km2 situated in central Java, Indonesia. It is one of the most important archaeological sites in the world for human evolution studies. The Human Origin Heritage (HOH) program is an international participatory training for students and also for professionals. This program aims to share knowledge among the entire participants. In 2018, participants and professionals were from three different subcontinents as well as nine different countries. The countries are Indonesia, France, Bangladesh, Belgium, Cambodia, China, Chile, Italy, and Spain. All the participants are divided into seven groups. Every group included members from foreign and local students and also from Sangiran. The main three themes of the program are Science, Conservation and Local Community/ Society.

2- Material and method

In order to uncover questions about how to communicate and transfer scientific knowledge through the experience of the archaeological material, it was decided

to use the local infrastructures of BPSMPS and to operate field observations. We therefore went to the Krikilan, Ngebung and Bukuran Museums to put emphasis on the internal group communication. Krikilan storage facilities were visited too. The village of Pablengan was also explored, along with relevant places regarding the local prehistory, for example where the lower lahar can be observed.

To collect raw material and hammer stones for the experimentations as well as identify fossil and artifact bearing layers, surveys were undertaken. The stones were collected in the riverbed of the Cemoro river, and other surveys were conducted in the area of Manyarejo. Another survey was made near the Triangulasi area, where the first Sangiran stone tools were found. This aimed at discussing how the local participants were concerned with the importance of such places, and their relation to archaeological material.

Two workshops were organised: knapping, in order to produce flakes that were then reused for the butchery workshop, and bamboo knives crafting. The butchering workshop involved another group, which allowed for a greater amount of exchanges among the participants. This workshop aimed at producing cut-marks on bones with the flakes that were previously made, and being able to observe them after. The idea was to create a reference collection about cut-marks and confront their structure and differences when using different tools.

Besides, an artifact casting session was also undertaken. One of the main purposes of the session was to familiarize the local participants with these techniques. The session was conducted by Mr. Iwan, a Sangiran inhabitant who works for long with the scientists. He could also explain the complete process in Indonesian *bahasa*, so it became easily understandable for the Pokdarwis and YGC participants.

Along with other groups working on similar approaches, a 3D Scanning session was organised. A chopper stone tool and a Bovidae tooth from the BPSMPS collections were scanned. The main purpose of this activity was to display some analysis steps of the scientific *chaîne opératoire* and discuss it with the Pokdarwis and YGC members.

After the experimentation workshops were conducted, laboratory work started. Microscopes and Dinolite were used to observe and record the several traces on the experimental bones. Use-wear was also observed on the flakes.

When possible, some local personalities or workers were interviewed (see Annex). This was done to have insights on the relation between people and archaeological materials. Mr. Sadiman Subur, founder of the Pokdarwis and formerly working at several Sangiran excavations, but also interested in landscapes, geology, fossil collection and heritage in general, was interviewed. Some personnel from the safeguarding staff at BPSMPS were also interviewed. The aim was to understand how they manage the archaeological records in the Krikilan museum. Their relationship

with the fossil hunters and local people who fortuitously find fossils in Sangiran was also explored.

3- Activities in Sangiran and their objectives

The first day in Sangiran, the Krikilan Museum was visited by groups. The purpose of this activity was to get more information about Sangiran archaeological records, focusing on the lithic assemblages for a background that will be used for the future group activities in Sangiran. Then we visited lower lahar near Krikilan Museum, Pablengan Village, Pucangan to understand the geology of the area.

On the second day, few groups joined the 3D scanning session. In this session, we scanned two artefacts; a stone tool (Chopper) and a tooth (Bovidae) from Sangiran by BPSMP Sangiran. The main purpose was to transfer knowledge to Pokdarwis and YGC. This day started with a survey on the Cemoro River to collect some raw materials for experimentation. Then, we went to a sand mining area near the Manyarejo Museum.

Our next activity was visiting Ngebung and Bukuran Museum to collect more information. Our visit to Ngebung museum gave us a lot of information about the history of research in Sangiran, particularly about the archaeological value of the area and how the stone tools have been recognized. Second session of day three, stone knapping session began. The purpose was to produce flakes for the next experimentation in front of our local participants (Fig. I). We also tried to make some bamboo knives. Interestingly, one of the local participants was skilled at that, so he shared his knowledge with us and it made our task easier.

Next day, Fossil Group joined our group to do an experimental butchery (Fig. 2) for the use of the flakes that had been prepared the day before to identify the cut marks and intentional breaks on the bones. This activity purposed to create a reference collection about cut-marks and confront the structure of cut-marks using different tools. The next morning we interviewed Sadiman Subur, who worked in Sangiran regarding excavations, landscapes, geology, fossil collection and heritage. Later our group did a survey in Triangulasi area because in this area had been found the first stone tools in Sangiran. The survey aimed to search for some archaeological artefacts and to show the local participants, making them concerned about the importance of the place. In the rest of the day, we started the laboratory work about cut marks and use-wear. During this session the local people use the laboratory instruments and realized the importance of such devices.

The last day of field survey started with an interview with the museum safeguarding staff, in order to understand how they manage the archaeological records in the

Krikilan Museum and their relationship with the fossil hunters and local people who find fossils and artefacts in Sangiran. We also visited the museum storage to see some fossils and the way collections are managed. During the visit our local group participants from Pokdarwis and YGC were really amazed to see the collection which belongs to their land. Beside all of this work we also attended casting sessions, intended to share this technical knowledge among the local participants.

4- Analysis

The observation of cut marks is conducted with the binocular and Dinolite digital microscope. Both of the microscopes are available in the laboratory of the Conservation office of Sangiran Early Man site. In this observation, a magnification 20 - 30X was used to obtain convenient pictures (Fig. 3 to 7).

Experiments in use-wear analysis are useful for validating hypotheses and building reference patterns. Conducting experiment in use-wear analysis is a necessary work which may be the only way to obtain information on the nature of use-wear types. When the experiment achieved more realistic and imitative stage, it would produce more reliable data on interpreting traces remained on stone tools, especially regarding its use-wear. All observations were conducted with the digital microscope in BPSMPS. The observation focused on distinguishing different scars such as feather, step, breakage, the orientation that appeared in the experimental material.

From the observation on unretouched tools that had been used for removing meat from the bones, we could see clearly that the scars appearing along the cutting edges is hinge and feather termination which is caused by semi hard and soft material. For the direction of the scar we could see that there are two directions which showed us that the mechanical movement is back and forth.

From the observation on retouched flakes that had been used, we could see that the scars that appeared are feather and hinge termination which showed that it has been used for semi hard material and soft material. These scars appear on top of each other (superposition) caused by retouch activities. The direction of the scar also produced several orientations (bidirectional) which showed us that the mechanical movement is back and forth.

5- Discussion and Conclusion

Each activity had a specific aim, but there was a general goal to be achieved that was relevant in the framework of the HOH project. All the activities were planned in order to foster collaboration with. If they did not feel comfortable in an activity, then we failed to reach our goal. However, the task was not easy because we were trying to

communicate with local participants who never did such kind of activity before. This was particularly the case for 3D Scanning, identification of Cut Marks and use wear etc. which are generally implemented only in a purely scientific context.

The purpose was not to pretend that anyone could efficiently implement such approaches without a relevant training, but to bridge different groups of stakeholders by making the local participants aware of the interest to manage and analyze the archaeological record data and objects in a specific way. It was also important for them and for the project that they enjoyed the activities. Talking to them about the general experience we can affirm that they understood the methodology and the importance of a good management of archaeological records. It has not been boring for them and they shared video clips to their friends because they were proud of their results.

In general we got a good result because the local people learned. The basis of the methodology was to connect their knowledge about Sangiran to the field of prehistoric sciences (e.g. the technique to knap stones like during the Paleolithic times). It was also to make them enjoy the process of sharing methods for studying the archaeological records, contributing to the cultural dissemination in one of the most important areas in the world, without making it boring.

We think that continuing on this way is a good solution to develop local people's awareness and ownership of the heritage, hence fostering its conservation. Such an effort should include:

Practical scientific dissemination initiatives, e.g. how to understand several kinds of stone tools, how they are made, how they are used use, and how to distinguish between modern stone tools and those dating back to prehistoric periods.

General information initiatives about any heritage dimension included in the natural and cultural context of Sangiran (sites, landscapes, artefacts, fossils etc.)

Involvement of local communities members in seminars concerning Sangiran sites from different perspectives (management, conservation, research, development etc.).

The foreign and Indonesian participants from our group learnt many different aspects of knowledge from the local community. On the other hand, the participants from Sangiran experienced working in a practical way. More than that, all the participants now have much awareness concerning education about the heritage of Sangiran.

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ANNEX

Survey form: Collecting Prehistoric Data

Form Survei: Pengumpulan Data Masa Prasejarah

Name/ Nama: ……. Age/Umur: ……....

Sex/Jenis Kelamin: Male/Pria Female/Wanita Profession/Pekerjaan: ….....

Address/Alamat: ……...

Question 1: What do you know about the Stone tools found in Sangiran?

Pertanyaan 1 : Apa yang Anda ketahui tentang alat-alat batu di Sangiran ?

Answer/Jawaban:.

……..……
……
……
……
……

Question 2: How do you know? From where, you hear about the stone tools?

Pertanyaan 2: Apa yang Anda ketahui? Dari mana Anda mendengar informasi tentang alat-alat batu tersebut?

Answer/Jawaban: ……
……..……
……
……
……

Question 3: What is your Idea about the function of the Stone tools? Have you seen someone using stone tools?

Pertanyaan 3: Menurut Anda, apa kegunaan atau fungsi dari alat-alat batu? Apakah Anda pernah melihat seseorang menggunakan alat-alat batu tersebut?

Answer/Jawaban: ……
……..……
……

……
……

Question 4: Do you know how *Homo erectus* (Or the Ancient People) makes the Stone tools?

Pertanyaan 4: Apakah Anda mengetahui bagaimana *Homo erectus* (manusia purba) membuat alat-alat batu?

Answer/Jawaban: ……
……..……
……
……
……..

Question 5: Do you know about Knapping technic? Have you seen anyone doing Knapping? When and Where? Please describe.

Pertanyaan 5: Apakah Anda mengetahui tentang teknik memecah batu? Apakah Anda pernah melihat seseorang menggunakan teknik tersebut? Kapan dan dimana? Jelaskan!

Answer/Jawaban: ……
……..……
……
……
……

Number of Photographs/Jumlah fotografi:

……

Add anything find interesting (Only for Surveyor):

Tambahan informasi menarik (Hanya untuk pensurvei) ……
……
……
……
……

Date of Data Collection Name & Signature of Supervisor

Tanggal Pengumpulan data Nama & Tanda Tangan Supervisor



Fig. I Stone tools experimentation workshop



Fig. 2 Butchery experimentation workshop



Fig. 3 Cut marks on bones by bamboo



Fig.4 Cut marks on bones by unretouched flakes



Fig. 5 Cut marks on bones by retouched flakes

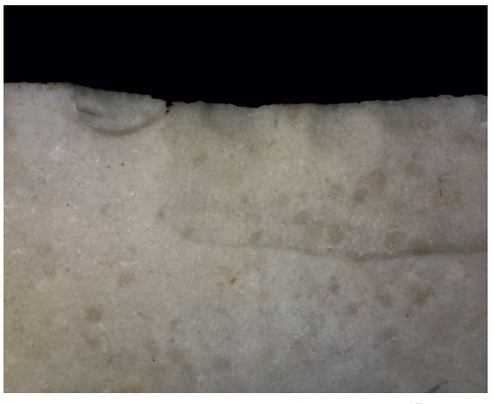


Fig.6 Use-wear on unretouched flakes used for removing meat from the bone



Fig. 7 Use-wear on unretouched flakes used for removing meat from the bone

Perceptions of Fossil Discoveries in the Sangiran Dome

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1- Introduction

This project focuses on the theme "Fossils". Our team is composed of various individuals from different backgrounds (archaeology, tourism, anthropology...), which influenced the way we saw fossils. As the Sangiran Dome is a very rich land fossil-wise, we wondered if the stakeholders involved in the preservation of fossils in Sangiran (government officers, scientists and local communities) also viewed fossils through different filters. In order to answer this question, we collected data directly in Sangiran by doing activities (such as visiting museums, sorting microfauna) and interacting with the stakeholders.

2- Material and method

We organized our activities in the field according to three very important pillars: conservation, science and community. The preservation of heritage englobes the production of data for present and future generations, but also the preservation of practices and the exchange of knowledge between both scientists and the community. The more we progressed into our schedule, the more we became aware

of the interrelations between our activities and these three different pillars.

a- **Three-dimensional scanning and casting** (Fig.I)

Three-dimensional scanning and casting are examples of activities strongly related to the conservation pillar. Three-dimensional scanning output can be used for research, science and education purposes without damaging the real fossil. We taught the process to the Pokdarwis by scanning a bovid tooth. The aim was to provide them a new tool of communication and education for the visitors. Casting can be used for science and education too. In the same manner, the Pokdarwis learnt to create fossil replicas to have a better understanding of what they show to the public.

b- **Construction of the scientific knowledge**

We kept on exploring conservation issues with the visits to storage rooms of Krikilan, Bukuran and Dayu museums. A staff member of Dayu Museum (Mr Niko), explained the ideal lightning level, temperature and humidity conditions for the preservation of fossils, and the reward system for the fossils seekers too.

We visited the exhibitions of the five museums of Sangiran in order to enhance our scientific knowledge on fossils. The permanent exhibition of the Krikilan Museum mostly depicted human evolution while the one in the Manyarejo Museum more focusses on the *Balung Buto* myth. In the Dayu Museum, we learnt more about the different strata that compose Sangiran ground.

Microfauna sorting (Fig. 2) allowed us to study a sample of sediment from the upper Pucangan Formation. The purpose was to participate in the reconstruction of the paleoenvironment of Sangiran, especially the Pucangan layers, whose sediments deserve more studies. It introduced the locals (Pokdarwis and Young Guardian Club) to a kind of smaller fossils they are not used to see.

Taphonomy and anatomy lessons are also other examples of activities strongly related to the science pillar. It enabled us to learn from scientists (Mirza Ansyori and Pr. Bienvenido Martinez Navarro) and a local, Pak Tanto.

c- **Interview of the different stakeholders**

We interviewed government officers, scientists, and local communities. For the

elders, we relied on Mr Subur, Mr Tanto, Mr Asmorejo and Mr. Siswanto testimonies. Mr. Subur and Mr. Tanto are involved with the Pokdarwis. Mr. Tanto is a fossil seeker, as well as Mr. Asmorejo and Mr. Siswanto. For the youngsters, we relied on the testimonies of the Pokdarwis Mrs. Lilis and Mr. Sumanto. We also interviewed Chandra, a Young Guardian, and Mr. Sukadi, the son of the discoverer of Sangiran 17, a *Homo erectus* fossil skull.

d- Activities with elementary school children

The meeting with students from Miri Elementary School is an example of activity strongly related to the three pillars. It was a collaboration with the Collecting and Managing Data Together group (see the chapter written by Anggraeni et al. in this volume). During this meeting, our main objectives were to make the children understand the importance of fossils and to give them knowledge about fossil identification and preservation (Fig.3).

For that purpose, we did a simple presentation on fossils. Then, they briefly put themselves in the shoes of scientists by playing at matching fossil fragments of *Bos* with a complete skeleton. Finally, they did a little tour in the storage room of the Krikilan Museum. This moment gave us the opportunity to speak about conservation practices.

3- Results

a- The value of fossils

Our data highlight the fact that the value of fossils change according to the different stakeholders involved in their preservation in Sangiran.

Local people give very different values to fossils, that sometimes contradict each other. For instance, an elderly, Mr. Asmorejo, views fossils as a medicine that can be used to cure diseases and discomforts, such as stomachaches, and heals people with elephant tusks. However, he also keeps some fossils for his personal collection. He was the only one that we encountered that thought that way, but there could be more like him.

Fossils can also be perceived by the locals as a tool to boost one's income, thanks to the reward system put in place by the government. Indeed, it goes from 100 000 to 25 000 000 Rp, which represents a month's worth of salary or more. On the contrary, for the elders, fossils have a sacred value, as they are linked to the *Balung Buto* myth,

and are therefore part of their heritage. Surprisingly, fossils hold no value whatsoever for some locals. It was the case for Mr. Siswanto, one of the most renowned fossil seekers in Sangiran and its surroundings. This diversity of answers could be explained by the different ages, jobs and geographical localizations of the locals we interviewed. For example, we learnt from Mr. Sukadi, a young local that participates in excavation programs, that people from Dayu do not look on purpose for fossils. It is a phenomenon that is proper to Sangiran. The reason behind this is still unprospected.

In comparison, the answers of the scientists are much more in accordance. For them, fossils are part of our heritage and a mean to reconstruct the past. The government officers that we interviewed have the same opinion. There are no contradictions between the way they value fossils. For them, fossils are mostly part of Indonesia's heritage and attractors to tourists.

It is very important to notice that all the stakeholders see, at one point, fossils through the filter of heritage. This is a very precious piece of information because it puts forward a common interest on the question of preservation. Nevertheless, we have to keep in mind that the heritage value is not shared by all the locals.

b- The reward system

As mentioned above, fossils have an economical value for most of the locals and members of the government. This is due to the reward system. It is fixed by law and proposes money in exchange for the report of fossil presence. The amount of the reward is based on the rareness of the fossil, its appearance and the honesty of the fossil seeker (as some people lie in order to increase the amount of the reward). This controversial system can induce good and bad behaviors among the locals. For example, it helps with the conservation, as fossils are put in one of the museum's storage rooms to be preserved for future generations. It also helps with the collection of data, as the locals are encouraged to leave fossils *in situ*, so the scientists can collect data on the site. In a more practical fashion, it can increase one's income in a significant manner. Nonetheless this system encourages people to regard fossils as an economic tool, and not as a part of their heritage. This loss of respect for fossils allows some people to be more creative in order to earn more money: some can separate or glue fossils parts together to get higher rewards, forge fossils out of stones, or go to Dayu, where people do not seek fossils, to look for them and then lie about their origin by pretending it is from Sangiran village, making it impossible to identify the original layer. This kind of behavior has a serious impact on the collection of data and can lead to false results.

c- Lack of sense of belonging

For most people in the local communities, fossils are a mean to an end and nothing more. This way of thinking has a serious impact on the conservation of fossils, which undermines the preservation of heritage and the collection of scientific data. Indeed, if the locals discard fossils or leave them on the site without reporting them to museums, they cannot be preserved for the future generations. It will not be part of our heritage since it will be unknown to the public. Moreover, scientists will miss the potential data provided by the fossils for a better understanding of the past.

However, these are not the only consequences of the lack of sense of belonging of fossils by the locals. In the most extreme cases people are caught smuggling fossils to be sold on the black market. Such illicit behaviors are related to their lack of respect for fossils. Fortunately, they only concern a handful of people. In general locals obey the reward system.

4- Discussion

a- Alternative solutions

Based on the problems we discovered, we may try offer a few alternative solutions which might at least mitigate some of the above-mentioned negative aspects:

- **The involvement of the locals in scientific projects**

Most of the local people in Sangiran do not seem to care or are not interested in fossils, nor in their conservation. However, during our discussions with few of them that had scientific experiences in Sangiran, we found out that they became more interested and aware of fossils after doing excavations. Pak Sukadi, the son of the finder of Sangiran I7, insisted on that point, as it happened to him. Involving locals in scientific research conducted in Sangiran may consequently improve their interest and knowledge regarding fossils. Scientists need not only to involve the locals who already have knowledge on fossils like Pak Tanto, but also the ones who do not have any. By doing so, we expect them to have a stronger sense of belonging for fossils, which could help their preservation.

- **Increase the institutions' involvement with the local communities**

The relationship between institutions such as museums and local people has a big impact on the conservation of fossils. The role of museums for the locals is to spread the knowledge on the importance of fossils and on how to preserve them. Until now, the activities conducted by museums to improve local people awareness regarding the importance of fossils such as education, socialization, and the reward system already have an impact on the locals' perspective and help improving fossils conservation (recognition *in situ*, better management of the report after a discovery, better understanding of the importance of the conservation etc.).

- **Community museum**

The community museum is one of the alternatives we discussed and offered to the locals. It is a museum that is owned and managed by the community. The concept is "the museum from the people, by the people, and for the people". In the case of the Sangiran site, we can offer the idea of establishing a community museum that focuses on findings which define Sangiran as a prehistoric site, so locals can preserve both the site and the findings. By giving the locals from Sangiran something they can own, they can take responsibility for that and have an increasing sense of belonging for fossils. After we presented this idea to some local people, we faced several answers: some really supported this idea, some supported this idea but thought they needed to get money from the government to manage the museum, and on the contrary, some did not care. Establishing a community museum in Sangiran would probably help some locals to feel responsible and increase their sense of belonging to preserve the Sangiran site, especially its fossils.

b- Perspectives

In order to push this project further we can increase the time spent in the field and the interactions between the participants and the local people across generations (youngsters, adults, elders), add an intensive language training of Bahasa for foreign students and English for Indonesian students and local people, and finally increase the interactions with other groups. Some of our activities could also be reconsidered, especially the ones focused on the conservation of fossils. Indeed, according to Mr. Sumanto the three-dimensional scanning was very difficult to implement. Photogrammetry would be more appropriate because the process is easier and less expensive. Moreover, the Pokdarwis noticed that casting is easier than three-dimensional scanning to reuse for the visits.

c- Future projects

This project is a multi-group project, as it is not just about fossils but the collaboration between all the groups. By increasing the interactions with the other groups, we would have more interesting results, and answer some questions left unanswered.

We came up with a few ideas that could improve future projects, such as having more activities with the children, have a lesson of taphonomy with the River group, have discussions with the Landscape group regarding the impacts the change of landscape can have on the preservation of fossils and have an intensive taxonomic study with the First humans group.

5- Conclusion

Our interdisciplinary approach enabled us to figure out the values of fossils for the different stakeholders involved in their preservation in Sangiran. These values are numerous, but the heritage value is recurrent. The economic value given by some locals and the lack of regard for fossils by an important number of them appeared to be the main problem against fossil preservation.

The most relevant strategies found to solve these problems are the increase of exchanges between communities and scientists, and the empowerment of the local communities. Indeed, some of the locals have specific scientific knowledge to share, and our data showed that the more people are interested or get invested in a heritage project, the more they care about preservation.

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Fig. I Fossil casting by Hernawan (Iwan)



Fig. 2 Microfauna sorting



Fig. 3 Interacting with the children

Perception of Human Evolution in the Sangiran Dome

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1- Introduction

According to UNESCO, Sangiran is one of the key sites for understanding human evolution. Besides lithic technology and animal remains, more than 100 individual fossils of *Homo erectus* dating back to 1.5 million years ago for the oldest have been found in Sangiran sites. This fact has created an intricate interaction between local understanding and scientific knowledge around this topic. Therefore, within the scope of the HOH program, the main question we developed is *how different levels of understanding human evolution interact in the Sangiran dome*.

Conservation, heritage and dissemination were assessed as the prime concepts of our study (Fig. 1). The second-level concepts consisted of three main actors: museums, YGC and Pokdarwis. Finally, the third-level concepts stemmed from interactions between the latter, encompassing activities and concepts such as comparative anatomy and linear evolution.

2- Methods

The methodology implemented followed different approaches, such as interviews, visits to museums and dissemination activities.

a- Interviews and visits

Here we discussed with three locals, Pak Marwandi, Pak Subur and Pak Ratmo.

Pak Marwandi is member of the Pokdarwis, a local heritage awareness group, who volunteer as museum guides within the Sangiran dome. He and Amanda (a member of YGC) participated with us throughout the week-long project. Gathering information with Pak Marwandi was mainly collected during museum visits. Indeed, he first visited the Krikilan museum as a guide for us. Hence, we could evaluate his knowledge about human evolution, as well as his opinion of the exhibition itself in terms of the relevance of the data presented to the public. Therefore, we asked him precise questions, for instance how he understood evolution when it came to phylogenetic ancestors, species that were living during the same time periods, etc.

Pak Subur is one of the founders of Pokdarwis. We visited him in his house where we discussed the history of Sangiran, the role of Pokdarwis concerning dissemination and heritage in the past, present and the challenges for the future.

Pak Ratmo (Fig. 2) is Toto Marsono's son (founder of the oldest Sangiran museum). With him, our approach focused on local archeological history to understand how visions of human evolution have been developed in the dome. We finally interviewed Pak Iwan Setiawan Bimas, the head of utilization and conservation at the Krikilan Museum. Here we tried to understand his opinion on the fossil heritage and more importantly the nomenclature of hominids found in Sangiran.

We visited Krikilan, Bukuran and Ngebung Museums. We tried to pinpoint the advantages and disadvantages of the different exhibitions we watched.

b- Activities

We first identified the main issues and concepts involved in our research question. Then we tried to figure out how to unravel them through some activities (identifying fossils, doing some experimental: casting, 3D scan, and learning from compared anatomy - Fig. 3).

The field activities allowed us to acquire information from direct sources and explore different aspects of the subject. We aimed to understand how, from specific inputs such as human fossil discoveries and their oral dissemination, different ways of understanding the "first humans" appeared. We also tried to understand how these inputs have an implicit value particularly related to heritage, dissemination and conservation. Additionally, interacting with concerned local people allowed us to exchange knowledge, as well as identify and clarify some aspects that were

misunderstood.

3- Results

a- Interviews

A first meeting with Pak Marwandi introduced us to the intricate boundaries between scientific knowledge, common knowledge and dissemination. Indeed, during the first visit of the Krikilan museum, Pak Marwandi explained how he approaches the topic of human evolution depending on the person he is dealing with. When visitors reject the idea of human evolution, he usually explains it in general terms as a hypothesis, in an effort to respect their beliefs. Otherwise he explains human evolution by splitting *H. erectus* into several species and subspecies (e.g. *Meganthropus*, *Pithecanthropus*, *palaeojavanicus*, archaic, typical, and progressive types). During the guided tour he showed a deep knowledge of the stratigraphy of Sangiran dome, prehistoric fauna composition, stone tools, discovery of fossils and their relationship with local myths.

Pak Subur is one of the co-founders of the Pokdarwis group. Together we discussed how scientific knowledge of human evolution can be disseminated in the Sangiran dome. Moreover, Pak Subur gave us a lot of information concerning what can be done in the future and how locals view human fossils and evolution. According to him, a lot of people living in Sangiran do not believe in the concept of evolution or simply do not know about it.

Pak Ratmo is the fifth son of Toto Marsono, the founder of the first museum in Sangiran. He explained the history of Krikilan, when it was first created, how and why it was moved and how his father transmitted this knowledge to him. That is why Pak Ratmo knows a lot about fossils, including how to recognize and combine them according to the process of evolution. Therefore, we were able to better understand the locals' perspectives about this very topic, and how his family managed to enlighten discoveries of surrounding fossils.

Pak Iwan Setiawan Bimas, from BPSMP Sangiran, explained how to disseminate information to locals (e.g. discussing with teachers about fossil naming and how they are linked to the history of research). He also attempts to provide knowledge to the locals so that they can understand the importance of their heritage. Recently, with the help of governmental funds, he was able to write a book about the different names that fossils can have. He thinks it is important to keep the historical names (*Meganthropus*, *Pithecanthropus*, *paleojavanicus*) in the exhibition.

A museum saleswoman was part of the second generation of shop owners. She told us that she does not know how to read, and therefore it has been difficult for her to

understand the information provided by the exhibition. Moreover, she was not able to tell us the differences between *H. erectus* and *H. sapiens* nor to say to which species we belong. She also told us that the articles she sells do not come from a particular interest in human evolution, but rather she only sees the financial benefits from them.

b- **Visiting museums**

The three museums that were visited, Krikilan, Bukuran and Ngebung, each brought different aspects of our reflection around the main question of the first humans in Sangiran.

The Krikilan Museum has been targeted mainly as an important museum for public dissemination. However, data shown to the public are split into both old and new representations with the same vision. This vision is somewhat connected to the notion of linear evolution. More interestingly, some rooms display information that echo each other. Indeed, the last room shows an old representation of *Homo erectus*, dating back to the seventies, in contrast to the new artistic version of *Homo floresiensis* just in front of it. It is interesting to pinpoint these two contrasts in the same room, even though both refer to the vision of mankind dominated by nature. One could say this reflects a romantic interpretation of prehistory.

Linear evolution is not only displayed at Krikilan museum. In fact, Bukuran also shows this somewhat biased vision of evolution. The Bukuran museum tries to show the gradual evolution of fossil forms from *Australopithecus* to *Homo sapiens* (Fig. 4). What we have found in this representation is that lack of « proper » knowledge about human evolution leads to the belief that *Homo sapiens* slowly and gradually evolved from a single *Australopithecus* who himself evolved from several *Australopithecus* subspecies, evolving into *Homo erectus*, *Homo heidelbergensis*, *Homo neanderthalensis*, and finally *Homo sapiens*. Amanda asked several key questions allowing us to identify the main misunderstood concepts; after looking at the linear display of hominids, she asked why there were two or more species living at the same time (e.g. *Australopithecus* and *Paranthropus*). In fact, she thought if species evolved in a linear way, it would imply that one species came from another one, so they couldn't coexist. This question made us take a long hard look about the way of representing evolution in museums and how it could be misunderstood.

Additionally, migrations and the way the « Out of Africa » model was explained is another problem we discussed. When you look over the panels of the museum, one ought to think and understand that humans are direct descendants of *Homo erectus lato sensu* and that Java island is the core place from where *Homo sapiens* comes from. We know that *Homo sapiens* appeared in Africa during the Middle Pleistocene and not in Java. Therefore, panels explaining migration models seem

old in terms of the extant scientific theories. Moreover, the same panels show *Homo sapiens* splitting into several "races", such as mongoloids, negroids, australoids and caucasoids. This was deciphered as a real biological concept, bringing us back to the beginning of the 20th century when the eugenic move was at its highest acceptance. Again, this part was a very interesting result as it shows an issue when it comes to explain intraspecific variation to the public.

Ngebung museum was the last one we visited. It does not really focus on human evolution in itself but more about the history of research in the Sangiran Dome. In terms of dissemination, the information is accurate and it provides both scientific knowledge and cultural knowledge. For this reason, the Ngebung museum is an important asset for dissemination: we can learn about myths (such as the Balung Buto) that were shining before the beginning of the scientific studies and that are still present in Sangiran. Otherwise, this museum also gives important information about the discoverers and researchers who worked in the dome as well as the current and new researchers working in now. Therefore, we can also learn about the concepts behind the naming of the fossils, varying from one researcher to another as well as some evolutionary points of view (homology of shapes, should the fossil studied be put in a new species, subspecies and so forth...). Insights given in this museum are therefore heavily related with the notions of property, identity and therefore to politics, heritage, conservation and dissemination.

c- **Academic activities**

The goal of these activities was to strengthen the knowledge of fossils. We studied the cranial features of some extinct species such as *Homo erectus* and *Homo neanderthalensis* with Pak Marwandi, Amanda, and some other YGC members (Fig. 5). This was the first part of the learning process. We then switched to 3D scans which purpose was (i) to find the proper *H. erectus* cast to scan; (ii) to identify some autapomorphies of *H. erectus* and (iii) to save it into the computer that, later, was given to the headmaster of Girimargo elementary school for educational purpose.

All the groups have been able to see how casting works with real artifacts such as bones and bolas which purpose was, again, dissemination. Finally, we studied postcranial features between pig, deer, *H. sapiens* and some *H. erectus* casts in a comparative anatomy process. Therefore, the visit to the Krikilan museum storage was another way of understanding variability in fossils and how to differentiate a species from one another.

4- Discussion

From the interviews we were able to perceive changes for two main issues linked to the first humans in Sangiran. Indeed, a political sphere containing concepts such as property and identity seems to be a recurrent vision of Sangiran heritage. However, we found that this sphere has been replaced by a deeper layer in which conservation and dissemination are now the main concerns. Those involved encourage strategic activities that could have an impact at both a local and global level.

Concerning the activities, the dissemination of scientific knowledge plays an important role, specifically in schools and educational institutions or organizations in general, such as YGC. This could have an essential role in the reinforcement of conservation and heritage spheres.

However, in museums for instance, we still found some concepts of the most superficial level, e.g. linear evolution, biased by preconceived ideas and a romanticized interpretation of prehistory. We think this issue should be deeply studied in order to modernize some exhibitions, make them more interactive, etc.

5- Conclusion

In order to answer the original question: *How different levels of understanding human evolution interact in the Sangiran dome*, this study proposes that human evolution in Sangiran is displayed by three different levels of understanding. Through different activities we tried to unravel complex interactions between them. This allowed us to exchange knowledge, identify common and scientific knowledge, and identify some misunderstood concepts.

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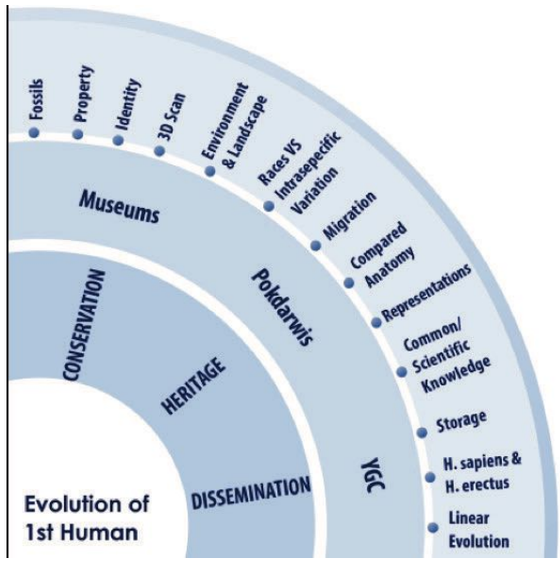


Fig. I Diagram organizing the three concept-levels we identify. Conservation, heritage and dissemination were assessed as the prime concepts. The second-level concepts consisted of three main actors: museums, YGC and Pokdarwis. The third-level concepts stemmed from interactions between the latter, encompassing activities and concepts.



Fig. 2 Pak Ratmo guiding us through his house in order to explain the history of his father's studies



Fig. 3 Activity of compared anatomy of postcranial features in different species



Fig. 4 Room in the Bukuran Museum exposing human evolution through fossils from *Australopithecus* to *Homo sapiens*



Fig.5 Identifying cranial features on hominid fossils

The Place of Science in Sangiran's Society

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1- Introduction

The main interrogations that guided us during the development of this study concern which elements make Sangiran a place of science. The whole communication and economy of the place turns around the fact that it is a site of major scientific discoveries, and our analysis focusses on why and how is was established.

To better understand these interrogations, it is useful to know that Sangiran has been known since 1936 for its discovery of *Homo erectus* fossils (or *Pithecanthropus erectus* at the time), by the German geologist and paleontologist G.H.R von Koenigswald. This kind of fossils had already been found before that time in east Java and began to attract researchers. The scientific enthusiasm for the region allowed new discoveries inside the Sangiran dome that made it famous all around the world. After his first discoveries, von Koenigswald and other teachers trained and surrounded themselves with local researchers, notably the archeologist R.P. Soejono, the geologist S. Sartono and the paleoanthropologist T. Jacob. These three eminent researchers then trained their own students: H. Widianto, H. Truman Simanjuntak, Y. Zaim and T. Djubiantono worked with a lot of international scientists of different disciplines on the Sangiran dome.

The Sangiran sites generate a special interest for the knowledge of the prehistoric

cultures of Java and Southeast Asia as they record main discoveries in the understanding of human evolution for the Lower and Middle Pleistocene. With the museums and sites of Sangiran, it is possible to present a chrono-cultural framework of the archaeological sequence in a clear archaeo-stratigraphic context. The consequent amount of I.5 million years old human and animal fossils and artifactual discoveries makes Sangiran one of the key sites for the understanding of *Homo erectus* evolution, paleoenvironment and dispersal through the Asian continent and archipelagos.

Sangiran is a place where discoveries and research are closely related. The process of the archeological work (from the site investigation to a scientific publication) in the case of the Sangiran dome can be explained with the differentiation of several important steps in order to understand the context in which actors are evolving.

The first big step is excavation. But before that, field surveys are usually conducted by scientists who have a good knowledge about scientific concepts (such as stratigraphy, geology, anthropology). They work with the help of local people who are interested in archeology and have a very good knowledge about their own lands. Most of the sites are found due to a fortuitous discovery or by field survey. Some museums (like Manyarejo and Pucung - nano museum (Fig. I,2)) ground their historical and scientific communication by presenting real excavations in order to explain archeology and its disciplines and raise awareness about the importance and the complexity of a heritage site. An excavation is an activity which combines a lot of different disciplines and their researchers. Archaeologists, geologists, paleontologists and others must work together and link their knowledge for the same purpose that is to understand the site and its contents. An excavation is also a place of training and practice for the next generation of researchers and for locals.

The second step is the laboratory. After the excavation, the fossils, artefacts and sediment samples follow different steps such as identification (e.g. anatomy for fossils), conservation (cleaning and fixing) and classification and study by the scientists (Fig. 3).

People working in Krikilan Laboratory (and from the other clusters) have various backgrounds such as archeology, biology, chemistry and physics and work for a various amount of time together, depending on the number of fossils excavated. Once in the storage room (Fig. 4, 5), scientists can access the material for their research and write their publications before they share it with the local people who helped in the discovery of the fossils via the museums. Public can also have access to the PDF of the main articles about Sangiran in the Dayu cluster or in the library at the Krikilan cluster. Socialization produces knowledge for local people and help them understand the scientific disciplines that are directly affecting their life via excavations. Moreover, Pokdarwis and YGC (Young Guardian Club) contribute to spread the knowledge about Sangiran dome to the local people and to the visitors

of the site: history, discoveries and their meaning for human evolution but also an expertise in the survey of valuable sites, their preservation and the identification and preservation of fossils.

2- **Material and methods**

To understand what makes Sangiran a place of science we met and questioned scientists about their work in the museums of Krikilan, Dayu, Bukuran, Ngebung and Manyarejo, all linked with an excavation site in the Sangiran dome. Four of these five museums are also a place of research with laboratories, reference collections and libraries. The museum of Manyarejo is still a very interesting cluster for the scientific aspect since it shows the original archeological excavation of this site. We also visited the excavation of Pucung, near the Dayu cluster that is an ongoing excavation (only paused for the season) and its "nano museum". In order to understand if the scientific aspects of Sangiran are appreciated and understood by the local people, we had conversations with about 25 persons.

To the tourists around the different museums we asked which was their motivation to go to the museum, if they knew about the place before they came, if they came for the scientific aspect, if they lived in the region. We questioned them before and after their visits in the museum at the most peak hours (end of morning, beginning of afternoon and end of afternoon). Some people were unwilling to talk with us due to their shyness and only answered very basic questions such as "did you already knew the museum?", "did you like it?", without more development.

To the local inhabitants we asked what they knew (in terms of human evolution, fossil identification, paleoenvironments, stratigraphy etc.) about Sangiran, if they already had interactions with scientists (archeologists, paleoanthropologists, geologists, zooarchaeologists) and what they were thinking about the infrastructures dedicated to science in their area of living. We came to these people with a list of questions mostly about their perception of science in Sangiran and their sensibility to the prehistory of the site but we realized that it was easier to have a more casual conversation with them to collect this kind of information instead of following a list of questions. Some were very enthusiastic about talking to us and they anticipated a lot of questions, while others were more reticent when we questioned them especially since we recorded most of the interviews to be able to make a synthesis about their response afterwards.

3- **Results**

According to all the interactions we had with different actors during this study we came to the conclusion that Sangiran is a rich place for research and collaboration

for people coming from many countries (Indonesia, Philippines, France, etc.). In every museum visited, the focus is placed on the diversity of persons who were able to work on the Sangiran dome.

But the actors for the collection of data are not only the researchers but also the local community who acquired expertise in the identification of stratigraphic layers and fossils with the help of scientists.

We had the chance to meet some people who benefited from these experiences and were able to find work in the archeological field Fig. 6, 7). They keep a very good memory of this time and still want to help for the fossil determination. Their knowledge is very valuable, and they are enthusiastic to spread it in their surroundings. The involvement of some local community people in fossil understanding is a supporting factor towards the development of Sangiran as a center of science.

Of course, more and more people (especially young persons) show a poor interest in archeology. Most of the children we talked with did not have a clue of the scientific value of Sangiran and did not seem interested about it.

Sangiran as a center of knowledge cannot be separated from the role of local communities and community organizations that work as partners to support tourism, and also support Indonesian and international researchers (Fig. 8) with the moral responsibilities to develop the Sangiran site as a center for science. Since each cluster has its own laboratory to conserve fossils found nearby, it is expected that their presence is a strong support for learning about the conservation and identification of fossils between other scientific techniques (e.g. consolidation, casting, rehabilitation). We saw how accessible the persons working in the laboratories are and how enthusiastic they are when it comes to explain their job in the laboratories. They explained to us that a lot of local people interested in archeology and usually members of an organization such as Pokdarwis are welcome to come to the laboratories in order to learn scientific techniques used on fossils.

An example of international collaboration that takes place in the Sangiran dome is the program Human Origin Heritage (HOH). The collaboration between Indonesian and European Universities, bringing Indonesian and foreign students work along with local communities, opens various perspectives on the knowledge of the prehistorical importance of Sangiran and related perception in the dome. This program aims to share information between students from different research fields and local communities and their experience.

During our research, the help of the Pokdarwis members was very valuable. Although they do not have a scientific background, they are local experts of the history of Sangiran and its different museums. With their museum tours and collaboration with

programs such as HOH, they play an important role as safeguards of the regional scientific heritage. They cover the entire five clusters of Sangiran. According to them it is a way to increase a little their earning while doing something they think important for the region.

Challenges highlighted by Pokdarwis members are largely technical and about their well-being. Their main expectation is a better coordination with several key stakeholders, such as BPSMP Sangiran, regional government, the Department of Tourism and their own organization. Besides being more regularly involved in field research tasks, they would like to receive more training from the support of these authorities, including language courses and also more administrative help to secure the acknowledgment of their skills, promotion of their services and, if possible, a regular income.

The role of YGC as a youth (junior and high school) organization is also very important in the spread of science in the local community. Besides from school, they often get involved in museum activities in Sangiran. Their presence and enthusiasm about prehistory in Sangiran is useful to spread scientific interest in the youth population by participating in programs such as HOH since they can act in their school and organizations by raising awareness of the scientific value of Sangiran. Now YGC is facing the classical problem of many voluntary associations which is regeneration and sometimes lack of interest of their classmates arguing that their activity looks monotonous, the museums not offering enough opportunities. This phenomenon points to the importance of developing scientific activities for high school level.

The concerns of BPSMPS (Balai Pelestarian Situs Manusia Purba Sangiran) are divided into two main parts: infrastructural provision and regulation with regards to safety and enhancement of scientific instruments and incentives. The technology which enables laboratory macroscopic analysis is hoped to develop, and they are conscious that such a development implies also an investment in safety devices (e.g. for chemical products use). Therefore, their hope is that their institution can fully fulfill in the future both their demanding non-researching responsibility and their research one.

4- **Discussion**

A huge investment has obviously been made in order to develop Sangiran as a center of science, although there are still opportunities for the enhancement of the scientific environment, including through a deeper involvement of the local community. Pokdarwis, as an established community with strong commitment, can participate in the scientific activities, in the dissemination of knowledge and benefit from foreign language training.

Concerning the YGC, the problem of regeneration could be addressed by involving broader audiences from non-YGC members to generate awareness and bridging a sustainable dialogue. For them, language training is needed as well for education purpose or the ability to absorb more resources of knowledge.

There are opportunities for Sangiran's laboratories, although budgetary constraints obviously limit the speed of development.

5- **Conclusion**

Depending on the actors, the value of Sangiran is not the same. From a researcher point of view, it is a site that brings major knowledge on human evolution with its worldwide famous *Homo erectus* remains. The creation of infrastructures of research had an impact on Sangiran and its inhabitants that is perceived in a mixed way: some locals don't understand the implication of the government but others can see an opportunity to share their knowledge about fossils investigation by working directly with the scientists. As a result, on the local people point of view, the scientific aspect of Sangiran can be beneficial since it gives importance and notoriety to the region, emphasize tourism and economy and create jobs or opportunity for some experienced amateurs, non-scientific experts such as local fossil collectors, Pokdarwis and YGC to spread their knowledge about the site and emphasize the importance of Sangiran as a place of science.

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Fig. I Manyarejo Museum



Fig. 2 Nano Museum of Pucung site



Fig. 3 Taking care of material



Fig. 4 Storage

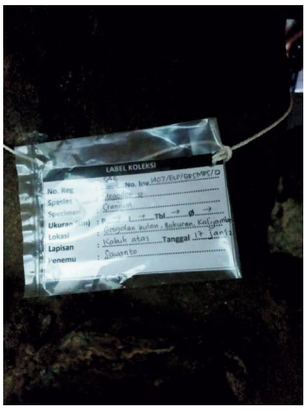


Fig. 5 Labeling

Pak SutantoP(



Fig. 6 Field survey



Fig. 7 Discussion with Pak Sutanto (who works with many scientific teams)



Fig. 8 International collaborations: inauguration of Krikilan Museum, 2011



Example of human evolution perception: Batik of pupils' shirts (Girimargo elementary school)

CHAPTER 6 - Children and Heritage

Preserve the Heritage: a Case Study Based on Local Participation in Managing Prehistoric Collection at Miri Locality, Central Java

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1- Introduction

The objective of our project was to assess how local population could be involved in the collection and management of scientific data from the field to exhibition. An additional objective was to establish the need of developing a database or a geographic information system for the Miri museum.

Those questions arose for different reasons: many fossils are accessible directly from the surface in the Sangiran dome and its surroundings. Some people know how to recognize them but not everybody. The fossils will eventually be left on the site or sometimes taken by someone who will bring it home or to the museum but, in most cases, some data will be lost. The idea was to assess if a simple way of collecting data coupled with awareness on fossils could enable the local population to be more involved in the preservation of their heritage. The second objective is about the need or not to develop a computer database with or without mapping. Currently there is a common database for Krikilan museum and Miri museum but with very few data and no mapping. The idea will be to assess if the use of a simple database by the curator of Miri Museum is possible and if GPS data collection and mapping can be realised easily.

To work on those questions, we went to Girimargo I Elementary School for six days, in order to develop a simple but scientific method of collecting data based on a participatory approach. The school is situated in the Sragen regency, Miri district, 25 kilometers from Surakarta and 13 kilometers from Sangiran museum in Krikilan. This site is interesting because it is a picture of the natural evolution of the two last million years, which is linked to the uplift of the Kendeng hills and the recession of the sea from Solo depression (Sémah et al., 1990). Today, it is composed of rural landscapes, shallow woods and several rivers. This area consists of sandy and clayish limestone, sandstone, mollusk-bearing sand, marls and deltaic conglomerates (Djubiantono & Sémah, 1991). Many excavations were conducted and discoveries were made in the Miri area since the 1980s and fossils are currently easily being found on the surface.

The Miri museum opened in Girimargo Elementary School in 1988 to present the fossils discovered in the area. It has been renovated in 2017. The collection of Miri museum is not complete, a part of it having been moved to Krikilan museum during the past years. Almost no discovery has been reported in Miri locality since the excavations 30 years ago.

2- Equipping, teaching, training: how the children experienced fossil finding

a- Equipment and method

During the program and prior to work at school, several tools were acquired and developed. First of all, two smartphones and one computer were acquired. The smartphones were to be used as cameras and GPS, and the computer was to be used as a support for a database. The choice of using a smartphone instead of a GPS tool is justified by the wide and easy use of smartphones. GPS Map Camera is a free photo application combined with a GPS that was installed on both phones. To be sure that the application gives the right localization, the GPS point was checked several times with a GPS tool. A prototype of a very simple database with two parts was developed: one part to input the data and one part with the list of registered data (user interface). Survey forms for children and teachers were also created to collect and check the data directly on the field during the simulations (Fig. 1)

Two simulations were conducted in which data collected by the children were composed as follows: Name; date of discovery; context of discovery; date of collection; location (longitude, latitude); picture; colour; sediment; type of fossil; represented anatomical part. Some personal comments were also allowed. For the teachers, the form was mainly composed of verification issues. For items with a number of possible answers, multiple entries were suggested on the forms as well as a possibility for children and teachers to give their own answer if not in the list.

The participants of this assessment were composed by ten children from Girimargo School, all in 5th grade and among the best students of the school. There were also two teachers and the future curator of the Miri museum. During the week of collaborative work with the school, only two hours per day with the children were allowed because of the period of religious fasting. Every morning was dedicated to work with children and every afternoon dedicated to team work.

The children were separated in two groups, each one composed by three girls and two boys. Thereby each group was given a smartphone and the simulations were designed to allow them to experience this assessment as a game.

A roadmap for simulations was defined by a flowchart created beforehand.

b- Training process

To be able to test the method, a training process was developed for the different participants of the assessment. It consisted of several steps:

- Awareness about fossils using very simple lectures

- Training with technological tools
- Simulations on the field: fossils searching with data recording
- Data input

c- Introducing Prehistoric Heritage

To introduce prehistoric heritage, a short lecture was given to the children in Miri museum about the origins of fossils, their recognition and the reasons for their preservation.

A more specific lecture was given by another group from the HOH program at Krikilan museum (Sangiran) on the same topic. However, they added details and new subjects, such as compared anatomy to identify a fossil and history of human migration from Africa. The children were also introduced into the museum laboratory where they were given the opportunity to look at researchers' work and at the storage room. They were given explanations on the conservation process in the museum and about the exhibition. Finally, for their last moment in Sangiran and to complete their training, the children had a demonstration of artefact casting (Fig. 3).

More teaching was also given during the second simulation. Some researchers took advantage of this moment to talk to the children about the formation of Kedung

Kancil stratigraphic layers and about the previous landscape covering the area there.

d- Using the equipment

Prior to simulations, and to ensure they were done correctly, the children were shown how to use the smartphones and the Camera/GPS application and how to take a correct picture with proper good light and a scale (Fig. 4). An introduction about the collection of data, through the survey form, was also given. To ascertain the children understood all the process, a game was organized inside the school garden: some fossils were hidden and clues given to children to help them find the fossils. Afterwards they had to take pictures and record data as explained earlier.

e- Gathering the information from the field through simulation

The heart of this assessment was the work on the field using the instruments. The children were brought on two different simulation sites in two days (Fig. 2 & 5).

The first site was along the Giren River, five hundred meters from the school. For this simulation, four fossils from a storage room were hidden along the river. They were put on the surface and arranged in such a way that they were easily findable. Two delimited areas were created, each area containing two fossils. After some reminders, the children were asked to work by team to search for the fossils. Each team was provided with a smartphone, two survey forms, a pen and two plastic bags (to collect the fossils). After collection of fossils they had to report the data to their teachers so that they could ensure the data were taken correctly. The teachers had to fill their own form afterwards.

The second site was Kedung Kancil, along Kaliuter River, five minutes driving from school. For this second simulation it was decided not to hide fossils but to let the children find fossils by themselves, the site being a good provider. As before, some reminders were given and the two teams looked for fossils using the same process as for the first simulation.

f- Inputting and managing data after collection

Back to school after simulations, the curator got back the smartphones, the forms and the fossils from teams and teachers. He had then to validate the data and to input the data in the database.

g- Environmental care

It has to be noticed that after each simulation, some awareness about plastic pollution was given. The two sites of simulations were heavily polluted and it seemed that it would be interesting to discuss with the children about it. Girimargo I School is already engaged in this kind of action so it was not new for the children. Everybody was asked to clean all the plastic bags they could see for 5 minutes. Eventually they were brought back to be thrown using the school disposal facility.

3- From school children to "young archaeologists"

The main difference between the two simulations was the use of hidden fossils in the first one whereas the children had to find *in situ* fossils in the second one.

For the first simulation (Giren River), it took the children about thirty minutes to find the four fossils hidden and to collect the data. During this simulation they did not really know what to look for at first. During the second simulation (Kedung Kancil) they found six fossils that they recorded and they brought back four of them. About the two fossils they left on the site, one was a shell stuck into the rock and they considered the other one not in danger. There was no difference in the recording of data between the two simulations but they looked more comfortable to recognize fossils on the second one.

Throughout simulations, all the actors correctly followed their roles as defined in the flowchart. The forms were filled and validated at each simulation and data were entered into the prototype database. Eventually, a map was developed using data collected on the field.

It should be observed that the Camera/GPS application recorded the localization of the pictures in the meta-data on the computer. Thereby, it could be used as a validation process for localization of the finding.

4- Discussion: an experience to be renewed

a- Success and difficulties

Several good points were raised during this program:

- All of the participants were interested and well involved.

- The flowchart was well adapted.
- After the end of the program, a new fossil was brought back to the teacher by a child, data were collected and put within the database.

But there were also some difficulties:

- For the children: it was not always easy to differentiate between stones and fossils and it was not easy to take good pictures (without shadow, or with paper scale well visible).

- For the curator: it was difficult to input new data in the database without help as he never used a computer before.

The time with the children seemed to be short at first but was actually enough. It was also challenging to always keep them interested through games and interactive awareness.

b- Larger scale implication

At last, the aim of this work with the local school was to assess the possibility of involving the local population in the preservation of heritage. Indeed, the ultimate goal is to improve the quality of scientific recordings from the local population. However, it has to be noted that this sample is not representative of the local population because of the small size of the group and its characteristics (selected children). For this group of children, the result was positive and could be representative of what could be done with other children from the school.

The school and local government of culture and education expressed their support to further program engaging heritage preservation in the school. That is to be noticed that school has a good motivation by being engaged in Adiwiyata Green Schools competition from UNESCO. Teachers would like to keep raising awareness among the entire school and try to involve children in the creation of exhibitions in Miri museum. It has to be hoped that the school would still feel concerned by heritage preservation after the competition.

To be clear with the project, it was reminded to the children that they were not trained to hunt fossils, which is totally forbidden, but only made aware about the importance of the preservation of their own heritage.

During the program it was discussed the possibility of giving rewards to the children

when they find a fossil. The only available example is the Krikilan Museum which gives money to people bringing back fossils there. There are many pros and cons about it and it was finally decided not to give a reward for finding a fossil. Instead, they were offered backpacks and books during the first days. The idea here would be to bring heritage preservation to become a cultural habit.

Despite the difficulties faced by the curator to use the computer, he expressed his motivation to learn and to use this kind of database. His feeling is that it would be more efficient to update and organize the data and would be more long lasting than on paper.

The accuracy of recorded data might not be fully guaranteed with the use of participatory approach. However, this kind of citizen sciences could allow saving more heritage and data than if it was not achieved. Also, the validation process enables improved data recording.

5- Conclusion and perspectives

It was agreed that program was a success. It shows that it is possible to involve motivated and aware children in the action of collecting scientific data even if this sample is not representative of the local population.

The motivation expressed by the different stakeholders could be a good start to develop standard awareness on heritage preservation in the Miri area. The computer and the two smartphones were offered to the school so they can keep collecting data as well as a poster (Fig.6) to present the work accomplished during the week.

The interest related to the database comforted the idea of developing a more complete and specific database, in which classification and research tools would have to be developed in the future.

Acknowledgements

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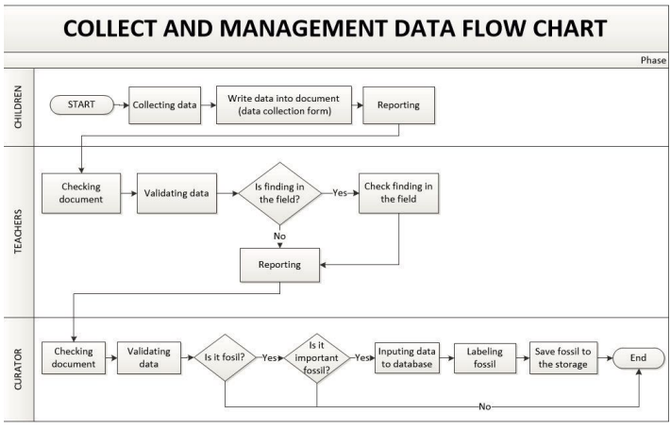


Fig. 1 Data collection form

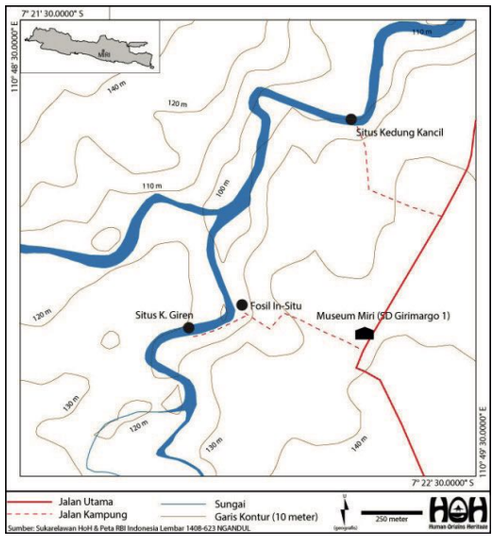


Fig. 2 Map of Giren River (simulation I) with positioning of the different findings



Fig. 3 Demonstration of casting



Fig. 4 Training session: the use of smartphone to take pictures of artifacts



Fig. 5 School students collecting data from the field at Giren River (Simulation I)

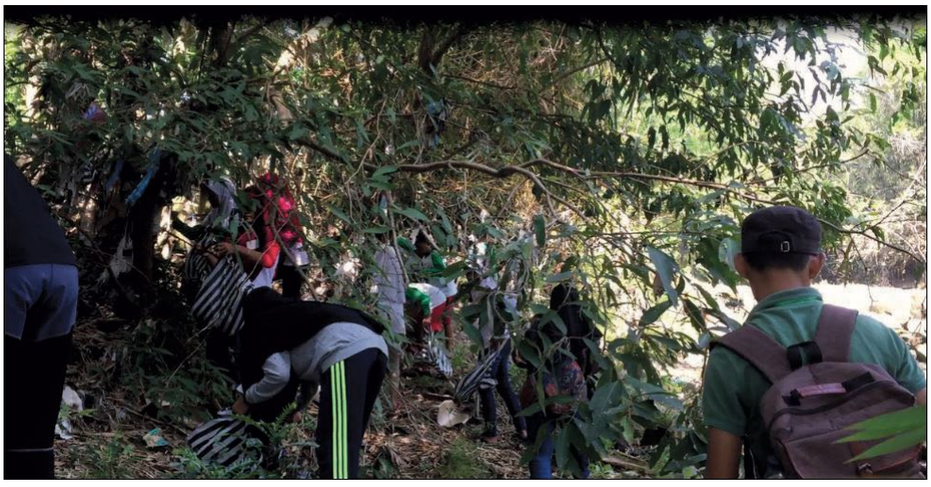


Fig. 6 Environmental care



Fig. 7 Full team of school students, teachers, curator and students from CMDT group at Krikilan Museum



Team HOH 2018



Team HOH 2019



Local communities certificate award - Dayu Museum 2018

Diploma supplement award - UKSW 2019

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Hasna Aulia Zulfa

Laila Rahmanda Sari

Lanix Atlasia Musa A.A

Muhammad Wafid Mutarrif

Mutiara Solikhah

Among other involved members of communities

Hernawan

Ikhsan

Jumadi

Suratmo

Sutanto

Yuli Purwanti

MATUR



Together with Pokdarwis "Wonderful Sangiran" members



Seminar with Pokdarwis and Sragen government representatives

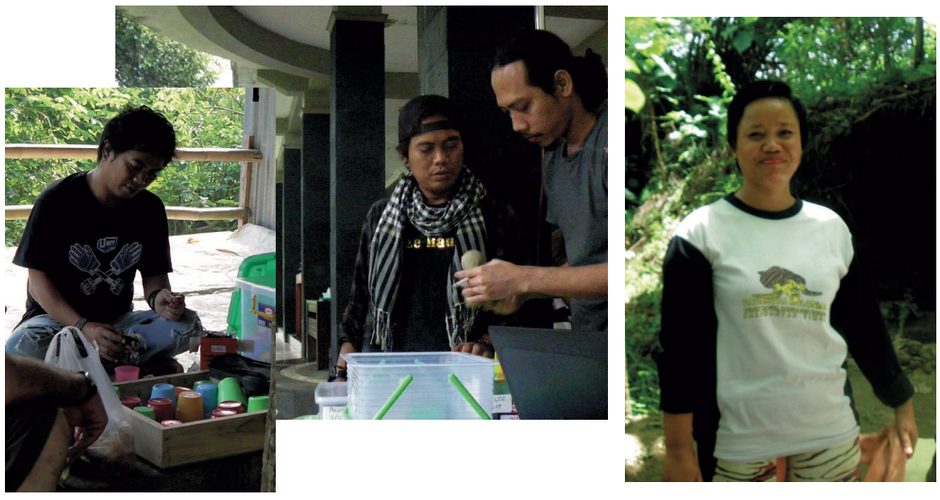
NUWUN



The legendary "mobil monyet"



Wijianto and Sukadi who take care of the Pucung site and Nano Museum



Shadust Satriani and Bu Jumati, key responsible of logistics

The HOH International Participatory Training School is implemented by:

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