The uniqueness of eco-friendly Pagerjurang pottery products

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Abstract. This study aimed to investigate and to describe the characteristics of Pagerjurang pottery products which are environmentally friendly and safe to be used as tableware. The pottery art village in Pagerjurang has existed for more than 400 years. The following characteristics of Pagerjurang pottery products make them deserve to be called a tradition, i.e.: 1). Its dark land (earthenware land). 2). Its making process, i.e. by using slant-turning rotary technique. 3). The existence of human resources. 4) Abundantly available material resources. These five characteristics are the advantages which can be developed and considered as the superior qualities of Pagerjurang pottery. This research is based on the following assumptions: What materials are used to make Pagerjurang pottery? What standards indicate that this pottery product is environmentally friendly (eco-friendly)? This study used qualitative research methods to obtain general, flexible, and dynamic results. In addition, the data were obtained from interviews conducted with resource persons and observation to the products from the artisans.

In general, Pagerjurang pottery is environmentally friendly and is supported by the traditions of the people who feel bound to their natural surroundings, but the artisan are not familiar with environmental issues at a wider level.

1. Introduction
The history of pottery in Pagerjurang hamlet (local term: dusun, an administrative area under village government), Melikan village (local term: desa, an administrative area under subdistrict government), Wedi subdistrict (local term: kecamatan, an administrative area under regency/city government), Klaten regency (local term: kabupaten, an administrative area under provincial government), Central Java province of Indonesia, is estimated to be approximately 600 years old. Based on insufficient written historical sources and formal methods of modern history, it is stated that the pottery tradition in Pagerjurang hamlet or in Melikan village in general cannot be separated from the history of a famous figure buried in Jabalkat hill (many call it a mountain), i.e. Sunan Pandanaran, whom is thought to have lived in 16th century AD. Sunan Pandanaran is assumed to be one of the students of Sunan Kali Jaga (Demak), one of the nine saints of Islam (local term: Wali Songo) in Java. Historical figures such as Sunan Pandanaran, Sheikh Domba, Sheikh Sabuk Janur, Ki Ageng Becik, Panembahan Jiwa, Menangkabo Prince Kajoran (a noble member who did a rebellious act during Amangkurat Agung period) were several believed to have lived in the area. In addition, from historical data, it is stated that the settlements around Melikan were occupied by aristocratic or noble families, both from kingdom of Islamic Mataram, East Java and parts of northern Central Java, particularly before the Java War in 1825-1830 AD. This seems to have influenced the existence of a fairly advanced tradition around Melikan village, including pottery which has survived until today [1–3].
Even though from the literature of mainstream history it is factually uncertain, this historical factor shows that Bayat area, including Melikan village was a developed area because it became the destination of migration and movement of the nobles in the past so that it can be implied that this village has a human resources base which is relatively more advanced than those in other regions. Pagerjurang is one of the ten hamlets in Melikan village which is famous for being the center of pottery craft. Moreover, Pagerjurang is considered as a hamlet that is considered to be more prominent in its pottery tradition due to its relatively strong pottery tradition and its location. This village is situated very close to the center of pottery raw materials, i.e. Jabalkat hill. According to several senior pottery artisans, the land which has been used for generations in Jabalkat hills now belongs to Perhutani (state owned forestry company); thus, there is a conflict of several rules regarding taking the soil in the land to produce pottery.

Based on several studies, there are a lot of constraints faced by pottery artisans in Melikan. One of which is the limited soil raw materials in Jabalkat hill. Besides, there are other problems such as limited capital, the declining number in artisans’ regeneration (human resources), low ability to cooperate, and low production volume. The regeneration problem is not only on capacity, human resources, and making distinctive pottery of Pagerjurang, but also on the understanding of the younger generation of pottery artisans concerning various aspects, i.e. knowledge about soil, relationships with nature, sustainability issues and economic-political problems. The main point is that the younger generation doesn’t only see the art heritage of Pagerjurang pottery as a “source of income”, economy and welfare [4].

Another study also found that the soil in Jabalkat hills was actually higher in its plasticity level and very sticky and this evidence has been tested in many laboratories. The plasticity level of the soil in Jabalkat hill requires special processing technique. Accordingly, it seems that the slant-turning technique or perbot miring (local term) technique was derived from the interaction of Pagerjurang community who are familiar with the characteristics of Jabalkat hill soil with high plasticity [5]. The putar-miring (slant-turning) technique is recognized as the only pottery making technique in the world as stated by Professor Chaitara Nakamura of Seika University, Japan.

The character of soil in Jabalkat hill is dark brown and will turn black while leaving a slight red tint. The process of making Pagerjurang pottery requires at least the following stages: Soil extraction in Jabalkat hill, soil preparation, forming the initial model of pottery, dyeing the pottery (which is commonly called by the artisans as lethoh process) using red soil from the same land source, drying-cooling by letting it dry naturally by air flow method and firing process. According to one of the sources of this study, it was stated that the soil raw material in Jabalkat hill still leaves many “surprising” colors when it is developed and the artisans are persistent to conduct some measurable trials and innovations.

The number of pottery production in Melikan, including in Pagerjurang, is estimated at 160,000 per year with various designs. The Pagerjurang pottery consists of kitchen utensils, cooking utensils, flower vases, some bathroom utensils, and living room accessories. The level of production is commonly constrained by financial capital, human resources (low regeneration), and limited raw materials [6].

Concerning on the raw material constraints, the soil in Merak hill, Temugiring hill, Santren hill, and Cakaran hill based on laboratory tests has the same characteristics with identical plasticity level as the soil in Jabalkat hill which has been used as the raw material to make Pagerjurang pottery. It is significantly necessary to collect historical data, understand the soil quality which is used as the raw material for making pottery, the availability of raw materials, human resources, production levels, constraints during production and the potential for developing Pagerjurang pottery because it is related to the potential of pottery which will be used as an alternative instead of using plastic in the future. Many researchers and environmental activists stated that there will be a transition from plastic to pottery [7].

Waste and pollution from plastic have become one of major environmental problems (ecological crisis) in the world including Indonesia which is in the top five countries with the largest plastic waste. One of alternative solutions to be free from plastic addiction is by conducting cultural engineering so that people begin to switch their containers, tools, components, and daily utensils from which are made of plastic to more easily biodegradable materials. Consequently, as an alternative, pottery is in the first rank, in addition to leather and wood.
The data related to the pottery tradition in Pagerjurang hamlet illustrates that Pagerjurang pottery is included as a type of pottery which is more environmentally friendly, eco-friendly, and has intrinsic potential related to its sustainability requirements, i.e. sustainability that does not damage the environment [8].

2. Methods
This study, as mentioned earlier, is a qualitative research by applying a dynamic approach, in which three models of data mining and processing were carried out. First, the author conducted interviews with five pottery artisans in Pagerjurang hamlet, i.e. Mr. Suharno, Mrs. Sukamti, Mrs. Sularni, Ms. Juminarni, and Ms. Endang Mujiyo by considering their great concern for the sustainability of pottery in Pagerjurang. Moreover, two of them were from the younger generation to find out the regeneration issue. They were not only interviewed, but also invited to join in-depth discussions about many aspects related to the focus of this research, i.e. sustainability of the Pagerjurang pottery tradition and environmental crisis issue.

Those interviewed commonly have their own assumptions regarding environmental issues. Some studies also discuss about pottery in Pagerjurang hamlet [9]. Second, the author also interviewed those who had conducted research for academic purposes in Pagerjurang hamlet to obtain the complex dynamics of pottery art in Pagerjurang hamlet. Third, written data about pottery in Pagerjurang hamlet were collected and then discussed in specific and limited way with a number of ceramic observers and academics. From these three steps, the data of this research were obtained and used to see the dynamics of pottery in Pagerjurang hamlet, especially on the problems, constraints and potentials, as well as the increasing importance of mainstreaming environmental awareness issues of pottery [10].

The theory used in this study is developed by activists and academics focusing on responding to environmental crisis issues. In long term it is inevitable for everyone to be involved in changing the approach to science and knowledge which is as Riana Esiler’s term mostly dominative towards nature and take the leap by putting the theories forward, closer to nature, such as the “Embracing interconnectedness”, a theory of author and activist Jeremy Lent.

The theory of “interconnectedness” is always related to have dynamics with social contexts, space and time. Like the Indian ceremony of Lakota tribe chanting the prayer “Mitakuye Oyasin” (“We are all related” or “we are all connected”), they believe that humans are connected to all living things, and the proper way of life is to follow the pattern of the nature’s work. “This is the fundamental idea which underlies ecological civilization, i.e. using nature’s own principles to reimagine the basis of our civilization. In this case, it is essential to transform the operating system of our civilization into the system which naturally leads to life-affirming policies and practices rather than to rampant extraction and destruction practices” [11].

Jeremy Lent convinced that there was a secret formula hidden deep within the intelligence of nature, which catalyzed every major evolutionary leap of life over billions of years that eventually has formed the basis of all ecosystems. The natural formula meant by Lent lies in the simple but profound concept of mutually beneficial symbiosis; a relationship between two parties that each of which contributes something that is not owned by the other, and both finally get the expected result. With such symbiosis, there is no zero-sum game: The contribution of each party creates a whole that is greater than the sum of their contribution parts.

Jeremy Lent’s theory of “interconnectedness” can be perceived as the four R’s principle of an environmental activist, Comanche LaDonna Harris, i.e. Relation, Responsibility, Reciprocity, and Redistribution (division), which does not only apply to relationships in family and other human beings, but also to all forms of relationship with animals, plants and the earth. Relation is a kinship obligation. However, recognizing value is not only applied in the family but in “all our relationships” including with animals, plants, and the living Earth. Responsibility is the obligation of the community in identifying the necessity to maintain and care for the relationship. Reciprocity is a cyclical obligation to balance what is given and taken; and Redistribution is the obligation to share what one owns—not only material wealth, but also his skill, time, and energy.
Lent, inspired by Fritjof Capra, said that modern civilization not only has flaws and defects, but it also requires alternative views drawn from other civilizations. It is time for modern science and knowledge to make a dialogue with other systems and traditions of thought because modern science and knowledge are no longer able to concern on the fate of human civilization alone [12].

3. Results and discussion
The term ecological crisis or environmental crisis has become a phrase commonly used by general public to describe the declining life quality of living things due to the impact of radical decline in the natural order. Scientists call this period of “degradation of the quality of life” as the anthropogenic phase. It is the period of the earth’s age in which humans become very dominant among other living things. Some name the current phase of present nature’s life as “capitaliscene”. Environmental crisis (ecological crisis) is caused by two turning points. The first is the dynamics of nature itself or natural causes, such as volcanic eruptions and shifts in the natural order. Second, the environmental crisis is caused by human activities, as an impact of bad human activities on nature, such as industry with all of its varied activities like logging (deforestation), etc [13].

In short, environmental crisis issues include the following issues: Climate change, decreasing clean air quality, decreasing clean water quality, scarcity of clean water, deforestation, erosion and poor soil fertility, land use change, habitat destruction and biodiversity loss. Of these environmental crisis issues previously mentioned, the problem of the widespread use of plastic since 1950 in the world is related to almost all major environmental issues. Plastic has been produced on a large scale in the world. It is believed that 8.3 billion tons of plastic produced in the last sixty or seventy years. Until 2015, it was estimated that there were 6.3 billion tons of plastic, and of which only 9 percent was successfully decomposed, 12 percent was burned, and 79 percent of plastic is inlaid in nature, both land and oceans. It is predicted that there will be 12 billion tons of plastic in 2050.

Plastics are made of synthetic materials and petrochemicals. Moreover, plastic is one of the macromolecules of which the manufacturing process goes through polymerization stage. Polymerization is a process of combining several simple molecules or monomers into large molecules called macromolecules or polymers produced through a chemical process. Polymers are formed from hydrogen and carbon. Plastic is a product composed of a synthetic polymerization process which is formed on the basis of organic condensation and a mixture of certain substances so that it is very easy to shape according to human needs. The basic shape can be cylinders, blocks and bars which are then constructed into various forms of finished goods such as glasses, plates, packaging bottles, and plastic bags crackle [14].

Moreover, in addition to meeting the needs of clothing, food-beverage containers (including cooking utensils), applied technology, and retail business, plastic has been like stuff embodied with daily human activities. In consequence, it requires radical changes to change it, including the efforts to make a big leap in human awareness not to use plastic and leave the use of plastic. As a combustible material, plastic that becomes waste will be decomposed through a burning process which certainly releases toxic gases such as Hydrogen Cyanide (HCN) and Carbon Monoxide (CO) that are very harmful to the body and can cause air pollution. Meanwhile, if buried, it takes centuries for the soil to decompose. Moreover, when it is thrown into the sea, it can decompose itself into small pieces that later will be consumed by marine habitats and may cause significant death of marine habitats [15].

Sandra Haris described the initial steps to change plastic dependence by humans such as by reducing the use of plastic in everyone’s daily activities, e.g. clothes, accessories, food-beverage containers, shopping tools (shopping bags), toiletries and bathroom equipment as well as other daily appliances. In her qualitative research, Haris said that one of many solutions to the daily use of plastic is to switch to natural materials, i.e. terracotta, then glass and stainless utensils. If translated according to the definition of the variety, Haris referred terracotta to pottery, not ceramics in technical interpretation of ceramic. Pottery comes from natural materials, i.e. the choice of soil, the firing process with a measured temperature, and it does not require a chemical mixture as in ceramic firing process [16].
There is a debate about the eco-friendliness of ceramics, particularly on the scale of ceramic production, i.e. ceramic industry which requires high firing temperatures. This process usually uses gas that is considered problematic since it can cause air heating, a part of global warming process. Ceramic artist, Janet Kim, for instance, stated that there is always a “gap” or alternative space to emphasize that ceramics are still safer than plastic or utensils, tools and containers for daily stuff used by humans (interview with news portal www.Mindfulwriter.com on August 6, 2019). Some of the gaps are to ensure a decrease in the production scale accompanied by an increase in artistic aspects and to reduce chemicals in firing process which requires thousands of degrees of high temperatures. Furthermore, many types of glaze require (at least) two-time firing process. Then, if the energy used for firing the ceramics in the kiln is from fossil raw materials, it is very vulnerable and may bring a negative impact on the environment [17].

Ceramic production process is much lower in energy consumption than that in glass production. In addition, there are a number of explanations from ceramic artisans stating that ceramic studios and ceramic industry have their own sustainable patterns, for example heating from the firing process does not require heat from outside the firing kiln, and heat from ceramic firing process can be transferred to the land around the firing (studio) to keep the soil warm which is greatly needed by vegetable crops [18].

However, it must be admitted that few aspects in the process of making ceramic is less eco-friendly as there are still many harmful chemicals in some glazes, especially lead, which can leach into food and also liquids used to coat the ceramics. The glazes on some forms of ceramics also take centuries to decompose. In general, ceramics when damaged are more eco-friendly than plastic. Accordingly, many scientific efforts have been carried out to remove toxic materials in the glazes, particularly lead, which is quite difficult to find in pottery in the most developed countries. Recently, there are also available a variety of beautiful non-toxic glazes.

Ceramics, compared to plastic, are much more durable than other materials often used for eating: people would never think of throwing away the ceramic cups or plates after they use it, as people almost always do with plastic or paper tableware. Meanwhile, wooden and bamboo plates and cups may last longer than these materials, but they (wood materials) are more susceptible to water damage and scratch or cuts than ceramics are. Some experts and artists have no doubts regarding pottery about its eco-friendly intrinsic elements. However, the problem found is only about how to maintain the sustainability of the soil as the raw material for pottery.

Pottery production in Pagerjurang hamlet, Melikan village, Bayat subdistrict, Regency Klaten, Central Java province Indonesia has met the general criteria related to environmentally friendly pottery considering the interconnectedness between the environmental crisis and pottery, particularly regarding human dependence on plastic which triggers global warming, land and sea degradation, and accelerates the reduction of plant and marine habitats. The interaction of the artisans with nature around Pagerjurang hamlet, especially with the main area for taking soil raw materials in Jabalkat hill is still in the corridor of tradition, i.e. they maintain the flow and the law of pottery raw materials sustainability in Jabalkat hill. The scale of pottery production with all its shortcomings and constraints is still very far from industrial law though. Thus, there will be a process of regulating and adjusting the production scales in the future along with the stronger environmental problem as the mainstream issue specifically in Indonesia [19,20].

The community of Pagerjurang hamlet and Melikan village mostly still has land resources in other hill chains, as mentioned earlier above, if they are able to regenerate and increase the consolidation with their fellow pottery artisans. Some senior artisans in Pagerjurang hamlet are actually worried about the regeneration problem for the interest of the younger generation in Pagerjurang hamlet has decreased drastically because they think that there are other jobs which are assumed to be much more financially promising. The solidarity and cohesiveness of fellow artisans have led to another problem, i.e. specifically most artisans only see pottery art in Pagerjurang hamlet as a pure business activity, not as a tradition [21].

Several senior artisans admit that they still adhere to the wisdom of their ancestors in producing pottery in addition to following the development of environmental crisis issues which are increasingly
developing in the community. They understand that they need to build cooperation with other various parties to develop the tradition of Pagerjurang pottery. Moreover, they expect for a more sustainable and familial model of cooperation as they are not too sure about the sustainability of pottery art in their hamlet without working cooperatively with many parties whose concern and commitment to preserve and to develop pottery art which they have inherited through the generations.

This includes sharing ideas about eco-friendly pottery for example, maintaining and developing the standard of environmentally friendly pottery production. This includes, first, the process of making environmentally friendly pottery which preserves natural resources and protects them from exploitation and extraction. Second, it is essential to continue conducting studies and experiments with soil materials, other sustainable materials, and considering the method of handling waste from firing pottery by doing various techniques and eco-friendly materials, although so far the problem of waste from firing pottery is very small. Third, open more extensive cooperation with various parties related to the development of renewable energy such as geothermal, rain, biomass, wind, and sunlight. It’s certainly related to the potential and highly possible that it has been carried out by various communities in Indonesia. Fourth, finally, the pottery production process should be aware on saving water issue as a source of basic environmental needs.

There are four general standards of eco-friendly production. Moreover, when compared to pottery production in other countries which maintain eco-friendly factors, the four steps of pottery production in Pagerjurang hamlet, as mentioned at the beginning, have met the general requirements of eco-friendly pottery. As stated by a small number of artisans, it takes a long-term continuous struggle to improve the pottery production with environmental standards. In short, it is necessary to strengthen the understanding of tradition, mainly the wisdom of the ancestors of Pagerjurang hamlet community which contributes values, a web of meaning and their perspective on life to interpret the complexities of challenges in their life.

Another potential is the variety of pottery designs in Pagerjurang hamlet, and as emphasized by several senior artisans, they still have potential development, not only in the design, but also in “surprise-layers”. Such surprise layers are obtained from a natural process, i.e. the processed soil from Jabalkat hill, as it still retains its natural surprise, in terms of soil plasticity and color. Some senior artisans and younger artisans’ generations have conducted experiments and trials for developing processed Jabalkat hill soil of which the products of their trials have not been sold on market yet.

4. Conclusion
The pottery in Pagerjurang hamlet not only has its own character since its production process uses slant-turning technique, and not only because of the quality of the soil plasticity but is also supported by human resources who are still committed to continuing the ancestral tradition of pottery in Pagerjurang hamlet. Some senior artisans do not see their pottery tradition as a mere business activity. Instead, they are also aware that they have a responsibility to develop new possibilities from the potential of pottery tradition which they have inherited. Moreover, they open themselves to the other parties such as universities whose relationships with pottery art, researchers, entrepreneurs, business owners, etc. as an effort to ensure the sustainability of their pottery heritage. The followings are some brief conclusions based on the research data processing:

First, the assumption that the pottery in Pagerjurang hamlet meets the eco-friendly (environmentally friendly) requirements is caused by the fact that the community’s view of life towards the environment is still well preserved. Their way of life towards the heritage of pottery is still traditional with some modernism residues in some aspects. The concept of “connectedness” with the nature is also still stronger than any other views of life which have come in their life. Not only that, the process of pottery production in Pagerjurang hamlet still maintains the natural patterns as previously described. There have been many studies on pottery in Pagerjurang hamlet, including in Melikan village in general. Yet, there is not any study or research focusing on aspects of religious traditions which have become one of the foundations of tradition held by Pagerjurang hamlet community traditions. In addition to the importance of considering religious traditions which teach them work ethic and connection with nature, it is very
important to build good collaboration between Pagerjurang hamlet community and various parties such as artists, researchers, lecturers, non-governmental and cultural organizations. This is immensely significant to explore the foundations of their rich traditions more deeply.

Second, in general, the environmental crisis has not become a primary concern of Indonesian people in general. Moreover, the sensitivity to the environmental crisis is still very low (WALHI – the Indonesian Environmental Forum or Friend of the Earth Indonesia). Nevertheless, most artisans in Pagerjurang hamlet have actually followed the outline of the environmental crisis. The artisans and most people in Indonesia have not seen and not even been aware yet that pottery is the most potential “substitute” for people’s dependence on plastic. In terms of discourse and work – environmental movement (environmental activism) is not yet as rich as the achievements of discourse and work conducted by environmental movement in Europe and some countries in Asia. This fact is contradictory to the seriousness of the environmental crisis in Indonesia.

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