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Article

A Reflection on Archaeology and Sustainability in the Brazilian Amazon

Joanna Troufflard [1]

[1] Department of Anthropology, University of Florida, Gainesville, FL 32601, USA; E.Mail: jtroufflard@ufl.edu; Tel.: +1-352-672-4231

Capes Foundation, Ministry of Education of Brazil, Brasília – DF 70040-020, Brazil

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Abstract:
This paper addresses environmental, social and economic sustainability in the Brazilian Amazon from an archaeological perspective. This reflection follows three main themes: evidence of ancient indigenous environmental management and transformation, the productive dialogue between archaeologists and local residents resulting from public archaeology, and the economic and social benefits of the current production of objects inspired by archaeological artifacts. First, ecological conservationists denounce humans' negative impacts on the Amazonian rainforest and advocate the preservation of a pristine forest. The discovery of multiple archaeological sites in the Brazilian Amazon demonstrates the region's long history of dense human occupation and transformation. Archaeologists suggest that these environmental modifications helped preserve and even increase biodiversity rather than destroy it. Thus, archaeology can uncover sustainable ecological ways of living in the Amazon. Furthermore, sustainability efforts are not only linked to environmental preservation but also focus on more social facets through the recent emphasis given to public archaeology. Indeed, since 2002 the Historic and Artistic National Heritage Institute in Brazil made public archaeology a requirement for all contract archaeology programs. Thus, archaeologists now work with communities living on or close to archaeological sites. This practice enables archaeologists to include various interpretations of the archaeological record in their research and increases the communities' knowledge about the indigenous past. Finally, local industries benefit from the creation of archaeological knowledge. Indeed, the production of handicrafts inspired by the material culture of past famous complex indigenous societies of the Brazilian Amazon recently emerged in the state of Pará. This not only has economic consequences; it contributes to identity construction. In sum, this paper discusses three themes to demonstrate how archaeological research can contribute to the present environmental, social, and economic development of the Amazon.

Keywords: Brazilian Amazon; Sustainability; Pre-colonial Archaeology; Public Archaeology; Handicraft.

1. Introduction

The aim of this paper is to address environmental, social, and economic sustainability in the Brazilian Amazon from an archaeological perspective. In other words, it asks the following question: what role can be played by archaeology in present day concerns over sustainable development in the Brazilian Amazon? While ecological conservationists denounce humans' negative impacts on the Amazonian rainforest and advocate for the preservation of a pristine forest, archaeological research demonstrates that the Brazilian Amazon has been densely occupied in the past. Ecologists and archaeologists have different methods to address the relationship between indigenous people and sustainable development. When ecologists look at present day indigenous populations, they argue that small scale agricultural exploitations are a positive model for sustainable development [1]. Archaeologists demonstrate that larger indigenous populations also lived in a sustainable way in the past [2,3]. Ethnographic studies and the application of Traditional Ecological Knowledge (TEK) [4,5] can certainly enrich the archaeological view of sustainable development; however, that is a topic that deserves its own article.

Archaeological knowledge has a significant role to play in contemporary debates concerning environmental, social, and economic problems in the context of increased political tensions between indigenous groups and national interests. Indeed, the increasing implementation of national plans for development in Brazil has the potential to revive indigenous people's contestations for cultural and territorial rights, as was the case for the *Mobilização Indígena* organized by the *Articulação dos Povos Indígenas do Brasil* (a national association representing indigenous peoples in Brazil) that occurred between September 30th and October 5th 2013 in the major cities of Brazil. During this event, indigenous groups protested against the fact that designation of indigenous lands had been recently slowed down by the government. Recent studies emphasizing the relation between archaeology and sustainable development [6,2,3,7] show how the use of archaeological knowledge in the Amazon can serve to contemplate solutions for global problems.

This article will first illustrate environmental sustainability through archaeological evidence of ancient indigenous management and environmental transformation through the use of an Amazonian Dark Earth (ADE) that did not have the degradation and destructive impacts on biodiversity observed in present day. Secondly, social sustainability is evoked through the productive dialogue between archaeologists and local residents resulting from public archaeology. One of the aims of this practice is to involve communities in the archaeological projects in an effort to increase the chances of preserving archaeological cultural heritage. Furthermore, archaeological works inside indigenous reservations done through ethnoarchaeology, a subfield of archaeology, represent an opportunity to investigate the formation of ADE, compare and contrast past and present occupations, include multiple interpretations of archaeological remains, and empower indigenous peoples through the increase of historical and technological tools. Finally, economic sustainability is one of the benefits brought by the production of objects inspired by archaeological artifacts, which represent a significant monetary source in Paracuri, a district in the state of Pará. The use of forms and iconographic elements found in ancient indigenous ceramics progressively formed state identity.

2. Archaeological sites as an example of environmental sustainability in the Brazilian Amazon

The consideration by archaeologists of the impacts of ancient indigenous occupations on the Amazonian environment is increasing through time. In fact, the transition from cultural ecological interpretations to historical ecological ones by archaeologists sparked changes in our understanding of pre-colonial societies. During the second half of the 20th century, significant scientific archaeological research in the Brazilian Amazon was done through the creation of the *Programa Nacional de Pesquisas Arqueológicas* by the American archaeologist Betty Meggers and her husband Clifford Evans. The main ideas claimed by Meggers concerned the origin and social complexity of indigenous populations in the Amazon. In fact, Meggers had a static vision of indigenous societies where groups of the past are analogous to those of the present. Based on environmental determinism and diffusionist theories, she believed that no complex societies could emerge in the Amazon due to environmental limitations such as poor soils in the rainforest that prevent indigenous groups from developing agriculture [8]. However, Meggers had to find an explanation for archaeological sites that present artificial mound and complex decorative style in the ceramics as on the Marajó Island. Her explanation was that the remains were associated with populations coming from the Andes. A genealogy for these interpretations can be found in the formation of Brazilian archaeology during the Imperial period (1822-1889) [9].

Meggers's arguments started to be seriously challenged in the 1980's by the American archaeologist Anna C. Roosevelt, who argued that differences existed between past and present day indigenous people and that they originated from the Amazon proper. Based on archaeological records and ethnohistorical accounts, she described past Amazonian populations at the time of the European conquest as complex chiefdoms with several thousand individuals [10]. She emphasized the disastrous effects brought by the European conquest such as demographic, geographic and sociocultural changes among indigenous societies. Thus, this idea of change in indigenous history, which contrasted with the static vision stated by Meggers, is still followed by the new generation of archaeologists currently working in the Brazilian Amazon. Present archaeological research demonstrates that complex societies developed in the Brazilian Amazon around 1000 B.C. and 1000 A.D. in several regions such as Marajó Island (state of Pará), Amazon (states of Amazonas and Pará), Tapajós (state of Pará, Xingu (states of Mato Grosso and Pará) and Purus Rivers (state of Acre) [2, 11-13].

The presence of a particular anthropogenic soil in most areas with archaeological evidence for complex societies like geometric ditched enclosures, artificial wells, causeways, raised fields, and the existence of earthworks such as artificial mounds, illustrates one of the most remarkable solutions found by indigenous people to develop complex societies in the Amazonian rainforest. This soil type called ADE is an anthropogenic extremely fertile soil formed in pre-colonial indigenous occupations that contrasts dramatically with the natural soil of the rainforest. It is described as having: "darker color, higher organic matter content, higher pH, greater total phosphorus (P) content, greater exchangeable calcium (Ca) and magnesium (Mg), and increased minor element concentrations" ([14], p.255). Furthermore, one of the most distinctive quality of these soils is the sustainability of their fertility [15]. The use of this soil type makes a strong argument against the idea of environmental determinism defended by Meggers by showing how the Amazon can be modified by populations to

sustain large populations. However, scientists are still trying to understand if these soils were formed intentionally or not. Recent studies use ethnoarchaeology in indigenous reservations to investigate the formation of ADE [3,16,17]. Conclusions show that as opposed to public areas that are generally kept clean (for example the central plaza present in indigenous villages), discard areas present more favorable conditions for the formation of ADE [16]. Moreover, Amazonian Dark Earth is also associated with the use of ancient intensive agriculture production [3] which suggests that the Amazon could have carried intensive production in a sustainable way. Indeed, much of the research today focuses on the reproduction of ADE for modern agricultural purposes [15].

Thinking of sustainable environmental development through the observation of indigenous modifications and management of landscapes leads one to the following question: what are the exact impacts that indigenous people had in the Amazonian environment? Even if it is still impossible to give a precise answer to this question, archaeologists already propose several hypotheses. Indigenous impacts on the forests are contrasted to contemporary mechanized agriculture and are compared to the ones observed in temperate forests of Medieval Europe ([18] cit. in [3]). Furthermore, recent studies argue that the Amazonian forest has not only been modified by indigenous people, but part of it has literally been created by them [19]. According to Balée, who uses the expression “forest builders” to describe indigenous people ([20], p. 32), 11.6% of the Amazonian forest demonstrates human influence [20,19], though this could be an underestimation as a more precise means of calculating this data is not yet available. On top of this argument, a Historical Ecology approach [21,22] defends human action in past landscapes as having, in fact, enhanced biodiversity. Indeed, observations have been made concluding that most modified soils and forested areas in the past are the ones that are more likely exploited by present day indigenous people for agricultural purposes due to the fact that they concentrate a higher quantity of useful species [23].

Several authors address how these interpretations of anthropogenic environments can be dangerous when they are misunderstood [24,25,6,2]. In fact, the revalorization of indigenous past by claiming that complex societies transformed the Amazon has the advantage of introducing the notion of change among the construction of indigenous history (see [26] for more information about transformation and historical discontinuity in indigenous history). However, it can also be construed by governments and development agencies as a justification for large scale agricultural exploitation of Amazonian forests [24]. Thus, several misinterpretations based on archaeological claims have already emerged. The consequences of land exploitation by indigenous people are compared to present day ones and used as an argument to deny indigenous territorial rights. The consequences of land exploitation by indigenous people also serve to excuse environmental degradation and destruction. The resilience of the tropical rainforest is used to argue that if it has recovered in the past, it will again [6]. Finally, these arguments highlight ideological and political uses of archaeological research that have to be seriously considered by archaeologists. Even if it is obvious for most archaeologists that the scale of impact indigenous groups had on the environment is incomparable with present day environmental degradation, this has to be clearly explained to people outside the archeological community.

3. Public archaeology as an example of social sustainability

As of 2002 the Historic and Artistic National Heritage Institute in Brazil made public archaeology a requirement for all contract archaeology programs (Law No. 230). This has sparked an increase in discussions concerning public archaeology in Brazil [27-33]. The main social goal of public archaeology can be summarized in one of the ten assertions made by Rossano and Funari when expressing their conception of archaeological engaged research:

"*Public devolution and social inclusion*. Heritage must involve a devolution of knowledge acquired through any kind of research that supports contemporary societies and analysis of past people. Archaeological cultural heritage only achieves its social function when it is understood as a social belonging— something of common use and usufruct by the Brazilian people. Thus, it is urgent that from now on our researchers bring cultural heritage to the population, with citizen-supported preservation." ([31], p.1132).

It is not rare in the Brazilian Amazon for archaeological research to take place among communities that live on archaeological sites. Most of these sites have large areas of ADE still used by present day populations for agricultural activities and the people are generally aware of the existence of artifacts; however, different attitudes towards archaeological remains are observed in these communities. Such communities are rarely neutral, though an example of indifference is seen in the Lower Tapajós region in [34]. Here, people commonly collect artifacts for a range of reasons, eventually forming "domestic collections" preciously stored in their houses [35,36]. Sometimes artifacts are collected and reused in daily-life such as stone axes that serve as door barriers or ceramics used as candle holders. People can also collect artifacts for identity purposes, that is, they identify themselves as indigenous and consequently associate archaeological remains to their ancestors. Archaeological remains can also be used as a proof of indigenous occupation of the land to serve ideological or political purposes (for examples see [36]). On the contrary, people sometimes discard artifacts as a way of denying indigenous identity or for religious reasons (for examples see [36]). While these collecting activities are not always viewed as destructive for cultural heritage [35], other activities such as looting constitute an enormous challenge for the preservation of archaeological sites. Any of these practices are allowed by the Historic and Artistic National Heritage Institute (Law No. 3.924/1961).

A good example of public archaeology is found in the project *Musealização do geoglifo Tequinho: Arqueologia Comunitária no Acre,* supervised by the Brazilian archaeologist Denise P. Schaan. It takes place in the earthwork, or geoglyph, called "Tequinho" in the state of Acre. The aim of the project, which started in April 2012, is to make the archaeological site of Tequinho available for public visits administrated both by the owner and the local community. While archaeological excavations were taking place on the geoglyph, children and professors from the closest schools were able to visit the site. During these visits, children were led by archaeologists on walks that followed the monumental structure whose geometric forms can only be well understood from the sky (Figure 1). Exhibitions of didactic posters were organized at schools and workshops in an effort to investigate local knowledge through discussions and drawing activities focusing on local cultural heritage. These activities were intensively disseminated through the media and the project's facebook page [37].

Figure 1. Children standing on the Tequinho geoglyph during school visits as part of the Project *Musealização do geoglifo Tequinho: Arqueologia Comunitária no Acre* (source: Project *Musealização do geoglifo Tequinho: Arqueologia Comunitária no Acre*).

Since the 1990's primary school textbooks include archaeological knowledge "in order to give the children a more complex view of the past, enabling them to better understand present-day social contradictions." ([31], p. 1129). Public archaeology's priorities in the region can be defined as the increase of people's consciousness, their understanding and valorization of cultural heritage, the inclusion of multiple perspectives in the interpretation of archaeological remains and the fight against prejudices against indigenous populations strongly present in the Amazon. Therefore, it is vital that people familiarize themselves with cultural heritage, so that they may learn to protect it. Local communities are certainly the best solution for the conservation of archeological sites [32].

Archaeological work in indigenous reservations offers a unique opportunity for archaeologists to observe the relationship between past and present indigenous populations. Community Archaeology also occurs when archeologists work in collaboration with indigenous populations on the reservations and benefit from each other's unique perspectives. One goal of community archaeology is to practice a less colonial archaeology that gives equal weight to multiple voices [33]. In practice, both sides participate in the elaboration of the project, the excavations, and the interpretation of the archaeological record.

One of the main advantages of this practice for indigenous peoples is the improvement of knowledge about their past. For example, Silva and her colleagues show that old and new generations of Asurini in the state of Pará are worried about the loss of indigenous "traditional knowledge" [33]. In fact, archaeology can also reveal elements of the indigenous past that the modern populations were unaware

of before [30]. Another positive aspect of this practice is that indigenous people learn how to map their reservations, such as with "participatory mapping" of pre-colonial and historical sites in the Kuikuro reservation of the Upper Xingu (state of Mato Grosso) [30]. This is a way of converging indigenous and archaeological interests; "participatory mapping" is a significant tool used for the protection of indigenous archaeological sites by the local groups.

The interpretation of archaeological remains by indigenous peoples can be different from archaeologists' interpretations and is a fundamental step in the inclusion of multiple voices for the construction of indigenous history in a long term perspective. In this way, the Asurini see the archaeological remains found in their reservations as associated to their family or mythic ancestors [38,33]. For instance, polishing stones are interpreted as the foot and buttocks imprints of a mythic hero called, *Mayra,* who is said to have fallen down from the sky [38]. Furthermore, the ceramics are associated with the mythic figure called, *Anumai* [38]. Thus, through reuse, the archaeological artifacts are physically integrated into Asurini's daily life and mythology. As stated by Silva, archaeological remains represent "one of the aspects of construction and maintenance of their ethnic identity as they are material that speak for them about their ancestors and contribute for maintaining their social memory" (our translation, [38], p.184). Through a collaborative perspective, this practice also plays an important role in empowering indigenous discourse about identity and land claims.

4. Handicraft production inspired in archaeological remains as an example of economic sustainability

When one arrives at the handicraft market of Paracuri, located one hour by bus from the city of Belém (state of Pará), one can see a poster that says: "*Marivaldo arte ceramica – produzimos peças arqueológicas, marajoara, tapajônica, maraca, kunaní e ceramica icoaraci – à 150 m*" (Marivaldo ceramic art – we produce archaeological remains, *marajoara, tapajônica, maraca, kunaní and icoaraci ceramic – 150 km away)*. The poster also bears the symbols of Visa and American Express cards. In this market, like in other parts of Pará such as Belém, Santarém, Alter-do-Chão, or Soure in the Marajó Island (an archipelago located at the mouth of the Amazon), it is possible to find ceramics inspired from regional archaeological remains. In fact, these handicrafts are inspired by the material culture of the most famous complex indigenous societies from the Brazilian Amazon's past: Marajoara and Tapajônica cultures (Figure 2). In the case of the Marajoara culture, handicrafts copy the famous polychrome ceramics that were present during the pre-colonial period in the Marajó Island. For the Tapajônica culture, handicrafts inspiration comes from the culture that existed in the present day Santarém area. In fact, ceramics such as the caryatid vessels and *muiraquitãs* – an archaeological artifact made of green stone that generally presents the stylized shape of a frog and seems to be associated with high status people – constitute the primary source of inspiration for craftsmen. Furthermore, some ceramists also copy funerary urns from Maracá and Aristé cultures (Cunaní – in reference to the poster described previously – is the name of an archaeological site where artifacts of this culture were found) which originated in the present day state of Amapá.

Figure 2. Ceramics inspired by archaeological remains in a store of Paracuri (photograph by the author).

This phenomenon, which emerged in the 1970's, was the idea of the ceramist Raimundo Cardoso, also known as "Mestre Cardoso." He decided to reproduce the archaeological artifacts that he had seen at the *Museu Emílio Goeldi* in Belém [39]. The ceramist chose to make ceramics with the same techniques used by indigenous peoples in the past. Referring to Hobsbawm's concept of "invented traditions", Schaan states: "When he made archaeological ceramics come alive again, Mestre Cardoso eventually invented a tradition." (our translation, [39], p.25). Other ceramists followed the same idea but used modern manufacture techniques, modified the iconography originating from archaeological artifacts and invented new meanings for the objects, all based on commercial interests. Thus, objects from the indigenous past served as an inspiration to promote tourism; they are for instance always present in craft stores inside airports. A lot of the ceramics produced in Paracuri are sold in Icoaraci, a city located in the same area. This is the reason "Icoaraci ceramic" is mentioned as the last element in the poster described previously. In fact, the name of the district is eventually used to describe the style of the contemporaneous ceramics that are inspired by archaeological remains, but differ in more significant ways. For example, ceramics that have football team logos associated with geometric patterns evoking pre-colonial cultures are also available.

Paracuri's economy is mainly supported by ceramic production and the city even has a school to educate future ceramists called, *Liceu escola de Artes e Ofícios Mestre Raimundo Cardo*so (a tribute to the precursor of this phenomenon) that was inaugurated in 1996 with sustainable development purposes. In a context of globalization, these objects are not only found in Brazil but also outside of the country, in Portugal for example. In fact, it is possible to buy handicraft inspired in the ancient

civilizations of the Brazilian Amazon in a Lisbon store called *Jangada Solta*. It opened in 2008 and sells several objects imported from Brazil (Marajó Island and Rio through the Folklore Museum and *Arteíndia*) [40].

According to Schaan, these handicrafts are related to "a search for "roots" or for culture "origins" (our translation) ([39], p.20). One example of this phenomenon is the re-appropriation of the *muiraquitã*, the stone frogs found in elite contexts of the Santarém region. Craftsmen sell ceramic ones as pendants and market them as being part of a legend about the mythical Amazon women warriors. This design is also found on pavements and as a name for various businesses such as art craft stores, restaurants and even driving schools. The use of indigenous artifacts from the past is a source of inspiration for producing ceramics today. But, how is this related to people's identity? Does the reuse of symbols associated with ancient indigenous cultures mean that everyone assumes her/his indigeneity in Pará state? Maybe, at least the production and exportation of ceramics inspired by archaeological remains heighten the existence of indigenous history of the region inside and outside the Brazilian Amazon.

4. Conclusions

When walking in the main street of the Brazilian city of Santarém, one can see a large advertisement of a multinational company stating: "Crescimento sustentável. Essa é a base de negócios da Cargill." (Sustainable increase. This is the basis of Cargill's business). Multinationals that work with food processing, mineral extraction, or electricity production in Brazil commonly identify with sustainable development. However, the use of this term by companies that are responsible for environmental damage, economic disturbances in local communities, and the destruction of archaeological sites is ironic. Indeed, this word frequently used as a positive counterbalance of unsustainable activities has a strong and fashionable ideological content.

This article illustrates the role that archaeology can play in present day to bring solutions for the environmental, social and economic development of the Amazon. Ancient indigenous knowledge buried in pre-colonial sites with Amazonian Dark Earth is a hope for modern problems caused by intensive agriculture management in the Amazon. In fact, recent research focuses on reproducing this soil type. It can offer sustainable agricultural alternatives that will slow down deforestation, pesticide use, and contaminations, in an effort to decrease the loss of biodiversity. Public archaeology is seen as a way to enhance archaeologists' social responsibility by bringing archaeological research to local people, increasing the chances of preservation of archaeological sites. Creating a bridge between past and present times, archaeology in indigenous reservations can be helpful in debates concerning indigenous territorial claims. Furthermore, indigenous identity is often seen as a stigma. For instance, inhabitants of the state of Acre commonly do not believe that ancient indigenous people could have been able to build geoglyphs; they prefer to believe a supernatural explanation instead. Thus, prejudices concerning indigenous populations are omnipresent from both descendants and non-descendants of indigenous people. Archaeological knowledge should be used as a weapon to fight against this. Whereas a lot of inhabitants of the Amazon are of indigenous descent there is also a significant migration history that challenges the way that people interact with indigenous cultural heritage. For example, recent migrants from the South of Brazil (mainly starting from the 1990's, due to the construction of main roads linking Amazonian states to the rest of the country) that have land

properties in the Santarém area do not have much respect for indigenous cultural heritage, which they do not see as theirs. This is shown by the increase use of mechanized agriculture that destroys the archaeological remains. Finally, handicrafts inspired by pre-colonial ceramics are a major economic activity in Paracuri, where a new "Icoaraci" ceramic tradition and style is born. The dissemination of these products inside and outside Brazil contributes to the affirmation of the Amazon as one of the cradles of indigenous history.

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Conflict of Interest

The author declares no conflict of interest.

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