An Environmentally Friendly Alternative Method of Producing Religious Images for Philippine Holy Week Tableaus

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ABSTRACT. This paper presents a proposed process of making Philippine Holy Week sacred images from clay, plaster, and paper fiber instead of the more precious wood from the country's shrinking forests. This paper theoretically established the durability of the product and environmental soundness of this alternative process compared to the traditional wood carving or the more recent resin casting by thoroughly describing this alternative process by understanding the notion of durability based on the traditionally preferred woods among *santeros*, by understanding the conservation status of these preferred woods, and by undertaking comparative calculations of the environmental impacts of the productions of the three current alternatives. This paper is significant because it proposes a sustainable way of assuring the continued existence of the Filipino cultural tradition of making and presenting Holy Week images.

1.0. Introduction

The Roman Catholic Holy Week is probably the most intensely religious festival in the Philippines. This is the time when flagellants punish themselves on the streets, crucifixion reenactments, some with real nails happen, folk healers go into caves and sacred forests to reenergize their powers, the story of Christ's passion is chanted in homes and community centers. The faithful organize their Good Friday processions in their parishes/towns. These processions involved several floats that bear life-sized biblical tableaus owned and prepared by some families in these parishes/towns. Art, images, and the experience of the Divine have a fairly documented connection (Guerrero & Chavez, 2023). The sacred images that constitute these tableaus descended from the Spanish sculptural tradition of polychrome wood and the Spanish practice of dressing the images with expensive textiles and elaborate costumes. In some Philippine parishes/towns, such as Baliuag, Bulacan, San Pablo, and Laguna, the number of these floats and tableaus can be several dozen. Many of these tableaus are heirloom pieces, but since owning these sacred objects is not only considered expressions of religious devotion but also a status symbol in the local communities, in many parishes/towns, the number of tableaus is growing (Venida, 1996; Piamonte et al., 2020). Furthermore, Filipinos have this concept of *panata* in which they promise to do something in exchange for an intention they prayed for to God or the saints (Bonilla, 2021; Arceta, 2020). Sometimes, this *panata* will involve putting up a new Holy Week tableau annually for the rest of one's lifetime, even beyond when these tableaus become heirloom pieces or join their processions as local pilgrims.

The demand for life-sized religious images for these floats and tableaus keeps the wood carvers of Betis, Pampanga, Paete, Laguna, and other localities busy all year round. Wood, coming from the country's fast-shrinking forests, is the main material of these Holy Week tableaus. This paper developed an alternative material for this craft to replace wood and save forests. The author of this paper is a published scholar on Philippine culture and religion, an amateur sculptor, and a member of a five-generation extended family of *camareros* or keepers of these sacred images.

Instead of carving wood, this paper proposed the modelling of sacred images using natural clay or plastic clay and casting this later in plaster and paper clay. This paper developed a new method of casting that does away with the cumbersome plaster molds. The absence of molds in the casting process assured the individuality of each sacred image produced and the richness of details that would otherwise simply clog the plaster molds. Plaster had been used in making religious images. But it is not the choice material for Philippine Holy Week tableaus because of its brittleness, as these tableaus are annually assembled, moved around through the main streets

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with throngs of people, and then dismantled for storage. There is at least one antique religious image in the country, the Lady of Piat in Cagayan Province, made of papier-mâché. Secular papier-mâché figures, known locally as *takas*, are also produced alongside the wood carving industry in Paete, Laguna (Canete, 2013). But paper is also not the choice material for religious images because of its vulnerability to water and dampness. But by mixing plaster and paper clay, which is made of paper fibers, the brittleness of plaster and the vulnerability of paper to water are simultaneously mitigated. The paper fibers reinforce the plaster, while the plaster protects the paper fibers from water and dampness.

This paper looked into the environmental impact of this proposed alternative compared to traditional raw wood materials and other modern alternative raw resin materials. Thus, it aims to offer help in making the Holy Week biblical tableaus, a strong and growing Filipino Roman Catholic expression of lay religious devotion, an environmentally sustainable practice. The art of religious wood carving is now more and more constricted by forest regulations. Providing the concerned craftsmen with alternative materials to work on will assure them of their livelihood and help preserve and develop their talents, which in themselves are part of the country's intangible cultural heritage.

2.0. Methodology

This paper has four substantive sections consisting of 1) a more detailed documentation of the alternative sculptural method formulated by this project, 2) a comparative study on the toughness and durability of the proposed alternative sculptural product, 3) a study on the conservation status of the three preferred woods, and 4) a comparative study on the eco-friendliness of the said alternative sculptural method, the traditional use of wood, and the more current use of resin.

For the first substantive section, this paper recounted the basic steps of this alternative sculpting method, including the materials and tools needed for each step. This method will only cover the creation of heads, hands, feet, and other props. The bodies of these images can be constructed separately by supervised carpenters, either as *de bastidor* type, composed of wooden slats, or as *de manikin* type, composed of roughly carved wooden limbs and a torso resembling a mannequin. These bodies are then covered with costumes that can be created separately by tailors and dressmakers.

For the second substantive section, desk research was undertaken to understand the notion of durability implied by the preferred woods among traditional *santeros*, as well as compare the proposed alternative product with these preferred woods, unreinforced plaster, papier-mâché, and resin in terms of compressive strength, tensile strength, moisture resistance, insect resistance, degradation through time, and overall durability.

For the third substantive section, desk research was undertaken to understand the conservation status of the three preferred woods among the traditional *santeros* to grasp these resources' availability.

For the fourth substantive section, another desk research compared the environmental impacts of these three preferred woods with resin and the proposed alternative product. This comparative environmental impact analysis focused only on the production aspect of the life cycles of the three mentioned materials, as their aspects of product transportation, use, and end of use are more or less the same. This comparative life cycle assessment used a calculator spreadsheet from VentureWell (n.d.) and the database of Ecolizer 2.0 (n.d.).

3.0. Results and Discussion

A Detailed Look at the Alternative Sculptural Method

The alternative sculptural method has five basic steps, namely: building the armature, modeling the figure, casting the modelled figure, chasing and detailing, and painting. These steps, together with their materials and tools, are recounted in the following paragraphs.

The Armature: The armature is the structural support that will provide rigidity to the clay during the modelling step. Ordinarily, the armature is a temporary item that is discarded after the casting step. But in this alternative sculptural method, the armature will remain embedded in the finished project and add to its strength and durability. The armature must be structurally strong to hold together the plaster and paper shell that will cover the whole of it. For the hands and feet, wire, wood, and paper clay can be used in constructing their armatures. The armature must be completely dry before moving on to the next step. The materials needed for this step are galvanized iron wire, paper, PVA glue, paper clay, and masking tape. The tools needed for this step are pliers, scissors, cutters, and a lot of common sense and imagination.

Modelling with Clay: This step is the central sculptural phase of the whole alternative method, where the primarily additive sculptural process, in opposition to the subtractive sculptural process of wood carving, is used. Plastic clay is the author's choice of material as this will be less messy, paving the way for the possibility of doing this whole step on his home office table. Plastic clay will also not create moisture damage on the wire and papier-mâché armature. Plastic clay may be environmentally problematic compared to natural clay. But this shortcoming is minimized by the fact that after the casting step, the plastic clay can be reused again ang again and can last for over a decade and maybe more. The advantage of additive modelling over subtractive carving is that the former allows the sculptor to work and rework a given project until his/her desired effect is achieved. Three-dimensional clay modelling can be planned through two-dimensional pencil and paper sketches. The material needed for the modelling step is plastic clay. The tools needed for this step are wooden/plastic and wire modelling tools, a sculptor's divider or caliper, an articulated wooden mannequin model, articulated wooden hands models, and a lot of creative imagination.

Moldless Casting: Casting is the process of transferring the figure created with the more ephemeral clay to a more lasting substance such as plaster, bronze, concrete, or resin. Without casting, plastic clay will remain supple and pliant, while natural clay will harden, but it will remain brittle and vulnerable to moisture damage unless fired into terracotta. Ordinarily, casting involves molding around the clay figure and then pouring the preferred substance into such mold. Using plaster molds can be very cumbersome; it can cancel out so many details from the clay model and result in a badly damaged and disfigured product. These problems can be mitigated with the use of silicone rubber molds. But this material can also be very expensive, especially if the project involves life-sized images. Thus, instead of using the cumbersome plaster mold or the very expensive silicone rubber mold, the author developed a moldless casting method. In this alternative process, a small section is excised out from the clay model to expose its wire and papier-mâché armature; the empty space left behind will be filled in by the mixture of plaster and paper clay and the surface remodeled after the excised section. The surrounding clay will serve as the guide surfaces in such a remodeling task. This process is repeated until all of the clay parts of the model are replaced with plaster and paper clay. The materials needed for the casting step are plaster, paper clay, and water. Paper clay, in the form of dry fibers, is commercially available in art supplies stores. The tools needed for the casting step are spatulas, wooden/plastic and wire modelling tools, and patience.

Chasing and Detailing: Even with the moldess casting formulated by the author, the resultant product will still be rough and riddled with imperfections and distortions. The step of chasing and detailing will correct all of these. In the case of this alternative sculptural method, this step is the messiest stage because of the dust generated by the sanding, filling, and filing. This stage cannot be done anymore on an office table. The materials needed for this step are filling substance (same mixture of plaster and paper clay, or acrylic-based wall putty) and sandpaper. The tools needed for this step are small spatulas, an electric sander, an electric engraver, files, protective goggles, protective masks, and additional loads of patience.

Painting: After chasing ang detailing, the figure is ready for painting. Ordinarily, two separate *santeros* are in charge of this step: the *encarnador*, which literally means "enflesher," and the *dorador* or the gilder. In this alternative method, the author stands as both the *manlililok* and the *encarnador*, and even the *dorador*. Following the Spanish tradition of polychrome sculpture, the *encarnador* prepares the base coat using gesso. However, the author used industrial-grade white acrylic paint in this alternative method. Again, following the Spanish tradition of polychrome sculpture, the *encarnador* uses thin washes of oil paint to achieve the life-like flesh tones. But in this alternative method, the author used the more modern, quick-drying, and durable artist-grade acrylic paint. For gilding, the author used artist-grade metallic acrylic paint instead of the more expensive gold leaf. The materials needed for the painting step are artist-grade acrylic paints, industrial-grade white acrylic paint, and water. The tools needed for this step are an artist's brushes, a palette, and a sharp eye for details.

Comparative Study on Durability

At the beginning of the 20th century, Schneider (1916), in his book *Commercial Woods in the Philippines*, noted two groups of religious sculptures in the country, namely, those that were intended to be placed indoors and those that were intended to be placed outdoors. Filipinos have no solid tradition in stone statuary carving or bronze casting. Thus, he noticed that outdoor religious sculptures were made of hardwood molave or ipil. But with the arrival of concrete cement, what Scheider observed for outdoor religious sculptures was eventually replaced with cast concrete and, more recently, with cast resin. He documented that indoor religious sculptures are primarily made of the softer yellow batikulings, and if these are not available of santol and lanete. The sacred images of the Holy Week tableaus, although primarily intended to be paraded outdoors, are actually indoor religious sculptures as most of the time, these are kept in storage indoors.

In his book *The Uses of Philippine Woods*, Ahern (1911) characterized these batikulings as soft to moderately hard wood, invulnerable to insect attacks, and having a durability score of II. In Ahern's (1911) durability scale, score I means "very durable," can resist "the weather or contact with the ground for long periods," and is exemplified by the already mentioned molave and ipil; score II means "durable," can "last many years even in the ground or exposed to the weather," and is exemplified by calamansanay and tindalo; score III means "fairly durable," can "resist the weather fairly and last several years even in the ground," and is exemplified by apitong and guijo; and score IV means "not durable," "should not be exposed to conditions of constant moisture or to a constant alternation of moisture and dryness," and is exemplified by lauans and nato. Santol is characterized as moderately hard, invulnerable to insect attacks, and has a durability score of III. Lanete is characterized as soft to moderately hard, invulnerable to insects, and has a durability score of III (Ahern, 1911, pp. 23-33).

Based on Ahern's (1911) characterization of the three leading choices of wood for Philippine indoor religious sculptures, it is clear that the traditional craftsmen were not interested in woods under durability score I but went for the softer woods under durability score II and even durability score III. What seemed important for them was the ease in carving due to the relative softness of the materials and their granular uniformity, lightness of the materials as the finished images were originally meant to be carried on platforms called *andas* instead of placed on wagons called *carrozas*, and the resistance of the materials against insects especially termites (Zobel, 1958). The researcher had a close encounter with these menacing insects when his uncle decided to expand their family's tableaus a decade ago and went for an inferior wood to construct the La Pieta scene. Recently, the images have been infested with termites, causing the whole extended family so much heartache.

A good way to analyze the durability of the proposed alternative material in comparison with the typical woods, unreinforced plaster, papier-mâché, and resin, is to look at their compressive strengths, tensile strengths, insect resistance, moisture resistance, and resistance to degradation over time. Compressive strength refers to a material's capacity to withstand forces acting to reduce its size. Tensile strength refers to a material's capacity to withstand lengthwise stress. Insect resistance refers to a material's characteristics that either repel insect attacks or withstand such attacks. Moisture resistance refers to a material's capacity to withstand water or moisture. Resistance to Degradation over time refers to a material's capacity to withstand temporal deterioration. The criteria of compressive and tensile strengths are common contemporary material science categories. The criteria of insect resistance and moisture resistance, as well as resistance to degradation over time, are important categories as far as the conservation of artifacts made of wood or similar materials is concerned, and these three categories were all included in Ahern's (1911) durability scale.

Based on literature and informed estimates of the author, table 1 compares the compressive strengths, tensile strengths, insect resistance, moisture resistance, resistance to degradation over time, and overall durability of wood, unreinforced plaster, papier-mâché, resin, and this paper's proposed mixture of plaster and paper clay. For each criterion, these materials were rated either as high (with a numerical equivalent of 3), medium (with a numerical equivalent of 2), or low (with a numerical equivalent of 1). The overall durability rating was based on simple averaging with the value ranges of 1.00 to 1.67 interpreted as low, 1.68 to 2.34 interpreted as medium, and 2.35 to 3.00 interpreted as high.

Table 1
Comparison of the Durability of Wood, Plaster, Paper-Mâché, Resin, and this Proposal's Plaster and Paper Clay Alternative

Sculptural Materials	Compressive Strength	Tensile Strength	Insect Resistance	Moisture Resistance	Resistance to Degradation over Time	Overall Durability
Wood	High (3)	Medium (2)	High (3)	High (3)	High (3)	High (2.80)
Plaster	Medium (2)	Low (1)	High (3)	High (3)	High (3)	High (2.40)
Papier-Mâché	Medium (2)	High (3)	Low (1)	Low (1)	Medium (2)	Medium (1.80)
Resin	Medium (2)	Medium (2)	High (3)	High (3)	Medium (2)	High (2.40)
Plaster &Paper Clay	Low (1)	Medium (2)	High (3)	Medium (2)	Medium (2)	Medium (2.00)

The preferred woods for Philippine indoor religious sculpture have high compressive strength. They also have high tensile strength if the pressure is applied perpendicular to their grain. However, if this pressure is applied parallel to their grains, their tensile strength would dramatically decrease. This explains why breaks along the grains often happen on wooden statues' fingers, ears, and noses. Thus, these woods' high and low tensile strengths were written as medium in Table 1. Ahern (1911) attested that these woods have high insect resistance, high moisture resistance, and high resistance to degradation over time. Hence, these woods have a high overall durability rating.

Compared to the preferred woods, plaster has a medium compressive strength. It is established in the literature that plaster's tensile strength is lower than its compressive strength. This low tensile strength makes plaster not the preferred material for Philippine Holy Week tableaus. Definitely, plaster has high insect resistance. Although water can damage plaster, as far as the expected weathering for indoor religious statuary is concerned, it can have a high moisture resistance. Based on the fact that there are items made of plaster, such as death masks, that date back to the ancient Egyptian period, the material has a high resistance to degradation over time (Ngaaje, 2021). Hence, plaster has a high overall durability rating.

Papier-mâché statues are usually hollow inside, with much thinner material than plaster ones. Its compressive strength is lower than its tensile strength, and these were, therefore, respectively, written as medium and high in Table 1. It has low insect resistance and moisture resistance, causing it not to be the preferred material for religious statuary in general (Thornton, 1993). Since it can survive through several centuries, as exemplified by the Our Lady of Piat statue, as well as several specimens of interior architectural highlights, furniture, and even anatomical models, its resistance to degradation over time was written as a medium in table 1 (Van der Reyden & Williams, 1992; Thornton, 1993; & Asser et al., 2008). Hence, papier-mâché has a medium overall durability rating.

Resin statues are also usually hollow inside, with the material even thinner than those made of papier-mâché. If resin statues are not reinforced with natural or synthetic fibers, their compressive strengths would be more or less like their tensile strengths. Otherwise, their compressive strengths would be lower, while tensile strengths would be higher. Thus, these statues medium and low compressive strengths, and medium and high tensile strengths were written as medium in table 1. Definitely, resin has high insect resistance as well as moisture resistance. Since resin can become brittle with age, its resistance to degradation over time was written as a medium in Table 1. Hence, the resin has a high overall durability rating.

The proposed alternative statues made of plaster and paper clay are also hollow inside the heads, with the material thicker than those made from unreinforced plaster. Literature has established that mixing paper pulp into plaster at about 10% by mass will decrease the product's compressive strength but increase its tensile strength compared to unreinforced plaster (Ngaaje, 2021). Thus, the compressive and tensile strengths of the proposed alternative material were written as low and medium, respectively, in Table 1. The insect resistance of this proposed alternative material is high, similar to that of plaster. But its moisture resistance is lower than that of plaster. Literature assumes that plaster's low alkalinity will not degrade the natural fibers mixed with it (Coutts, 1986). However, since the paper fibers will not last as long as their plaster binder, the resistance to degradation over time of this proposed alternative material was written as medium in Table 1. Hence, such material has a medium overall durability rating.

Table 1 states that among the five sculptural materials analyzed, the traditional wood choices are the best option in terms of overall durability. These are followed by a tie between plaster and resin. But because plaster is flawed by its shortcoming in tensile strength, resin comes as the second best option in durability, while plaster ends up as the third best option. It turns out that the proposed alternative material is inferior to plaster in terms of overall durability. But it is better than plaster because plaster is flawed by its shortcoming in tensile strength, which is crucial for these religious statuaryncerned. The proposed alternative material's compressive strength flaw is not a significant shortcoming because heads and hands are not usually exposed to compressive forces. Only the feet, which are very seldom created in Philippine Holy Week tableaus, are exposed to compressive forces. But these feet, if indeed they will be created, can be easily reinforced with more substantial industrial-grade wood. Table 1 also shows that the proposed alternative material is superior to papier-mâché in terms of overall durability and insect and moisture resistance.

In terms of durability, this paper's proposed alternative material is a viable substitute to the preferred woods and resin, although it cannot surpass the overall durability of these first and second-choice materials. The primary value of this proposed alternative material is based on its environmental soundness, which will be elaborated in the succeeding section of this paper.

Conservation Status of the Three Preferred Woods

In the early 20th century, Ahern (1911) identified *batikuling, santol*, and *lanete* as rare woods. At present, batikuling is considered an endangered species according to the Department of Environment and Natural Resources (DENR, 2017). In the country, santol has been cultivated for its sour fruit but not for its timber. This explains its rareness as wood despite the commonness of its fruit. Lanete is more common than both batikuling and santol as this lanete is used in reforestations at elevations of 200 to 1,500 meters above sea level (Lemmens et al., 1995; International Union for Conservation of Nature's Red List of Threatened Species, 2020b). Nevertheless, even this lanete is protected by a comprehensive logging ban implemented by the national government in 2011.

Although santol and lanete are, respectively, the second and third wood choices among traditional *santeros*, these are far second and far third choices. Escobin et al. (2019) in their work "Scientific Restoration of National Shrines and Landmarks in the Philippines by the Forest Products Research and Development Institute's Wood Identification Technique," examined 1,911 movable and immovable wooden artifacts from five heritage sites, and were able to establish that 16.54% of these are made of batikuling wood. In contrast, only 0.47% are made of santol wood, and only 0.05% are made of lanete wood. This means that for every lanete artifact, there are nine santol artifacts and 316 batikuling artifacts, and for every one santol artifact, there are 35 batikuling artifacts, as far as their samples are concerned. This heavy preference for batikuling wood is what caused the current endangered status of the said species (Ecosystems Research and Development Bureau, 2017).

An advice that *santeros* and their wood suppliers should be planting batikuling trees is easier said than done. First, batikuling trees cannot just be planted in any backyard or peripheral land, as their habitat requires an elevation of 150 to 500 meters from sea level (International Union for Conservation of Nature's Red List of Threatened Species, 2020a). Second, batikuling is a slow-growing tree that makes it an unattractive product to cultivate (Tolentino, 2008). Third, there is this issue of land ownership in the Philippines, where the more knowledgeable farmers do not own their land, and absentee landlords do not care much about the nitty gritty of land management. Fourth, this issue of harvest uncertainty is caused by changing government regulations (Santos et al., 2005). These obstacles are also true for the planting of lanete trees. However, this initiative by the Southern Luzon State University started in 2013, when 15 hectares of land were planted with batikuling trees. This project will yield wood in about 2033 to 2038 (Baraoidan, 2019).

This current endangered status of batikuling trees side by side by the ongoing comprehensive logging ban forced the traditional *santeros* towards their previously far second choice wood, santol. Apparently, santol wood is sourced from backyards and peripheral lands or salvaged from trees uprooted by typhoons. An advice that *santeros* and their wood suppliers should plant more santol trees is a feasible idea as this species is not only fast-growing but can also thrive in backyards and peripheral lands near the sea level up to an elevation of 1,200 meters (International Union for Conservation of Nature's Red List of Threatened Species, 2017).

Comparative Environmental Impact Analyses

This paper's comparative life cycle assessment is a segment of the full life cycle assessment that looks at a product or products from a cradle-to-grave point of view. This comparative assessment aims to show that using the plaster and paper clay alternative in producing sacred images has a lesser environmental impact than using rare solid wood (batikuling, santol, or lanete) or resin. The scope of this comparative life cycle assessment is only the production phase of these three kinds of sacred images, as this paper assumed that their transportation phases, use phase, and end-of-use phase are more or less the same and that the material extraction phase is factored into each of the materials used in the said three kinds of sacred images. The functional unit used in this comparative assessment is the head of a sacred image slightly bigger than life-size made of plaster and paper clay, rare solid wood, and resin. This paper cannot provide an estimated weight of this head as such would vary depending on the densities of the three alternative

Table 2
Life Cycle Assessment of the Production of a Head of a Sacred Image Using Solid Rare Wood

Production Step	Material/Process	Eco-intensity	Notes	Amount per item	Uncertainty %	Calculated Impact per Item	Calculated Impact per Step
Air Drying & Blocking	Wood	239	Value of hardwood, sawn timber, raw, air/kiln dried (u=10%)/kg in Ecolizer 2.0	8.00 kg	20%	1,912.00	1,931.61
	Electric Saw (750 w)	53	Average from the regional electric eco-intensities listed in Ecolizer 2.0	0.37 kwh	20%	19.61	
Roughing	Electric Drill, Rasp, and chisel (550 w)	53	Average from the regional electric eco-intensities listed in Ecolizer 2.0	2.75 kwh	20%	145.75	145.75
Detailing	Electric Rotary Sander (130 w)	53	Average from the regional electric eco-intensities listed in Ecolizer 2.0	1.30 kwh	20%	68.90	68.90
Painting	Oil Paint and Turpentine	393	Proxy eco-intensity from alkyd paint, white, 60 in solvent/kg in Ecolizer 2.0	0.05 kg	20%	19.65	19.65
			Total Calculated Impact			**2,165.91 mPt**	

Table 3
Life Cycle Assessment of the Production of a Head of a Sacred Image Using Resin

Production Step	Material/Process	Eco-intensity	Notes	Amount per item	Uncertainty %	Calculated Impact per Item	Calculated Impact per Step
Armature	Iron Wire (Reusable)	0	These materials and processes can be used over and over again and, therefore, have very negligible impacts.	0.25 kg	10%	0.00	4.56
	Iron Wire (Drawing Method) (Reusable)	0		0.25 kg	10%	0.00	
	Wooden Base (Reusable)	0		0.06 kg	10%	0.00	
	Paper	76	Recycled paper without deinking as listed in Ecolizer 2.0	0.06 kg	20%	4.56	
Modelling	Natural or Plastic Clay (Reusable)	0	This material can be used over and over again and, therefore, has a very negligible impact.	10.00 kg	20%	0.00	0.00
Casting	Plaster	62	From Ecolizer 2.0	4.00 kg	10%	248.00	2,406.00
	Silicone Rubber	274	From Ecolizer 2.0	2.00 kg	20%	548.00	
	Resin	644	From Ecolizer 2.0	2.50 kg	20%	1,610.00	
Chasing & Detailing	Electric Rotary Sander (130 w)	53	Average from the regional electric eco-intensities listed in Ecolizer 2.0	0.65 kwh	20%	34.45	34.45
Painting	Oil Paint and Turpentine	393	Proxy eco-intensity from alkyd paint, white, 60 in solvent/kg in Ecolizer 2.0	0.05 kg	20%	19.65	19.65
Total Calculated Impact						**2,464.66 mPt**	

materials mentioned and the solid or hollow nature of such head.

As mentioned, this comparative life cycle assessment used a calculator spreadsheet from VentureWell (n.d.) and the database of Ecolizer 2.0 (n.d.). Ecolizer 2.0 (n.d.) is based on the ReCIPE 2016 method as developed by RIVM (National Institute for Public Health and the Environment of the Netherlands), Radboud University Nijmegen, Leiden University, and the consulting firm PRé Sustainability (Huijbregts et al., 2016). This method considered 16 midpoint impact categories (namely, particulate matter, tropospheric ozone formation-human, ionizing radiation, stratospheric ozone depletion, human toxicity-cancerous, human toxicity-non cancerous, global warming, water use, freshwater ecotoxicity, freshwater eutrophication, tropospheric ozone formation-ecological, terrestrial ecotoxicity, terrestrial acidification, land use/transformation, marine ecotoxicity, mineral resources, and fossil resources), eight damage pathways (namely, increase in respiratory disease, increase in various types of cancer, increase in other diseases/causes, increase in malnutrition, damage to freshwater species, damage to terrestrial species, damage to marine species, and increased extraction cost), and three endpoint areas of protection (namely, damage to human health, damage to ecosystems, and damage to resource availability) (Huijbregts et al., 2016). In Ecolizer (n.d.), the values are expressed in millipoints (mPt) and translated into one-millionth point of environmental impact per kilogram, per kilometer, meter, or other relevant units of material or process involved. The higher the millipoint, the higher the environmental impact. Ecolizer' s 2.0 (n.d.) values are already consolidated and do not lend re-disaggregation into midpoint impact values and endpoint areas of protection values. The life cycle assessment made by the author was reviewed by a licensed environmental planner from the University of the Philippines Los Baños.

The traditional sculptural method of carving rare solid wood has four basic steps: air drying and blocking, roughing, detailing, and painting (Viva TV, 2018; Lee, 2020). Table 2 presents the environmental impacts of the significant materials and processes involved in each of these steps and the total environmental impact of producing a head of a sacred image using this traditional sculptural method.

Table 2 shows that producing a head of a sacred image using rare wood will have an environmental impact of 2,165.91 mPt, with the biggest impact from the air drying and blocking step (1,931.61 mPt), followed by the roughing step (145.75 mPt), then by the detailing step (68.90 mPt), and then by the painting step (19.65 mPt). Wood is the single material with the highest environmental impact (1,912.00 mPt). This life cycle assessment did not factor in the rareness of the wooden material because Ecolizer 2.0 (n.d.) assumed that the wood involved here is a renewable resource.

The now popular method of producing the head of a sacred image using resin has the same five basic steps as that of the proposed alternative using plaster and paper clay, namely: building the armature, modeling the figure, casting the modeled figure, chasing and detailing, and painting. Table 3 presents the environmental impacts of the significant materials and processes involved in each of these steps and the

Table 4
Life Cycle Assessment of the Production of a Head of a Sacred Image Using Plaster and Paper Clay

Production Step	Material/Process	Eco-intensity	Notes	Amount per item	Uncertainty %	Calculated Impact per Item	Calculated Impact per Step
Armature	Iron Wire	195	Proxy eco-intensity from low alloyed steel in Ecolizer 2.0	0.25 kg	20%	48.75	66.11
	Iron Wire (Drawing Method)	40	Additional process needed to make wire out of iron in Ecolizer 2.0	0.25 kg	10%	10.00	
	Paper	76	Recycled paper without deinking as listed in Ecolizer 2.0	0.06 kg	20%	4.56	
	PVA Glue	280	From Ecolizer 2.0	0.01 kg	10%	2.80	
Modelling	Natural or Plastic Clay (Reusable)	0	This material can be used over and over again and, therefore, has a very negligible impact.	10.00 kg	20%	0.00	0.00
Casting	Plaster	62	From Ecolizer 2.0	3.00 kg	10%	186.00	264.60
	Paper Clay	262	Proxy eco-intensity from recycled paper with deinking as listed in Ecolizer 2.0	0.30 kg	10%	78.60	
Chasing & Detailing	Electric Rotary Sander (130 w)	53	Average from the regional electric eco-intensities listed in Ecolizer 2.0	0.65 kwh	20%	34.45	34.45
Painting	Acrylic Paint and Water	309	Proxy eco-intensity from alkyd paint, white, 60 in water/kg in Ecolizer 2.0	0.05 kg	20%	15.45	15.45
			Total Calculated Impact			**380.61 mPt**	

total environmental impact of producing a head of a sacred image using resin.

Table 3 shows that producing a head of a sacred image using resin will have an environmental impact of 2,464.66 mPt, with the biggest impact from the casting step (2,406.00 mPt), followed by the chasing and detailing step (34.5 mPt), followed by the painting step (19.65 mPt), and then by the armature step (4.6 mPt). The modeling step has zero impact since the clay here can be reused an almost infinite number of times. Resin is the single material with the highest environmental impact (1,610.00 mPt).

As already mentioned, the alternative sculptural method proposed by this paper has the same five basic steps of the method using resin. Table 4 presents the environmental impacts of the significant materials and processes involved in each of these steps and the total environmental impact of producing a head of a sacred image using the proposed plaster and paper clay.

Table 4 shows that producing a head of a sacred image using the alternative sculptural material will have an environmental impact of 380.61 mPt, with the biggest impact from the casting step (264.60 mPt), followed by the armature step (66.11 mPt), followed by the chasing and detailing step (34.45 mPt), and then by the painting step (15.45 mPt). Again, the modelling step has zero impact since the clay here can be reused an almost infinite number of times. Plaster is the single material with the highest environmental impact (186.00 mPt).

Table 5 presents a synopsis of the comparison of the steps involved in creating heads of sacred images using solid rare wood, resin, plaster, and paper clay.

Moreover, it shows that the sculptural process using resin has the highest environmental impact, with its casting step carrying the highest millipoints. This is followed by the sculptural process using solid rare wood, with its air drying and blocking carrying the highest millipoints. It also shows that the sculptural process using plaster and paper clay has the least environmental impact. This comparative life cycle assessment has demonstrated that the use of rare wood in making these sacred images will cause 5.7 times damage to the environment compared to the use of plaster and paper clay and that the use of resin will cause 6.5 times damage to the environment compared to the use of plaster and paper clay. The current use of resin is causing 1.1 times more damage to the environment than rare wood use.

Table 5
Comparative Life Cycle Assessment of the Production of a Head of a Sacred Image Using Solid Rare Wood, Resin, and Plaster and Paper Clay

Production Step	Using Rare Solid Wood	Using Resin	Using Plaster & Paper Clay
Air Drying & Blocking	1,931.61	NA	NA
Armature	NA	4.56	66.11
Roughing	145.75	NA	NA
Modelling	NA	0.00	0.00
Casting	NA	2,406.00	264.60
Detailing (& Chasing)	68.90	34.45	34.45
Painting	19.65	19.65	15.45
Total	2,165.91 mPt	2,464.66 mPt	380.61 mPt

4.0. Conclusion

This paper has shown that there is a way of making the vibrant Philippine Holy Week tableaus the centers of sustainable local pilgrimage and religious tourism by offering this paper's alternative method of making these tableaus using plaster and paper clay. While the product of this alternative method may not surpass the durability of wooden and resin products, this alternative method is far more friendly to the environment than the traditional methods that depend on rare woods and synthetic resin, as demonstrated by the comparative life cycle analyses undertaken by this paper.

More specifically, this paper will serve as the preliminary work for a succeeding part. It will conduct fieldwork among *santeros* and *camareros* to investigate how they perceive this alternative method of producing sacred images. The ultimate aim of bigger action research is to design an information campaign to convince more and more *santeros* and *camareros* to eventually embrace this alternative method for environmental sustainability.

However, at this point of this ongoing bigger action research, the author of this paper can only hope that these primary stakeholders will positively consider this alternative method. In case their reaction would be negative, this paper uncovered a backup plan as it looked into the conservation status of the three choice woods. This backup plan is a little long-ranged and consists of encouraging parishes/towns with growing Holy Week tableaus, as well as *santeros* and ardent *camareros* who happen to be landed, to engage in planting santol trees. This paper was able to discover that among the three woods that were most preferred by traditional Filipino sculptors, it is santol that can be most easily planted on church yards, town plazas, cemeteries, and other peripheral lands. Planting the slow-growing batiking and late trees needs more effort, a special elevation range, and a more stable entity, such as a state university, a local government unit, or the national government.

5.0. Limitations of the Findings

The findings on the compressive and tensile strengths were based on literature. It would have been better if actual testing were done on the materials compressive and tensile strengths. This paper did not venture into comparing sculptural frames of different materials.

6.0. Practical Value of the Paper

The method proposed by this paper could be the middle ground between the existing industry of papier-mâché and the more serious art of wood carving. Mainstreaming this method could both save the environment and the intangible heritage of sculpting holy week tableaus.

7.0. Directions for Future Research

It would be interesting to investigate the origin and mainstreaming of papier-mâché in wood carving communities of Paete, Laguna. It would also be interesting to investigate the views of the *santeros* and *camareros* on the alternative sculpting method proposed by this paper.

8.0. Declaration of Conflict of Interest

There is no conflict of interest involved in the research and writing of this paper.

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