POLITECNICO DI TORINO
SECOND SCHOOL OF ARCHITECTURE
Master of Science in Architecture
Honors theses

Slow Tech Systems
Physical/Technical Analysis and LCA study on vegetal ivory
Experimentation of new materials for Interior Design
by Alessandro Marchis
Tutor: Jean Marc Tulliani
Co-tutors: Roberto Giordano and Marco Sangermano

The aim of the study is analyzing an interior coating system realized with Tagua or Vegetal Ivory, an international patented system by the Ivory Forest company in 2005. This project focuses on the geographical area of Ecuador, which boasts the wider spontaneous plantations of Phytelephas Aequatorialis, ivory plants.
The analysis intends to evaluate the environment and energy impacts originated from the production process of a manufacture in vegetal ivory, to be used in building industry as interior coating.

The use of an environment management tool, the LCA (Life Cycle Assessment), allowed quantifying the environment impact and to develop compensation strategies aimed at the safeguard of the Amazonia Forest, in order to obtain a zero impact system.

The experience in Ecuador allowed me broadening the field of analysis to further local materials; in particular coating systems have been developed through the use of local seeds.
The research thesis is composed by three parts: the first, developed in Ecuador, let me know and analyze the vegetal ivory world and it allowed me building flow chart, necessary for an exhaustive environment analysis. This study has been possible thanks to the collaboration with ONG Fundacion Otonga, organization operating in Ecuador for the safeguard of the Amazonia Forest.

The second part of the research includes two research and experimentation phases realized simultaneously at Politecnico di Torino, DISMIC and DINSE Departments. Three laboratory tests have been carried out (analysis of hardness, of water absorption and of thermal resistance) in order to determine the physical technical characteristics of vegetal ivory. An evaluation of the environment impacts has been elaborated through the use of Boustead model software.The third part, developed in Ivory Forest company in collaboration with DISMIC laboratories, allowed me studying and developing new coating systems; the work focused on the use of local seeds of Ecuador, proposing new technological systems composed by natural materials and local materials of Piedmont: bovine horns (industrial waste of the meat production).

The Tagua plant, Phytelephas Aequatorialis, is known in Ecuador with different names according to the regions of the country.
The vegetal Ivory, called in this way for its consistency and for its physical similarity to the animal ivory, is taken from the giant seeds of the Phytelephas Aequatorialis fruit.
The seeds have been included in the list of not wooden forestal products, drawn up by FAO in 1996 in Santiago in Chile, and they represent the only economic resource for many families of Ecuador.
The analysis and environment evaluation are realized in compensation actions aimed at safeguard of the Amazonia Forest. At the end of the studies it was possible to quantify the environment impact of the whole production system of coatings in vegetal ivory, then the CO2-equivalent for the production of 1 kilogram of finished product and it was possible to quantify the share of Amazonia Forest to safeguard in order to obtain a zero impact of the whole system.

The results of the environment analysis, combined with the laboratory ones for the physical technical characterization of the material, allowed the realization of a product card, representing a real environment report.
The final part of the thesis is focused on the development of new coating systems by using the seeds found in Ecuador. These seeds and the plants of origin have been studied and analyzed in their place of origin.
Because of the reduced dimensions of the seeds they have been dipped in a resin matrix in order to obtain a real tile. Initially, I tried to use natural resins, such as the Epoxidised Soya Bean Oil, in order to obtain a “block” entirely created with natural materials; unfortunately it was not possible to use this kind of resin. Subsequently, I used epoxidised synthetic resins and I obtained excellent results.
In conclusion, I developed new models by using waste materials from Piedmont region, the bovine horns. They are the rejects of the slaughtering and for this reason the use of this material can be consider very interesting in terms of environment sustainability.

For further information, e-mail:
Alessandro Marchis: alessandromarchis@yahoo.it