CHARACTERISATION OF CLAYS FROM THE KINSHASA REGION (D. R. CONGO) USED FOR MANUFACTURE OF RAW EARTH PRODUCTS

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The region of Kinshasa contains abundant raw clay materials. These clays are either residual formed by in situ alteration of the Inkisi Neoproterozoic sandstones, or alluvial deposits from the Congo or Ndjili rivers. They are already highly valued in terracotta construction. This work aims at valorising these natural clay resources in another sector of construction which is the raw earth, and by this, defining them as a sustainable and energy-saving alternative.

Three sites marked by important clay resources were sampled in the low Congo River Basin (Kasangulu, Lutendele and Ndjili Cecomaf). The materials of the different localities were characterized in terms of their suitability for raw earth constructions according to current techniques and standards.

The samples were studied with respect to their mineralogical (X-ray diffraction), physical (density, natural water content, grain size, plasticity index) and geotechnical properties (compressive and bending strength). Sampled clays from the three localities are characterized by the following properties.

(1) Kasangulu material are characterized by a 28-day compressive strength (Rc28) ranging from 2.33 to 2.58 MPa and a low 28-day bending strength (Rf28) from 0.56 to 0.59 Mpa, a high density (1800 to 2605 kg/m^3), a low natural water (< 15%) and clay content (< 6% of particles lower than 2 microns) and a plasticity index between 10 and 16.

(2) Lutendele material is marked by low Rc28 (1.69 MPa) and Rf28 (1.33) values but a high natural water (> 15%) and clay (> 20%) content. The measured plasticity index is lower than 10.

(3) Ndjili Cecomaf material is characterized by the highest Rc28 value (3.81 Mpa) and intermediate Rf28 (1.01) and density (1677 kg/m^3) values. Like Lutendele, the Ndjili Cecomaf raw clays contain a high percentage of natural water (> 15%) and clay (17%) but the plasticity index is slightly higher of 12.

Those parameters allow to propose two different applications for the raw clays from the three sampled localities. The Kasangulu material can be classified as more favorable in compressed earth constructions (i.e., rammed earth and compressed earth block). The Lutendele and Ndjili Cecomaf materials can rather be classified as more suitable for molded earth constructions (adobe, mortar, cob).

In the rest of the study, characterized clays will be valorised for the production of blocks of raw earth stabilized by the addition of vegetable waste coming from households, markets or the agriculture sector. In the region of Kinshasa, clay mining for construction is generally artisanal. It produces small quantities of materials which are not accessible to all and whose price remains high for a large part of the population. In order to limit the energy cost of production and produce a resistant building material, the use of vegetable waste seems to be a solution. These wastes are widely available at low cost and their use in construction constitutes new outlets for these materials. The recycling of those waste also reduces environmental impacts.