

# Characterisation of clays from the Kinshasa region (D.R.Congo) used for manufacture of raw earth products

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16<sup>th</sup> International Clay Conference

Granada, 21 July 2017

# Context and objective

- Challenging conventional construction methods
- Anticipating population growth
- Ecomaterials as solution

**What?**



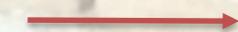
Natural material : clay



Raw earth blocks



**Where?**



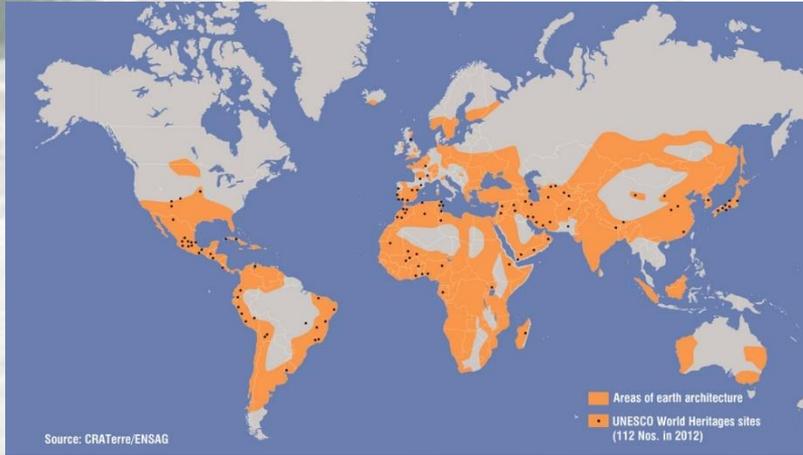
Kinshasa region

**Why?**



- Developing a building material that takes into account the requirements of the current environmental context.
- Development of low cost alternative building materials
- Valuing local natural resources

# Raw earth



- Present on all continents
- 50% of the world population
- 50% in developing countries (80% in rural areas, 20% in urban areas)



Shibam - Yemen



Great Wall of China

# Molded earth



**Adobe**, the molded and sun dried brick

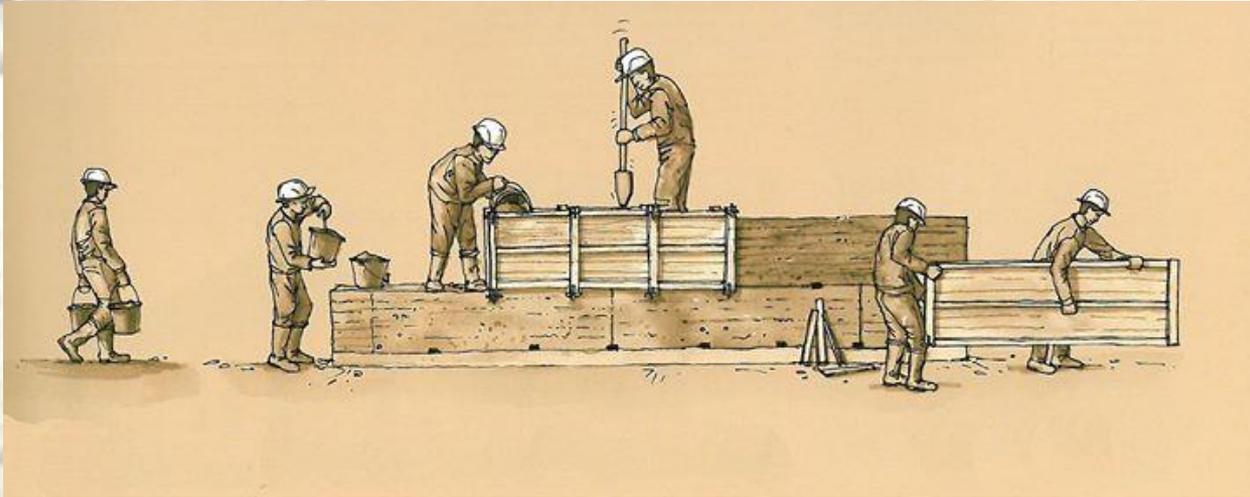


**Cob**, the earth built in layers



**Wattle and daub**, the earth used in filling load-bearing structures, usually made of wood.

# Compressed earth (Rammed earth, CEB)

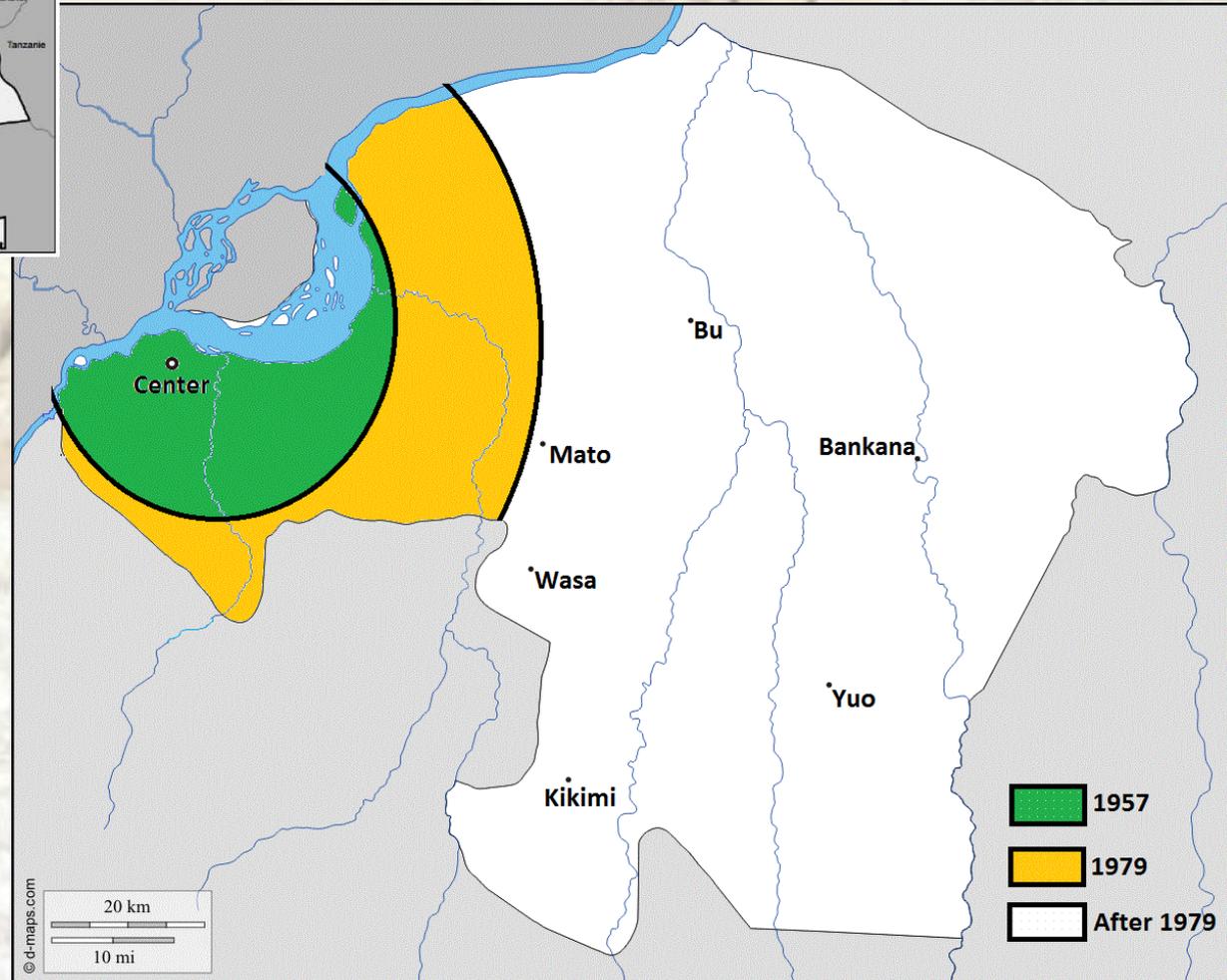
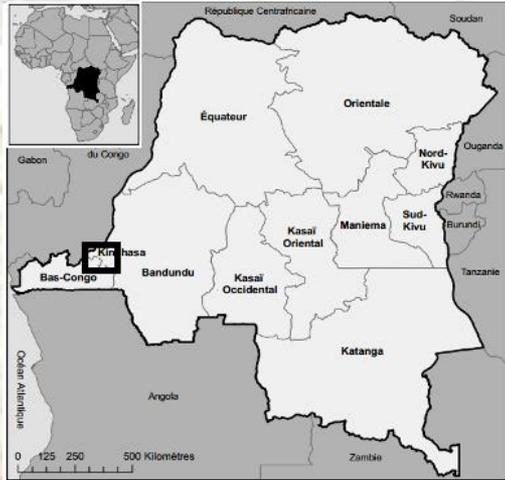


**Rammed earth, earth compacted in a framework**



**Compressed Earth Brick (CEB):** compacted earth, achieved using manual or mechanical presses.

# Site selection



## Evolution of the population

- 1957:  $\approx$  440,000 hab.

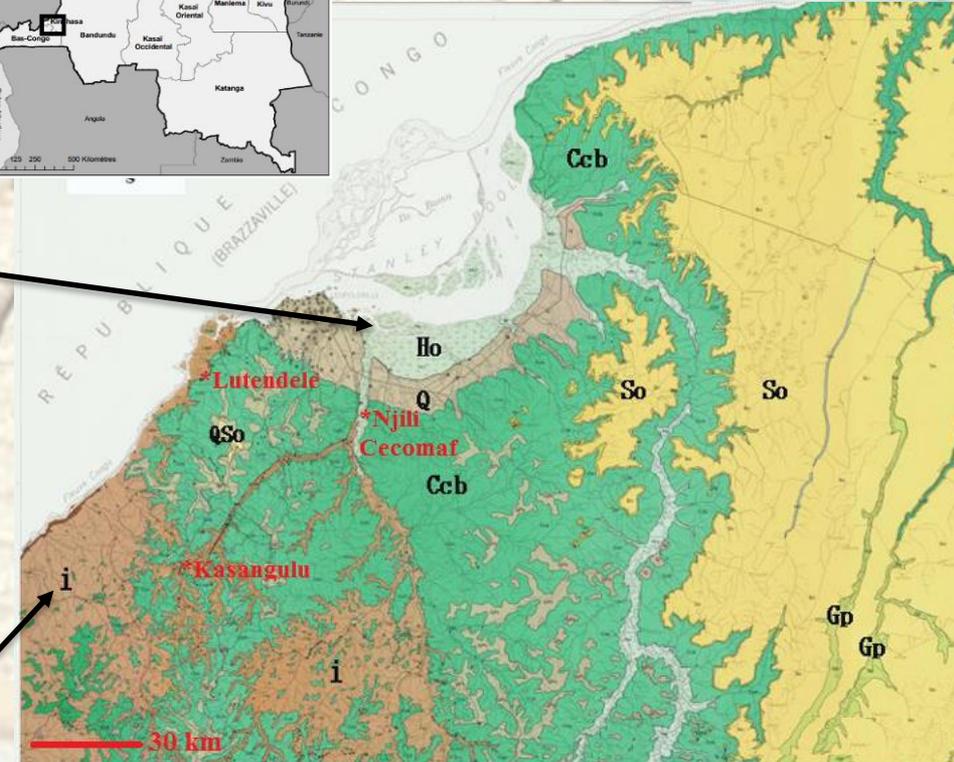
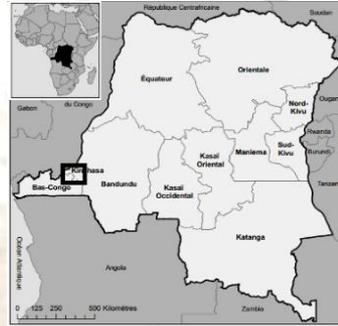
- 2015:  $\approx$  12, 000, 000 hab.

## Built area:

Evolution  $\approx$  10 times

between 1957 and now

# Site selection



<b>Ho</b>	Alluvions de fonds de vallées et de basses terrasses	<b>Gp</b>	Grès polymorphes
<b>Q</b>	Alluvions de moyennes terrasses	<b>Ccb</b>	Grès tendres du Crétacé
<b>QS0/So</b>	Sables, argileux, fins, gris clair à jaune ocre	<b>i</b>	Inkisi (Schisto-gréseux)

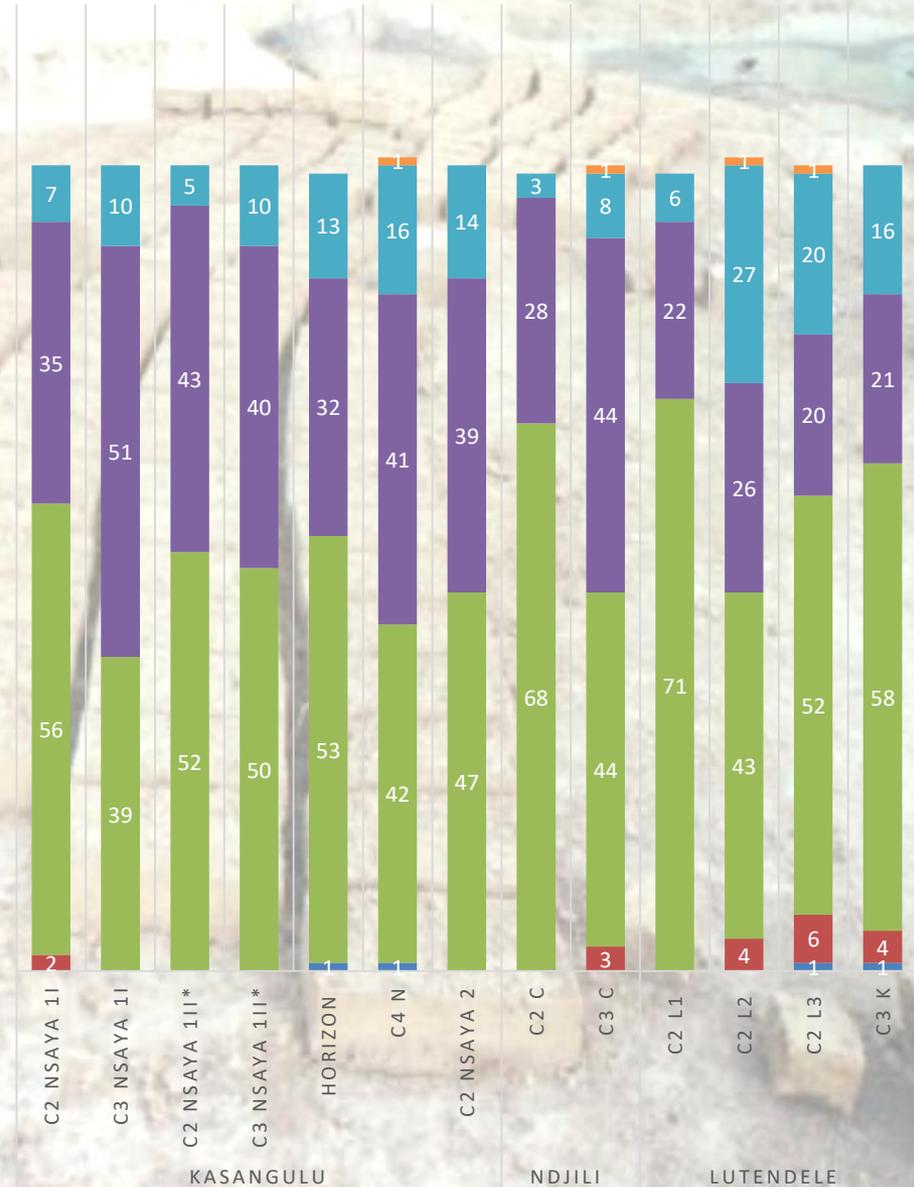
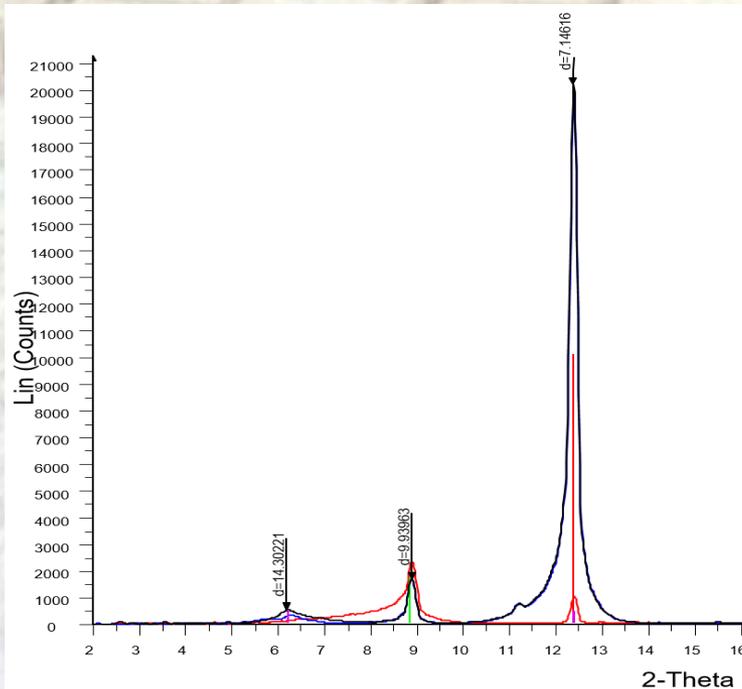
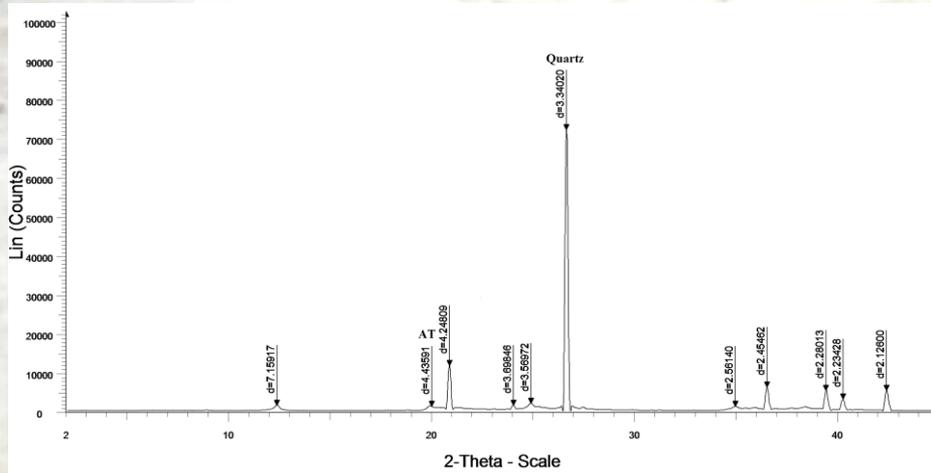
Sources : HVK (2007) ; MRAC (1963)



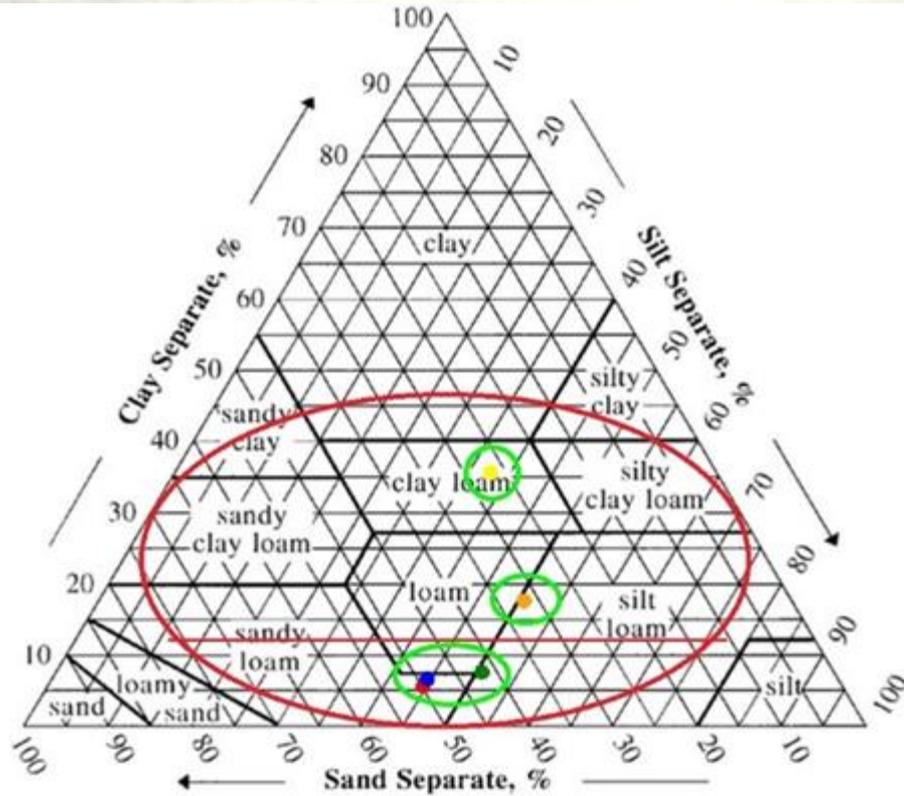
# Results and discussion

## MINERALOGY

■ Muscovite ■ Feldspath0K ■ Quartz ■ Kaolinite ■ Illite ■ Chlorite



# Results and discussion



COMPRESSIVE STRENGTH (MP<sub>A</sub>)

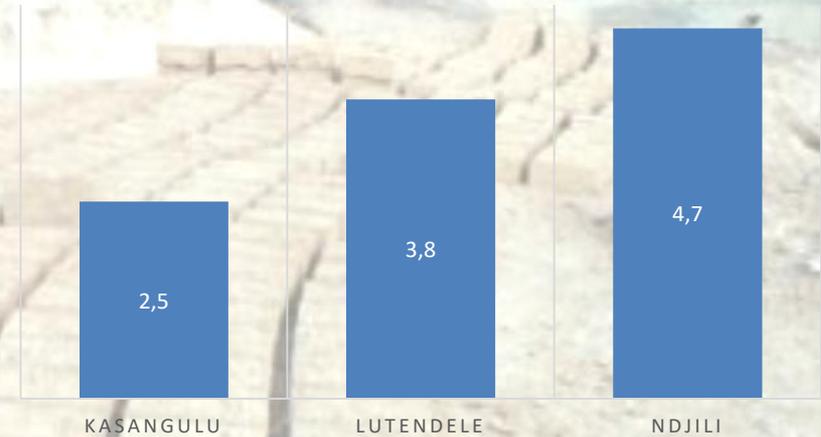
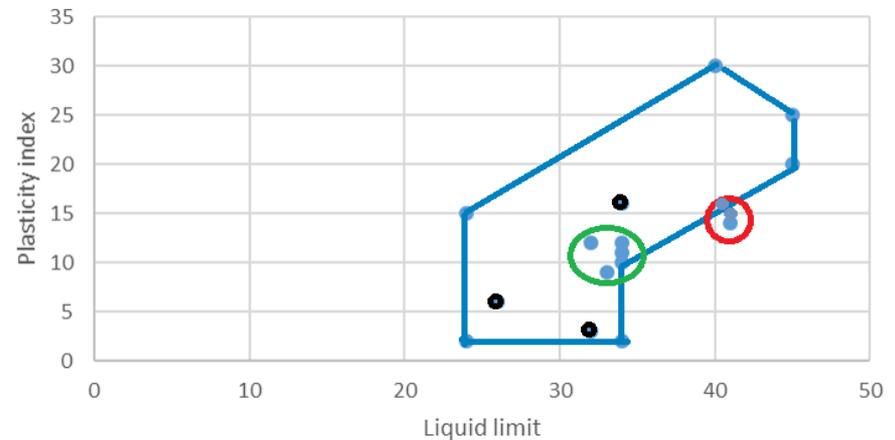


Diagram of plasticity



# Prospect

**Valorization of vegetable waste**



**Manufacture and characterization of CEB**

Mechanical properties  
Hygrometric properties  
Thermal behavior



- Preventing drying cracks
- Lightening the material
- Increasing tensile strength

**Thank you for your attention**

