

# Nearly zero-energy buildings in Central and West Africa : Lessons learned from practice

Authors: Dominique Tagny

Supervisor: Filip Descamps and Shady Attia

E-mail: dominique.tagny@yahoo.com

Address: Building Design Lab (SBD)  
Quartier Polytech 1  
Allée de la Découverte 13A  
4000 Liege, Belgium  
www.sbd.ulg.ac.be  
Tel: +32 43.66.91.55  
Fax: +32 43.66.29.09

## ABSTRACT

The concept of nearly zero-energy building (nZEB) needs investigation in Central and West Africa under the hot and humid Climate. The thesis analysed the passive strategies that are featured on the Belgian embassy in Kinshasa, the first building in the region with nZEB standards. Then, these strategies were applied on the energy model of an existing building in Douala (same region, same climate) to compare and assess their efficiency. Shading devices, good airtightness of the envelope, roof thermal insulation, reduction of the conditioned volume and efficient buildings systems appear to be the most effective strategies.

## KEYWORDS

Nearly zero-energy building, hot and humid, Africa

## PROBLEM

The Central and West Africa region is facing a significant need of infrastructures and buildings. The current building techniques are still the legacy of the colonisation period and that leads to a very low performance of buildings. It is important for the sustainability of the region to adopt design techniques that are more suitable to the region climate and to the people needs.

## OBJECTIVE / HYPOTHESIS

Objective : Define some effective design strategies that improve the energy performance of buildings based on the study of an existing nZEB in the region

## AUDIENCE

Architect Engineers, Civil Engineers, Architects, Researchers

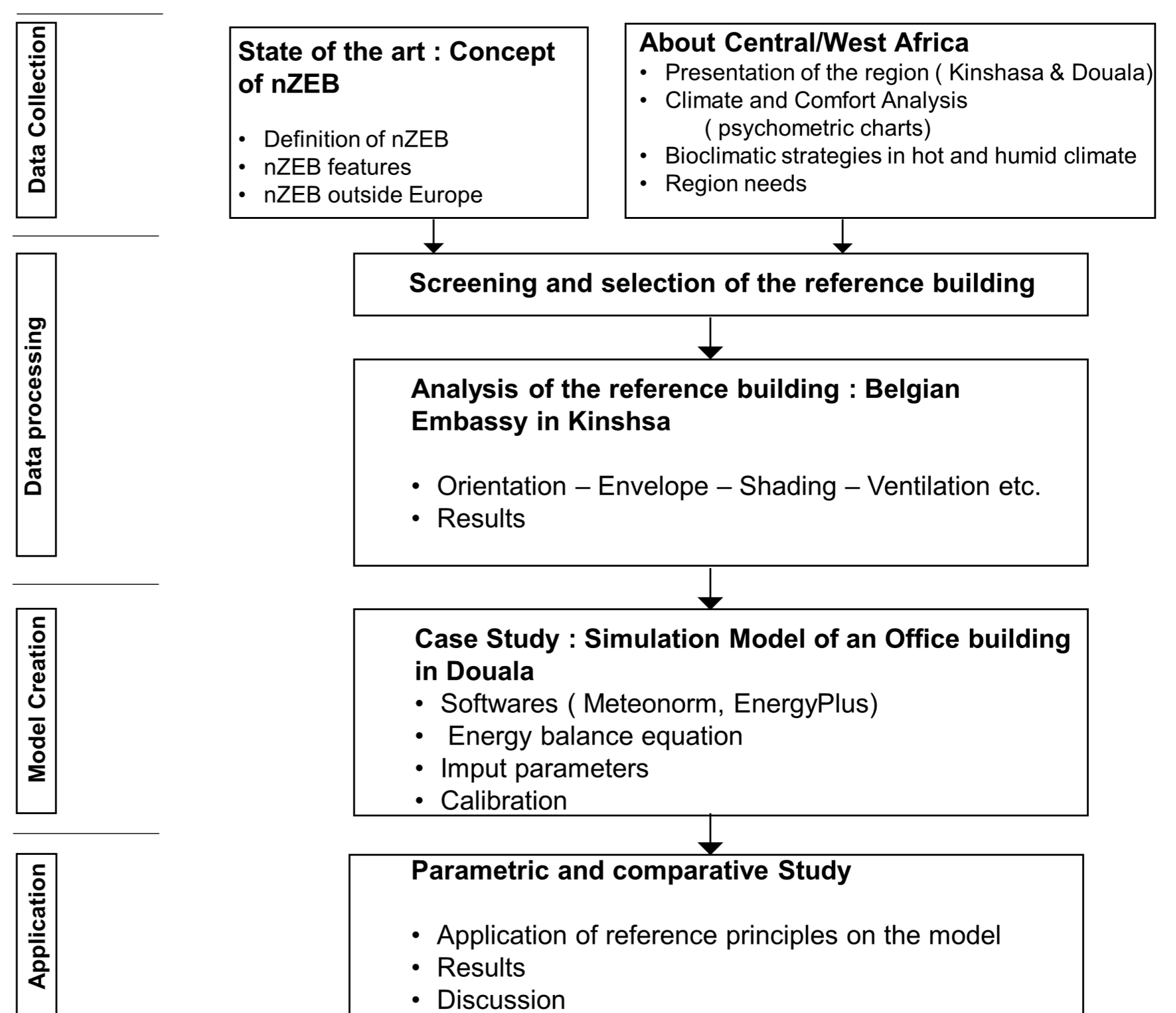
## RESEARCH QUESTION

What are some effective design strategies that can help to reach nearly zero-energy building standards in Central and West Africa under the hot and humid climate?

## ORIGINALITY

This research is based on the analysis of the very first nZEB in the region with verified and certified performance.

## METHODOLOGY



## RESULTS

Most effective strategies after the analysis of the reference nZEB and the simulations on the case study model :

Strategy	Expected reduction on the energy demand of buildings
Shading devices	35%
Good Airtightness of the envelope	25%
Thermal insulation of the roof	15%
Reduction of the conditioned volume	
Efficient building systems	

## CONCLUSION

The thesis showed promising results regarding the nZEB topic in Central and West Africa under the rude hot and humid Climate. By applying effective strategies during the design of new buildings, it is possible to significantly drop their cooling demand (64% for the case study). It is important to mention that elements such as CO<sub>2</sub> emissions, renewable energy production and the financial feasibility of nZEBs in the region were not considered by the study in order to freely focus on the reduction of the energy demand.

## RESOURCES

- Branders, A. (2017, November 3rd). Kinshasa A2M. (D. Tagny, Interviewer)
- Underwood, C., & Yik, F. (2004). *Modelling Methods for Energy in Buildings*. Wiley-Blackwell
- Attia, S., & De Herde, A. (2010). Strategic Decision Making For Zero Energy Buildings in Hot Climates. In *Proceedings of EuroSun 2010*