Comparative analysis *for comfort, passive heating and cooling strategies in Madagascar*

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ABSTRACT

Madagascar has been classified into 7 zones. One city in each zone is used to study comfort and see how to improve it using passive heating and cooling strategies.

KEYWORDS

Passive strategies, Thermal comfort, Bioclimatic Chart, Composite Climate, Madagascar

PROBLEM

Malagasy want to construct houses using bioclimatic design but local climate studies are insufficient and the actual thermal comfort model are proven not suitable for hot and humid countries. Therefore we want to use a new tool for climate analysis to fix thermal comfort boundaries for the local climates and find design solutions by cooling and heating passives strategies.

OBJECTIVE / HYPOTHESIS

Aim : To develop bioclimatic charts for 7 locations within a composite climate zone in Madagascar.

Objective : To derive spatial distribution maps for thermal comfort and passive heating and cooling strategies for the 7 different locations within the composite zone.

AUDIENCE

Urban designers, environmental architects, engineers, municipal officials, sustainability experts.

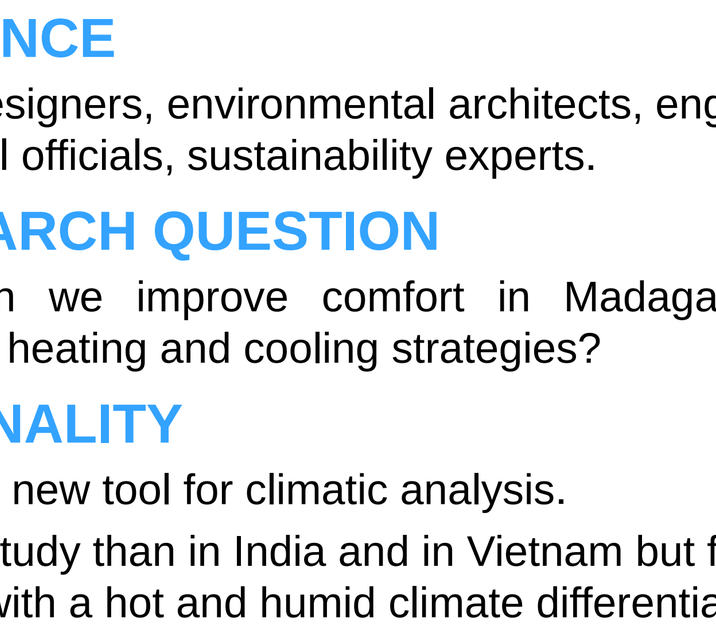
RESEARCH QUESTION

How can we improve comfort in Madagascar using passives heating and cooling strategies?

ORIGINALITY

- Using a new tool for climatic analysis.
- Same study than in India and in Vietnam but for a country with a hot and humid climate differentiated into 7 climatic zones.

METHODOLOGY

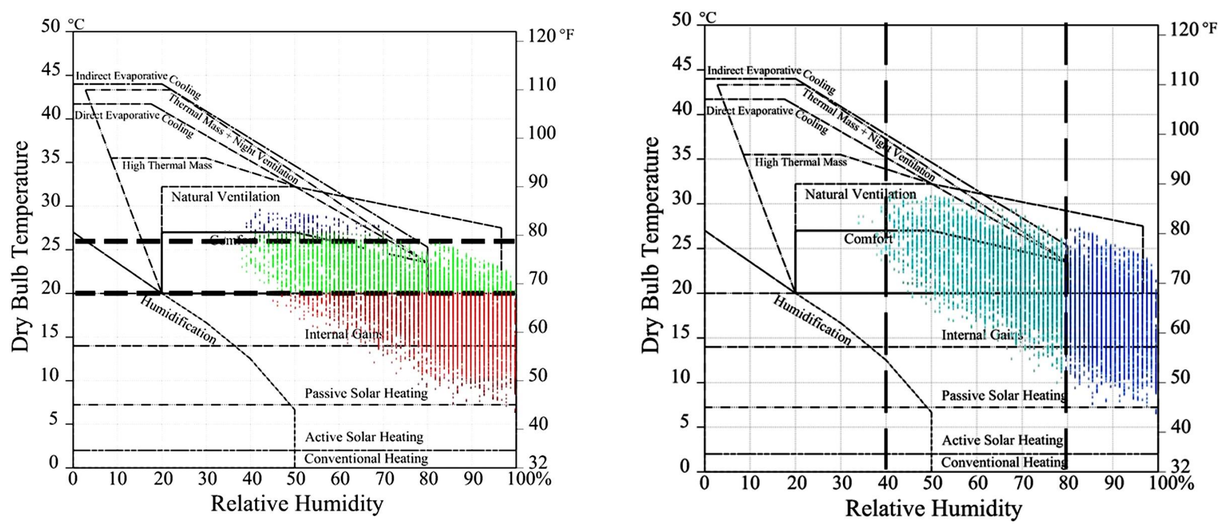


RESULTS

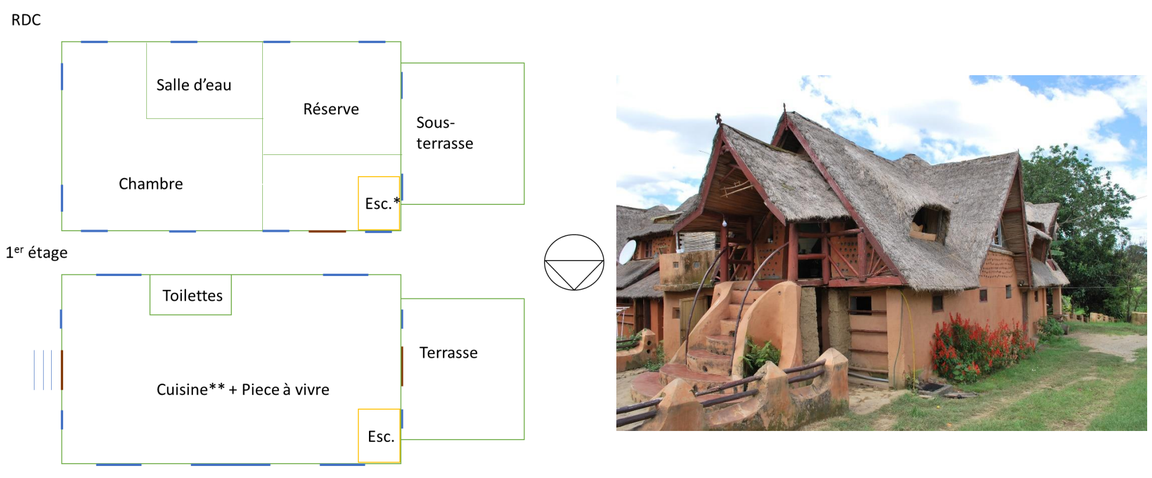
Ville	Zone	Coordonnées	Altitude (m above MSL)
Tsihombe	1	25.19 S 45.29 E	150
Fianarantsoa	2a	21.27 S 47.05 E	1200
Maintirano	2b	18.24 S 44.06 E	12
Tuléar	3a	23.21 S 43.40 E	11
Antananarivo	3b	18.54 S 47.31 E	1276
Toamasina	4	18.08 S 49.24 E	12
Ambatondrazaka	5	17.50 S 48.25 E	800

Zones	Characteristics	Locations
1	Low altitude >23°C average 22-23000 KJ/m²/day	North and South plains
2a	High altitude <15 - 23°C average 21-22000 KJ/m²/day	Central Highlands
2b	Low altitude 23 - >27 °C average >23000 KJ/m²/day	South-West Coast
3a	Medium Altitude <27°C average >23.000KJ	South-West
3b	Medium Altitude <23°C average <21000KJ/m²/day	East Highlands
4	Low Altitude >23 - 27°C average <21000 KJ/m²/day	East Coast
5	Low to Medium altitude >23-27°C average <20000KJ/m²/day	East Coast till Highlands

Zones and locations characteristics



Bioclimatic charts for 1 of the 7 locations (Relative Humidity and Air Temperature)



Model and plans of the Base Case

CONCLUSION

- We chose the comfort model ASHRAE -55 Adaptive as the most suitable for the 7 different zones of Madagascar.
- We create maps for thermal comfort and passive strategies
- With this study, other building typologies can be evaluated in order to understand heating and cooling energy requirements based on climate variation and location. It also can be conducted in other climatic zones of Madagascar.

RESOURCES

Attia, S., Lacombe, T., Rakotondramiarana, H. T., Garde, F., & Roshan, G. R. (2018). Analysis Tool for Bioclimatic Design Strategies in Hot Humid Climates. *Sustainable Cities and Society*.

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