Building zero energy districts in tropical climates. 
Development of design tools for morphology/comfort/energy coupled optimization.
Aymeric Delmas

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**Approved: DELMAS**

**Reproducible to existing and future tropical climates**

**Design recommendations from the simulation data**

**Modeling and simulation skills Conveyable to the design teams**

**Algorithmic optimization of the urban environments easy.**

**Passive design strategies: To couple them**

**From rules of thumb to assess the overall building environmental study**

**Derived from proven strategies**

**To improve optimized building form**

**To make them suitable for urban planning**

**Zero energy districts in tropical climates. Development of design tools for morphology/comfort/energy coupled optimization.**

**Coupling multiple weather-based simulation models and tools via a Rhino-Grasshopper platform.**

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**APPRAOCH**

The couple Rhino-Grasshopper is a parametric modelling tool that is able to algorithmically control 3D models and geometrically optimize them to any defined criteria.

Grasshopper as a script-based Rhino plug makes generating complex geometries easy. Architectural building designs belong to these complex geometries and are nowadays a reality.

Environmental sustainable building design requires the use of multiple weather-based simulation tools to assess the effect of the built environment on the local weather conditions.

**OBJECTIVES**

**How to design bioclimatic neighborhoods in dense tropical urban areas?**

Current design practice for buildings located in dense urban tropical areas imply multiple, independent and multi-scale models, tools and interfaces making continuity of the overall building environmental study (from mesoscale to microscale) impossible. This modelling issue makes the efficacy of passive design strategies adapted to tropical climates uncertain.

**EXPECTED RESULTS**

The expected achievement of this thesis is a coupling platform, solving continuity (temporal and spatial) issues of current global environmental study of buildings in tropical urban areas.

**METHODOLOGY – DESIGN PROCESS**

“Design is the process of realizing intentions.”

Developing design tools for morphology/comfort/energy coupled optimization involves a development methodology following a global design process.

This thesis’ methodology is built around selected design principles and experiences drawn from zero energy built and monitored projects in the tropical climate of La Réunion. The methodology can be illustrated by the following spiral.

From zero energy building design experience to passively optimized urban form.

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“Design is the process of realizing intentions.”

It will use the great range of weather-based simulation tools to assess the impact of the urban microclimate on buildings, occupants and pedestrians’ comfort and ultimately optimize the urban form to passive design strategies.

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