


# Maldyves: positive energy housing in Guadeloupe

by Laurent Darviot / 2022-04-06 00:00:00 / France / 10738 / FR

**New Construction**



**Primary energy need :**

0 kWhep/m<sup>2</sup>.an

(Calculation method : RT Guadeloupe )

**ENERGY CONSUMPTION**

Consumption Range (kWh/m <sup>2</sup> .an)	Grade	Building Grade
< 50	A	A
51 à 90	B	
91 à 150	C	
151 à 230	D	
231 à 330	E	
331 à 450	F	
> 450	G	

*Economical building* (Grades A-C) | *Energy-intensive building* (Grades D-G)

**Building Type** : Collective housing < 50m  
**Construction Year** : 2020  
**Delivery year** : 2021  
**Address 1 - street** : 52 rue des écoles 97128 GOYAVE, France  
**Climate zone** : [Aw] Tropical Wet & Dry with dry winter.

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**Net Floor Area** : 340 m<sup>2</sup> SHON  
**Construction/refurbishment cost** : 540 000 €  
**Cost/m2** : 1588.24 €/m<sup>2</sup>

## General information

The Maldyves residence was born out of the pseudo impotence and fatality of the construction of collective housing. We would all be willing to consume less, to live better together in a healthier way, but this only come true for individual housing.

The challenge was obvious: to build an experimental collective housing building (5 flats), in wood, in a seismic and cyclonic zone and with all the "panoply" of sustainability and the blessing of the tropical climate of Guadeloupe. The Maldyves residence was built in the city centre, in what could be described as a hollow tooth (a 280m<sup>2</sup> micro-waste land), in 14 months.

The constructive demonstration also had to be part of the game, optimising prefabrication, minimising nuisances in the city, and favouring local production. Pre-walls on the ground floor for the common areas and garages, two levels of locally prefabricated walls and timber-framed floors, balconies and metal terraces: a total of 6 days of lifting (not consecutive), zero scaffolding. Out of water, out of air in 6 months. The finishing work was entrusted to craftsmen, at a peaceful and respectful rhythm, a couple of plasterers and painters, a plumber, an electrician and a carpenter. The kitchens and most of the furniture were tailored made and on site, with a "solar" micro-carpentry in the garages for 4 months.

The building is self-consuming thanks to its own photovoltaic power plant, autonomous, equipped with rainwater tanks including a dedicated toilet and water supply network, city water tanks (recurrent interruptions), shared Internet subscriptions, shared garage, collective laundry room, and a shared micro garden.

This project, although experimental and exemplary, was not intended to be futuristic or ostentatious. The architectural choices, although revisited, respect the codes of the Caribbean city: mineral base, wooden living levels and metal balconies. A mural fresco completes the work and perfects the adhesion of the population.

# Sustainable development approach of the project owner

This approach is facilitated by the profile, skills and experience of the project owner, a dplg architect with over 25 years of experience in bioclimatic construction in Guadeloupe and a sincere desire to be exemplary. Laurent Darvot is also the manager of the SARL Agence Architectures.

The project owner also asked the EQUINOXE consultancy firm to carry out an AMO service to optimise the energy performance of the housing. EQUINOXE is an independent technical consultancy based in Guadeloupe, run by Laurent SÉAUVÉ, a consulting engineer with over 20 years' experience in energy management in tropical climates.

The main objectives of this mission are :

- To optimise the architectural choices, the construction processes, the sizing and implementation of efficient equipment to aim for an ambitious but realistic objective of a zero-energy building, i.e. globally autonomous, while being connected to the network. This exemplary approach is intended to serve as a demonstration of the energy transition undertaken in Guadeloupe, aiming for energy autonomy by 2030.

This project is supported by the Guadeloupe Region for the implementation of measures in favour of energy performance in the framework of an exemplary housing project.

The process will be monitored by the ADEME, Agency for the Environment and Energy Management, Guadeloupe Regional Directorate.

## Architectural description

The plot, with a surface area of 283 m<sup>2</sup>, is located in the town of Goyave (Guadeloupe), rue des Ecoles. It can be considered as a "hollow tooth", in the analysis of the town planners, because it has been unused for many years, bordered by residential spaces and perfectly served by the networks, roads and communal services, schools and college.

The project therefore fits perfectly into the revitalisation of the town centre, with multiple environmental virtues.

The building is located on the edge of the road, including the regulatory overhang of the corbelled balconies, and not on the edge of the adjoining building in order to promote porosity and ventilation and to avoid possible conflicts (fire, site nuisance, maintenance).

The ground floor is composed of garages and common premises imposed by the regulations of the PLU, it will be built in reinforced masonry. Above, two levels of housing and their roofing will be built entirely of wood frames and wood (or composite) cladding, in compliance with the paraseismic and anti-cyclonic rules in force.

The joinery will be in aluminium and wood. The technical roof terrace and the access kiosk will be waterproofed with a PVC membrane. The walkways and balconies will be prefabricated in galvanised steel.

The construction and fitting out materials will be selected for their intrinsic qualities and their pedigree. The preferred construction system is prefabrication, to increase the comfort of the building site and reduce nuisance to the neighbourhood.

Avoiding the ostentatious aspect of spectacular and identifiable "green building", the architecture will be careful and respectful of the local context and forgotten uses: wooden collective housing, metal walkways and balconies, mineral base, planters, typical tropical architecture revisited.

## Building users opinion

These are 5 couples of young Guadeloupeans, from diverse backgrounds, who have become friends and show solidarity through their collective residence.

## See more details about this project

<https://maldyves.com>

<https://agence-architectures.com>

## Photo credit

Laurent Darvot

## Stakeholders

### Contractor

Name : sarl Maldyves

Contact : contact[a]maldyves.com

<http://www.maldyves.com>

### Construction Manager

Name : sarl agence architectures

Contact : agence.architectures[a]wanadoo.fr / laurent[a]agence-architectures.com

<http://agence-architectures.com>

## Stakeholders

Function : Company

COALYS

Florian BARBEYRAC 06 90 31 12 00 guadeloupe[a]coalys.eu

<http://www.coalys.eu>

double masonry garages, timber frame housing walls, timber cladding

## Type of market

Global performance contract

## Energy

### Energy consumption

Primary energy need for standard building : 50,00 kWh/m<sup>2</sup>.an

Calculation method : RT Guadeloupe

Breakdown for energy consumption : The building produces its own electricity in self-consumption (photovoltaic power station) and is in fact really ZERO ENERGY. Its energy consumption excluding renewable energies is 100 kWh/m<sup>2</sup>.year

### More information

Only the cooking is with gas, the consumption is very dependent on the uses according to the profiles (gourmets, ...) and it will be evaluated later after several months of exploitation. Ratio: 1 bottle of butane of 12.5 kg contains 12.66 kWh/kg = 158 kWh (final energy) / year.

## Renewables & systems

### Systems

Heating system :

- No heating system

Hot water system :

- Solar Thermal

Cooling system :

- No cooling system

Ventilation system :

- Natural ventilation

Renewable systems :

- Solar photovoltaic
- Solar Thermal

Renewable energy production : 100,00 %

Autonomous photovoltaic plant producing 100% of the building's electricity needs. Solar hot water loop producing 100% of the building's DHW needs.

## Environment

### Risks

Hazards to which the building is exposed :

- Earthquake
- Wind / Cyclone

## Risks measures put in place :

Rather than building a blockhouse resistant to all tests, which would be solicited for a few hours in certain years (Caribbean cyclone) or with a return period of the order of 50 years or more (seismic 5 Caribbean plate), we opted for a ductile, permeable and comfortable construction for its normal and regular use.

The earthquake is not predictable, so the construction is light, with a seismic load proportional to the own weight and of reasonable proportion to the design: 2 wooden levels, regular rectangular plan, no corbelling or overhang.

The cyclone is predictable, expected and prepared. Its trajectory and its intensity are communicated, the parade, if it is conceived and prepared is thus possible. The design of this residential building includes classical protections (anti-cyclonic aluminium shutters) but also countermeasures such as metal balconies "shield", and actions to be taken in case of alert; for example, the complementary stowing of photovoltaic panels.

Let's not forget: resilience is during the crisis, but it is also after the crisis! The first autonomous collective building not connected to the grid in France, the installation and the batteries will provide electricity during the crisis (radio, TV, internet), while EDF preventively cuts the electricity or when trees fall on the lines and affect the network. These systems will also make it possible to supply the building after the crisis if it is particularly serious: power and communication failure for several days, which means no more lighting, fridges, defrosting freezers... Moreover, the garages on the first floor of the building will be able to accommodate the fridges of the neighbors, the dimensioning and the power of the installation being comfortable. Similarly for the water issue, the building is equipped with tanks on the AEP network but also on the recovery of rainwater.

## Urban environment

Land plot area : 283,00 m<sup>2</sup>

Built-up area : 60,00 %

Green space : 15,00

The project is located in a "hollow tooth" in the heart of the village of Goyave (97128 Guadeloupe). This plot of 283 m<sup>2</sup> faces the garden of the town hall, multifunctional lawn (carnival, patronal feast, various events). At the back, the old town with multicolored individual huts and villas (R+c or R+1), behind the castle, the ZAC de l'aiguille, hosting several hundred social housing units. Nearby, the college and the kindergarten.

## Products

### Product

Photovoltaic autonomy

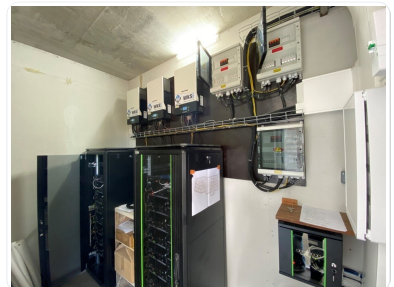
Watt U need

info@wattneed.com

<https://www.wattneed.com/fr/>

Product category : Second œuvre / Equipements électriques (courants forts/faibles)

The building is autonomous, not connected to EDF, in the event of a cyclone or post-Seismic, the 15 KW power plant will supply the accommodation and probably a few neighbors.



Balconies Shields

Coalys

communication.gp@coalys.eu

<http://www.coalys.eu/>

Product category : Gros œuvre / Structure, maçonnerie, façade

The cyclonic winds, at more than 250 km/h, stress the buildings by pressure, they are also carriers of projectiles, metal balconies complete the protection of the wooden facades.



Cisterns

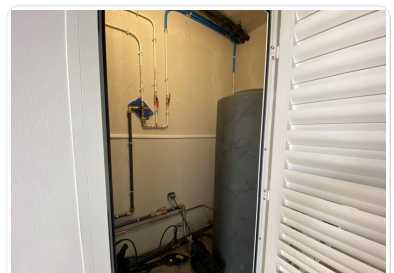
Procap

cpradel@caiali.fr

<https://procap.fr/stockage-eau/citerne-bambou/>

Product category : Second œuvre / Plomberie, sanitaire

The post-crisis phase is often long, the networks are often defective, the double installation of cisterns on the drinking water network and the recovery of rainwater will improve daily life.



## Costs

## Construction and exploitation costs

Renewable energy systems cost : 40 000,00 €

Cost of studies : 12 000 €

Total cost of the building : 580 000 €

Subsidies : 40 000 €

## Health and comfort

### Water management

Consumption from water network : 120,00 m<sup>3</sup>

Consumption of harvested rainwater : 60,00 m<sup>3</sup>

Water Self Sufficiency Index : 0.33

Water Consumption/m<sup>2</sup> : 0.35

Water Consumption/Dwelling : 24

### Indoor Air quality

Building entirely with natural ventilation (plus air fans in the event of a trade wind failure) located in a low-polluted environment (air quality in Guadeloupe / Goyave 29 IQA US).

## Contest

### Reasons for participating in the competition(s)

#### Green Solutions Awards 2020-21

- First wooden building in Guadeloupe for 50 years
- Optimization of the maximum prefabrication of the structural work
- Autonomous collective housing building not connected to EDF in town
- Really "collective" building (tanks, laundry room, garage, garden, internet...)

#### Resilient Buildings Awards 2022

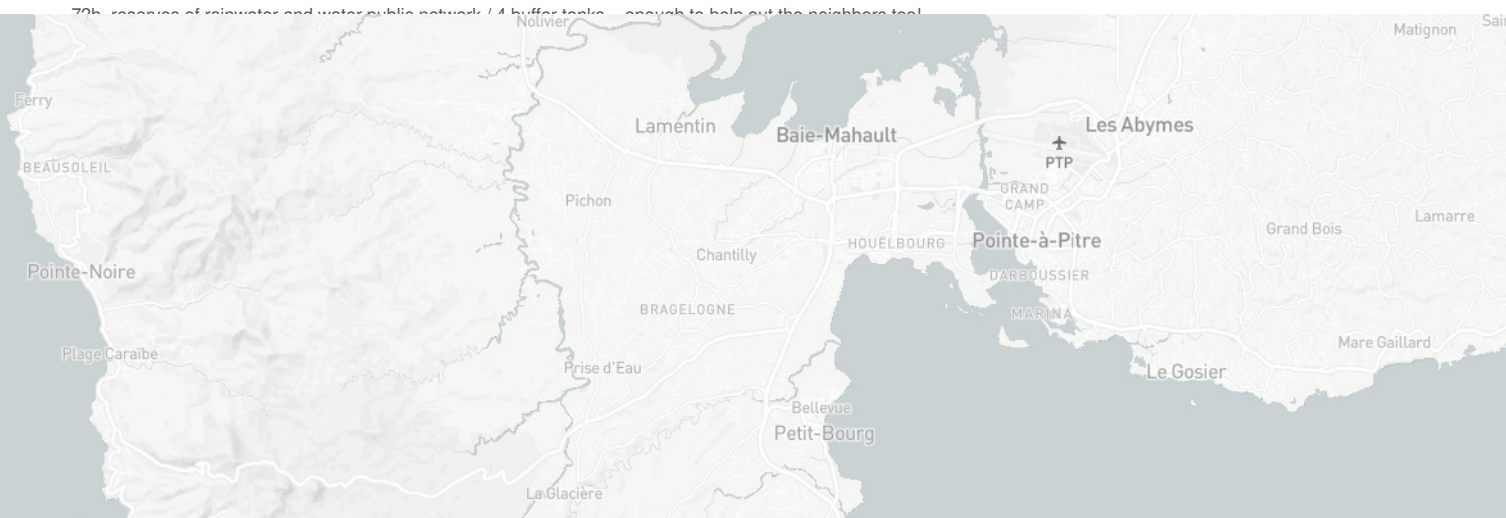
Back to common sense: the resilience of wood to "unexpected earthquakes" (Zone 5 in Guadeloupe), responses to "predictable cyclones" (up to 250 km/h), autonomy and post-crisis survival.

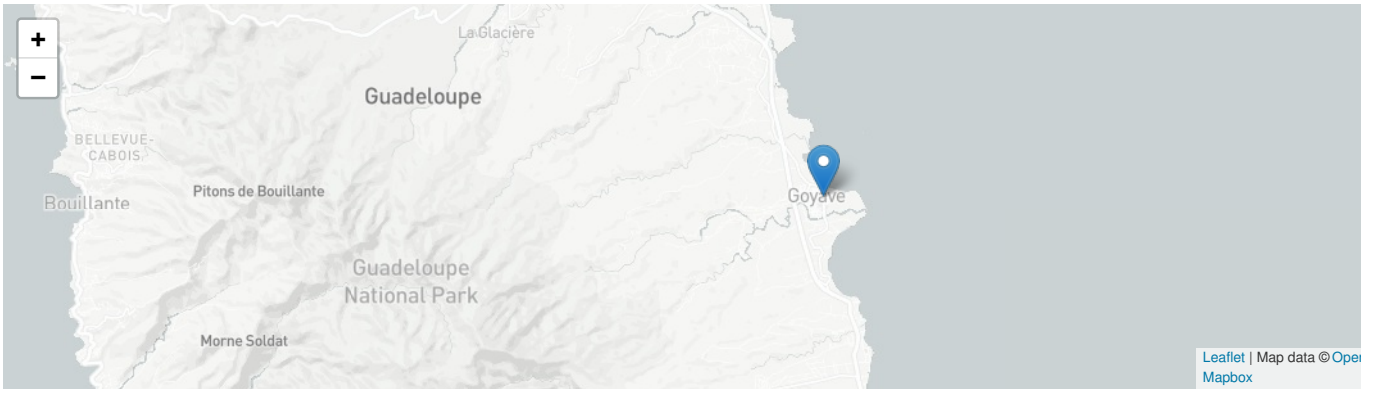
SEISMIC- The choice of wood for the living levels: seismic load proportional to the own weight therefore divided by 7, natural ductility of the materials, advantageous mode of ruin / pockets of survival.

CYCLONIC - The construction is sized to PS and Eurocode8 standards and the anticyclonic flaps. The metal balconies form a shield / projectiles, the weighted solar panels are stowed in the event of an alert. The laundry room, clearance and technical rooms on the ground floor are safe shelters, in reinforced concrete from the walls to the ceilings.

AND AFTER THE CRISIS - The building is self-consumption thanks to its own photovoltaic and e-autonomous power plant (national first). It is equipped with rainwater cisterns including a network dedicated to toilets and drawing water and city water cisterns (recurrent cuts). Finally, the inhabitants have the pooling of a garage (in a gym), a collective laundry room and a shared micro garden.

Results: zero cuts during the alert or the crisis, therefore radio, light and operational refrigerators (preventive cuts EDF), autonomy on Lithium batteries of 48h see 72h reserves of rainwater and water public network / 4 buffer tanks - enough to help out the neighbors too!





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