PANORAMA PAQUETÁ

Sense of place for a vulnerable island community

Graduation project Lodewijk Luken - 29 January 2019
INTRODUCTION

1. RESEARCH

2. FUTURE SCENARIO

3. INTERVENTION: BEACH POOL
INTRODUCTION

Trends and relevance
ILHA DE PAQUETÁ

4500 residents on 1.2 km²
ISLANDS IN = OUT

products IN → island → waste OUT
ISLANDS IN = OUT

products IN  →  ISLAND

waste OUT
ISLANDS RICH CULTURE AND STRONG COMMUNITY
How can cultural and societal characteristics of a place play a role in the implementation of circular strategies?
How can the environmental state of Ilha de Paquetá be improved, taking an urban metabolism perspective, while strengthening the tourism sector and enhancing the island’s culture and identity?
1. ILHA DE PAQUETÁ

The beauty and the painpoints of Paquetá
ON A CALM ISLAND
The streets are the domain of cyclists and pedestrians.

Paulinho, ecotaxi driver
TOURISTIC HOTSPOT

Around 1970
TOURISM DAY TRIPS

Ricardo, 41, bicycle shop

“We, residents, organize ourselves to serve the needs of tourists.”
What do you think of the island and what would they like to change?
‘In the past there were many fishermen. Now we are only 20.’

Vanderlei, fisherman
PAINPOINTS LITTLE THINGS TO DO

Marilena, 65, Librarian

‘In the past we had our own cinema.’

Rafael, electric tourist cart driver

‘Tourists frequent the island mostly in weekends and on holidays. On other days we have little work.’
José Lavrador, director Casa de Artes

‘We don’t want mass tourism in the weekends only.’
Inappropriate Transportation

Ricardo, 41, bicycle shop

‘Bicycles and small electric vehicles fit well here. Big trucks destroy the roads and cause pollution.’
Every day we bring to trucks with waste to Rio.

Marcus, waste collector
PAINPOINTS PAQUETÁ

The dirty bay and beaches makes tourist stay away.'
CONSCIOUSNESS AMONG RESIDENTS

José Lavrador, director Casa de Artes

Marcia, 58

‘We don’t want mass tourism in the weekends only.’

‘At my house, Casa Amarela, I organize gastronomic and cultural events.’
CONSCIOUSNESS SMALL SCALE TOURISM

José Lavrador, director Casa de Artes

Marcia, 58

'We don’t want mass tourism in the weekends only.'

'At my house, Casa Amarela, I organize gastronomic and cultural events.'
CONCIOUSNESS SMALL SCALE TOURISM

Event: domestic food festival

Casa da Coruja
Casa Verde
Casa flor
Hospedaria Sta. Barbara
Casinha Amarela
Casa de Artes
Ricardo, 58, Plantar Paquetá

‘We have to preserve the natural beauty of Paquetá.’
CONSCIOUSNESS SUSTAINABILITY

- Separate collection of recyclables
- Butterfly garden (compost + local food)
- Beach clean-ups (facebook)
- Solar PV on 200 homes
What are the dimensions of the current energy, water and material flows on Ilha de Paquetá, and what are the opportunities for system-level interventions?
Most energy is consumed by ferries and boats.

LPG is imported and used for cooking.

Local energy potential is unused.
WATER

- Water flows < 1000 m³

- Groundwater 4624 m³
- Fresh water 474.500 m³
- Rainwater 916.800 m³
- Evaporation 755.045 m³
- Surplus 288.422 m³
- WWTP 355.555 m³
- Surface water 460.617 m³

- Bar and restaurants
- Tourist accommodation
- Households residents
- Households veranistas
- Public services
- Retail
- Tourist accommodation

Potable water 431 m³
WATER

- Rainwater potential is left unused
- All fresh water is imported
- Waste water discharged to the bay; effectiveness of central treatment is questionable
- Bad infrastructure: fresh water losses
**MATERIALS**

- **FOOD AND BEVERAGES**: 3263 t
  - food and drinks: 3033 t
  - coconut: 260 t

- **OTHER MATERIALS**: 6074 t
  - packaging: 1832 t
  - clothes: 21 t
  - electronics: 22 t
  - consumer goods: 365 t
  - construction materials: 3833 t

- **LOCAL ENVIRONMENT**: 2787 t
  - bay: fish: 104 t
  - plant growth: 1533 t
  - bay: solid waste: 1150 t

- **COLLECTION**: 8475 t
  - cellulose: 183 t
  - urine and faeces: 1904 t

- **BIOBASED**: 2240 t
  - pruning: 730 t
  - coconut: 156 t
  - wood: 45 t
  - leather: 1.5 t

- **NON-BIOBASED/MIX**: 6703 t
  - plastics: 566 t
  - paper: 420 t
  - glass: 139 t
  - metal: 80 t
  - textile: 19 t
  - electronics: 2.2 t
  - bulk: 365 t
  - mixed: 2555 t
  - debris: 2555 t

- **LOCAL PROCESSES**: 2452 t
  - compost: 183 t
  - water: 355,555 t

- **HOUSEHOLDS, COMMERCIAL, PUBLIC**
- **CONSTRUCTION**
- **STREETS**
- **BEACHES**

**PARKS, TREES**

**Different waste collection services exist**

**All waste is mixed and transferred to landfill in Rio**

**Food and construction materials are the major inputs**

**Different waste collection services exist**

**All waste is mixed and transferred to landfill in Rio**

**Food and construction materials are the major inputs**
2. FUTURE SCENARIO

Improve the metabolism and enhance local culture and identity
1. SUPPORT CURRENT INITIATIVES BUTTERFLY GARDEN: SMALL FARM FROM ORGANIC WASTE

'Ricardo, 58, Plantar Paquetá

'I prefer to plant 1 trees with 30 people over planting 30 trees with 1 person.'
2. IMPROVE TRANSPORT SYSTEM HIGHER EFFICIENCY + ELECTRIFICATION

(smaller) electric ferry

increased transport efficiency and small electric vehicles
3. UTILIZE POTENTIAL OF ORGANIC WASTE

“We should try to keep all organic waste on the Paquetá.”

Ricardo, 58, Plantar Paquetá
4. IMPROVE EXISTING HOUSING STOCK
5. DISCOVER OTHER POTENTIALS OF WASTE
3. INTERVENTION: BEACH POOL
BUILDING PROGRAM BEACH POOL

BEACH POOL

small scale tourism

regenerate Guanabara bay
BUILDING PROGRAM BEACH POOL

BEACH POOL

- small scale tourism

COMMUNITY FUNCTIONS

- things to do for residents

- regenerate Guanabara bay
BUILDING PROGRAM BEACH POOL

BEACH POOL
- small scale tourism
- regenerate Guanabara bay

COMMUNITY FUNCTIONS
- things to do for residents

OPEN KITCHEN
- conscious tourism
- economic opportunities for residents
BUILDING PROGRAM BEACH POOL

BEACH POOL
- small scale tourism
- regenerate Guanabara bay

COMMUNITY FUNCTIONS
- things to do for residents

OPEN KITCHEN
- conscious tourism
- economic opportunities for residents

BIO-DIGESTER
- improve metabolism
waterfront potential

commercial opportunities for direct environment

natural sloping terrain
SENSE OF PLACE
PEDRO BRUNO
PERGOLAS AND PAVILIONS

Pergolas: embrace nature

1 - Pergola no Parque da Cidade
2 - Pergola no Parque de São Roque
3 - Pergola no Parque Machado de Castro
4 - Pergola no Parque das Laranjeiras
5 - Pergola no Parque Delfim Nogueira

Pavilions: experience natural environment

1 - Pavilhão no Parque da Cidade
2 - Pavilhão no Parque de São Roque
3 - Pavilhão no Parque Machado de Castro
4 - Pavilhão no Parque Delfim Nogueira
5 - Pavilhão no Parque Laranjeiras

6 - Pára-sol no Parque Delfim Nogueira
7 - Pára-sol no Parque Laranjeiras
light upper structure (wood)
heavy base (granite)
IMPLEMENTATION BEACH - OLD STABLE - HILL

BAY
IMPLEMENTATION POOL ON FOOTPRINT
IMPLEMENTATION WATER SYSTEM
IMPLEMENTATION HEAVY BASE
IMPLEMENTATION LIGHT UPPER STRUCTURE
Section through pool
HEAVY BASE
LOCAL MATERIALS: BLEND INTO LANDSCAPE
LIGHT STRUCTURE WOOD
FLEXIBILITY PLATFORM
FLEXIBILITY WATER CANAL
PLAN GROUND FLOOR ENTRANCE VIA EXISTING BUILDING
PLAN UPPER FLOOR
José Lavrador, director Casa de Artes

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CONCIOUSNESS SMALL SCALE TOURISM

Casa de Artes

Casinha Amarela
Section through wetlands
WATER

BAY WATER 8250 m³

BUILDING METABOLISM
FRESH WATER 1980 m³

SURFACE WATER / EVAPORATION 1350 m³

BAY WATER 8250 m³

WATER

Fresh water 900 m³
Bay water 450 m³
Buildings metabolism water flows < 400 m³
MATERIALS
- FOOD 7500 kg
- BAY WATER 8250 m³
- ORGANIC WASTE 14,700 kg

WATER
- FRESH WATER 1980 m³
- BAY WATER 450 m³
- FRESH WATER 900 m³
- BEACH SHOWERS 900 m³
- SURFACE WATER / EVAPORATION 1350 m³

BUILDING METABOLISM
ENERGY
- no net energy input (utilize power grid and ecotaxi batteries to balance out net electricity demand and supply)

ELECTRICITY 4560 kWh
- lighting and appliances 1560 kWh

HEAT 4320 kWh

BIOGAS 2760 kg

MATERIALS

FOOD 7500 kg

ORGANIC WASTE 14.700 kg

WATER

FRESH WATER 1980 m³

BAY WATER 8250 m³

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FRESH WATER 1980 m³

SURFACE WATER / EVAPORATION 1350 m³

BAY WATER 8250 m³

FERTILIZER 5550 kg

FRESH WATER 1980 m³

BEACH SHOWERS 900 m³
How can cultural and societal characteristics of a place play a role in the implementation of circular strategies?

**FUNCTIONAL**

What the economy and community needs

**ARCHITECTURAL**

Sense of place
CEMENT produced in Rio de Janeiro state

TREATED PINE reforested wood from São Paulo state

SAND from Rio de Janeiro state

CLAY on site

GRANITE locally sourced on Paquetá

CEMENT produced in Rio de Janeiro state
ENERGY Future scenario

- CO2 EMISSIONS: 1203 tCO2eq

- LOCAL RENEWABLE ENERGY: 33.7 TJ
  - Solar power: 2.6 TJ
  - Solar heat: 5.1 TJ

- ELECTRICITY: 22.8 TJ
  - Coal: 4.3 TJ
  - Nuclear: 1.0 TJ
  - Hydro: 6.0 TJ
  - Geothermal, solar: 2.0 TJ
  - Solar power: 2.6 TJ

- GASOLINE: 0.05 TJ
- DIESEL: 5.1 TJ

- UTILIZE SOLAR ENERGY FOR ELECTRICITY AND HEAT
- REPLACE DIESEL-FIRED FERRY BY A SMALLER ELECTRIC BOAT
- REPLACE LPG BY BIOGAS
- UTILIZE HEAT FROM COLD STORAGES

- CO2 EMISSIONS: 180 tCO2eq
- 114 tCO2eq
- 33 tCO2eq

- FERRIES PASSENGERS
- FERRIES FREIGHT
- PUBLIC SERVICES
- HOUSEHOLDS
- HOUSEHOLDS RESIDENTS
- HOUSEHOLDS VERANISTAS

- INCREASE TRANSPORTATION EFFICIENCY AND REPLACE DIESEL TRUCKS
WATER

Rainwater potential is left unused

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- metals 2.2 t
- bulk 365 t
- mixed 2555 t
- debris 2555 t

**COLLECTION 8475 t**
- illegal debris dump 365 t

**DIFFERENT WASTE COLLECTION SERVICES EXIST**

**ALL WASTE IS MIXED AND TRANFERRED TO LANDFILL IN RIO**

**FOOD AND CONSTRUCTION MATERIALS ARE THE MAJOR INPUTS**

**SYNERGY WITH OTHER FLOW TYPES**

- HOUSEHOLDS, COMMERCIAL, PUBLIC
- CONSTRUCTION
- STREETS
- BEACHES
- PARKS, TREES
- LOCAL ENVIRONMENT
- LOCAL PROCESSES
- Collection
BUILDING METHODS HEAVY MATERIALS

FOUNDATION AND PAVEMENT: GRANITE
- local material
- traditional building method

FOUNDATION: CONCRETE
- common building method (RCC frame)

WALLS: RAMMED EARTH
- local material (clay-sand-silt mixture)
- heavy base, grounded its natural environment

FLOORS: CASCAJE ELEMENTS
- similar to common method, but with much less cement
BUILDING METHODS LIGHT MATERIALS

STRUCTURE: TIMBER
made of smaller, lighter (imported) parts
tectonics derived from traditional methods (simple connections)
BUILDING METHODS FINISHES

SEPARATION WALLS: WATTLE AND DAUB ELEMENTS
local material
‘modern’ version of a hippie building method

GREEN ROOFS
rainwater retention and filtration
blends in the landscape
CONNECTION RAMMED EARTH WALL - GREEN ROOF 1:5

column 150 x 150

handrail baluster

prefab wall and cladding element
CONNECTION CONCRETE COLUMN - WOODEN STRUCTURE - GREEN ROOF 1:5
RAMMED EARTH WALL PLATE 1:5

- Wall plate to protect rammed earth wall 25 mm
- Top beam 2 x 4
- Wire in rammed earth wall

Dimensions: 900
CASCAJE ELEMENT 1:5

- Structural concrete 1:2
- Floor finish concrete 1:8
- Steel grid
- Water drainage
- Edge beam to transfer lateral forces from cascaje element (concrete 1:2)
- Cascaje element 500 x 150 x 3500