

## 15. Favela green roof



**Type:** multi-stakeholder

**Region:** southeast

**State:** Rio de Janeiro

**Biome:** Atlantic Rainforest

### City of Rio de Janeiro

**Population:** 6 520 266 (2017 <sup>131</sup>)

**Area:** 1 264.2 Km<sup>2</sup> <sup>132</sup>

**Elevation:** from 2 m to 1 024 m high at the Pedra Branca peak

**Coordinates:** 22.902778 S / 43.207500 W

**MHI:** 0.799 (2010) <sup>133</sup>

### Context

In Rio de Janeiro the population living in slums (favelas) in 2010 was 19 % of the inhabitants (last census) <sup>134</sup>. The informal occupation of steep slopes and flood-prone areas occurs mainly because of the absence of social housing planning, inducing low-income people to use protected areas that the formal real-estate market cannot occupy. The climate is tropical, with extremely high temperatures especially in the northern zone where there are almost no green areas and where the low-income population live in extensive slums (favelas). The temperature can reach over 60 °C in this region <sup>135</sup>.

### Objectives

Introduce biodiversity to reduce the temperature and filter rainwater in a residence located at the dense Arará slum, in the northern zone of the city.

131. <https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/16131-ibge-divulga-as-estimativas-populacionais-dos-municipios-para-2017>

132. <https://www.geografos.com.br/cidades-rio-de-janeiro/rio-de-janeiro.php>

133. <https://cidades.ibge.gov.br/brasil/rj/rio-de-janeiro/pesquisa/37/0?tipo=grafico>

134. <https://www.brasil247.com/pt/247/brasil/31334/IBGE-Brasil-dobra-n%C3%BAmero-de-moradores-de-favelas-em-20-anos.htm>

135. For more information on the urban heat-island effect and urbanisation in the city of Rio de Janeiro, see Lucena et al. in the reference list.



Figure 72. Green roof at the Arará community in the heart of a highly built-up and paved area with extremely hot temperatures all year round.

## Actions

The existing 36 m<sup>2</sup> (6 × 6m) wavy fibre cement tile roof was retrofitted with the support of an academic, who developed the technicalities and monitored the roof for 2 years as part of his doctoral research. The support used for planting the ‘natured’

roof consisted of three layers of: (1) geotextile RT10; (2) PVC impervious membrane; and (3) geotextile RT16 to enable the rooting of the vegetation. A simple three-quarter-inch pipe irrigation system was installed, perforated on the deep part of the wavy roofing. The irrigation was used every night without rain. Native species of orchids and bromeliads are among the species used.

## Stakeholder involvement

Bruno Rezende Silva designed the green roof and selected the epiphyte and lithophite plants. The planting was done by two young ladies that could walk over the roof, and the owner Luiz Cassiano (known as Careca) coordinated and gave visibility to the project to encourage other favela residents to implement similar roofs.

## Implementation

The project was implemented at the end of the summer in 2016. The academic researcher and the owner, who is an activist who advocates the introduction of nature in slums, organised a collective effort to implement the vegetated roof.

## Outcomes

The monitoring of the temperatures comparing the vegetated roof and the bare neighbouring control roof showed that the inside of the green-roof house was 20 °C cooler at the peak of the heat during the day. The reduction of storm-water run-off was also verified.

## Success factors

The synergy between the residents' desire to have a green roof and the knowledge of the researcher was essential to implement the project.



Figure 73: Detail of the green roof at the Arará community: native bromeliads are some of the chosen species.

## Lessons learnt

Green roofs can and should be implemented in slums as low-cost, lightweight, and low-maintenance solutions to lower indoor temperatures, reduce the urban heat-island effect and storm-water run-off and improve quality of life in low-income communities.

## Limiting factors and risks

Extreme heat limits the diversity of plants that can live in this hostile environment.

## Contacts

Bruno Rezende Silva  
brsilva@jbrj.gov.br

## Selected references

Lucena, A. J. et al., 'A Evolução da Ilha de Calor na Região Metropolitana do Rio de Janeiro', Revista Geonorte, Edição Especial 2, Vol. 2, No 5, pp. 8-21, 2012, available at: <http://www.periodicos.ufam.edu.br/revista-geonorte/article/view/2475>, accessed: 5.7.2019 (in Portuguese).  
Silva, B. R., Telhados verdes em clima tropical: uma nova técnica e seu potencial de atenuação térmica, UFRJ/COPPE, Rio de Janeiro, 2016 (PhD thesis), available at: <http://www.coc.ufrj.br/pt/teses-de-doutorado/391-2016/5139-bruno-rezende-silva>, accessed: 5.7.2019 (in Portuguese).

