Spatial Water Management in Paraisópolis

Delft University of Technology
Urbanism
Graduation thesis
W.L. van der Velden
June 2016

Content

Problem analysis

History

1954

1994

2004

2010

images: SEHAB, 2009

Aerial View

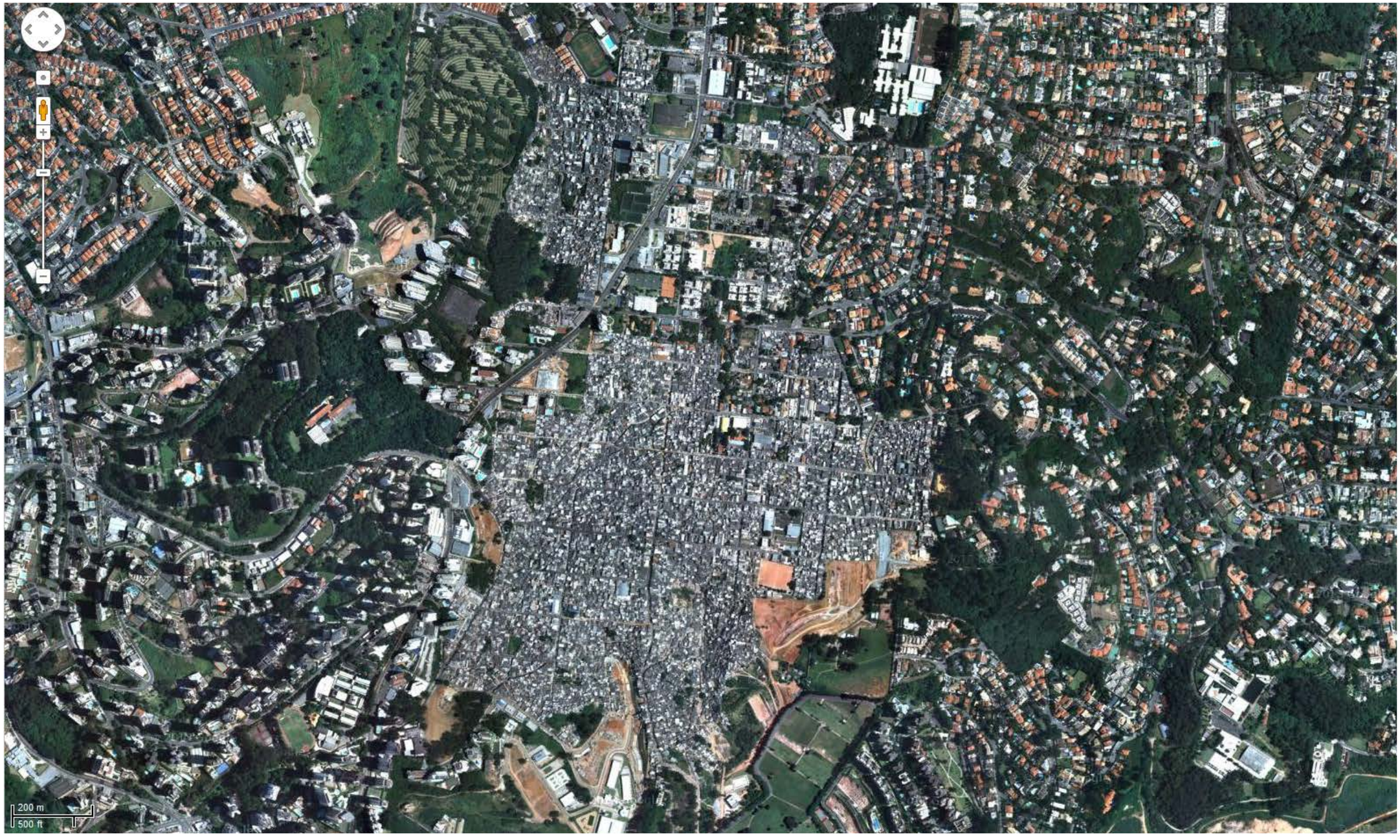


image: Google Earth

Height map

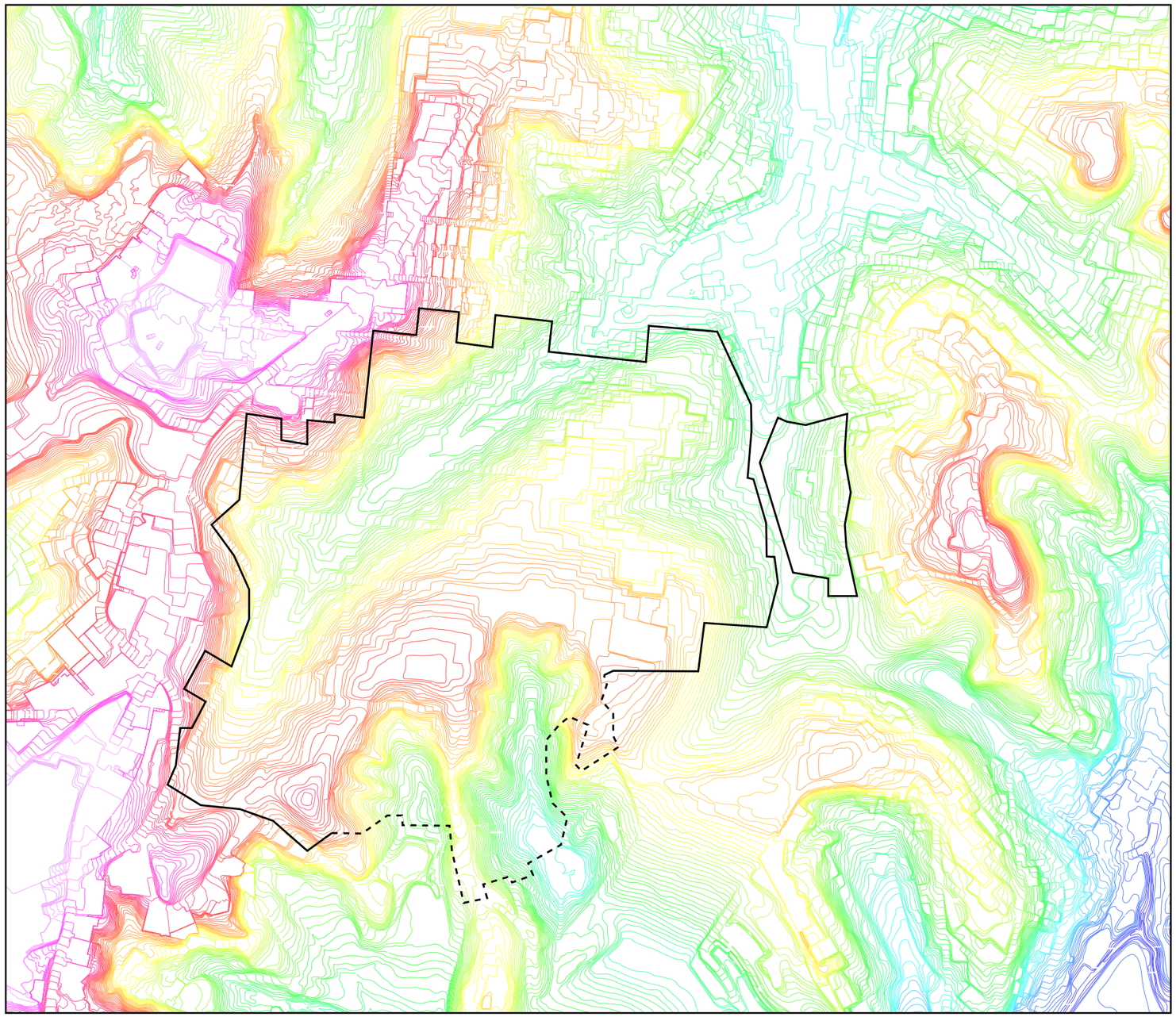


image: own image

Floods

image: Acervo SEHAB

Current water discharge

image: own image

Floods and landslides

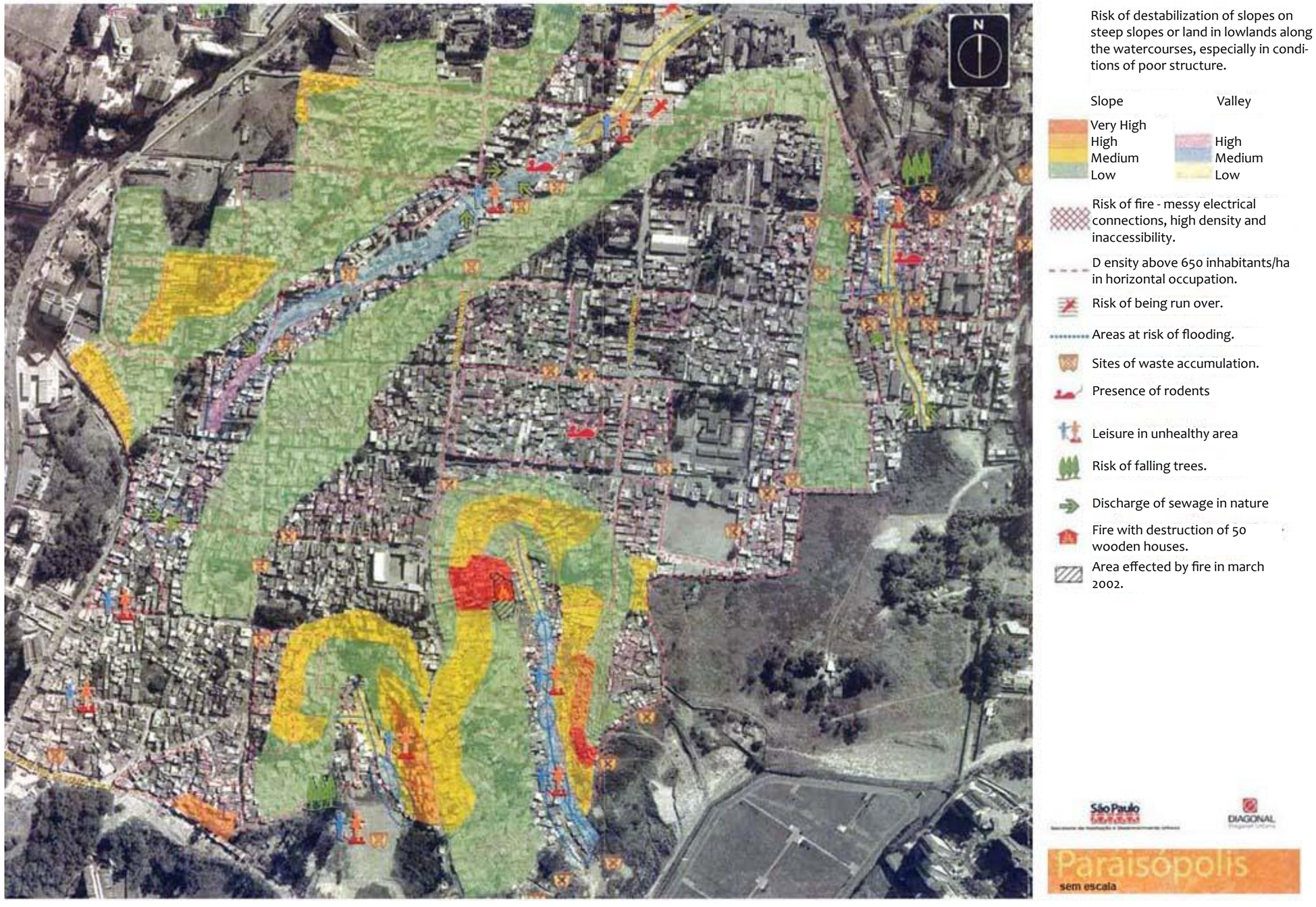


image: Diagnóstico Integrado da Favela Paraisópolis, SEHAB-PMSP (2004)

Greenery + stone surface

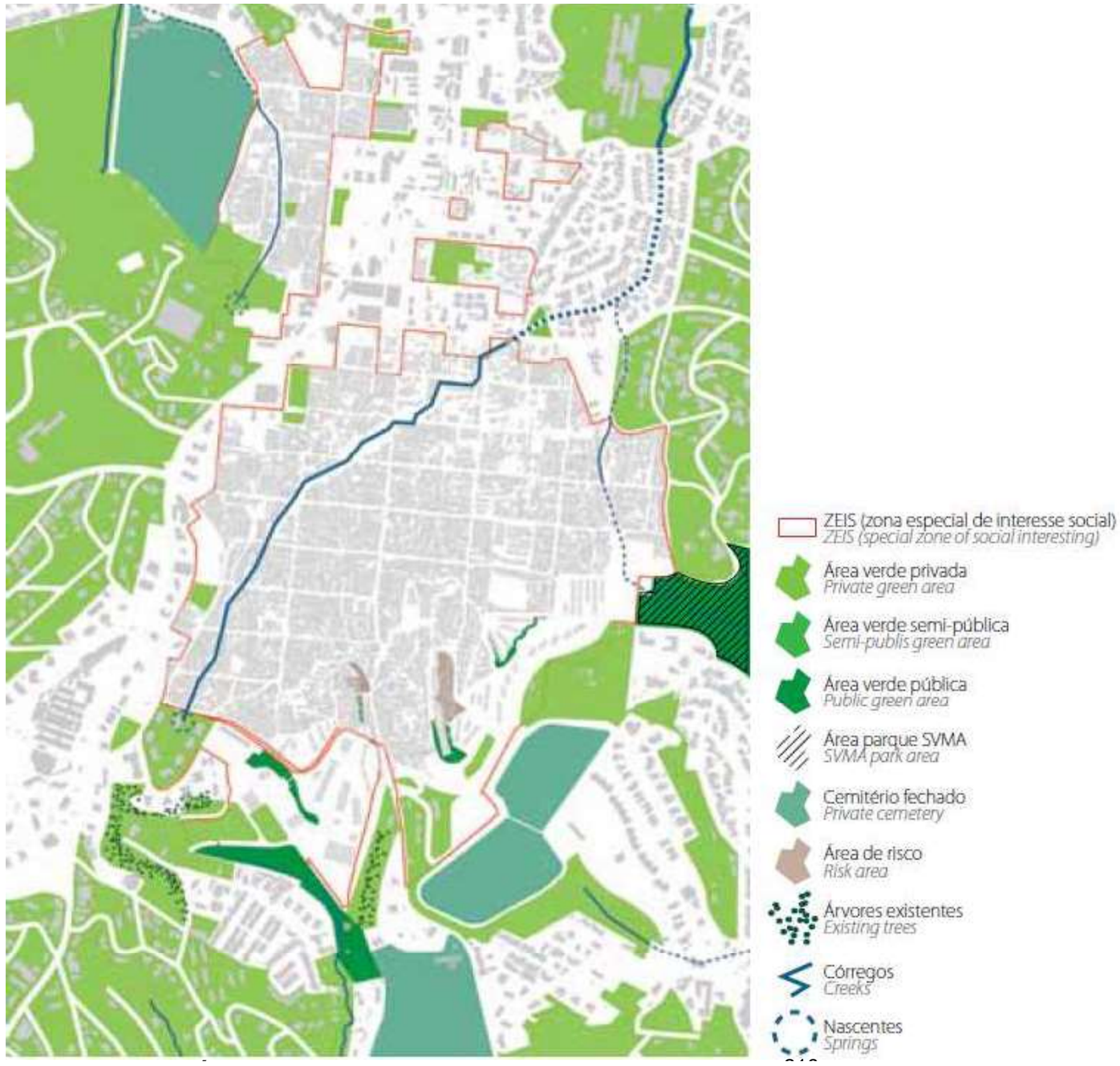


image: Plano Urbanistico de Parais6polis, p.19
In Prefeitura de São Paulo, 2012, CD-ROM.

Drought

image: NASA

Housing density

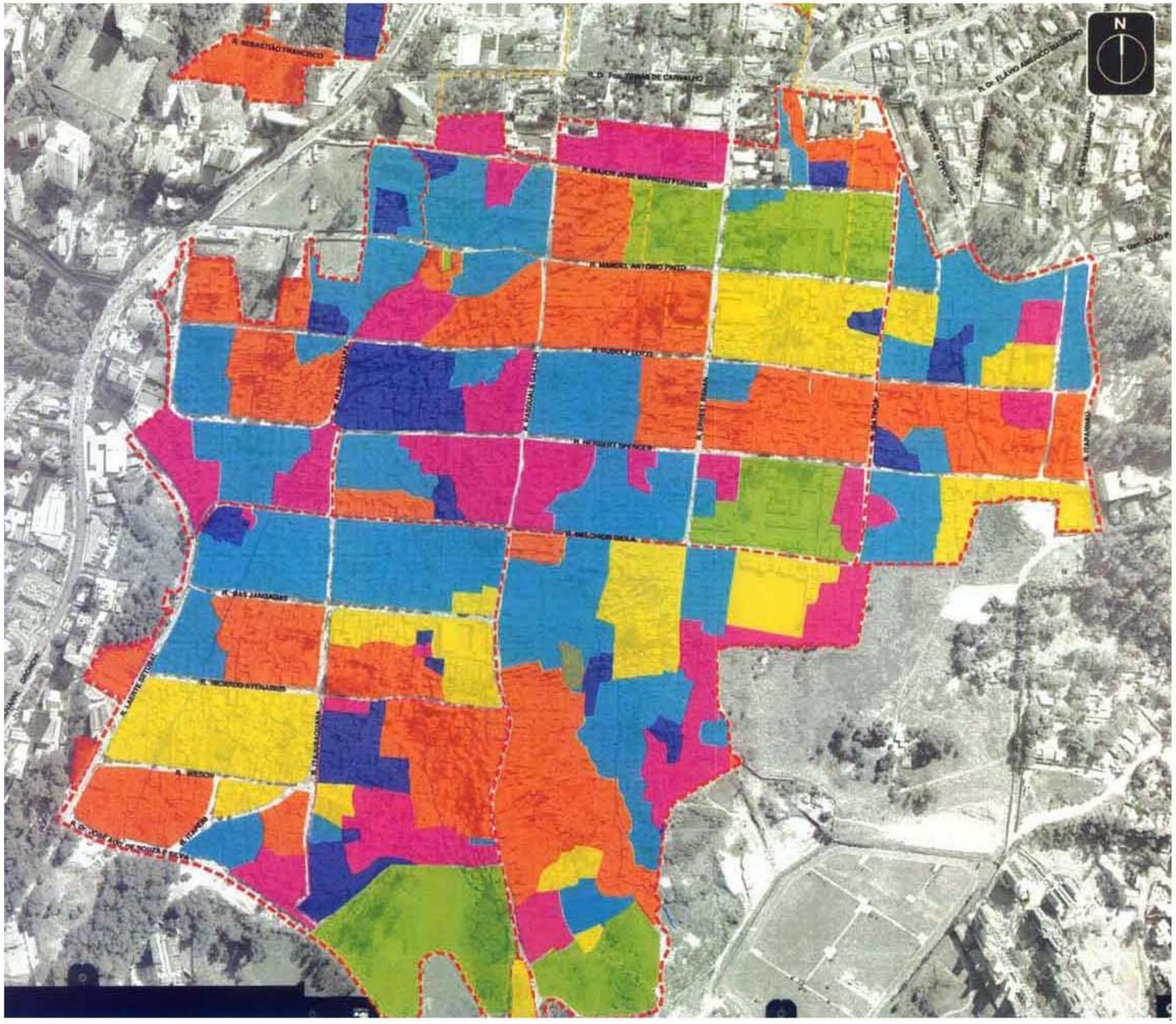


image: Diagnóstico Integrado da Favela Paraisópolis, SEHAB-PMSP (2004)

Housing quality

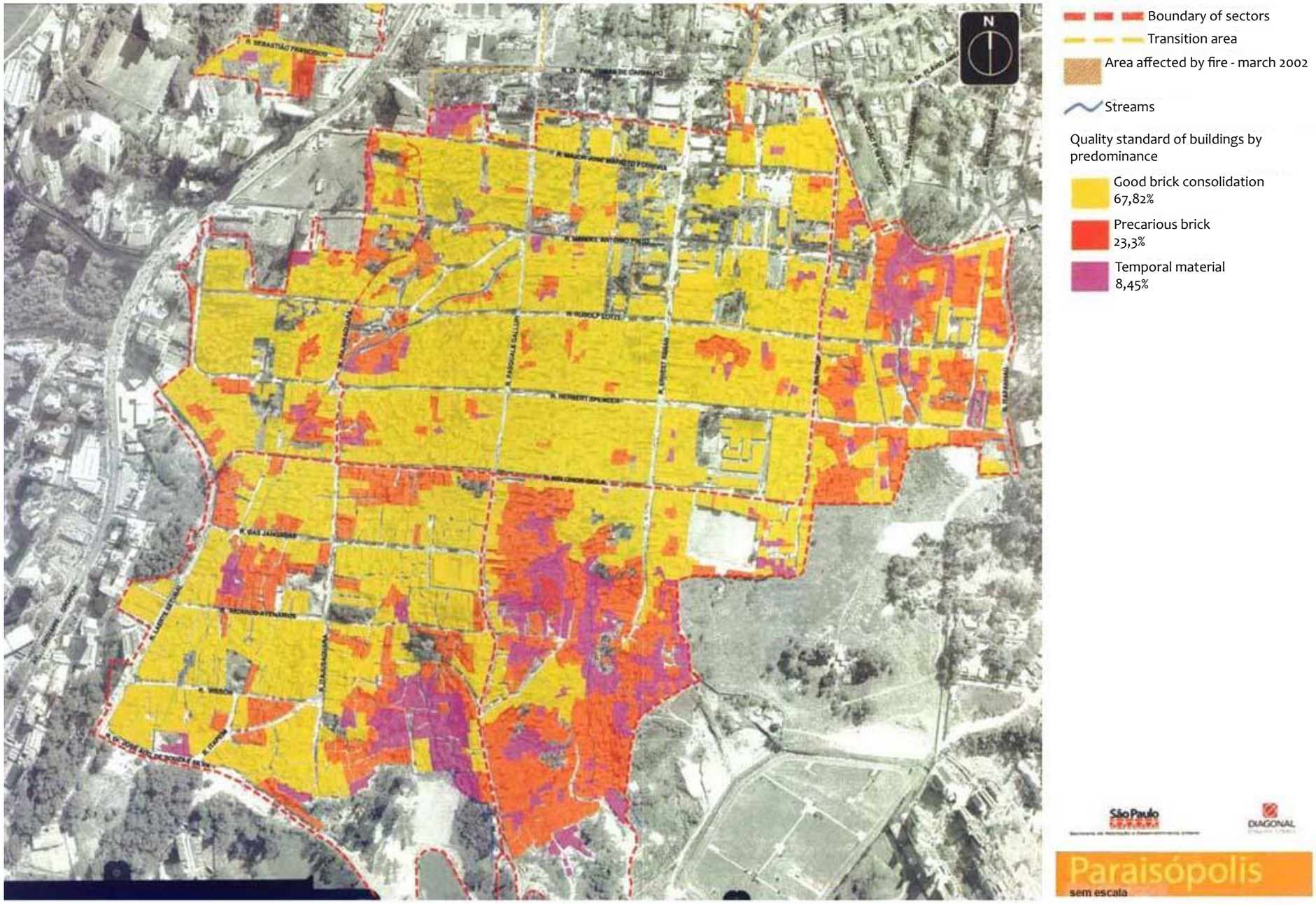


image: Diagnóstico Integrado da Favela Paraisópolis, SEHAB-PMSP (2004)

Waste collection

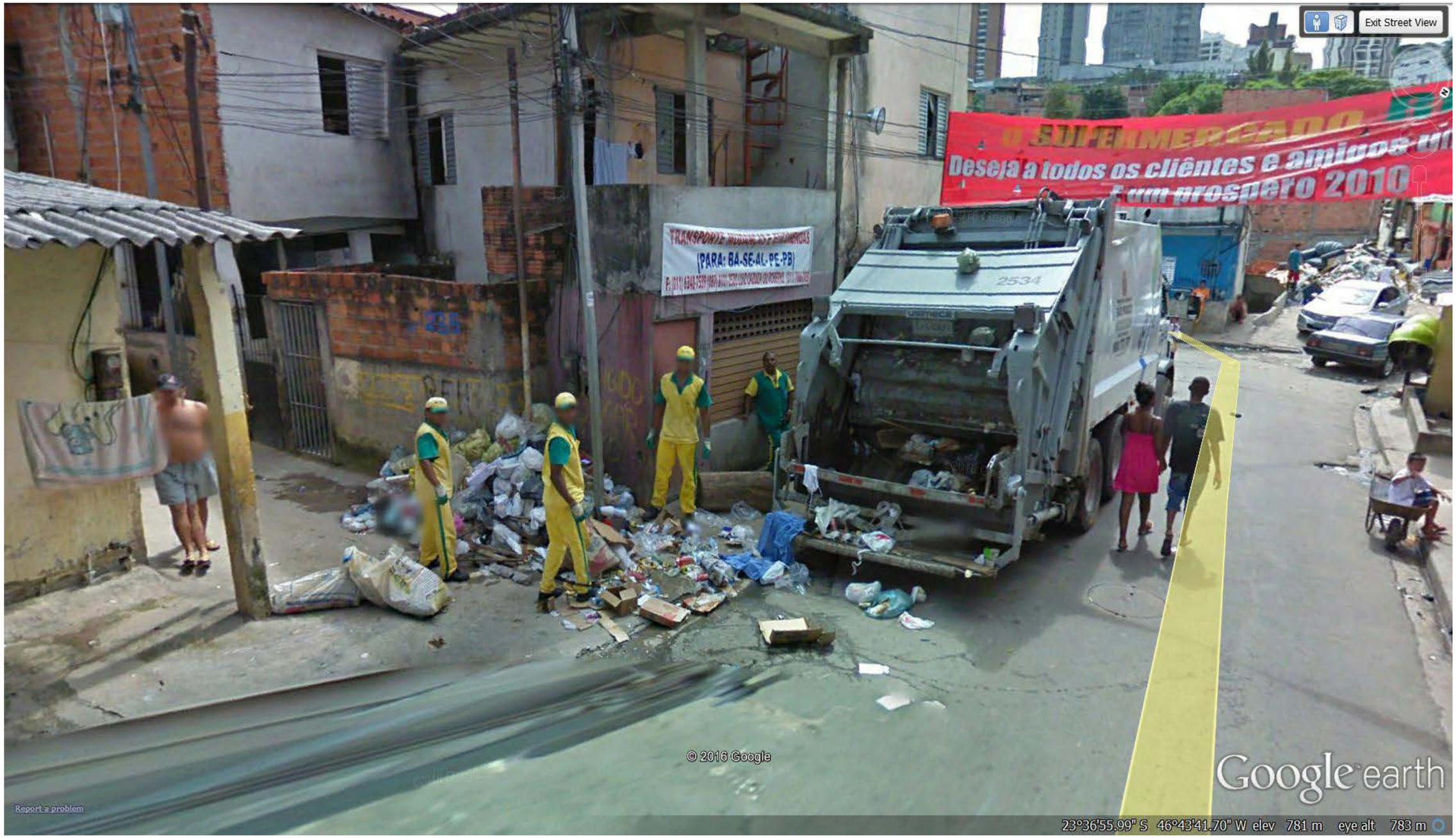


image: Google Streetview

Sewerage

image: Diagnóstico Integrado da Favela Paraisópolis, SEHAB-PMSP (2004)

Sewerage

image: caosplanejado.com

Sewerage

image: Ana Luiz Cardoso

Social complication

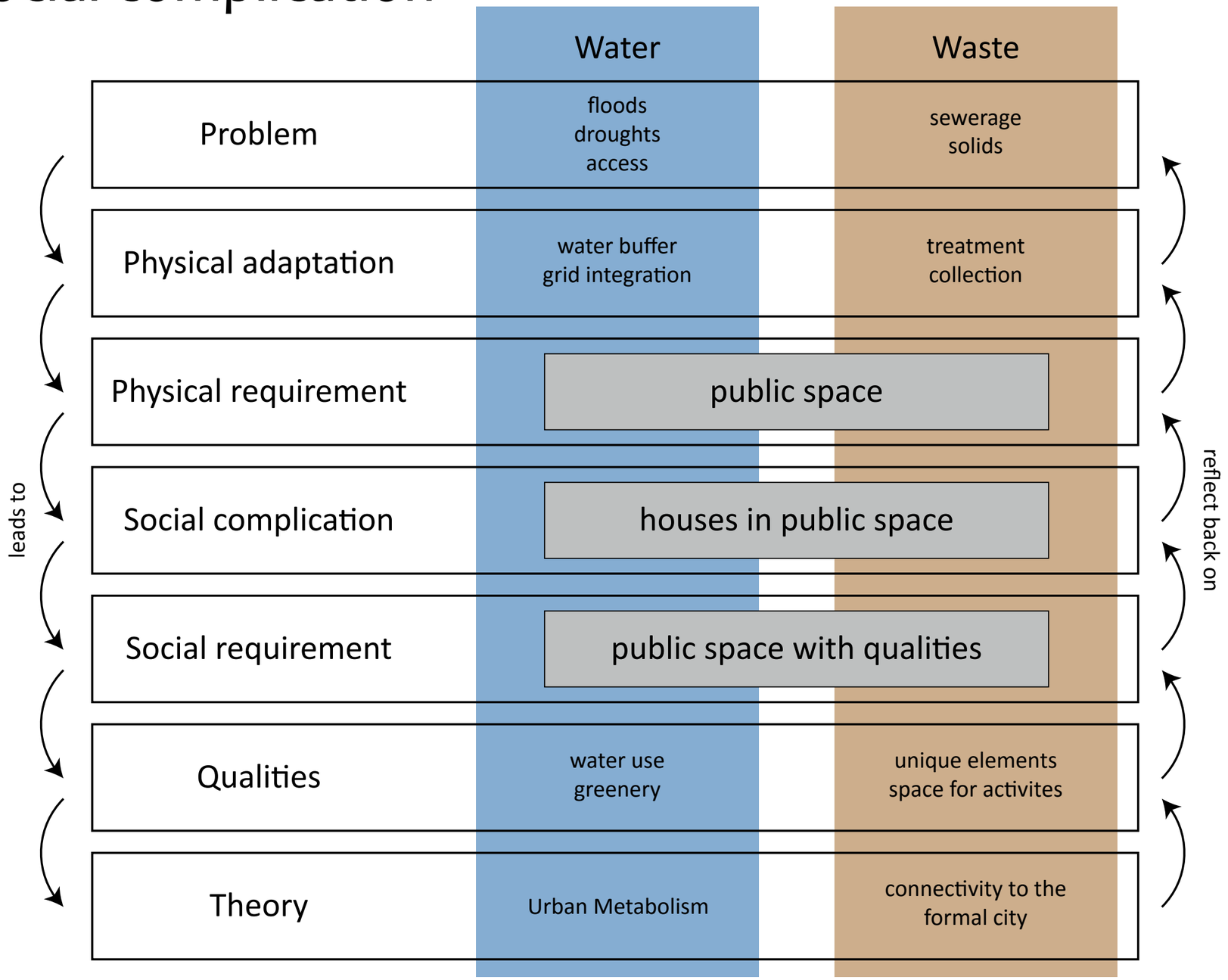
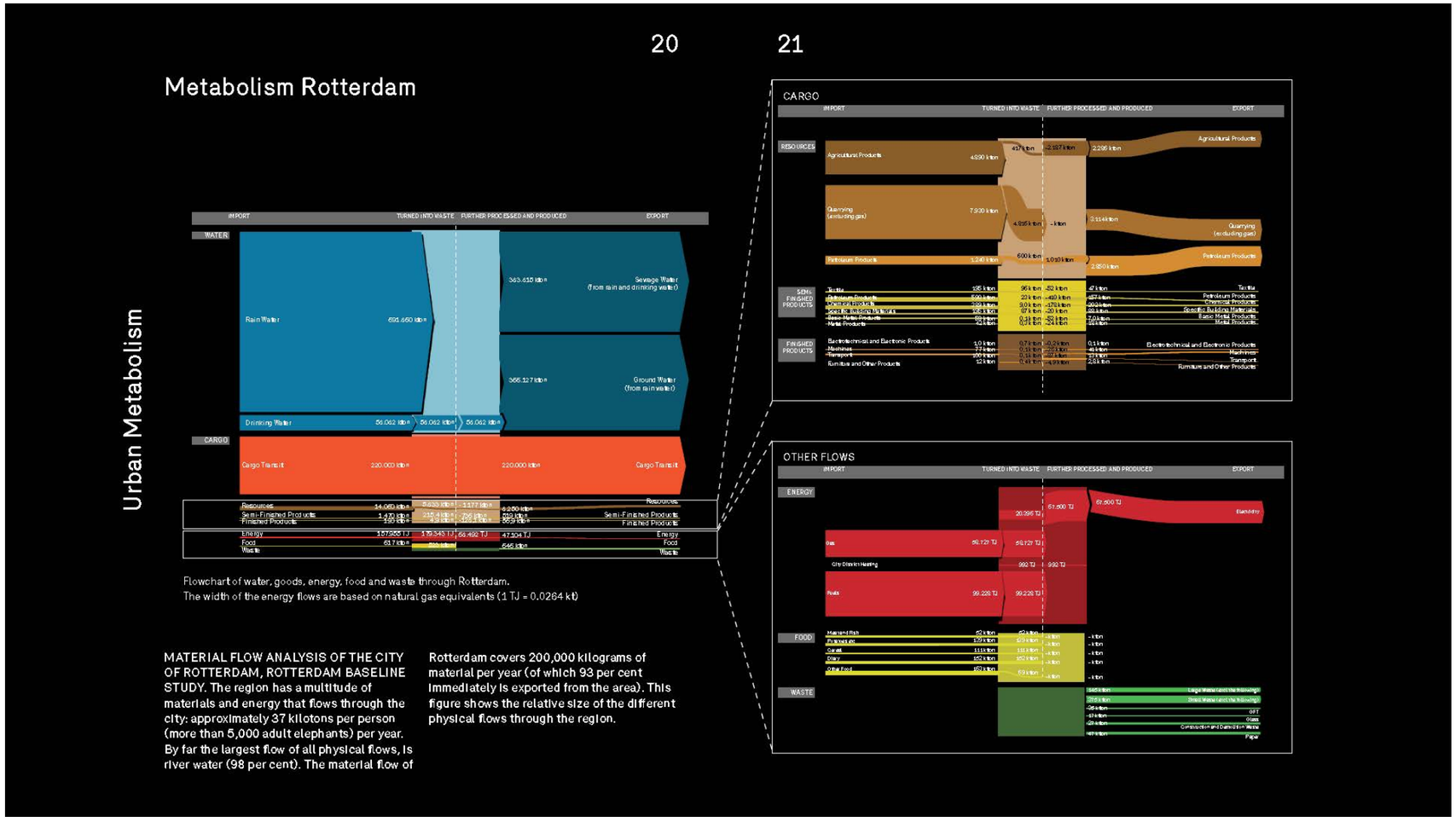
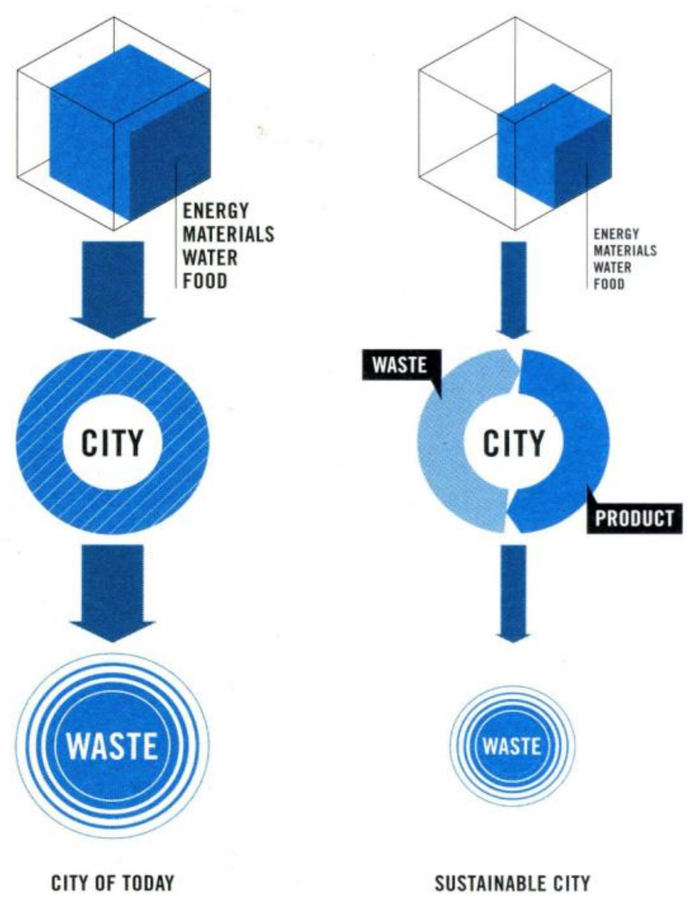


image: own image

Theoretical framework

Urban Metabolism





images: Tillie (2014) | Water, Energy and Waste, 29; Grimshaw Architects, Ed.; Andrew Whalley: London, UK, 2010; p. 56.

Network of public spaces

Image 39
plan, Villa Las Flores grid
Source F. Janches
FADU - UBA
Studio Ciudad Formal - Ciudad No Formal 2003

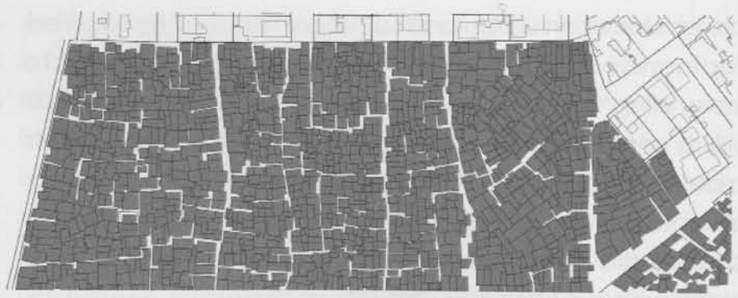


Image 40
plan, new system of public spaces along the border of Villa Las Flores
Source: FADU - UBA
Studio Ciudad Formal - Ciudad No Formal 2003

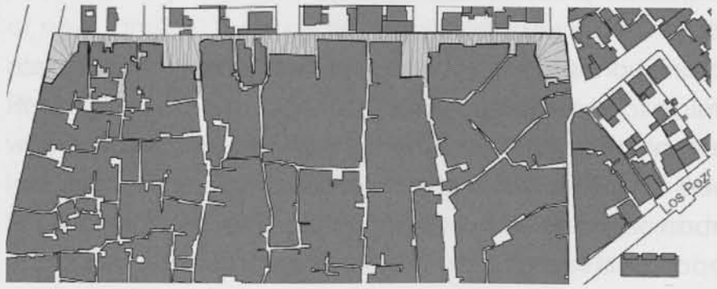


Image 41
plan, new system of public spaces in the Villa Las Flores grid
Source J. Fontana, M. Bergoglio
FADU - UBA
Studio Ciudad Formal - Ciudad No Formal 2003

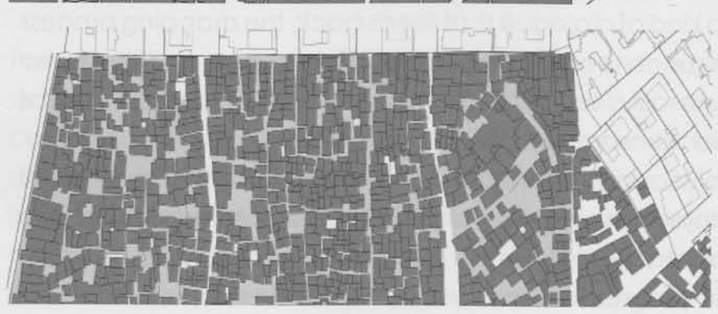


Image 42
plan, new system of connectors in the Villa Las Flores grid
Source E. Barone, A. Sanvame, J. Waldman
FADU - UBA
Studio Ciudad Formal - Ciudad No Formal 2003

Research question

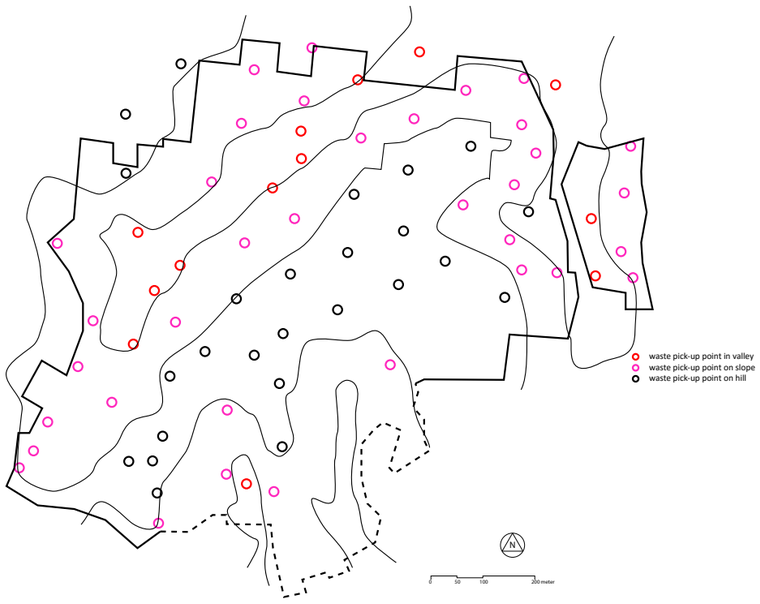
Research question

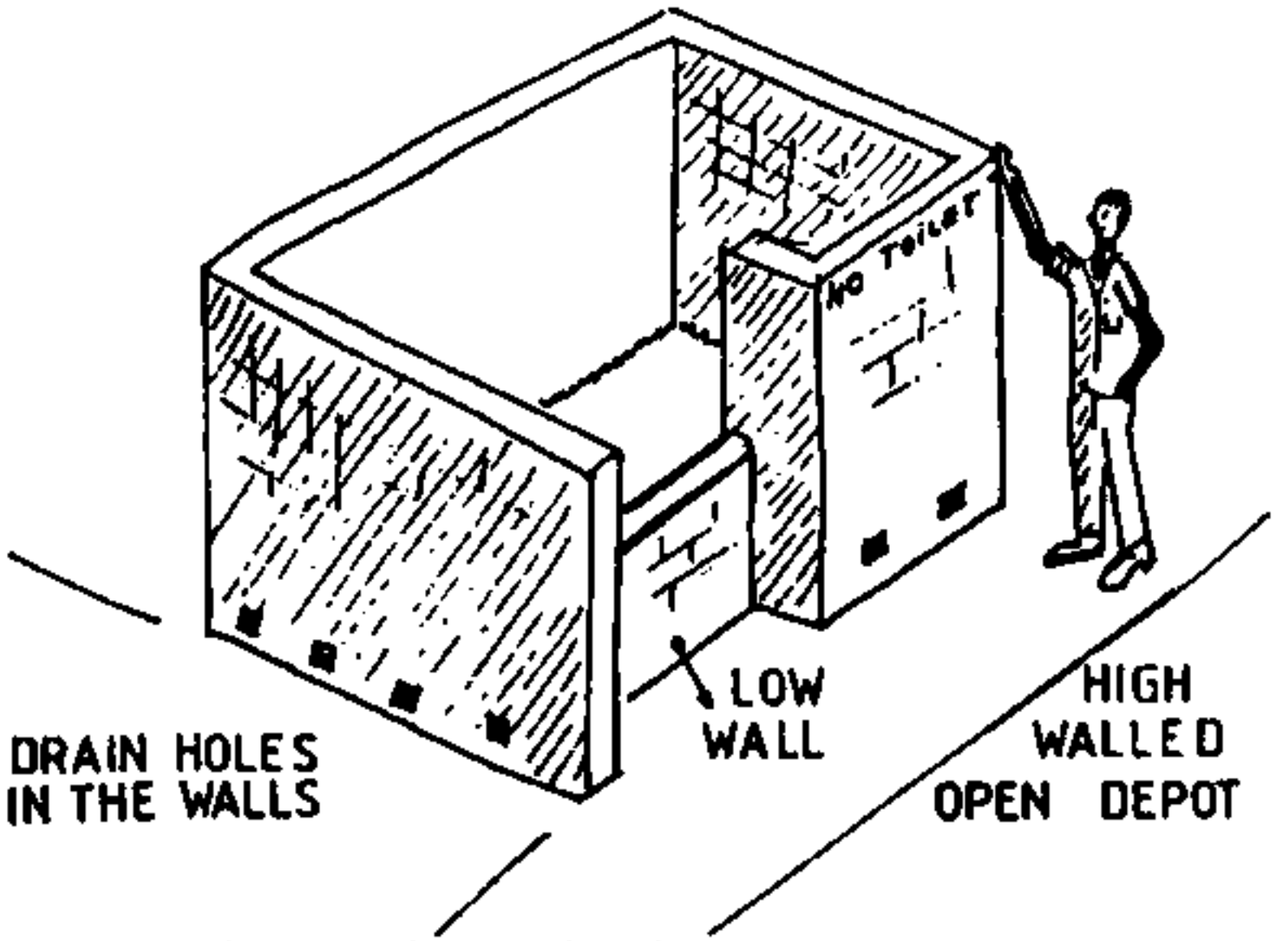
What is an effective spatial strategy to improve water management in Paraisópolis, by increasing quality of life and improving the quality of public space?

Interventions

Waste collection locations

Currently, waste is collected by truck throughout Paraisópolis. The collection locations are spread out, including in flood areas and on steep slopes.



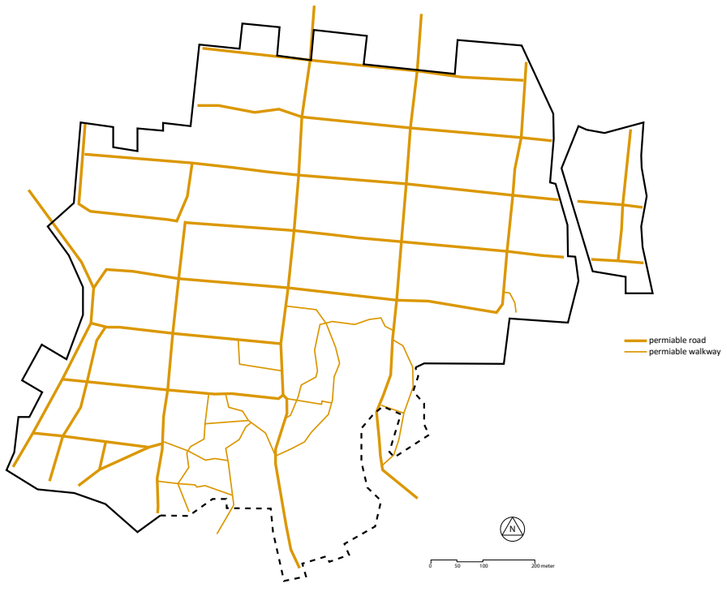


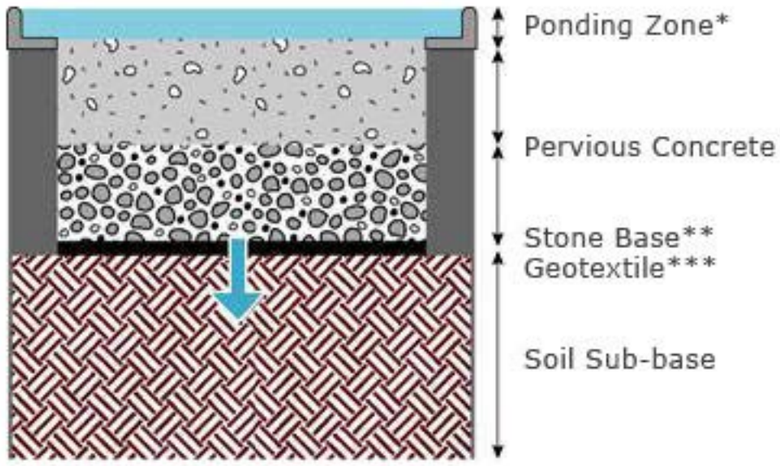
Communal waste depot, developed by UN HABITAT

image: UNCHS/HABITAT; 1989

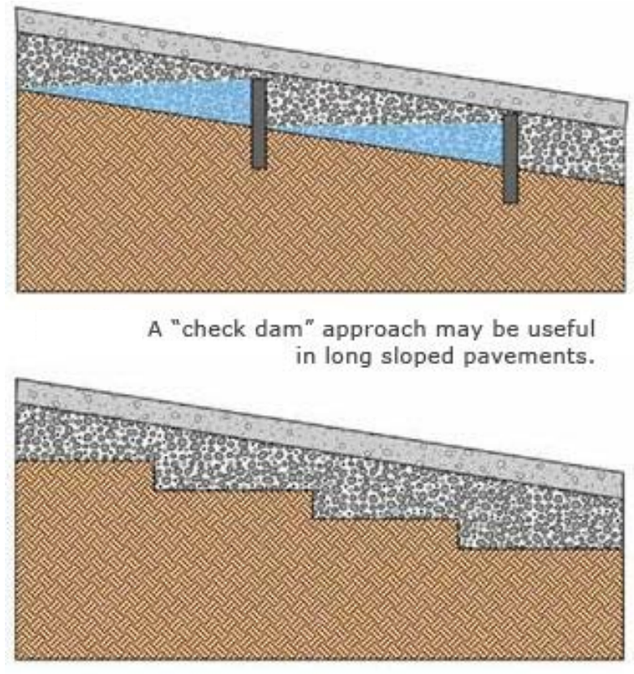
Permeable pavement

Paved roads in Paraisópolis are made of concrete or asphalt. This doesn't let water through, causing that all of the rain water has to be discharged, which contributes to flooding.





Example cross section of a pervious concrete pavement system. Curbs (on both sides) will increase the storage capacity.



A "check dam" approach may be useful in long sloped pavements.

Terraces in pervious concrete pavement system with long slopes.

image: www.perviouspavement.org

One-way streets

Already some streets in Paraisópolis are one-way. This is because of the steep slopes at these locations. By expanding this system, more space is freed up for water and trees in the streets.

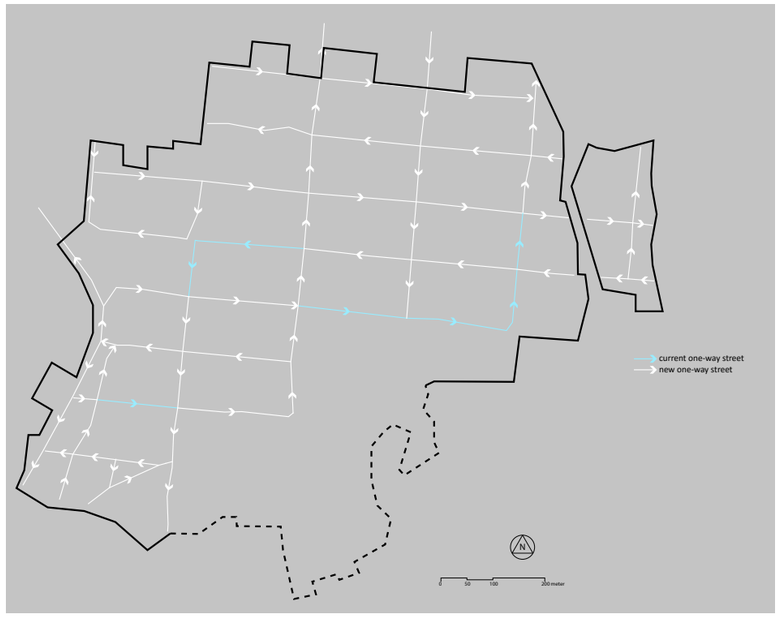
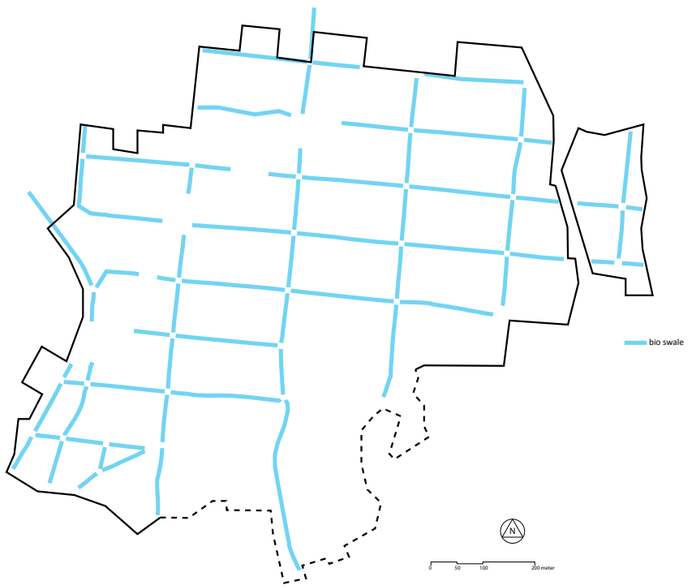


image: Google Streetview

Bio swales

Bio swales are ditches next to a road, which lets in rain water into the ground and filters it as well. The area allows for growing plants and trees.



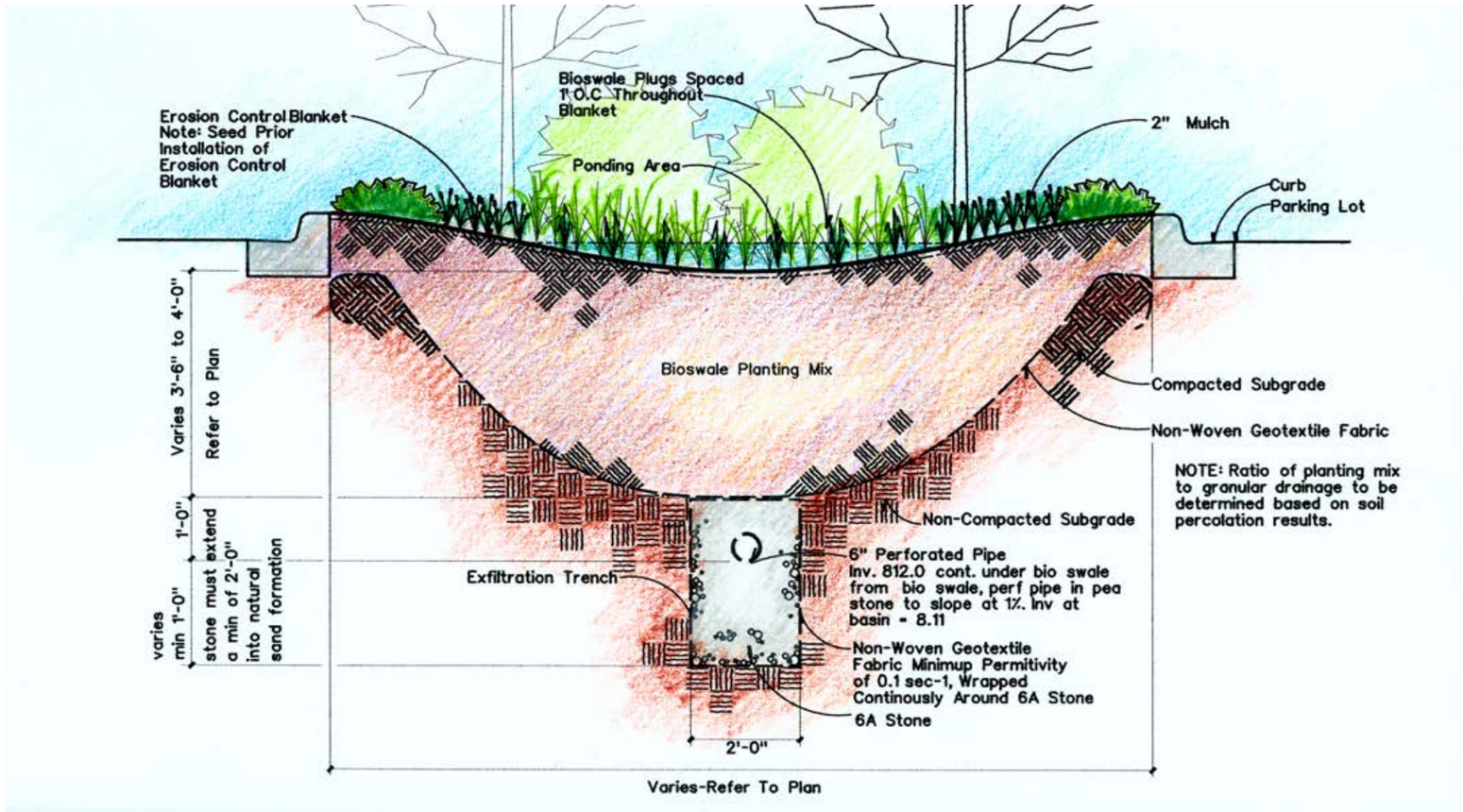
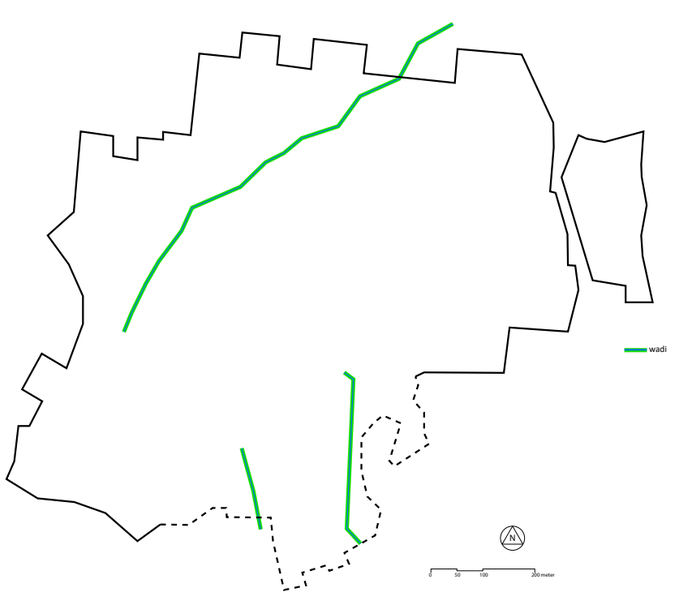
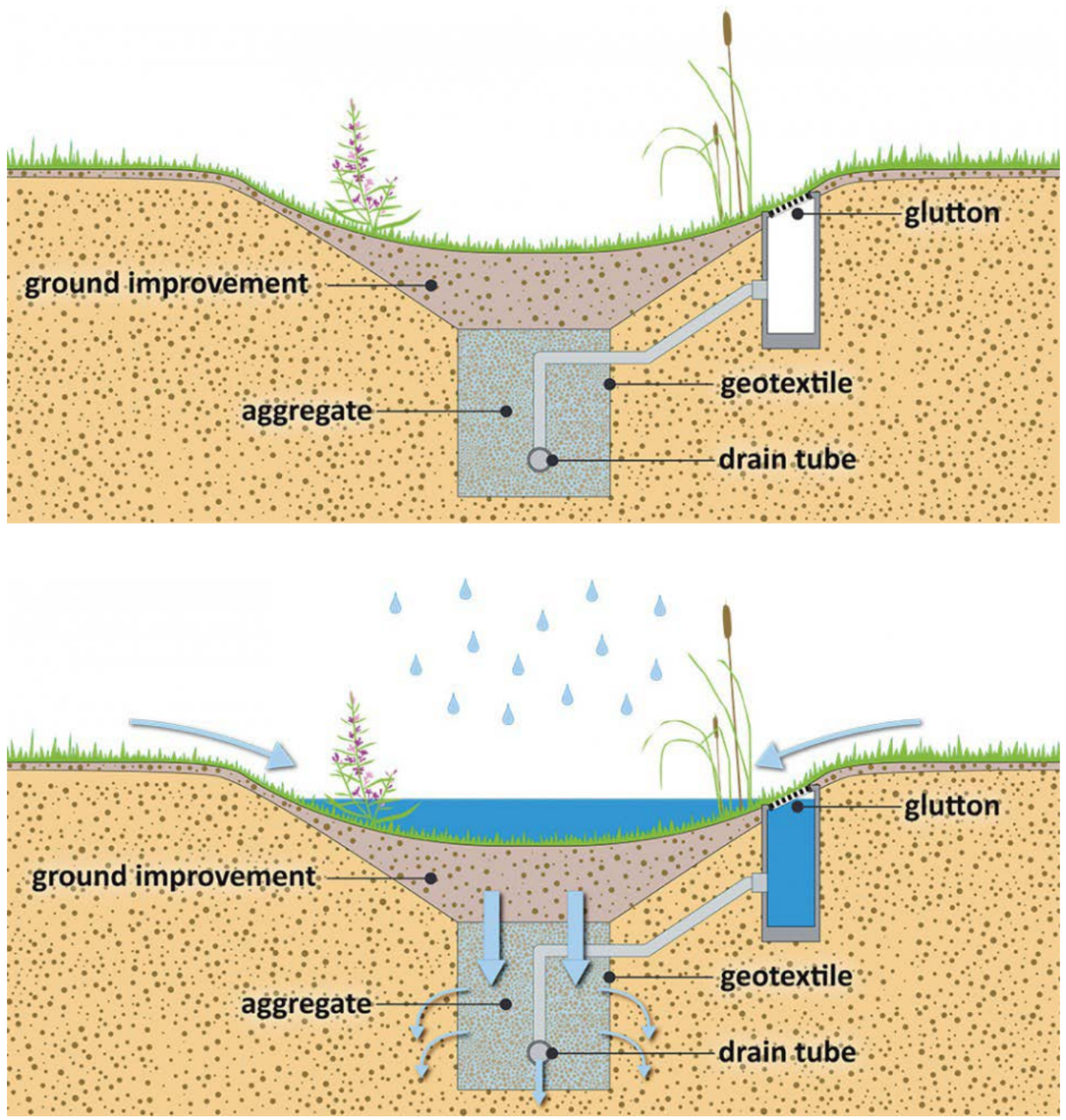


image: Sustainable Water Management LLC

Wadi

‘Wadi’ comes from the Arabic word for dry riverbed. It is an area that is design to function both when dry and when wet.

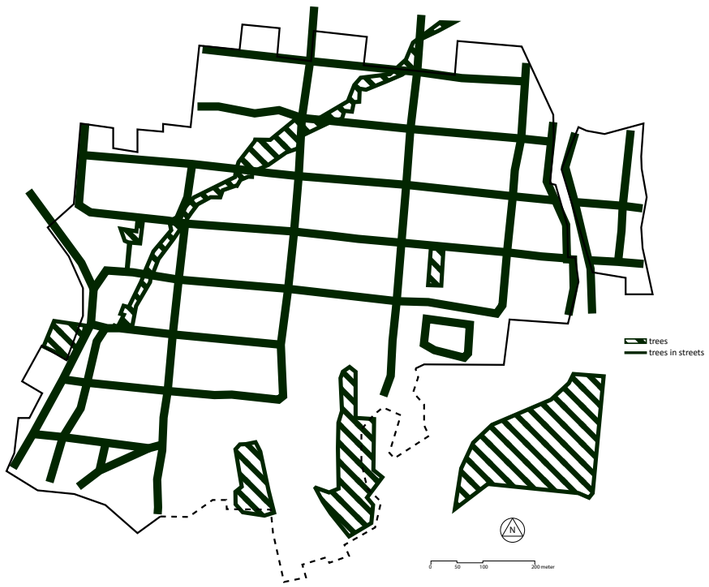




images: atelier GROENBLAUW

Trees

Trees hold on to water in their roots and leaves. In dry periods they give off water to the air, in wet periods they take up extra water.




Cambuci


Copaiba

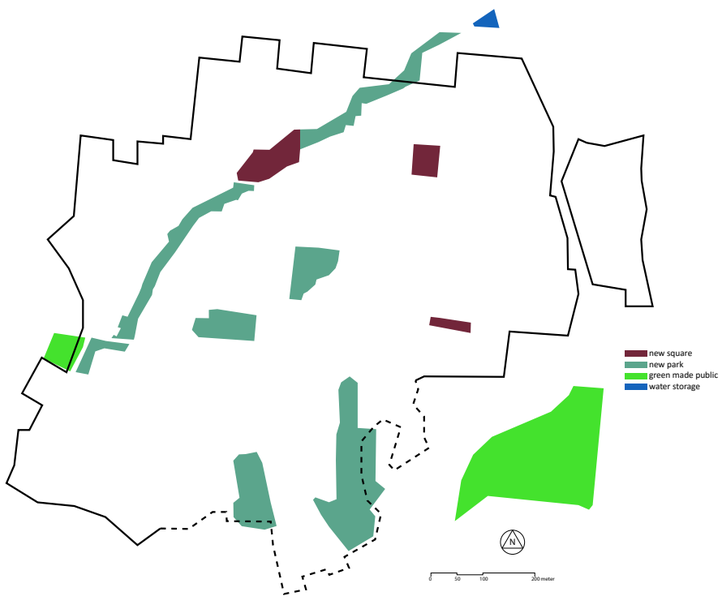

Ipê Amarelo

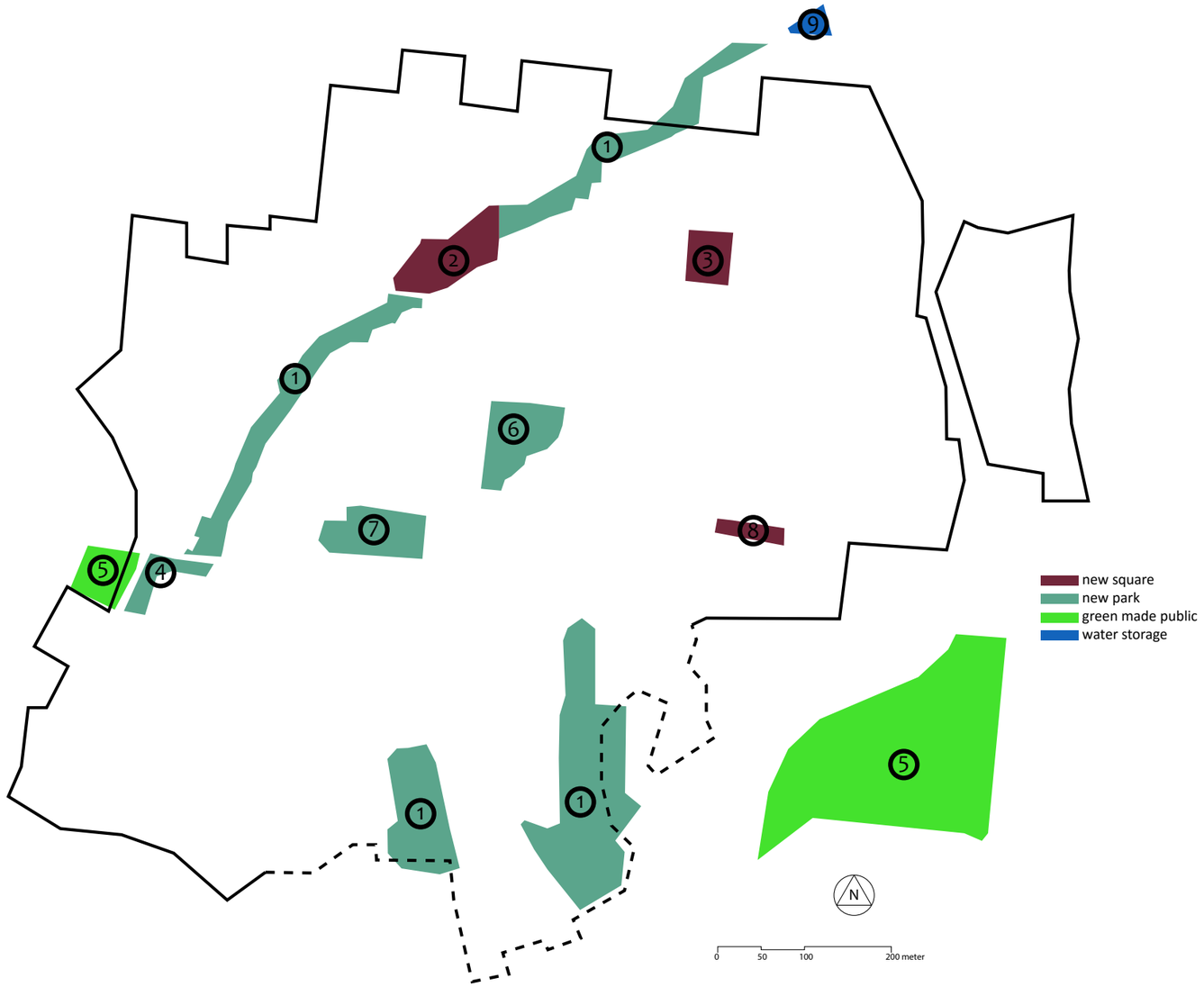

Palm tree

images: arvoresdesaopaulo.wordpress.com | Guardiãodocerrado (for Ipê Amarelo)

Squares and parks

In Paraisópolis, for various reasons, new public spaces are needed, or can be used.





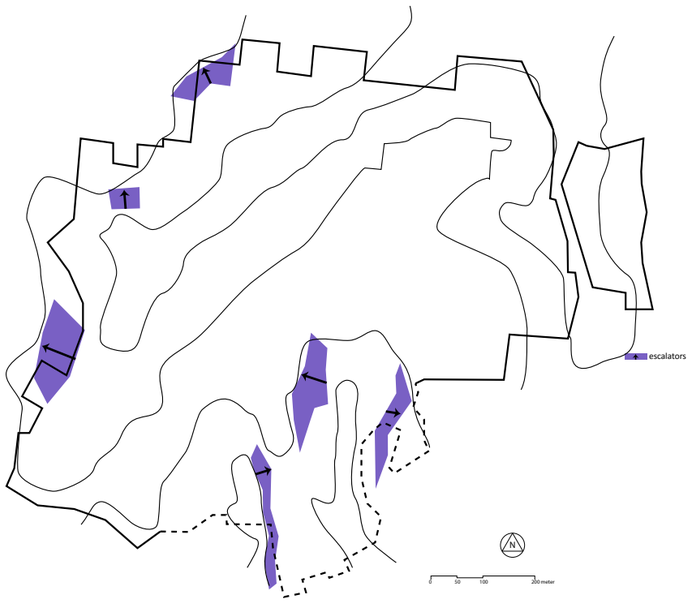
1 area cleared for flood risk
2 broadest part of flood area
3 across the road form shopping centre
4 connection area
5 unused open space

6 area in middle of Paraisópolis, containing precarious housing
7 area in middle of block, containing precarious housing
8 area between road and public football field
9 open area, just outside Paraisópolis, in the middle of flood risk area

image: own image

Escalators

Steep slopes can form a barrier. Escalators help disclose isolated areas and can be part of routes connecting Paraisópolis to the surrounding neighbourhoods.

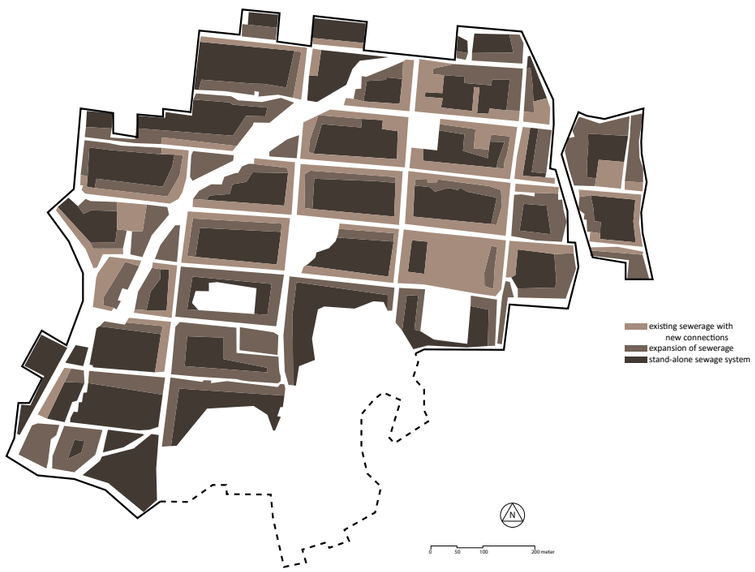


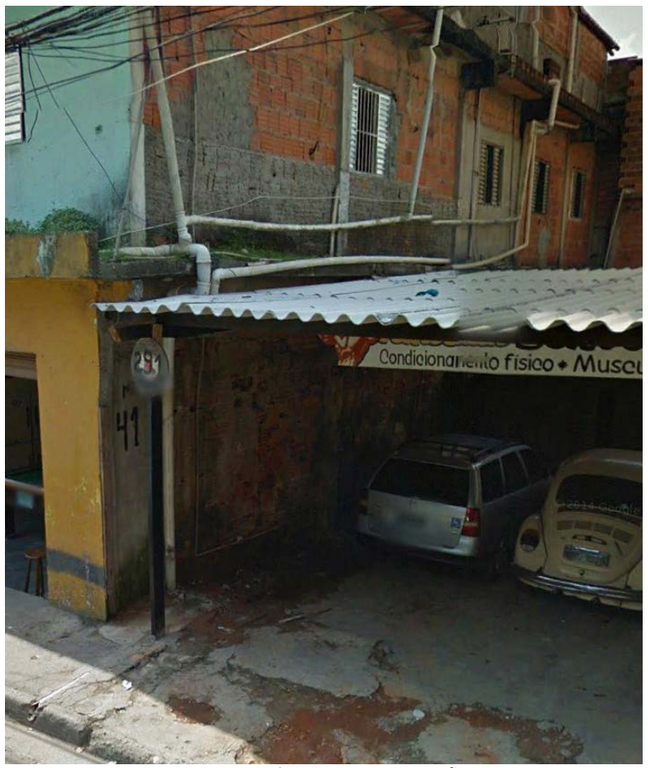
Escalators in Medellín, Colombia

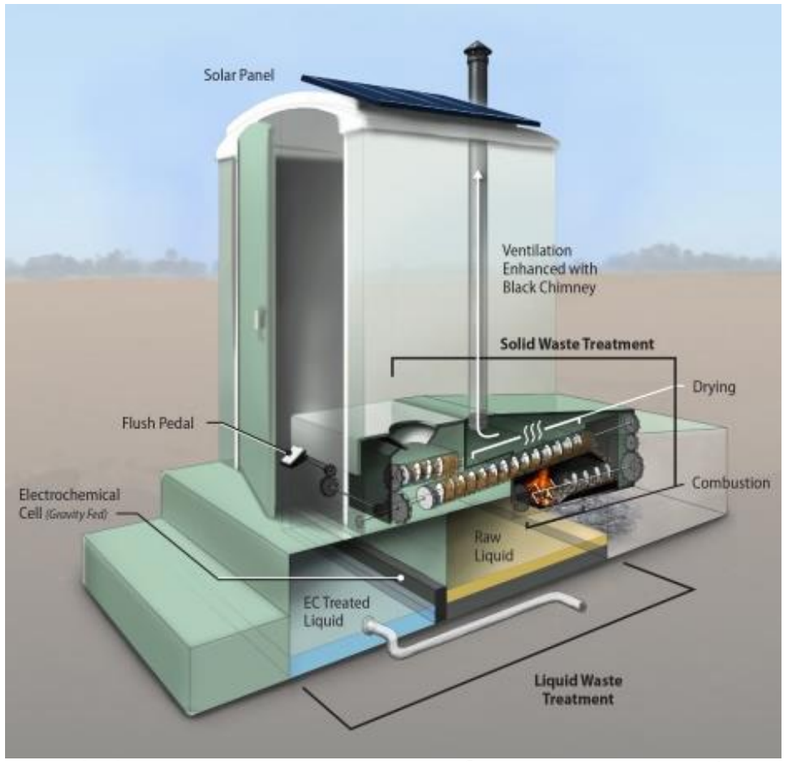
image: www.ibtimes.com

Sewerage

About 25% of Paraisópolis currently has sewerage that is being treated. Where possible, sewerage is connected and expanded, but inside city block, stand-alone units provide the sewage management.




Current sewerage ‘connection’

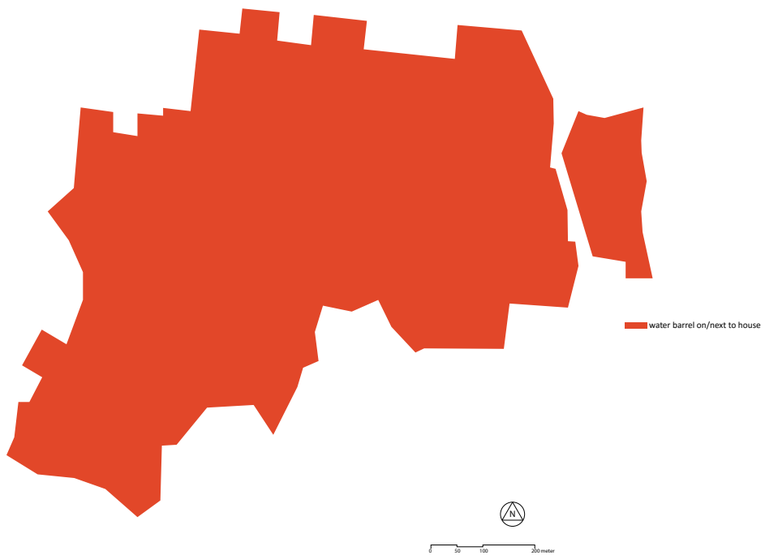


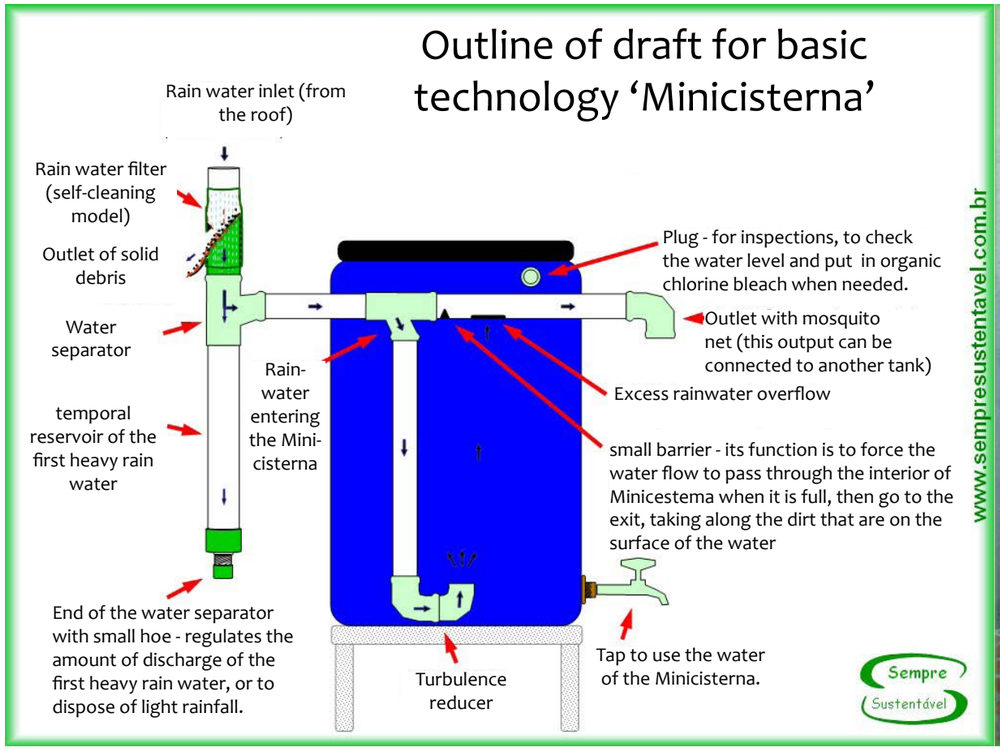
Stand-alone sewerage systems from RTI International

images: Google Streetview | www.dondereciclo.org.ar

Water barrels next to houses

Households can collect rain water in barrels. If done safely, it can be used for non-drinking purposes, like washing or for watering plants. ‘Sempre Sustentável’ has developed a good system.





images: Sempre Sustentável

Design

Design for Paraisópolis

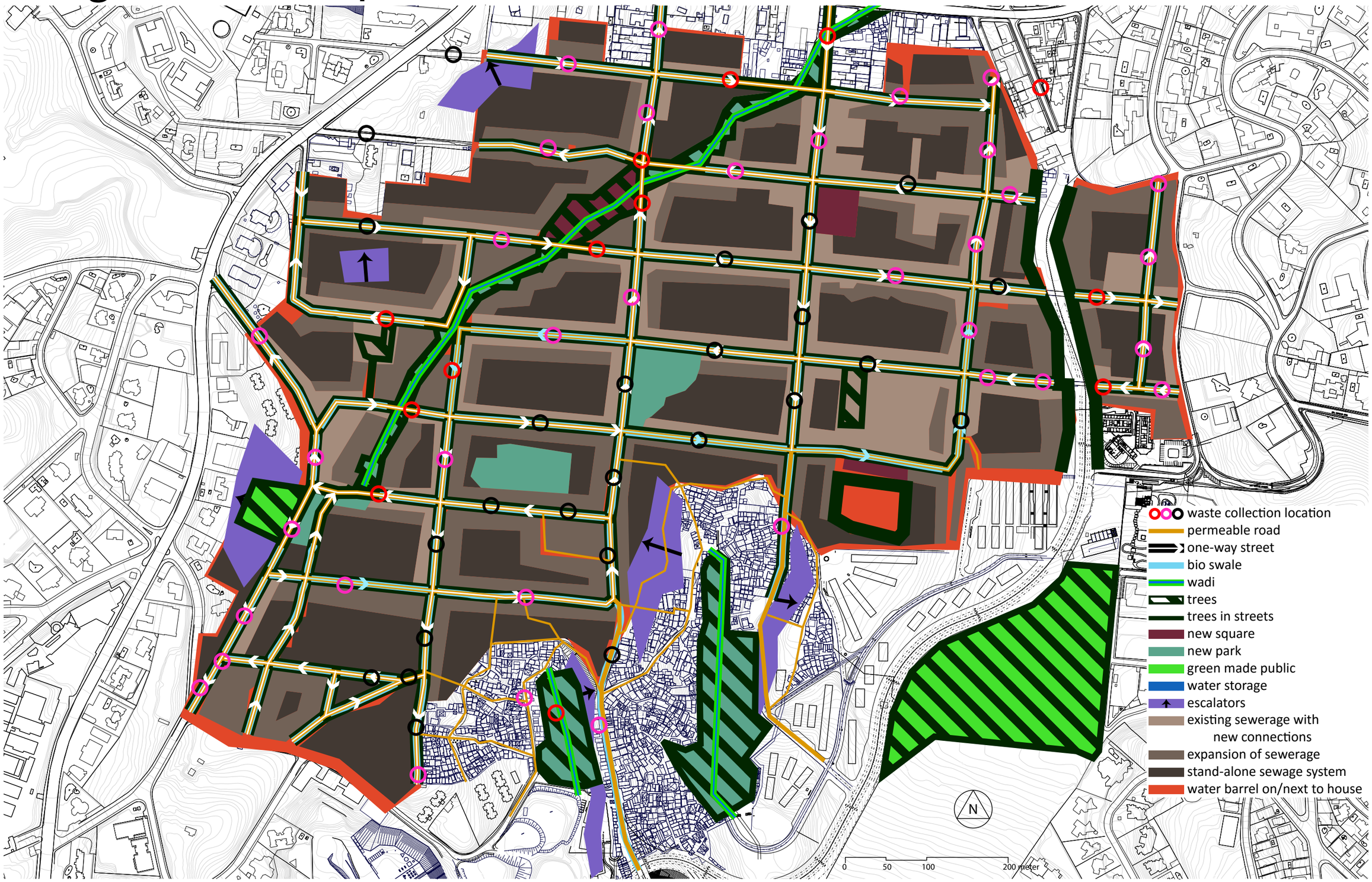
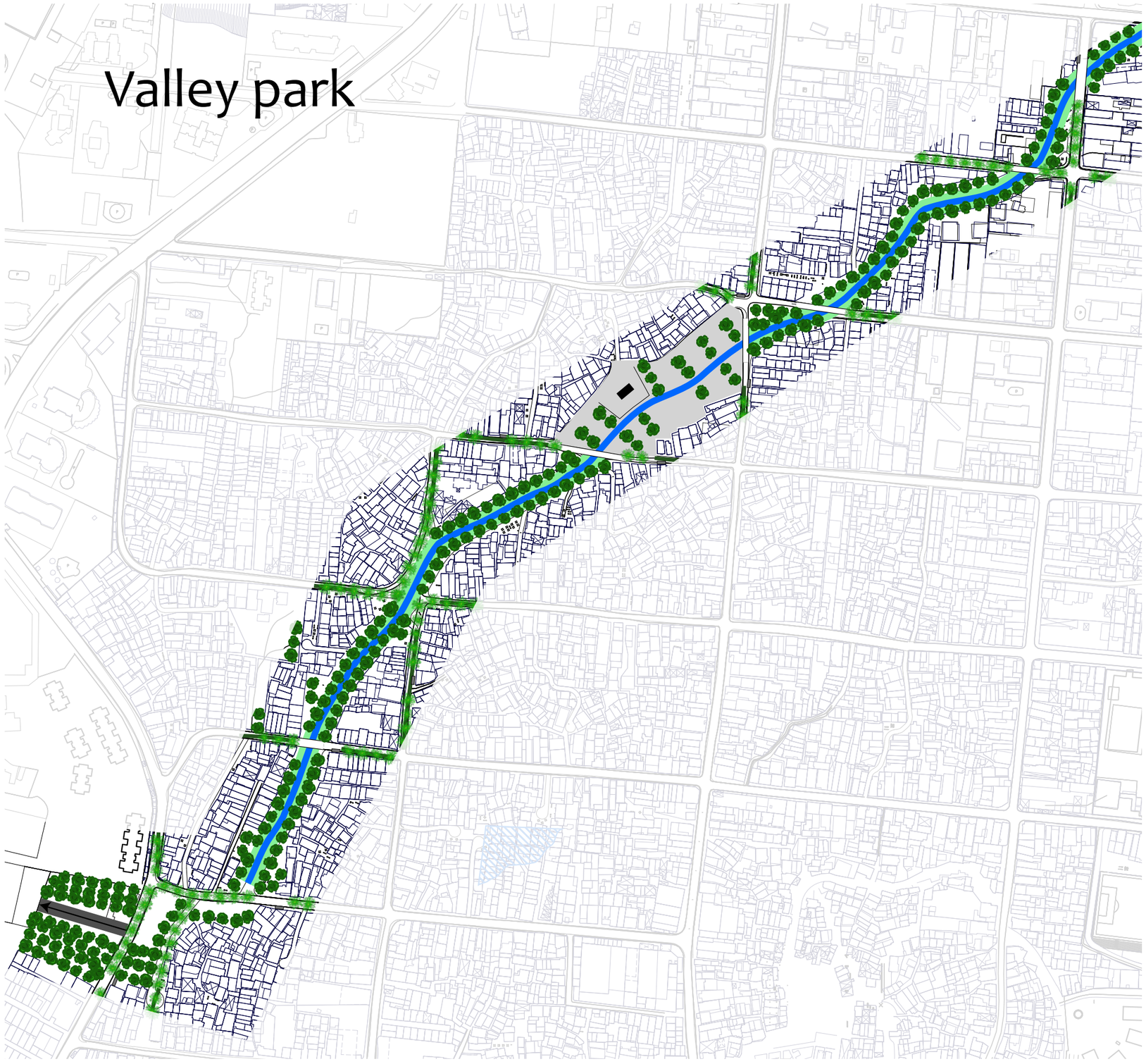


image: own image



Series of connected green public spaces

Connection to existing woods in southwest

Square in central area

image: own image

Valley

Square in broadest part of valley

Informal division with trees

Location for a restaurant

image: own image

Valley, current situation

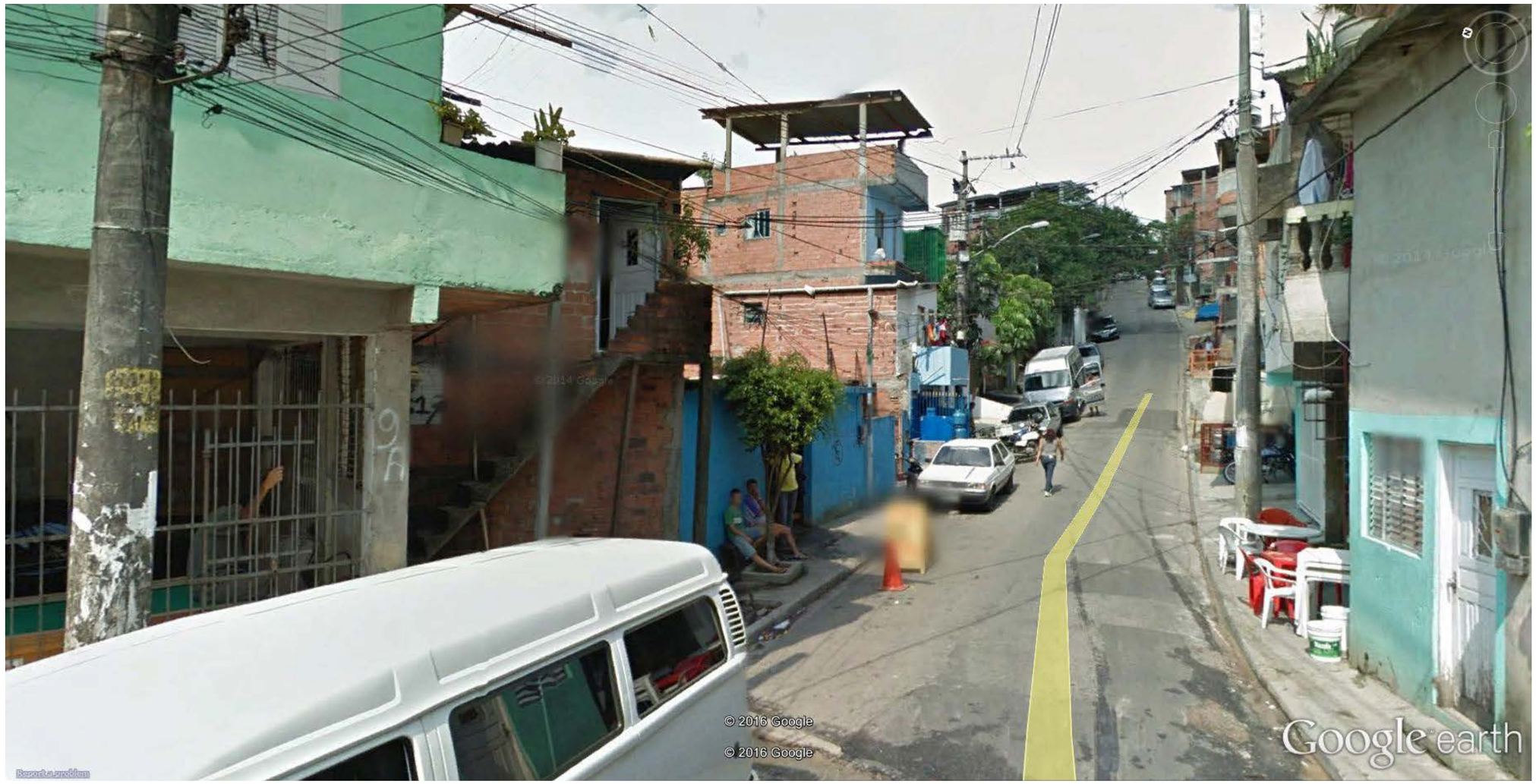
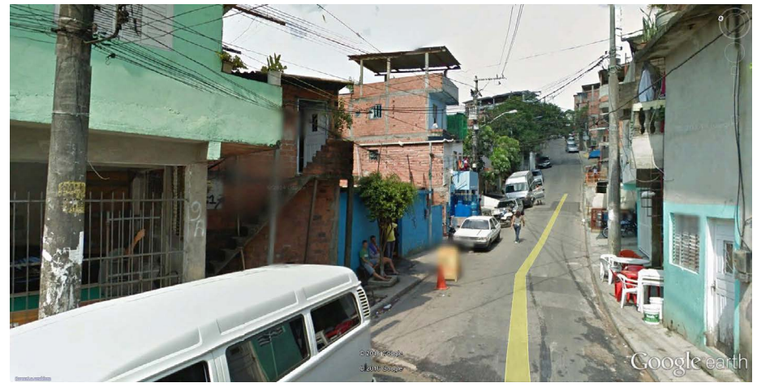


image: Google Earth

Valley, impression



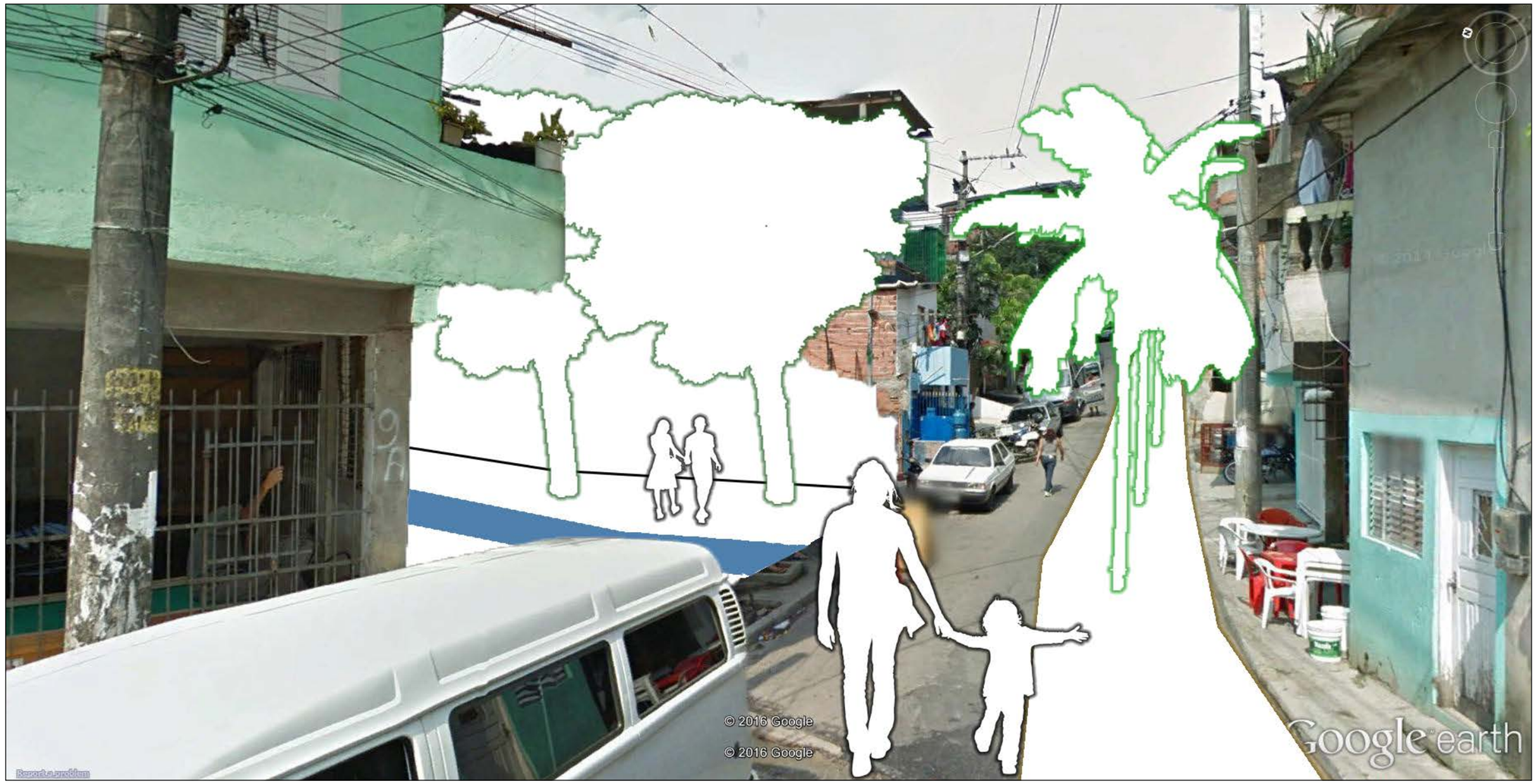
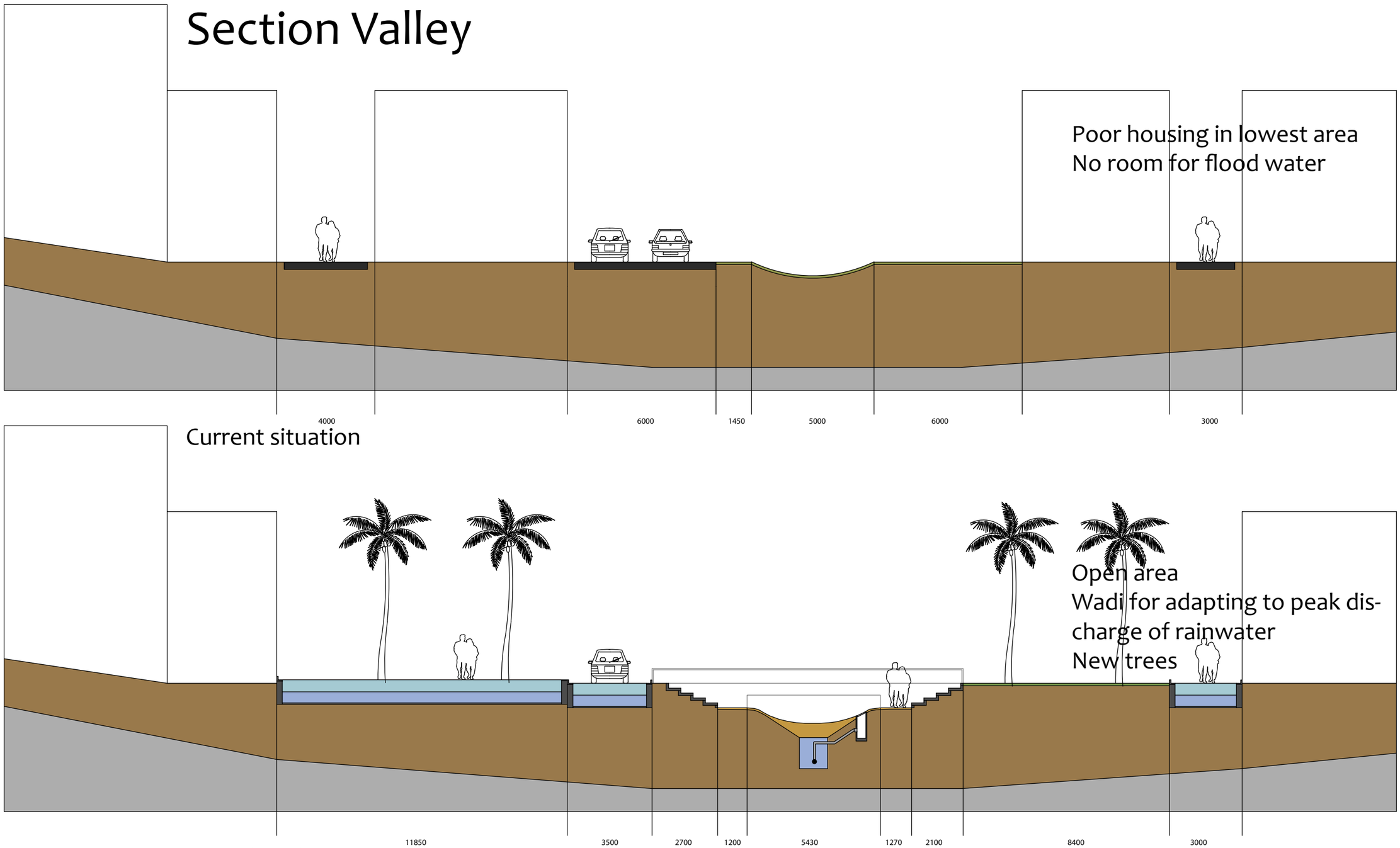


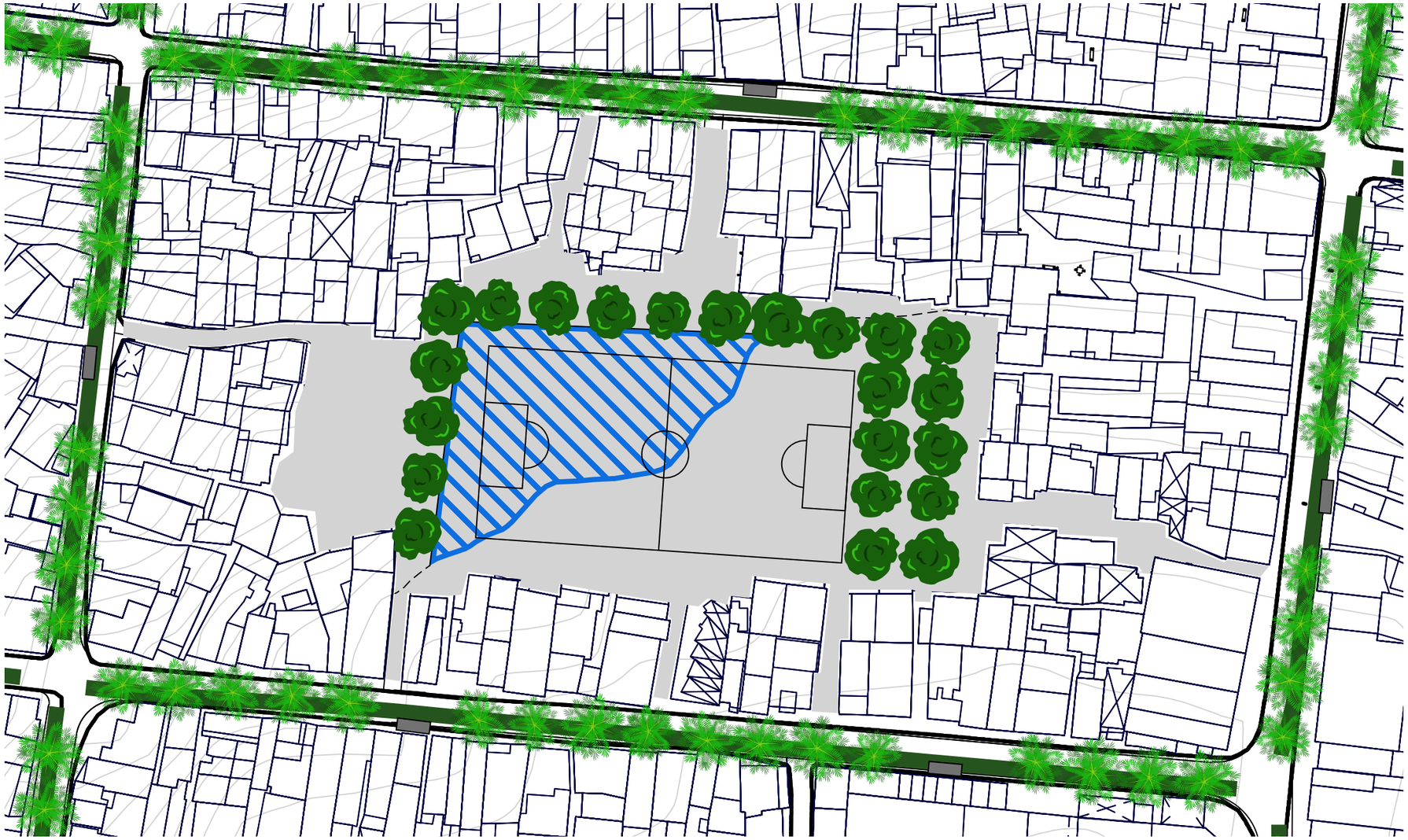
image: own image based upon Google Earth1

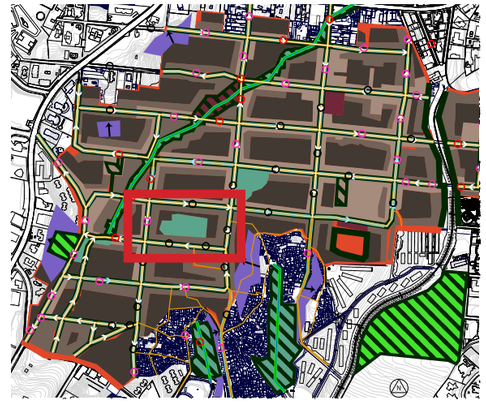
Section Valley



images: own image

Inner block





Water square with football field

Accessible from all sides

Space for different activities

image: own image

Inner block, current situation

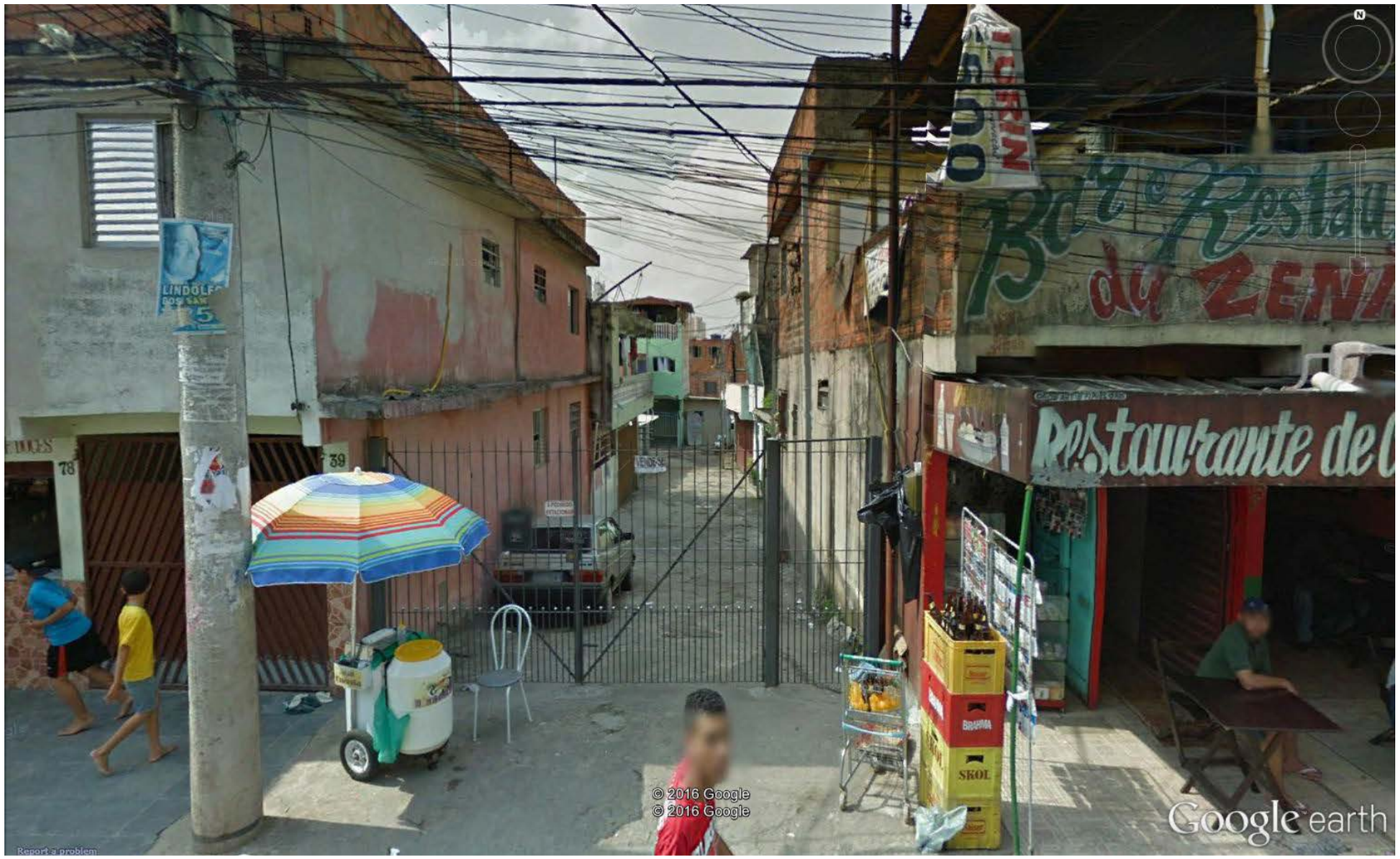


image: Google Earth

Inner block, impression

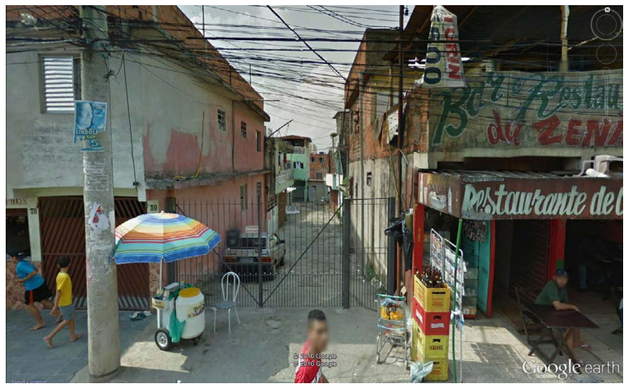
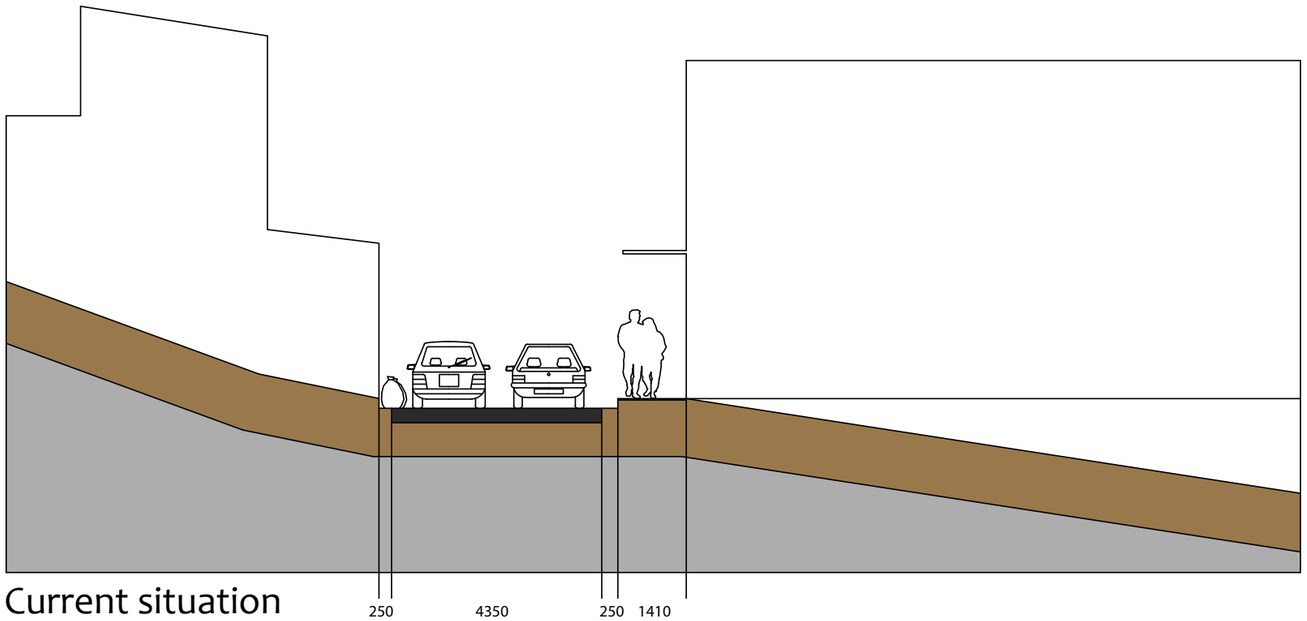


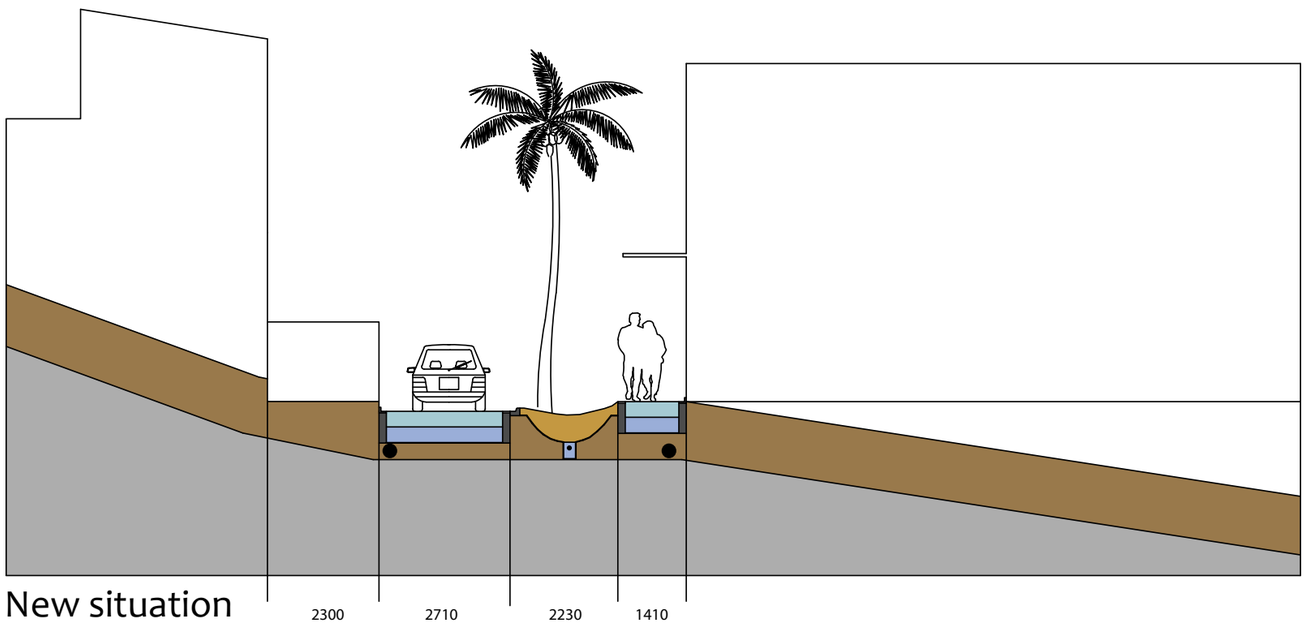
image: own image based upon Google Earth1

Section of a typical street



Current situation

Garbage bags on street
Soil doesn't receive rainwater

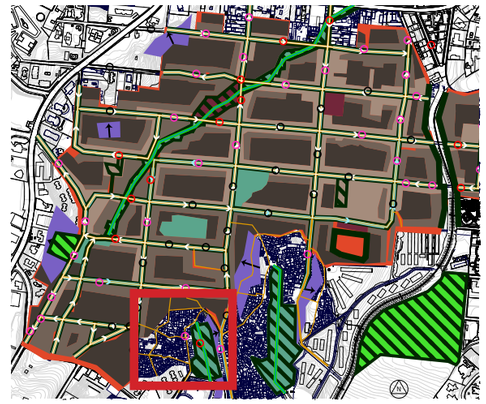


New situation

Garbage in collection location
Permeable pavement
New sewerage pipes underground
New trees

images: own image

Inner block



Total renewal of situation

New apartment buildings

Water park in valley

image: own image

Inner block, current situation

image: Google Earth

Inner block, impression

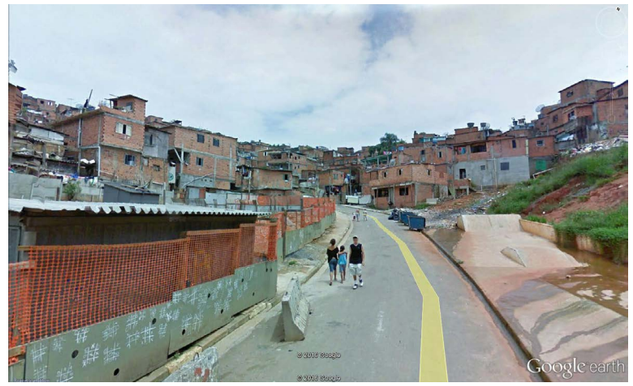
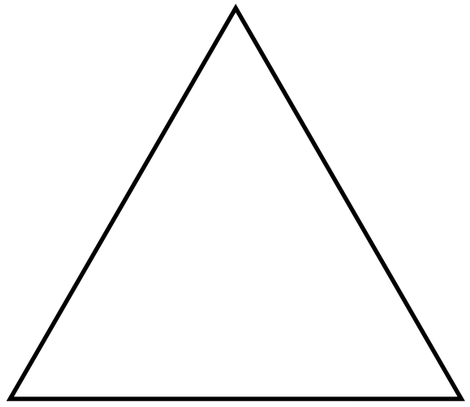


image: own image based upon Google Earth1

Governance

Hospital Albert Einstein
Local football associations
Community centre
Schools
Cemetery

Civil society



Public sector

Private sector

Departments of the municipality of São Paulo:
- Housing
- Infrastructure and Urban Constructions
- Urban Development

Local entrepreneurs
Waste collector ECO UBRIS
Waste collector Loga
Bus company SPTrans

image: own image

Governance

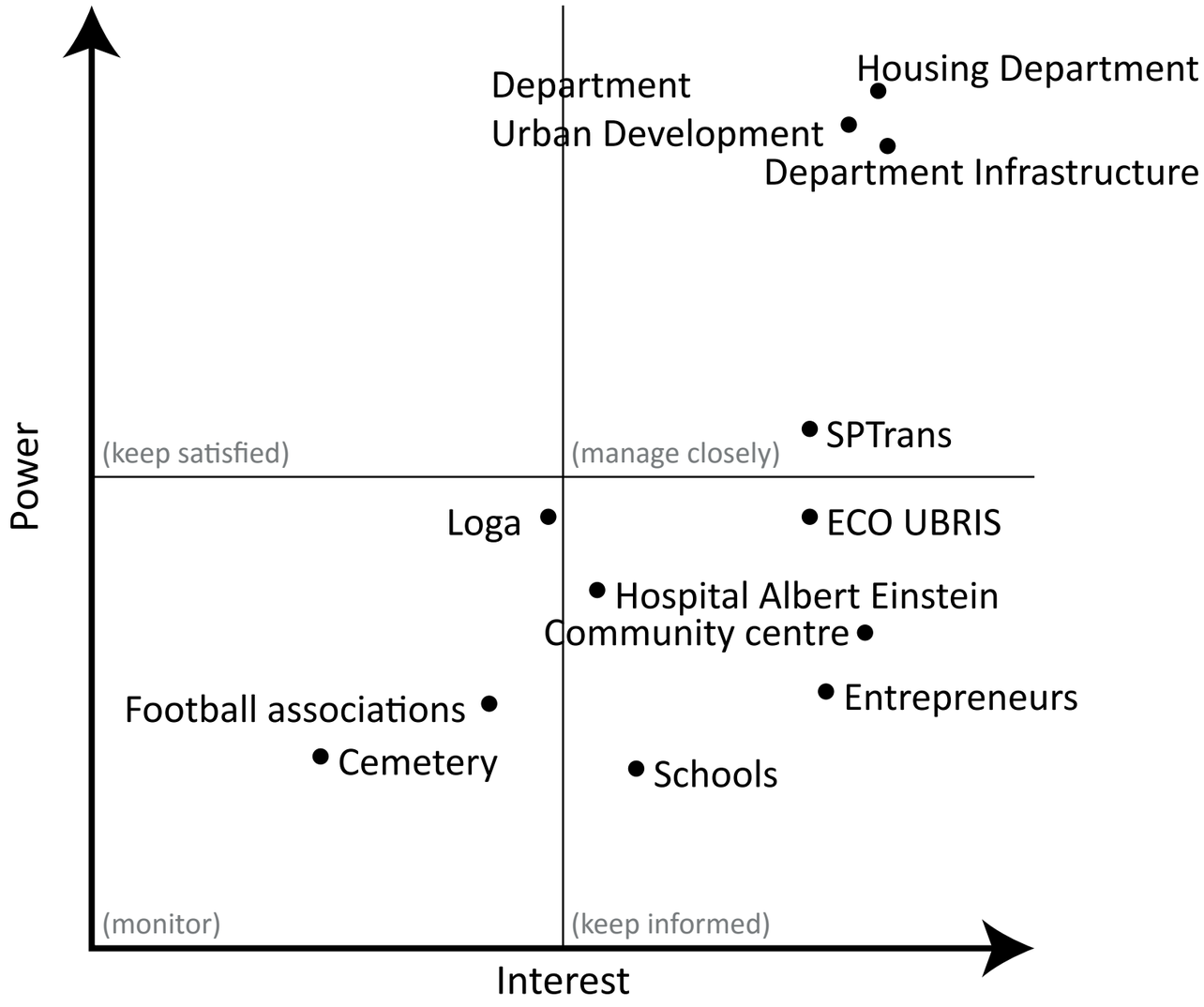
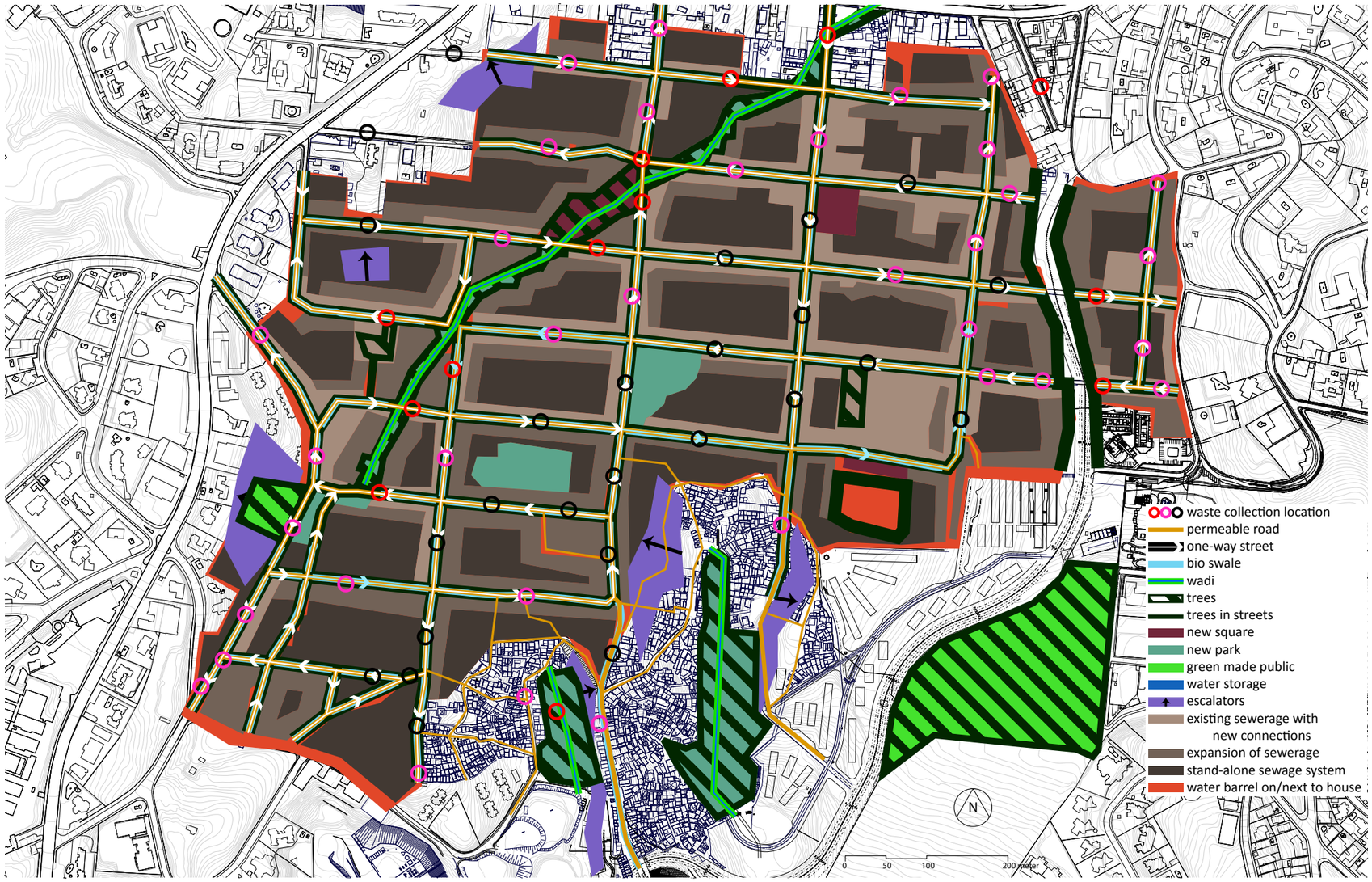


image: own image

Conclusion

How has the research question been answered?

What is an effective spatial strategy to improve water management in Paraisópolis, by increasing quality of life and improving the quality of public space?



New public spaces for water and waste

Design based on reason and analysis

image: own image

Thank you