

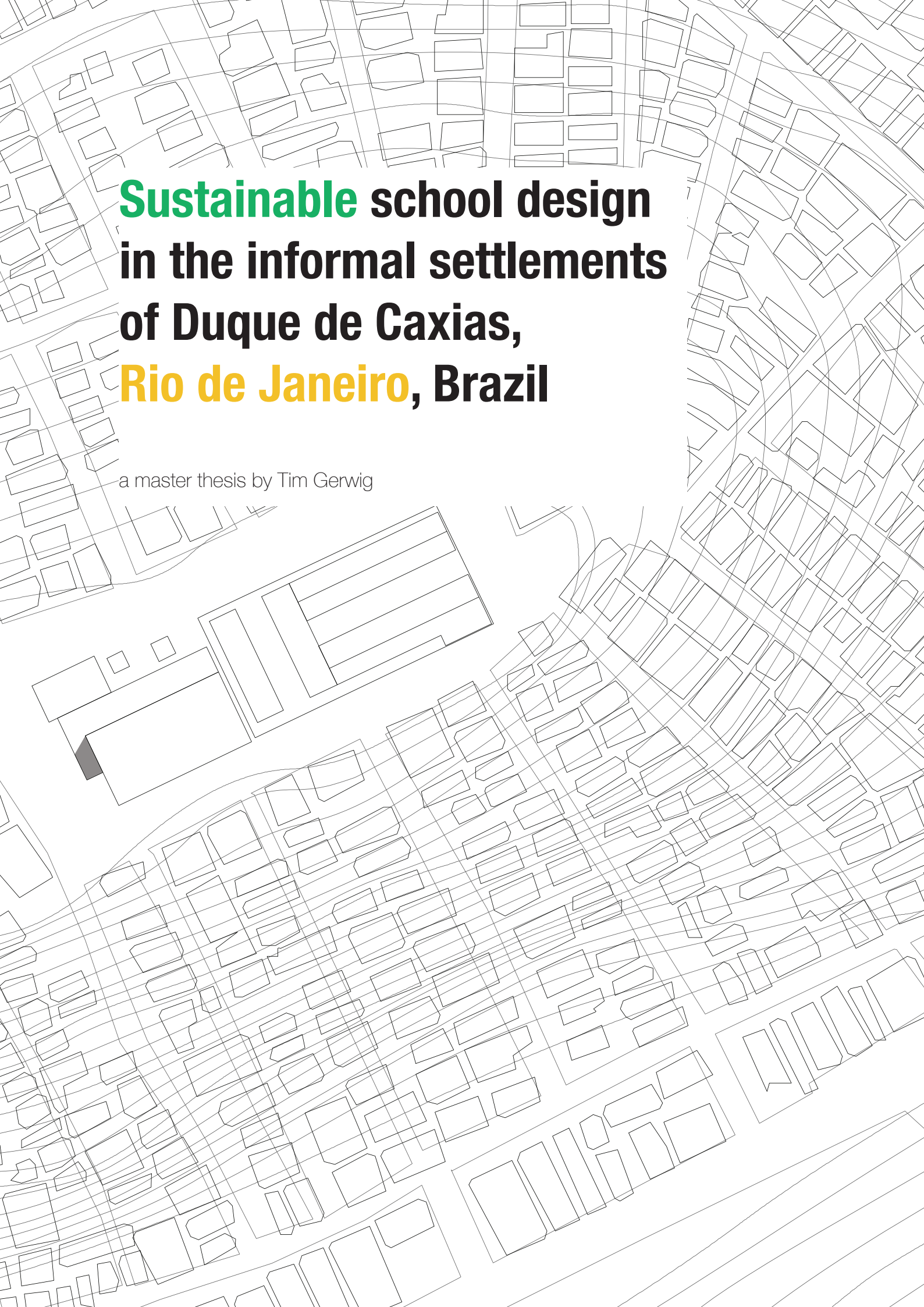
Sustainable school design in the informal settlements of **Duque de Caxias** Rio de Janeiro/Brazil

A Master Thesis at Hafencity University Hamburg 2016
with Prof. Dr. Ing. Wolfgang Willkomm and Dipl.-Ing. Martin Kohler
written by Tim Gerwig

For my beloved family
Günther, Peter, Karin and Jan

For Diana, and all residents of Vila Operária






Sustainable school design in the informal settlements of Duque de Caxias, **Rio de Janeiro, Brazil**

a master thesis by Tim Gerwig





NA INOCÊNCIA
DAS CRIANÇAS,
ENCONTRA-SE NOSSO
FUTURO.

"TUDO POSSO
NAQUELE QUE
ME FORTALECE"

"TUDO É FORÇA,
SÓ DEUS É PODER"

„In the children's innocence lies our future “
„Everything has force, only god has power“
Graffiti artists express criticism of state and public service
From MOF - Movement of Favela - Favela Vila Operaria



"No alto do morro"
The steep hillside to the cemetery -
Cemitério Nossa Senhora das Graças

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The native bird „Joao de Barro“ is commonly seen in urban Brazil. He is the so called Architect of birds an stacks up to four stories to his nests. It is a modular system that uses posts, beams or trees as support to give rigidity. Similar to the urban dense structure of Favela housing he leaves the opportunity to extend his home to the next generations.



Acknowledgements

Orientation

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UNIVERSIDADE FEDERAL
DO RIO DE JANEIRO

Thank you to the whole community of „Vila Operária“ and all supporters on my way completing this work.

Special thanks to my Professors, my parents, my brother the believers and further to mention my beloved girlfriend Diana Rocha Monteiro dos Santos, as well as Almir, Lau and Bobbyzinho.

Muito Obrigado por ter ajudado tanto nessa pesquisa e obra e ter aberto as portas da comunidade Vila Operaria e os que lerao esse tese.

In good memory of the people from Duque de Caxias.

This work is dedicated to you.

Preface

The Brazilian region called “Baixada Fluminense”, situated in the north of the metropolitan area of Rio de Janeiro, is known for its industry, heavy infrastructural deficits, a high crime rate and the high number of informal developed settlements. Since its foundation, in 1943, Duque de Caxias became a „bedroom town“ with a significant number of migrants seeking employment and a life opportunity in Rio de Janeiro. The three cities Duque de Caxias, São João de Meriti and Belford Roxo concentrate around 70% of the citizens living in informal developed settlements in this region. Moreover, despite the high economic potential and financial vitality, Duque de Caxias perfectly illustrates the contradictory development model with inequality. Disordered growth with emergence of popular neighbourhoods, slums, and poverty belts are the reality.

The public educational system is suffering for years, most schools lack of basic needs. How to transform a school in a Brazilian Favela together with local participation in construction and planning? This architectural proposal was developed in a constant communication process with local residents of the Favela Vila Operária.

Living for 5 months in the Favela has been an important requirement to understand residents and brought acceptance for this project. The residents are confronted with prejudice for belonging to the underprivileged class in Brazilian society, but they would never give up.

Plenty of creativity and strong spirit is what I met there and the rise and history of this place brings people together.



The view from „Vila Operária” to the PETROBRAS Oil refinery

Introduction



HALT
BLACK



CONSCIÊNCIA
NEGRA



Black consciousness-
Brazil is still fighting with racism and prejudice
of being Afro-Brazilian.

The need of sustainable school design

The city of Duque de Caxias in the “Baixada fluminense” has one of the fastest growing populations in the last few decades. Urban density is causing infrastructural and climate problems. Urban heat islands, and nearby heavy industry like the Petrobras REDUC oil refinery affect health and environment. The city's big social inequality has led to informal and disordered urban growth. Visiting the schools in several Favelas (Brazilian shanty towns or informal settlements) in the first district of Duque de Caxias, has shown a variety of examples of schools which were transformed in its programme and use, but did not adapt architecturally in its structure and space. The initial idea was the development of a new sustainable school system.

During research, after having interviewed local community residents, teachers, students and politicians, soon it has been clear that a transformation process of the already existing schools in or close by informal settlements is ecologically and socially worthwhile.

The schools that were visited are of basic and simple nature and were planned initially mostly as elementary schools (Pré-Escola, Fundamental 1) but serve nowadays as a higher school (Ensino Fundamental 2 and Ensino Médio).

The result is a lack of capacity and space, generating non-suitable school and learning environment. Technically schools as public institutions have a high-energy consumption and contribute greatly to the worlds carbon emission.

A school extension with shared community space, applicable to the existing schools, can provide a variety of purposes to social life.

“Schools are more than bricks and mortar – they are symbols of our commitment to education.” (Lackney,1999)

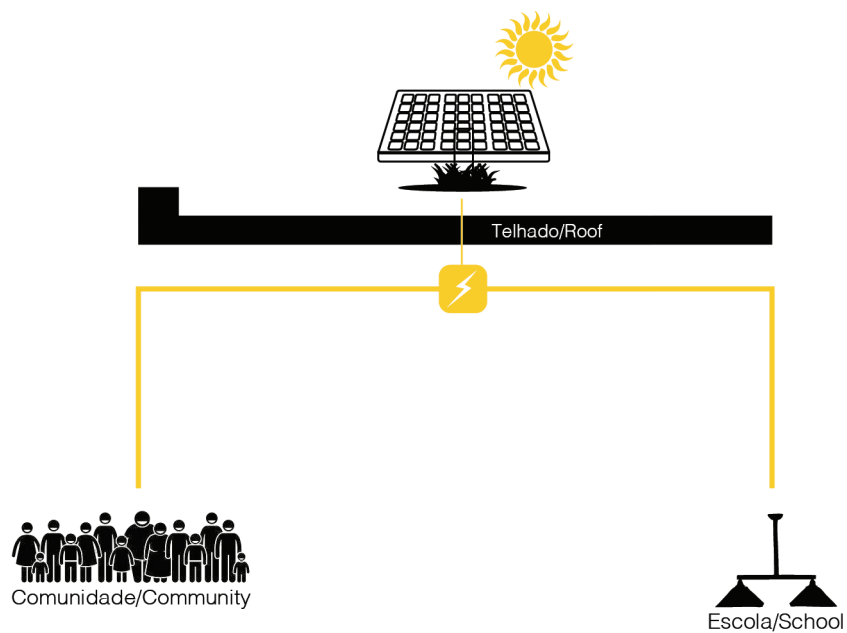
The school can raise a physical connection with its neighbourhood and its people. The prevention and consciousness for environmental issues challenge society to educate. Sustainable schools can contribute with environmental education and reduce the local issues that affect globally. An approach to a sustainable school design is trying to reduce environmental impact with empowering existing structure, and creating new, including social, technological and environmental transformation.



The school Colegio Estadual Vinicius de Moraes in the middle of the community is an essential element of Vila Operária and this Thesis. In front of the entrance of the school is the station of the Pacification police Unit UPP.

The aim is to design for long life, to have a lower impact on following generations. The schools visited during the research in Brazil mostly suffered thermal and infrastructural problems, like water for bathrooms and kitchen facilities as well as a reliable energy supply. The goal is to maximise use of renewable energy and run schools self-sufficient and independent from the local network. Furthermore, produced energy that is not needed can supply the local community.

To design a sustainable school that can furthermore inspire other projects is asking for a balance between specifically local design and identity as properties that would work in mass prefabrication.



Methodology and techniques used during the research

For the realization of this thesis, observing and analysing urban potential and deficits in the region, it was necessary to focus during the survey in three directions:

- Theoretical Approach: Bibliographical analysis in the areas of Sustainable Architecture, School Education and Society.
- Qualitative Approach: To understand the problems of social and technical Infrastructure interviews with the following different interest groups have been conducted: Education professionals, teachers, students, architects, politicians and local residents.
- Field Approach: Visiting the community and selecting several schools to obtain reports, photos and videos.

The choice of schools that would be visited during the field work was to analyse the best place that offers support for implementation of the proposed construction.

It was also necessary to receive an authorization of the Regional Metropolitan Education Directorate V in Duque de Caxias to visit the State and CIEP's schools.

What is a sustainable school ?

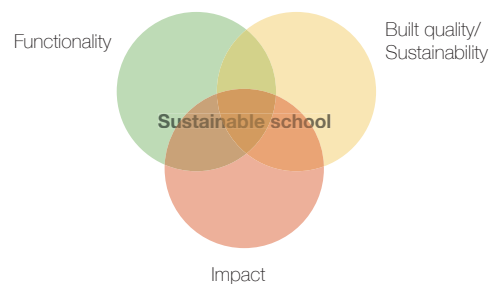
The term sustainability is often associated with “environmentally friendly”. Following the definition of the Brundtland Report, economic and social issues have to be regarded at the same time (WCED 1987). Although this work will focus on first and the latter, it addresses the economic dimension implicitly.

If it comes to the shaping of cities, and here specifically to the shaping of the informal city to a more sustainable environment, it is essential to consider the human dimension as well.

Working with the “free” services that nature provides, like wind, sun, thermal properties and natural lighting, can create a high quality environment and reduces the impact on our already burdened atmosphere.

The sustainable school can also provide education through the building itself, by showing how energy generation through sunlight functions and how rainwater harvesting can avoid water shortage. Green roofs have positive effects on internal heat gains. Through the possibility of the production of aliments, the students get closer in touch with the life cycle of nature.

The concept of sustainability in this report is based on the definition of Dr. Michael Ben-Eli (2005) which is described in a sensitive manner as a *dynamic equilibrium in the processes of interaction between a population and the carrying capacity of an environment, such that the population develops to express its full potential without adversely and irreversibly affecting the carrying capacity of the environment upon which it depends.*



The Venn Diagram indicates the balance between the factors that influence a sustainable approach in the design process. Considering all parts equal should match in a good design. The best design will be strong in all three areas.

A Functionality

- Access
- Uses
- Spaces

B Built environment

- Performance
- Engineering service
- Construction

C Impact

- Looks and feels good
- The school in its community
- Within the school
- Form and materials
- Character and innovation

Duque de Caxias



Culture in Duque de Caxias

Culturally the city of Duque de Caxias is rich in historical and natural heritage. There is still some baroque architecture, similar to those present in the state of Minas Gerais. The city nowadays is trying to preserve local history (CMDC, 2013)

Also according to the Town Hall of Duque de Caxias, the town also supports the Oscar Niemeyer Cultural Centre and the Municipal Theatre Raul Cortez (shown in the picture), both designed by the important Brazilian architect Oscar Niemeyer.

In the Centre of Duque de Caxias is the Musical Society and Artistic Golden Lyre, founded in 1957 by Acacio de Araújo, a Brazilian trombonist.

The region calls attention when it comes to Samba. Duque de Caxias has one of the most famous Samba schools, the so-called "Acadêmicos do Grande Rio", which is participating every year at the famous Rio Carnival and competing in the Sambódromo.

Football as well is an important cultural point.

The region is rich in fauna and flora and is a link through proximity to the Atlantic rainforest Mountain Range "Serra do mar" and the historical Town Petrópolis.

Tania Amaro, research director of the Historical Institute of the City of Duque de Caxias comments that:

"Although involved with huge environmental conflicts due to a cluttered urban development, pollution problems and violence, the Baixada now has a marked economic growth.

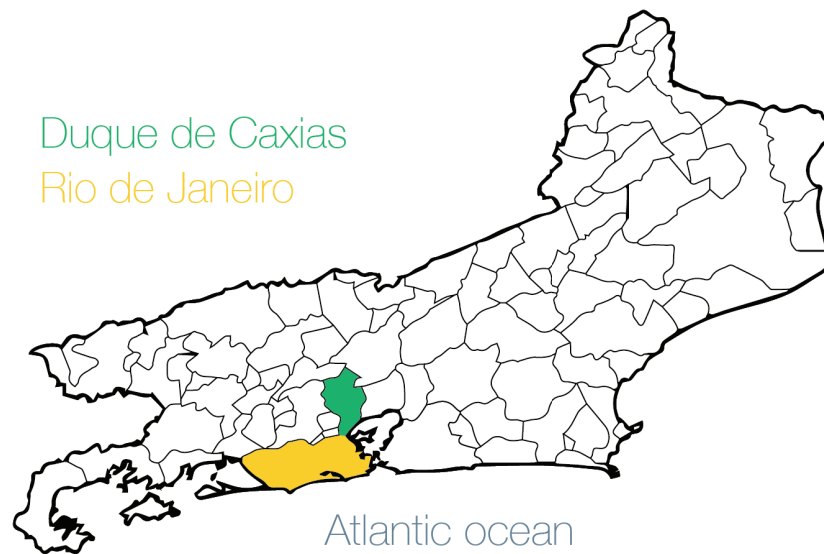
The now called Baixada Fluminense is the second most important region of the state and one of the most important micro-regions of the country. "

Modern Brazilian architecture in the centre of Duque de Caxias by Architect Oscar Niemeyer - The Theater functions for events like concerts and auditions. A public library in the front.

Location and history



Brazil has 26 states. The south-eastern region is Brazil's economical most vital region



The state of Rio de Janeiro with the Atlantic Ocean facing south.

Rio de Janeiro received its name by the first Portuguese explorers in 1500. They mistook it for the estuary of a mighty river and called it the “January River” – Rio de Janeiro. The stunning beauty of the bay has been suffering since urbanisation through heavy pollution.

Duque de Caxias population is estimated at 855,048 inhabitants. It's worth mentioning that, regardless of population density and the urbanization process, there're still numerous areas with rural aspects, lacking sanitation public services and basic infrastructure, such as electric power, street lighting and drinking water.

The limits of the municipality of 466,8 km² are defined by the Bay of Guanabara in the east, the city of Rio de Janeiro in the south and the mountain Range of the Atlantic Rainforest in the North. In the west the municipalities Nova Iguaçu and São João de Meriti that all make part of the Rios metropolitan area. “Baixada Fluminense” literally translated would be “low wetlands” with a significant hydrographical system of rivers coming from the mountains and flowing into the Bay of Guanabara, although the origin of the name has different approaches. One can find rural, industrial and dense urban areas in the entire municipality. The first district in which this study has been done is highly dense populated and suffers from urban heat islands with higher recorded temperatures than other areas.

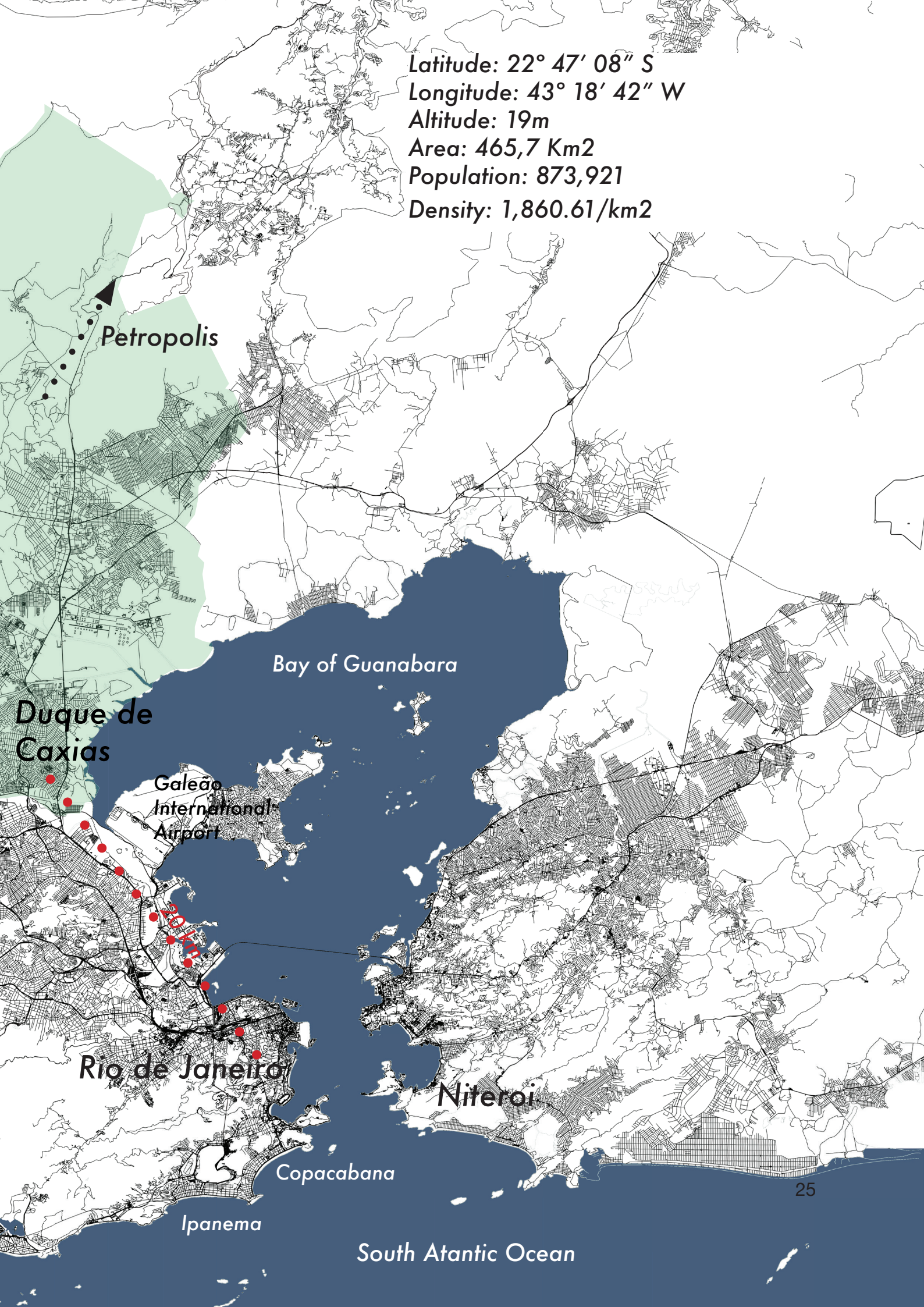


Municipality Duque de Caxias

This map shows the Municipality of Duque de Caxias, highlighted in light green, in the state of Rio de Janeiro. A dotted line with an arrow points from the city of São Paulo towards the municipality. The map also shows the coastline and the area of Barra da Tijuca at the bottom right.

Sao Paulo

Latitude: 22° 47' 08" S
Longitude: 43° 18' 42" W
Altitude: 19m
Area: 465,7 Km2
Population: 873,921
Density: 1,860.61/km2



Petropolis

Bay of Guanabara

Duque de Caxias

Galeão International Airport

Rio de Janeiro

Niteroi

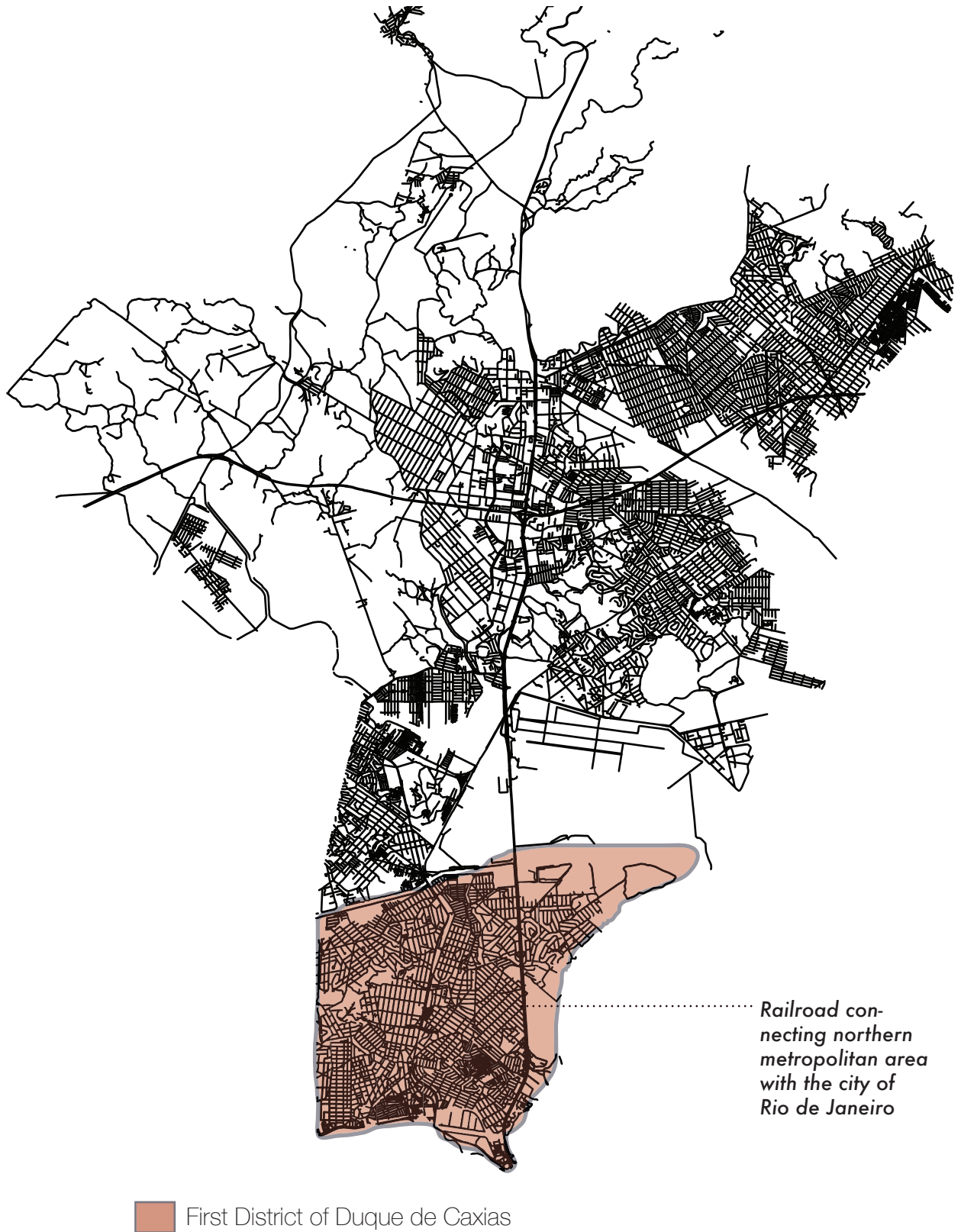
Copacabana

Ipanema

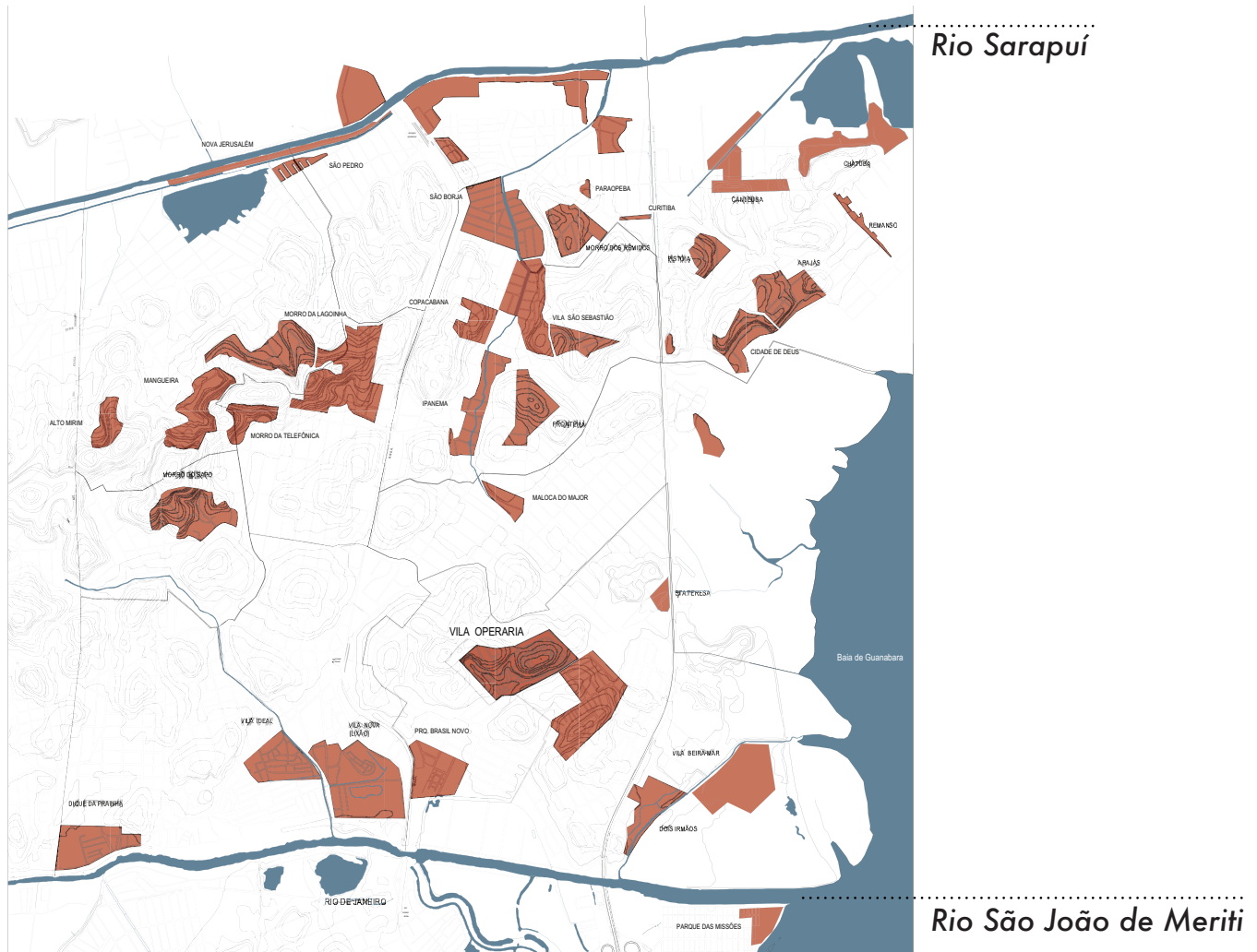
South Atlantic Ocean

25

Map of the Municipality of Duque de Caxias
and the first of four districts



Favelas of the first district in Duque de Caxias



The red shaded area represents the distribution of the Favelas in the first district in Duque de Caxias, state of Rio de Janeiro. The two limits of the first District are the main rivers, in the north Rio Sarapuí and south Rio São João de Meriti. The hydro-graphical system of creeks and rivers coming from the mountain ranges of the Atlantic rainforest is bringing urban pollution to the big bay and finally to the ocean. The Favelas are located mostly in areas of high risk where building was either too dangerous or too expensive. There are settlements in areas of flooding or at steep slopes where landslide can occur. There are exceptional cases, when the land was occupied before the urbanisation process started.

- Favelas
- Project side - Favela Vila Operaria



favela Vila Operária

The formal city separates the wealthier class from the informal grown settlements with prejudice. The lack of infrastructure has slowly been replaced. A school is not the same within a Favela or outside. The resources given by the government are little, urban poverty, environmental and infrastructural issues affect the schools. Teachers have to compensate for what should have been done years ago.





Morphology of the informal settlement

The layout of the Favela Vila Operária has dominant concentric rings and rays and was divided in terrains through the first occupants.



Approximate limite of the Favela Vila Operária





Project area
School
C.E. Vinicius de Moraes

Rua comercial
Commercial street

The topography is a “morro”, a hill. In the lower parts on the eastern site are the smaller and older plots and the beginning of occupation. Today this is the commercial centre. The second centre was developed around the school on the top of the hill. Through its steep topography bigger shops are situated in the lower parts, where access is easier.

The first school was the Escola Municipal Vila Operaria, former Escola João de Jesus, named after one of the first “moradores”, people of this place. He also founded the “Associação dos moradores” – and became the community leader.

In the seventies the school Escola Municipal Vinicius de Moraes was constructed as an elementary school on top of the “Morro” (hill) developed through the years to the central point of the Favela. Later it turned to a middle school and remained still the same size of building. There have been several small interventions until today, but always remained the same.

The rise of the Favela Vila Operária

With an estimated area of 467,62 km² and a population estimated at 882,729 inhabitants in 2015 (IBGE, 2016), the municipality Duque de Caxias, also the base of the country's biggest refinery of PETROBRAS, installed in 1961.

Apart from having vital economic potential, the social and historical importance has been observed through dates that register the first occupation of the region.

One of the examples is the Favela Vila Operária, located in the neighbourhood "Bairro" Parque Felicidade, that served as location for housing of workers coming from other states (mostly the north-east regions) in the search of a better life and work opportunity in the fifties.

Vila Operária, has in the historical context contradictory social and political conflicts, mainly with its history of origin. Various articles mention the uncertainty of the real owner of the region before the arrival of the first settlers, that until today characterize the location as an "initially abandoned place". (Ferreira, 2014)

Regarding to politics, based on oral reports of residents present in the article of Ferreira 2011, confirms the presence of the political party that supported the dictatorship-civil military, known as ARENA and in the opposition to this acted PCB and MDB.

Also according to Ferreira, in the social context, for not having decent infrastructure, residents organized task forces in which each person participated in a way in construction, using housing with masonry, wood, zinc or thatch and women generally took care of feeding groups and hygiene. Thus strengthening the ties of complicity and social identity.

This cooperative of new residents, allowed basic improvements in this small area to be realized.

This and the maintenance of the first school formerly known as Escola Municipal Itaperuna in 1959, today known as Escola Municipal Vila Operária worked with volunteer teachers before the possession of the Duque de Caxias City hall.

A origem da Favela Vila Operária

Com uma área correspondendo a 467,62 km² e população estimada em 882.729 habitantes em 2015 (Ibge,2016), o município de Duque de Caxias, também é a base da maior Refinaria do sistema Petrobras no Brasil. Instalada em 1961, ocupa uma área de 13milhoes/mt² e possui faturamento anual próximo a 13 bilhões de reais (Cmdc, 2013).

Além de apresentar potencial econômico, sua importância social e histórica é observada nos dados que registram a ocupação inicial da região. Um dos exemplos, é a comunidade Vila Operária, localizada no Bairro Parque Felicidade, que serviu de moradia para recém operários da década de 50 que vinham de outros Estados (principalmente nordeste) e cidades em busca de emprego.

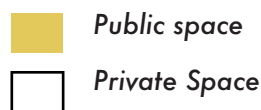
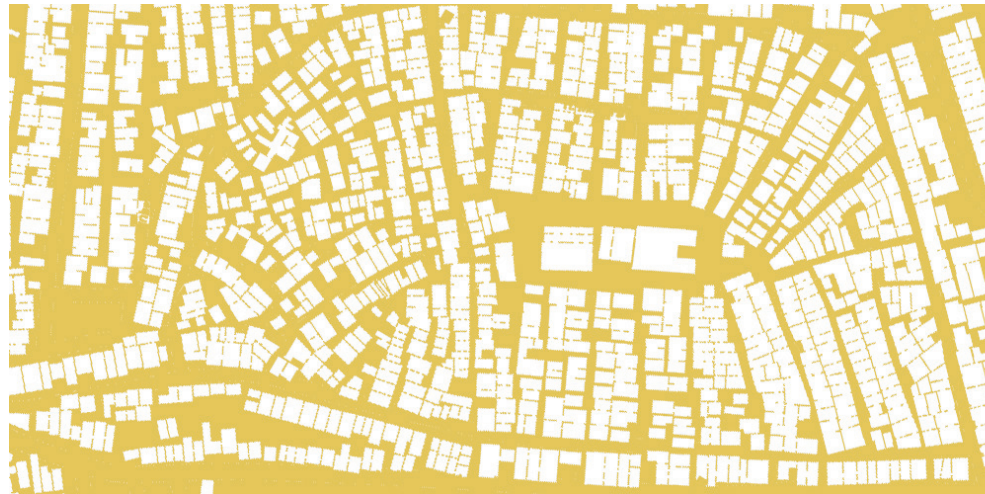
Vila Operária, apresenta em seu contexto histórico questões políticas e sociais bastante controversas, principalmente quando relacionada a sua origem. Vários artigos mencionam a incerteza sobre o verdadeiro dono da região antes da chegada dos primeiros moradores, que se questionados, até hoje a caracterizam como “local inicialmente abandonado”. (Ferreira,2014)

Quanto a política, com base em relatos orais de moradores presente no artigo de Ferreira,2011, confirma-se a presença do partido político que apoiava a Ditadura-Civil Militar, conhecido como ARENA, e em oposição a esta atuavam o PCB e MDB.

Ainda de acordo com Ferreira, no contexto social, por não apresentarem infraestrutura digna, os moradores organizavam mutirões, no qual cada pessoa participava de uma forma na construção, usando habitações com alvenaria, madeira, zinco ou sapê e as mulheres geralmente cuidavam da alimentação dos grupos e higiene. Fortalecendo assim os laços de cumplicidade e identidade social.

Este cooperativismo dos novos moradores, permitiu que melhorias básicas dessa pequena área fossem realizadas. Bem como a manutenção da primeira escola que anteriormente conhecida como Escola Municipal Itaperuna em 1959 e atualmente é conhecida como E. M Vila Operária, que funcionava com professoras voluntárias antes a posse da Prefeitura de Duque de Caxias.

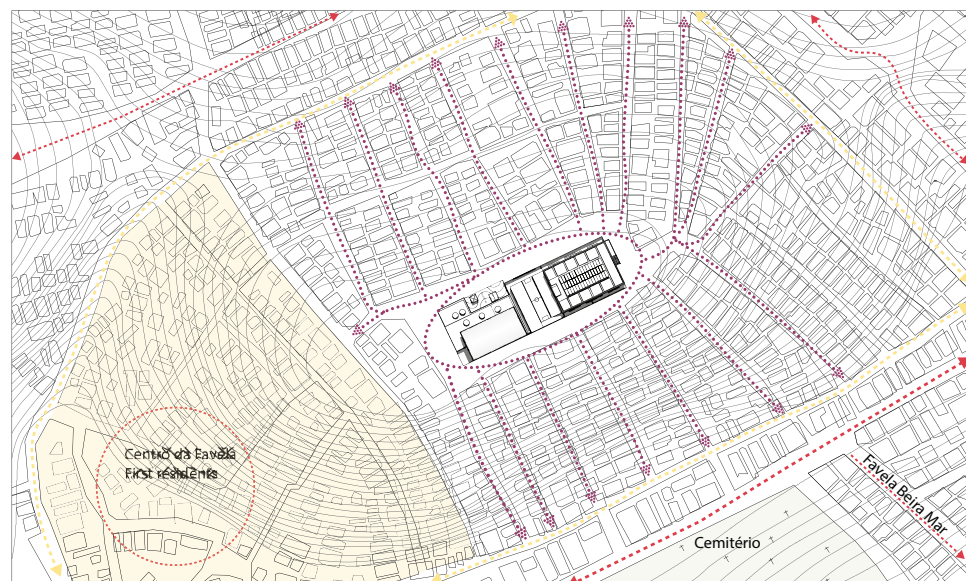
Public Space



Through the rapid urbanisation and informal growth, there is evidently a lack of public space within the Favela. Connecting community and school, offering shared spaces for multi-purpose uses can start reducing this lack.

An identification with the school within the community can serve as a protective mechanism and rise the value for all residents.

Next page: Two examples of public space within the community



The map shows the urban movement and mobility within the Favela. The school on top of the hill has developed to the social centre of the community. Weekly events are held like „Roda de Samba“. In the first centre are the regular Favela Baile Funky Parties.



Local building tradition



In a Brazilian informal settlement and in most parts of Brazil bricks and concrete are commonly used. these materials are used in residential and public construction as well. Studying the built structure of the buildings in Rio de Janeiro's Favelas we can identify repeating patterns, measurements and dimensions. Individual adaptation happens through limitation in space



and finance. Using these patterns creates an architectural language that is representative for informal settlements in Brazil. There are still parts remaining wooden shacks. Apart from these common materials alternative materials are rarely used, either it is not affordable or simply not available. The timber industry is developing in the southern part of the country, Bio-climatic construction of earth and bamboo have tradition in the rural areas. ***The accessibility determines the use of construction material.***

Reclaimed materials are parts like windows, doors, steal beams and corrugated sheets. Apart from the environmental issues that can occur in

informal settlements, there is a housing problem. Some houses are constructed in areas that risk landslides. Potentially it is common to use material of less quality and construct through experience rather than engineered calculation.



A frame construction of reinforced concrete with a corrugated sheet roof.

Vertically perforated bricks do the bracing and non-supportive walls.

They are low priced materials and almost available everywhere.

The slabs are made with semi finished carriers with bricks as infill and concrete finishing.

The blue water tanks on the roof have a volume of 1000 liters and provide one household with water. The public water supply is undependable.

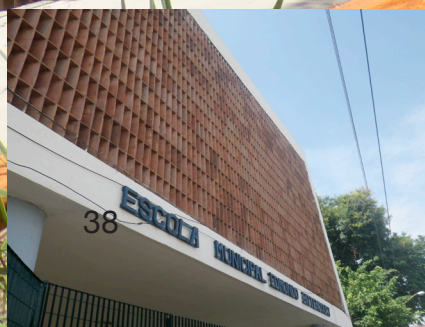
The measurement of the beams and posts are done by experience and the form-work board measurements that exist. A common house that can adapt up to 5 or more stories the posts and beams have a dimension of 10x30 cm. This can vary individually.

There are still houses being built without a frame-work, using only bricks, which interlock at the corner of the building.

The examples on the right show some traditional Favela construction found in the Community-



Reading Pedregulho

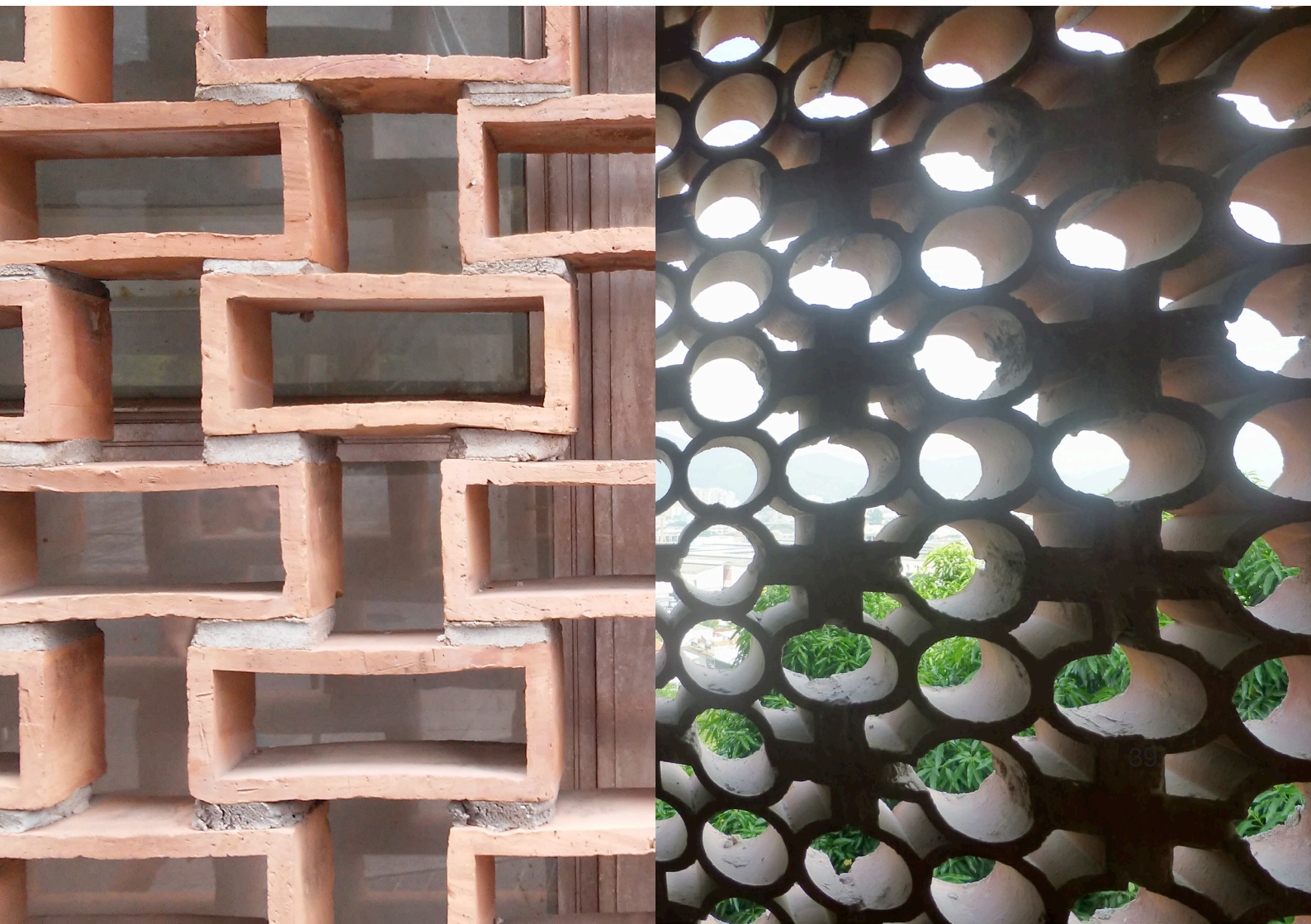


The housing project, **Conjunto Residencial Prefeito Mendes de Moraes (Pedregulho)** was designed in 1947 by Brazilian Architect and modernist Affonso Eduardo Reidy. It was designed with the idea of natural ventilation and illumination. The influence of Architect Le Corbusier by that time in Brazilian modernism was powerful.

The patterns of modernism in construction one can find in Favela construction.

The Cobogó, an element mostly made from cement or ceramic, which is used for improvements of ventilation and natural illumination. It was designed for the tropical climate.

Nowadays it is an established element in traditional Brazilian architecture and can be found in residential, commercial and industrial buildings.

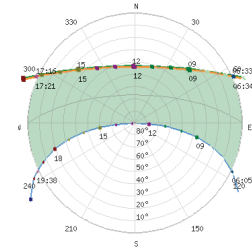


Climate

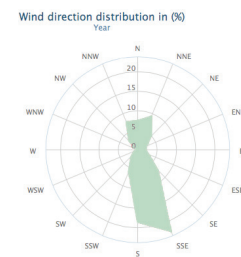
Warm and humid climate



Sun path diagram



Predominate wind direction



Every climate region is asking for its specific climate adaptive architecture

The city of Duque de Caxias lies in the Tropical zone. It has a tropical warm and humid climate with a significant difference between winter and summer month, shown in the sunpath diagram. Heavy rainfall can occur during the summer from December until March and less during winter from June to September. Seasonal flooding in summer and temperature drops is common during the year.

The climate and urban pollution favour the increase of tropical diseases like Dengue, Zika or Chikungunya that is transmitted through mosquitoes breeding in still standing water.

Environmental issues

Environmental education today is fundamental in schools. A conscious appreciation for the drawback of environmental pollution and the problems caused by this to our ecosystem, society and quality of life, should be taught in schools for the creation of a reasonable citizen. People living in the Community are mostly aware of the consequences that pollution can bring to their life and quality within their neighbourhood. Through the improvements that have been done during the years in the community, quality of life has significantly increased. The process of legalisation of residence and ownership has helped a lot, that has been uncertain for many years. Authority could show up at any time to expulse them from their plot. Little investment in steady goods resulted from these uncertainty.



Part I

**Between school & community,
how do you live?**





Growing vertical through urban density -
Built environment serves as playground where the permanent lack of
infrastructure is present.



Access to houses is mostly difficult through barriers and stairs



Weekly informal market in the lower part of the Favela



Transformation of a house to a shop



Stairways lead through a corridor between the houses.



This house sells construction materials and ice-cream.



Protest banner calls attention to corrupt politicians and the recently held World Cup 2014 in Rio de Janeiro.



The way down the steep slope from the school Vinicius de Moraes.
In the back lies the Cemetery, the boundry to Favela Beira Mar.



Supermarket on top of the hill, selling gas and food.



Family performing for photo.



Concrete stairs as improvements in the Favelas infrastructure.



PAGODÃO do J
EM FRENTE AO UPA - T
DJ PATRICK
PIPI dos TECL



The entrance to the Favela "Lixao". The drug-gangs rule this area and control the entrance by using improvised barriers. Only residents or clients are allowed to enter.



Mulher



Homem



Garbage collecting point behind the school Vinicius de Moraes



The public “Quadra”, court is lying in the middle of the community, right behind the school Vinicius de Moraes.



"Soltando pipa" - Flying kites is the most common spare-time activity of young kids.



This house is a kite manufacture.



Students from the school Vinicius de Moraes having no class because of the ongoing strike.



Students' parliament elections in the Vinicius de Moraes school.





Part II

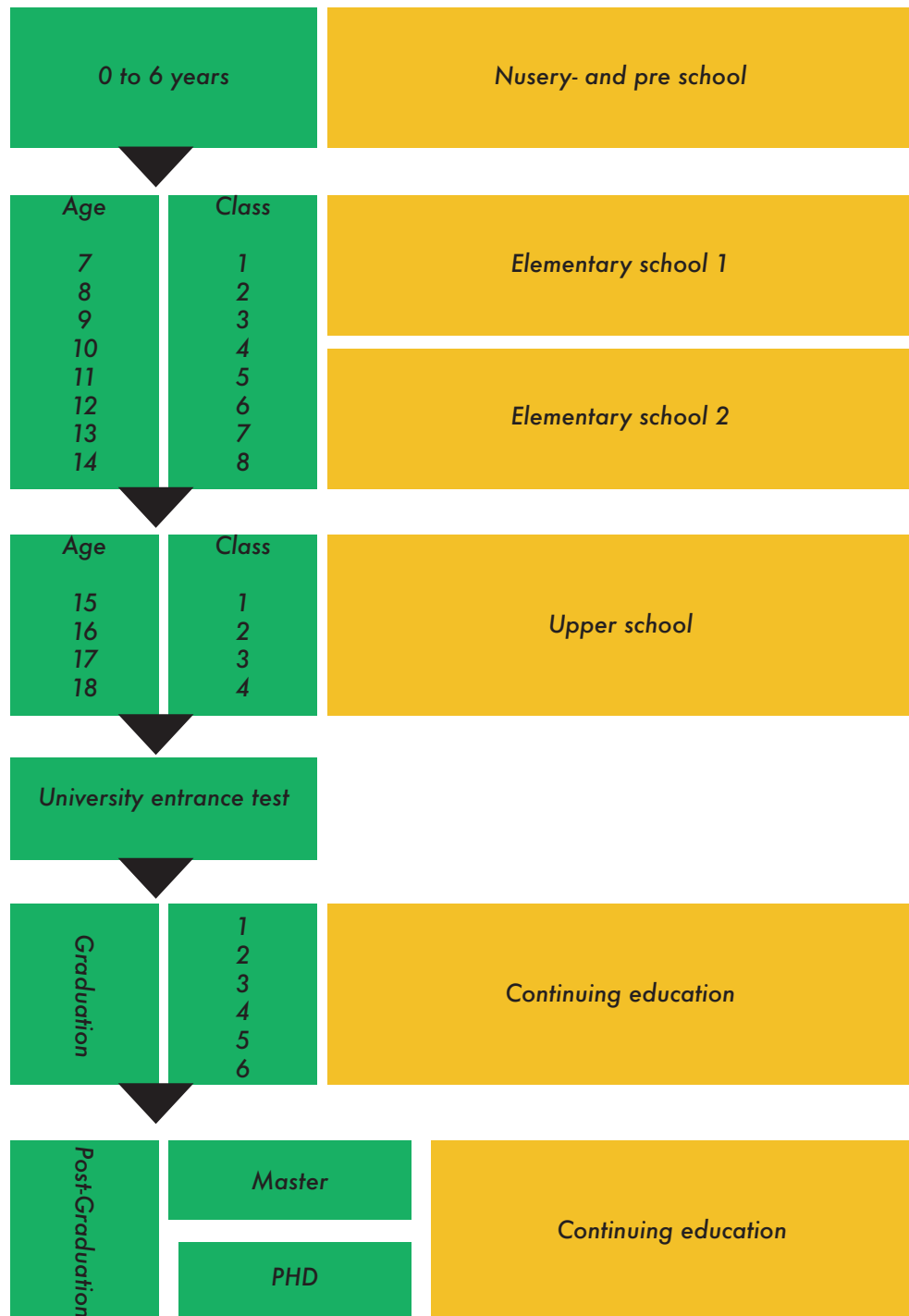
School design in Duque de Caxias a brief guide through 3 Brazilian schools



Brazilian School System

Students who visited a public school have little chances to pass the University entrance test, because preparation in public schools is so low that only a few students every year pass the “vestibular”.

The result is that they need to pay, if possible, to go to a private University. Students who come from a wealthier family and can afford to send their children to a private school make up the majority of those who enter in the best public Universities of the country.



Which strategy has been applied in the school design process ? And which results can we measure ? Interviews with locals, politicians, students and teachers brought up ideas and experience and they were integrated in the design process.

Six schools were visited in total. Interviews were conducted partly guideline-based and partly with standardised questionnaires. With the interviewees' consent, the guideline-based interviews were documented using a camera.



The map shows the location of the four schools that will be presented in this chapter marked in green:

Schools that were visited during field research of the first district

- E.M. Vila Operária **1**
- C.E. Vinicius de Moraes **2**
- CIEP Brizolão 098 - Profa Hilda Carmo Siqueira **3**
- C.E. Herbert Moses
- Inst. De Educ. Gov. Roberto Silveira
- C.E. Miguel Couto

Como a pobreza urbana afeta a escola?

Muitas vezes preocupados influenciar positivamente a vida do aluno (seja mostrando os caminhos que o conhecimento podem levar, tanto profissionalmente como na formação de um cidadão crítico e participativo na sociedade), muitos educadores deixam em segundo plano o fator de que a vida do aluno fora da sala de aula, pode afetar seu aprendizado, seja positivamente como negativamente.

No entanto, observa-se o crescimento da preocupação de educadores sobre tais impactos da vida do aluno em seu desempenho escolar. Um exemplo disso, foi a pesquisa realizada em 2009 pela Unifesp com apoio do INEP(Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira), IDEB (Índice de Desenvolvimento da Educação Básica) e também do CEDEC (Centro de Estudos de Cultura Contemporânea), cujo objetivo foi analisar o impacto da pobreza em alunos do ensino fundamental e médio de todos os municípios brasileiros.

O resultado dessa análise constatou que a pobreza afeta negativamente principalmente alunos matriculados em redes municipais (que se enquadra o ensino básico e fundamental 1) em determinadas regiões do Brasil, como por exemplo o nordeste cuja população ainda sofre bastante com a pobreza e falta de recursos.

“Uma criança que não tem acesso a jornais e livros em sua casa, que tem poucas oportunidades de usufruir de atividades culturais e cujos pais não concluíram o ensino fundamental terá necessariamente um desempenho escolar inferior ao de outras crianças que vivem em um contexto social mais favorável”, observa a pesquisadora.

E como a pobreza pode influenciar? Falta de estímulo do estudante diante dos problemas enfrentados pela família (Desemprego, fome, ausência de atividades culturais, trabalho infantil), condições graves de pobreza, famílias desestruturadas, problemas de saúde e em ambientes de violência, podemos citar também dificuldade de transporte, onde muitas vezes o aluno enfrenta problemas para conseguir chegar na escola.

How does urban poverty affect school ?

Concerned persons often positively influence the lives of the student, by showing the ways that knowledge can lead, both professionally and in the formation of a critical and participatory citizen in society.

Many educators leave in the background the factor that the student's life outside the classroom can affect their learning, either positively or negatively.

However, there is growing concern from educators about such impacts of student life in their school performance. One example is the survey conducted in 2009 by Unifesp with support from INEP (National Institute of Educational Studies Teixeira), IDEB (Education Development Index Basic) and also the CEDEC (Contemporary Culture Studies Centre) whose objective was to analyse the impact of poverty on middle and high school students from all Brazilian municipalities.

The result of this analysis was that poverty negatively affects mainly students enrolled in municipal networks (which fits the primary and fundamental 1) in certain regions of Brazil, such as the Northeast whose population still suffers a lot from poverty and lack of resources.

"A child who does not have access to newspapers and books in their home, which has few opportunities to enjoy cultural activities and whose parents have not completed primary education necessarily have a school performance lower than other children living in a more favourable social context", notes the researcher.

And which effects can poverty have? Lack of student stimulation on the problems faced by the family

(Unemployment, hunger, lack of cultural activities, child labour), serious conditions of poverty, broken families, health problems and violent environments, we can also mention transportation difficulties, often where the student faces problems trying just to get to school.

School 1

Escola Municipal Vila Operaria

Ensino fundamental / Primary school

8 turmas / 8 classes

210 alunos / 210 students

16 funcionarios / 16 employees

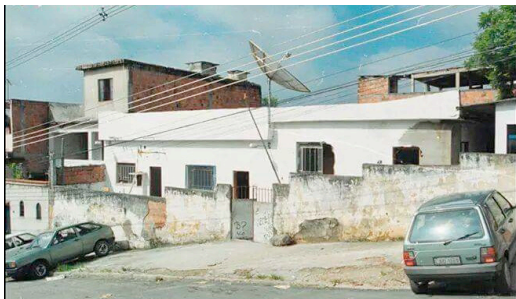
Comunidade / community: Vila Operária

Endereço

Rua Badger da Silveira, 9
Vila Operária
Duque de Caxias - RJ
CEP: 25080-520

The school Escola Municipal Vila Operária was the first school in the community. It serves only as a primary school. Most students from the neighbourhood begin their students life here and study until the age of ten years. After they move for the next level to the Vinicius de Moraes school to the top of the hill. The entire school until the university entrance test can be done within the community.

The school has a big shortage of space and also needs to extended. There is no green space in the school and no possibility to do activities outside of the class-room. It has one storey, there have been plans for extensions, but the execution stopped due to a lack of financial resources.



The school just after the opening



After the first renovation

The school today



Entrance area - teachers welcome students for class



Classroom



Internal patio

School 2

Colegio estadual Vinicius de Moraes

Ensino Fundamental/ Elementary school
Ensino Médio / Middle school

12 turmas / 12 classes

498 alunos / 498 students

61 Funcionários / 61 employees

Comunidade / community: Vila Operaria

Endereço

Prc Paulo Biar, 0
Vila Operaria
Duque de Caxias - RJ
CEP: 25080-420

Como seria a escola dos seus sonhos?

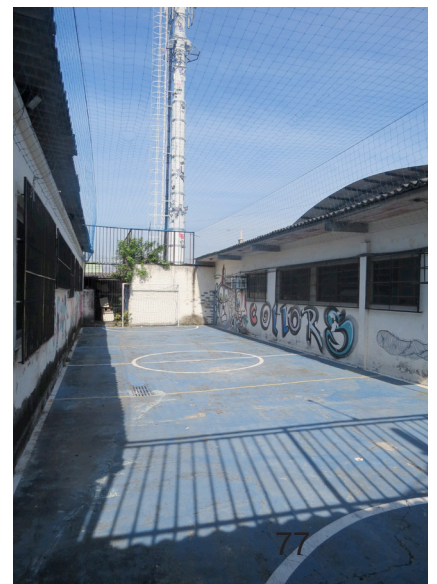
Armários nos corredores
Mais alimento
Reformada/com laboratórios/aulas
Salas recreativas, biblioteca com acesso livre
Tempo integral
Cadeiras confortáveis, ar condicionado, boa iluminação
Futebol feminino incluído
tempo integral / horários diferentes e
Atividades extracurriculares
Com mais interação e projetos
Como nos filmes com dormitórios
Com quadros digitais mais tecnologias igual a dos EUA
Jardinagem/ dança
Armários individuais para alunos
Tipo as escolas de filme
Com área verde, laboratórios
Biblioteca maior com muitos livros
com teto solar, artesanato e culturas
Wifi e com mais ar condicionados
Extracurriculares e capoeira
Com teto solar, sala de informática com
Todos os Pcs funcionando

How would be the school of your dreams?

Lockers on the corridor
More food
Reformed, with laboratories
Room to relax, library with free access
Full-time school
Comfortable chairs, air condition, good lighting
Female football as well
Full-time school, different schedules
Extra-activities
With more interaction and projects
Like in the movies with dormitories
With digital tablets and more technology like in the U.S.A.
Gardening and dancing class
Individual lockers for the students
Like the schools in the movies
With green space, laboratories
Library with plenty of books
With a solar roof, hand-crafting and culture
Wifi and with more air conditions
Extra classes and Capoeira
With a solar roof, Computer classroom with all working



Elections of student parliament



Students

O que você acha que falta na sua escola?

Responsabilidade
Professores, espaço
Atividades extraclasse/ laboratórios
Laboratórios/sala de informática/pintura
Nova/atividades diferentes
Aulas melhores e ambiente melhor
Aulas melhores de educação física(esportes)
Uma quadra
Mais salas

Como deveria ser a aparência da sua escola?

Com tema do vasco
Sem pixação
Mudando teto, piso,janelas.. aparência
Aconchegante
Mais viva, reformado e com mais salas
A aparecia devia ser de acordo com a idade dos alunos
Bonita e funcional/que estimule o aprendizado
Mais colorida e com áreas verdes
Mais colorida
Mais organizada e com boa pintura
Mais area verde e mais cuidado
Com flores na entrada, boa aparencia
Paredes bem pintadas, salas reformadas
Modernizar a aparencia da escola
Bonita e mais visivel,com coisas reciclaveis
A escola deveria ser maior matematica

What do you think is missing in your school?

Responsibility
Teachers and space
Additional activities, science laboratories
Laboratories, Computer-class, painting
New, different activities
Better subjects and an better environment
Better sports-class
A sports-field
More classrooms

How should your school look like?

In the style of "Vasco" football team
Without Graffiti
Change the ceiling and floor, windows, appearance
Super nice
More alive, reformed and with more classrooms
The appearance should suit to the age of the students
Beautiful and functional
Colourful and with more green space
More colourful
More organized and with beautiful paintings
More green space and more looked after
With flowers at the entrance, beautiful look
Walls nicely painted, reformed classrooms
Modern the look of the school
Beautiful and more visible, with recycled things
The school should be bigger and have more mathematics



The best in our school are our teachers.

School 4

Centro Integrado de Educação Pública

CIEP - Centros Integrados de Educação Pública (Escola Pública Estadual)

Ensino Fundamental / Elementary school
Ensino Médio / Middle school

20 salas de aulas / 20 classrooms
128 funcionários / 128 employees

Endereço

Estrada Sao Vicente, 3
Vila Guanabara
Duque de Caxias - RJ
CEP: 25086-030

Comunidade / community: Vila Beira mar

The CIEP schools were designed by the Architect Oscar Niemeyer. The initial idea was to build schools close to the Favelas that offer an integral concept with plenty of space. The modular construction of prefabricated concrete elements was fast in construction but could not adapt to its surrounding or topography.



The internal walls are kept low for ventilation and an open school concept.



The classroom with internal sun shading elements

Como os problemas ambientais das comunidades afetam escola?

How does environmental issues affect school?

Os mais incômodos neste CIEP estão relacionados a poluição, sonora, os alagamentos e o calor associado a falta de vegetação.

(Professor da escola)

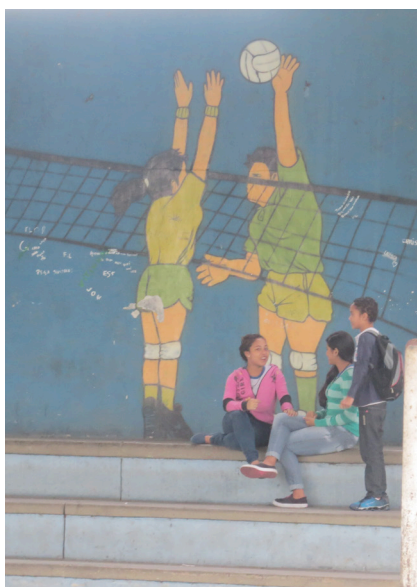
Most uncomfortable here are the things related to pollution, noise and waterloggings and the present heat because of the missing vegetation. (Teacher of the school)

Existem rituais tradicionais na escola brasileira, quais são?

Do you have traditional rituals in a Brazilian school?

A colação de grau e algumas festas comemorativas como a festa junina.

The graduation and some events like the Junina fest.



The refectory is located in the ground floor open for cross ventilation

Part III

Community oriented school extension



Inclusion and integration

Living in a Favela sometimes means to be confronted with prejudices and environmental problems. Social injustice is widely spread.

Through informal growth, public space for adequate cultural events or educational purposes rarely exist.

In this case the local school can be seen as a multi-purpose object that could, if designed with social sense, contribute many lacking facilities to its community. Because of security problems most of the time schools are more closed to its exterior and built like castles with a high wall around. This should prevent external hazards and students escaping from class. So we could ask what is responsible for students wanting to escape from school? The built environment and lacking facilities in programme and use are disturbing a productive learning environment.

Inclusion of school in the community is creating a physical connection with its environment and citizens. As important as it is to develop the curriculum, it is equally important still to design a fix and central, steady point for the residents.



These observations lead us to the following points that will be considered during the design process:

- The school should be connected with the community and offer a programme for education and cultural facilities.
- Public use is wished to be included. A school can be for everyone and work as well as a community centre.
- Joining generations and bringing them together can be realised with regular events throughout the year.
- School has to be seen in social context and patterns, always considering circumstances.
- Cultural identity and variety is unique at every place. And can be seen as an engine to build the link between school and community.

It can bring generations together instead of separating them, life long learning.

(Henry Morris, 1920)





Community projects are nowadays financed by the government. The public "Quadra" (court) is reformed with the help of local craftsmen that live in the Favela.

Participation



The need of a participatory process in architectural projects is evident. Participation and decision-making gives the power to the people. In a design process of a school should be considered that planners and architects do not know the needs of the user exactly and the cultural dimension between school and community. In the community it is common to participate in construction and improvements done in their neighbourhood.

The "Associação de moradores" is the institution that does local politics related to their neighbourhood. There are held weekly reunions and every resident can participate.



Favela Project nursery school

The nursery school is receiving an extension. Where now the kids play was a public square before. Residents participate during the construction process.

It is a governmental financed project and approved by the residents' association.



These observations leading us to the following points that will be considered during the design process:

- The advantages of participative working brings acceptance to the concept.
- Participation of students and young people involved in the design process from the early beginning.
- Developing design criteria and strategies together with local residents.
- The creation of identity through individual design and appearance of the school, can be seen as a participatory process where design tries to adapt to its surrounding and respects the wishes of the users.
- Co-working on construction and execution
- Learning through building and participation

Conclusion:

Architectural constraints

As a result of the previous analysis, various important aspects can be seen as constraints for the architectural design of the school's extension. These constraints will be discussed below.

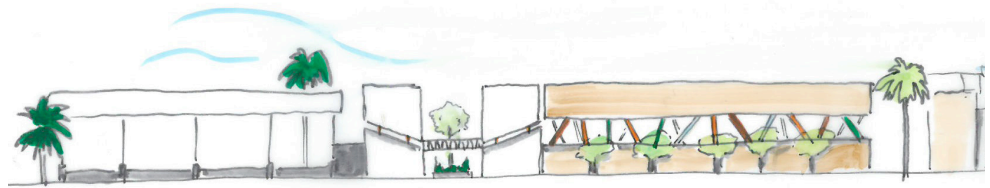
The school's history shows how important it is to leave room for adjustments to future developments which cannot be anticipated in the present. As a consequence, floor plans have to be as flexible as possible. At the moment the learning environment in the school is affected negatively by noise and a lack of spatial capacities, as different interviewees mentioned. Any built intervention has to address this as a main goal. To contribute to a productive atmosphere, the school has to be a secure space for the pupils. One more detailed aspect which addresses the latter issue, is to improve the accessibility of the existing multifunctional court. It has not yet been used by the school, since it does not have a direct link. To make it a shared space bears the potential to strengthen the relation between the school and the residents in the neighbourhood. In order to stimulate the students' curiosity for sustainable issues, the rooftop should be used – for a rooftop garden and solar panels to generate energy.

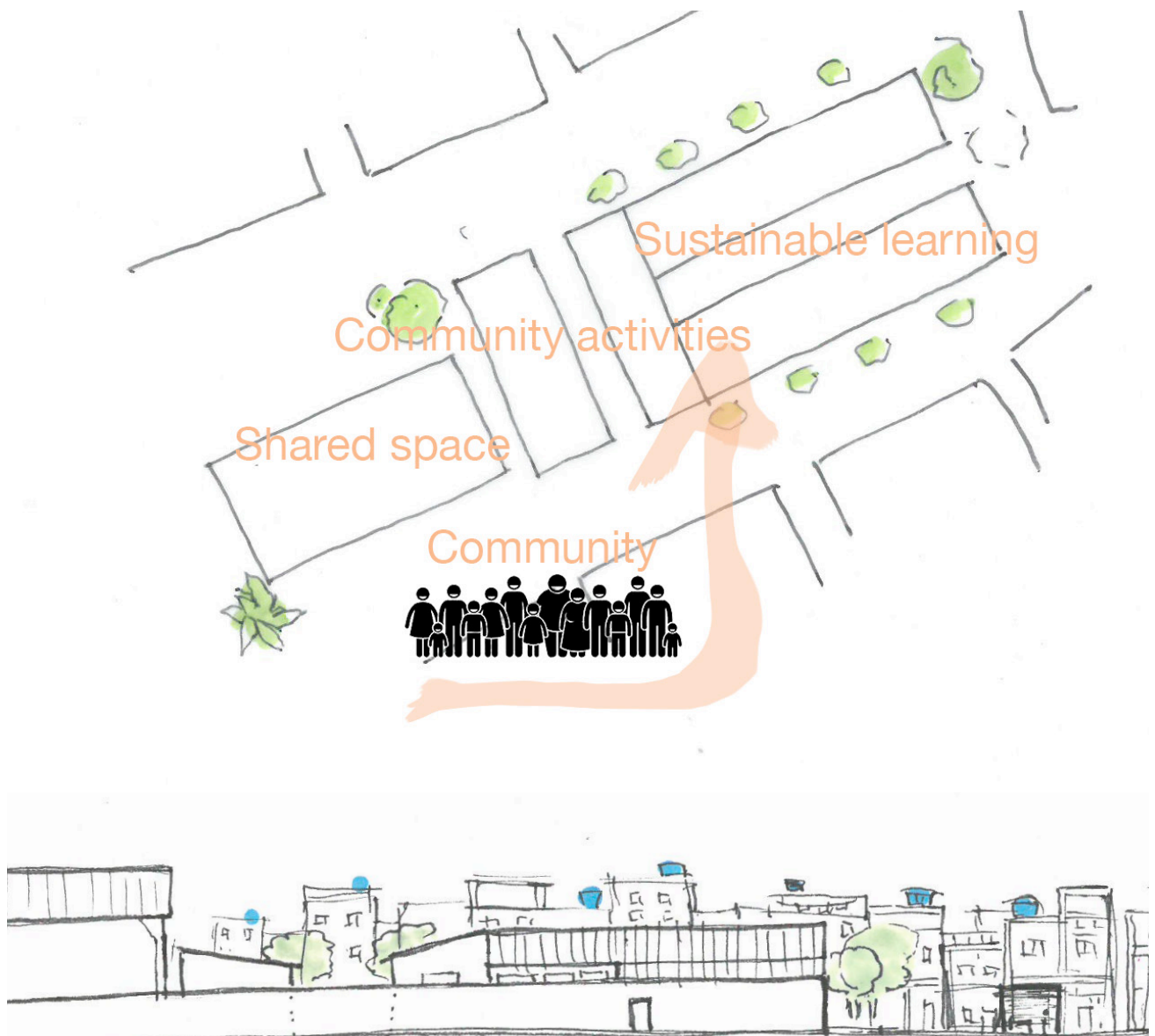
To address the demanding climate in a resource-efficient way, the design of the extension has to consider the natural ventilation and the sun path in order to create a comfortable climate indoors. To reduce the ecological footprint of the additional construction, recycled and reclaimed materials have to be used. In this case: recycled concrete and bricks as well as reclaimed doors and windows. This goal is in line with the ambition to follow the local building tradition to accomplish acceptance for the built interventions.

This ambition is related to the public space around the school, whose central character has to be respected. Therefore, existing activities have to be strengthened (e.g. Capoeira) whilst additional ones have to be enabled. One opportunity which could be identified in this context is to give credit to the dynamic street art culture by providing the east façade of the school as “canvases” for their art, another could be an architectural gesture like an auditorium for musicians who perform in the public space.

Part IV

Architectural proposal and strategy for school improvement and renewal





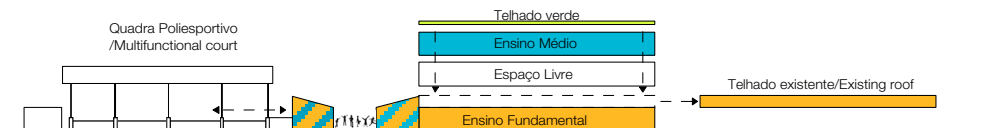
The Vinicius de Moraes School

App. size of existing school: 607m²

The pictogram below shows the extension idea of the existing school. The wooden roof will be taken off and the new frame structure of recycled concrete will be added, creating two more levels. The free space offers shared space function and community activities.

The top level holds the older students of the secondary school.

The steps of intimacy by Christopher Alexander has led through the sensitive design process of composing the social order of space within the school.

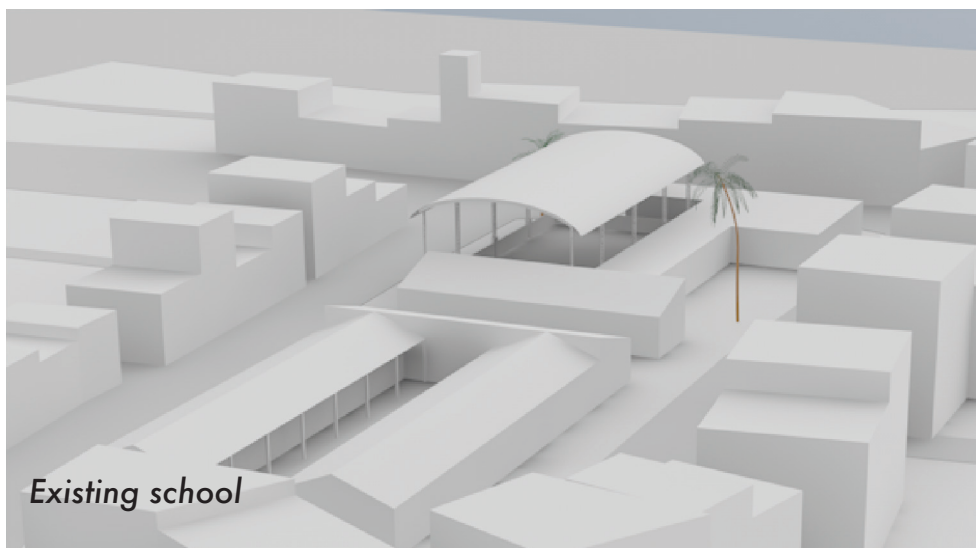
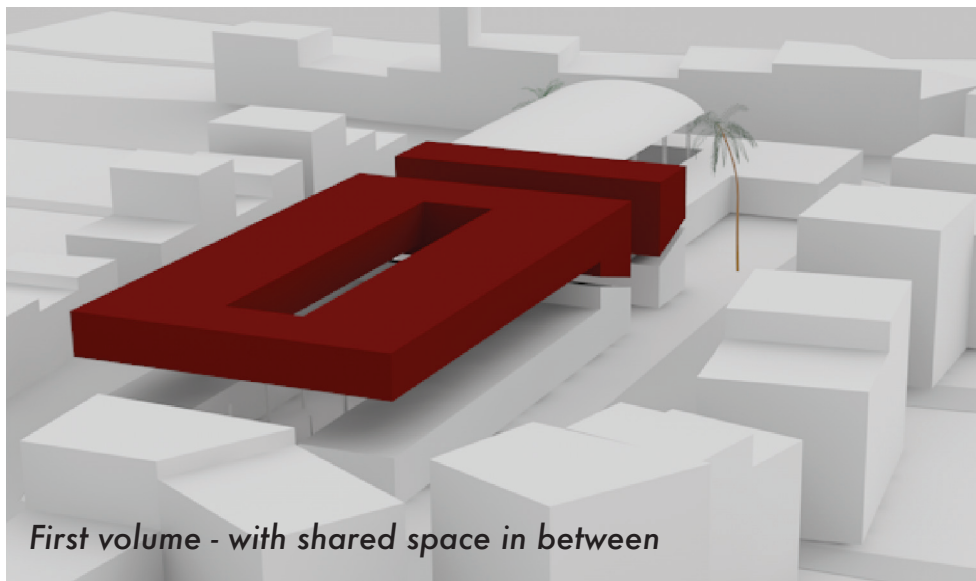


The principal idea to connect and integrate the new school building within the community is the so called „Espaço Livre“.

The free space storey is a link between the inside and the outside.

Through informal growth the land was mainly used as housing space.

The lack of public space can be reduced by adding a shared space in the new concept of that school.





Sustainability concept

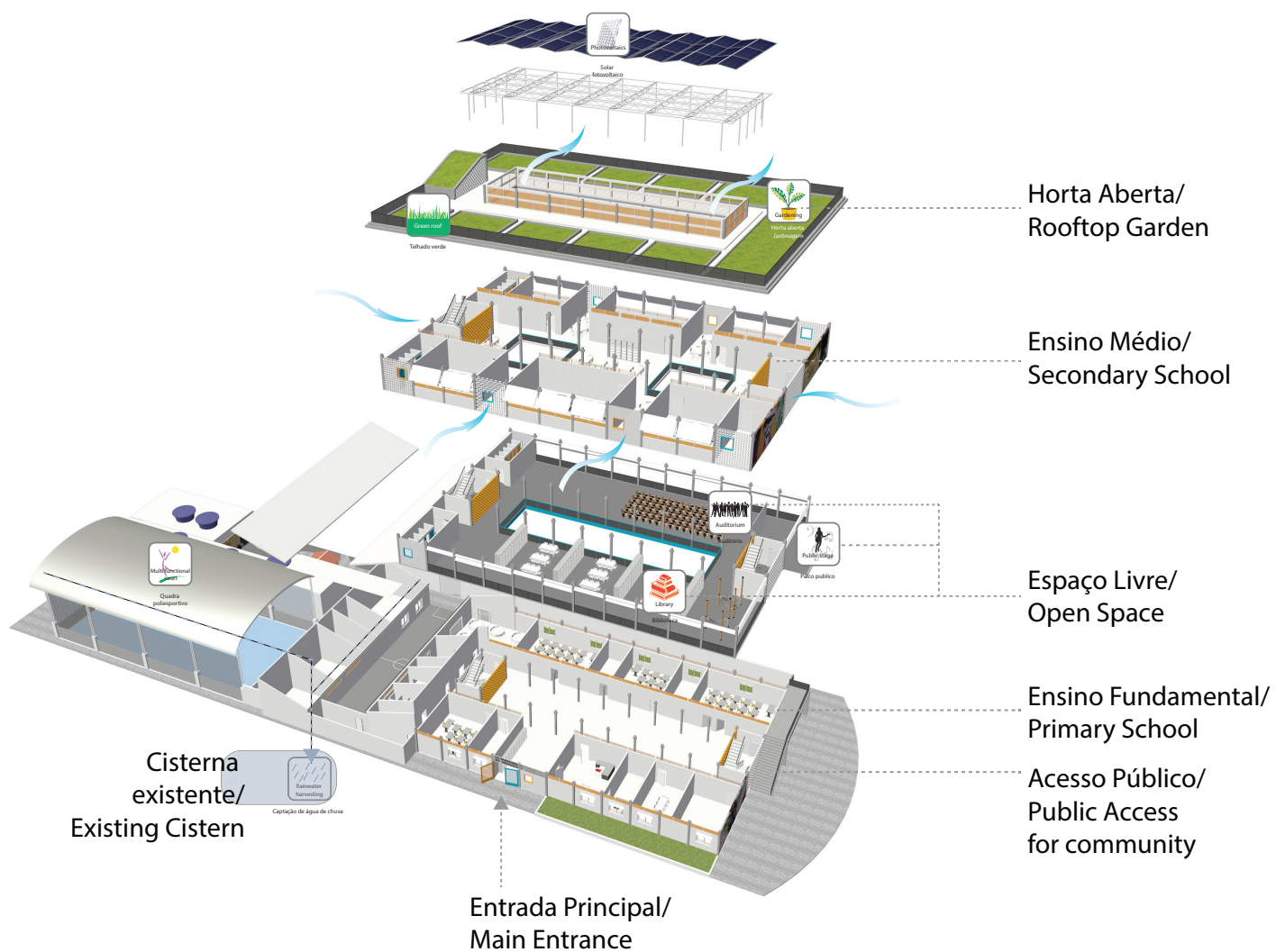
- **Free space** for continuing ventilation and open shaded space
- **Natural ventilation** openings with bamboo lamellas for each class room to both sides, improving cross ventilation.
- **Rainwater harvesting** through green roof capture-system and additional gutters at the sports court. The water gets directly led into the existing cistern that used to be filled before with water from the street. To guarantee a reasonable water quality, it will be used a Brazilian water filter system.
- **Green roof** as shared space for urban school gardening for the production of food and educational purpose.
The green roof also reduces internal heat gain.
- **Cobogó**, is a perforated traditional building element in the tropics and allows in a cross ventilation through the building. It is a Brazilian made brick that was inspired by the Arabic architecture. The free working space between the classrooms benefits of this ventilation.
- **Natural lighting** improvements through translucent photovoltaic elements covering the internal patio as well as the flippable window panels that allow indirect sunlight to enter but let the direct sunlight outside.
- **Photovoltaic Panels** supply the school with energy and excessive energy can provide the community.

Through optimal building orientation to predominant wind direction and sun path, the school maximise the natural use of recourse.



The Intelligent school

- Climate responsive architecture in planning and construction
- Affordable construction from local building materials
- Independent supply of energy and water (photovoltaic and rain water harvesting)
- Use of vegetation for natural shadings and for the production of food, like vegetables. Sustainable- and productive landscaping (*Paisagismo sustentável e produtivo*)
- Environmental education for the students (*Educação Ambiental*)
- Incorporating local culture
- Waste- and sewage water management



Cultural benefits

The school can interact with the community by providing a stage for cultural events to the east side of the community. Weekly events like Sambas take place here.





Telhado verde



Solar
fotovoltaico



Captação de água



Biblioteca



Pixação



Capoeira



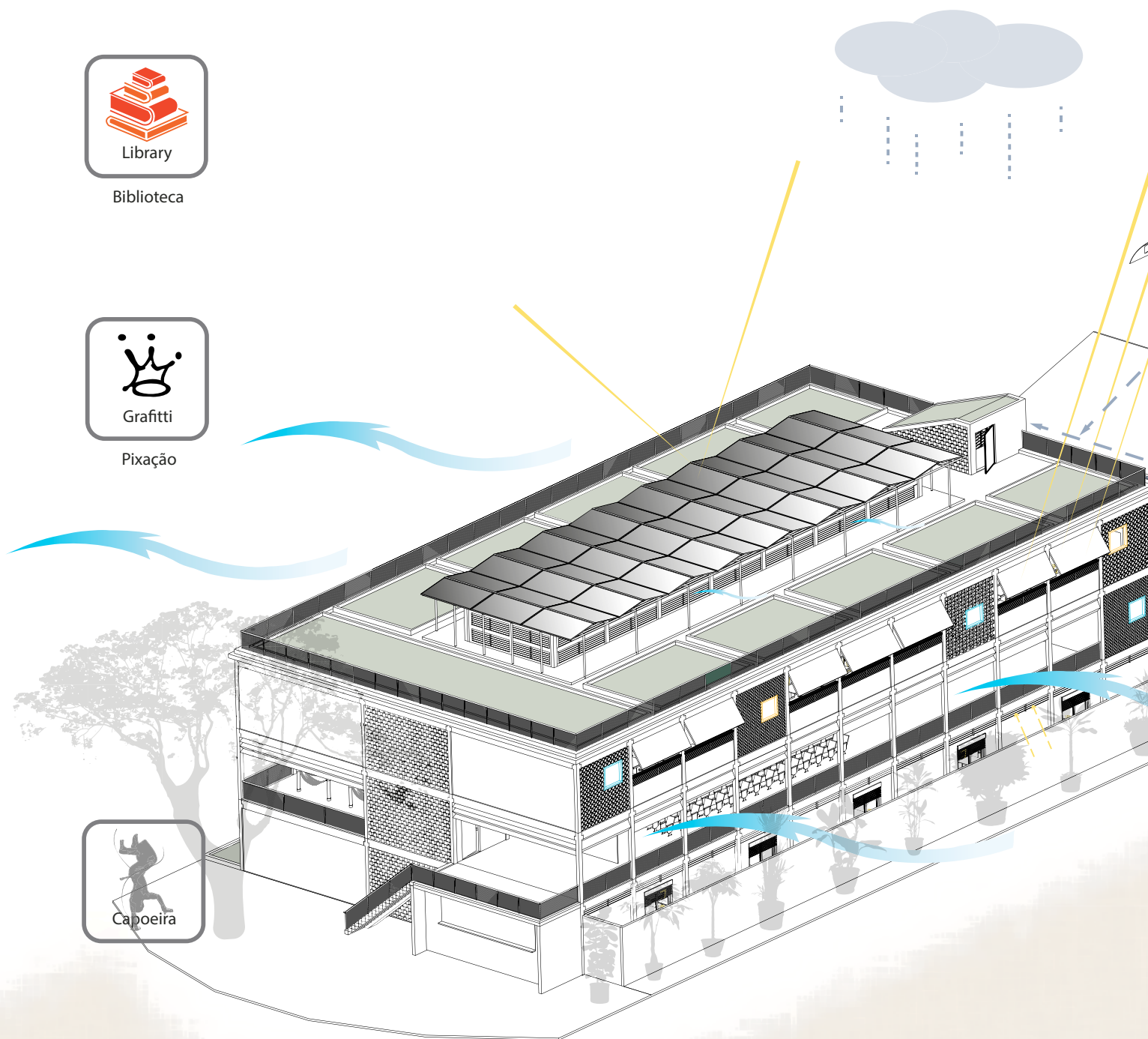
Horta aberta
Jardinagem



Palco publico



Plantas nat





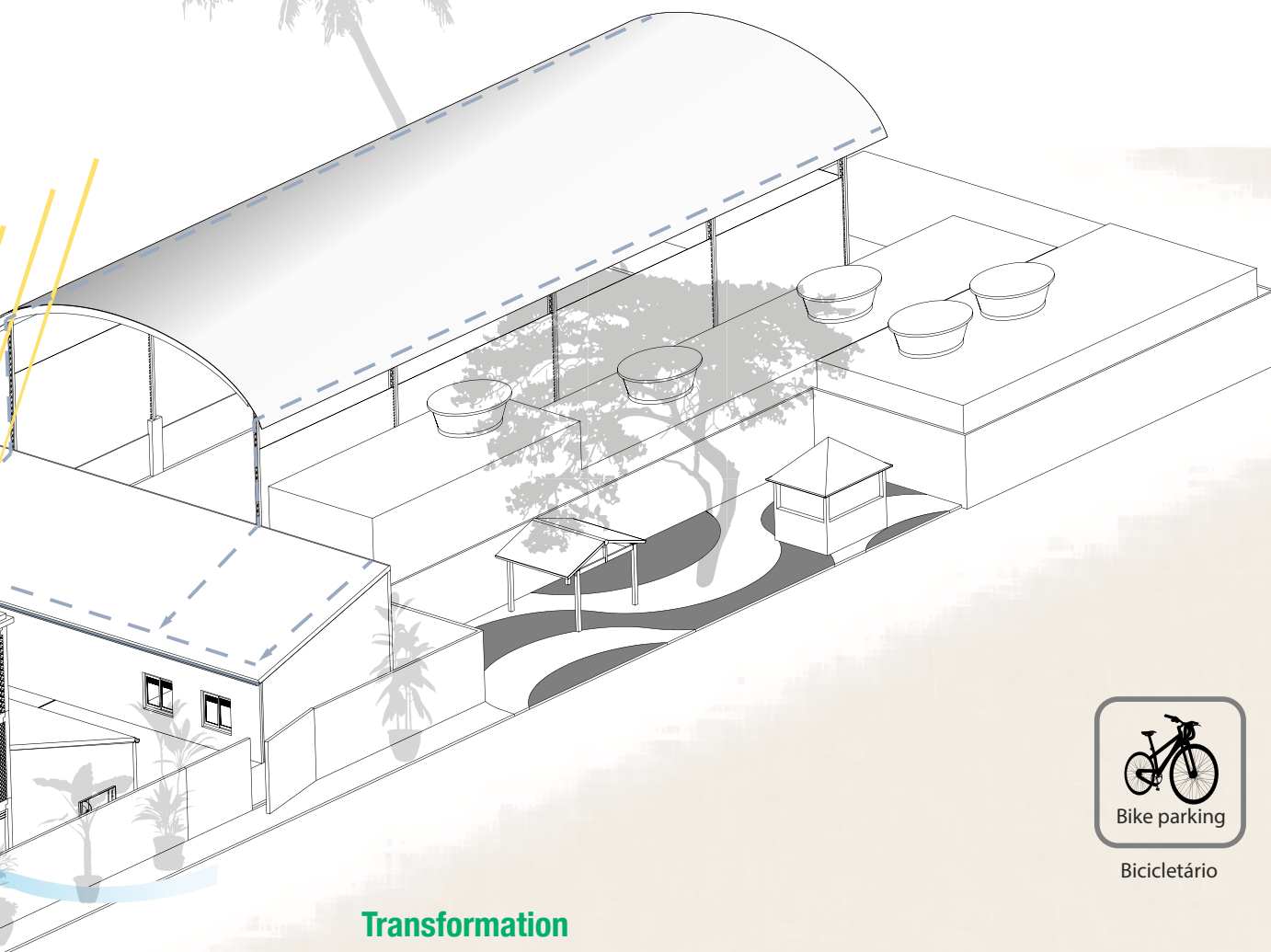
er
ng
a de chuva



Sun shading
Sombreamento



Multifunctional
court
Quadra
poliesportivo



Transformation

This concept scheme shows the school after the transformation. The icons show the benefits the building will have and provide to the community.



Bike parking
Bicicletário



Auditorium
Auditório

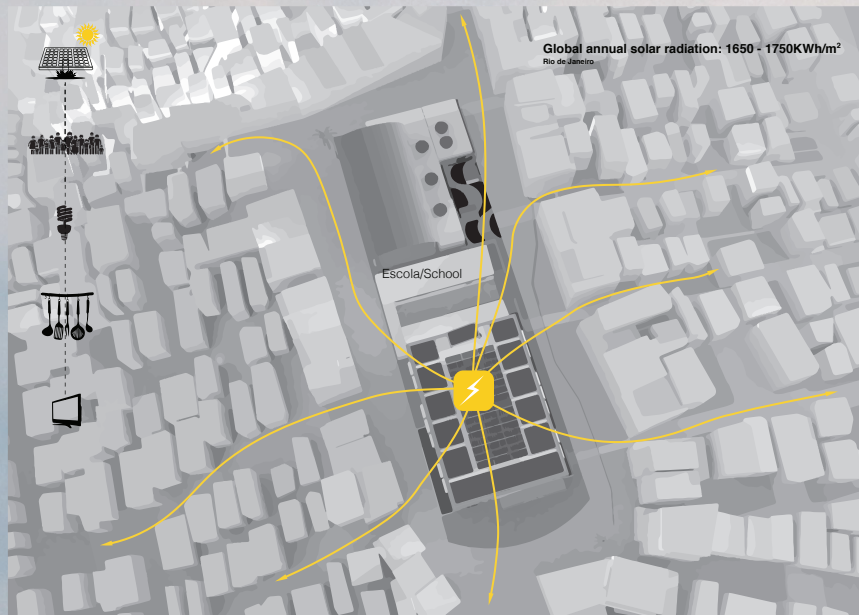


Natural
ventilation
Ventilação
natural



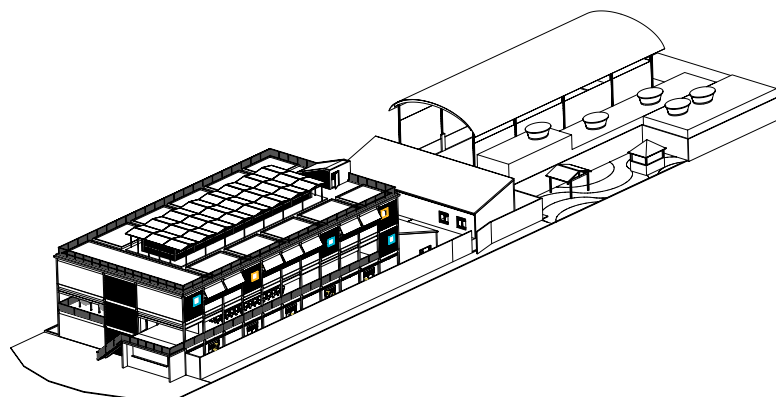
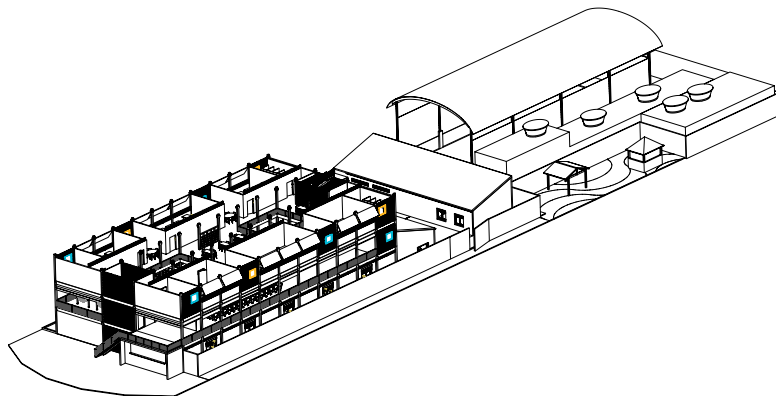
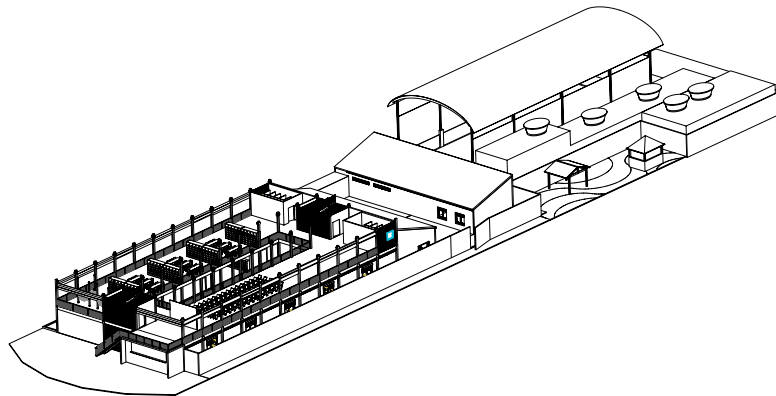
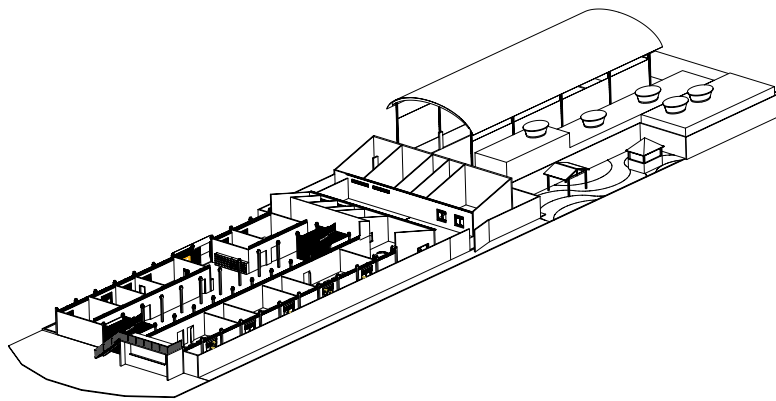
Daylighting
Iluminação
natural

Solar potential can provide energy.



- Built with recycled and reclaimed material like recycle concrete and recycling bricks
- Local energy production
- Rainwater management
- Contribution to local ecosystem





Programma escolar / space allocation plan

.....Terreo/Ground floor

1. Portaria / Entrance hall, security
2. Secretaria / Secretariat
3. Conselho Executivo / Head of school office
4. Salas Trabalho Professores / Teachers room
5. Sala da informatica / Computer classroom
6. Sala Polivalente / Multifunctional classroom
7. Salas de Aula / Classrooms
8. Espaços para o Ensino Experimental das Ciências / Science lab
9. Salas de Artes / Arts studio
10. Cozinha/Refeitório / Refectory
11. Armazem da cozinha / Storage room kitchen
12. Espaço Estudante, Loja do Aluno / Student shop
13. Baheiros masculino e feminino / Bathroom m.&f.

.....2ºAndar/1st floor

1. Auditorio/espaco da musica/banda / Music hall, auditorium
2. Biblioteca com acesso publico / Library with public acess
3. Palco multifuncional / Convertable stage
4. Estacao de Informatica / Computer work station
5. Sala da musica e arte / Music and arts classroom
6. Baheiros masculino e feminino / Bathroom m.&f.

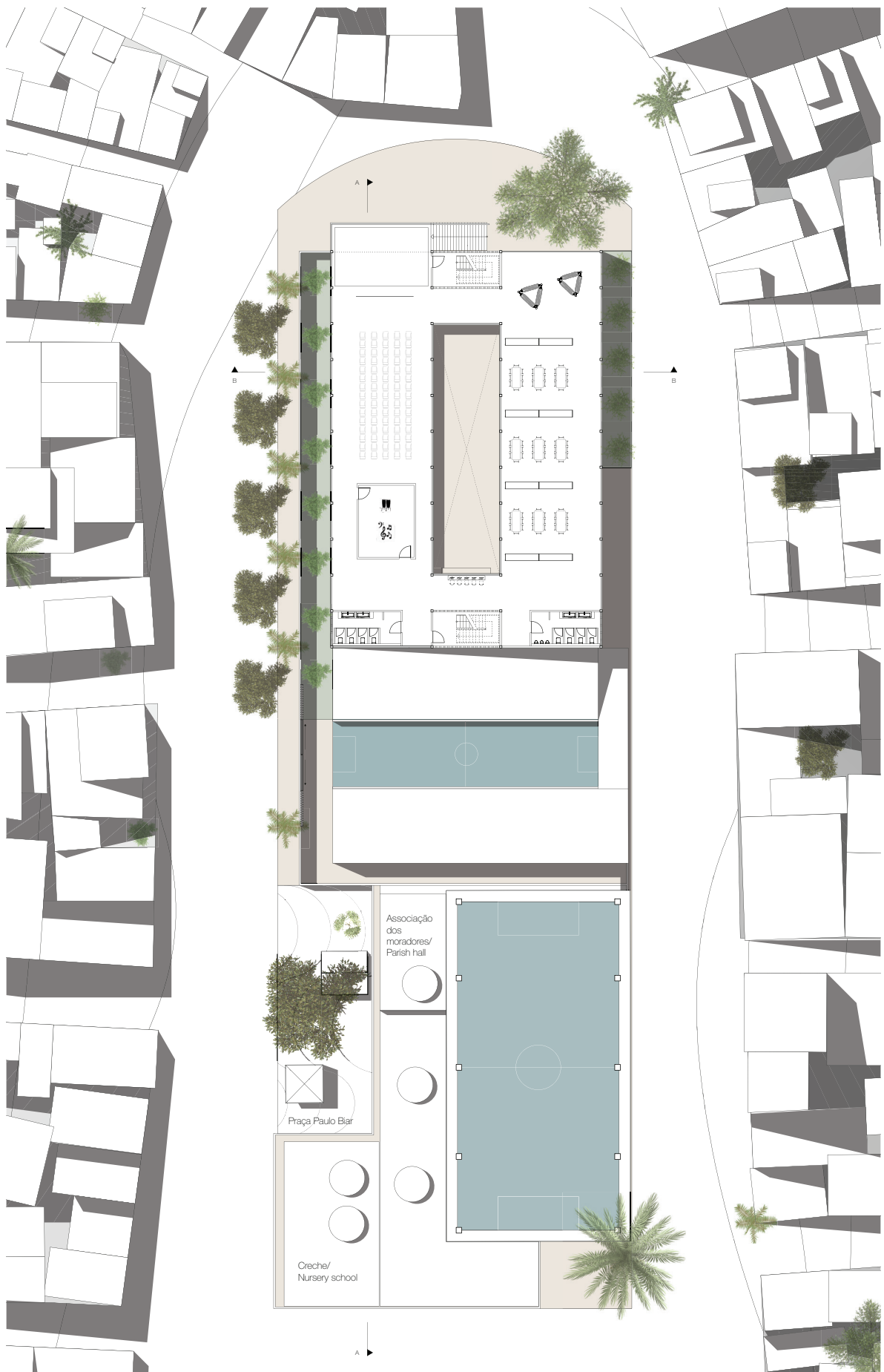
.....3ºAndar/2nd floor

1. Salas de aula / Classrooms
2. Ilha do ensino / Open space learning island
3. Sala Polivalente / Multifunctional classroom
4. Armazens / Additional classroom extension
6. Baheiros masculino e feminino / Bathroom m. & f.

.....Externo-Telhado verde/ Rooftop

1. Quadra / Sportsfield
2. Quadra poliesportivo / Multifunctional sportsfield
3. Horta e jardim / Patch and garden
4. Area do ensino ao ar livre/ Open air education area

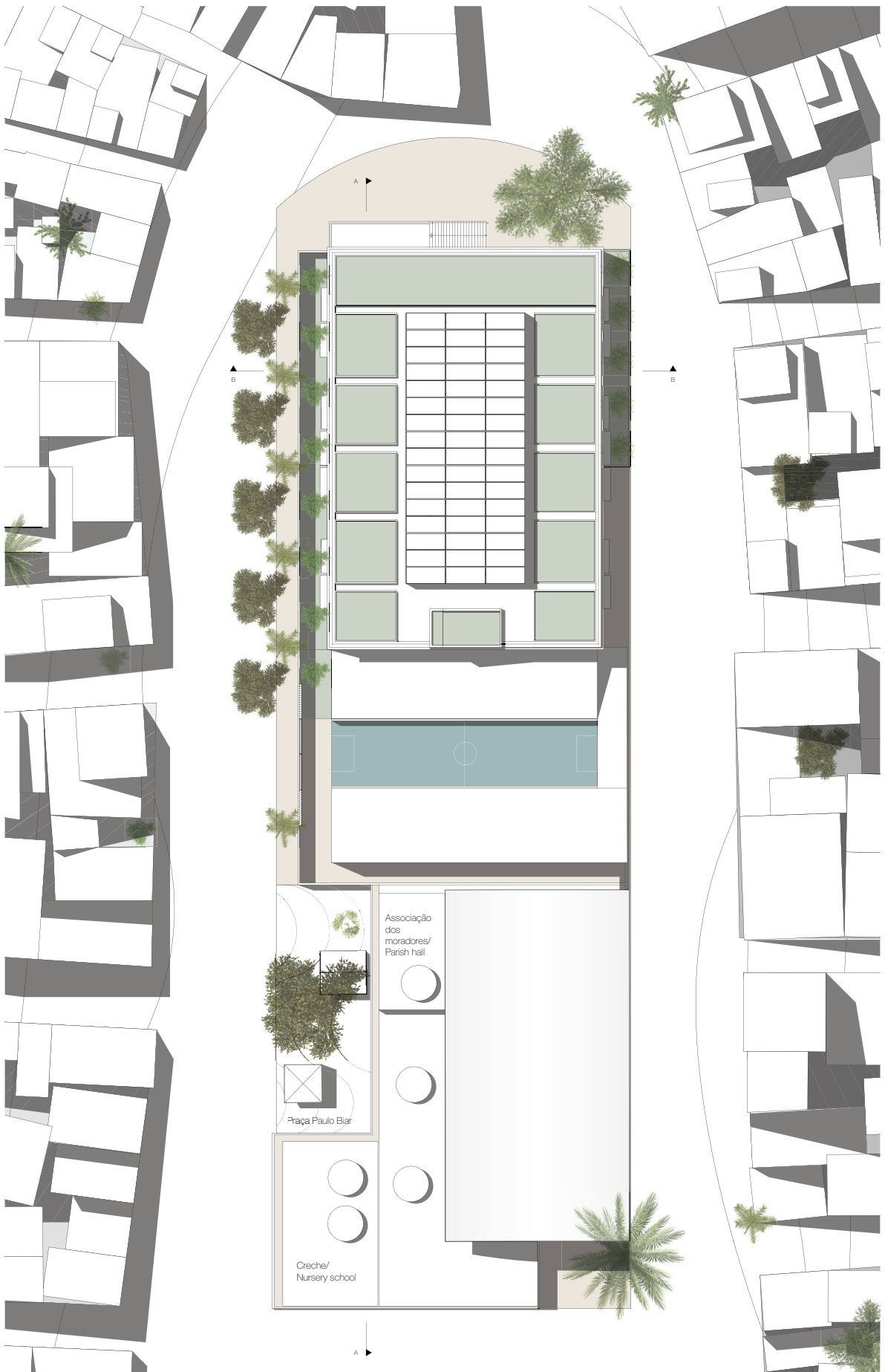




First floor 1:500







Rooftop garden 1:500









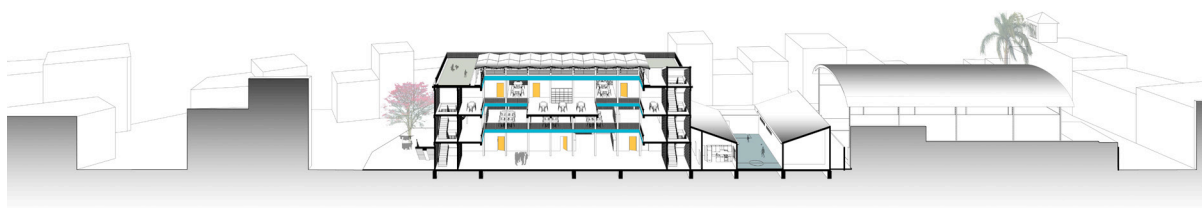
Elevation north 1:1000



Elevation south 1:1000



A-A Section longitudinal 1:1000

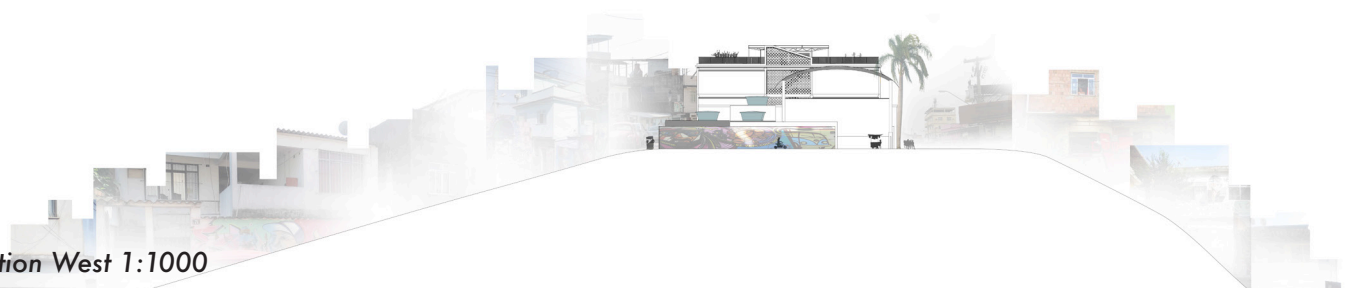


Section longitudinal 1:1000





Elevation East 1:1000



Elevation West 1:1000



B-B Cross section 1:1000



Section Longitudinal 1:1000



CE VINICIUS DE MORAES

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vamos cuidar do brasil com escolas sustentáveis : educando-nos para
pensar e agir em tempos
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Page 8, Native bird of Brazil, Design by Diana Rocha Monteiro dos Santos


Page 30/31, satellite picture from google earth

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Interviews were recorded either written or by film.

For having the entire interviews, please contact timgerwig@yahoo.com

"No one is born fully-formed:
it is through self-experience in the world that we become what we are."
— Paulo Freire



This Thesis turns its attention to the transformation of schools in the informal settlements of Duque de Caxias. The northern metropolitan area of the marvellous city Rio de Janeiro has been mostly left out of Favela upgrading programs, though it is not in the focus of international Interest.

Educação não transforma o mundo. Educação muda as pessoas. Pessoas transformam o mundo.
Paulo Freire