DESIGNING FOR URBAN GROWTH

SETTLEMENT STRATEGIES IN BHUBANESWAR

Master thesis
by Anne Møller and Katrine Hoé

MSc. 04 URB 06, May 2014
Department of Architecture, Design & Media Technology
Aalborg University

"The city is both real and imaginary, something lived and something dreamed, the most complex artefact of human civilisation, an object of nature and a subject of culture."

[Levi-Strauss, 1955 in Weightman, 1973: 155]

Master Thesis, short dissertation programme 2014
Department of Architecture, Design & Media Technology
Aalborg University
Urban Design

Project title: Designing for Urban Growth - Settlement Strategies in Bhubaneswar
Project theme: Urban growth in developing countries
Project subtheme: Housing, sanitation and rainwater management

Group: MA4-URB6

Main supervisor:
Lea Louise Holst Laursen, Associate Professor, Aalborg University

Technical consultant:
Jes Vollertsen, PhD, Professor of Environmental Engineering, Aalborg University

Project period: 03/02/2014 - 28/05/2014

Number of copies: 5
Number of pages: 101
Number of appendix: 3

Abstract
This thesis project deals with the theme of urban growth in developing countries, more specifically in Bhubaneswar, India. Bhubaneswar is a medium-sized city, compared to Indian standards, and it has experienced a massive influx during the last decades. Therefore the city is facing more challenges regarding housing, lack of sanitation facilities and insufficient rainwater management. The aim of this thesis is to address the challenges above in an investigation of urban settlement strategies in order to improve everyday life situations for women and children in the city. This results in the development of two design solutions; an implementation of toilet facilities and public spaces in a developing slum area and a proposal for an affordable housing area in central Bhubaneswar. The two projects are tied together in a new housing strategy that incorporates low-income housing in the center of the city and at the same time focuses on improving the living standards in the emerging slum areas.

Anne Møller

Katrine Hoé

PREFACE

This thesis project is developed by Anne Møller and Katrine Hoé on the MSc 04 – Urban Design semester at Aalborg University, Department of Architecture, Design & Media technology. The project takes place in the period from February 3rd 2014 to May 28th 2014 and with final examination in June 2014.

The project takes its point of departure in a multi-disciplinary workshop with 36 participants and educators from Nepal, India, Estonia and Denmark. The workshop, called Design_Lab Orissa, took place in the city of Bhubaneswar in India, from February 6th 2014 to February 22nd 2014, and was conducted by the method and techniques developed by INDEX: Design to Improve Life Education. The workshop formed the basis of the collection of empirical data and a methodological reflection of the experienced techniques. The empirical knowledge gained in India was expanded and reflected in a theoretical investigation of Terrain Vagues, Leftover Landscapes and Urban Acupuncture. Along with an in-depth analysis this resulted in two conceptual design proposals with theoretical, aesthetical and technical evidence.

A special thanks to our fellow Indian participants of the workshop, who gave us a priceless insight in the Indian culture and helped us translate interviews on fieldtrips and especially thanks to Sujit Mahapatra, the founder of Bakul Foundation in Bhubaneswar for being a fantastic host and providing us with the necessary information and contacts. Additional thanks to architect Bandeesh Patro, who took the time to enlighten us in the architectural history of India and who provided us with data for our initial research. And finally thanks to Sander Hiire, who besides being a participant of the workshop also worked as a photographer, and whose pictures we were allowed to use in this report.

READING GUIDE

The diagram below displays the overall structure of this master thesis report. The project proceeds by alternating opening up and narrowing down the project theme and by this specifying both challenges and solutions. The report contains a prolog with formalities as well as motivation, introduction and a description of the methodological and theoretical framework and six additional chapters. The objective of the prolog is to state the reasoning and setting of the project.

Secondly a chapter containing the project frame widens the theme in a research of City Development, Culture, Climate, Streetscape and Housing. The conclusion of the project frame narrows the project down to the main challenges by formulating a problem statement.

Hereafter the project is yet again widened in a context analysis containing both an analysis of Bhubaneswar city and the neighborhood of Satya Nagar. The conclusion of the chapter leads to the application of Urban Acupuncture as a strategy and by this to the selection of two project sites.

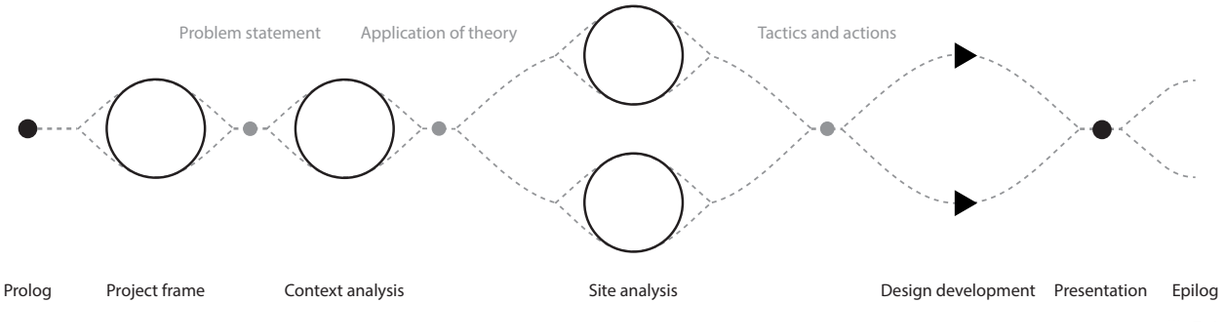
The two project sites are analyzed and the findings result in the phrasing of one tactic and three actions for each site. The tactics are overall gestures to approach the sites and the actions are guiding the design development in order to achieve the overall tactic and to solve the problem. Moreover the actions provide a sequence of steps, which form the basis for the following design development.

The chapter containing the design development is structured by a series of steps to reach the final design proposal. Along with illustrations of the design principles the steps provide the reader with the argumentation and reasoning behind program, form and technical solutions.

The design solutions are presented in plan, section and visualization and the qualities and principles of each design are thereby displayed in both text and imagery. The chapter concludes with a strategic timeline introducing the notion of adapting the qualities of the two designs to other similar parts of the city. Thereby the perspective of the solutions is opened up towards greater impact in Bhubaneswar.

The final chapter, the epilog, contains a conclusion of the design solutions, a reflection on the shortcomings and a discussion of the working method. Furthermore the discussion debates the design methods of INDEX comparing it to the Integrated Design process used at the education of Architecture and Design. Additionally the role of urban designers is contemplated in relation to user participation and thus the project finishes by opening up the perspective yet again.

With this structure, the project progresses from analyzing global conditions of India to regional conditions of Bhubaneswar to local conditions of Satya Nagar and finally to analyzing the two specific project sites. The design solutions are developed on the basis of the site specific conditions and therefore this project aims at interlacing local and site specific designs to regional and global challenges.



Ill. 5.1

TABLE OF CONTENTS

MOTIVATION

The motivation for this thesis project is the chance to experience and design for an entirely different culture with different traditions, values and aesthetics. Traveling allows us to meet and experience other cultures but it also enables us to see our own country and culture with fresh eyes and a wider perspective. Compared to the third world, we live a sheltered and stable life in Denmark. Confronted with a country like India we, as humans, grow. It leaves us with a paradoxical feeling of being insignificantly small and at the same time with a naive and spontaneous desire to act.

In India we were confronted with “the ugly”; the ugly of poverty, of suppression and of cities. We saw miserable souls, frail and decayed homes and totally neglected and forgotten parts of the city. Amidst the ugly were however colorful women, curious children and an enviable public life to brighten up the experience. In India it is easy to be overwhelmed by the many problems and even harder to discover the potentials. When tackling the very complex physical and mental context it is important to localize the smaller task within the big problem. Choosing to solve only a fraction is better than doing nothing.

During a study trip to Brazil a couple of years back we experienced the explicit difference between the formal and informal city. Located behind massive skyscrapers and gated communities we found the favelas – the illegal settlements growing up the mountainsides. For the first time we saw how urban design as a discipline can be used to improve quality of life in developing countries. We experienced a direct link between implementing design and raising living standards.

In order for us to design in a culture like the Indian we need to have an in-depth understanding and we have to acknowledge that it is impossible to solve all problems. Additionally the problems and challenges are often associated with a change of mentality and behaviour, which can be difficult to handle and requires a longer time frame. Our strength as designers from another and western part of the world is that we see other possibilities and solutions than locals who are stuck in certain mindset.

An important aspect of getting to know the country and city you are designing in is to interact with the people living there. This interaction allows us to change our perspective and our understanding of people´s lives. Through observation and dialogue we can change our position as outsiders to a more central position where we understand relations and synergies, barriers and obstacles. It is never possible to gain an inside perspective but many things can be done in order to qualify the foundation of design.

This project will create a foundation for approaching the task of designing in a foreign culture. It is the ambition to inspire a sensitive and varied response to the design challenges of our globalized world.


ORISSA
BHUBANESWAR

INTRODUCTION
URBAN GROWTH IN BHUBANESWAR

Today the world is experiencing the biggest urban growth in history, with the majority of its population living in cities or towns. [Martine, 2007] This is a result of people migrating from rural to urban areas in hopes of finding work, and by the generally improved living conditions. [Martine, 2007]

The first great wave of urban growth occurred in Europe during the 19th century as a result of the industrial revolution, however now the same transition has begun on developing continents, such as Africa and Asia. This second wave will be much bigger and with a much higher pace than during the industrialization. [Martine, 2007] In developing countries the urban population is expected to double between 2000 and 2030, and by 2030 these countries will have around 80 % of the world's urban population. [Martine, 2007]

Although most of the attention during this rapid urban growth has been on the so-called mega-cities, the future growth is most likely to occur in smaller urban areas. [Martine, 2007] These areas are facing a more extensive urban growth rate and even though mega-cities still are quite influential, smaller cities will predominate. [Martine, 2007]

Smaller cities often have more unaddressed problems, such as insufficient infrastructure and poor sanitation, than larger cities. Furthermore they are less capable of handling the pressure of urban growth because of fewer financial and technical resources, and only a few of the developing countries produce enough jobs to comply with the demands of the rising urbanization. [Martine, 2007] This results in an increased poverty rate in the cities and by this also the development or expansion of existing slum areas. [Martine, 2007]

According to the UN-Habitat, slums are defined as a group of households gathered in a dense, urban area, which may lack access to clean water, sanitation and permanent housing. [Martine, 2007] Not all people living in slums are poor and not all poor people live in slums, however poor people often fall through the formal system of the city and therefore settle as illegal dwellers. [Martine, 2007] Additionally women are particularly vulnerable to poverty, as most jobs in developing countries aren't dedicated women, and as they traditionally are obliged to take care of the household. Thus women compose a significant role in the family structure and improving living conditions for women will therefore improve the conditions of the entire family. [Martine, 2007]

With the growing cities and the growing share of indigent people, the urban spaces gain a significant role in the urban environment. [Martine, 2007] As many individuals live in overcrowded areas, these public spaces are their only leisure options and additionally they serve as space where social status isn't prominent. [Martine, 2007]

The city of Bhubaneswar is not unacquainted with the global urban growth tendency. The city is the capital of Orissa, which is a state located by the Bengal coast in Northeastern India. Orissa is one of the country's most rural states, and as a result of poor agricultural conditions, it is also one of the most impecunious. [Citypopulation] This induces people moving from the rural areas into the cities in search of work and better living conditions. Consequently Bhubaneswar has experienced a massive population growth during the last six decades with a population of only about 16,000 people in 1951 and about 885,000 people in 2011. [Citypopulation] A forthcoming escalated population rate is expected and therefore Bhubaneswar is facing some substantial challenges. [Citypopulation]

Bhubaneswar has a rather high percentage of its population living in slums. [Rout, 2008] These slum areas are characterized by being unhealthily dense, with poor or no sanitation and bad housing conditions. Furthermore they are particularly vulnerable to climatic events, as for instance flooding during the monsoon season. [Rout, 2008]

This project deals with the design of two selected sites in Satya Nagar, which is a neighborhood of Bhubaneswar. The sites, an infrastructural intersection and a vacant residential plot, are representatives of types, which can be found in additional places within the city and also in a larger, global context. The focus of the designs are on improving living conditions for women and children, as this target group is the most exposed but also the most resourceful fragment of the population. Through the two designs also climatic solutions, regarding management of rainwater, are integrated.

METHOD
DESIGNING TO IMPROVE LIFE

To initiate this project we participated in a workshop in Bhubaneswar, India. This chapter summarizes the course and methodology of that workshop and the remaining project period in Denmark. By this it is the aim to form the basis for a discussion of the approach of the workshop in relation to this thesis project. The discussion is further elaborated in the epilog of the report.

The Design_Lab Orissa workshop was conducted in February 2014 and consisted of cross-cultural and interdisciplinary teamwork with participants from four different countries; Nepal, India, Estonia and Denmark. Through the workshop, the working methods and techniques developed by INDEX: Design to Improve Life Education, was applied to solve local and simple challenges of the communities involved.

INDEX: Design to Improve Life
According to the Danish non-profit organization INDEX: Design to Improve Life, the modern perception of design isn't solely linked with aesthetics. Everything man-made, whether it is a service, a process or a physical product, is increasingly being recognized as design. John Heskett, professor of Design at the Hong Kong Polytechnic University, defines design as:

> *Design is the human capacity to shape and make our environments in ways that satisfy our needs and give meaning to our lives.* [Heskett in INDEX: Design to Improve Life, 2012: 13]

In this sense design is something that everybody is capable of and an ability that everybody possesses; designers are just those, who have sharpened this ability and who have been taught certain methods and skills to analyze and develop ideas into design solutions. [INDEX: Design to Improve Life, 2012] This perception of design constitutes the frame of INDEX, whose philosophy is that not only experts and designers should solve the urgent challenges of the world, but instead the world's problems should be solved by the entire population together. [INDEX: Design to Improve Life, 2012]

The confrontation with the statement above during the workshop in India raised several questions regarding the importance of the profession of design. If everybody is capable of designing, what is then the role of the architect and urban designer? And how can the competencies gained during our academic education and any additional experience achieved in the field apply to that? It is our experience from the workshop in India that we as designers possess important skills and competencies to create form and narratives of design. It is however equally important to state that one cannot belittle the quality of the interplay, which might occur by involving people of other professions and perspectives in the design process. Ideas and knowledge can come from various sources but applying and reasoning them in a new narrative requires design practice and skill.

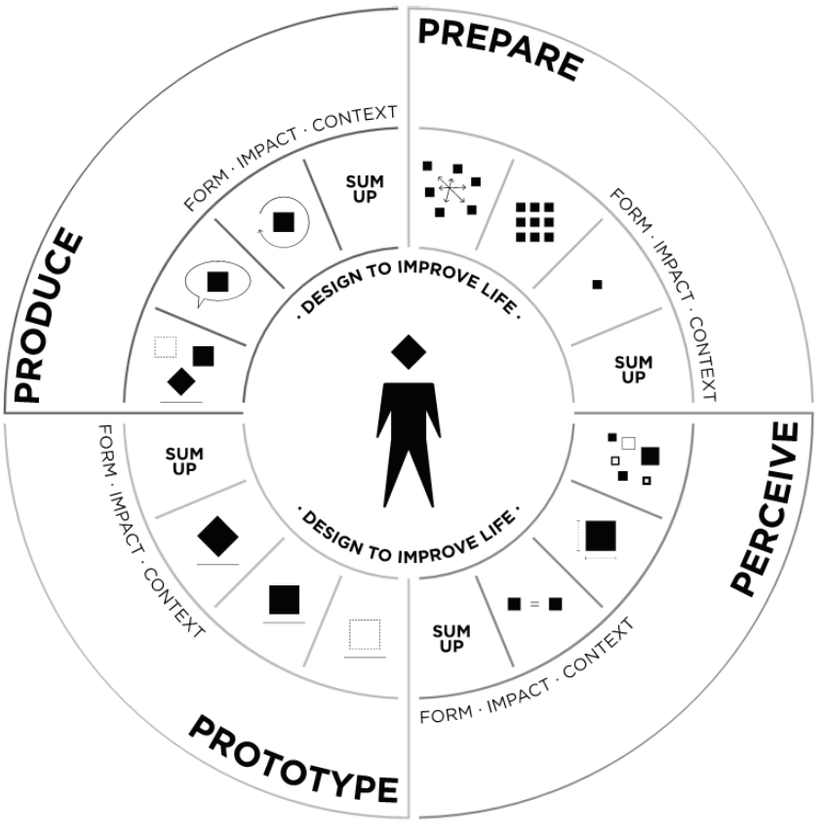
The compass
INDEX's goals are to inspire, educate and engage people in sustainable design solutions to both local and global challenges. [INDEX: Design to Improve Life, 2012] Therefore they have come up with the Design to Improve Life compass, which is a management tool to plan and navigate in a design process. The compass is divided into four phases; *prepare*, *perceive*, *prototype* and *produce*, and each phase has three specific actions and a sum up. Additionally each action is supported by different techniques. The actions are a series of steps that ensure that the learning goal of the individual phases is achieved. [INDEX: Design to Improve Life, 2012] The techniques are a set of specific tools that support and ease the process of the actions [INDEX: Design to Improve Life, 2012]. The designs are regularly assessed in the sum ups of each phase on the basis of the three Design to Improve Life parameters; *form*, *impact* and *context*. This means that the solutions are not only evaluated on materiality and aesthetics (form) but also social, economic and ecological sustainability (impact) and how well the solution fits into the culture and geography, which it is projected for (context). [INDEX: Design to Improve Life, 2012]

The process has to be seen as a holistic and iterative process, where it is possible to shift back and forth between the different phases as required. [INDEX: Design to Improve Life, 2012]

Prepare phase
In the prepare phase resourceful design teams are made. The teams then identify the problems and potentials of their project site and finally they decide on a specific challenge to work further with. The focus of this phase is to discover especially those challenges, which have a negative impact on people's lives. [INDEX: Design to Improve Life, 2012]

Perceive phase
The objective of the perceive phase is to specify and refine the chosen challenge through analyses, especially with focus on the context or environment, which the solution has to be implemented in. [INDEX: Design to Improve Life, 2012] This covers geography and culture as well as the potential user and target groups.

Prototype phase
In the prototype phase, ideas on how to solve the challenges are developed through sketching and model making. Concurrently the ideas are tested and



Ill. 13.1: The INDEX: Design to Improve Life compass, which functioned as a management tool during the workshop in Bhubaneswar. The compass represents the four design phases and its actions.

evaluated with the user and target group, and subsequently they are refined and tested yet again. The focus of this phase is form and aesthetics. [INDEX: Design to Improve Life, 2012]

Produce Phase
In the final phase, the produce phase, all materials are gathered and prepared for presentation. By the end of the process the design solutions are evaluated based on the three Design to Improve Life parameters mentioned earlier. [INDEX: Design to Improve Life, 2012]

A fundamental principle of the Design to Improve Life method is that the user is the center of attention throughout the entire process. [INDEX: Design to Improve Life, 2012] By this, it is the aim that the project teams understand the needs of their potential users by observing and actively involving them in the process.

INDEX's rather broad perception of design raises the question if it is at all possible to make a common definition and applying method to the act of designing? One might argue that in order to comply with the different scales of design; from product or process design to architecture and urban design, different sets of techniques are required. However INDEX encourages a flexible use of the compass and techniques and urges people to design their own compass and customize the process to fit specific projects. One could then argue that the design and planning of a process requires the same level of professionalism as physical design and thus is not something everyone can do.

Design_Lab Orissa
The method of INDEX: Design to Improve Life was put into practice at a workshop in Bhubaneswar. The objective of the workshop was to come up with innovative design solutions to local challenges and by this to initiate change in the involved communities. Furthermore it was the aim that every participant should gain knowledge and experience with the method of INDEX and hereby be able to continue to develop change-making projects in their home countries. By conducting such a workshop with participants from different countries and with different professions, the facilitators wanted to spread the acquaintance to the Design to Improve Life thinking and incite creative processes as a new education method.

The workshop proceeded by the phases of the compass, which increased the awareness of the projects' progression and enabled the teams to

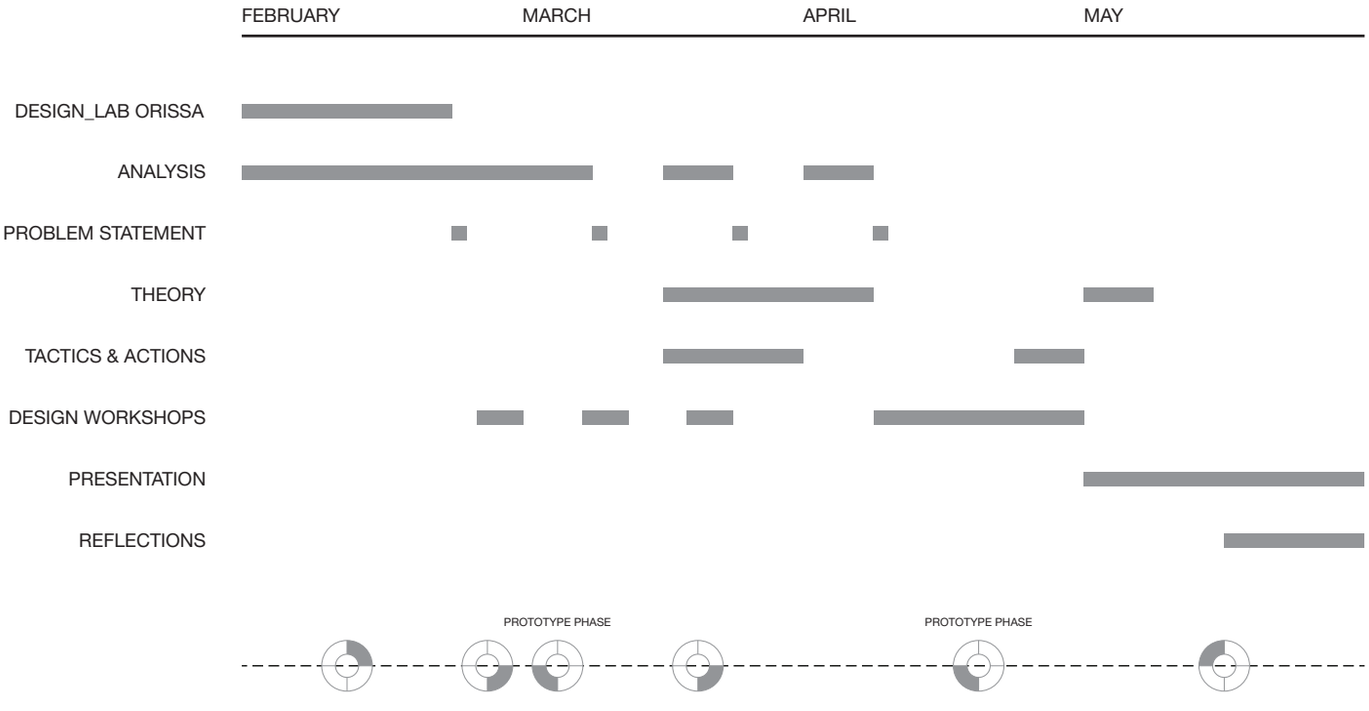
track and navigate in their own process while being in it. However due to the relatively short period of time (2½ weeks), it was not possible to shift back and forth between the phases as intended and hence the process became very linear and intense. Therefore decision-makings had to be rapid, and this resulted in some limitations to the developed solutions. Nevertheless it also forced the groups to be specific and focus on creating very simple solutions in a context with various and complex problems.

The involvement of potential users was conducted through interviews and observations at fieldtrips and testing of prototypes. This way of interacting gave a more comprehensive understanding of the cultural background and the consequences hereof. Due to restrictions in time the involvement mainly consisted of observations and interviews and not actual participation as the method of INDEX suggests. The interviews and games conducted with the users often occurred in a chaotic and slightly problematic setting in the streets, and we experienced that in order to achieve qualified participation it requires both fixed physical and process-related frames. Otherwise the effect becomes too random and the participators can't see the intentions and outcome of the process.

Besides being participants in the Design_Lab workshop, we used our stay in Bhubaneswar to explore, analyze and collect data for this thesis project. Even though the specific outcomes of the workshop aren't used directly in this project, the learning outcome of working in a foreign and unfamiliar context in close collaboration with both local inhabitants through user involvement and team members of different cultural origins was priceless for the production of this project. We gained an insight in the Indian culture and history, which we otherwise couldn't have achieved in such a short period of time.
The individual solutions of the workshop are more thoroughly described in appendix 1.

Application of method
By being a part of the Design_Lab Orissa workshop and by immersing into the local context, the aim was to get a thorough understanding of the cultural and geographical conditions of Bhubaneswar. Additionally by involving the local inhabitants it was the goal to expand our perspectives as outsiders and get as close as possible to understanding the viewpoint of the insiders; the local experts. Therefore the motive of participating in the workshop was to initiate our thesis project with as much insight and knowledge as possible.

During the remaining project period, the method attained from the workshop, was adapted and modified to fit

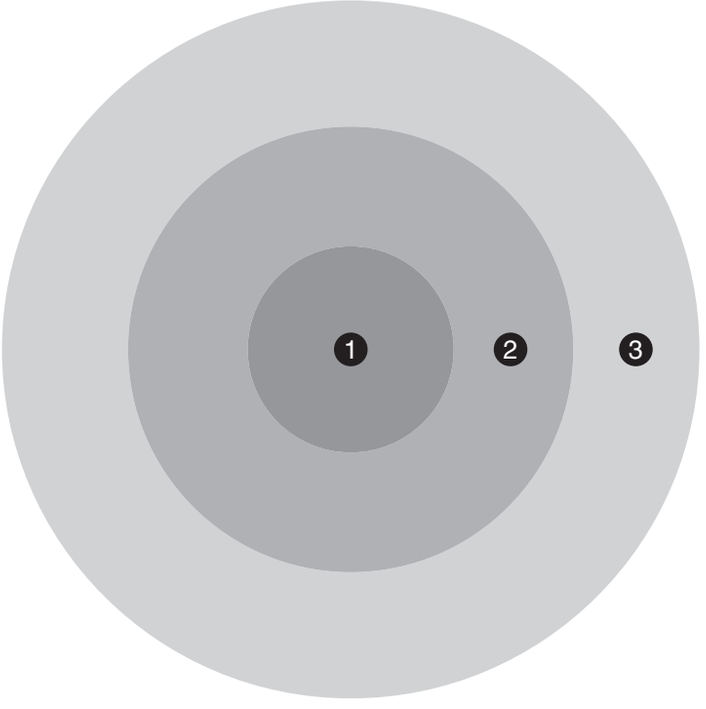


the continuing process and the urban design practice, by allowing a shift between the phases of the compass in a more flexible structure than at the workshop. Hence the method of INDEX: Design to Improve Life Education was not continued faithfully, however selected techniques have contributed to the generation of ideas in the design phase. Likewise the organization and the awareness of the process from the Design_Lab Orissa influenced how the remaining project period was structured. In this way the workshop in Bhubaneswar has first and foremost contributed with inspiration for the process management and as a part of the empirical collection of data. Moreover empirical data was collected from literature and interviews with both local inhabitants and stakeholders of the municipality of Bhubaneswar, which composed the prepare and perceive phases of the compass.

The process of the project proceeded as an iterative course of parallel theoretical and analytic work combined with design development. The analyses were conducted through phenomenological work based on fieldtrips to the chosen project sites as well as objective data gathering based on maps and literature. The theoretical framework of the project was conducted as a theoretical paper discussing relevant theories and strategies to deal with the urban situation. The design development was conducted through more workshops using different methods, from sketching to model making.

The Design_Lab workshop and the subsequent project have to be seen as a coherent course and not as two separate processes even though they differ in intent and outcome.

Ill. 14.1: The schedule displays the process of the project in relation to the phases of the compass.



Ill. 15.1: The diagram shows the difference between (3) having an outside perspective (society), (2) having a middle perspective (stakeholders and municipality) and (1) having an inside perspective (the local inhabitants). The motivation for participating in the Design_Lab Orissa workshop was to expand our outside perspective and get closer to the knowledge of the local inhabitants, the insiders.

THEORETICAL FRAMEWORK

LEFTOVER SPACES AND URBAN ACUPUNCTURE

The aim of this chapter is to provide the theoretical foundation for the project as well as discussing and adapting it to an Indian context. Therefore the implicated theories will be accounted for in relation to their origin in a western setting and subsequently they will be discussed in relation to the perspectives of this project.

The contemporary city is a complex compilation of various elements such as architecture, infrastructure and landscape. It is a site of economic, political and social activity and it is continuously undergoing a transformation that will affect both its physical appearance and human's perception of it. [Thorns, 2002] Urban transformations are composed by inevitable and complex processes, which can take various forms. [Weinstock, 2014] Addressing these complexities require specific approaches in order to utilize the inherent potentials of urban change and preserve the dynamics and adaptability within the city. [Weinstock, 2014]

Cities have undergone a number of transformations through time, however in the western world the 19th century's industrialization was the most radical. The industrial revolution triggered a dramatic growth in both population and size. The centers developed from being commercial and administrative centers to also being centers of industry. This caused an expansion, often accomplished by a continuation of the existing infrastructural grid. [Nielsen, 2001] By this, the infrastructure was used to organize the built-up areas into a system of building blocks, and together they constituted an open and infinite system with the city center as point of origin. [Nielsen, 2001]

In India the history and development of cities are completely different. India, as well as other developing countries, was not affected by the industrial revolution in Europe in the 19th century but has instead experienced a massive growth in recent years. [Martine, 2007] However the city of Bhubaneswar do have some similarities to western cities as it was modernized and redesigned with a grid plan structure by a German architect in the 1940s. [BMC 2] The design was only intended a population of 40,000 and therefore the original plan is today only visible in the city center meanwhile the remaining city and its outskirts are sprawling organically due to the rapid and uncontrolled urbanization. [Praharaj, 2013]

The Spanish architect M. de Solá-Morales (2008) states that the metropolises of Asia not simply grow with the infrastructural system, which was the case during the industrial revolution in the western world. Instead there are more complex and random logics behind this second wave of urbanization. The cities grow by taking *"advantage of the opportunities offered by land or location, by novelty or residue, by being in the public eye or out of it, by proximity or distance."* [M. de Solá-Morales, 2008: 159]

A by-product of city expansion in Europe was just this residue, which came into existence in the surplus areas between the planned and built-up areas. [Nielsen, 2001] These areas were inescapable and showcased the limitations of planning. [Nielsen, 2001] Moreover, when existing structures in the city were demolished, as for instance old industrial sites, it created these in-between, indefinable spaces. [Nielsen, 2001]

During the last decade, the interest in exactly these in-between spaces has been ascending. Politicians, artists and photographers among others have found the voids within the built environment fascinating and of great potential. [I. de Solá-Morales, 1995] Two of the theoreticians who have found these spaces valuable to discuss are Ignasi de Solá-Morales (1995) with his term of *Terrain Vague* and Tom Nielsen (2001) with *Leftover Landscapes*. Both seek to determine why and how these spaces stand out from the built environment and then in what manner to cope with them.

This paper will examine a product of the rapidly growing cities – the leftover spaces, discussing and comparing the perspectives of Ignasi de Solá-Morales (1995) and Tom Nielsen (2001). Subsequently an investigation of an alternative approach to urban design and masterplanning, *Urban Acupuncture* by Manuel de Solà-Morales (2008) and Jamie Lerner (2007), will be performed. The paper will work as a framework and point of departure for analyzing and understanding the city of Bhubaneswar, in which the project takes place.

Terrain Vague

The French expression *Terrain Vague* was coined by the Spanish architect Ignasi de Solá-Morales in an essay from 1995, in which he endeavors to define and make meaning of the abandoned, obsolete and unproductive spaces within the contemporary metropolis. The essay begins with a discussion of the photography as a medium for perceiving the city, which I. de Solá-Morales (1995) claims to be problematic as it imprints a manipulated, composed and framed image instead of displaying reality:

> *When we look at photographs, we do not see cities – still less with photomontages. We see only images, static framed prints. Yet by way of the photographic image we receive signals, physical impulses that steer in a particular direction the construction of an imaginary that we establish as that of a specific place or city.* [I. de Solá-Morales, 1995: 119]

From this starting point the discussion of the non-spaces, the Terrain Vagues, ascends. I. de Solá-Morales (1995) describes the places as existing outside the productive circuits of the city: *"…internal to the city, yet external to its everyday use."* [I. de Solá-Morales, 1995: 120] Moreover these places are *"where the city is no longer"* [I. de Solá-Morales, 1995: 120], and can be found in a variety of formations, among these unsafe neighborhoods, industrial areas, ports or railway stations. [I. de Solá-Morales, 1995] Terrain Vagues expose the disorder within the city and highlight economic stagnation. [I. de Solá-Morales, 1995] Their boundaries are often blurred and their function volatile. [I. de Solá-Morales, 1995]

Although the common understanding of these voids is unfavorable, I. de Solá-Morales (1995) insists that the meaning of Terrain Vagues isn't purely negative and that they in fact are of great value to the city as they offer possibility and expectation:

> *Unincorporated margins, interior islands void of activity, oversights, these areas are simply un-inhabited, un-safe, un-productive. In short, they are foreign to the urban system, mentally exterior in the physical interior of the city, its negative image, as much a critique as a possible alternative.* [I. de Solá-Morales, 1995: 120]

I. de Solá-Morales (1995) states that exactly the absence of activity and lack of boundaries give a sense of freedom and room for spontaneity in the city. Thus Terrain Vagues can function as spaces of informal activity that otherwise will have difficulty finding a proper space in the public realm. [I. de Solá-Morales, 1995]

Where architects and planners often seek to make meaning and colonize these voids, I. de Solá-Morales (1995) insists on the value of the unproductivity and the voids as spaces of freedom. Furthermore he argues that architects have to learn from the existing urban environment instead of trying to recreate it and at the same time allow disorder and not attempt to organize and rationalize the spaces. [I. de Solá-Morales, 1995] The consequences of not doing so will be a violent transformation and dissolution of the captivating voids. Consequently I. de Solá-Morales (1995) proposes a focus on forces rather than forms, emphasizing the flows, energies and rhythms of the site:

> *How can architecture act in the terrain vague without becoming an aggressive instrument of power and abstract reason? Undoubtedly, through attention to continuity: not the continuity of the planned, efficient, and legitimated city but of the flows, the energies, the rhythms established by the passing of time and the loss of limits.* [I. De Solá-Morales, 1995: 123]

The statements of I. de Solá-Morales raises more questions regarding how to treat the voids in an Indian city. Here the risk of creating a violent transformation is even more likely to occur as the context is foreign and unfamiliar. However at the same time exactly these circumstances of being unfamiliar may be seen as a potential for better absorbing and immersing into the context. By this one's senses is sharpened and therefore it is possible to notice the forces and energies present at the sites. Moreover when I. de Solá-Morales (1995) insists of these voids as spaces of unproductivity and freedom, one might ask if it at all is possible to transform such a space and keep its unproductivity? Therefore in this project the concerns are on maintaining spaces of opportunity rather than of unproductivity.

Leftover Landscapes

A follow-up on the terminology of Terrain Vague is *Leftover Landscapes* by Tom Nielsen, Ph.D. and associate professor at the School of Architecture in Aarhus. Nielsen (2001) portrays cities of today as a compilation of centers of varying scales, which together constitute a network or a field of a city. This field can be described as consisting of two types of spaces: The built and the un-built. The un-built can be seen as a residue from planning or extension and the built enclaves cast a shadow of leftover, unused spaces, which will appear unorganized and unplanned in contrast to the adjacent built environment. [Nielsen, 2001] The more controlled an area, the more the unplanned leftover space neighboring it will seem. [Nielsen, 2001] The idea of the urban field gives a perception of the city where the un-built is just as important as the built and the dense spaces aren't more interesting than the empty. Without empty spaces, there would be no field. [Nielsen, 2001]

Nielsen (2001) describes two different ways of perceiving the city: from above or from within. From above the city can be described by structural models, whereas the experienced city emerges through narratives and images. [Nielsen, 2001] He defines these two perceptions as "the urban field" and "the picturesque city". Nielsen (2001) uses these terms to frame the phenomenon of Leftover Landscapes, both through structural analysis and through perception and experience. [Nielsen, 2001]

The appearance of Leftover Landscapes points out the limitations of planning. It is not possible to plan a city with none of such spaces, however planners often attempt to. [Nielsen, 2001] One of the causes for this is that it is not possible to determine the exact limits of a field for transformation. Cities have boundaries, however they

are not clearly defined thus there will always be an outside of what is designed and planned. [Nielsen, 2001]

Similar to I. de Solá-Morales, Nielsen (2001) argues that these spaces are precious to the city, as they constitute alternative public spaces. He disputes that the Leftover Landscapes have a tendency to attract people from different social layers into activities of different nature; skating, drinking alcohol, walking or painting graffiti:

> *More and more of these groups live their public life in spaces where architects and planners haven't been able to control the development or at the backsides of their constructions. In an alternative public space which is found as a parasite on the "backside" of the space constructed as the primary public space.* [Nielsen, 2001 (translation)]

Therefore in a society with more and more gated communities, these spaces are of a great value as alternative public spaces. [Nielsen, 2001]

Nielsen (2001) argues that Leftover Landscapes are always temporary, as for instance a parking lot, which is only a leftover in those hours, where no cars are parked, or an empty urban area until it is built. Thereby the Leftover Landscape is only leftover when it's abandoned by its primary function. [Nielsen, 2001] He subdivides the term into three categories, all part of the so-called Leftover Landscape-family. It is a number of different spaces, yet they all have some similarities. The categories are: *the Leftover Hill*, *the Leftover Space* and *the Leftover Surface*. [Nielsen, 2001] The Leftover Hill often emerges as a waste depot of dirt, industrial garbage etc., and can be an attracting element in the urban environment because of its stand out topography. [Nielsen, 2001] The Leftover Space category covers the spaces that occur between the city's infrastructural lines, such as between roads, under bridges or at empty parking lots. [Nielsen, 2001] These spaces exemplify the great difference in energy between the flow of the infrastructure and the abandonees of the spaces themselves. Finally the Leftover Surface is the most frequently occurring of the categories. These spaces are temporarily deserted commercial surfaces, parking lots outside big building enclaves or former industrial sites of the city. [Nielsen, 2001]

In relation to this project Nielsen's (2001) suggestion of experiencing the city from above as well as from within is pivotal for understanding an unfamiliar and complex context as that of Bhubaneswar. However trying to locate Leftover Landscapes in a foreign context might raise even more questions than answers. How is it possible to determine which areas are leftovers - also in the mentality of the local Indian inhabitants? And is it at all possible to categorize and describe these Leftover Landscapes in a joint theory and apply it to India? At first sight Bhubaneswar might seem crammed with leftover spaces, as the contrast between the formal and informal parts of the city is quite explicit. However at the same time the city also seems to be devoid of such spaces, as the Indian citizens are very good at adopting and finding use for the space available.

Designing the Terrain Vagues and Leftover Landscapes

Exploring the ideas and thoughts of I. de Solà-Morales (1995) and Tom Nielsen (2001) generate both memories and mental images of neglected and undefinable spaces but also strong recollections of comprised potential and forces. I. de Solá-Morales (1995) suggests a focus on forces as a way of transforming these areas into positive zones of the city. But designing with forces and for continuity can be a difficult and unspecified task. With his work, I. de Solá-Morales (1995) points out the conflict between embracing the emptiness and architecture's tradition of colonization and making form:

> *In this situation the role of the architect is inevitable problematic. Architecture's destiny has always been colonization, the imposing of limits, order, and form, the introduction into strange space of the elements of identity necessary to make it recognizable, identical, universal. In essence, architecture acts as an instrument of organization, of rationalization, and of productive efficiency capable of transforming the uncivilized into the cultivated, the fallow into the productive, the void into the built.* [I. De Solá-Morales, 1995: 122]

Both I. de Solá-Morales (1995) and Nielsen (2001) strive for an acknowledgement of the voids within cities as valuable for experiencing the whole. Furthermore they claim that these in-between areas are as much a necessity as they are an inevitable effect of city development. Architects and planners have to concede that cities are too complex to be fully planned and that the outcome of this isn't necessarily negative. By this the incomplete, irregular and complex conditions of a city should be exploited as a potential rather than as constrain holding back the transformation. [Nielsen, 2001]

Nielsen's (2001) suggestion of the leftovers as potential alternative public spaces, relates to I. de Solá-Morales' (1995) idea of the existing conditions of these sites being the take-off for any new design intentions. With this the Leftover Landscapes or the Terrain Vagues have to be transformed, if at all, with respect and acknowledgement of the present and specific qual-

ities of the sites.

In order to apply these theories to this thesis project one cannot escape the question of how to make such a transformation in practice and at the same time keep its value as an urban void. Therefore in this project it is not the absence of function or intention that has to be preserved but the inherent potential of the chosen project sites. It is thereby the aim to maintain the existing qualities while incorporating new intentions and future visions.

Urban Acupuncture

While the theories of Terrain Vague and Leftover Landscape deal with the discovery of urban voids and the preservation of their innate potentials another and more practical approach to urban transformation is the theory of *Urban Acupuncture*. This theory complies with speed, forces and continuity but on a more action oriented level. The approach can be seen as an alternative to traditional masterplanning, which often isn't an adequate tool to handle the current and complex urban situation. One of the theoreticians, who argue that urban designers need a new set of tools, is Joan Busquets (2007). He reasons that the old patterns and outlines such as masterplanning remain a part of most urban projects but no one questions these instruments of urban design. [Busquets, 2007] Busquets (2007) aims at creating reflections on new design paradigms that will serve as better responses to the situation and he believes that it is time to discover new approaches and tools that fits the current design condition.

Urban Acupuncture is a theory, which takes its point of departure in the traditional medical approach of Chinese acupuncture as healing of the whole by stimulating certain key points. [Casagrande, 2013] Urban Acupuncture views the city as a living organism, pinpointing areas in need of repair and by this aiming at revitalizing the whole by healing the parts. [Casagrande, 2013] This means that the strategy uses punctual small-scale interventions as a mean for a larger urban transformation. By activating the 'sick' places of the city, it revitalizes its surroundings and triggers a positive chain-reaction that will 'cure' the entire system of the city. [Casagrande, 2013]

Jamie Lerner is an architect, turned politician, who served three terms as mayor of Curitiba. Lerner (2007) believes that working with Urban Acupuncture as a strategy can help designers and architects to find solutions for the contemporary urban situation. He defines Urban Acupuncture as a strategy of finding the most appropriate places to release energy. [Casagrande, 2013] The nodes with the biggest potential to regenerate are chosen through analysis of social, economic and ecological factors. By focusing on small pressure points positive ripple effects can be generated throughout the city. [Casagrande, 2013]

> *(…) As with the medicine needed in the interaction between doctor and patient, in urban planning it is also necessary to make the city react; to poke an area in such a way that it is able to help heal, improve, and create positive chain reactions. It is indispensable in revitalizing interventions to make the organism work in a different way.* [Lerner, 2007 in Casagrande, 2013]

The strategy of Urban Acupuncture is a bottom-up approach to planning and urban design. [Casagrande, 2013] It is meant as an alternative to top-down masterplanning of large and expensive interventions. [Casagrande, 2013] It focuses on local resources and promotes the idea of the citizens taking responsibility for the interventions and thereby it also becomes a strategy of community empowerment. [Casagrande, 2013]

Manuel de Solà-Morales, a Spanish architect and designer, is one of the founders of Urban Acupuncture as a strategy and has additionally worked on the transformation of Barcelona in 1980's applying exactly this method.

M. de Solá-Morales (2008) considers touch and vision as the primary senses when experiencing and designing the city and he refers to this as "material urbanity" as opposed to "urban structure" – a concept on which most planning has been based. Instead of applying a structure or a system on the city he wishes to put emphasis on the gateways and corners: *"… because in them we feel with our weight the shape and size of the city."* [M. de Solá-Morales, 2008: 23] M. de Solà-Morales' (2008) point of departure when understanding and designing a city is the bodily experience of architecture and the sensory experience of materiality. Instead of emphasizing structure and areal development he urges designers to use their senses and intuition in creating a diverse city. [M. de Solá-Morales, 2008]

M. de Solà-Morales (2008) takes the metaphor of Chinese acupuncture further and describes the skin of the cities just as the skin of the human body. The skin of cities is to M. de Solá-Morales: *"constructions, textures and contrasts, of streets and empty spaces, of gardens and walls, of contours and voids."*[M. de Solá-Morales, 2008: 23] The urban experience lies in our meeting with the skin, between body and physical matter. The epidermis is understood to form a system just as the city is. Pricking the epidermis of the skin is what enables us to change internal metabolism of the organism. Translated to the urban skin the strate-

gy of acupuncture enables us to transform social, economic and cultural situations. [M. de Solá-Morales, 2008] The location of the sensitive point is the first step in the transformation process or as M. de Solà-Morales (2008) calls it; the treatment of the urban skin. It requires both in-depth understanding and the right intuition to identify the right spot and be able to add new qualities. [M. de Solá-Morales, 2008]

M. de Solà-Morales (2008) warns that acupuncture as a strategy and analogy is in danger of becoming trivial if the interventions are kept to a minimum of small-scale and low-cost reforms. He states that: *"Project acupuncture is less concerned with the small, the minute or the delicate than with the strategic, the systemic and the interdependent."* [M. de Solá-Morales, 2008: 24]

In a context like the Indian traditional urban design methods, such as masterplanning, will have a hard time finding its eligibility. Therefore, as Busquets (2007) endorses, alternative tools might have better possibilities of creating change. By incorporating Urban Acupuncture as a method it is possible to strategically pick and cope with the problematic areas of a city through simple gestures. Moreover when discussing Urban Acupuncture as a bottom-up approach in contrast to top-down masterplanning, it is important to state that this project finds itself somewhere in-between. The project is managed and decided on from above while the pursue of the initial Design_Lab workshop in Bhubaneswar, through the method of INDEX: Design to Improve Life, was to involve and engage the local inhabitants in the project. Especially in a foreign context of a developing country the empowerment of locals have a great significance for the success of a project.

Adapting to an Indian context

As debated earlier, in the application of the theoretical framework to this thesis project it is relevant to discuss if the theory of Leftover Landscapes and the strategy of Urban Acupuncture also apply to developing countries and India in particular.

M. de Solá-Morales (2008) discusses globalization and the effect it has on the discipline of urban design. He argues that urban designers and architects need to learn to read the differences in the globalized world. [M. de Solá-Morales, 2008] Instead of viewing the world and its cities based on the same limited parameters we need to develop our rhetoric and intellectual reflection of them. [M. de Solá-Morales, 2008] He claims that people's understanding of today's cities is somewhat incomplete:

> *...we are less familiar with the cities from having walked through them, from how people live in them or how they have been made. This limitation produces a weakness in our common capacity to read today´s cities or, more specifically, to read the contemporary parts of our cities.* [M. de Solá-Morales, 2008: 157]

By this the organically growing metropolises of Asia cannot be planned by a deterministic and generalizable growth. Regarding the Asian metropolis, M. de Solá-Morales (2008) states that: *"It is attractive not for being uncontrolled but for its value as a response, beyond abstract controls or infrastructural factors, to more immediate opportunities or advantages."* [M. de Solá-Morales, 2008: 160]

In continuation this paper argues that the strategy of Urban Acupuncture can be viewed as a response to the contemporary Asian metropolis and as a strategy that can cope with the problematic and conflict-ridden areas of the city. Utilizing the forces and opportunities in strategically picked leftover spaces of Bhubaneswar comply with the thoughts of using simple gestures for achieving maximum effect. Masterplanning is a comprehensive process whereas Urban Acupuncture is a site-specific approach that can utilize local opportunities more precisely. Perhaps it could even be argued that in order to create a sustainable development in Bhubaneswar a more delicate, sensory and less invasive approach, such as Urban Acupuncture, is required.

In order for Urban Acupuncture to work it is necessary to pick the right points of impact. In *Byens Rum 2* Helle Juul (2009) describes some of the important conditions and factors for the theory to work as a strategy. Juul (2009) discusses where, when and how to use Urban Acupuncture. To find the right points of impact in the city Juul (2009) suggests a mapping of social networks, flows, relations and identities. Through this mapping it is possible to locate the weakest points and by this finding those places that have the greatest potential of recovering and generating a positive chain reaction. [Juul, 2009]

Instead of exclusively targeting the weakest points in the city of Bhubaneswar this project will focus on the areas with the highest level of potential energy and thereby make a selection based on the ideas of both Ignasi de Solá-Morales (1995) and Tom Nielsen (2001) where the Terrain Vagues and Leftover Landscapes possess positive forces that could sustain a future development. Applying Urban Acupuncture to leftover spaces of Bhubaneswar implies a great focus on mapping and analyzing structures and forces in order to pick the right points of impact. Incorporating a strategic and tactical character in the in-

terventions will strengthen the notion of Urban Acupuncture. Thereby it is possible to cover a wider spectrum of solutions, impacts and timeframes.

Finally when working in a foreign context it is particularly important to learn from the existing urban environment, as I. de Solá-Morales (1995) suggests. To avoid making a violent transformation, it is vital to allow some disorder and not to transform it purely into a western vision of what is appropriate. Moreover, as Tom Nielsen (2001) points out, it is crucial to understand the city from above as wells as from within; from structural analyses as well as from perceptual considerations and narratives. Furthermore when applying the term of Leftover Landscapes in an Indian context one has to be aware that they might differ from leftovers in western countries. At first all sites might seem more or less as an unplanned leftover, however through thorough analyses, some sites will appear to be well functioning and as an important part of the existing system.

Perspectives

Related to this thesis project it is important to stress the reasoning of M. de Solà-Morales (2008) and not translate the strategy to minimal actions, minimal effort and minimal cost. It is essential to lift the project to a strategic level and thereby also cause greater ripple effects. Applying Urban Acupuncture as an approach has the potential to reveal hidden abilities in specific points of the city and catalyze a greater development. This development does not necessarily have to be a physical transformation it could also be a mental change:

> *De Solá-Morales' method offers a handhold for analysis of how the city as a built entity can impede or promote human behavior and thereby affect the habitus of the urban resident.* [Hans Ibeling in M. de Solá-Morales, 2008]

Finally reflecting on I. de Solá-Morales' (1995) notions on the photographic representation of the city it is important to place this project in a perceptual framework as well. The project is aiming at relating and understanding a different society and culture. We are outsiders from a completely different part of the world - that is our perspective and our point of departure in understanding and designing the acupunctural interventions. The understanding and experience of this foreign context is however the main motivation behind this project.

CHAPTER 01

PROJECT FRAME

This first chapter aims at giving a comprehensive understanding of the cultural conditions and physical environment, in which the project takes place. The chapter consists of five project frames: City Development, Culture, Climate, Streetscape and Housing.

Each frame consists of both factual information and extracts from travel journals giving both an objective and a subjective insight into the given topic. Together they capture the most essential problems and potentials of the city and give rise to the phrasing of a problem statement. Thereby they constitute the point of departure for the further context analysis of Bhubaneswar.


Goodwill

CITY DEVELOPMENT
BHUBANESWAR IN PAST AND PRESENT

Historical outline
Bhubaneswar, or "The City of Temples" as it is often referred to, was once scattered with up to 7,000 temples. [BMC 1] The city's history can be divided into two main periods; the ancient period and the period of the modern city, which came into existence in 1948. [BMC 2]

The first appearance of Bhubaneswar in Indian history dates more than 2,000 years back and mentions the area as capital of the Kalingan Kingdom ruled by Emperor Asoka. [Important India] Here one of the most infamous and savage wars in Indian history occurred and as a result of its severity, it became a turning point in the mindset of the emperor. [Important India]
Ashoka subsequently converted to Buddhism and had a pivotal role in conveying the religion and the message of non-violence in Asia. [Important India]

Throughout the ancient period maritime trade routes with Europe and the rest of Asia induced a cultural opulence and with this numerous temples emerged in and around Bhubaneswar. [Odisha Maritime Museum] Today around 500 temples remain and together with the cities of Konark and Puri, Bhubaneswar constitute the so-called "golden triangle" which makes it an attractive destination for pilgrimage and one of the most visited sites in East India. [Orissa Tourism]

Due to its desirable location at the Bengal cost, the state of Orissa was one of the first areas to fall under British rule. Nevertheless it wasn't until 1936 that Orissa became a separate province in British India and the twin city of Cuttack gained the capital status. Finally with the independence in 1947, Bhubaneswar was once again declared capital of the state. [BMC 1]

Designing a modern capital
With Bhubaneswar as the re-appointed capital, German architect Otto Königsberger was hired to redesign it into a modern city. [Praharaj, 2013] The design was intended a population of 40,000 and with administration as its primary function. Königsberger's design consisted of six units, of which one unit was the administrative center and the remaining five were planned by neighborhood principles. These units were placed in short distance to public facilities such as schools and hospitals. [Praharaj, 2013] The original plan proposed horizontal expansion instead of vertical growth and incorporated wide avenues, gardens and parks in a grid structure. [Praharaj, 2013]

Bhubaneswar today
Today Bhubaneswar is one of the fastest growing cities in the eastern part of India. [UNISDR, 2011] Even though some parts of the city still reflect the intentions by Königsberger, the rapid growth in population has made planning impossible to control. [BMC 1] Today the image of the city appears as a contrast between the central, planned structures and the organically growing outskirts.

Bhubaneswar is one of the few cities in the world that has surpassed its planned projected population in every decade. By 2030 the population in Bhubaneswar will have increased from 885,000 to about two million. [UNISDR, 2011]

Meanwhile the city is transforming from a heritage city into a knowledge based society by attracting educational institutions and information technology based industries. [UNISDR, 2011] Bhubaneswar is thus nowadays characterized as a technology and knowledge hub with even more higher education institutions than temples. [The Sunday Indian, 2012]

"

As the doors of the Bhubaneswar Airport terminal opened, a warm and pleasant breeze welcomed us. It was as if all tiredness from the long journey suddenly disappeared and we were yet again filled with new energy, ready to take in the city. The first meeting with Bhubaneswar was also the first meeting with the Indian people. A crowd of women and children were positioned along the terminal building, trying to get a glimpse of what was going on inside. It took a while for us to realize that this crowd wasn't awaiting anyone, they were simply standing here of curiosity. From the airport, a 30 minute cab ride offered the first insight to the complexity of the city. The longer distance from the airport the more chaotic and informal the city seemed. The skyline was a mix of modern high-rises, ancient temples and poor residential neighborhoods.

- Anne Møller, extract from travel journal

Ill. 25.1

Ill. 26.1

CULTURE
FAMILY PATTERNS AND TRADITIONS

"

Today Sujit, the founder of Bakul Foundation, told a story, which made us sympathize even more with the women of India. We were already familiar with some of the harsh living conditions that women here have to comply with, however as a foreigner it is always hard to determine exactly how severe the conditions are. Sujit told us about his early morning walk to Bakul. Here he inevitably passes by the open drains at the side of the roads, and as he came closer he saw a woman sitting inside the drain. Immediately he thought that the woman had had an accident and needed help, however he soon realized, that the woman had climbed into the drain in order to relieve herself unseen from the roadside.

It is quite surprising that anyone would climb into one of the smelly and unhygienic drains voluntarily, yet it really emphasizes the problem with lack of toilet facilities for women. They have to hide or risk getting assaulted every day when doing one of the most natural human activities.

- Anne Møller, extract from travel journal

As a cause of Bhubaneswar's rich temple heritage, religion and spirituality play an important part of city life. The majority of people belong to Hinduism, however also Buddhism, Islam, Christianity and tribe religions are to be found within the area. [Bharatonline]

Family patterns and traditions
Besides religion, family is a core value in most Indian societies. Marriages have a great significance in Indian culture, and even though "love marriages" have become more acceptable in recent years, most Hindu matrimonies are still arranged. [Lonely Planet Publications, 2013] In some conservative communities dowry is still a matter of concern, although it is illegal. Some families may fall into debt in order to provide the necessary amount of money or present to the daughter's family-in-law. [Lonely Planet Publications, 2013] Once married, the wife traditionally comes to live with her husband's family and takes over the household duties assigned by the mother-in-law. Divorces are generally not well tolerated by society, and widows are expected not to remarry but instead live a life in celibacy. [Lonely Planet Publications, 2013]

The caste system
Although the caste system is not recognized by the Indian constitution, it still has a great amount of influence on social standings in a community, especially in rural areas. [Lonely Planet Publications, 2013] Hindus believe that they are born into one of four castes: Brahmin (priests and scholars), Kshatriya (soldiers and administrators), Vaishya (merchants) or Shudra (laborers). By living a righteous life, they improve their chances of being reborn into a higher caste and hereby into a life with better conditions. [Lonely Planet Publications, 2013] A fifth group, the Dalits or Untouchables, compose a caste beneath the four main castes. This group holds the most demeaning jobs such as servants, latrine cleaners or garbage sweepers. To improve the living conditions of the Dalits, the government reserves a certain number of jobs in the public sector and seats at the university for them. [Lonely Planet Publications, 2013]

Women in India
Women in India are authorized to vote and own property; however they are strongly underrepresented in politics and higher professions. [Lonely Planet Publications, 2013] Especially in low-income families, girls can be considered a financial burden, because of marriage dowry. For that reason the abortion rate of female fetuses is quite high, even though sex identification tests are banned in India. [Lonely Planet Publications, 2013] For women with higher social status, it is still expected that once married she will be a mother and a homemaker above all. [Lonely Planet Publications, 2013]

In the last decade there has been a growing number of reported sexual violence in India but it can be hard to explain this increase. [Neuman, 2013] A part of the explanation could be that the society still is structured by a patriarchal system, which means that women are perceived to be submissive and to be kept under the control and supervision of men. [Kapoor & Dhingra, 2013] These 'traditional' norms and values clash with 'modernity' and the fact that women now have the right to education and waged labor. In that respect the speed of economic change in India has outpaced a change of social patterns. [Neuman, 2013] When women choose to work outside the home and live a more 'modern' life they challenge traditional gender roles and the patriarchal system. Violence and harassment can thus be seen as a way for men to reinstate a patriarchal authority over women. [Neuman, 2013]

CLIMATE
RAINWATER AND SANITATION

Climate
Geographically, Bhubaneswar is situated at the eastern coastal plains of the state of Orissa. [Pruda, 2012] The city is located within a tropical climate and more specifically a tropical wet and dry climate. The average temperatures range between a minimum of around 12 °C in the winter to a maximum of 45 °C in summer. [Pruda, 2012] The city passes through three distinct seasons: Summer from March to June, monsoon from July to October and winter from November to February. [Pruda, 2012] For more information see appendix 2.

Extreme weather
Orissa has been affected by several extreme weather events: from heat waves to cyclones, drought to floods. A heat wave in 1998, a super cyclone in 1999 and a catastrophic flooding in 2001 all took the city by surprise because of the unprecedented amount of sun, wind and rainfall. [UNISDR, 2011]

The civic infrastructure was not prepared for these events and during the super cyclone in October 1999 almost 20,000 people were killed. [Times of India, 2010] Climate-related hazards especially affect the poor and vulnerable citizens, which means those who live in slum and squatter settlements on the railway lines, in poorly drained areas, or in low-lying areas. [UNISDR, 2011]

By 2030, India can expect a 1°C to 1.5 °C rise in temperature and more intense periods of rain. [UNISDR, 2011] Bhubaneswar city has also experienced signs of climatic weather change and the change in temperature means there will be more rainfall, the summers are getting hotter and the winters colder. [UNISDR, 2011]

Lack of toilets
According to The City Sanitation Plan (2012), drafted for the Ministry of Urban Development and the Government of India, the urban sanitation situation is cause for concern and the impact of unsafe sanitation conditions will affect especially the urban poor. [Pruda, 2012] The slum profile of Bhubaneswar shows that many slum dwellers do not have access to either individual or community toilets. This means that a high percentage of the city population is forced to defecate in the open, which increases the risk of spreading diseases. [Pruda, 2012]

The amount of available toilet facilities doesn't comply with the demands of the city, and especially women suffer from the lack of such amenities. As sexual harassment isn't unusual in India, women have to be extra careful when walking alone and when going to relieve themselves in remote areas. [Pruda, 2012] Women typically go defecating early in the morning or after nightfall, which doesn't make the situation any safer for them. The majority of children also defecate in the open and the disposal of infants' excreta in the open is common practice. [Pruda, 2012]

Sewage system
The City Sanitation plan (2012) states that the surface water runoff and domestic wastewater is discharged into the open drains in the roads. Most of these drains have lost their original flow carrying capacity due to dumping of garbage in the drains and to the accumulation of sand. [Pruda, 2012] Narrow drains, drains with improper slopes or non-existence of drains in some areas have caused flooding and thereby increased the risk of diseases. [Pruda, 2012] The Connections from houses to drains are improperly done and cause spilling of wastewater on roads. In absence of an adequate sewerage system, sewage is discharged into open drains without any treatment. [Pruda, 2012]

"

Walking through the local village community near the hotel is also a journey of smells. The narrow street is filled with cows, dogs, street vendors, children and rickshaws - walking here demands awareness and I constantly move sideways avoiding a motorcycle or staying clear of a cow. In some areas the nauseating smell of waste and still sewage water overwhelms me but a few meters ahead I am embraced by the smell of a lovely curry before stepping into a cloud of smoke from a pile of burning garbage.

- Katrine Hoe, extract from travel journal

Ill. 29.1

Ill. 30.1

STREETSCAPE
THE PUBLIC SPACE OF INDIA

“Who would have thought, crossing the road would be one of our most dangerous experiences; Just start walking. Look up and don’t be scared. It was a chaotic scenery with cars, scooters, auto rickshaws, bicycles, pedestrians and cows in one joint mess. The ultimate “shared space”. The honking was the common language of the road and no rules seemed to exist.

Multiple auto rickshaw drivers saw a possibility to make a good deal and offered all foreigners a lift at too high a price. A little negotiation, and suddenly we found ourselves in an overloaded rickshaw in a high pace through the crowd. We passed by a cow calmly walking in the wrong direction chewing on a piece of plastic. At the same time a scooter with an entire family passed by. The man steered the scooter in between the cars, while two children held a tight grip in his shirt. At the back, a woman held an infant in her arms, while her colorful sari fluttered in the wind.

- Anne Møller, extract from travel journal

Infrastructure and atmosphere
Most people know that the traffic in India is chaotic and dangerous. The streets are filled with many different types of road users and in most cases the interweaving of vehicles, motorcycles, cows and pedestrians looks smooth and effortless. There are however also problems related to this giant shared space that is the streetscape of India. For instance India is responsible for the highest overall number of road deaths. [Washington Post, 2013]

Pedestrians are very challenged when they have to cross the big roads of Bhubaneswar. Many of them are oneways with four lanes of traffic headed in the same direction which means that they always are busy. [Times of India, 2012] Additionally there are no diversions, zebra crossings or pedestrian signals in the city and thus the pedestrians become vulnerable. [Times of India, 2012]

The smaller streets have a different character. They can still be busy and chaotic but the users move on more equal terms and cars and motorcycles show consideration for pedestrians and children. An Australian architect visiting a slum area in Delhi describes the streets as the active streets utopia and the type of street and city life that architects and urban designers dream of. [This Big City] The streets of India are lined with shops and small businesses such as vegetable traders, tailors, convenience kiosks and food vendors and the streets are filled with people - young, old, women, children - going about their daily business.

In the streets of Bhubaneswar the community and social capital also become very clear; people interact, talk and trade. Children walk to school and bicycles carrying cargo interweave with groups of chatting people, motorbikes and cows.

Children in the streets
In the streets and public spaces children are everywhere playing cricket, tag or other games. They don’t have properly designed playgrounds so instead they play right in front of their house, in the street and public realm. [Early Childhood Magazine] There is usually a shortage of space inside the houses where they live, and no public spaces dedicated to their use, so instead the parked rickshaws, vending stands, cars and bikes all serve as props in their games. [Early Childhood Magazine]

Children, and especially girls, in India take on multiple roles in everyday life and also have responsibilities in domestic work. [Early Childhood Magazine] This makes children very visible outdoors. Young girls carry infants and toddlers on their hip and move around freely in the narrow pathways and streets of the area. [Early Childhood Magazine] Many houses open up directly onto the street through a simple doorway and the interaction with the people passing by is easy and spontaneous. [Early Childhood Magazine]

The borders between indoor and outdoor seem to be erased in these communities and the street life and private life merges together in a shared rhythm of everyday life routines.

HOUSING
TRADITION AND MATERIALITY

Traditional Indian architecture
The courtyard house is a traditional Indian dwelling. [Creative Sulekha] The first courtyard houses originated in India around 6500-6000 BC and still plays a role in residential architecture today. [Creative Sulekha]

The layout of the courtyard house protected the dwellers from the weather and ensured a cooler environment under the extreme heat in the summers. [Creative Sulekha] Most private houses using this typology had rooms arranged around a central courtyard and doors and windows opening up into side lanes. [Creative Sulekha]

Courtyard housing in India was not just an architectural style. It was a way of life. The courtyard became the core of the structure and it was the spatial and social center of the home. [Creative Sulekha] This form of architecture met with the requirements and tradition of the joint family system. The inner courtyard was a private yet outdoor space, where the residents were secluded from unwanted eyes. [Creative Sulekha]

Vaastu
Indian houses are often laid out according to Vaastu principles. Vaastu is a system of organizing the rooms of a house in order to achieve the most optimal living conditions. Some of the explanations and arguments of Vaastu are linked to superstition e.g. how you ensure your family a happy life, but some of the arguments are more logic and scientific. Bandeesh Patro, a local Bhubaneswar architect explained that the layout also ensures a comfortable indoor climate with natural ventilation and cooling since it takes into account the natural conditions of the wind, heat and daylight.

Materiality and decay
The materials used to create dwellings are of various character and durability. Slum areas use bamboo and plastic covers for shelter while low-income families have the possibility of improving their homes with brick and sheet metal. [Patel & Kunte, 2012] Generally low-income families renovate or rebuild their properties in steps and research shows that they are more willing to invest in upgrading their homes if they have ensured ownership. [Patel & Kunte, 2012]

The houses are very affected by the climate and especially the monsoon season leaves behind traces of decay and instability. Even the more stable concrete buildings are affected by the climate and the high humidity causes the buildings to decompose.

Slum settlement architecture
In India they characterize dwellings in three categories: Kutcha, semi-pucca and pucca. [First Learn] Kutcha houses are made up of wood, mud, straw and dry leaves. These types of houses are also characterized as temporary structures. Pucca housing refers to dwellings that are designed to be solid and permanent and built from stone, brick, cement, concrete or timber while semi-pucca houses are somewhere in between using both permanent and temporary materials. [First Learn]

In a survey it was found that the majority of slum dwellers in Bhubaneswar had self-owned kucha or semi-pucca houses without separate kitchen, toilet and water. More precisely there were 25 % kucha houses, 69 % semi-pucca houses and 12 % pucca houses. [Rout, 2008] Looking at number of rooms, 80 % of the houses had one living room and there were 17 % houses with two rooms. [Rout, 2008]

“

In the slum area by the wetland we met a man who invited us into his home. He was eager to tell us his life story and answered our questions with great enthusiasm. He was new to the area but very proud of his house, which consisted of one room and an adjacent kitchen. The house was in pretty good shape, built in brick and supplied with electricity. He lived with his wife and two children and they all shared the one bed that took up most of the space in the house. Opposite the bed stood two plastic chairs and a small bedside table. When we asked him where his children did their homework he shrugged his shoulders and gave us a strange look. I couldn’t tell if he felt defeated or simply tolerant towards a silly question.

- Katrine Hoe, extract from travel journal

Ill. 33.1

CONCLUSION
PROBLEM STATEMENT

Bhubaneswar is, compared to Indian standards, a medium-sized city of 885,000 inhabitants. Its spiritual heritage is hard to ignore as it has left a remarkable imprint on its architectural expression, which appears to be a mix of ancient temples, modern high-rises, low-income neighborhoods and informal slum settlements. Especially the slum and low-income areas constitute a significant segment of the cityscape, in which the housing and sanitation conditions are particularly inadequate. The limited amount of underground sewers leads to a confluence of rain- and wastewater in open drains and in terms of for instance toilet facilities available, the number is almost non-existent in relation to the demand. As a result the majority of Bhubaneswar's population defecate in the open, which pose a significant health risk. Moreover these conditions are also related with a great security risk, mainly for women, who risk getting assaulted on a daily basis.

The generally poor housing conditions of the city also have severe effects, since most of the low-income or slum settlements are not capable of resisting a monsoon flooding. Therefore they are repeatedly exposed to the spreading of diseases and potential homelessness. The illegal slum settlements are additionally exposed to high levels of uncertainty regarding their rights to habitation. [Datta, 2012] This uncertainty is also a type of violence. [Datta, 2012]

> *We can also consider that for those living in squatter settlements, illegality is a legal, material and cultural violence that they must confront every day. When their settlements is deemed illegal and hence slated for demolition, their identities as urban citizens are called into question, and their practices of every day life are threatened through the violent enforcement of law.* [Datta, 2012: 11]

The poor women and children are an especially exposed group in India. Both groups are exposed to danger in the public realm. Children are in danger of getting hit by cars and motorcycles while playing in busy streets. Women are struggling with suppression both in the public space and at home in addition to dealing with a high risk of sexual harassment.

There is however also much potential that becomes evident when uncovering an Indian context; the blurred lines between private and public generates an extraordinary public life in streets and in-between zones. This kind of rich social life is especially clear in the low-income, residential areas where the simple, self-constructed housing typology supports the public life, since they are primarily designed for shelter and sleeping. All other activities take place outdoors in the public realm.

By analyzing the topics City Development, Culture, Climate, Streetscape and Housing of Bhubaneswar, three evident themes stand out as the city's main, future challenges: *Housing*, *sanitation* and *water management*. These challenges are approached with a focus towards poor and low-income citizens, and especially women and children.

This thesis project deals with the presented challenges in selected sites of Bhubaneswar. By addressing the three main problems it is the aim to solve the following problem statement:

How can urban settlement strategies improve everyday life situations for women and children in Bhubaneswar by using neglected and representative sites as catalysts for improving rainwater management, sanitation and housing conditions?

CHAPTER 02

CONTEXT ANALYSIS

This chapter is based on the findings from the project frame and begins with an analysis of housing, sanitation and water management in Bhubaneswar. Thereafter a representative neighborhood of the city, Satya Nagar, is chosen and a following context analysis of the area's main elements and functions is conducted. Finally the chapter leads to an identification of two specific points of impact based on the theoretical foundation of Leftover Landscapes and Urban Acupuncture.

BHUBANESWAR

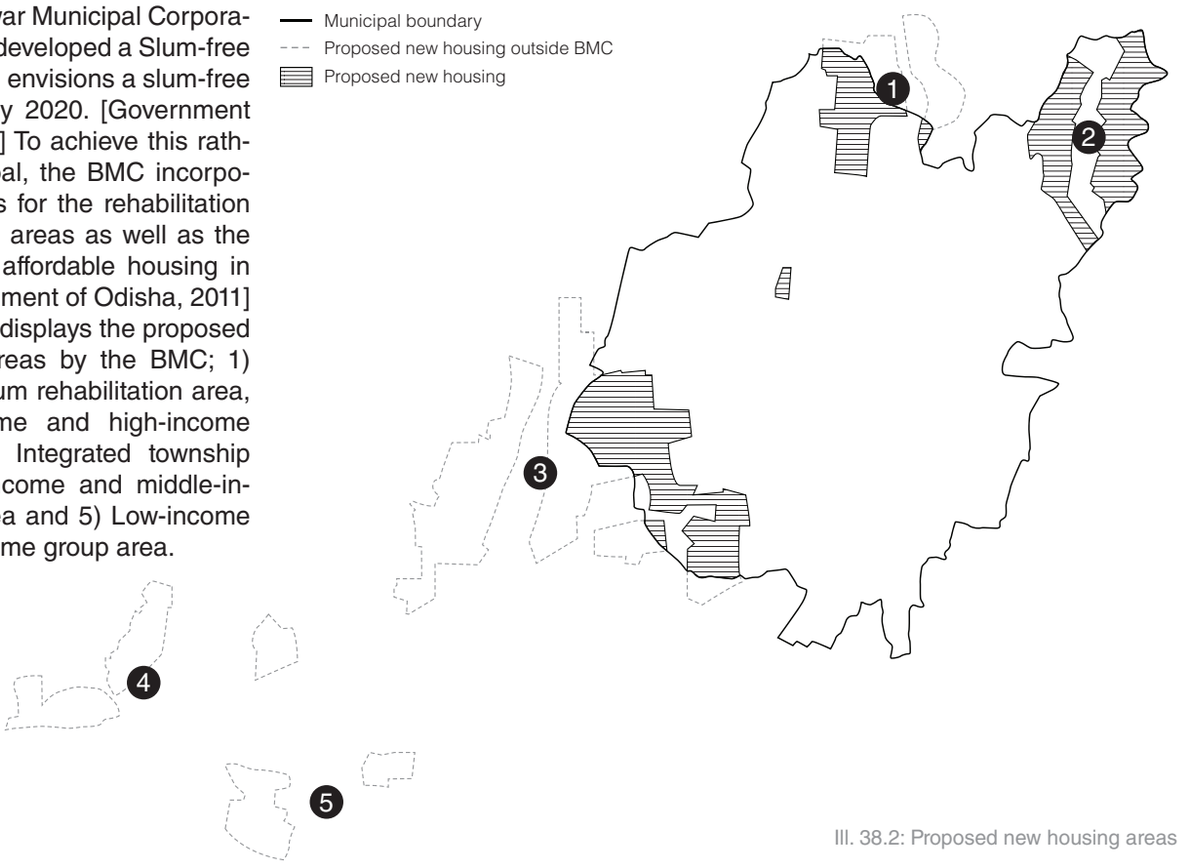
HOUSING, SANITATION AND WATER MANAGEMENT

Housing

Bhubaneswar's population growth rate is escalating concurrently with an exacerbating of the agricultural conditions in the rural areas of the state. As a result people migrate from rural to urban areas in hopes of finding work and attaining better living conditions. Bhubaneswar, however, has difficulties handling this massive influx both regarding generating the amount of jobs demanded and by supplying a sufficient number of affordable housing. Consequently the number of slum settlements in the city is growing. Slums in Bhubaneswar, and in many other developing cities, are most likely to emerge along its infrastructural veins. This originates in the facts that the land along these stretches is often unoccupied and that the best possibility for finding a job is nearby bigger infrastructural nodes. See illustration 38.1. [Orissalinks]

Ill. 38.1: Slum settlements along infrastructure in Bhubaneswar

The Bhubaneswar Municipal Corporation (BMC) has developed a Slum-free City Plan, which envisions a slum-free Bhubaneswar by 2020. [Government of Odisha, 2011] To achieve this rather ambitious goal, the BMC incorporates both plans for the rehabilitation of existing slum areas as well as the construction of affordable housing in the city. [Government of Odisha, 2011] Illustration 38.2 displays the proposed new housing areas by the BMC; 1) Campus and slum rehabilitation area, 2) Middle-income and high-income group area, 3) Integrated township area, 4) Low-income and middle-income group area and 5) Low-income and middle-income group area.



Ill. 38.2: Proposed new housing areas

There is an evident conflict between reality of slum settlements and the intentions by the BMC. By conducting affordable housing and slum rehabilitation at the outskirts, or far out of the city, the slum and low-income dwellers don't have the possibility or desire to relocate.

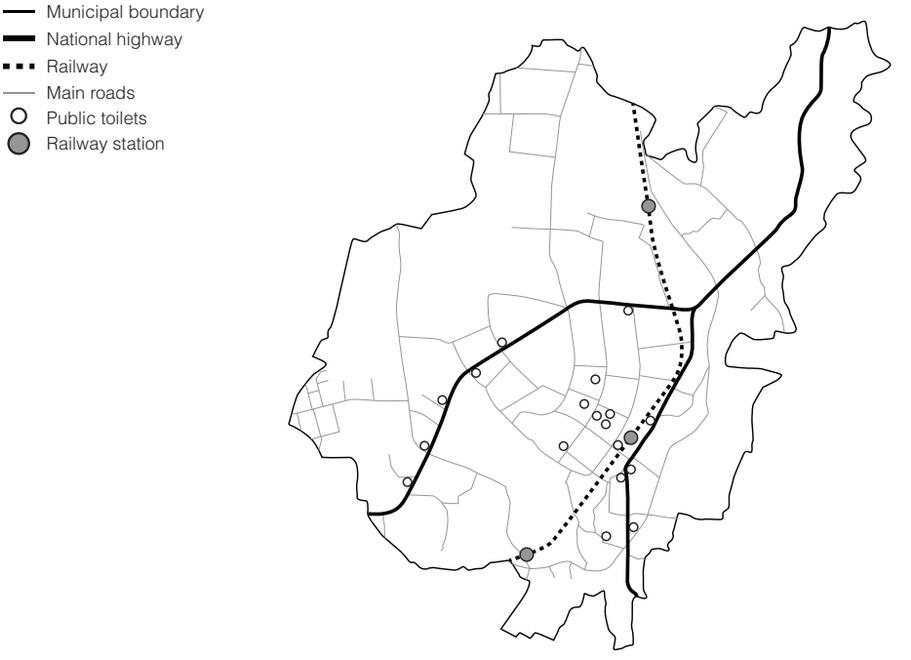
Sanitation

In Bhubaneswar the percentage of people not having access to either private or shared toilet facilities compose around 60 %, which means that the majority of the population, mostly from the economic weaker segments, defecates in the open. See illustration 39.1. [Pruda, 2012]

The amount of available, public toilet facilities doesn't comply with the demands of the city. From the City Sanitation Plan (2012) it appears that Bhubaneswar has around 108 public and community toilets, some of them run by the private sector and with user charges. Illustration 39.2 displays how these facility units are distributed and how most of them are located along one of the major highways of the city. Along the stretch of the railway, where many slum areas are located, the lack of toilet facilities is particularly critical. Consequently the rail tracks are used as an open "public toilet". [Pruda, 2012]

The overall sanitary conditions of Bhubaneswar cause some unhygienic and unhealthy environments, which promote the risk of spreading diseases through contamination of ground water and flies. [Pruda, 2012] Therefore the City Sanitation Plan (2012) proposes to make the city free of open defecation by 2021.

Ill. 39.1: Percentage of population practising open defecation

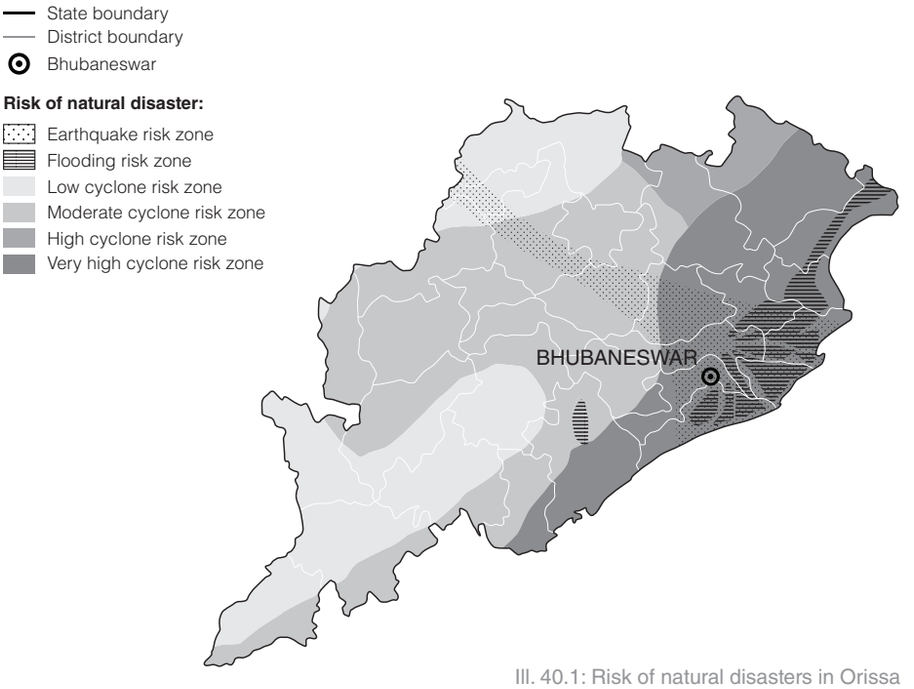


Ill. 39.2: Location of public toilets

Water management
Bhubaneswar, with its location in Orissa by the Bengal Coast, is exposed to different natural catastrophes. [Pruda, 2012] As illustration 40.1 shows, the city is located in a very high cyclone risk zone, in an earthquake risk zone and adjacent to areas that repeatedly get flooded. Even though Bhubaneswar is supplied with storm water drains, the amount only compose a third of what is necessary to prevent water from spilling over into inhabited areas of the city. [Pruda, 2012] Especially the low-income and slum areas suffer from the occurrence of natural incidents as their poor housing conditions make them less resistant. [Pruda, 2012]

The natural topography of Bhubaneswar provides a North-to-South drainage of water running in natural drains onwards to the Daya River, and because of the confluence of wastewater in these natural drains, Daya River ultimately functions as the “main sewer”. [Pruda, 2012] The river carries a substantial load of contamination, from household wastewater as well as industrial pollution. Se illustration 40.2. [Pruda, 2012]

The aim of the City Sanitation Plan is that Bhubaneswar should be provided with a sufficient water management system, to prevent flooding, contamination of water and the spreading of diseases. [Pruda, 2012] Furthermore it is the aim to prevent illegal encroachments to the system as well as educating the population in the correct handling of garbage and wastewater. [Pruda, 2012]



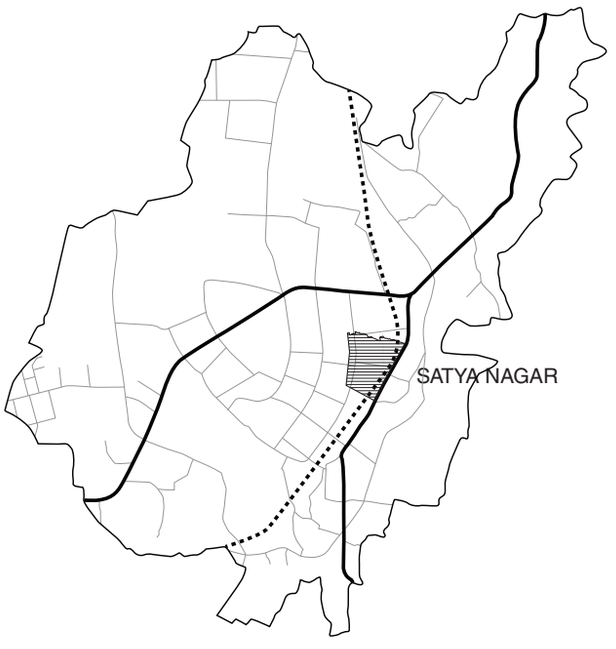
Ill. 40.1: Risk of natural disasters in Orissa

Ill. 40.2: Water chanels in Bhubaneswar

SATYA NAGAR
SELECTING A NEIGHBORHOOD

To address the main problems, found in the project frame and context analysis of Bhubaneswar, and solve them throughout the entire city will be too complex and too extensive a task. Therefore a smaller and representative project context within the city is chosen. The neighborhood of Satya Nagar has a central location in the city and is very diverse with different social layers as well as multiple functions. Furthermore it is the neighborhood in which the initial Design_Lab Orissa workshop and the appurtenant fieldwork took place, and consequently it is the most explored part of the city. As a result the following part of this project will take its point of departure in the conditions of Satya Nagar.

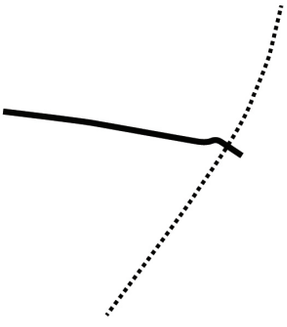
Satya Nagar is located along a stretch of the railway and next to one of the major highways. There are several elementary schools, both governmental and private, a high school and a university in the area. In addition there are a lot of commerce and businesses, which is related to the fact that a big part of Satya Nagar is well-of housing areas with middle and upper class residents. However also several low-income and slum areas pose a share and are a great contrast to the formal part of the neighborhood.



Ill. 41.1: Satya Nagar's location in Bhubaneswar

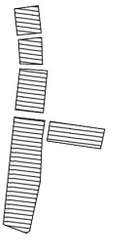
SATYA NAGAR
EXTRACTING KEY ELEMENTS

Ill. 42.1 displays the structural composition of Satya Nagar. Selected elements are extracted based on a clear differentiation in typology and user group and thereby they illustrate some of the conflicts between the formal and informal parts of the neighborhood as well as the gap between gender and social class.

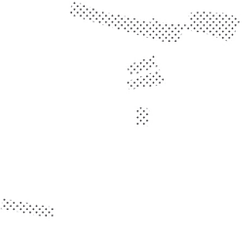


1 Main infrastructure

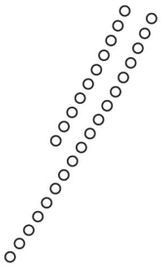
2 Fallow land



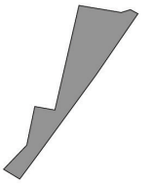
3 Comercial zone



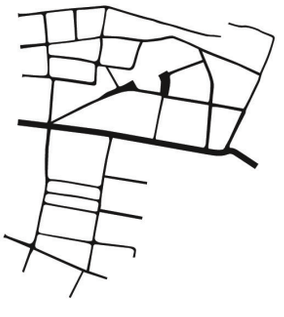
4 Low-income housing



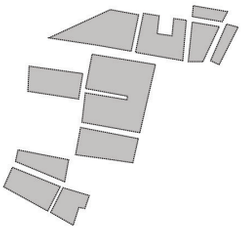
5 Illegal slum settlements



6 Railway land

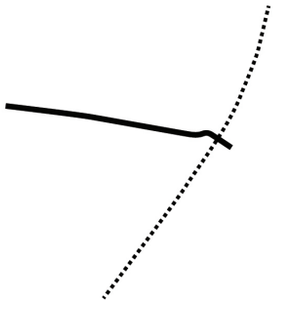
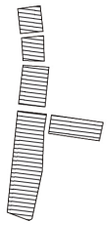
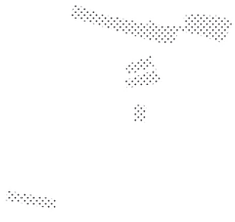
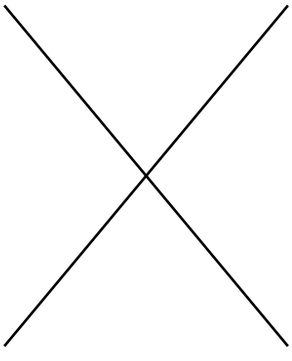


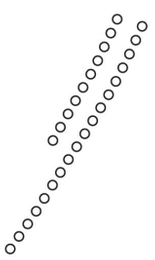
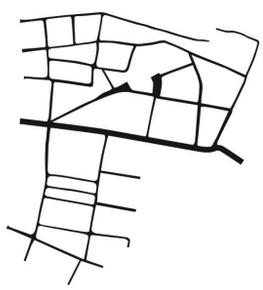
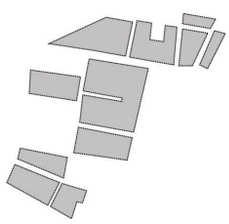
7 Infrastructure / Public space



8 Business / storage

CONTEXTUAL CATALOGUE

	INFRASTRUCTURE	FALLOW LAND	COMMERCE	HOUSING
ABOUT	The two main infrastructural elements of the neighborhood are the Satya Nagar Flyover Road and the railway. The two elements intersect in the East where the road elevates into a flyover in order to cross the rails. Underneath the flyover slum dwellers and low-income vendors have settled down in poorly built structures. The intersection also works as an informal crossing of the rail tracks and is used by pedestrians and bicycles.	In the middle of the neighborhood, surrounded by commerce, business and housing, lays a neglected and fallow piece of land. It is comprised of big piles of sand and building waste along with trees and bushes. There are no users and activities in this area and it is left to grow wild and uncontrolled.	On the edge of Satya Nagar is one of the most expensive roads in Bhubaneswar called Jan Path. Along this road are the most expensive hotels, shopping centers and cafés, which attract the high-income groups of the city, tourists and business people. Jan Path is a six-lane, high-speed traffic road that connects a big part of central Bhubaneswar and can be quite dangerous to cross on foot.	The residential zones highlighted on the map are low-income housing areas. They are characterized by small, chaotically structured units built by semi-robust materials. The main users are women and children using the streets and paths for domestic work and play. The zones are located as small islands in the city and along the wetland in the North.
FOOTPRINT	1 	2 	3 	4 
USER	 Slum children		 High-income shoppers	 Low-income family
MATERIALS	 Concrete and sand	 Sand and building waste	 Concrete and neon lights	 Metal sheets and bricks

	SLUMS	RAILWAY LAND	PUBLIC SPACE	BUSINESS
ABOUT	In relation to the intersection of the flyover and the rail tracks slum settlements have started to develop along the railway. The users are poor families from the rural areas who have moved to Bhubaneswar and are forced to settle down on illegal land since they cannot afford to live in the legal and formal part of the city. Their houses are in very poor condition and built from whatever materials they have handy - primarily from bamboo and old plastic covers.	Located along the rail tracks is a big area owned by East Coast Railway. The area is enclosed by concrete walls and used as railway yard and washing complex since Bhubaneswar Railway Station is located just south of Satya Nagar. The walls built to enclose the area are used by slum settlers to build up against.	There are no public spaces as known from the western part of the world. However the streets are a big part of public life in Bhubaneswar. The streets are all shared spaces where cows, bicycles, cars, rickshaws and people meet. Additionally many private functions such as washing clothes take place in the street.	Satya Nagar is also characterized by many enclosed business and storage facilities especially in the southern part of the neighborhood. These are surrounded by tall concrete walls and barbed wire and create a lot of barriers and edges in the city. These vertical edges are often used by vendors and settlers to build up against in order to create stability in their structures.
FOOTPRINT	5 	6 	7 	8 
USER	 Slum family	 East Cost Railway Company	 Children	 Low-income worker
MATERIALS	 Bamboo and plastic covers	 Metal, concrete and pebbles	 Asphalt, sand and garbage	 Concrete and barbed wire

CONCLUSION
APPLICATION OF THEORY

Shelter is a prerequisite for the well-being of all humans; however as one-fifth of the world's population live in slums, a large amount of people doesn't have adequate housing conditions. [Government of Odisha, 2012] As a consequence of the ongoing urbanization in cities of developing countries this problem is intensifying, and the city of Bhubaneswar is no exception. Housing conditions in the city are characterized by the great number of inhabitants living in poorly constructed shelters in slum or low-income areas. The municipality aims at eliminating slums by 2020, however their current approach of building affordable housings far out of the city, is rather dubious. Therefore new affordable housing areas in the central part of the city are much needed.

Going to the toilet is a basic human need and something that most people take for granted, however in some developing countries, this activity is related with multiple challenges. The lack of public toilet facilities in Bhubaneswar is quite problematic as it poses both a security and health risk. Especially slum and low-income areas are affected by the lack of such amenities. The BMC's vision of an open defecation free city by 2021 calls for the implementation of a large amount of public toilet facilities, strategically located to comply with the most exposed segment of the population.

The insufficient management of water in the city results in pollution, spreading of diseases and occasional flooding. To address this problem is relatively complicated as it demands a larger water management system with a separation of rain- and wastewater. However simple and low-cost solutions can be incorporated to improve living conditions of inhabitants in the local neighborhoods.

Satya Nagar is a diverse and representative neighborhood of Bhubaneswar. The area is characterized by a contrast between its formal and planned parts and its informal and unstructured parts. Furthermore the area contains more empty storage facilities and thereby the contrast between enclosed and open areas poses a significant role in the experience of the area.

By analyzing Satya Nagar and implementing the theories of Terrain Vagues and Leftover Landscapes it is possible to identify two leftover spaces and thereby two critical points of impact. They have different characteristics and uses but both are they neglected and without design intentions. Furthermore common to both sites is that they are typical areas, which can be found in multiple sites within Bhubaneswar and in other Indian cities. By applying Urban Acupuncture as a strategy, these two sites can be designed with the purpose of generating a ripple effect and gaining a greater impact in the city.

The first site, Railway Basti, is located in the infrastructural junction point next to the railway and under the flyover bridge. The site is surrounded by formal borders including both rails and high concrete walls enclosing the adjacent businesses. Some illegal slum dwellers have settled down at the site and are living without proper housing and sanitation. The space doesn't exist in the mentality of the formal city and thus it is a non-place. The second site, Kharbel Community, is the piece of fallow land located near the formal and expensive part of the city. The vacant building plot is without any functions, uses and activities. Using the notion of Tom Nielsen (2001) the selected sites fall within the Leftover Landscape categories; Railway Basti is a Leftover Space framed by infrastructure – located next to the rail tracks and under a flyover bridge and Kharbel Community is a Leftover Hill shaped by a depot of building waste.

Finally the two selected and representative points of impact provide an opportunity for creating a large-scale and long-term strategy for developing similar areas in central Bhubaneswar.

Ill. 47.1

CHAPTER 03

SITE ANALYSIS

In the light of the results from the context analysis of Satya Nagar and the two extracted sites, this chapter treats an individual analysis of them. Each analysis is composed by a phenomenological description of the site, a section displaying the site in terms of proportions and a mapping of key elements. Finally the chapter results in a summative conclusion, which forms the ground for the phrasing of one specific design tactic and three actions for each site.

RAILWAY BASTI
ANALYSIS

The area is dominated and characterized by two intersecting infrastructural arteries: The rail tracks and the flyover. Passing under the flyover there are vulnerable sheds used as dwellings, children in shredded or no clothes and a woman sitting on a rock with distant and sad eyes. The dwellings are in poor shape; simple bamboo sticks and plastic covers make it out for a home. Most of them don't have a proper roof but rely solely on the shelter from the flyover.

Piles of sand and dirt shape a landscape of ditches and shallow water ponds used by the residents of the area. By the looks of the ditch it is used for everything: Rainwater, wastewater and trash. There is no technical infrastructure - no electricity, no drains and no water. The women have to carry the water from the nearest pump a couple of hundred meters away.

There is a flow of people and bicycles using the flyover as a spot for an unauthorized railway crossing. People get off their bicycles, pick them up and move over the tracks to the other side where small vendors and a hairdresser have settled down under the concrete flyover structure. The flow is mostly limited to bicycles, motorcycles and pedestrians but also cars and trucks find their way to the more unauthorized streets moving through the area and along the flyover. The flyover is a high pace road where it would be unsafe for pedestrians to travel and as everywhere else in Bhubaneswar it doesn't have sidewalks or bicycle lanes. Moving across the rail tracks is the easier and possibly safer alternative for these vulnerable road users.

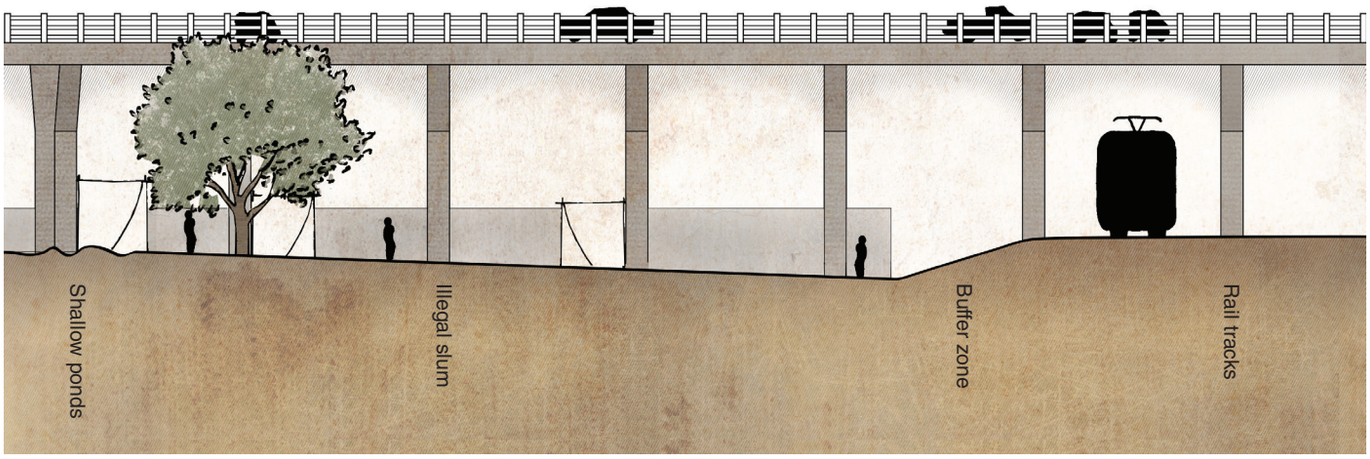
Bordering the rail track is a dump yard; an abandoned space entered from under a rusty and neglected sign that displays the ironic vision of a clean city in 2030. Concrete walls with barbed wire on the top frame the dump yard. The clear signal from the surrounding businesses and storage facilities is not welcome. The Basti is located on illegal premises and is a neglected and an almost forgotten area of the city. It is caught in between infrastructural elements and big enclosed businesses. It is an area without evident use or purpose and exactly for that reason it is an opportune area for poor city dwellers to settle down.

■

Ill. 50.1: The section displays the terrain with the elevated rail tracks and the shallow ponds of rain- and wastewater. In the backdrop the flyover bridge creates shelter for the illegal slum dwellers.

Ill. 51.1: The Railway Basti is a mental non-place of the city. It functions as an incipient slum area and is a typical example of illegal settelement along infrastructural veins.

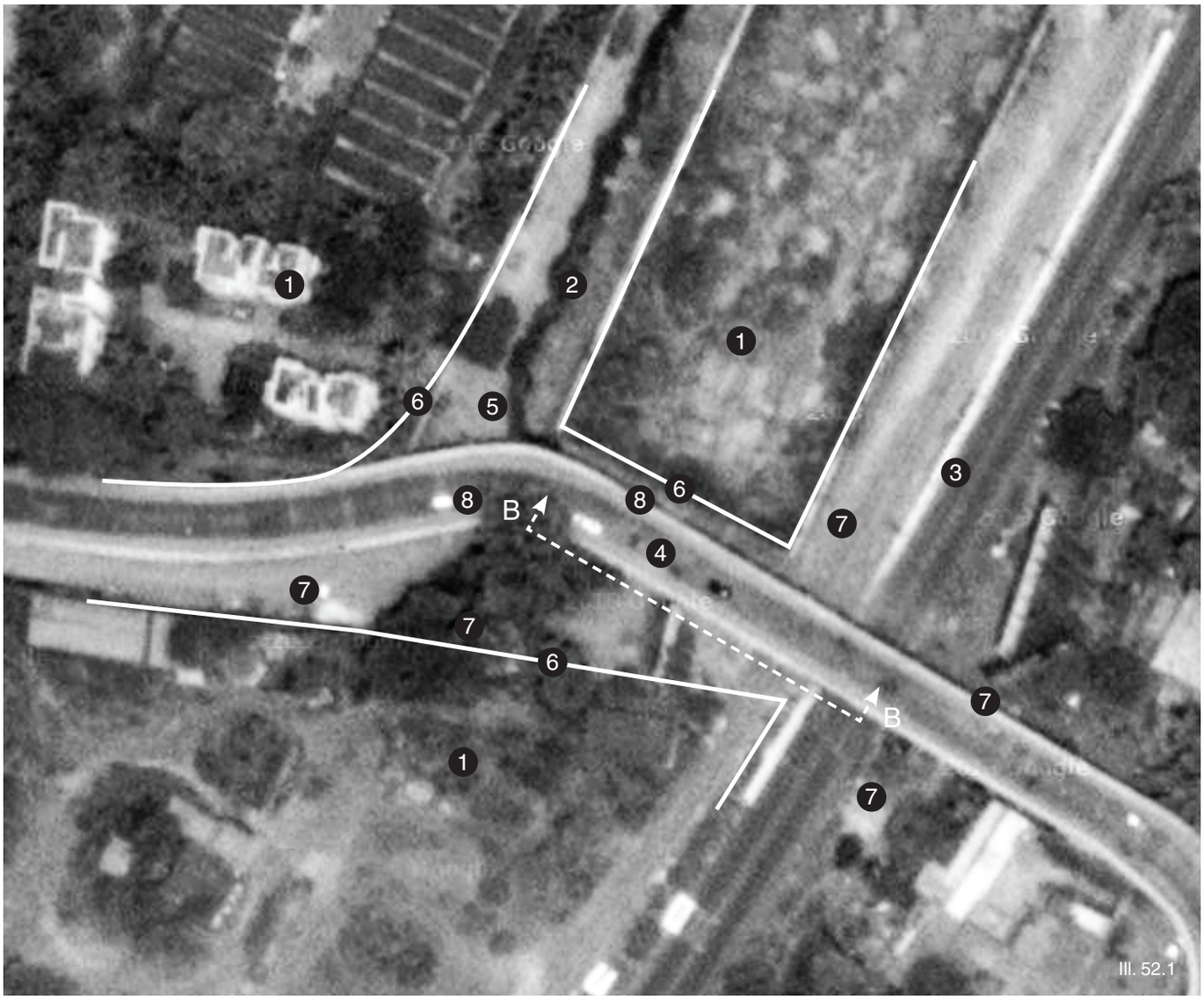
Ill. 50.1: Section AA



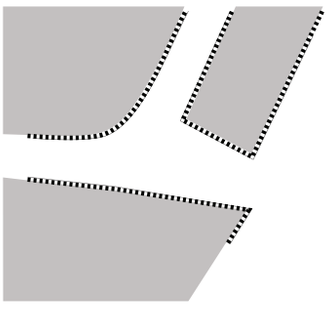
Ill. 51.1

RAILWAY BASTI

ANALYSIS

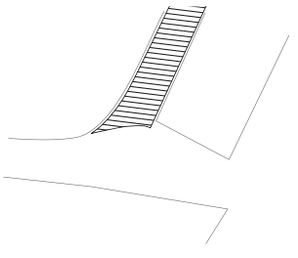


Ill. 52.1



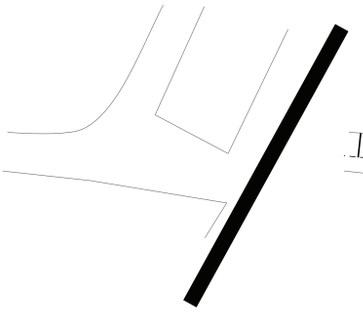
1 Enclosed areas and edges

Many storage facilities are located around the site. This creates edges and borders to the surrounding city.



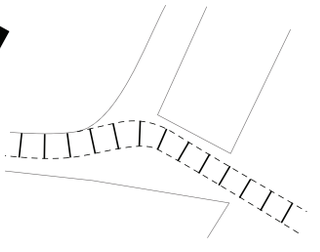
2 Dump yard

The main entrance to the area is through an empty dump yard area which mainly works as an infrastructural element.



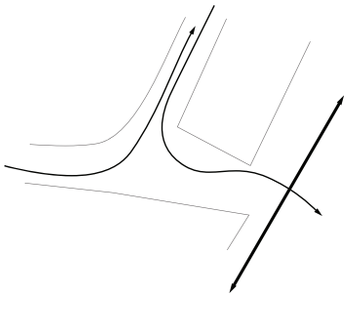
3 Rail tracks

The rail tracks run under the flyover bridge and create a barrier to the other side. The train generates noise and dynamics.



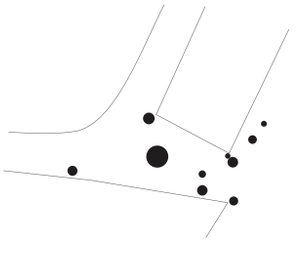
4 Flyover bridge

The flyover is one of the main roads in Bhubaneswar and connects two parts of the city. It leaves an empty space beneath.



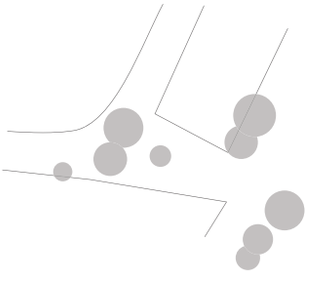
5 Flow

The constant flow of trains compose the main motion of the area, while commuters on foot or bike compose a minor flow through the site.



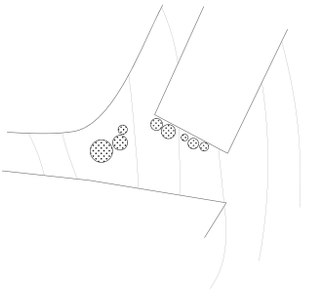
6 Trees

The existing trees provides the dwellers with shelter and shadow. There is a big tree in the center of the site where the children have put up a swing made from old clothes.



7 Settlement

Families and street vendors have settled down under the flyover and are using the pillars of the flyover and the edges of the storage facilities for building their houses up against.



8 Terrain and risk of flooding

The natural terrain is leading rainwater to the East, however large puddles of rain- and wastewater are still to be found within the site.

KHARBEL COMMUNITY
ANALYSIS

Pulled back from two of the main roads in Bhubaneswar is an empty, fallow area. In the municipal plans it is laid out as a residential plot but right now piles of sand and building waste is taking up the space. Around the plot are many businesses and enclosed areas, which means that the atmosphere is dominated by traffic flow and no vibrant urban life.

To the south of the plot is however a residential area characterized by low-rise units in an organic and chaotic structure. The residential area is the source for many activities and people. The residential area doesn't have any public spaces but uses the streets as their primary social gathering points.

The landscape of the plot is a strange mix of waste, sand and large trees and the wild character of the plot is nowhere else to be found in Satya Nagar. The large piles of sand and waste underline the fact that this spot is a neglected leftover space in the city.

Approaching the plot from the north reveals many contrasts and opposites. It is a strange experience moving from the bigger streets of Bhubaneswar with shopping centers, polished glass facades and cafés to and industrial area with concrete walls making the streetscape less than exiting and then discovering an island of fallow land that doesn't have any relation to its urban context.

The users of the area are limited to commuters and children riding their bicycles and no one is moving across or into the plot.

■

Ill. 54.1: The section displays the undulating landscape and the adjacent low-income, residential neigborhood south of the site.

Ill. 55.1: Kharbel Community is a vacant residential plot without any functions. Trees and piles of sand and waste compose the landscape of the site.

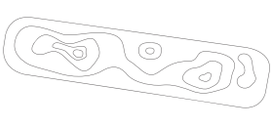
Ill. 54.1: Section BB

Ill. 55.1

KHARBEL COMMUNITY

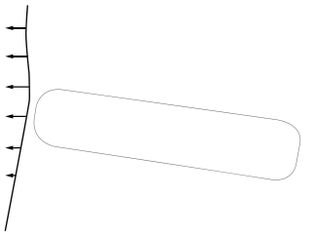
ANALYSIS

Ill. 56.1



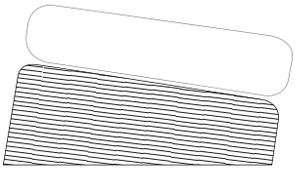
1 Undulating landscape

The area itself is dominated by big piles of sand and building waste creating an undulating landscape.



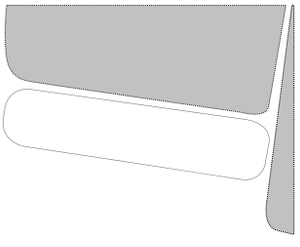
2 Backsides

To the east is the backside of one of the most expensive roads of Bhubaneswar with hotels and commerce.



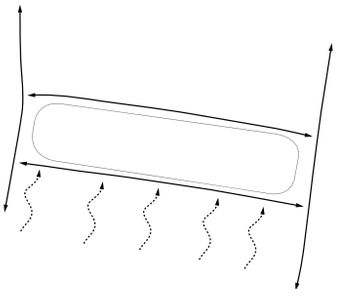
3 Housing

South of area is a low-income residential area with small units and a dense and organic structure.



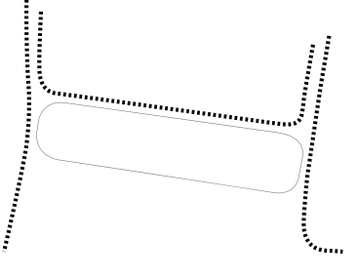
4 Enclosed areas

North and west of the area are large enclosed businesses creating hard and introverted edges.



5 Flow

There is no flow across the site, however a flow of bikes, scooters and cars is to be found along the adjacent streets.



6 Edges

West, north and east of the site, the areas are enclosed with hostile fences. Only the low-income residential area south of the site adresses Kharbel Community.

7 Terrain

The natural terrain leads rainwater from Northwest to Southeast.

CONCLUSION
TACTICS AND ACTIONS

Offhand the two sites in Satya Nagar seem very different, both in terms of physical settings, functions, user groups and challenges. However common to both sites is that they immediately leap out as somewhat leftover or unplanned spaces with great potential of transformation.

The Railway Basti contains some challenging problems, such as the immediate need for basic household utilities and the poor dwelling conditions. At the same time one can't disregard the fact that the dwellings are located on illegal premises. Furthermore the challenges of this project site also deal with an international problem with illegal slum settlements along infrastructural veins. As in many other big cities, Bhubaneswar has experienced a massive growth in population, to which the building development can't compare. Indisputable this will result in more illegal settlements, of which most of them will be located at sites such as the Railway Basti. Due to that the project site has the potential to be an example of how such areas can be developed with simple and low means and with focus on improving the living standards of the dwellers.

The empty residential plot at Kharbel Community is interesting because of its potentials rather than its problems. This site gives many possibilities and is an ideal location for further densification of the center of Bhubaneswar. The project frame revealed the many challenges that Bhubaneswar face today with massive urban growth and poor living conditions for the new urban settlers. Kharbel Community provides the opportunity of creating an ideal living situation for low-income families with an integrated design for rainwater management in an area near the possibility for a job. The design for Kharbel Community can reflect values and principles applicable to other parts of Bhubaneswar as well.

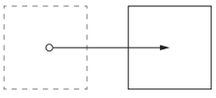
Combined the transformation of the two sites in Satya Nagar should contribute to a development of the neighborhood with focus on housing sanitation and rainwater. Additionally the design should inspire the city of Bhubaneswar to reconsider their approach to urban growth. The two acupunctural designs should be viewed as alternatives to the municipality's strategy of resettlement.

In order to approach the different sites with attention towards their different contexts and characteristic a set of tactics is defined. The tactics outline an overall gesture that is able to induce impact on a respectively local, regional and global scale. For Railway Basti the tactic is *Converting the mental non-place* and for Kharbel Community it is *Establishing the vacant plot*. Converting the mental non-place refers both to a physical and mental transformation that will place focus on the integration of the Railway Basti in the city and in the minds of its inhabitants. Establishing the vacant plot implies creating something new from scratch, however the current conditions of the site still have to be implemented as a potential, making this area a part of the "lived" city.

Each tactic is followed by three actions. The actions are a series of steps guiding the further design development. The actions are direct responses to the three main problems outlined in the project frame: Housing, sanitation and rainwater management. Together the tactics and actions outline the intentions and design parameters of the project.

INDEX
A

NAME
RAILWAY BASTI



TACTIC

CONVERTING THE MENTAL NON-PLACE

ACTIONS

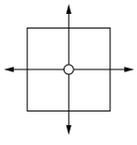
1. Sculpt the ground to manage rainwater in a simple and low-cost manner.

2. Organize toilet facilities around a structuring element.

3. Merge structure and landscape to ensure flow and public spaces.

INDEX
B

NAME
KHARBEL COMMUNITY



TACTIC

ESTABLISHING THE VACANT PLOT

ACTIONS

1. Compose the urban landscape to handle local rainwater using infiltration and retention.

2. Interlace private and public functions in a shared, affordable housing typology.

3. Position the typology in a dense formation along the existing contour lines.

CHAPTER 04

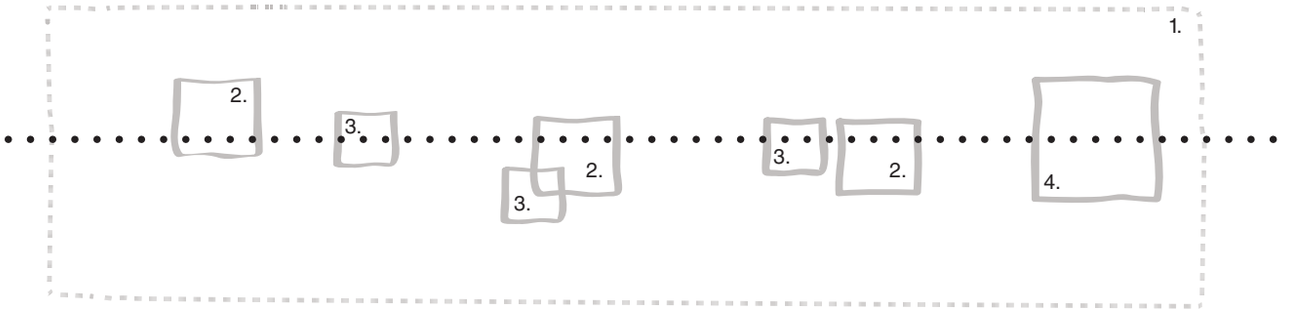
DESIGN DEVELOPMENT

In this chapter the program and development of the two design proposals are presented. The development is illustrated in conceptual diagrams and structured according to the previously defined actions. Each action is carried out through a series of steps and design principles.

General for both sites is that the first action deals with rainwater and landscape design, the second action relates to a generic unit whit a specific program and the third action illustrates how the unit and landscape is integrated and affected by each other.

RAILWAY BASTI

CONVERTING THE MENTAL NON-PLACE



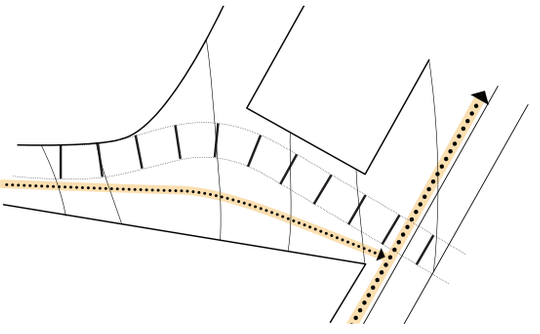
Ill. 62.1

1. Housing
2. Toilet facilities
3. Public spaces
4. Temporary interventions
Flow of traffic and rainwater

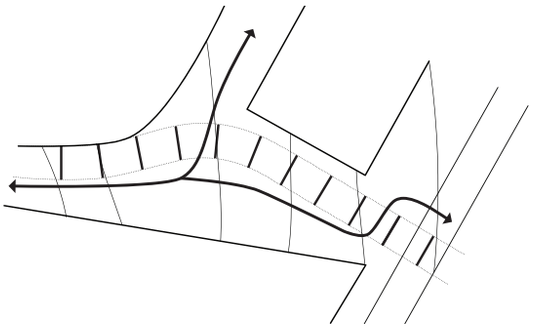
As illustrated and explained in the analyses, the Railway Basti will most likely develop into a dense slum area and thus the main program for the site will be housing. The dwelling typology itself is however not the focus of this project. Instead providing toilet facilities to the residents will be the center of attention, as it is a program lacking in many slum areas of the city. Furthermore ensuring quality in the public spaces, which includes providing opportunities for easy access and stay in the public realm, will be a key parameter for developing the design proposal. Especially conditions for women are in focus when choosing toilets as one of the main programs at the Railway Basti. The toilets will improve the living standards of the area since they provide an alternative to defecation in the open. Moreover the toilets are located in close connection to the public flow in order to create a safer environment for women. Having the constant public flow nearby the units will reduce the risk of assault and sexual harassment for women. Public spaces are another important program of the Railway Basti. Since the slum areas usually grow extremely dense and unhealthy it is a priority to ensure open spaces where children can play and the residents can meet and interact. In addition to ensuring a flow of traffic it is also essential to create a system for draining the rainwater. Due to the poor construction of the slum dwellings, they are less resistant to flooding, and therefore it is important to keep the rainwater out of the houses by creating drainage on the street. Finally the space underneath the flyover in the intersection with the public flow has the potential to be used for several community programs such as a pop-up school, a health clinic or skill training activities for women in order to strengthen and empower the community, and women and children in partiqular.

In the following pages the actions of the design development for Railway Basti is clarified in a series of steps. Attention is especially paid to the third and final action where the architectural units are merged and integrated in the landscape.

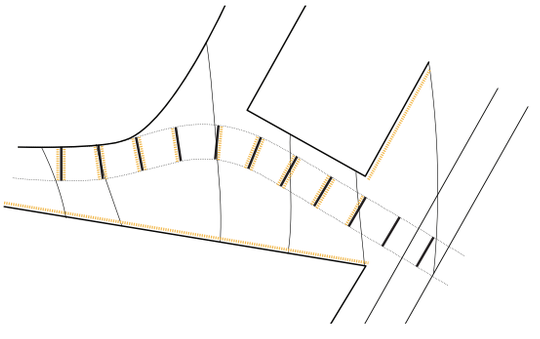
1. SCULPT THE GROUND TO MANAGE RAINWATER IN A SIMPLE AND LOW-COST MANNER



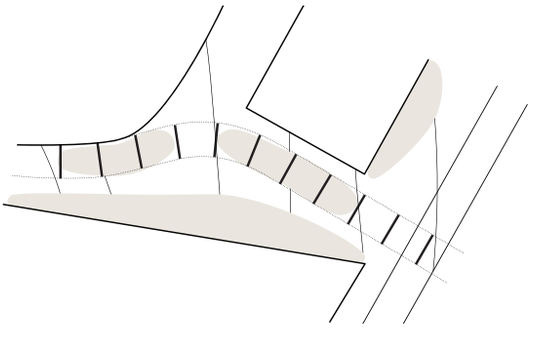
1.1 Drain rainwater in swales according to terrain



1.2 Preserve the existing flow



1.3 Use existing walls as a potential for future development



1.4 Use soil from excavated swales for creating dwelling islands

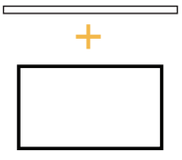
The Railway Basti is located on illegal land and thus the management of rainwater has to be done in a simple and low-cost manner. The rainwater is drained in swales according to the existing contour lines running from West to the rail tracks in East. The natural terrain allows a large drain running along the rail tracks and serving a large part of the city. This drain ends up in a wetland located Northeast of the site (1.1). Besides having to manage the rainwater it is crucial to preserve the existing flow and use it as a potential in the development. Subsequently the drainage of rainwater will be integrated with the flow. (1.2)

As mentioned in the analysis, slum dwellers use existing walls to stabilize their homes and therefore the edges surrounding the Railway Basti are most likely to be utilized in this way. These edges are primarily located underneath the flyover along its pillars and along the wall towards the South (1.3).

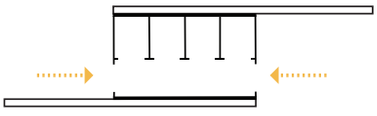
Based on these observations it is possible to create residential islands using the soil from the excavated swales and thereby generate a safer foundation for the future and inevitable slum development. (1.4)

2. ORGANIZE TOILET FACILITIES AROUND A STRUCTURING ELEMENT

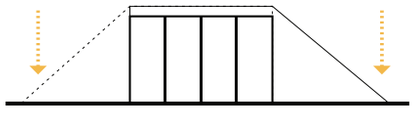
2.1 Spaces of possibility



2.2 The wall and the unit

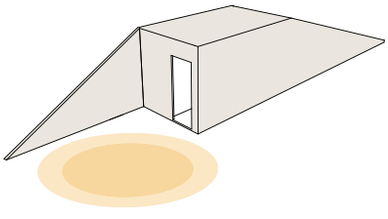


2.3 Access from two sides

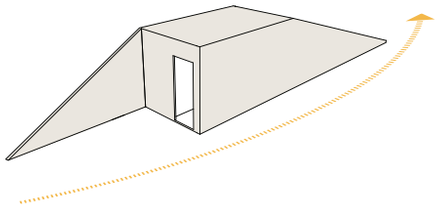


2.4 Lowering the corners of the wall

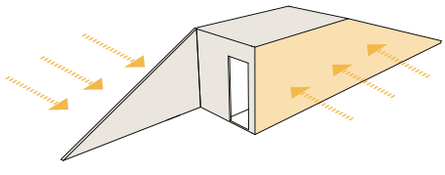
Principles of implementation



The wall ensures public spaces



Flow integrated with the unit generates a safer environment for women



The wall offers the dwellers the possibility of building up against for structure and stabilization

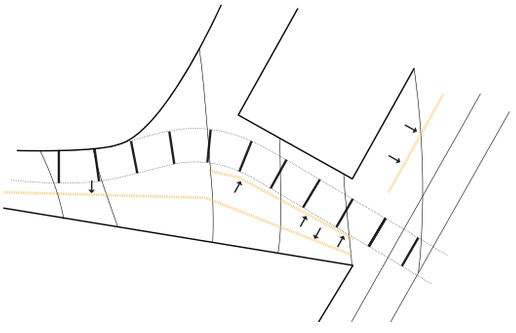
The inherent potential of the Railway Basti lies in the possibilities of the spaces underneath the flyover. These spaces offer a spatial quality along with the practical convenience of shelter for the dwellers that choose to settle down underneath it (2.1). A main element, extracted from the analysis of the Railway Basti, is the potential of the wall in relation to the construction of dwelling units. (2.2). By rethinking this unit and the wall a new toilet structure that provides access from two sides, is created. (2.3) The walls, supporting the toilet and allowing additional support for future dwellers, are lowered down in the corners permitting a visual connection and minimizing the physical barrier (2.4).

Pairing the wall and the unit provides a number of constellations and possibilities. The parameters applying to this project is the ability of the structure to ensure public and enclosed spaces and thereby creating small pockets in the upcomming, dense slum area. It is equally important that the structures are placed in relation to the flow in order to create a higher level of safety for women using the facilities and finally an additional feature of the structure is that slum dwellers can use it for stability and structure for their homes.

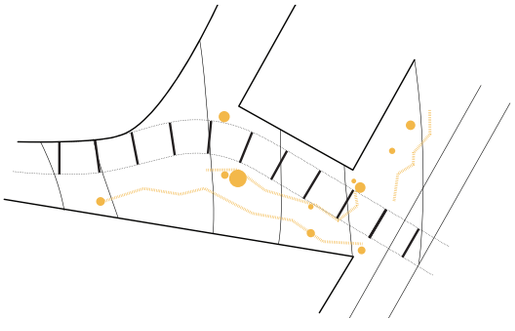
The third action involves merging the ideas of the landscape from action one with the unit presented in action two. First of all the wall is implemented along the flow (3.1) and next the wall is modified according to the location of existing trees (3.2). This deformation creates pockets in relation to the trees, which gives a pleasant shadow in the public spaces (3.3). The swales presented in action one are located along the wall (3.4). For further details, see appendix 3. The excavated soil from the swales is used to create islands for the future slum dwellers (3.5). At this point the walls are varied in height in order to create access and visual connections and at the same time the toilet units are implemented inside the wall structures providing access from two sides; the private and the public (3.6). As the density of the area increases it is possible to implement more wall structures along the rail tracks (3.7) and finally as the slum is fully developed, the flyover offers the opportunity for implementing temporary community programs. The infrastructural node near the rail tracks is an evident place to locate fuctions such as a pop-up school for children, a temporary health clinic and skill training for women.

3. MERGE STRUCTURE AND LANDSCAPE TO ENSURE STABILITY AND THE OPPORTUNITY FOR PUBLIC SPACES

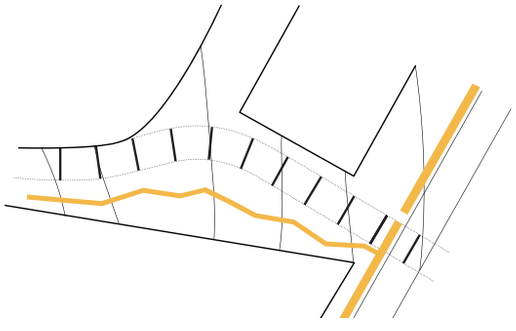
3.1 Implement wall structure to ensure the existing flow



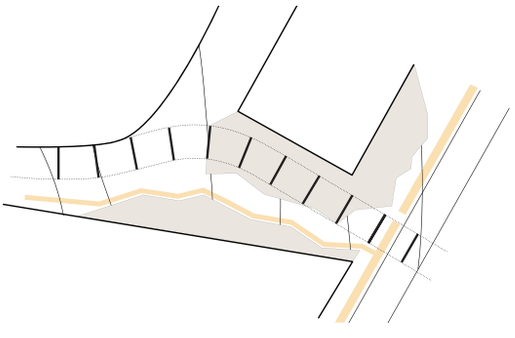
3.2 Alternate the course of the wall according to trees



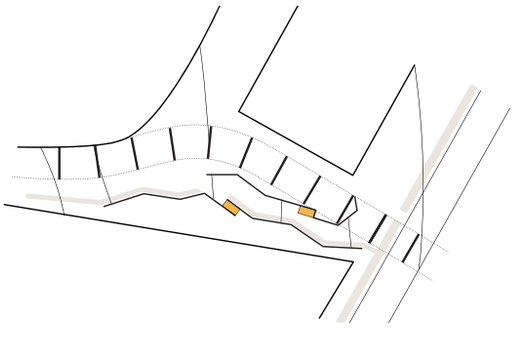
3.3 Create open spaces in connection to the trees



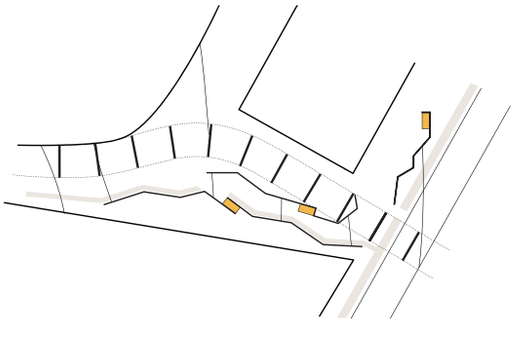
3.4 Implement swales along the wall and the railway



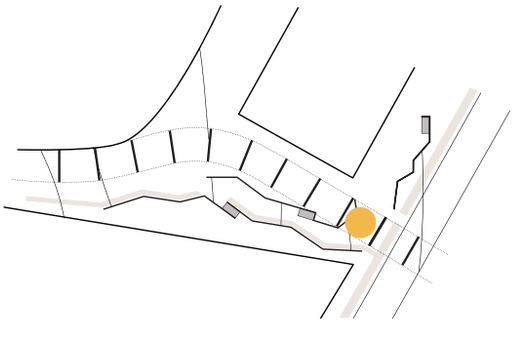
3.5 Utilize soil from swales for dwelling islands



3.6 Alternate the height of the wall and implement units



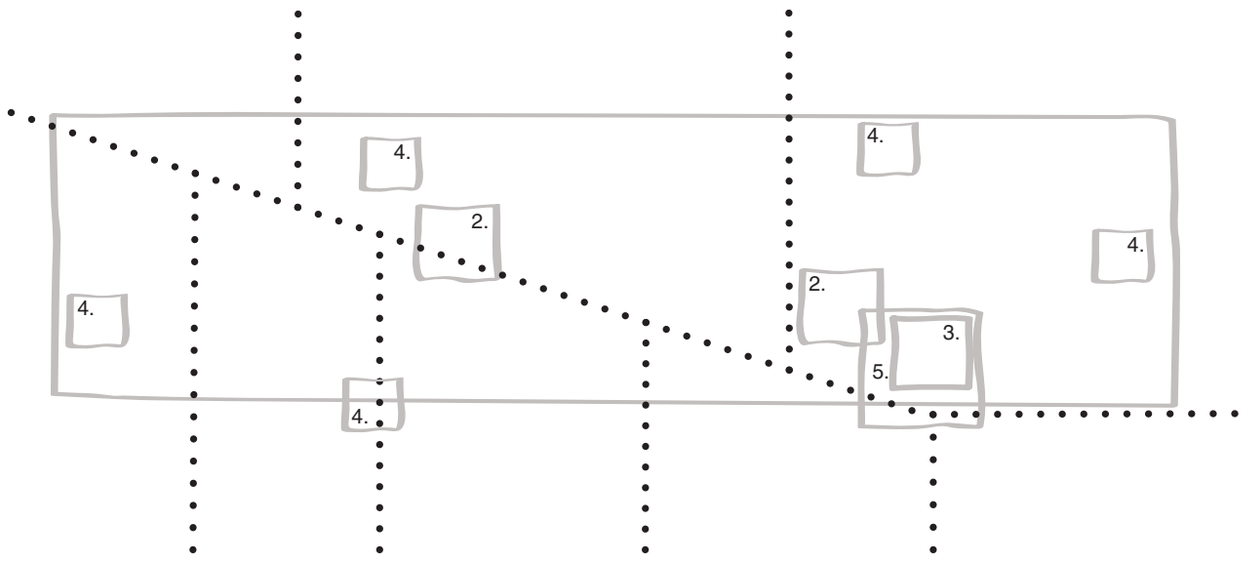
3.7 Implement an aditional wall as the density increases



3.8 Conduct temporary community programmes under the flyover

KHARBEL COMMUNITY

ESTABLISHING THE VACANT PLOT



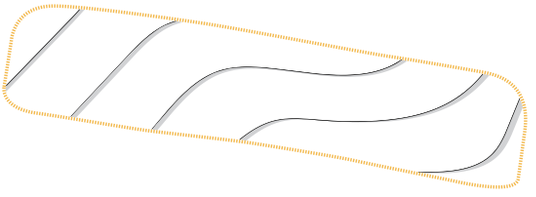
Ill. 66.1

1. Housing
2. Vendor zones
3. Playground
4. Urban farming
5. Rainwater basin
- - Flow of traffic and rainwater

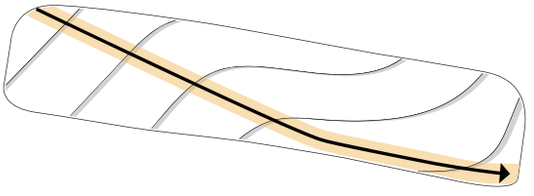
The programs of Kharbel Community has emerged from the analysis where it was discovered that there is a lack of housing for the low-income segment of the population. Due to the size of the plot it is possible to create a new community within the neighborhood. The ambition is that this community will interweave with the existing residential area to the South and provide the public functions currently missing from this site. This includes a public space with a playground for children, vendor zones that function as small meeting places in the city and finally of urban gardening. Another primary function is rainwater management with drains located along infrastructural veins, ending up in a retention basin in the lower part of the plot. Some of the functions are overlapping in order to create synergies and thus the playground is located within the rainwater basin in order to double program it and motivate the residents to maintain and take ownership over the basin. The vendors are located near the infrastructural nodes and the urban farming is dispersed throughout the area creating multiple zones for especially women to meet and interact. This particular function of urban farming is meant as an empowerment of women and because women are reluctant to stay in the larger public spaces, typically dominated by men, the urban farming is pulled back from these and is instead located in between the housing units.

On the following pages the actions defined in the previous chapter are elaborated step by step to illustrate how the intentions of this design proposal are translated into physical form and design. The first action deals with the landscape and rainwater management, the second action is related to a generic architectural housing unit, developed to accommodate the program and finally the third action merges the landscape and unit in a holistic design proposal.

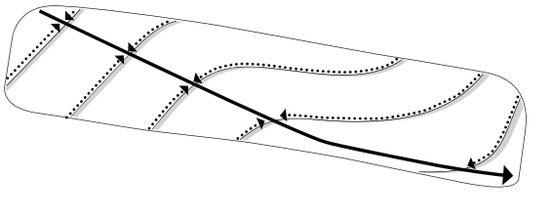
1. COMPOSE THE URBAN LANDSCAPE TO HANDLE LOCAL RAINWATER USING INFILTRATION AND RETENTION



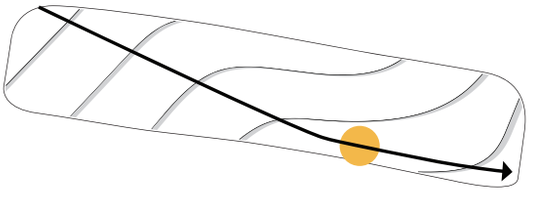
1.1 Manage rainwater locally



1.2 Utilize terrain to drain rainwater



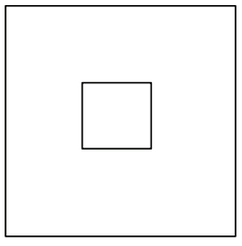
1.3 Implement a system of canals



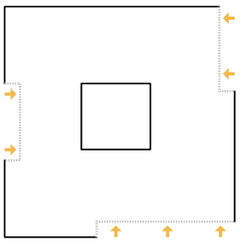
1.4 Implement a retention basin

Due to the location of the site just behind a big road with large drains it is possible to handle the rainwater locally only managing a relatively small catchment area (1.1). Due to the inclination of the terrain it is natural to lead the water in a diagonal angle across the site in a canal. The rainwater is managed in an open system since it is easier to maintain and repair in case of clogging (1.2). In addition to the main canal, a system of adjoining canals is implemented. The system of canals will follow the contour lines of the landscape and flow towards the main canal running orthogonally on the contour lines (1.3). Located In the southern part of the site, across the course of the main canal, is a retention basin. The basin will infiltrate the water into the ground and at the same time the smaller outlet will delay the flow of water to the surrounding neighborhoods. The basin is able to store water in times of heavy rainfall and later release the it into the adjacent drains with a more moderate flow (1.4).

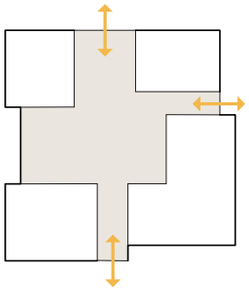
2. INTERLACE PRIVATE AND PUBLIC FUNCTIONS IN A SHARED, AFFORDABLE HOUSING TYPOLOGY



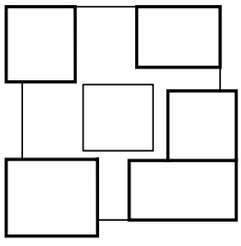
2.1 Use traditional courtyard



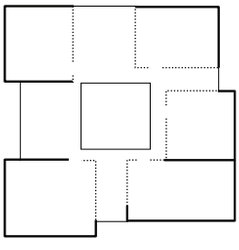
2.2 Vary facades



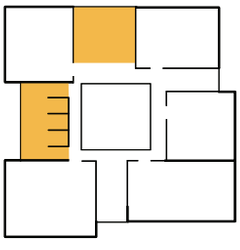
2.3 Create shared courtyard



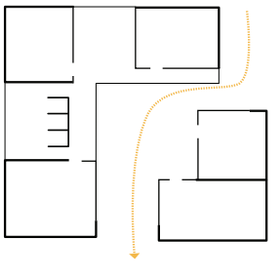
2.4 Divide into multi-family home



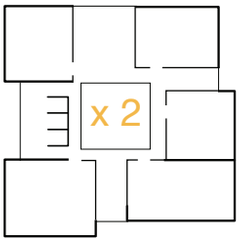
2.5 Apply light material inside



2.6 Place shared facilities according to Vaastu principles



2.7 Break up the unit with flow



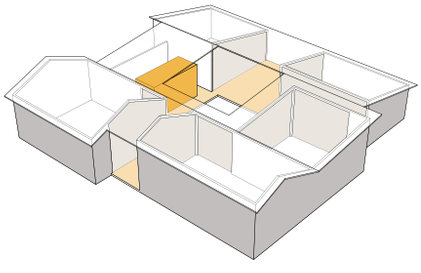
2.8 Create two-storey typology

The typology is based on the traditional Indian courtyard typology (2.1). The traditional house was designed for one family, however in this case the typology is modified to accommodate several families sharing the courtyard space and common facilities such as toilet, bath and kitchen. The courtyard is modified by creating varying facades and thereby generating a changing and diverse streetscape (2.2). Next a shared courtyard is implemented and thus access in three of the facades is created (2.3). The access points result in a natural subdivision into five units – one for each family (2.4). The materials of the courtyard are differentiated, with heavy materials on its exterior facades, capable of absorbing the heat from the sun during the day and releasing it during the cooler nights due to its thermal mass. The materials on the interior of the courtyard are lighter and in a warmer tone since it is the materials, which the families primarily are in contact with (2.5). The shared functions are implemented around the courtyard. The toilet is enclosed by dwellings and thus located in a private part of the courtyard. The kitchen is in an open part of the structure and will become a part of the adjacent street life. Additionally they are located according to Vaastu principles, among other things ensuring natural ventilation in the toilet (2.6).

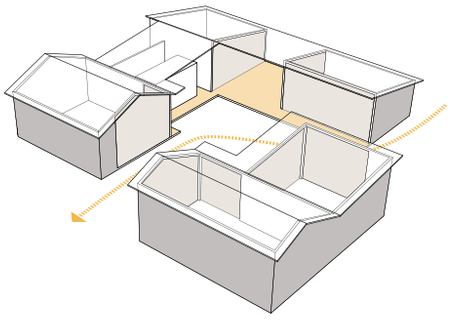
At this point two additional variations of the courtyard are created. One derivative of the typology is the open courtyard. It is transformed by breaking up the typology and thus allowing a flow to pass through it (2.7). The second derivative is developed by vertically multiplying the courtyard and thereby creating a two-story building with room for up to ten families (2.8). The exterior facades of the second storey is covered with a lighter, wooden material in order to create ventilation and aesthetically diversing its expression.

Finally the roof of the typology is developed in order to shelter from the weather and create an optimal indoor climate. The roof is designed with eaves to create shadow from the sun. Its varying inclinations makes it easy to collect rainwater and finally the bath- and toilet cores are kept apart from the roof in order to allow natural ventilation.

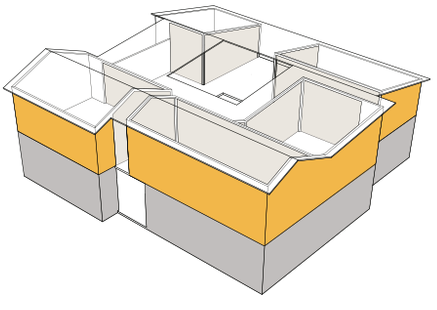
Variatons of typology



Closed courtyard

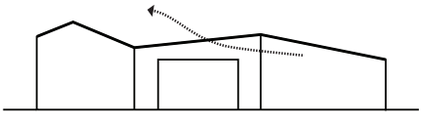


Open courtyard

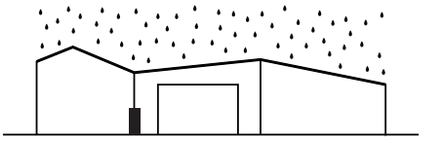


Two-storey courtyard

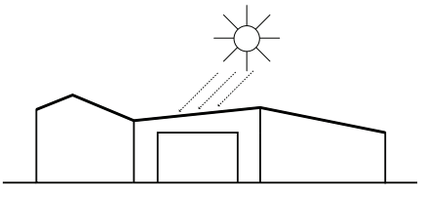
Climatic principles



Natural ventilation

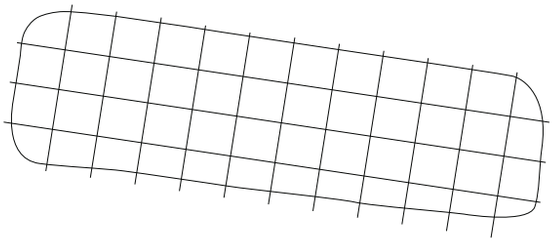


Rainwater collection

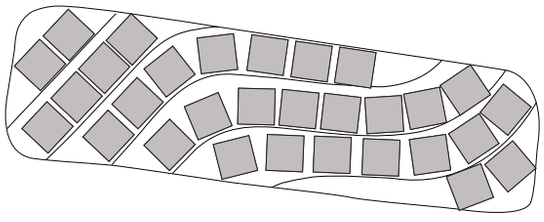


Protection from sun

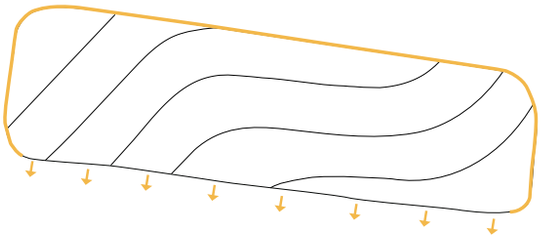
3. POSITION THE TYPOLOGY IN A DENSE FORMATION ALONG THE EXISTING CONTOUR LINES



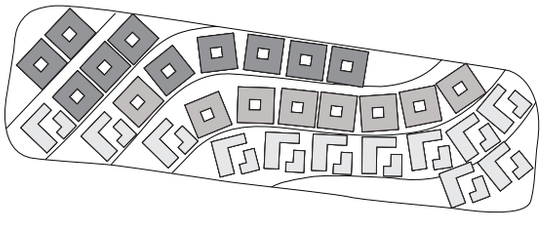
3.1 Impose a high density



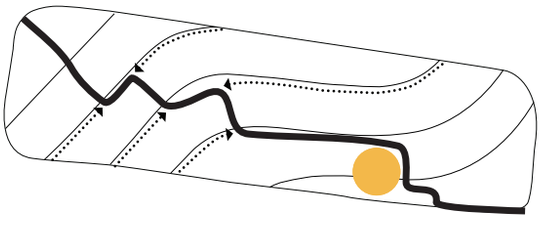
3.2 Place units along contour lines



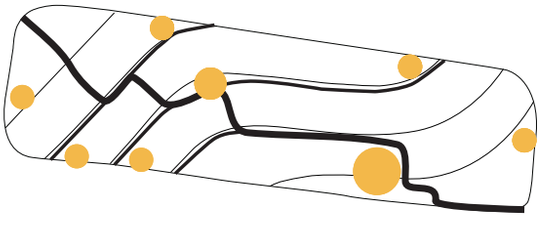
3.3 Direct attention towards the South



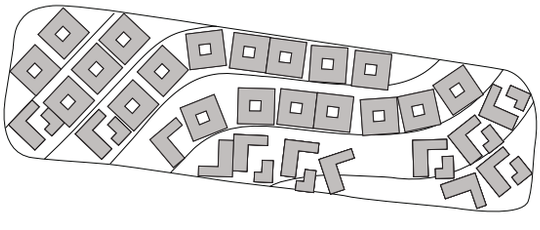
3.4 Vary the typology according to topography



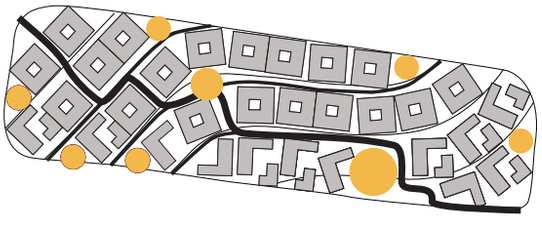
3.5 Integrate a rainwater basin and open canals



3.6 Implemente streets and pockets with public spaces



3.7 Rotate the courtyards according to public spaces



3.8 Integrate courtyards, flow and public spaces in a dense neighborhood

Finally the courtyard typology is integrated with the landscape. Due to the central location of the site in the city it is important to build with a relatively high density. In the case of Kharbel Community the density will be corresponding to building up the entire surface (3.1). Placing the courtyard structures along the contour lines preserves the qualities of the landscape and ensures a curved and varying streetscape (3.2). It is additionally important that this new residential area is integrated with the existing context (3.3). In order to merge with the residential zone towards the South the open courtyards are placed in the South while the tow-storey courtyards are placed in the topographical highest parts of the area (3.4). The typology thereby reacts to its surroundings; opening up and lowering down near the low-rise, low-income area, and in the same way getting higher in the part of the area located near the tall commerce and business facilities in the North and Northeast.

Next the open canals and rainwater basin, presented in the first action, is implemented. The open canals are merged with the flow of traffic and thus the roads can, in case of heavy rain, also function as large drains, keeping the water from flooding the courtyards (3.5). For more details, see appendix 3. The remaining pockets and open spaces are transformed into public spaces. Urban gardening is placed in the smaller pockets and vendor zones and a playground in the larger areas located near the main infrastructural elements. The rainwater basin is double programmed and thus it will work as a playground for the children in the dry seasons of the year. That is the main reason for its location pulled back from the periphery and the main roads, giving it more central location on the border of the new and existing residential plots (3.6).

The typologies are subsequently rotated and modified according to the public spaces and thereby a close relation between the semi-privacy of the courtyard and the public life of the streets and public spaces are ensured (3.7).

The final step illustrates the merging of infrastructure, rainwater, typologies and public spaces (3.8). The plan provides a conceptual framework for the detailing and elaboration of the following site plan and section in the presentation chapter.

CHAPTER 05

PRESENTATION

The presentation of this project contains plans, sections and visualizations of the two design proposals beginning with the Railway Basti and finishing with Kharbel Community. The proposal for the Railway Basti is presented in three plans spanning over a time frame. The plans display a conceptual and estimated growth of the slum settlement and thus the dwellings represented on the plans are not an integrated part of the design solution. The site plan for Kharbel Community is enclosed separately. The remaining drawing material is all presented in the scale 1:500 and 1:200 in the report.

RAILWAY BASTI

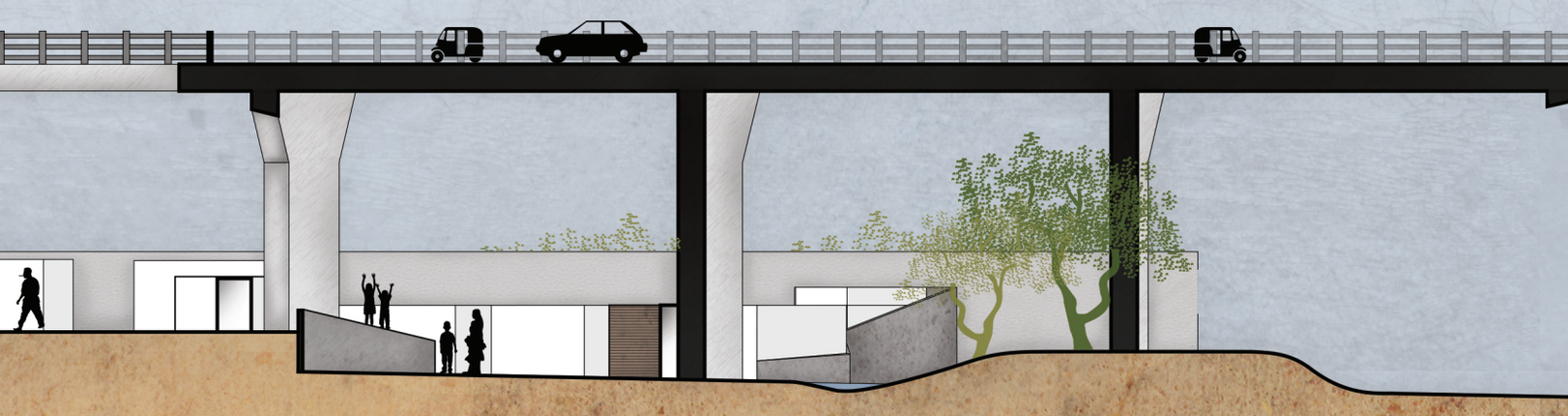
CONVERTING THE MENTAL NON-PLACE

The Railway Basti is despite its status as a mental non-place, located in a central part of Bhubaneswar and continuing to ignore the space and the dwellers will only lead to a chaotic, unhealthy and dense environment.

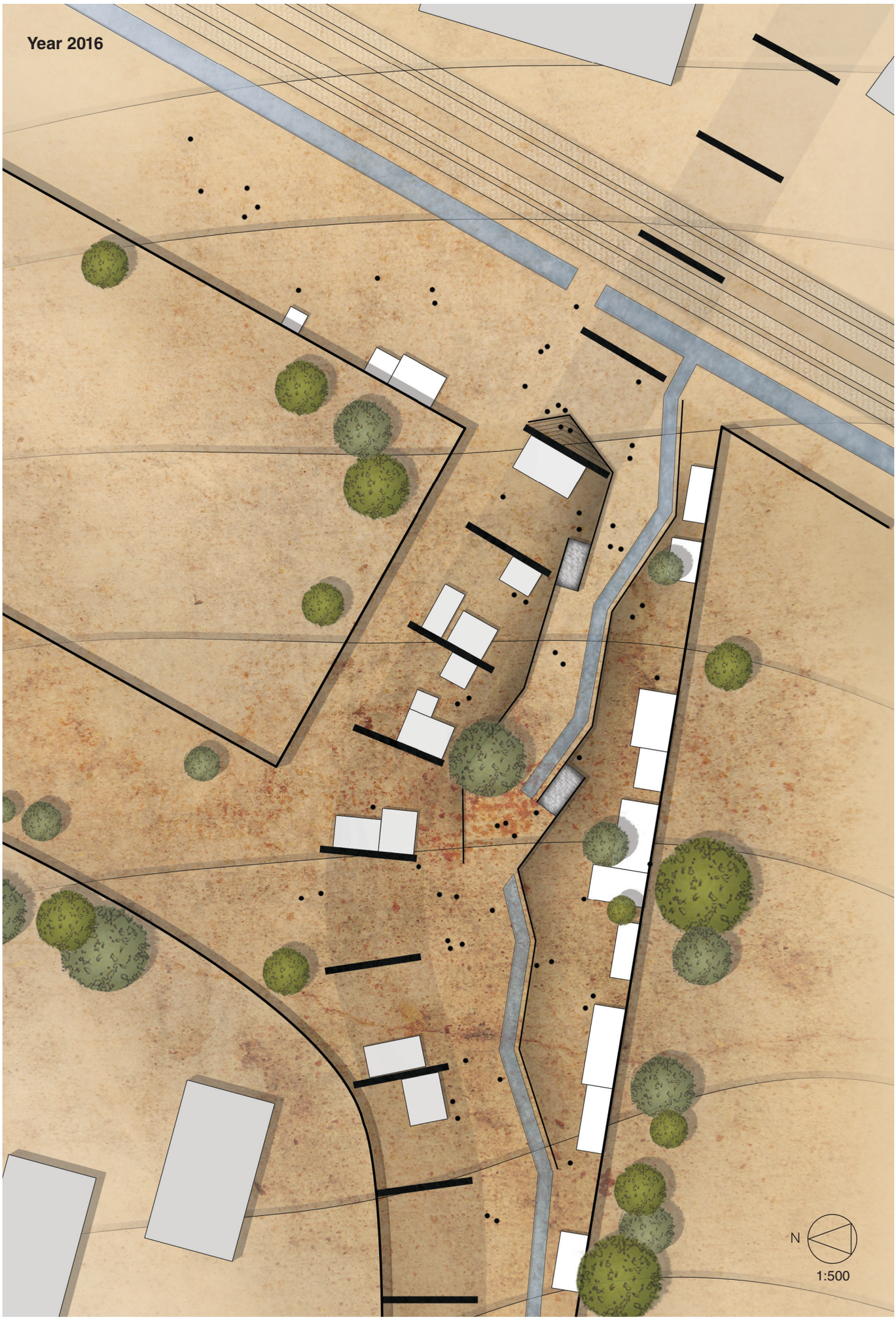
The concrete walls cutting their way into the landscape provides this area with the structure it needs in order to ensure qualities in everyday life for its inhabitants. The wall defines the border between private and public but still allows access and visual connections across the two spheres. The structure becomes a part of the landscape and visually emphasizes the characteristics of the space; enclosed or open, wide or narrow. Finally the wall has more practical features as it offers stability for the dwellers to build up against just as it becomes a playful element for children.

The section illustrates the lowering and rising of the wall as it runs parallel to the flyover. It shows how the wall becomes the frame of public life and gathers vendors, flow, children and women in a diverse setting. It clarifies how the toilet facilities are strategically placed in the area of tension between the public flow and the privacy of the dwellings in order to create a safer environment for women using them.

The flyover forms the basis for the existence of the Railway Basti since this space is created and shaped by the elevated structure, and very appropriate the flyover becomes the roof over this new little slum village in Satya Nagar. Along with the implemented concrete walls it provides the slum dwellers with possibilities and shelter.



1:200


Year 2016
N
1:500


Year 2018
N
1:500


Year 2020
N
1:500

The slum is expected to develop in the years to come and the units and structuring walls will be implemented gradually as the number of slum dwellers increase. In 2016 the first structures and units are implemented to accommodate the existing dwellers. The swales and larger canal along the rail tracks are realized and a small public space is implemented in relation to the big tree next to the flyover. An additional gathering point is designed underneath the flyover in relation to the rail track crossing. It is an open space with stairs climbing up one of the pillars. The stairs function as a seating area during temporary community programs, such as pop-up schools, courses and similar events but they also work as an informal public space where the commuters can settle down during the intense mid-day heat or as a playful structure for the children of the slum.

In 2018 a third structure is implemented along the rail tracks to accommodate the expansion and growth of the slum. As the other structures it ensures flow and public space in the new development and thus becomes a central location within the community. The plan of 2020 illustrates how the area can accommodate additional growth and still maintain a specific set of values in the now densely developed slum. The qualities created by the structure include a continuous flow and easy access, public spaces and gathering points in the community and better health conditions by providing toilet facilities for the residents.

The street is busy with children running back and forth between the shaded and cool spot underneath the tree and their homes. They jump up and down from the concrete edge and challenge each other to go higher up on the wall. The big tree provides an area of shadow, which is a much needed relief from the stinging sun. Underneath the tree a women is hanging her laundry up to dry and a couple of dogs are lazily wandering around. The street food vendors are doing their last preparations for lunch and there is an appetizing smell of curry and fried vegetables spreading in the small square. A man on a scooter is passing by heading for the rail tracks, nodding and wiggling his head to greet the people he passes by. A young boy has climbed the tree to escape from some older boys bullying him. He is looking forward to tomorrow where he is going to school underneath the flyover.

KHARBEL COMMUNITY

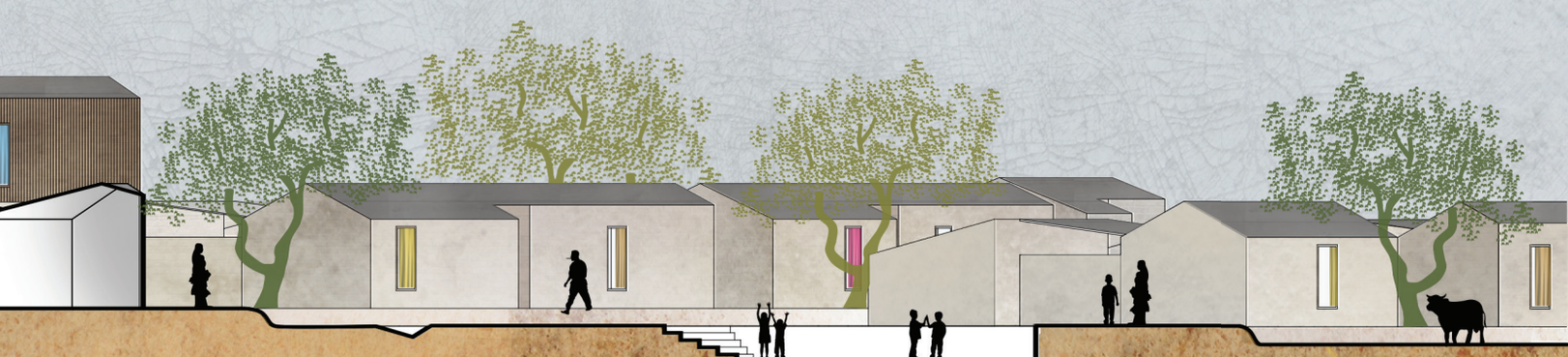
ESTABLISHING THE VACANT PLOT

The once vacant plot at Kharbel Community has been established as a new and dense neighborhood in the central part of Bhubaneswar. The plot is dominated by courtyard typologies which are positioned along the contour lines of the landscape, thus merging with and promoting the qualities of the existing terrain while creating a diverse and varying streetscape between them. Furthermore the local rainwater management composes a prominent feature as a continuous rainwater drain and an abutting retention basin. The basin also functions as a social gathering point and as a playground for children in the dry seasons of the year. In the irregular spaces between the buildings urban farming areas are located as small crests in the landscape. These areas are intended the Indian women, who often have difficulties finding their space in the public realm.

The section below displays how the placement of the courtyards enhances the surroundings and the subtle inclination of the landscape by dissolving towards the South and increasing in height towards the Northwestern corner of the site. The rainwater basin is situated at the Southeastern corner as a public space between the dissolved typologies, thus merging the private, semipublic and public functions.

The exterior facades of the courtyards are composed by sandstone bricks, while the interior is made of bamboo lamellas allowing natural ventilation into the individual living units. Furthermore the upper stories of the two-storey courtyards differ in materiality. Here the exterior is conducted in wooden planks giving a differentiated expression when walking through the neighborhood.

Through this design proposal Kharbel Community has been established as a dense, low-income but high quality neighborhood.



1:200


N
10 m
30 m
50 m

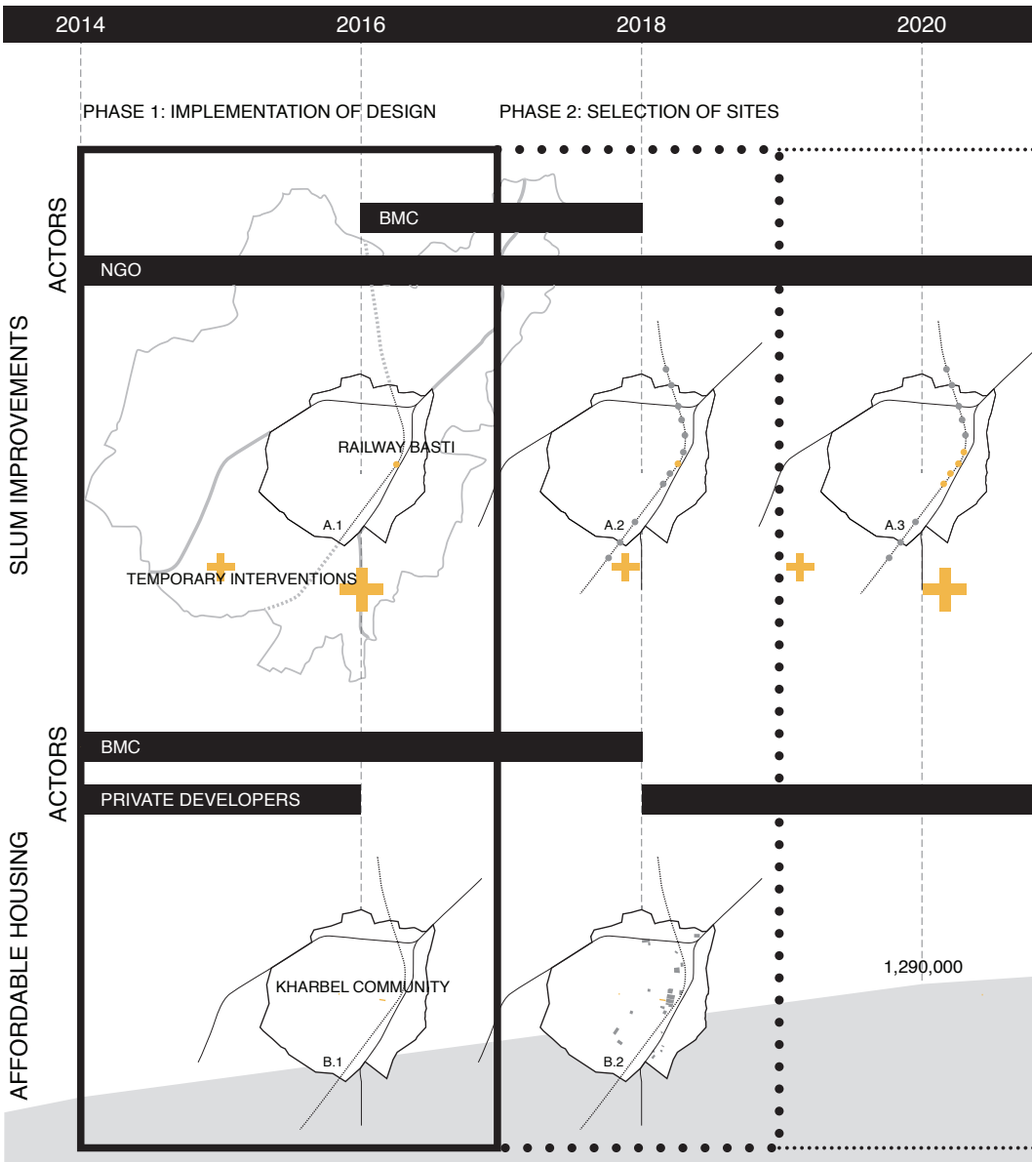
Despite the heat the streets of Kharbel Community is busy as usual. While their husbands are executing today's work, transporting goods, the women are doing the domestic chores, sweeping and cooking lunch. Passing by one of the open kitchens of the courtyards, a smell of spicy dahl and rice converges with the dusty air and titillates the nostrils. These openings interlace the semiprivate and shared functions of the courtyards with the course of the winding street and its constant flow of both people and animals. Furthermore the material contrast between the exterior bricks and the interior bamboo lamellas is even clearer when passing by the openings. Further down the street colorful curtains flutter in the few occasional breezes.

DESIGN IMPACT
STRATEGY OF IMPLEMENTATION

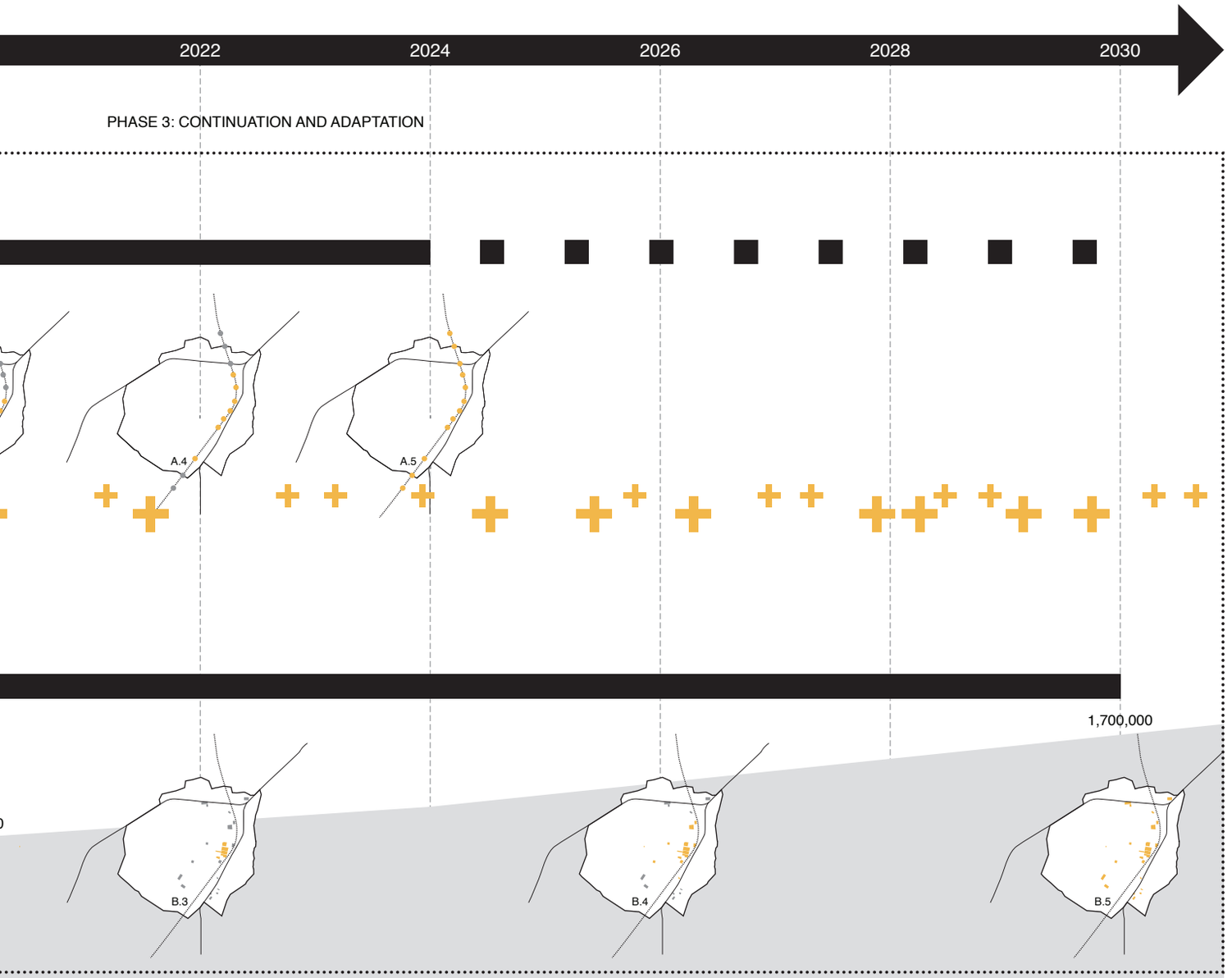
The design proposals of respectively Railway Basti and Kharbel Community have to be seen as parts of an interconnected strategy, which aim is to cope with the massive urbanization and future population growth in Bhubaneswar. Together the two proposals offer an alternative to the initiatives currently being conducted by the municipality. As described in the context analysis chapter, the initiatives by the Bhubaneswar Municipal Corporation involve slum resettlements far out of the city as well as unspecified plans for the implementation of public toilet facilities. The initiatives are connected to the BMC's visions of a slum free Bhubaneswar by 2020 and an open defecation free city by 2021.

The strategy of this project is neither to achieve a slum free nor an open defecation free city, but to improve basic living standards for slum dwellers and to create neighborhoods with affordable housing in the central part of the city. Both Railway Basti and Kharbel Community are representative sites in Bhubaneswar, hence other and applicable sites can be found. The diagram displays the design proposals in connection to an action plan for the central part of Bhubaneswar in the years until 2030. The strategy includes possible actors and is divided into three main phases of implementation.

The presented strategy and diagram is a conceptual continuation of the design proposals. Therefore it is developed with an abstract vision of how the proposals might have an impact on its surroundings and affect city development in Bhubaneswar. Furthermore it is important to state that the strategy isn't a complete plan that solves all concerns regarding the urbanization, however it is an attempt to promote an alternative settlement strategy for the urban poor.



Phase 1: Implementation of design
The first phase of the action plan includes implementing the two design proposals, Railway Basti (A.1) and Kharbel Community (B.1). This will be the starting point of the strategy and open up for more interventions in other parts of central Bhubaneswar. In relation to the implementation of the proposal at Railway Basti (A.1), the responsibility and initiative is intended local NGOs. Furthermore these NGOs are envisioned as stakeholders of more temporary interventions at the site, such as awareness campaigns, health clinics, pop up schools, skill training workshops and so on. The aim of applying these interventions is to empower the local slum dwellers. At Kharbel Community (B.1) the execution is conducted through a collaboration between BMC and private developers. Due to the costly land prices in central Bhubaneswar, private developers don't find it attractive to create affordable housing in these areas. Consequently the BMC will have to put the land at the developer's disposal.



Phase 2: Selection of sites
In the second phase more applicable sites are pointed out. As shown on A.2 these sites are located along the stretch of the railway as these sites have similar conditions to Railway Basti and as they have the most urgent need of the implementation of toilet facilities. At B.2 other vacant plots, similar to Kharbel, are pointed out. Some of these plots are empty storage facilities, which can be relocated at the city outskirts and by this give room for affordable housing areas in central Bhubaneswar. The stakeholder of mapping and relocating these functions are the BMC, while private developers are to conduct the implementation.

Phase 3: Continuation and adaptation
In the final phase the selected sites are transformed with respectively the implementation of more toilet facilities in the slum areas along the railway (A.3 – A.5) and more low-income neighborhoods with affordable housing in the city center (B.3 – B.5). The NGOs will in the period subsequent to A.5 be involved in a more sporadic course as stakeholders of the temporary interventions. The number of interventions will increase as the number of transformed sites escalates.

EXPECTED POPULATION GROWTH

CHAPTER 06

EPILOG

This chapter of the report contains a conclusion, reflection and discussion. The conclusion summarizes the report and clarifies how the designs response to and solve the problem statement. The reflection addresses the shortcomings and limitations of the project and the consequence of our western perspective when designing in a developing country. Finally the discussion put the participatory method into a new perspective and contemplates how the learning outcome can be applied to a Danish context.

CONCLUSION

Designing for urban growth is a complex task, which this project approaches through the notion of Urban Acupuncture. Urban Acupuncture is a strategy of urban transformation that focuses on pricking the urban skin in optimal points and thereby generating positive ripple effects in a larger context. Thus this project aims at improving everyday life situations for women and children in two selected spots in the neighborhood of Satya Nagar. The points of impact are selected based on their character as leftover spaces, their ability to work as representative sites in the city and their inherent potential of regenerating. Thereby positive ripple effects can be generated in areas similar to those of Railway Basti and Kharbel Community.

The notion of catalyzing development in other parts of the city is acchieved through two coherent and collaborating settlement strategies that compose an alternative to the Municipality of Bhubaneswar's current response of placing slum resettlements and affordable housing areas far out of the city. Thereby this project wishes to contribute to the discussion of life quality in slums and low-income areas. The proposed, new settlement strategies of this project are based on the idea that cities in developing countries should accept and utilize urban migration and integrate slum dwellers in the social and economical systems of the city.

As expressed in the problem statement this project is set out to solve the challenges of poor rainwater management, sanitation and housing conditions at the two sites. In addition the focus of both design proposals has been to create a better framework for public spaces and especially providing women and children with access and opportunity for staying in the public realm. Both design proposals are composed by two main design elements: Landscape design and a generic architectural unit. The design of the landscape is twofold. It is designed to manage rainwater and prevent flooding of dwellings and at the same time it is a response to the social conditions and processes. The landscape thereby becomes more than a natural and environmental feature. It is a system designed to serve the community and it tells a story about the society inhabiting it. Both landscape designs have experiential and technical qualities. In the case of Railway Basti the landscape is sculpted to protect the community from waste and rainwater. The landscape is a direct response to the climatic conditions of Bhubaneswar but also a product of the society since it has to deal with the conditions of the globalized world – uncontrollable urban growth. In Kharbel Community the landscape has a more formal character and integrates rainwater management with a public space.

Just as the quality of the landscape is its unique merging of site-specific, social and environmental processes, the quality of the generic units is exactly that it easily can be adopted and applied to another context. However the strength of the designs lie in the fact that the landscape and the units are merged and integrated in a new urban landscape.

The two design proposals are conceptual solutions that define certain characteristics and principles in order to ensure a higher quality of life for the local inhabitants. It is these principles which can be adopted and applied to similar areas within and beyond the borders of Bhubaneswar.

The design of Kharbel Community focuses on creating ideal public and semi-private spaces and at the same time blurring their borders in order for the activities of the private life to merge with those of the public. Thus a main parameter extracted from the design proposal of Kharbel Community is the idea of organizing dwellings around a semi-private space. The dwellings should be located in a way that ensures openings and flow between the public zone and the semi-private sphere. Organizing the dwellings in clusters makes it possible to implement an additional design principle, which is the shared, basic functions such as toilet, bath and kitchen. By having more families sharing these facilities it is possible to keep the construction costs at a minimum and the density of the area high. Another important parameter is to ensure programs that address women and children in the public spaces. Only by inviting these segments of the population into the public spaces the transformation towards a more diverse and equal public realm can be initiated. In the case of Kharbel Community the children are favored in the public space by providing a field for playing in the integrated rainwater basin and women are empowered through the program of urban farming. The final principle extracted from Kharbel is the proposed solution for draining the rainwater locally. By handling the rainwater on the surface it is possible to keep the solutions simple and low-cost.

The site of Railway Basti has a different, more temporary character than Kharbel Community and thus it is even more important to keep the solutions simple and low-cost. This is done by utilizing the soil as the primary material. Sculpting the ground to manage rainwater includes using the excavated soil from the swales to make residential island and thereby responding to one of the main challenges of keeping rain and wastewater seperated from the dwellings. The second adoptable principle is the pairing of the wall and the unit, which allows for a number of possibilities. In the Railway Basti it is possible to integrate the wall with the

landscape or the unit with the existing walls. The main feature of this system is that it is possible to implement the essential toilet units in addition to ensuring spatial qualities in an otherwise dense area. The programs of the Railway Basti are equally important and focuses on providing toilet facilities for women - a requirement in the whole of Bhubaneswar.

The two design proposals are gathered in a joint strategy envisioning how their implementation can generate additional transformations in the city. By this the two seperate solutions are seen as part of achieving the same goal and not as alternatives to oneanoter.

The final aim of this project is to display a method and an approach to designing in developing countries; an approach that seeks to reveal hidden potentials and unfold the inherent possibilities. The theoretical framework of Urban Acupuncture, Terrain Vague and Leftover Landscapes are applied to this project in order to not only place the project in a societal and political discussion of urban growth but also in a design academic discussion.

REFLECTIONS

There are many problems to adress when working in a context like Bhubaneswar and India in general, and narrowing it down to one task has proven to be quite difficult. We found that the two sites differ from each other but are still two examples of the possibilities and limitations you meet when designing in developing countries.

The Railway Basti is an emerging slum area on illegal premises. Even though there is an urgent need to improve living standards for its inhabitants and a chance to be proactive, it is hard to find the project's entitlement as well as actors and stakeholders for developing a project here. Realistically the intervention would have be temporary or the plot would have to notified as a slum area. This notification of the slum is highly doubtful but would however transform the Railway Basti into a part of the formal city and only then would the mental non-place be truly converted. Designing and planning for a highly insecure future poses many dilemmas especially when the programs, which the slum dwellers are lacking often requires comprehensive technical infrastructure. Another concern is whether the design proposal of Railway Basti encourages slum development or prevents a chaotic and badly organized slum area from emerging. However through research it became clear that slums had kept popping up along the railway and therefore in order to explore a more proactive approach for the slum development of Bhubaneswar the design proposal for the Railway Basti is justified. As mentioned previously India and the city of Bhubaneswar have a vision of a respectively slum free country and city. This ambition seems relatively naive and untenable given the massive urban migration taking place in India in these years and the minimal effort conducted to cope with it. Slum resettlement has proven its inefficiency in many places around the world. The slum dwellers prefer to live in a central location in the city close to the jobs and not in the outskirts with a long and expensive commute. The approach in Railway Basti is an alternative to the municipality's long-established strategy of resettlement. With this project, we strive for complying with the limitations and restrictions by creating low-cost and simple solutions. The municipality is not usually proactive in these situations but by doing nothing, the exact same situation and consequences will repeat themselves in various points of the city.

Kharbel Community does not have the same legal restrictions since it is a leftover space in the middle of the formal city with easy access to technical infrastructure. It is however expensive land and the municipality might prefer to use it for high-income purposes – either residential or business. We however see a great potential in developing this plot for low-income residents. Only by giving the big group of urban poor and low-income citizens a proper alternative to living in slums the municipality can prevent slum developments from growing in the present pace.

An important consideration when designing in developing countries has been to realize that we cannot solve all problems present. Thereby it becomes even more important to specify a problem and a target group to adress, thus focusing on solving smaller and simple problems within the, at times, very big challenges. For instance the technical part of this project consists of conceptual rainwater management solutions for the two sites. They are local solutions, however to solve the problems of flooding they need to be a part of a greater system within the city. The rainwater consequences are determined by an interrelated topographical system and in order for us not simply to relocate the problem of flooding it is necessary to design a larger and more comprehensive rainwater management system. This project delimitates itself from designing the bigger system and instead deals with more immediate and pressing local solutions, which later can be connected to a bigger system.

In regards to the given target group of women and children we found that women are a tough target group to address. Due to the societal and cultural norms women are not present in the public realm. They do not claim their right to the public spaces, which instead is dominated by men and partly children. Children are also a submissive group of society, but we found that they a better at claiming their use of public spaces, especially at times where it is not preoccupied by other users. They see empty spaces as spaces of possibilities to play. During the initial workshop in Bhubaneswar we experienced that children are a great resource for initiating change in the mentality of society. They are eager and enthusiastic and since a mentality change is a long and comprehensive process, we found that children are the best place to begin. In a hypothetical realization process it would be highly relevant to involve both children and women in a participatory process in order to found and inform the design in the local community.

Finally it is also relevant to discuss the consequences in relation to designing in another context than your own. Our Danish background provided us with preconceived opinions about India and developing countries, and the difference in language provided barriers of communication. Both are they good reasons for why it can be difficult to design in another culture than your own, however we also experienced that exactly our difference in perspec-

tive provided us with the opportunity to see potentials that the locals did not experience. Through our western perspective we saw a great potential in the public life of low-income areas and we experienced unplanned and un-designed spaces as spaces of opportunities and possibilities.

DISCUSSION

The discussion will primarily focus on the method of INDEX: Design to Improve Life, which was applied to the 2½ week workshop in India and, in a modified and more flexible form, to this thesis project. This paragraph will discuss the effect and opportunities of participatory design, the outcome of the workshop in India and finally reflect upon how the knowledge gained in India about process and participation can be applied to an academic and Danish context.

The method and ideology of INDEX entail that everyone can design [INDEX: Design to Improve Life, 2012]. Design is however also an academic discipline. To anchor a design project in a theoretical and methodological foundation is a way to exert the discipline of designing and something we are taught as urban designers in spe. But perhaps it is through the interplay between designers, local experts and other disciplines such as teachers or anthropologist that the best outcome is generated. The arguments and possible designs can then be supported and informed by other academic perspectives and to a high extent by involving the locals. As architects and urban designers we are also a part of the political and societal discussion as we plan and design in the cultural, social and economical discourses of society. A part of that is to understand and relate to the context you are designing in, a fact that becomes very clear when you have to design for a fundamentally different context like the Indian. Participatory processes, including interviews, games and public meetings, can in our experience help us as designers to find not just a narrative but the right narrative.

> *Designs as narratives, if they are created on the basis of a collective memory, can create a new shared sense of citizenship and enable new collective resources in place, new creative commons.* [Andersson & Laursen, 2011: 102]

Basing the narrative on the needs of the user and a critical analysis of the context are thus a big part of what constitutes the professional discipline of design. [Andersson & Laursen, 2011: 102] User participation can then help inform both the design and the process along with creating a common ownership towards the project, which is an important fact, since the locals are those, who have to maintain and carry on the project after its completion.

User participation and co-creation are main ideas behind the ideology of INDEX: Design to Improve Life. It is our experience, from having been a part of the workshop in India, that there are certain sources of error and uncertainties, which are hard to avoid when you are designing for another culture than your own. In India people are very curious and willing to be involved, but there is however the risk that they give you the answer, they think you want to hear, and not necessarily tell you the truth during interviews. These situations make it necessary to examine the answers critically by being thorough and aware when applying the participatory process. Consequently design can't solely be informed by interviews and dreams of the locals but have to be additionally evaluated and qualified by physical, social and political analyses.

Launching this project in February, we initially thought that we would be able to use the specific outcomes of the design workshop in this thesis project. However in India we realized that we had very little control over where the process of the projects were headed. Each team member had their personal area of interest and perspective and it took great effort to combine ideas and academic strengths into one project. Additionally the fieldtrips, interviews and participatory processes gave unexpected results that would take the project in a new direction. Even though we weren't able to use the design products from the workshop directly we gained something else, just as important, from the process. The workshop was a unique opportunity to get to know the country and the people. Working in close collaboration with Indians gave us insight and understanding of the culture, their way of life and last but not least their way of thinking. Concluding the workshop provided us with knowledge and experiences that we could never have achieved on our own in a foreign context.

The method and tools of INDEX have been used in both the workshop and this thesis project. The tool of the compass illustrates the iterative nature of design processes offering you the possibillity to go back and forth in the process. Despite a few setbacks in the Design_Lab workshop the time frame didn't allow for an iterative process as intended. The subsequent process conducted through this thesis project was a chance for us to use the compass and the idea of tracking our own process, being aware of when to do what and why. The process of the thesis project has given us the chance to go back and forth in the compass and phases. The method of INDEX and the iterative design processes are however not unfamiliar to us, since it resembles the Integrated Design Process developed for Architecture and Design by Mary-Ann Knudstrup (2004). The Integrated Design Process is an approach that integrates architecture and engineering. It consists of five phases: Problem Formulation, Analysis, Sketching, Synthesis and Presentation. [Knudstrup, 2004]

These phases are similar to those of INDEX's compass and method: Prepare, Perceive, Prototype and Pro-

duce [INDEX: Design to Improve Life, 2012]. The difference from the workshop in India and the project work we previously have conducted at Aalborg University is first of all the collection of techniques, which INDEX has developed to support the phases and the course of the process. These techniques include among others mind mapping, association games and personas. We found that the techniques and warm-up exercises could push the process further when it was at a halt, provide inspiration and finally it created at common language to discuss the project and process. Some of these tools, we believe, could successfully be implemented in the early years of the education at Architecture and Design. It would help facilitate the process and activate the creativity of the group members.

The compass as a process management tool is helpful to make all participants, or in the case of Aalborg University group members, aware of where you are in the process, where you are going and how you are getting there. Eventually the steps and decisions you make moves a process forward and will be natural and esoteric between the group members, hence the phases will become more blurred and moving back and fort between them more effortless.

The compass is a profitable tool for those inexperienced in managing and organizing a design process. Furthermore the techniques can be implemented in many different educational purposes, including when professional designers have to involve people unfamiliar with the act of designing e.g. in a participatory process. The compass becomes more esoteric when design professionals, with a shared understanding of design and processes, are working together.

The experience and knowledge gained in India made it clear to us what we contribute with as designers in a process of transformation and intervention. Our analytical skills allow us to choose one problem and a task from the many. We are able to transform abstract ideas into form and communicate narratives and intentions. And finally we are able to manage and track our own process. The workshop gave us additional tools to manage a process and techniques to advance the process when it is stalled. These skills are something we can bring with us into the professional field in Denmark; Explore and refine through further experience and practice.

It has been a contradictory experience making a project in a foreign and completely unknown context. The understanding and absorption of a new culture, climate and society have been a fascinating journey but at the same time we have experienced many challenges and frustrations, especially in relation to the limitations of regulations and economy. However we found that our approach of designing, sculpting and composing the landscape can be used as a universal design approach across the borders of the western and the third world.

A holistic landscape approach entails not only designing for environmental processes but also the shaping of culture and creating identity. [Andersson & Laursen, 2011]

> *Thus, the landscape becomes a planning instrument that can improve the living environment architecturally, socially and structurally due to its inherent ability to connect, structure, and bind.* [Andersson & Laursen, 2011: 101]

This notion of landscape as a gathering element in the city is known as *Landscape Urbanism*. Landscape Urbanism prioritizes the open space as opposed to the built and views the urban as a continuously changing process. [Andersson & Laursen, 2011] Applying Landscape Urbanism and designing the urban landscape is a site-specific strategy that utilizes local potentials in order to create a new identity. [Andersson & Laursen, 2011] We found that this approach can be integrated with the theoretical notions presented in the beginning of this report. The idea of Landscape Urbanism can help uncover the potentials of the Terrain Vagues and Leftover Landscapes of Bhubaneswar and finally the notion of Urban Acupuncture can be viewed as a way of transforming the urban landscape piece by piece as a part of a dynamic process. Urban Acupuncture impacts in local areas of the city and hopefully these local designs can inspire others to do the same in new parts of the city. The tactics of this project; Converting the mental non-place and Establishing the vacant plot, are highly related to Landscape Urbanism since they encourage utilization of existing spatial and topographic possibilities, which implies using and optimizing the local conditions in the future development.

This project has provided us with comprehensive methodological and analytic ballast for designing in the future both in Denmark and abroad. Reflecting cultural, environmental, political and social conditions and aspirations in a physical design requires qualified decisions from the designers. We believe that the right decisions are made in the correlation between the perception and dreams of the locals and the designer's critical and academic reflection of these.

LIST OF REFERENCES

Literature:

Datta, A. (2012): *The Illegal City,* Ashgate Publishing Limited, Surrey

Department of Architecture and Regional Planning - Indian Institute of Technology Kharagpur (2006): *Perspective Plan – VISION 2030 and Comprehensive Development Plan for Bhubaneswar – Cuttack Urban Complex: A Concept Paper*

Government of Odisha (2011): *Slum Rehabilitation and Development Policy (SRDP) for Orissa*

Government of Odisha (2012): *Scheme for Affordable Urban Housing in Odisha 2012, Housing and Urban Development Department*

INDEX: Design to Improve Life (2012): *Design to Improve Life Education – Teacher's guide*

Juul, Helle (2009): *Byens Rum 2 – Det kendte i det fremmede,* JUUL I FROST Arkitekter, København

Knudstrup, Mary-Ann. (2004): *Integrated Design Process in PBL,* Aalborg University Press

Levi-Strauss, C. (1955): *Tristes Tropiques*, translated by Weightman, J. & Weightman D. (1973), Penguin Books

Lonely Planet Publications (2013): *India*

Martine, G. (2007): *The State of World Population 2007 - Unleashing the Potential of Urban Growth,* United Nations Population Fund

Neuman, S. (2013): *The Issue of Sexual Violence against Women in Contemporary India,* School of Social Sciences, Linnæus University

Nielsen, Tom (2001): *Formløs – Den Moderne Bys Overskudslandskaber,* Arkitektskolens Forlag, Aarhus

Pruda (2012): *Draft City Sanitation Plan*

Solá-Morales, Ignasi de (1995): *Terrain Vague in Anyplace,* MIT Press, Cambridge MA

Solá-Morales, Manuel de (2008): *A Matter of Things,* NAi Publishers, Rotterdam

Thorns, David C. (2002): *The Transformation of Cities,* Palgrave Macmillan, New York

UNISDR (2011): *The United Nations Office for Disaster Risk Reduction, Making Cities Resilient - My City is Getting Ready*

World Health Organization (1991): *Surface Water Drainage for Low-income Communities,* Geneva

Articles:

Andersson, L. & Laursen, L. (2011): "Differentiated decline in Danish outskirt areas", *Danish Journal of Geoinformatics and Land Management* Vol. 46 (2011), No. 1, p. 96

Casagrande, Marco (2013): "Urban Acupuncture"
Online at: http://helsinkiacupuncture.blogspot.dk [15.04.2014]

Kapoor, V. & Dhingra, K. (2013): "Sexual harassment against women in India", *OIDA International Journal of Sustainable Development* 06: 10, p. 85
Online at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2389784 [10.05.2014]

Praharaj, M. (13.04. 2013): "Königsberger's guidelines not followed in today's planning", *The Pioneer – Bhubaneswar*
Online at: http://1.bp.blogspot.com/-W37oVPux80o/UW5x9Rrh-II/AAAAAAAAAWE/No5Du-amg28/s1600/M+41+13th+April+2013+The+-Pioneer.jpg
[10.05.2014]

Rout, N. R. (2008): "Slum growth in Bhubaneswar: a problem or solution?", *ITPI Journal* 5 : 4, p. 59
Online at: http://itpi.org.in/pdfs/journal_5x4/07_Nihar%20Ranjan%20Rout.pdf [10.05.2014]

Patel, S. & Kunte, K. (2012): "Spaces of informality", *S.L.U.M. Lab* Edition 7, p. 88
Online at: http://u-tt.arch.ethz.ch/publications/slum-lab-asian-mode/
[10.05.2014]

Mohanty, D. (30.03.2014): "The city of new temples", *The Sunday Indian*
Online at: http://www.thesundayindian.com/en/story/the-city-of-new-temples/7/32528/
[10.05.2014]

Rout, H.K. (30.10.2010): "Orissa victims recount October 29, 1999 super cyclone", *Times of India*
Online at: http://timesofindia.indiatimes.com/india/Orissa-victims-recount-October-29-1999-super-cyclone/articleshow/6840684.cms
[10.05.2014]

Singha, M. (15.07.2012): "Walk into trouble on Bhubaneswar streets", *Times of India*
Online at: http://timesofindia.indiatimes.com/city/bhubaneswar/Walk-into-trouble-on-Bhubaneswar-streets/articleshow/14940275.cms?referral=PM
[10.05.2014]

Pradhan, A. (02.07.2013): "Affordable housing project by August", *Times of India*
Online at: http://timesofindia.indiatimes.com/city/bhubaneswar/Affordable-housing-project-by-August/articleshow/20874833.cms
[10.05.2014]

Khazan, O. (18.01.2013):
"A surprising map of countries that have the most traffic deaths", *Washington Post*
Online at: http://www.washingtonpost.com/blogs/worldviews/wp/2013/01/18/a-surprising-map-of-countries-that-have-the-most-traffic-deaths/
[10.05.2014]

Internet:

BMC 1
Online at:
http://bmc.gov.in/Templecity.asp?lnk=2&PL=3
[12.04.2014]

BMC 2
Online at:
http://bmc.gov.in/History.asp?lnk=2&PL=2
[12.04.2014]

Bharatonline
Online at:
http://www.bharatonline.com/orissa/travel-tips/religion.html
(13.04.2014)

Citypopulation
Online at:
http://www.citypopulation.de/India-Orissa.html
[17.04.2014]

Creative Sulekha
Online at:
http://creative.sulekha.com/traditional-hindu-central-courtyard-houses-of-goa_439264_blog
(07.05.2014)

Delhi Tourism
Online at:
http://www.delhitourism.com/climate-bhubaneshwar.html
[07.05.2014]

Endvawnow
Online at:
http://www.endvawnow.org/en/articles/251-safe-public-spaces-for-women-and-girls.html
[13.04.2014]

Early Childhood Magazine
Online at:
http://vps.earlychildhoodmagazine.org/challenges-and-opportunities-for-new-urban-imaginations/
[06.05.2014]

First Learn
Online at:
http://www.first-learn.com/types-of-houses.html
[07.05.2014]

Important India
Online at:
http://www.importantindia.com/293/causes-and-effect-of-kalinga-war-on-ashoka/
[12.04.2014]

Incredibleorissa
Online at:
http://incredibleorissa.com/en/affordable-govt-housing-units-bhubaneswar/
[24.04.2014]

Odisha Maritime Museum
Online at:
http://www.odishastatemaritimemuseum.org/Maritime-History.html
[12.04.2014]

Openideo
Online at:
http://www.openideo.com/challenge/womens-safety/research/the-city-gendered-making-visible-women-s-experiences-of-safety-and-security-in-our-neighourhoods-streets-and-public-spaces
[13.04.2014]

Orissa Tourism
Online at:
http://www.orissatourism.org/travel-to-orissa/bhubaneshwar/history-of-bhubaneshwar.html
[12.04.2014]

This Big City
Online at:
http://thisbigcity.net/active-streets-in-indias-dharavi-slum/

Video:

Weinstock, M. (2014): *Keynote: AESOP Planning & Complexity 12 - Confronting Urban Planning & Design with Complexity*
Online at:
http://vimeo.com/85880682
[24.05.2014]

LIST OF ILLUSTRATIONS

If not stated on the list below, the illustrations are own illustrations and photographs.

CHAPTER 07

APPENDIX

This chapter consists of three parts. Appendix 1 gives an overview of the workshop in India. The process and selected techniques are presented in photos and text and the six design solutions in a catalogue. Appendix 2 illustrates the weather conditions of Bhubaneswar and forms the basis of climatic principles of the design. Finally the third appendix presents the technical aspects of the design proposals and in text, illustrations and calculations giving an overview of the drains and basin. The dimensions of the drains are found through calculations whereas the size of the basin is a rough estimation based on Danish conditions and is modified in order to comply with the heavy rain of Bhubaneswar.

APPENDIX 1
DESIGN_LAB ORISSA WORKSHOP

As mentioned in the preface, this report took its point of departure in an intense 2½ week workshop in Bhubaneswar, India. Together with 34 other young people, youth workers and educators from four different countries we participated in the workshop called Design_Lab Orissa. The four international partners of the Design_Lab were: Continuous Action from Estonia, CHILDREN-Nepal from Nepal, Bakul Foundation from India and from Denmark, INDEX: Design to Improve Life, who also were the workshop facilitators. The project was co-founded by the European Commission from the Youth in Action programme and by the Ministry of Foreign Affairs Estonia from the Development Cooperation Programme.

The project took place from October 2013 to September 2014, and the Design_Lab workshop in Bhubaneswar took place from the 6th to the 22nd of February 2014.

The aim of the workshop was to come up with innovative design solutions and to initiate change in the local communities by applying the method and techniques of Design to Improve Life Education. On an individual level, the goal was that each participant had to gain practical knowledge and experience with the method in order for them to initiate more change-making projects at home after their training.

The Design_Lab consisted of cross-disciplinary teamwork with one participant form each country in each group. With focus on fieldwork and cooperation with the local communities, the teams sought to identify the local challenges and develop simple, but life-improving solutions. The results could be a physical design product as well as a service, a social initiative or a strategy. During the workshop the design teams ended up working with three major challenges; waste, sanitation and education.

The process of the workshop followed the steps of the design compass by INDEX: Deisgn to Improve Life Education. The compass is divided into four distinct phases; Prepare, Perceive, Prototype and Produce.

The outcome of the workshop is presented in a result catalogue on the following pages.

The prepare phase
(February 6th to 10th)
The objective of the prepare phase was to understand the upcoming process and to discover and select a specific challenge.

The perceive phase
(February 12th to 14th)
In the perceive phase, the focus of the chosen challenge was narrowed down through research and analysis of the site and the target group.

The prototype phase
(February 17th to 19th)
In the prototype phase, ideas for a solution of the challenge were developed and shaped through different design techniques. Furthermore the initial prototypes were tested in the context and with the intended users.

The produce phase
(February 20th to 22nd)
The objective of the produce phase was to finish the designs and communicate them to others through a 1:1 mock up and presentation at an exhibition.

105.1: Each phase began with and introduction of its goals, actions and techniques.

105.2: Observations and interaction with the target group on fieldtrip in the perceive phase.

105.3: One of the techniques in the prototype phase was “idea poker”, which is an association game with image cards.

105.4: Each phase ended with a common sum up, where the achieved results were presented.

105.5: Testing the initial design in the context and with the chosen user group during the prototype phase.

105.6: Further design development in the prototype phase, using the “crazy circle” technique.

105.7: Testing of 1:1 prototype in the produce phase.

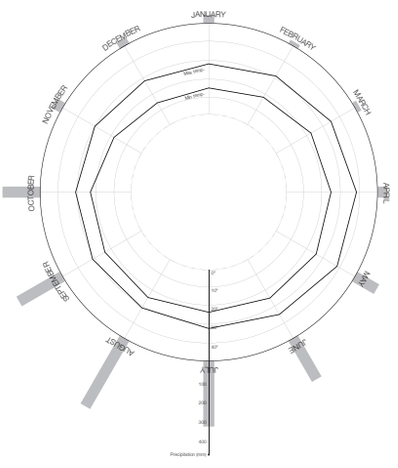
105.8: Feedback and evaluation of design in the produce phase.

	ABOUT	TASK & CRITERIA	SOLUTION
CREATABLE - JUST FOLD IT	**DESIGN TEAM:** Katrine Hoe, Piret Jeedas, Sander Hiire, Anvesh Killamsetty and Damodar Subedi **CONTEXT:** Schools of Satya Nagar **TARGET GROUP:** Children and teachers	**TASK:** "How can we use waste to create low-cost practical solutions for the classroom while engaging children?" **CRITERIA:** The success criteria for the solution are that it should be: • Functional, practical and sustainable • Aesthetical • Educational (skill training and empowerment) • Made of waste material • Including children in the process	 CreaTable is a multipurpose furniture for the classroom, mainly used as a table for reading, writing, drawing etc. The table is an one-piece cardboard furniture, which can be folded by the students themselves. It is easy to pack, it can reach bigger number of children in different communities and it is possible to transport to disaster areas (e.g. after flooding).
LEARNING THROUGH STORYTELLING	**DESIGN TEAM:** Anne Møller, Dimple Pattnaik, Heidi Paabort and Sagar Poudel **CONTEXT:** The Muslim area of the Mali Sahi slum **TARGET GROUP:** Children	**TASK:** "How can we implement in-formal learning that will improve the basic reading and writing skills of the children of the Mali Sahi slum?" **CRITERIA:** • The final solution must be inexpensive and made of local materials or natural resources. • The solution must give possibility for a lot of children to use it at the same time. • The solution must be simple and work without any facilitators.	 The designed solution is an in-formal learning game that will enable children of different ages to make their own stories while learning the alphabet and basic words. The solution is made out of empty plastic bottles, bamboo sticks, rope and paint. By turning the bottles, the children will be able to put different stories together and use their imagination while learning.
HAND WASHING POPULARISATION	**DESIGN TEAM:** Alisha Kuanar, Henrik Louring, Manju B.K, Mihkel Güsson and Sunita Bhandari **CONTEXT:** A local government school by the Santhi Nagar colony **TARGET GROUP:** Children	**TASK:** "How can we reduce health risks for children getting dirty from playing in schools?" **CRITERIA:** • Reduce water consumption • Make it fun to wash hands • Reduce the risk of transmitting diseases via unclean hands • Used by children without the assistance of teachers • Learn the users about why they should wash hands	 The project is an easy and hygienic hand washing solution. It is made of plastic bottles, which are easily available everywhere, and with a water lock system. The water comes out only when the water lock is lifted, which means that it is very water efficient. With 1 litre of water 5 - 8 people can wash their hands.

	ABOUT	TASK & CRITERIA	SOLUTION
GAI CAFÉ – A SOLUTION TO SEPARATE WASTE	**DESIGN TEAM:** Trine Kofoed Hybholt, Karin Kilk, Krishna Prasad Kharal and Satyajit Dash **CONTEXT:** Middle-class area of Satya Nagar **TARGET GROUP:** A cow on the streets, a housewife and a wrack picker	**TASK:** "How can we avoid cows eating plastic from mixed waste piles on streets?" **CRITERIA:** • It should be easy to use for people and cows and fit into the local context • It should be sustainable and make it easy for cows not to eat mixed waste • It should be located where people are used to bring their waste	 The solution is a product that separates food waste and recyclable waste from other waste. It is made of bamboo sticks of varying heights and in an organic shape. The design can be fitted into various street areas throughout the city.
PLAY MILL - A SIGN FOR PLAY!	**DESIGN TEAM:** Madle Lippus, Krishna Paudel, Theresia Torenholt and Debi Prasad Sahu **CONTEXT:** A public space in a residential area **TARGET GROUP:** Families with children in the residential area	**TASK:** "How can we make it more safe for children to play in these shared places, by slowing down the traffic and creating more awarness about the children's usage of the space?" **CRITERIA:** The solution must: • Change the physical space • Create more awareness about children using the space for play • Be fun • Be easy to make, so children can make them themselfs • Be easy to move around for children	 The design is a windmill looking object made of available materials, such as plastic bottles, bamboo and colorfull ribbons. The solution functions as a sign, which can be placed near the road while the children are playing. This will make cars and bicycles aware of the usage of the street and thereby make them slow down the speed.
STREET VENDORS' PLASTIC BIN	**DESIGN TEAM:** Anuja Tarini Mishra, Jeanette ishi Lehn, Suman Poudel and Martin Sookael **CONTEXT:** The street between Sun Green Hotel and Bakul Foundation **TARGET GROUP:** The vendors of the street	**TASK:** "How can we find a sustainable product for a trash bin and a plan for the street vendors to ensure that their plastic does not end up in the drains?" **CRITERIA:** • The solution must be made of a material that is recyclable, locally available, aesthetically pleasing and possible to decorate • The design must be accepted by the vendors and be easy to put up • The design must be easy to implement and produced locally	 The designed solution is a trash can, which is capable of holding a single vendor's trash for an entire day. It is elevated and put up, hence cannot be reached and destroyed by animals or groundwater. It is made of up-cycled plastic, and is inexpensive to produce.

APPENDIX 2
CLIMATE DATA BHUBANESWAR

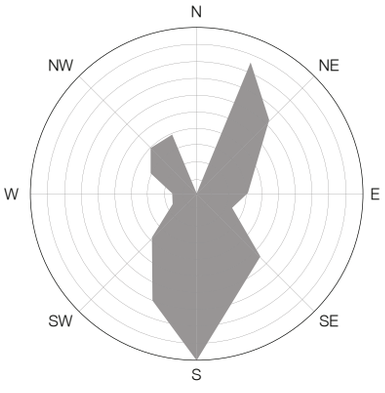
Temperature and rainfall



Ill. 108.1

Bhubaneswar lies in a tropical climate zone. The average temperatures range between a minimum of around 12 °C in the winter to a maximum of 45 °C in the summer [Pruda, 2012]. The monsoon season lasts from July to October and the average annual rainfall is 154 cm with an average maximum of approximately 400 mm in August [Pruda, 2012].

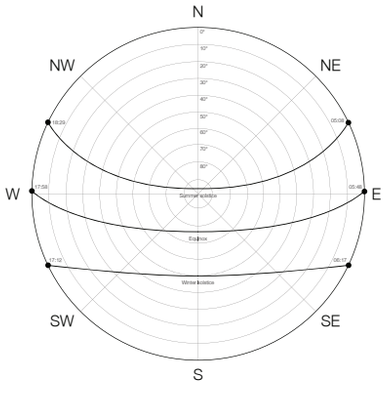
Wind direction distribution



Ill. 108.2

Bhubaneswar is situated at an altitude of 45 meters above sea level [Pruda, 2012] and the wind comes predominantly from the South. Compared to Denmark India is located closer to the equator, which means that there is not much variation in the length of days between winter and summer.

Sun path diagram



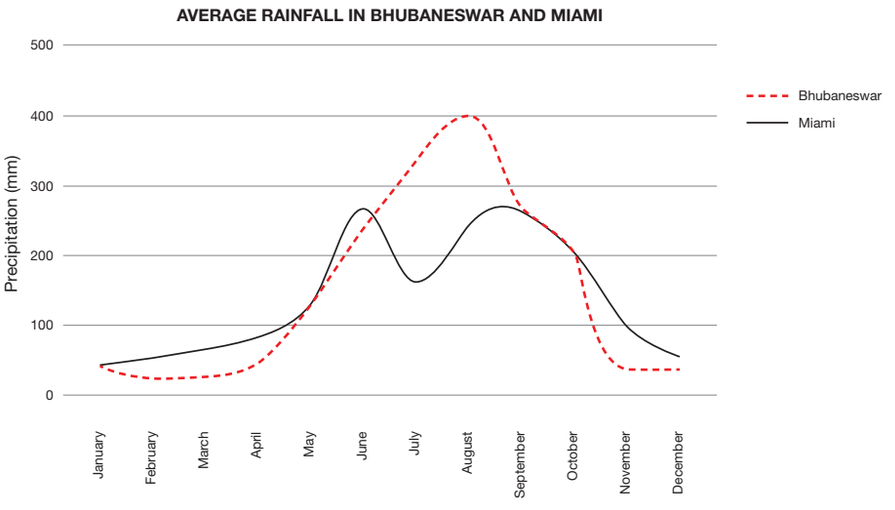
Ill. 108.3

APPENDIX 3
DIMENSIONS OF RAINWATER DRAINS AND BASIN

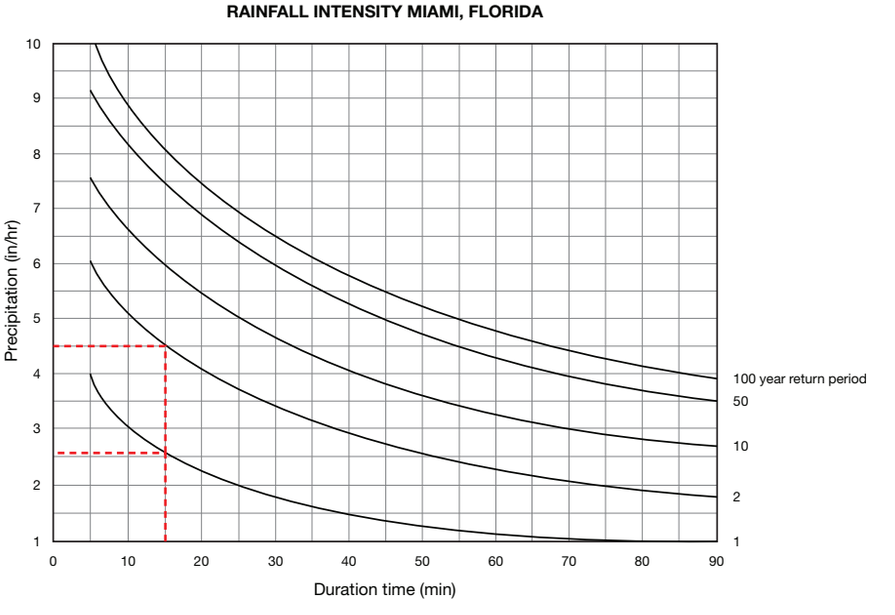
This appendix is based on *Surface Water Drainage for Low-income Communities* by the World Health Organization, 1991.

Through this project two simple and low-cost interventions regarding management of rainwater have been incorporated. At Kharbel Community a through-going rainwater ditch and an appurtenant rainwater basin are used to manage the local rainwater, whereas at Railway Basti ditches ease the local conditions and reduce the risk of flooding in the vulnerable slum area.

The dimensions of these rainwater designs are estimated on the basis of a series of rain data. In Bhubaneswar however, there is a lack of rainfall registrations and consequently the estimations are based on rain data from Miami, Florida. Miami has a tropical climate with a wet season from May to September and a mild and dry winter season, similar to the climatic conditions of Bhubaneswar. Furthermore comparing the annual precipitation of Bhubaneswar (1800 mm) and Miami (1660 mm) there is a difference in the annual rainfall of about 140 mm. This is considered an acceptable amount as it is not possible to find an exact rain data match for Bhubaneswar. However it is worth noticing that the average precipitation in the monsoon season of Bhubaneswar is heavier than in the wet season of Miami, see ill. 109.1. This has to be taken into consideration in the calculations as higher average precipitation typically leads to more intense and extreme rainfalls.



Ill. 109.1



Ill. 109.2

Calculations
To dimension drains it is necessary to calculate the maximum flow of water that they will have to convey. This involve:

1) Determining the return period and duration
2) Finding the rainfall intensity (*I*)
3) Calculating the catchment area (*A*)
4) Estimating a run-off coefficient (*C*)
5) Calculating the peak flow based on items 1-4

The return period is an estimate of the frequency of flooding. It should be determined based on a weighting of how vulnerable the given project site is and the economy of the project. The higher the return period the more protected against flooding and the higher the costs to achieve this protection will be.

The duration is the amount of time required for rainwater falling in the most distant point of the catchment area to run to the drain, which has to be designed. For smaller catchment areas (less than 5 ha) a duration time of 15 minutes can be used.

After determining return period and duration the rainfall intensity can be read off the rainfall intensity/duration graph (ill. 106.2). The rainfall intensity expresses how concentrated a given storm is. High rates of rainfall can occur in a short period of time, but not have long enough duration to cause a flooding, whereas a less intense storm with a longer duration can cause severe damages.

The catchment area is the area providing rainwater to the project site and is estimated from a map with contour lines.

The run-off coefficient depends on the soil conditions, land use and terrain. For humid, non-paved regions with a flat slope (0 – 1 %) and soil consisting of sandy loam the run-off coefficient is 0.20. However as a part of the catchment area is paved, the coefficient can be determined by ill. 113.1, which shows the relation between an unpaved run-off coefficient and the population density.

The peak flow is calculated by:

$$Q=C\cdot I\cdot A$$

Where *C* is the run-off coefficient [m^2/m^2], *I* is the rain intensity [$m^3/(m^2\cdot s)$] and *A* is the area [m^2].

And finally the peak flow is used to find the sectional area of the drain:

$$A_{cross}=\frac{Q}{V}$$

Where A_{cross} is the cross sectional area [m^2] and *V* is the flow speed (approximately 1 m/s).

Kharbel Community
The dimension of the drain at Kharbel Community is estimated from a duration time of 15 minutes (as the catchment area is less than 5 ha) and a return period of 1 year. This means that there in average will be water on the surface one time a year. To comply with this yearly occurrence, the road adjacent to the drain will function as precaution and is dimensioned by a 2 year return period.

For the drain, the rainfall intensity is read off as 2.6 in/hr = $18.34 \cdot 10^{-6}$ m/s, as shown on ill. 109.2. To account for the difference between the most heavy rains in Bhubaneswar and Miami, the rainfall intensity is multiplied with a factor 1.3 giving it an amount of $23.84 \cdot 10^{-6}$ m/s. The catchment area is shown on ill. 112.1, and constitutes an area of about 28400 m^2. The population density of the area is about 123 residents/ha giving a percentage of coved area of 30 %, which means that the run-off coefficient is 0.45. See ill. 113.1.

The peak flow is calculated:

$$Q = 0.45 \cdot 23.84 \cdot 10^{-6}\ m/s \cdot 28400 m^2$$
$$Q = \underline{\underline{0.305\, m^3/s = 305\, l/s}}$$

The cross sectional area is:

$$A_{cross} = \frac{0.305\, m^3/s}{1\, m/s}$$
$$A_{cross} = \underline{\underline{0.305 m^2}}$$

The same calculation is conducted for the dimension of the road. With a 2 year return period, the rainfall intensity is 4.5 in/hr = $31.75 \cdot 10^{-6}$ m/s - multiplied with a factor 1.3 = $41.26 \cdot 10^{-6}$ m/s. The peak flow and cross sectional area are:

$$Q = 0.45 \cdot 41.26 \cdot 10^{-6}\ m/s \cdot 28400 m^2$$
$$Q = \underline{\underline{0.527\, m^3/s = 527\, l/s}}$$

$$A_{cross} = \frac{0.527\, m^3/s}{1\, m/s}$$
$$A_{cross} = \underline{\underline{0.527 m^2}}$$

Consequently the cross section of the drain and the road is designed as ill. 113.2

At Kharbel Community also a rainwater basin is located. To calculate the dimensions of this is however more complex and therefore a simple estimation is made based on a comparison of rain data from Bhubaneswar and Denmark. By assuming that the outflow of the basin is 2 l/s and that the return period for flooding is 1 year, it would, under Danish conditions, result in a basin of 150 m^3. To account for the more intense rains of Bhubaneswar, twice this volume is implemented, resulting in a basin of 300 m^3. See ill. 114.1.

Railway Basti
The drain at Railway Basti is dimensioned. The duration is yet again set at 15 minutes, the return period at 1 year and then the intensity is multiplied with a factor 1.3 to accede to the differences of Bhubaneswar and Miami. This result in a rainfall intensity of $23.84 \cdot 10^{-6}$ m/s (ill. 109.2). The catchment area compose an area of 39700 m^2 (ill.112.1) and the population density at this site is only 35 residents/ha giving a percentage of paved area of 10 % and by this a run-off coefficient of 0.28. See ill. 113.1.

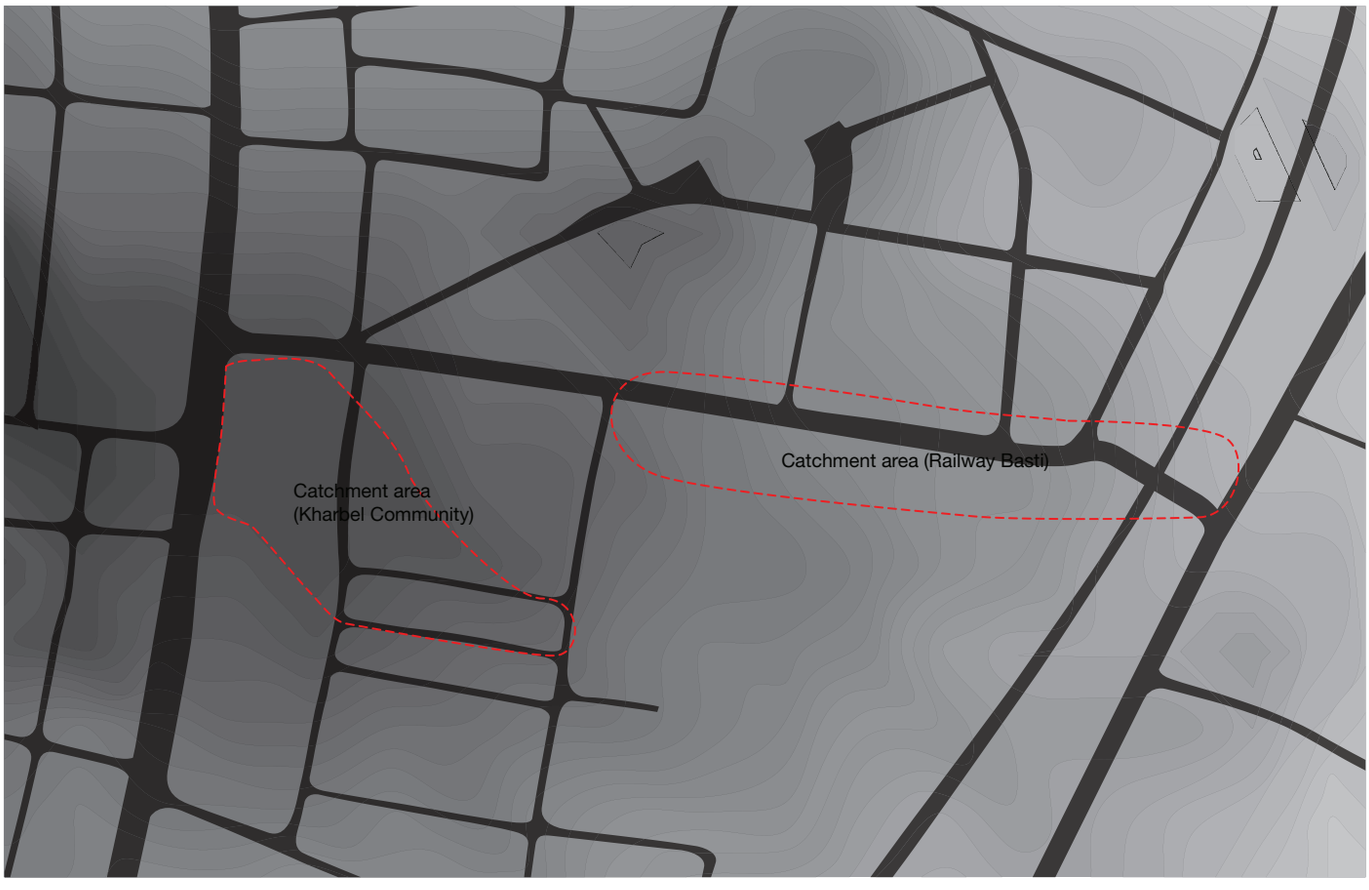
The peak flow is calculated:

$$Q = 0.28 \cdot 23.84 \cdot 10^{-6}\ m/s \cdot 39700 m^2$$
$$Q = \underline{\underline{0,265\, m^3/s = 265\, l/s}}$$

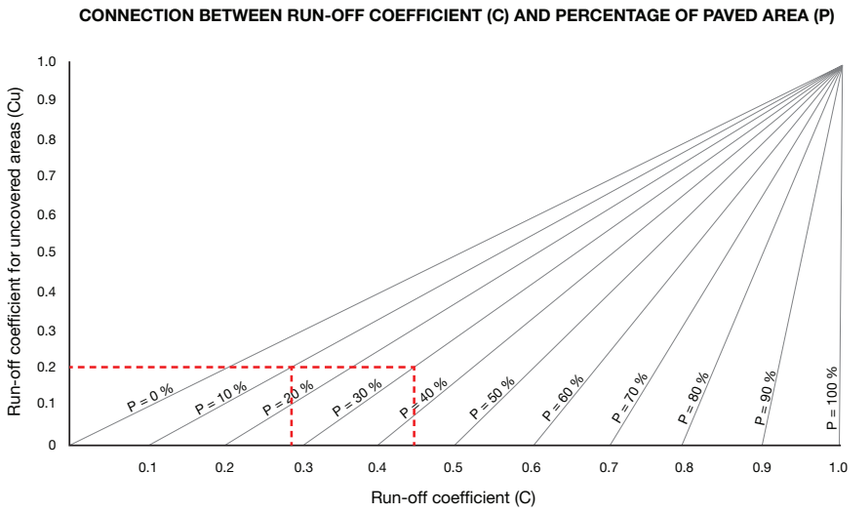
The cross sectional area is:

$$A_{cross} = \frac{0.265\, m^3/s}{1\, m/s}$$
$$A_{cross} = \underline{\underline{0.265 m^2}}$$

The cross section of the drain is illustrated at ill. 114.2.

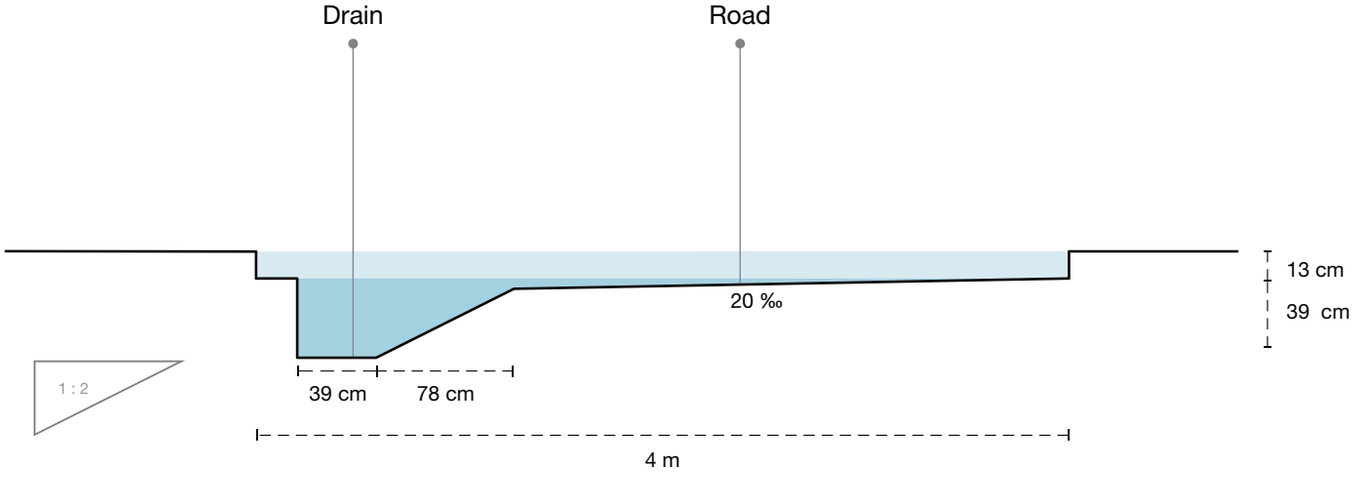


Ill. 112.1: Terrain of Satya Nagar and the project sites with their catchment areas.



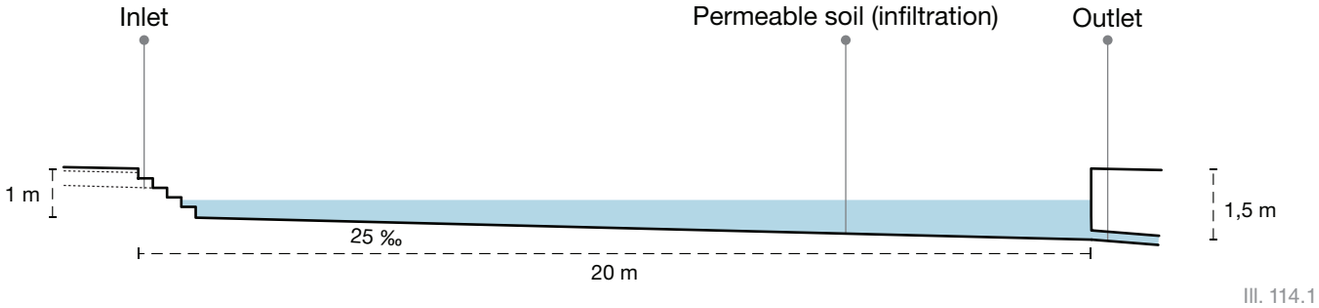
Ill. 113.1

CROSS SECTION OF DRAIN AND ROAD AT KHARBEL COMMUNITY



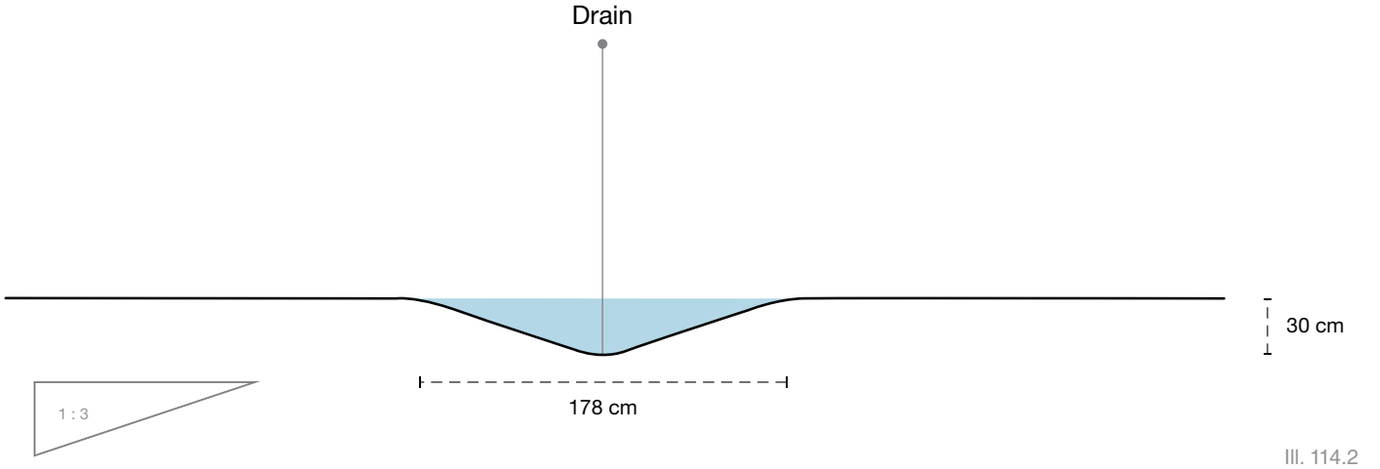
Ill. 113.2

CROSS SECTION OF BASIN AT KHARBEL COMMUNITY



Ill. 114.1

CROSS SECTION OF DRAIN AT RAILWAY BASTI



Ill. 114.2