निर्वाहाना
An Off-the-grid and integrated communal living

Student:
Akshata Bhimsen Vadavadgi

Studio:
Atelier Petr Kordovský
Contents

Declaration
Diploma Assignment
Abstract
Real deal in India
Project introduction
Project intent
Analysis
Current conditions of living
Contextual analysis
Site analysis
Design Principles
Techniques of construction
Program and essential design criteria
Tropical design and sustainability
Flexibility, expandability and adaptability: Housing expansion
Material Usage
Design Proposals
Housing typologies
Masterplan / Site plan
Commercial - dwelling relations
Cluster plans
Sections
Elevations
Visualisations
Acknowledgement
Bibliography
# CZECH TECHNICAL UNIVERSITY IN PRAGUE
## FACULTY OF ARCHITECTURE

**AUTOR, DIPLOMANT:**

**AUTHOR OF THE DIPLOMA WORK / DIPLOMA PROJECT**

Academic Year: ................................................. Semester

**TITLE OF THE DIPLOMA WORK / DIPLOMA PROJECT**
( IN CZECH LANGUAGE)

**TITLE OF THE DIPLOMA WORK / DIPLOMA PROJECT**
( IN ENGLISH LANGUAGE)

**LANGUAGE OF THE DIPLOMA WORK / DIPLOMA PROJECT:**

<table>
<thead>
<tr>
<th>Diploma Work / Diploma Project Supervisor</th>
<th>Ústav / Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma Work / Diploma Project Opponent</td>
<td></td>
</tr>
</tbody>
</table>

**Key Words**
(Czech)

**Annotation**
(Czech)

**Annotation**
(English)

---

The Author’s Declaration

I declare that I have elaborated the submitted diploma work / diploma project independently and that I have stated all the used information sources in coherence with the “Methodological Instruction for Ethical Preparation of University Final Works”.

(The complete text of the methodological instruction is available for download on http://www.fau.cvut.cz/En)

In Prague on .............................................................

Signature of the Diploma Project Author

This document is an essential and obligatory part of the diploma project / portfolio / CD.
ASSIGNMENT of the Diploma project

Date of Birth: 21/07/1995

Academic Year / Semester: 2011/2012 - SUMMER SEMESTER

Department Number / Name: 15126


Diploma Project Theme:
See the Application Form for DP - NIEVAHANA.

* An off-the-grid and integrated communal living *

Assignment of the Diploma Project:
1/ description of the project assignment and the expected solution objective
2/ description of the final result, outputs and elaboration scales
3/ list of further agreed-upon parts of the project (model)

To this list further attachments can be added according if necessary.

1) An attempt to create a sustainable, resilient, regenerative, and close knit community housing in response to issues like economic differences, socio-cultural bridging and the ecological aspects.

Date and Signature of the Student:

Date and Signature of the Diploma Project Tutor:

Date and Signature of the Dean of FA CTU:
(2) Final Outputs -
- Plans, elevations, sections (scale depends on scheme of project).
- Details - drawings
- Physical model
- Structural details
- Climatic analysis according to site
- Visualisations of proposed design.

(3) Working scheme -
- Site description
- Site analysis
- Design program (list of spaces & activities)
- Zoning of all activities & spaces.
- Form
- Planning & design (process)
- Final design
  - Plans
  - Sections
  - Elevations
  - Model.
India, like most major emerging economies, has been witnessing accelerating urbanisation. As per the census of India in 2001, about 72% of the population lived in rural areas, and 28% in urban areas. By 2011, these figures had changed to 69% rural population and 31% urban population. In fact, as per census 2011, for the first time since India’s independence, the absolute increase in population was more in urban areas than in rural areas.

According to estimates, around 600 million people are expected to move to urban India their home by 2031, a whopping 59% growth over 2011. As an increasing proportion of India’s population starts participating in its growth story, it brings with it mounting pressure on the existing infrastructure.

---

**A House is a Machine for Shitting In.**
Informality & Incremental Housing

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Huscha</th>
<th>Semi Huscha</th>
<th>Semi Huscha</th>
<th>Pucca (1)</th>
<th>Pucca (1.5)</th>
<th>Pucca (2)</th>
<th>Pucca (2.5)</th>
<th>Pucca (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA</td>
<td>12.5 sq m</td>
<td>12.5 sq m</td>
<td>12.5 sq m</td>
<td>12.5 sq m</td>
<td>15 sq m</td>
<td>25 sq m</td>
<td>35 sq m</td>
<td>75 sq m</td>
</tr>
<tr>
<td>COST (INR)</td>
<td>6000-8000</td>
<td>9000-12000</td>
<td>12000-15000</td>
<td>16000-19000</td>
<td>20000-23000</td>
<td>35000-4000</td>
<td>40000-45000</td>
<td>50000</td>
</tr>
</tbody>
</table>

- Basic: Shutter/Inward
  - No water
  - No sanitation
  - No security
  - No lighting
  - No ventilation

- Semi-Basic: Shutter/Inward
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks

- Semi-Basic: Shutter/Inward
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks

- Basic: Shutter/Inward
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks

- Basic: Shutter/Inward
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
  - Basic: Shutter/Inward + Bricks
This thesis objective is to expose the negative impacts of the present social housing mass production model and then to analyze the possibilities of a coherent alternative to housing based on identity, sense of community and uniqueness which could consistently improve the dwellings and the built environment. The main idea is to find inspiration and to develop a new concept for social housing.

The expandable housing project in Bangalore, in the state of Karnataka, in India is sensitive to the challenge of housing as mentioned above as well as accommodating the influx of migrants who come in search of better income and higher wages and the ever growing IT hub of the country.

Hence, flexibility of dwelling units with crucial income generating spaces which manage its own water, sewage and electricity systems. Thus, making it a new sustainably housing community that responds to the issues of a rapidly growing city.

First, six different housing typologies were designed. Each house type can have up to three different possible additions (2, 3, 4 bedroom from the base 1 bedroom house) that can be built along the years based on the necessity of each family.

The possible income generating spaces include -
1. Convenience store
2. Food stalls
3. Motobike and car repair
4. Taylor shop
5. Printing and photocopy/stationary store
6. Service apartments/room for rent
7. Cottage industries/workshops
8. Beauty salon
9. Household goods
10. Automated teller machine
In the absence of any meaningful intervention, is slated to double to 35 million units of this deficit for the EWS (Economically Weaker Sections) and LIG (Low Income Group) segments. While this number is huge, there is also a substantial chunk of “the emerging middle class”, who are also deprived of decent living conditions which would further aggravate the proliferation of unplanned and unsustainable urbanisation. Statistics show that more than 80% of this category are staying in congested homes.

The lack of available housing options, combined with limited income and minimal access to home finance for low income borrowers, means that millions of Indian households currently live in cramped, poorly constructed houses/stun areas/shanties. They lack access to a clean and healthy environment, with even basic amenities such as sanitation, clean water, sewage, waste management and electricity often absent. Thus, “Affordable Housing” is an idea whose time has come and sooner rather than later, planned sustainable urbanisation will have to be by default and not by choice.

Consequences of Urban sprawl in Bangalore.
The following are the key issues gathered from the lifestyle and conditions of living of the community I am working for, to provide respective solutions by proposing a planned scenario which further brings organization within the settlement and facilitates the proper function and enhances the living conditions of the dwelling community.

- Incremental housing can be defined as a gradual step-by-step process whereby building components are appended or improved by owner-builders as funding, time, or materials become available. In this way, the costs of housing construction can be reduced, especially compared with the housing delivery by contractors - ECONOMIC ASPECTS.

- The material selection and vernacular style of architecture reduces cost in both material purchase and efficient labour who are well-versed in this style - ECONOMIC ASPECT.

- Choice of various styles of houses with range of building plot sizes attracts people belonging to different classes in the economic ladder and encourages interaction and thus narrowing down the boarders - SOCIAL AND ECONOMIC ASPECTS.

- The incorporation of passive cooling building techniques and planning makes it a sustainable solution of living - ENVIRONMENTAL ASPECTS.
• Within the site, hierarchy of open, community spaces are introduced for gatherings and other social activities to happen at various scales, from each individual house level (terraces) to cluster level to biggest site level community spaces. Introducing spaces for46:38

community level festival celebrations - SOCIAL ASPECTS.

• The amalgamation of green terraces and intertwining green community spaces along with the family swellings makes it a green solution - ENVIRONMENTAL ASPECT

• The current unrestricted growth in many urban areas of housing, commercial development, and roads over large expanses of land, with little concern for urban planning is dealt with a properly planned settlement following all the byelaws with further development only with legal permits.

• When family demands an expansion, the family can simply do so at the same plot without the tedious displacement of themselves and their belongings.

• Organised and planned spaces for various commercial occupancy helps in the proper functioning and aesthetic aspects of the settlement.

• Allocated spaces for vehicular parking answers the problem of insufficiency of place to park vehicles which leads to road blockage due to unsanctioned spaces for parking on the road.

• By dedicating separate spaces for congregation, parking, daily routines and activities like washing, poultry, drying of clothes gives a great level of order to the site, decorum and increased hygienic levels of living.

• Effortless expansion at individual dwelling level happens by self-built floors as requirements demand for each family, without the use of expensive, space consuming equipments like cranes, RMC, etc., thus not causing inconvenience for current residents within and around the site.

• The intent of keeping the settlement low rise is simple to increase all these interactions between families to create a close knit community.
Each expandable unit contains technologies, material strategies and planning guidelines that can develop in different ways depending on local social, cultural and environmental conditions.

The only fixed element is the ground floor units, which are fixed units that include 1 bedroom homes at all the 6 different shape typologies of housing units.

1. The base unit will be built with conventional materials and methods - on RCC foundation that can support up to 6 floors. RCC beams and columns framework onto which modular walls with openings for doors and windows comprising of locally available and affordable building materials. This shall be constructed and financed by the developer or government housing agency.

2. Further, the system allows flexibility where the residents provide initial and expand further in accordance with their circumstances, requirement and budget allowance. These additions are made with aerated concrete which are characterized by their uniformity, low weight, high thermal insulation, stability and easy machinability (blocks can be cut as desired), allowing construction up to 5 storeys.

- Rainwater harvesting, sewage and septic tank systems, solar electric generation, and passive cooling techniques are integrated in each of these expandable units. Making it affordable and a self-reliant community.

Passive Design techniques and essential tropical criteria:
- Open interior space with minimal partitions, allowing optimum ventilation.
- Roof with sufficient slope for collection of effective rainwater runoff.
- Large roof eaves and balconies for effective sun shading.
- Fully operable windows made with locally produced bamboo with a low thermal capacity for cooler house interiors.
- Terrace gardening surrounding vegetation reduces the heat of buildings and energy costs.
- Linear configuration of units plans with operable windows on opposite wall enhances cross ventilation effect and cools the interiors.
- Open plazas and gathering spaces through the community, where several types of events like concerts, fairs, or farmers markets will happen.
- Owner participation on the construction (self-built)
- Sustainable features: cross-ventilation, natural light, rainwater harvesting, recycling, green roofs, small urban agriculture, use of cheap/local materials, pre-fab modules. In this thesis the idea is to discuss and develop house production in legal situations through the self-building process of individual families and their need for technical support.
India lies on the Indian Plate, the northern part of the Indo-Australian Plate, whose continental crust forms the Indian subcontinent. The country is situated north of the equator between 8°4' north to 37°6' north latitude and 68°7' east to 97°25' east longitude. It is the seventh largest country in the world, with a total area of 3,287,263 square kilometres. India measures 3,214 km from north to south and 2,933 km from east to west. It has a land frontier of 15,200 km and a coastline of 7,516.6 km.

India is divided into 28 states (further subdivided into districts) and 8 union territories including the National capital territory (i.e., Delhi). India’s borders run a total length of 15,200 km (9,400 mi).

Bangalore, officially Bengaluru, is the capital of the Indian state of Karnataka. It has a population of over ten million, making it a megacity and the third-most populous city and fifth-most populous urban agglomeration in India. It is located in southern India, on the Deccan Plateau at an elevation of over 900 m (3,000 ft) above sea level. It is multi-ethnic, multi-religious, and cosmopolitan with significant business and cultural sectors. It is often referred to as the "Silicon Valley of India."
SITE AND SURROUNDING GREEN SPACE CONNECTIVITY
SITE AND SURROUNDING BUILDING HEIGHTS
HAPAZARD (NO SIGNIFICANT ARCHITECTURAL PATTERN) 
THUS REDEVELOPMENT WOULD BE APT
RATIO OF EMPTY SPACES IS MORE THAN THE RATIO OF BUILT-UP SPACE

SITE STUDY - SPATIAL PATTERN (SHWARZ PLAN)
CLIMATIC ANALYSIS

- PRECIPITATION (RAINFALL)
- AND ORIENTATION

- PREVALENT WIND TYPE AND DIRECTION

PREVALENT WIND DIRECTION IS FROM "SW" TO "NE" ACROSS THE SITE.

THE PRESENCE OF A WATER BODY IN THE VICINITY MAKES THE AIR MOISTURE LADEN.

WIND FUNNELING EFFECT OBSERVED DUE TO THE PRESENCE OF TREES.

PRESENCE OF VEGETATION ALSO HELPS IN DECREASE IN SOIL EROSION LEVELS.

OVERALL, A COMFORTABLE MICRO CLIMATE.
COOLEST TOWARDS THE PERIPHERY
BECAUSE OF VEGETATION AND
INTERIOR LOCATION

HOTTEST TOWARDS THE MAIN ROAD
DUE TO VEHICULAR MOVEMENT AND
LACK OF TREES

NO SHADE FROM TREES IN
ANY DIRECTION (HOTTEST)

CLIMATIC ANALYSIS
- SUN PATH AND SOLAR INTENSITY
  AND VEGETATION
  - LARGE TREES ACT AS VISUAL MARKER
  - SITE CONSISTS OF A VARIETY OF TREES
    WITH LARGE CANOPIES
  - SHADED REGIONS
    AT DIFFERENT TIMES
    OF THE DAY

POTENTIAL REDEVELOPMENT
AREA FOR RECREATION
AND GREEN SPACES

SITE STUDY - NATURAL FEATURES
PHYSICAL PARAMETERS
- SHADOW ANALYSIS

The non-shaded regions need to be shaded by vegetation or by other treatment.

MUTUAL SHADING ON SITE

SITE STUDY - MANMADE FEATURES
CIRCULATION
- ROAD NETWORKS
  (CLASSIFICATION, TRAFFIC MOVEMENT, NODES AND JUNCTIONS)

- SECONDARY ROAD
- PRIMARY ROAD
- TERTIARY ROAD

CIRCULATION
VEHICULAR AND PEDESTRIAN DENSITY

PEAK HOURS OF TRAFFIC
MORNING
00:00 09:00
13:00 19:00
EVENING
05:00

VEHICULAR DENSITY
MIN.
MAX.

PEDESTRIAN DENSITY
MIN.
MAX.

SITE STUDY - MANMADE FEATURES
<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Spaces</th>
<th>No of People</th>
<th>Area Sq.m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Residential</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Typology 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 BHK</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>1 BHK + Dining</td>
<td>2</td>
<td>36.25</td>
</tr>
<tr>
<td>3</td>
<td>2 BHK</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>4</td>
<td>2 BHK + Dining</td>
<td>4</td>
<td>54.25</td>
</tr>
<tr>
<td>5</td>
<td>3 BHK</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>4 BHK</td>
<td>6</td>
<td>120.25</td>
</tr>
<tr>
<td></td>
<td><strong>Typology 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 BHK + Dining</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>2 BHK + Dining</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>3 BHK + Family room</td>
<td>5</td>
<td>128</td>
</tr>
<tr>
<td>4</td>
<td>4 BHK + Family room</td>
<td>6</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td><strong>Community spaces + Commercial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Shopping center</td>
<td>200</td>
<td>810</td>
</tr>
<tr>
<td>2</td>
<td>Café</td>
<td>50</td>
<td>160</td>
</tr>
<tr>
<td>3</td>
<td>Restaurants</td>
<td>80</td>
<td>250</td>
</tr>
<tr>
<td>4</td>
<td>Super market</td>
<td>200</td>
<td>420</td>
</tr>
<tr>
<td>5</td>
<td>Pharmacy</td>
<td>30</td>
<td>120</td>
</tr>
<tr>
<td>6</td>
<td>Galleries</td>
<td>50</td>
<td>120</td>
</tr>
<tr>
<td>7</td>
<td>Library</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>8</td>
<td>Fitness center</td>
<td>40</td>
<td>150</td>
</tr>
<tr>
<td>9</td>
<td>Auditorium</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td>10</td>
<td>Communal care-</td>
<td>30</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>(for elderly and children)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Recreational and other spaces</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Office spaces</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>Open air theatre</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>Play area</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>4</td>
<td>Parks</td>
<td>80</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>Cycling lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Urban farms</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>7</td>
<td>Service care</td>
<td></td>
<td>800</td>
</tr>
</tbody>
</table>
PART SEVEN

PROPOSALS
COMMERCIAL - DWELLING WORKABILITY
© SINGLE DWELLING LEVEL

PATIO - 1 BHK
NET SURFACE AREA = 100 sqm
OPTION 1 - FULL DWELLING
COMMERCIAL - DWELLING WORKABILITY

PATIO - 1 BHK
NET SURFACE AREA = 100 sqm
OPTION 2 - 30% DWELLING and 70% COMMERCIAL
COMMERCIAL - DWELLING WORKABILITY

PATIO - 1 BHK
NET SURFACE AREA = 100 sqm
OPTION 4 - FULL COMMERCIAL
33
The possible income generating spaces include:
- Convenience store
- Food stalls
- Motorbike and car repair
- Tailor shop
- Printing and photocopy/stationery store
- Service apartments/room for rent
- Cottage industries/workshops
- Beauty salon
- Household goods
- Automated teller machine

### PATIO - 2 BHK
- **Net Surface Area**: 160 sqm
- **Variable Ratios of Dwelling and Commercial**

### PATIO - 3 BHK
- **Net Surface Area**: 250 sqm
- **Variable Ratios of Dwelling and Commercial**

### PATIO - 4 BHK
- **Net Surface Area**: 300 sqm
- **Variable Ratios of Dwelling and Commercial**

**COMMERCIAL - DWELLING WORKABILITY**

@ SINGLE DWELLING LEVEL
COMMERCIAL - DWELLING WORKABILITY
@ SINGLE DWELLING LEVEL

PATIO - 2 BHK
NET SURFACE AREA
= 160 sqm
VARIABLE RATIOS
OF DWELLING
and COMMERCIAL

PATIO - 3 BHK
NET SURFACE AREA
= 250 sqm
VARIABLE RATIOS
OF DWELLING
and COMMERCIAL

PATIO - 4 BHK
NET SURFACE AREA
= 300 sqm
VARIABLE RATIOS
OF DWELLING
and COMMERCIAL
Various possible options of achieving Commercial to Dwelling relationships at cluster level. Note the increase in commercial density from left to right, as indicated in the above graphics of a single cluster.
3D VISUALISATIONS
DEPICTING ENTRANCE AND CENTRAL GATHERING SPACE
3D VISUALISATIONS
DEPICTING OUTDOOR LIFE
3D VISUALISATIONS
DEPICTING THE BALCONIES
3D VISUALISATIONS
DEPICTING THE SPACES WITHIN THE CLUSTER
3D VISUALISATIONS
DEPICTING THE CLUSTER’S OUTLOOK
3D VISUALISATIONS
DEPICTING THE COMMUNITY KNIT
Acknowledgment

The development of this thesis has been an intensive adventure. Having an architectural base from India, it has been very challenging to blend the learnings so far to the practicality of the project according to all the necessary conditions of a region completely different. Challenging, though satisfying has been the whole process.

This wouldn't have been possible without the help of some amazing people I came across on my way. I would like to express my sincere gratitude to my Project tutor doc. Ing. Arch Petr Kordonsky who has been so inspiring, full of energy, and bright that even when I was feeling down and preoccupied, he always managed to motivate me to overcome all my difficulties related to this project and helped me bridge the gap between the learnt and the execution process.

Working on this project was a joy and an extremely enlightening experience. I am glad I was able to put on it as much time and effort and would love to improve this project and see that it would be possible to realize something similar, hopeful of something beneficial to the problems and hardships faced in a city like mine and many others in the modern world we all reside in.

Thank you for reading it and I would love to hear any thoughts and criticism regarding this project that would allow me to make it better and more thorough out.