

R E P O R T

RISK ASSESSMENT

A CASE OF DEONAR DUMPING YARD

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Presented by :

Ankita Agrawal

Gautami Ghumatkar

Meenal Vaidya

Nikita Kothawade

Shivangi Thakur

Silky Jain

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Terminologies

Adaptation

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Capacity Development

The process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions.

Climate Change

(a) The Inter-governmental Panel on Climate Change (IPCC) defines climate change as: "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use".

(b) The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

Disaster risk reduction

The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Environmental impact assessment

Process by which the environmental consequences of a proposed project or programme are evaluated, undertaken as an integral part of planning and decision making processes with a view to limiting or reducing the adverse impacts of the project or programme.

Hazard

A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

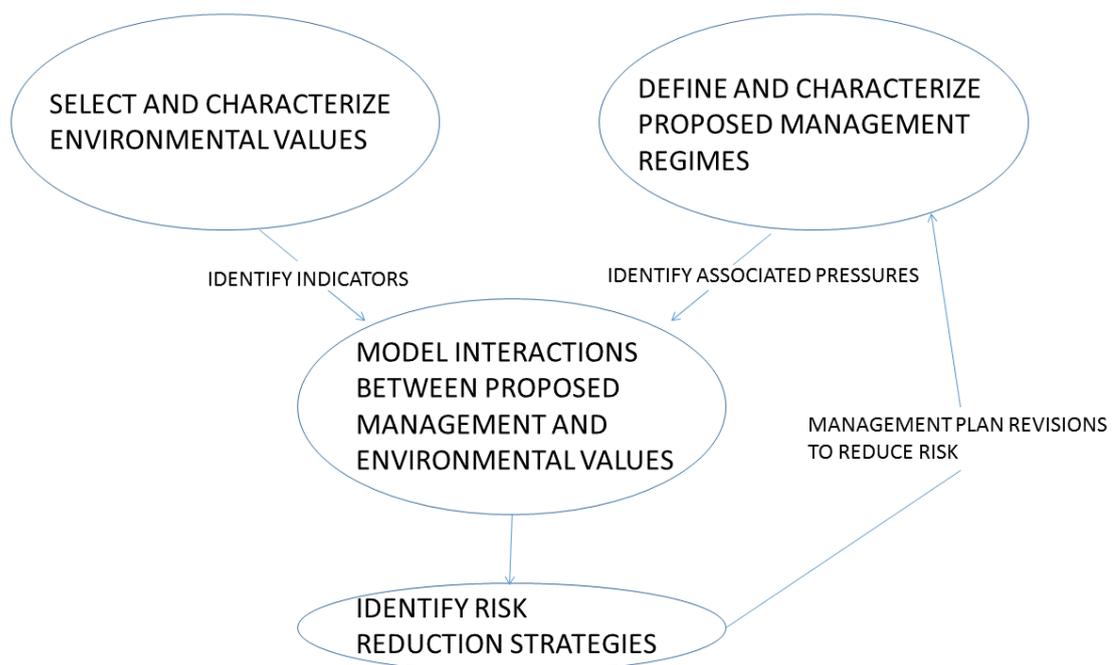
Public awareness

The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability to hazards.

Chapter-1

1.1 Introduction

Environmental Risk Assessment is a process for estimating the likelihood or probability of an adverse outcome or event due to pressures or changes in environmental conditions resulting from human activities. ERA is complementary to methods used in State of Environment Reporting (SOE), Environmental Impact Assessment (EIA) and risk management. The approach involves identification, analysis and presentation of information in terms of risk to environmental values to inform planning and decision making processes —it does not presume to provide all social and economic information relevant to making decisions, nor is the approach intended to supplant planning and management processes.



ERA is a flexible tool that can be applied:

- at a variety of scales and levels of detail appropriate to those scales (e.g., provincial to site specific);
 - for a variety of environmental issues (e.g., from wildlife to water);
 - at various levels of funding (i.e., for quick overviews to in-depth comprehensive studies);
- and,
- for short, medium or long-term time scales.

According to UNISDR terminology on Disaster Risk Reduction risk assessment is A methodology to determine the nature and extent of risk by analysing potential hazards and

evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

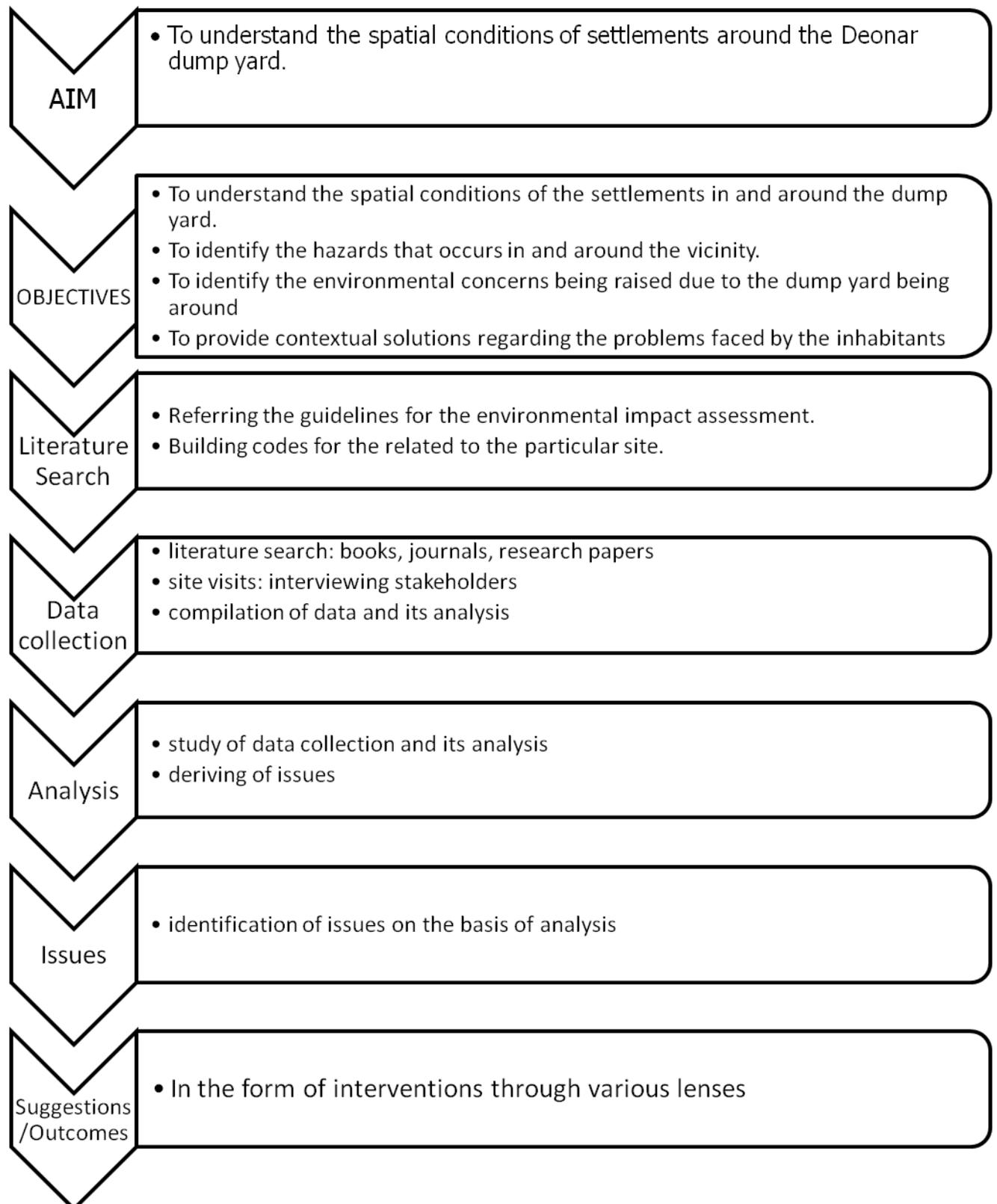
1.2 Aims

To understand the spatial conditions of settlements around the Deonar dump yard.

1.3 Objectives

- To understand the spatial conditions of the settlements in and around the dump yard.
- To identify the hazards that occurs in and around the vicinity.
- To identify the environmental concerns being raised due to the dump yard being around.
- To provide contextual solutions regarding the problems faced by the inhabitants.

1.4 METHODOLOGY



Chapter 2

2.1 SITE SELECTION

Deonar

Deonar, an eastern suburb of the city in the city of Mumbai houses the India's oldest and largest dumping ground set up in 1927. The dumping ground was set up in 1927 and comes under the jurisdiction of Brihan Mumbai Municipal Corporation. While rapid urbanization has created stark contrasts within urban spaces, the complexities within these contrasts require attention, especially in terms of glaring human development disparities that it invariably reproduces.



Figure 1 Google Image of Deonar with Dumpyard in its vicinity (Source: Google Earth Image)

It lies within the boundaries of M-east ward. The current population of M-east ward is 8,07,720 according to 2011 census of which 72.5 % is a slum and gaothans. 14 slum pockets itself are based in the the two major slum pockets known as Shivaji Nagar and Bainganwadi. Shivaji nagar comprises of Shivaji Nagar Slum and Lotus colony, Rafiq Nagar, Nirankari Nagar and Sanjay nagar in its periphery

Recording a slum population of 77.55 percent and a Human Development Index of 0.05, M-East ward ranked lowest in the Mumbai Human Development Report 2009. This apart, the 256 plus slum

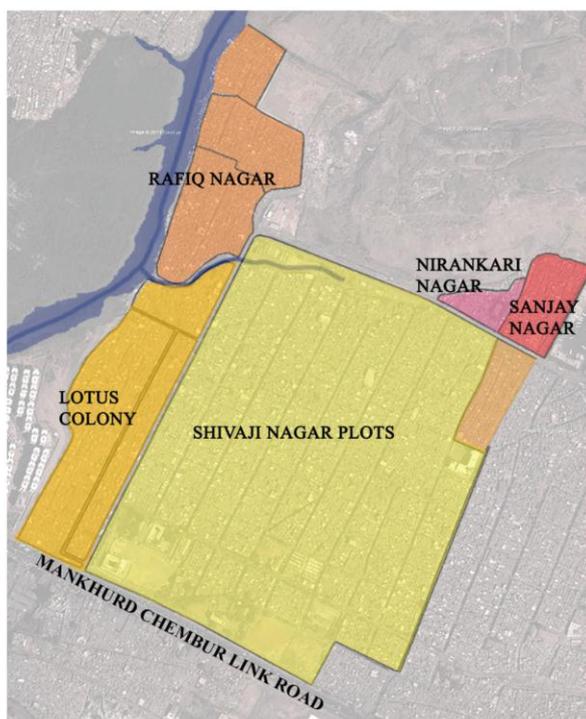


Figure 3 Shivaji Nagar Slums (source: Social,Economic conditions and Vlnerabilities: a report of the baseline survey of M(east) ward by TISS 2015

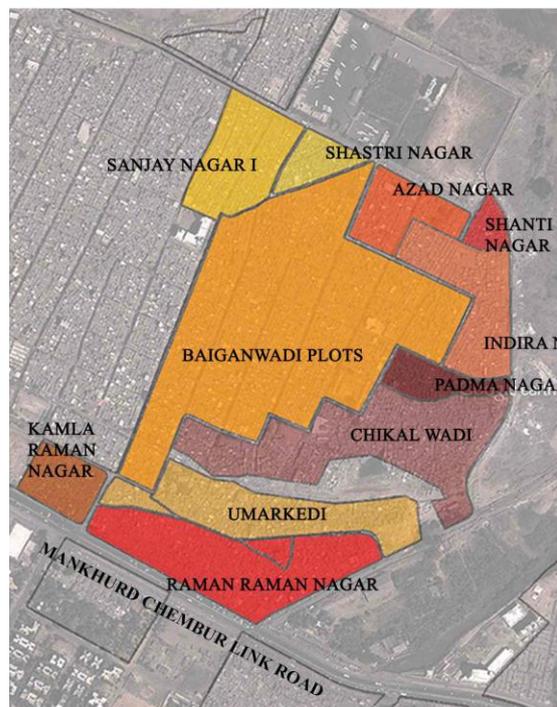


Figure 2 Baiganwadi slums (source:Social,Economic conditions and Vulnerabilities :A report of the baseline survey of M(east) ward by TISS 2015

settlements and 13 large resettlement colonies in this ward are reflective of the creation of a ghetto in a global city.

According to the Census 2011, the average literacy rate in Mumbai was 89.21 percent. As compared to the city average, M-East ward has more than double the rate of illiteracy. The survey reveals illiteracy at nearly 21 percent in the slums and gauthans of M-East. Baiganwadi, a Muslim majority slum, has the worst scenario with respect to illiteracy (above 25 percent) and educational attainment.

The proximity of the dump yard from the settlements gives rise to various hazards. The site is situated in the eastern suburbs of the city, adjacent to Thane Creek, in an area of about 132 ha of land. It is surrounded by the creek on three sides and a slum on the fourth side (Figure 1).

The inhabitants are vulnerable to the various health hazards, pollutants rising from the gases that gets emitted from the dump yard.

The inhabitants are exposed to the various toxic waste. Mercury being one of them. "Mercury does not degrade, and remains in the environment for a long time. It's contamination in water bodies can lead to ingestion in fish, which in turn can get amplified in humans upon its consumption. Long term exposure affects the nervous system, brains, lungs and kidneys."

The whole area is negligent in terms of the caring for the people there. The medical facilities are scarce. The children are suffering from various diseases ever since they are born.

The area of study is a pocket of slum known as sanjay nagar. The area was chosen because of its proximity to the dumpyard.

3.1 Ecology

The site has zero trees and the effect of the fire and toxic gases is felt more. It is advisable to plant trees like peepal (*Ficus reliogiosa*) and neem (*Azadirachta indica*) and similar plants like aloe that not only has a medicinal quality but also lessens the effect of toxic gases to an extent.

The vertical planting too should be practiced so as to expand more green spaces.



Figure 4 vertical planting along the walls to give more green spaces (source: <http://www.thehouseidea.com>)

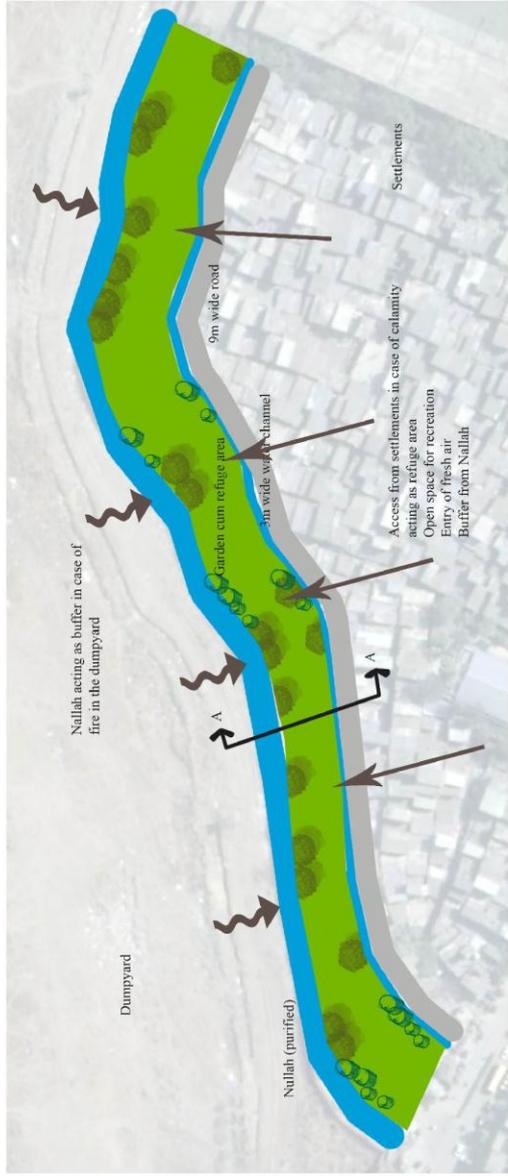
Planting of trees such as *Albizzia lebbeck*, *Cassia fistula*, *Zizyphus jujuba*, *Psidium guajava*, *Phyllanthus emblica*, *Tamaridus indica*, *Moringa olifera* along the roads will be apt and also make the cover green.

Also rejuvenation of nallah will enable proper channeling of the whole drainage. The people have adapted well to the environment.



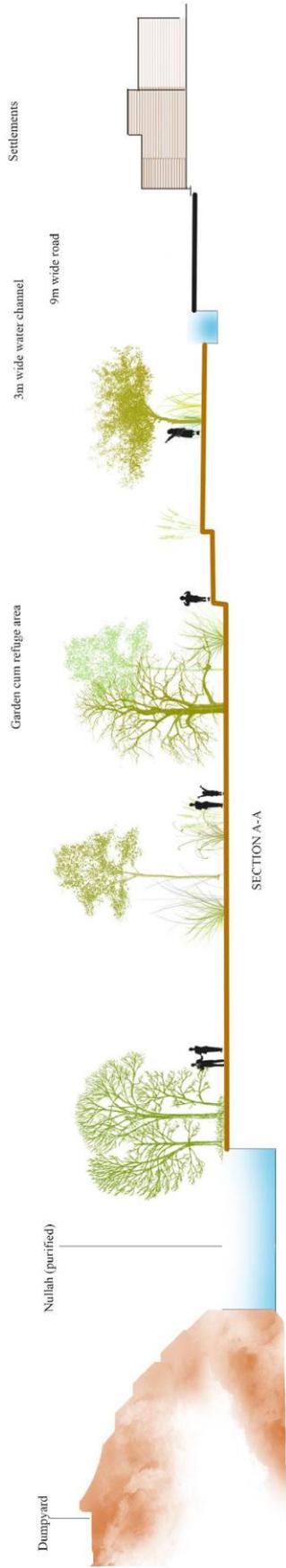
- Mangroves
- Creek
- Nullah
- Dumpyard
- Open space

A GREEN BELT BETWEEN THE DUMPYARD AND THE SETTLEMENTS ACTING AS BUFFER ZONE AND REFUGE AREA IN CASE OF CALAMITY



TREES THAT CAN BE USED AS AIR PURIFIERS

- Acacia arabica (Kateria babul)
- Aegle marmelos (Bel)
- Butea frondosa (Palus)
- Casuarina equisetifolia (Thau)
- Citrus medica (Lemon)
- Pithecolobium dulce (Jangal jalebi)
- Polyalthia longifolia (Ashok)
- Prosopis juliflora (Shami)
- Eucalyptus citrioidera (Eucalyptus)
- Ficus benghalensis (Bangad)
- Ficus infectoria (Pakar)



3.2 Livelihood

Deonar dumping yard is the source of livelihood for the rag picking community that resides in the neighbourhood. It has almost 132 acres of land, where the entire city of Mumbai dumps its garbage, almost 2,000 tonnes every day. They manage to segregate the useful from the mountains of dump and sell it in local recycling markets. Mostly children and women are dumped into this business. A daily wage ranging from Rs. 50 to 200 which enable them to earn living for a day. In this way rag pickers of Deonar always live on the edge.

This activity is shut because of the fire in recent time. This has left the rack pickers jobless. A survey conducted on the families of the 108 waste segregators indicated that at least 72 per cent of the families currently have no other alternative source of income. As per findings of the survey, 50 per cent of the families of the 108 waste segregators have taken loans for household expenses.

Over 11 per cent of the total population has to miss at least one meal a day more than 10 times a month. This means they are going hungry at least every third day, Unable to afford food despite having a ration card as they need the money to purchase drinking water.

Some of the rag pickers go into the dumping ground at night while a majority of them are struggling to find new jobs. The authority fails to provide an alternate job opportunity to the rack picking community.

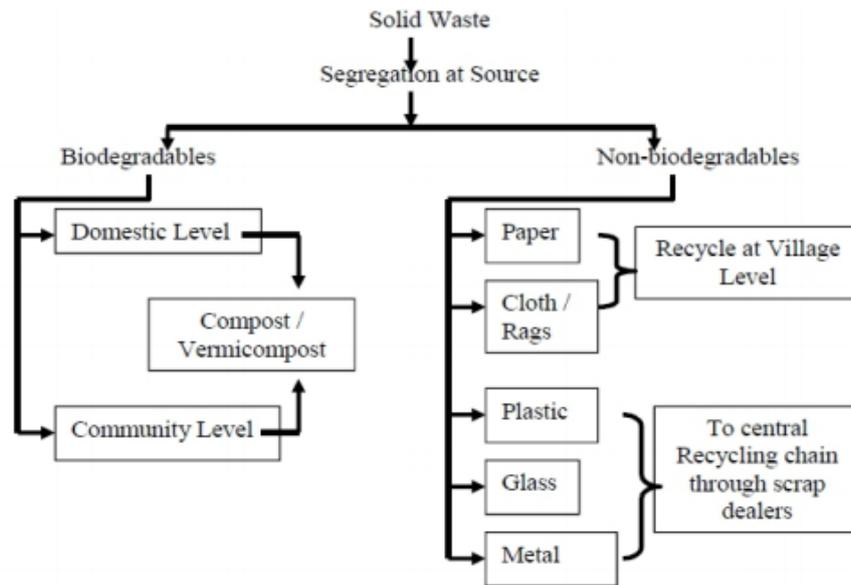
There is no waste processing plants around the dump yard and therefore all the waste get dumps directly into the dump yard creating unhygienic and filthy conditions.

Solutions:

Stage 1:

- **Segregation at source-** Educating people to separate their waste at source itself. This can be utilized as a job opportunity for rag pickers as well.
- Women training centres for promoting segregation at source
- Educating rag pickers on how to go door to door and help people to segregate their waste at initial stages.
- Clearing out the waste at dump yard by introducing small **composting pits at unit level** and generating manure out of it.

- This manure can further generate economy for each house hold and also clearing the



dump yard.

- **Stage 2:**
- When segregation at source is fully functional, **a cluster level composting unit** can be set.
- This will enable fast and scientific methods of composting the organic waste, which are segregated at source.
- A unit can be set up for its functioning, generating employment.

Stage 3:

- **A ground zero(no dump yard)** can be achieved where an Eco-Ideal can be set up. It is mooted on an idea to create an ecological ideal urban centre where all “waste” can be creatively transformed into useful resources. A one-stop centre with elements of public participation, education and skills creation, jobs and social cohesion will no doubt contribute to a sustainable urban development in cities.

These actors enter into partnerships for providing various activities related to solid waste management. These partnerships can be as follows:

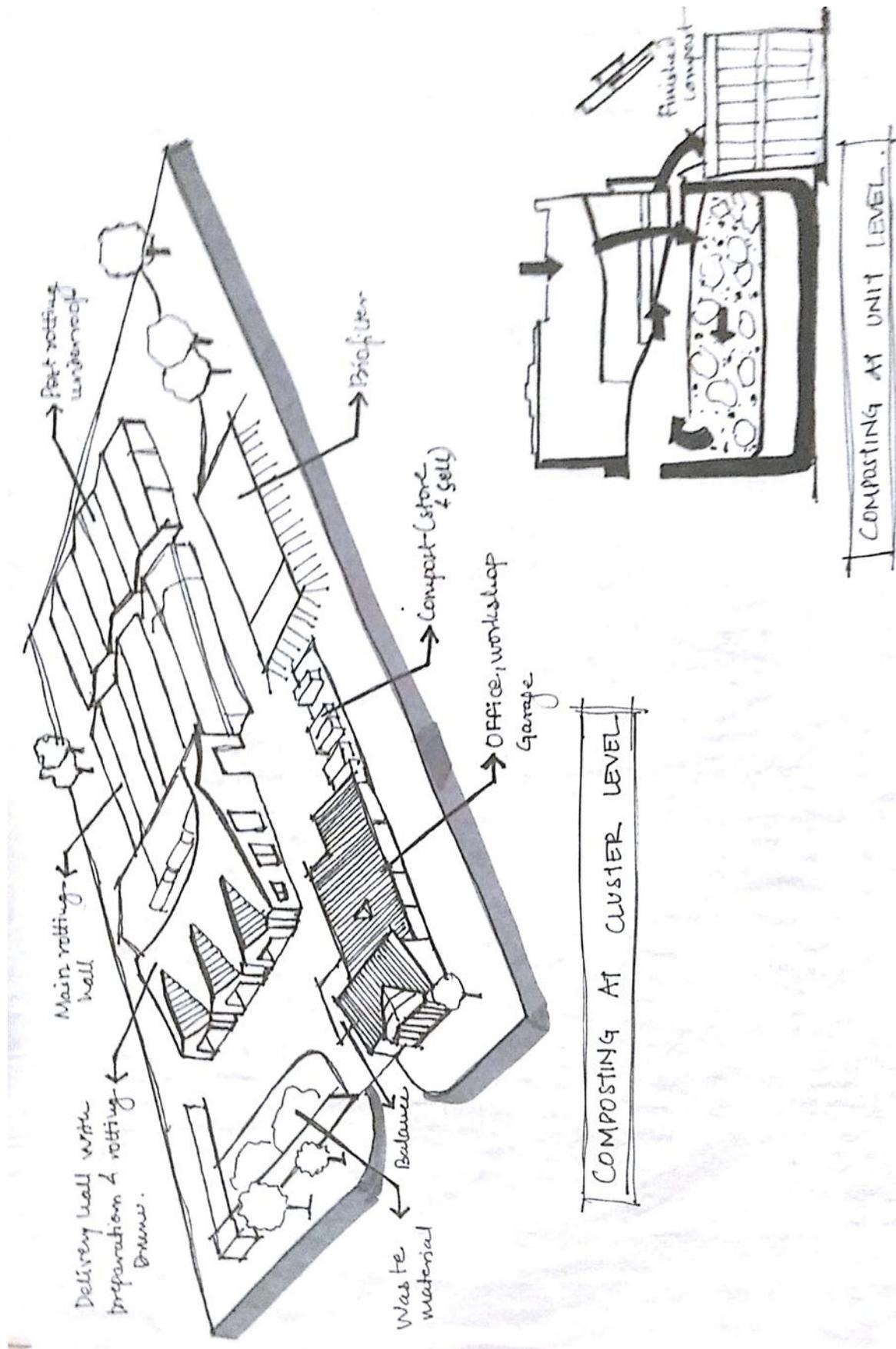
- public-private (Local Authority and private enterprises)
- public-community (Local Authority and NGOs)

- private-private (waste-pickers, itinerant-waste buyers, waste traders and dealers, wholesalers, small scale and large scale recycling enterprises)
- Public-private-community (Local Authority, private enterprises and NGOs).

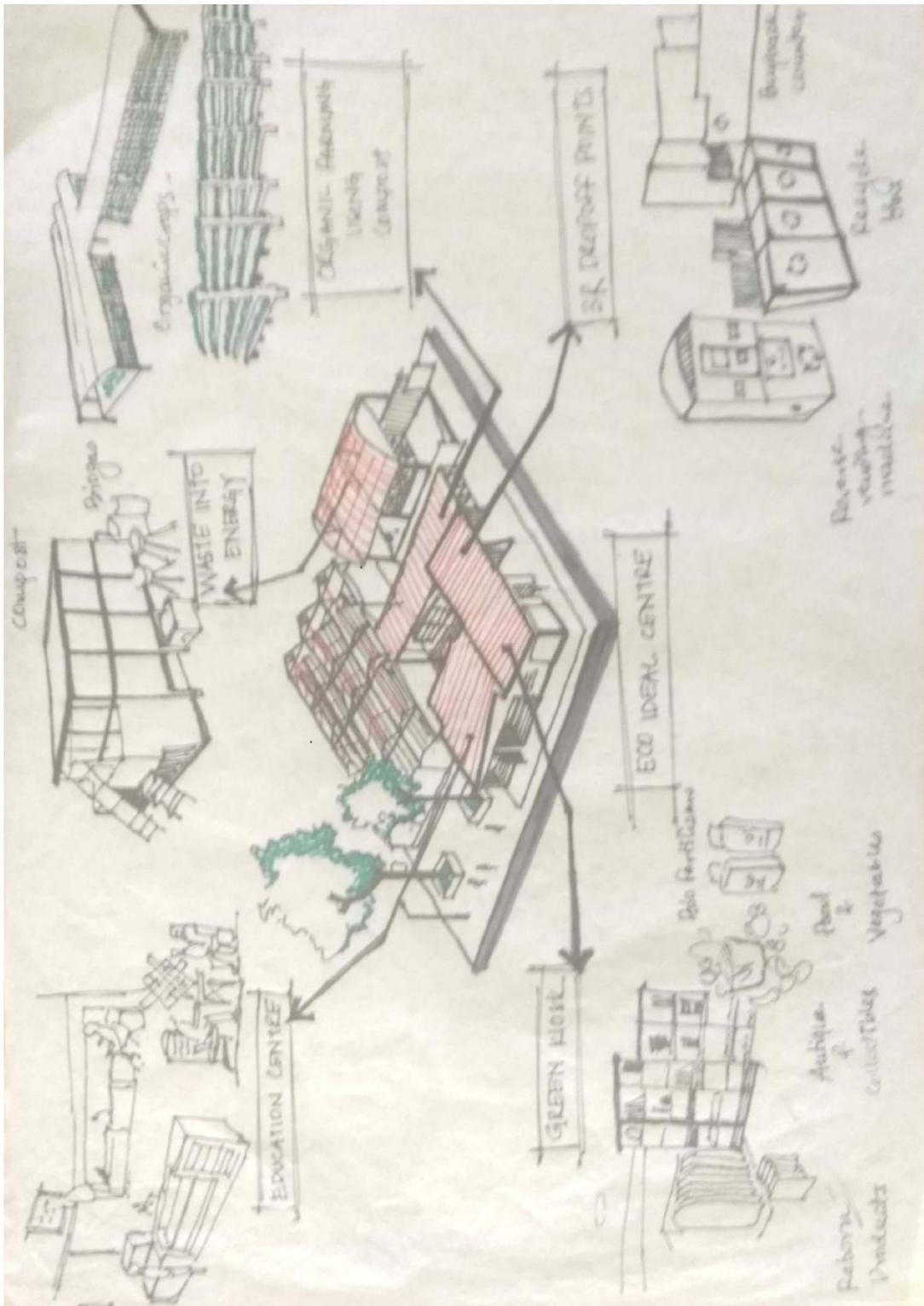
Rag Picking community

The informal community of rag pickers is a very important aspect of the waste segregation at the lower level. They sustain themselves by segregating the waste and selling it to the nearby waste mart.

The ragpickers of the nearby settlement should be made formalized by issuing of identity cards by the BMC and should follow the example of Bogota, Columbia. Where they recognized the rag picking as the profession, to help the community sustain.



composting at cluster level



composting at cluster level

3.3 Infrastructure

Slums in Deonar lack reliable sanitation services, supply of clean water, reliable electricity, law enforcement, proper drainage system, internal connectivity by roads and other basic services. These slums lack proper sanitation facilities. Even the common toilets that are used by the dwellers are not connected with proper sewage systems. There is no drinking water pipe lines laid. And with the number of people living in slums, the supply of pure water is scarce. Living conditions in slum areas are characterised by overcrowding, poor environmental conditions, scarcity of health and family welfare services, and total absence of minimum level of residential accommodation. As a result, conditions of people living in slums are far more pathetic than in rural. The connectivity and proper disposal of waste, especially plastic waste is necessary, along with increasing the sewer drainage system.



1 Plan showing the drainage lines in the settlement along proposal of public toilets

3.4.1 Proposals:

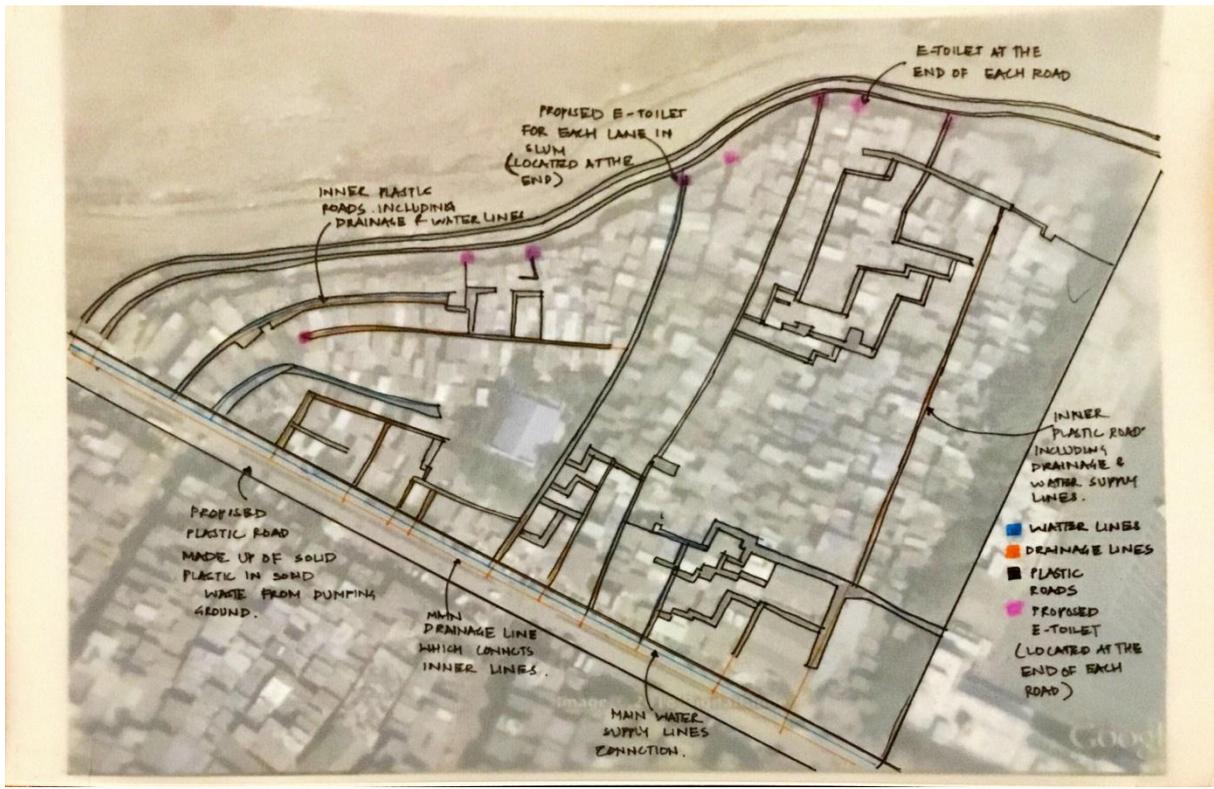
- A) **PlasticRoad:** The PlasticRoad concept consists of a prefabricated, modular and hollow road structure made from (recycled) plastic. The prefabricated production, the light weight and the modular design of the PlasticRoad make construction and maintenance faster, simpler and more efficient compared to traditional road structures. The hollow space can be used for sewage water drainage, thus preventing flooding of drainage systems during rains. The hollow space can also be used for the transit of cables and pipes, thus



preventing excavation damages. The PlasticRoad is a completely circular product that is made from recycled plastic. PlasticRoad is simple, efficient, low cost and easier to construct. It is sustainable, light weight, easy to repair and has prolonged life expectancy than normal road. **The PlasticRoad can be constructed using plastics from Deonar Dumping ground.**

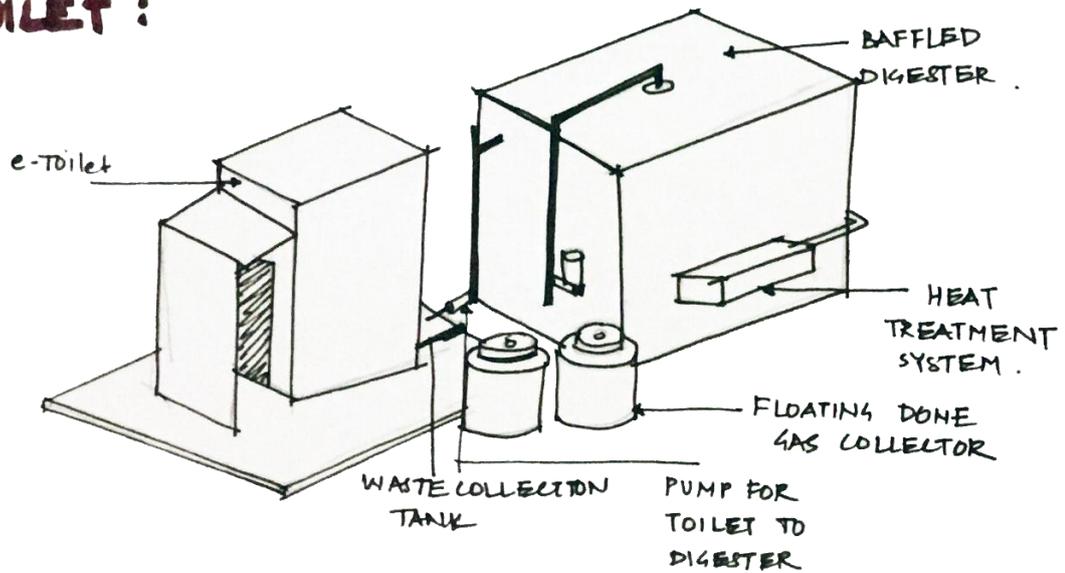
- B) **E-toilets:** e-Toilets are unmanned toilets which work on a sensor-based technology. The self-cleaning and water conservation mechanism in the toilet makes it unique. The user has to insert a coin to open the door and its sensor-based light system is automatically turned on once you enter the toilet. It also directs the user with audio commands. To conserve water, the toilets are programmed to flush 1.5 litre of water after three minutes of usage and 4.5 litres if the usage is longer. This “smart” toilet also washes the platform by itself after every five or 10 persons use the toilet. An instructional note is pasted outside the toilet to make the user familiar with the functioning of this toilet. **It is proposed to have one e-toilet for every twenty houses in Deonar slums.**





plan showing the layout of plastic roads and public toilets

E-TOILET :



2working of E-toilet

INCREASING GLOBAL PROBLEMS



FLOODING



PLASTIC WASTE

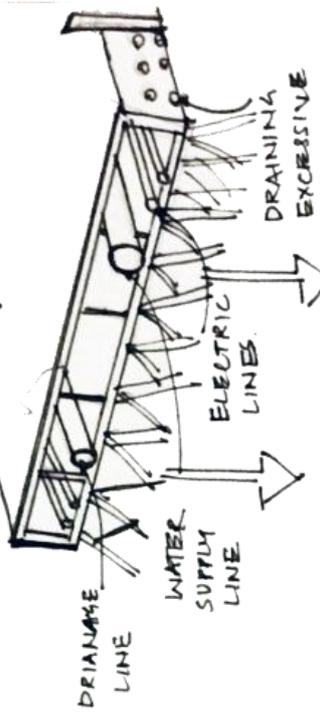
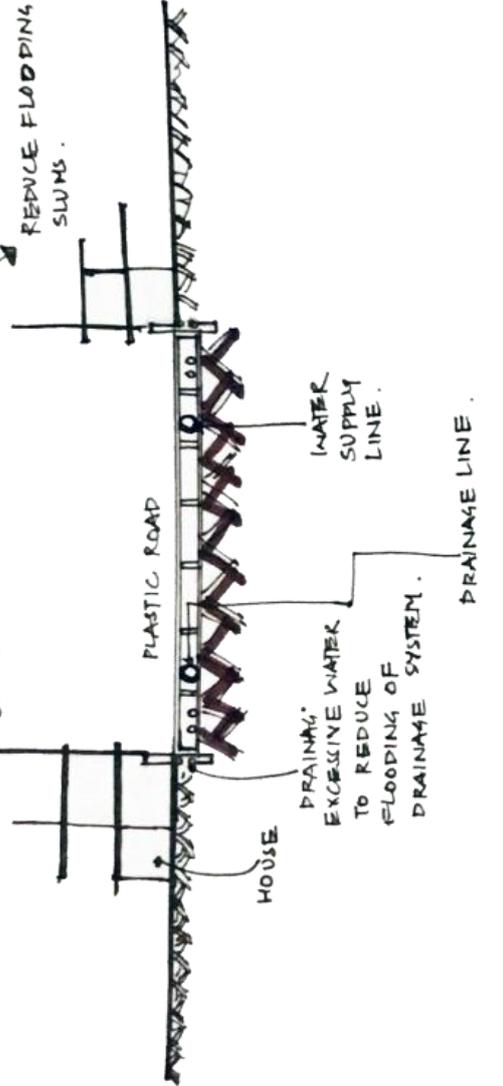
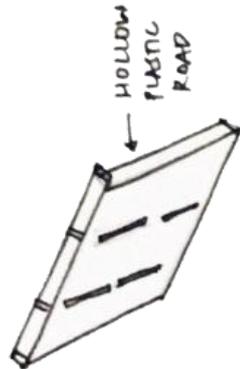


TRAFFIC CONGESTION



RECYCLING OF PLASTIC WASTE
BUILDING MORE SUSTAINABLE ROADS
REDUCE FLOODING IN SLUMS.

PLASTIC ROAD



3.4 Fire

Current Condition of the settlement in Sanjay Nagar (Deonar)

- Housing blocks located very close to each other.
- Lack of open space
- Narrow road widths for evacuation process of people.
- Inaccessibility of fire tender in case of huge fire spread in the settlement.
- Use of Building material prone to catch fire and location of houses in fire prone zone.
- Lack of public knowledge in constructing houses and use of material.
- Use of Aluminum sheets as side walls of the housing unit. Metal sheets do not provide any insulation during fire hazards.



Figure 1: Narrow allies with minimum walk able space is insufficient for evacuation during fire



Figure 2: Showing Use of metal sheets for housing units.



Figure 3: Unattended flammable material along the nala.



Figure 4: Location of settlements very close to dumping yard increasing the proximity to fire.

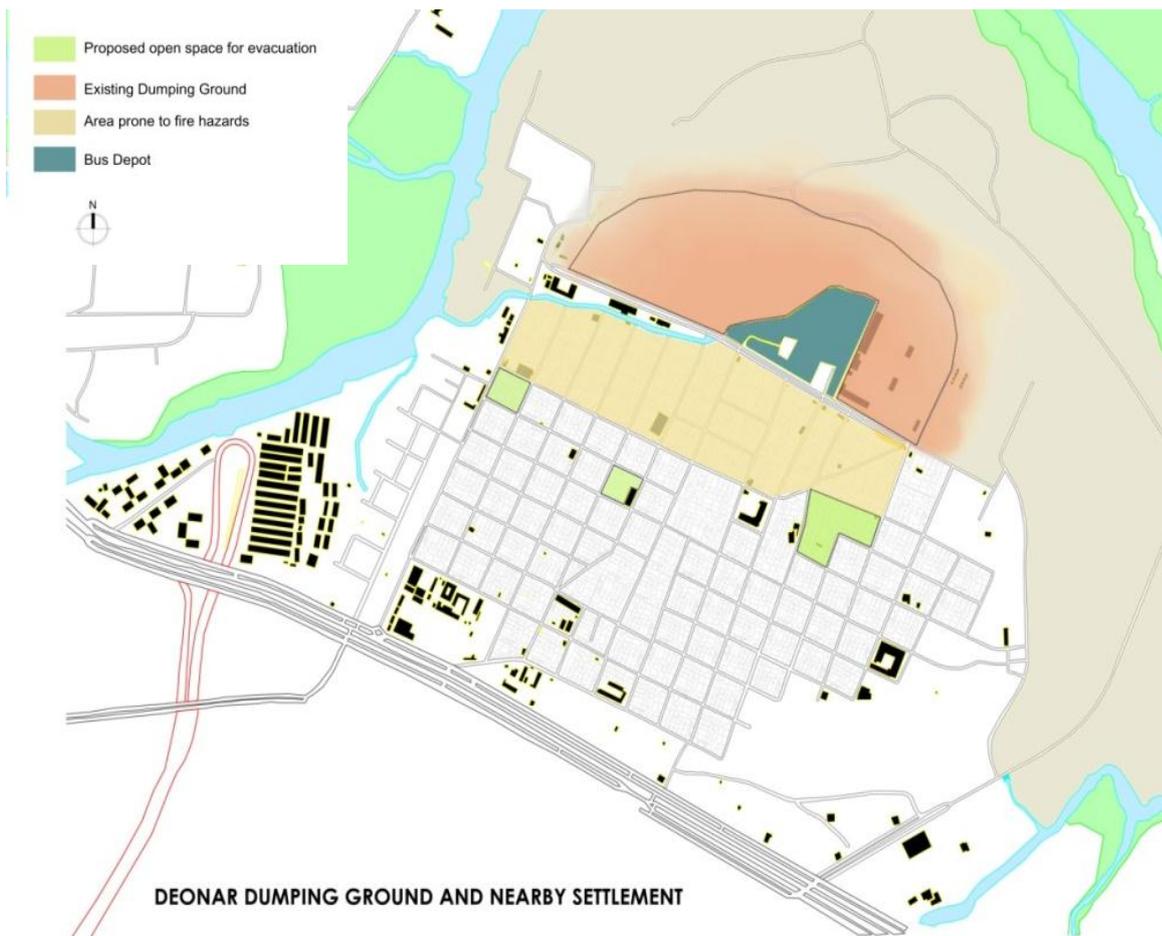


Figure 5 Plan showing fire prone areas of the settlement (source: KRVA library)

Steps Undertaken for fire safety:

- Analyzing the cause of fire break downs in the settlements and providing appropriate measures for it.
- Analyzing the current situation and provide suitable open spaces for evacuation of victims.
- Adapting new construction materials which are fire proof and cost efficient as well as durable.
- Providing new layout design for better livability as well as to ensure fire safety of the dwellers.
- Providing appropriate solutions so as to create community living amongst the residents.
- Making strict guidelines for material usage for building new houses.
- Implementation of certain guidelines for fire safety and material usage for new upcoming housing units.
- Ensuring the development is as per the proposed layout.

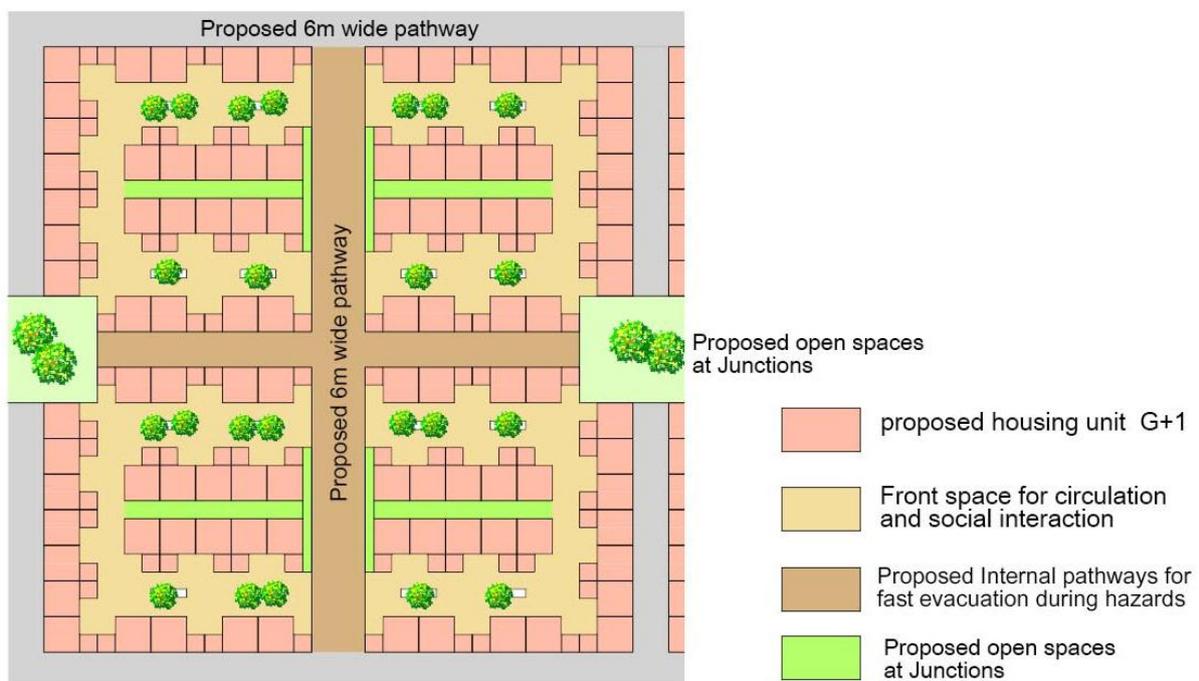
Policies for fire safety:

- Providing wide pathways within the interiors of the settlement. (up to 5-6 m)
- Rehabilitating the houses which are very close to the dumping ground.
- Usage of hollow concrete blocks for house construction to get insulation from heat.
- Using concrete roof instead of aluminum sheets.
- Provide insulation for roofs and walls.
- Provision of proper light and ventilation for houses to avoid chocking during fire due to smoke.
- The new layout provides open spaces at community level for preliminary evacuation of the people.
- Every quadrant must have dedicated open space with pollutant/toxic gases absorbing plant species as landscape.
- Introducing green pockets for reducing heat islands within the interiors of the settlement.

Design solution at a quadrant level:



Figure 6: Plan showing existing grid pattern of the slum settlement



Design proposal for a block with open spaces for evacuation at community scale

Figure 7: Plan showing proposed layout for better social livability and introduced open pockets for green cover.

Number of housing units provides within one quadrant = 100

Number of tenements within one quadrant (g+1 units) = 200

Average family size= 4

Total number of persons= 4x 200= 800

Density = 800 persons/ 4900 M²

Design solution at a quadrant level:

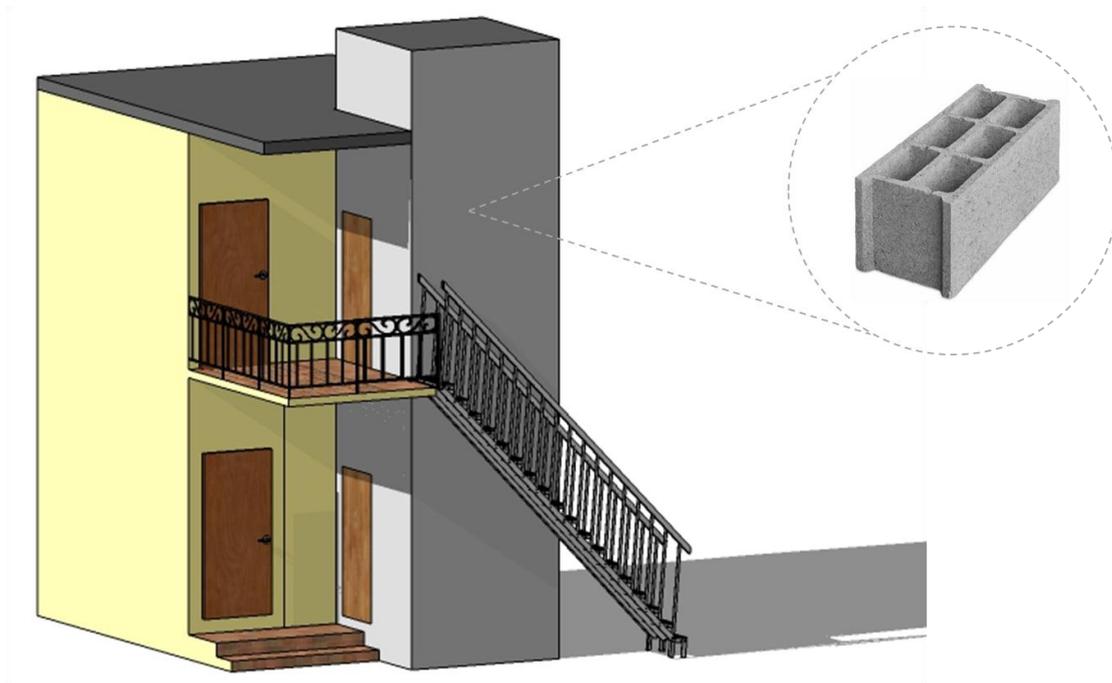


Figure 8: A prototype housing unit designed for fire safety and better standard of living.

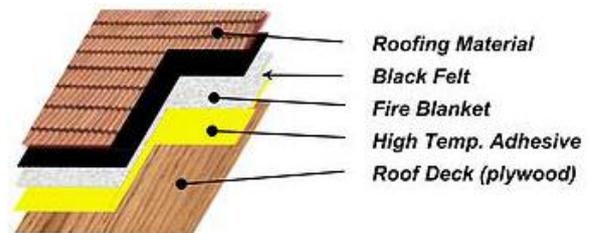
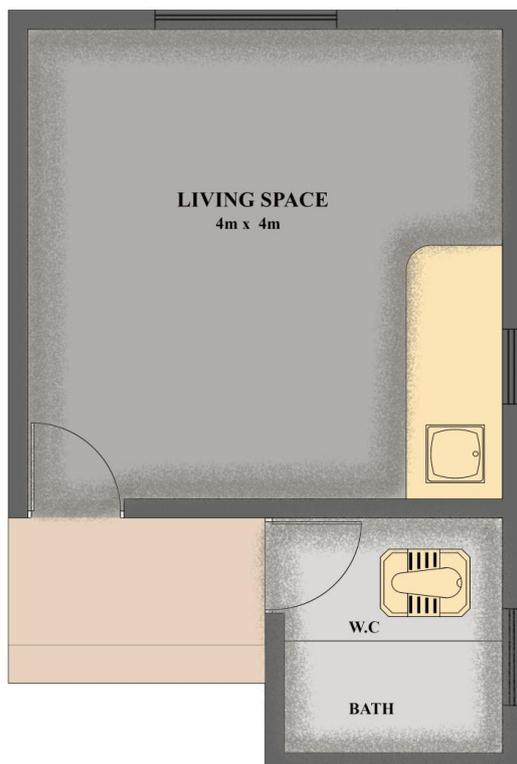


Figure 19: Methods of insulation techniques for roof

3.5 Housing conditions

Current typology

The various typologies were observed on site based on materials and space configuration. The following are the various typologies observed on site.

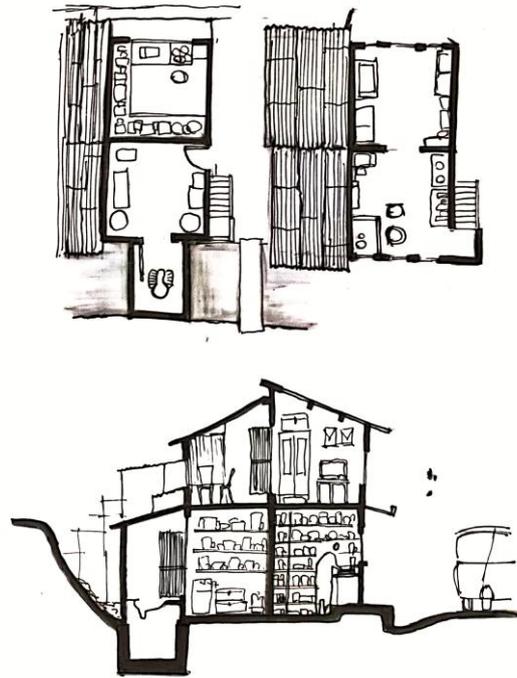


Figure 1-housing typology near the drainage line.

Observations:

- The housing typologies near the drainage line due to which the drainage line gets clogged.
- Some of the houses are too closely knit together that they have no evacuation space in times of hazards.
- Some houses have same access but the gullies are not wide enough for many people to evacuate in terms of hazards or any kind of ambulance to reach.
- The materials normally used are tarpaulin sheets, tin sheets and other inflammable materials that are normally prone to catch fire easily.

- Due to the unorganized cluster formation the houses don't have access to proper light and ventilation.
- Also lacks in proper sanitation facilities like that of toilets which also leads to rise of many epidemics.

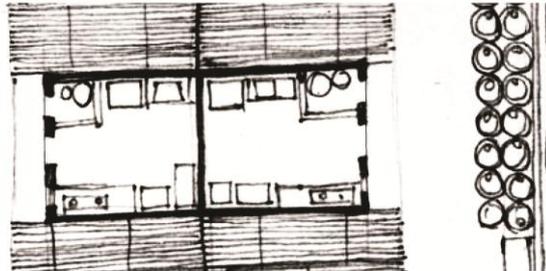


Figure 2 two houses having a common wall

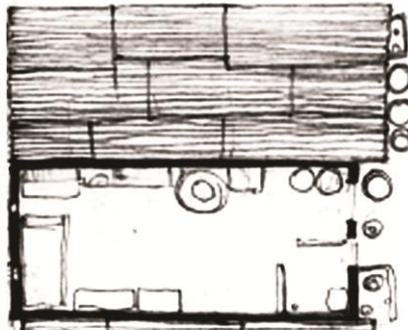
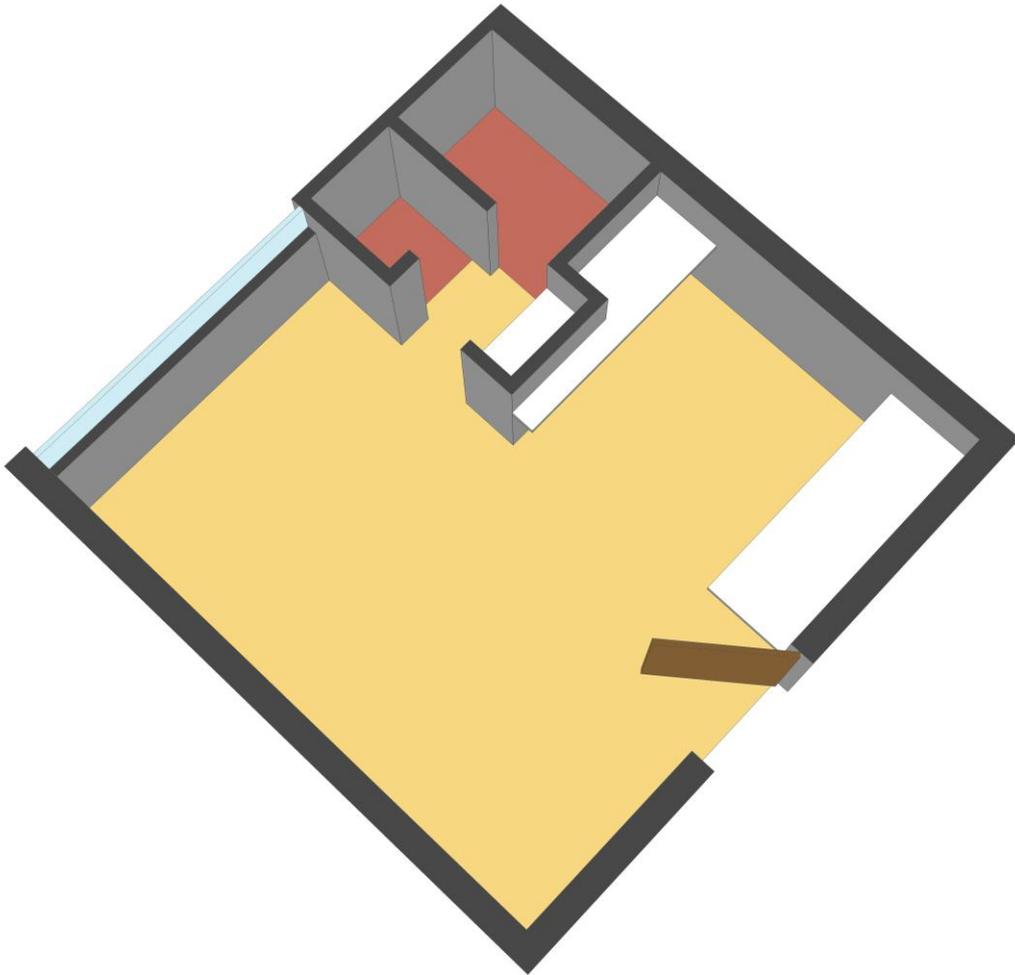


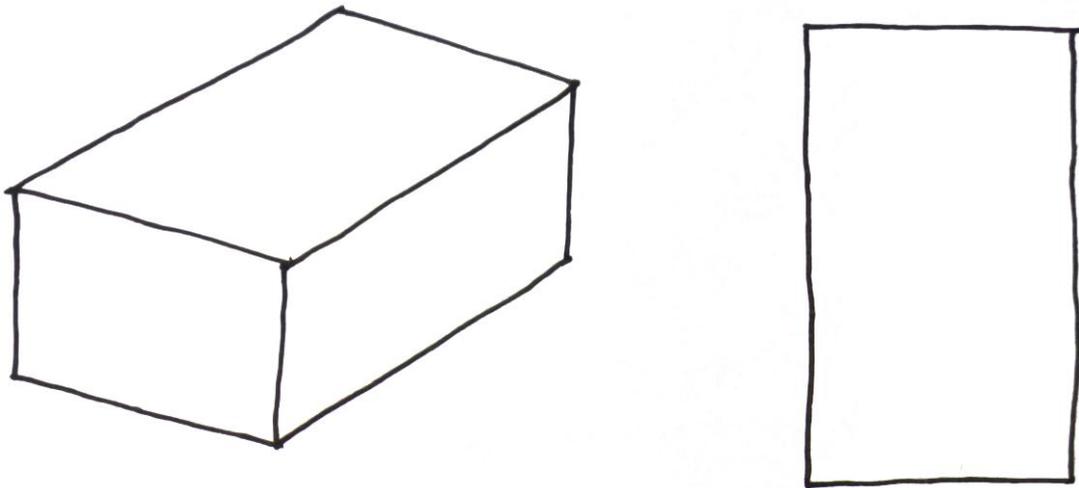
Figure 2 two houses having a tin sheet as primary construction material

Proposal:

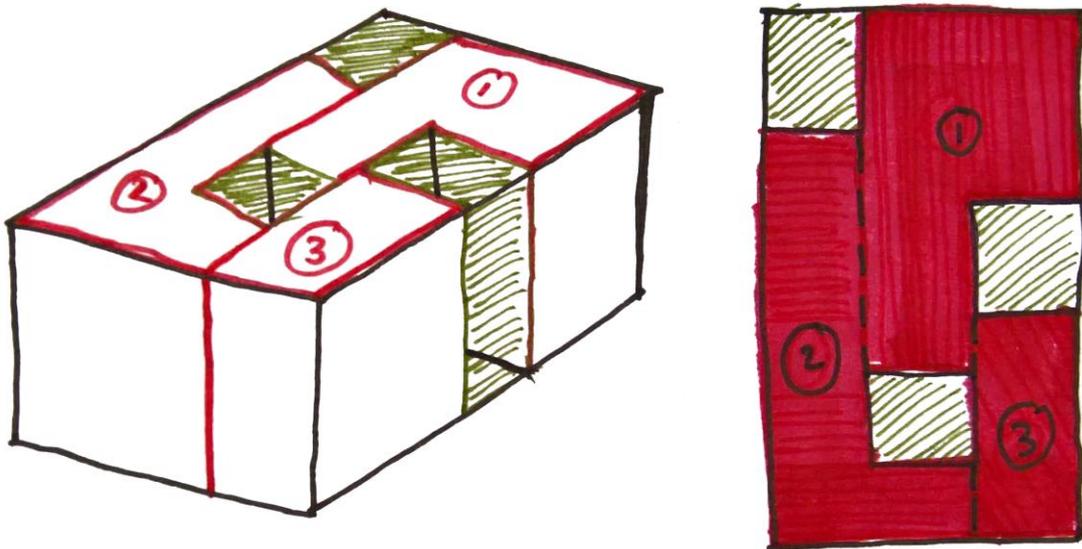


- A prototype for single house was designed considering the area of current houses existing in Deonar.
- A small unit of 25 m² area is designed as a module to give it flexible uses.
- Also gives the person flexibility to expand in future according to their needs and uses.
- The module can be replicated to form the cluster which can have multiple uses also gives rise to many community spaces for the interaction and communal activities within neighbourhood.
- Clusters can be organized to form the neighbourhood and be replicated in and around Deonar for further development.

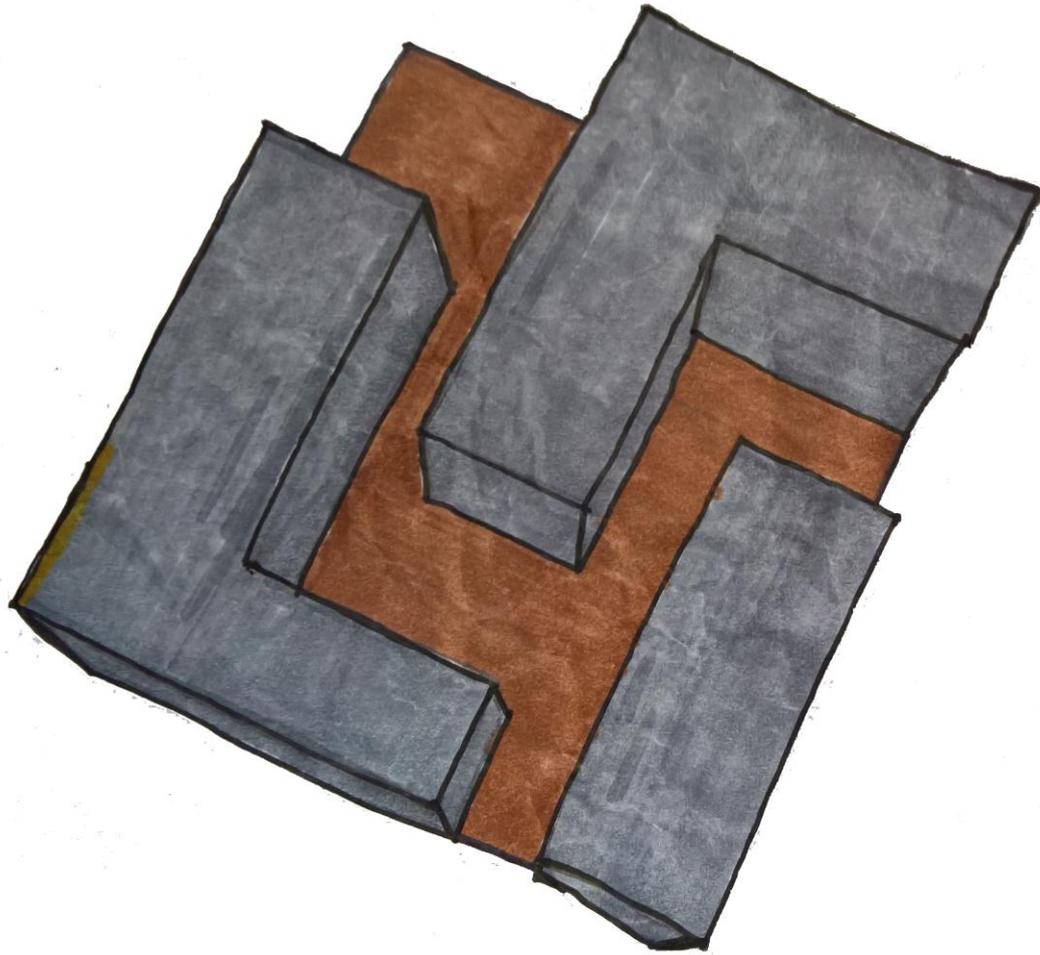
Formation of cluster



Dimensions considered from the existing area of single cluster.



Insertion of voids to introduce green spaces or community spaces within the cluster



Imagined group of cluster within the Deonar site

- The insertion of voids to introduce spaces to enable good amount of light and ventilation to each unit.
- The streets are wide enough to be used for evacuation purposes and also to be used in terms of emergencies.
- The open spaces also enable the fire services to approach the housing unit fast enough without any difficulty.
- The construction of the units to be used by recyclable material like fly ash bricks and also lightweight materials like hollow concrete blocks.

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- Social,Economic conditions and Vlunerabilities: a report of the baseline survey of M(east) ward by TISS 2015
- UNISRDT terminology for risk

