IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Study of Fishermen Settlement- JALARIPETA

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Abstract: One of the determining factors that formed informal settlements is that the high demand for homes that aren't comparable the homes that were provided by the government. The Fishermen settlement in Jalaripeta was built without a plan by settlers and wasn't involve government interference so as that the spatial pattern formed uncontrollable. The form of space that stretches represents the distribution of unplanned space. The aim of this study is to hunt out the structure of settlement and thus the connection between the space structures with the spatial pattern in Jalaripeta Fishermen settlement. Within the strategy of collecting data, the researcher makes the maps of the observation area, the structure of the space, and thus the connection between one space function with the similar space functions. Also, the researchers identify the spacing pattern and thus the effect of 1 spatial element against similar space. This paper will discuss the efficient sustainable strategies for a better livelihood in the fisherman settlement area. The settlement is chosen as the context due to the vulnerability of Jalaripeta, which showed by the government policy regarding the fisherman settlement.

Index Terms **- Fishermen settlement, neighborhood study, sustainable practices, energy efficiency, and alternative technologies.**

1. Introduction

Unplanned settlements are formed without government plan and indirectly involve settler in the process of building the space. Space grew accordance to the living needs of settlers who ultimately form the function of the space. The spatial functions associated with spatial forms affect the spatial pattern of settlements. Spatial extensively can be defined as space. In the built environment, spatially refers to physical elements such as structural systems, utility systems, road networks, and open spaces. Spatial or spatial planning is a major part of regional and urban planning that includes land use layouts, road systems, open spaces, and others. In addition to being identified as part of the spatial structure system, spatial patterns can also be used to detect land use and land cover. The problems of unplanned settlements and the difficulty of identifying the spatial patterns in unplanned settlement cause the settlers often get a one-party policy by the government. Therefore, identifying spatial patterns has advantages such as: (i) make it easier to determine the land-use policies and utility changes and transport systems; (ii) identifying key points for future development; (iii) to implement the effective plan for regional development through integrated support systems.

Jalaripeta Fisherman community consists of formal settlements and unplanned settlements. Unplanned settlements are defined by the lack of a secure housing system, lack of adequate mobility, access to clean water or inadequate sanitation, and the absence of secure tenure status. The quality of space that formed in unplanned settlements tends to not maximizing the needs of its inhabitants. The settlements spatial state can be caused by several factors. One contributing factor is the settlement's geographical factor. The pattern of settlements in the coastal areas and settlements on the periphery of the slope can be different in shape. The geographic aspect of the area may influence the dispersion of settlers on determining the area of their settlements. Besides the settlement location factors, the spatial pattern can also affect by the needs of the settler in building the built environment.

A highly dense residential neighborhood located in 17th ward of Greater Visakhapatnam Municipal Corporation. Jalaripeta is one of the oldest settlements in the region, predominantly is fishing village and is considered to be the largest fisherman settlement after Pudimadaka village. Overtime, Visakhapatnam city grew around Jalaripeta and is now with informal settlements a part of the city.

1.1 About the site

A. **Location**: Visakhapatnam, Andhra Pradesh
B. **Coordinates**: 17.7264°N, 83.3429°E
C. **Site Area**: 40 acres
D. **Climate**: Warm and Humid
E. **CRZ Zone**: II
F. **Type of soil**: Silty sand and red soil
G. **Type of land tenancy**: Occupational rights for few families and some families don't have any explicit/legal rights.
H. **Ace of settlement**: More than 90 years
I. **Population**: 9400 (census 2011)
J. **No. of household**: 1800

K. **Proximities**: Chinna waltair government hospital (1.8 km), railway station (6.6 km), bus depot-Maddilapalem (3.6 km), fire station-Seethammadhara (5 km)

L. **Justification of the site**: Major problems confronting by the settlement are: Disaster resistant buildings, Overpopulation which leads to informal settlements, Lack of basic infrastructure, Exploitation of the beach area. As the Jalaripeta area has an important socio-economic component so by using sustainable techniques and principles, the area can be made a better place to live in and the condition of people's health and environment can be improved.

M. **Access road**: 15m Abutting road (Beach road), 8m Entry road (bus depot route), 4m and 2m Internal wide road (Internal community cc roads)

N. **Historical background**: Overtime from 2004-2019 the settlement developed towards shore, due to increase in growth of population and Fishing being the main occupation. Jalaripeta basically contains PUCCA houses towards the West side (beach road), SEMI PUCCA houses on the central core and KUTCHA houses towards the shore line.

Figure 1 EVOLUTION OF JALARIPETA OVER 2004 – 18

O. **Socio cultural background**:

Figure 1 OCCUPATIONS IN DIFFERENT MONTHS

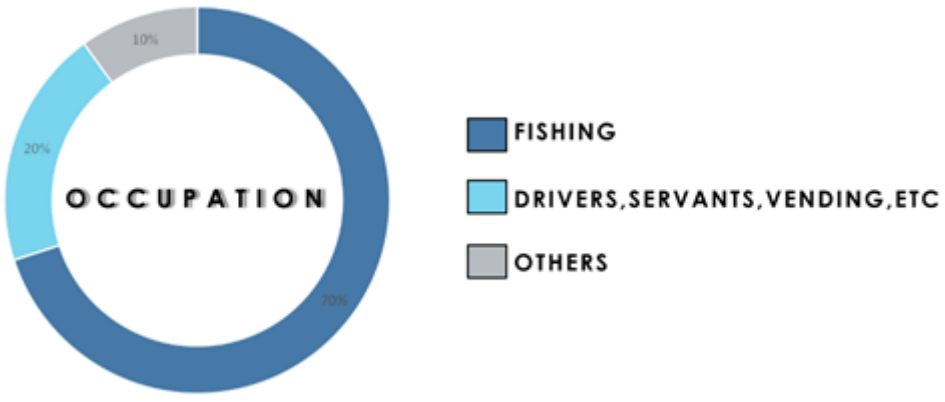


Figure 2 PERCENTAGE OF DIFFERENT OCCUPATIONS

P. **Economy**: Traders come to the neighbourhood to buy fish and fishermen go to fishing harbours to sell fish which is nearly 10 km from the site. On a daily basis they earn Rs 300 to Rs 400 from fishing. On the day with good catch they earn up to Rs 3000 in One day.

Q. **Morphology**:

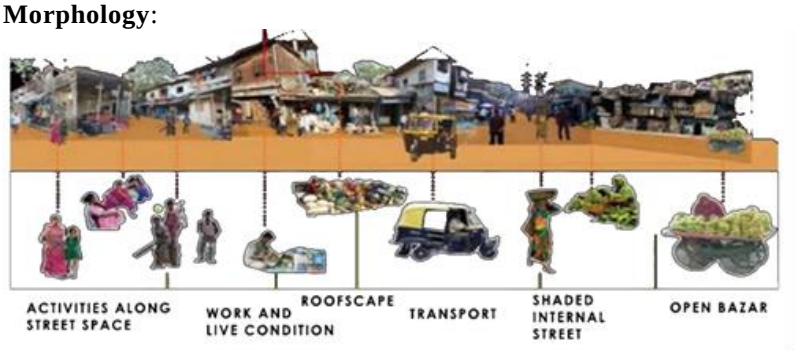


Figure 4 URBAN MORPHOLOGY

R. **Cultural Activities**: Fisherwomen going in a procession carrying pots containing milk, water and turmeric powder as part of Gangamma jatara.

Figure 5 FISHERWOMEN PROCESSION FROM TEMPLE TO SEA

S. **Demographic data**: According to Census 2011, Jalaripeta is a homogenous community where 88.5% of the residents belong to the caste Jalari.
Total Population: 9396
Household Size: 5-6 Ppl
Dominant Form of Family: Nuclear Family
Male: Female Ratio - 54% Male And 46% Female

T. **Existing land-use map**:

Figure 6 LANDUSE MAP

U. **Site surroundings**: P1 bus terminal, P2 Vuda Park, C1 temple, C2 community centre, C3 public toilet, C4 anganwadi, C5 School.

Figure 7 SITE SURROUNDINGS

V. **Topography**:

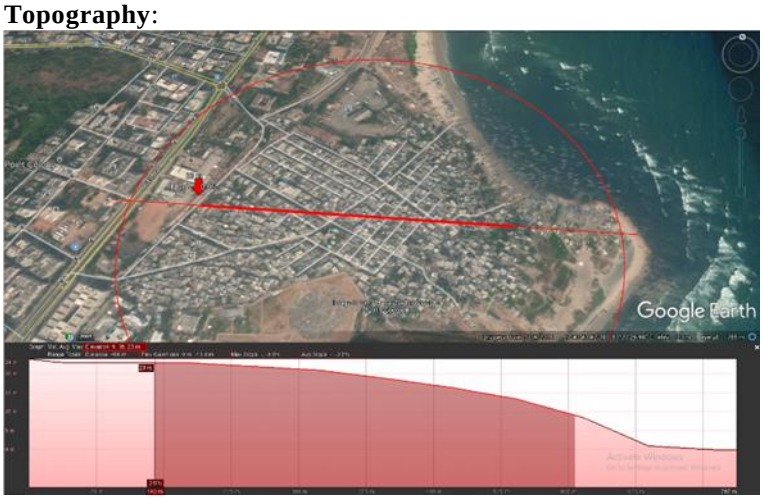


Figure 8 SECTION AA'

Section-AA - The slope of the land is towards West to East. Elevation: 9m, 18m, 23m, Slope: Max -8 %, Avg -3.2%

Figure 9 SECTION BB'

Section-BB - Elevation: 15m, 18m, 19m, Slope: Max 5.3%,-4.6 %, Avg 2.2% -2.3%

W. **Landscape**: Coconut (Cocos nucifera) and Palmyra (borassus) are the dominant vegetation, with a girth ranging from 300mm to 600mm, 600mm to 900mm and 900mm to 1800mm.

Figure 10 EXISTING COCONUT PLANTATION

X. **Water bodies**: The major feature affecting the microclimate of the settlement is sea, which is at distance of 200M from the Kutcha houses and even which increases the humidity. Primarily because of the close proximity to Sea, the settlement is vulnerable to disasters.

2. ARCHITECTURAL TRANSITION OF THE AREA

Figure 11 1ST TRANSITION

100Yrs old temple using design elements like Madras terrace roof, Mud plaster for walls, etc.

Figure 12 MADRAS TERRACE ROOF IN TEMPLE

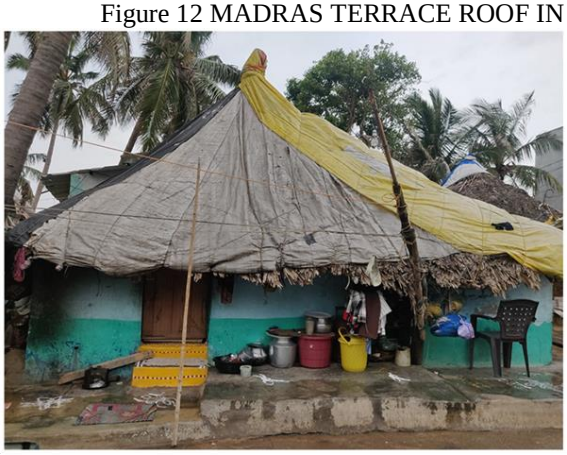


Figure 13 EARLY SETTLEMENTS

Typical vernacular fisherman house (Kutcha house) in Jalaripeta, using low overhang – conical thatch roof and mud for walls.

Figure 13 EARLY SETTLEMENTS
Typical housing typology sharing common wall construction and terracotta tile, asbestos for roof.

Figure 15 Present - (G+2/ G+3)

Present conventional construction typology buildings, using RCC slab and bricks.

3. LEGAL FRAMEWORK AND NORMS

Total No. of Houses: 1700 - 1750
Type of Urban Form: Organic
Level of hazard risk exposure: High
Physical infrastructure: Jalaripeta has Pucca, Semi-Pucca & Kutcha houses in all.
Sanitation: Few houses have toilet in their houses, and most of them defecate in the open. There is a paid public toilet near the coast.
Wastewater: All the wastewater is let out into open drains flowing directly into the sea without any treatment.
Solid waste management: Is also a major concern, as much of the waste is dumped into the sea.
Social infrastructure: The neighborhood has temple, GVMC high school, Anganwadi, community center and public toilet complex.

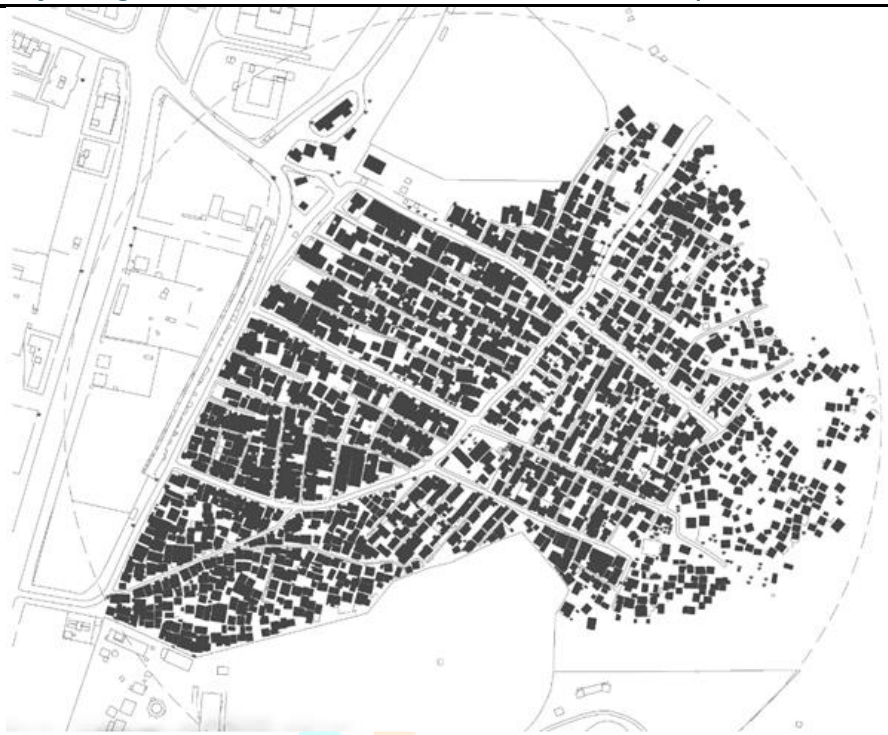
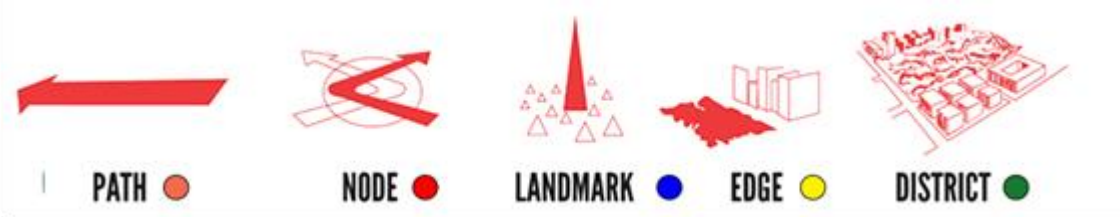


Figure 16 FIGURE AND GROUND MAP

Figure 17 BUILDING HEIGHT BASED ZONING



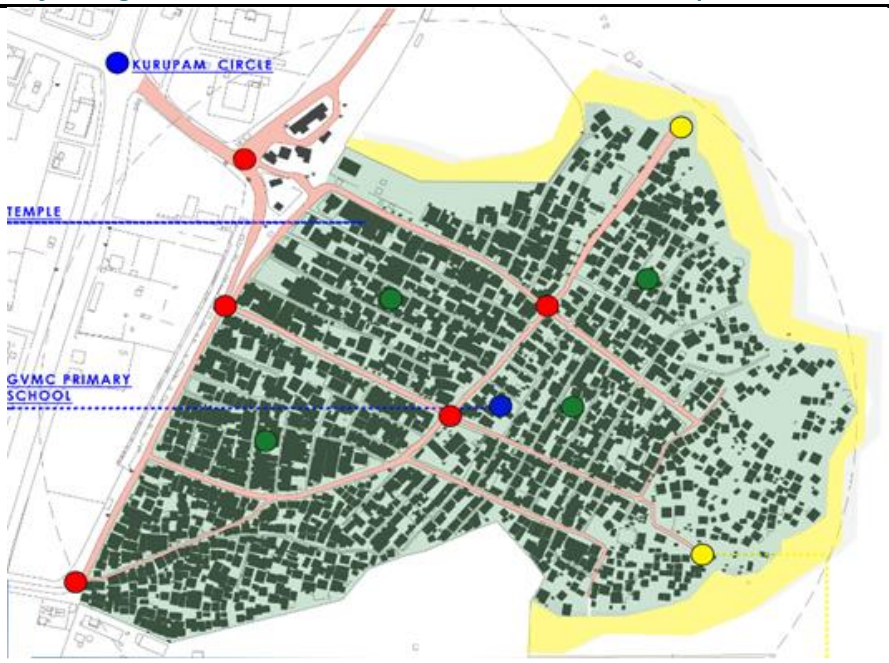


Figure 18 IMAGE OF THE PLACE

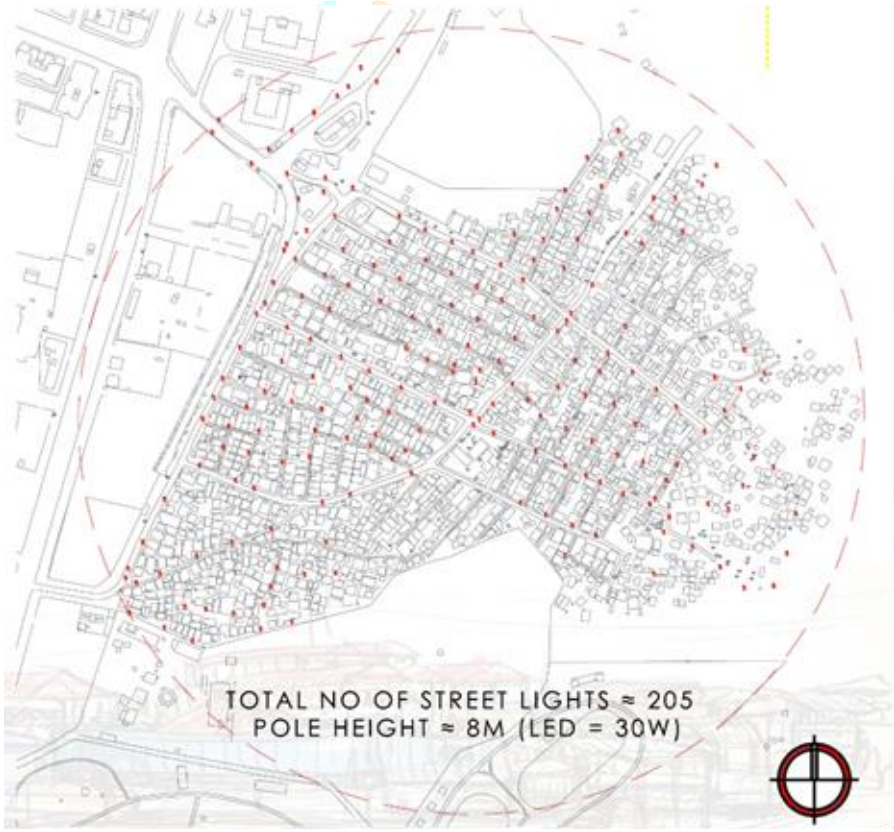


Figure 19 STREET LIGHT POSITION IN THE SETTLEMENT

4. BUILDING ORIENTATION

The selected area of study (settlement) is oriented 17^0 east geographically and is sprawling from west to east towards the shore. Majority of the houses face north south direction.

Figure 20 BLOCK MODEL OF THE SETTLEMENT

5. RESILIENT TO DISASTER

Since the settlement is at sea coast, it is quite prone to disasters like tsunami, cyclone and because of its informal characteristic it is prone to fire attack and flooding.

PREVIOUS IMACTS:

1. 1983 Fire accident – Destroyed 600 of 800 huts
2. 2004 Indian Ocean tsunami
3. 2014 Hud Hud cyclone

Figure 21 IMPACT OF HUD-HUD CYCLONE ON HOUSES NEAR COASTLINE

SWOT analysis

STRENGTH	WEAKNESS	OPPORTUNITIES	THREATS
INTERACTIVE COMMUNITY	HAPHAZARD LIFESTYLE	COASTAL FRONT DEVELOPMENT	SEA- LEVEL RISE
SECURITY	SQUATTER SETTLEMENT EXTREMELY CONGESTED AND UNFIT FOR LIVING	SMALL SCALE COTTAGE INDUSTRIES	SOCIO- ECONOMIC CRISIS
SHARED FACILITIES FEASABLE	DEGRADED ENVIRONMENT	LIVE SPACES SHARED	CREEK IN THE SETTLEMENT CAUSING SEASONAL FLOODING AND WATER LOGGING
COMMUNITY PARTICIPATION CAN BE ANTICIPATED	CONVINVING COMMUNITY	EXTENSION TO THE CHARACTERISTIC STREET	DISASTER PRONE (CYCLONE,T-SUNAMI)

Table 1 SWOT ANALYSIS OF THE SETTLEMENT

6. QUESTIONNAIRES

1. You say the sea is your god and provides you with food and opportunities, then why is whole bay so dirty? Don't you feel the responsibility to keep your home clean?

- The sea is our mother she accepts anything, the amount of waste we see here is nothing compared to its vastness. Sea is very huge. (Responders: Fishermen group of 10-12men, age: 20-60)

2. What if government provides you with housing facilities along the shore, for example near Rushikonda?

- If they approach us with any such proposal, we will ask for housing in the same location only. Even if we are provided houses along a different shore we may not want it because we want to live in a place where we can enter the sea.

- Near Rushikonda, the sea is very rough and we cannot enter the sea with our boats. If there was a possibility to enter sea, a fishing community would already be there by now. In addition, the harbour is very far for us. (Responder: Teddi Parasanna, president of Grama Seva Sangham of Peda Jalaripeta)

7. BUILDING LEVEL PARAMETERS

Total site area: 35ACRES / 141335 SQ.M

Total built-up area: 59276 SQ.M

Total open space: 82059 SQ.M

Existing roads: 22794 SQ.M

Total green area: 150 SQ.M

Ratio of open areas to built-up areas: 1.38

Green area available per person: 0.015 SQ.M

Density of population: 268.5 CAPITA/ACRE

7.1 TYPOLOGY - 1

Plinth area: 25sq.m
Built up area: 10. 2sq.m
WWR: 0
Height of structure: 2.9
Materials: thatch, mud, wooden structural members

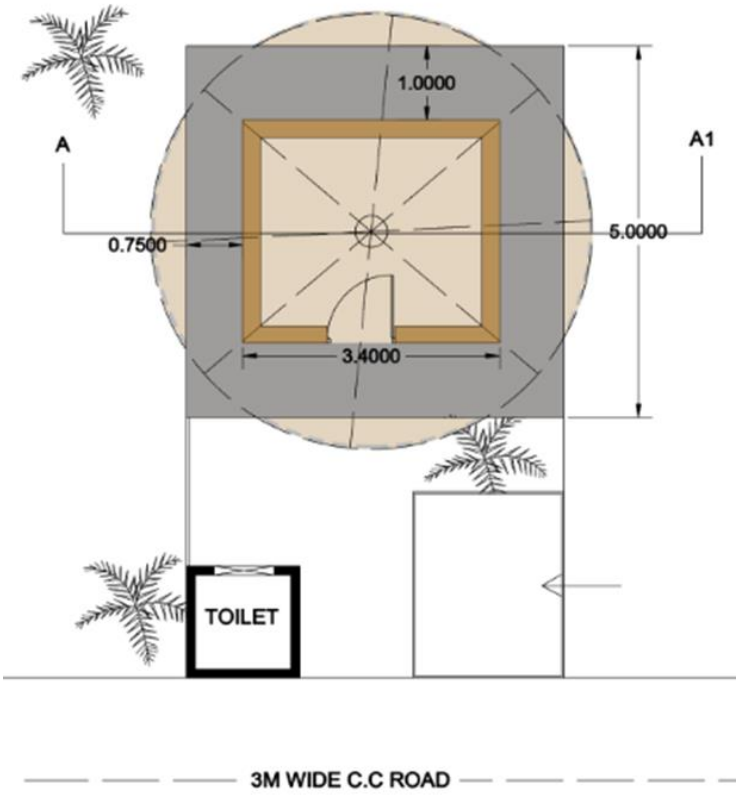


Figure 22 TYPOLOGY – 1(BUILDING LEVEL)

7.2 TYPOLOGY - 2

Plinth area: 37Sq.m
Built up area: 24q.m
WWR: 0
Height of structure: 3.8
Materials: Thatch, Mud, Wooden structural members

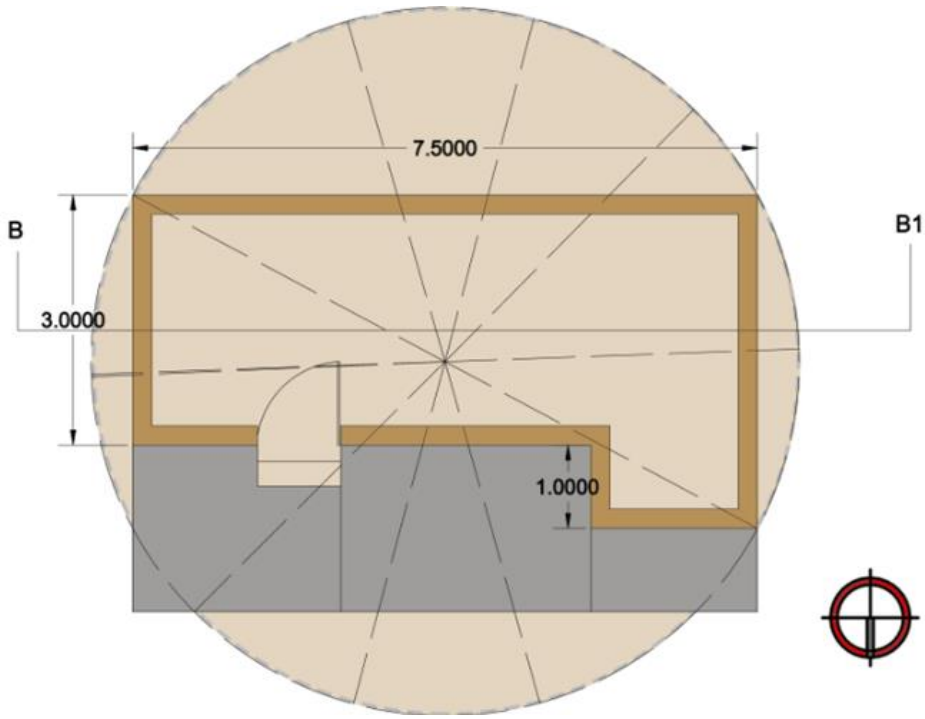


Figure 23TYPOLOGY – 2(BUILDING LEVEL)

Figure 24 TYPOLOGY – 2(BUILDING ELEVATION)

7.3 TYPOLOGY - 3

Plinth area: 140 Sq.m
Built up area: 244 sq.m
WWR: 0.11
Height of structure: 5.9
Materials: Brick walls, RCC roof and Asbestos roofing for the upper level rooms.

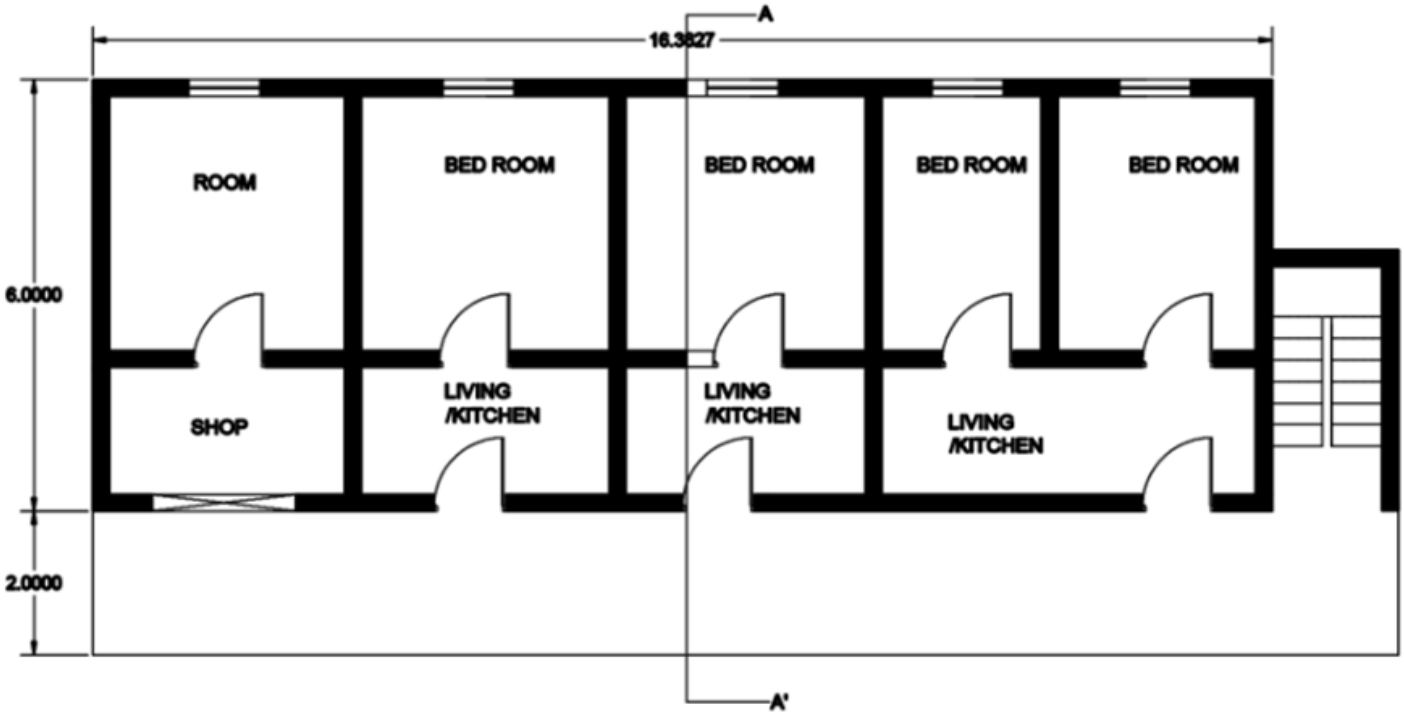


Figure 25 TYPOLOGY – 3 (G.F PLAN)

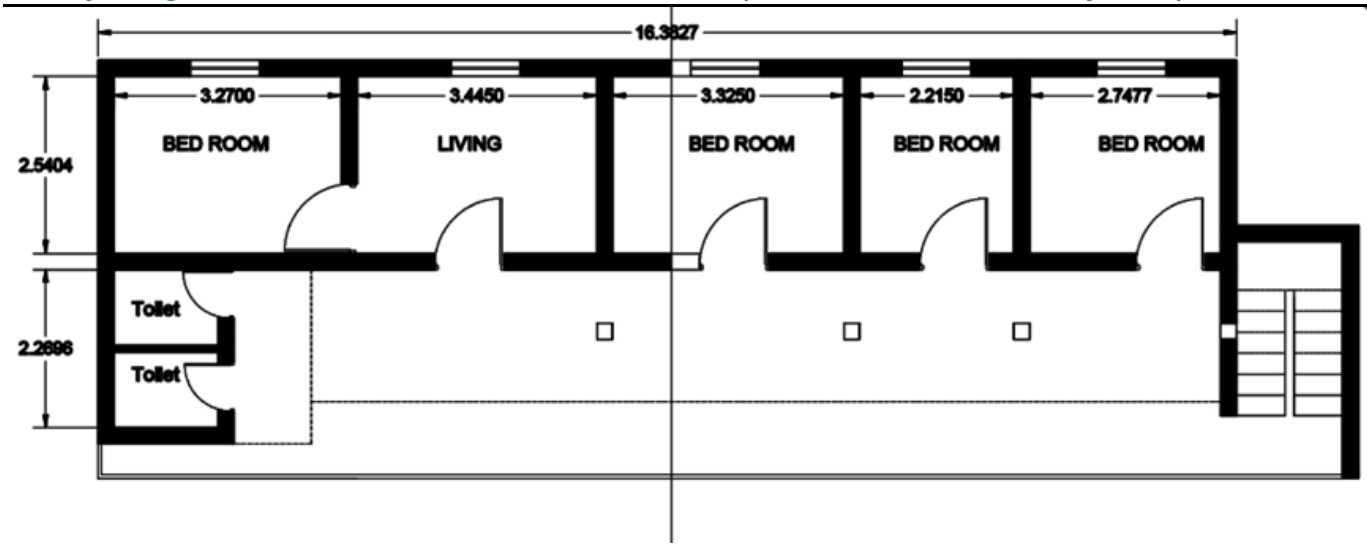
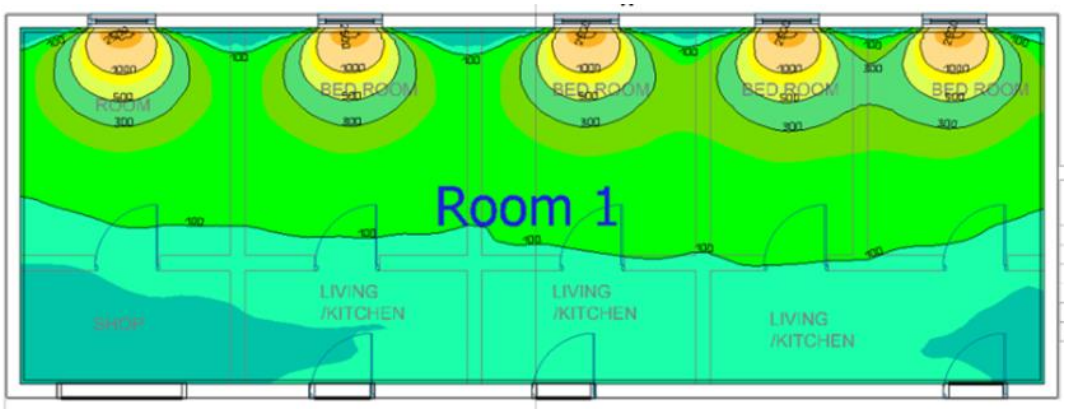


Figure 26 TYPOLOGY – 3 (F.F PLAN)



7.4 TYPOLOGY - 4

Total area: 40 Sq.m

WWR: 0.05

Height of structure: 5.0

Materials: Brick walls and RCC slab.

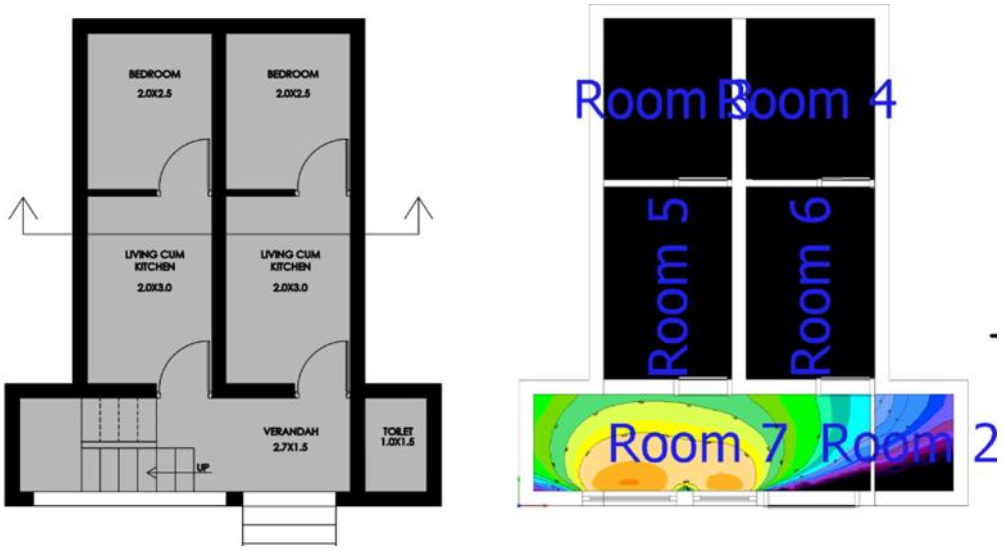


Figure 27 TYPOLOGY - 4 (PLAN AND DAYLIGHTING SIMULATION)

Figure 28 BEDROOM AND ELEVATION

7.5 ACTIVITY FLOW DIAGRAM

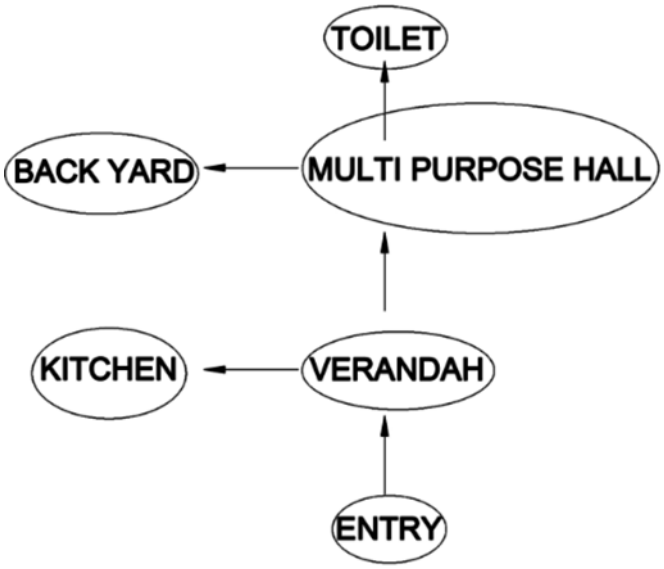


Figure 4 TYPE-1 ACTIVITY FLOW DIAGRAM

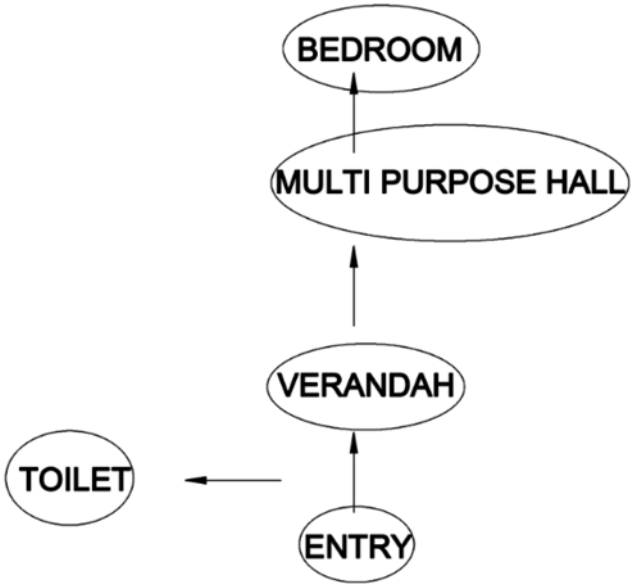


Figure 3 TYPE-2 ACTIVITY FLOW DIAGRAM

7.6 QUANTIFICATION OF PARAMETERS

Total site area: 35acres / 141335 sq.m
Total built-up area: 59276 sq.m
Total open space: 82059 sq.m
Existing roads: 22794 sq.m
Total green area: 150 sq.m
Ratio of open areas to built-up areas: 1.38
Green area available per person: 0.015 sq.m
Density of population: 268.5 capita/acre

8. WATER SUPPLY

- Water supply scheme is being implemented under AMRUT. Program under which house connections are being proposed.

- Water is distributed from reservoir at commissioner bungalow (glsr: 2600 kl) using h.d.p.e pipes and internal partial distribution with ci pipes.

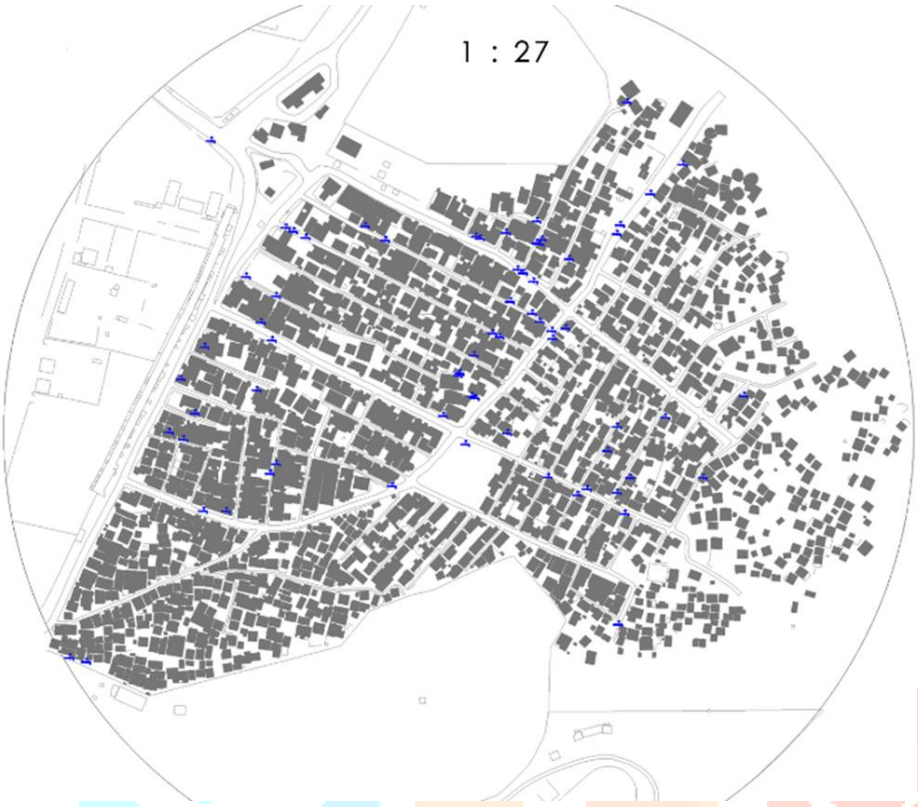


Figure 31 WATER TAPS LOCATION

PER CAPITA SUPPLY OF WATER THROUGH PIPED CONNECTIONS	70 lpcd - 100 lpcd (benchmark as per CPHEEO manual on water supply and treatment)	70 lpcd (provided)
TOTAL NO. OF WATER SUPPLY	66 taps (community level)	
DURATION OF WATER SUPPLY	45mins - 1hr (community level)	
TAPS : HOUSES	1:27	

Table 2 WATER SUPPLY DATA

8.1 SEWERAGE AND SANITATION

a. No UGD connections.
b. Majority open defecation
c. Open drainage

Community toilets: 2male + 2 female (2.nos)

: 12 male + 12 female (2n.os)

STP location and capacity : APPUGHAR (capacity - 25 mld)

Nearest pumping station: SHANTI ASHRAM PUMPING STATION

Jalaripeta current (MLD): 0.9267ml

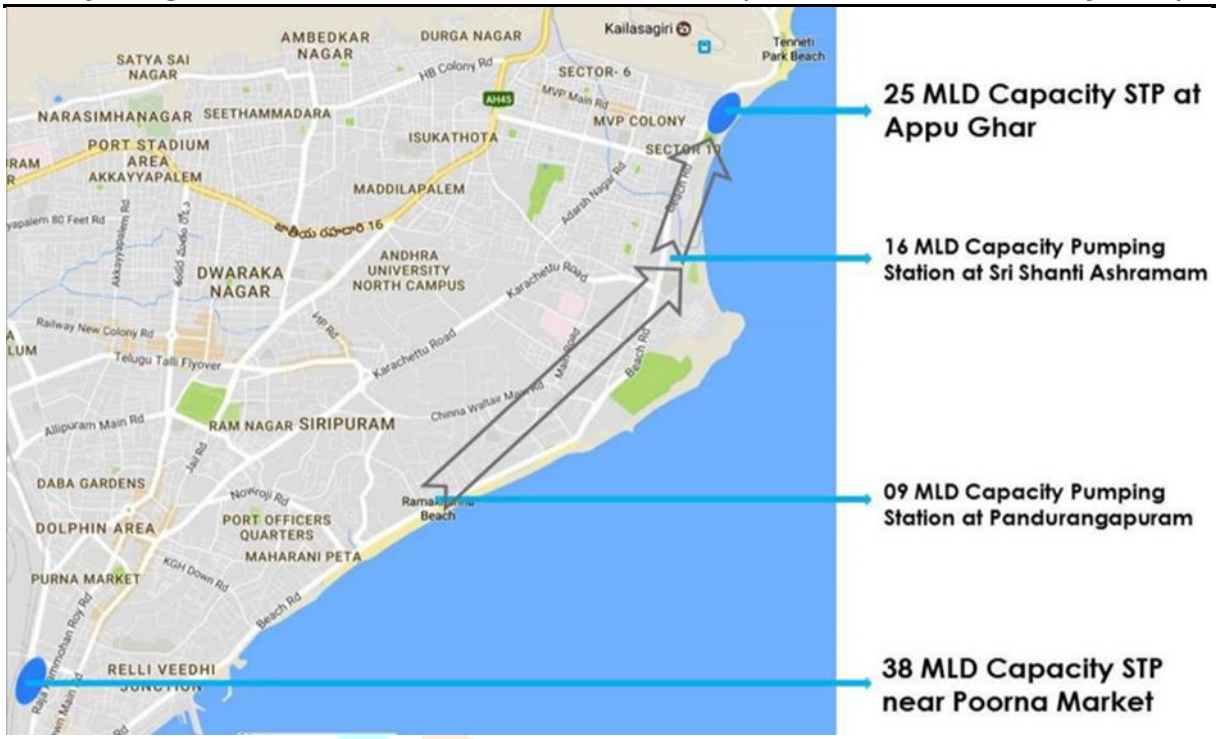


Figure 32 CITY LEVEL SEWARAGE AND SANITATION FLOW NETWORK

8.2 SOLID WASTE MANAGEMENT

a. Door to door collection
b. Waste segregation at source

No. of dustbins: 40
Solid waste generation: 0.25Kg/Capita/Day quantity (per capita/day)
Total volume: 2350Kg/Day
Process: waste collected from Jalaripeta is transferred to mini transfer station -1 at Mudasarlova (1-18wards).

Figure 33 DOOR TO DOOR GARBAGE COLLECTION

8.3 Storm water runoff:

Total runoff = σ surface area x runoff coef. x max daily rainfall
Total storm water runoff = 12704.98

MATERIALS	SURFACE AREA	RUNOFF COEF.	MAX. DAILY. RAINFALL	RUN OFF
THATCH	12371 Sq.m	0.2	0.25	618.55
ASBESTOS	1778 Sq.m	0.8	0.25	355.6
HANDMADE TILES	5631.2 Sq.m	0.75	0.25	1055.85
R.C.C	45049 Sq.m	0.7	0.25	7883.57
C.C ROADS	15955.8 Sq.m	0.7	0.25	2792.26

Table 3 STORM WATER RUNOFF CALCULATIONS

8.4 STREET LIGHT ENERGY DATA

Figure 34 STREET LIGHTS LOCATION

- Total no of street lights – 205
- Pole height = 8m (led – 30 w)

205 x 30w = 6150w x 12hr = 73800W 73.8kW/hr 73.8units / day	solar panels, recommended capacity = 10kw
Public sector, unit cost = 6/-73.8 x 6/- = 442.8 rs/day Monthly = 13,284/-	1kw = 80,000/- (approx.) 10kw = 8,00,000 /- 6% (interest/yr)= 3,36,000/- payback (11,36,000 /-)= 7yrs

Table 4 STREET LIGHTS DATA

8.5 BUILDING LEVEL PARAMETERS

Total site area: 35acres / 141335 sq.m
Total built-up area: 59276 sq.m
Total open space: 82059 sq.m
Existing roads: 22794 sq.m
Total green area: 150 sq.m
Ratio of open areas to built-up areas: 1.38
Green area available per person: 0.015 sq.m
Density of population: 268.5 capita/acre

9. CLUSTER / STREET TYPOLOGY

- Latitude: 17.729408° longitude: 83.343845°

- A stretch of 30m which consists of kutcha and semi pucca housing typology (4 types)

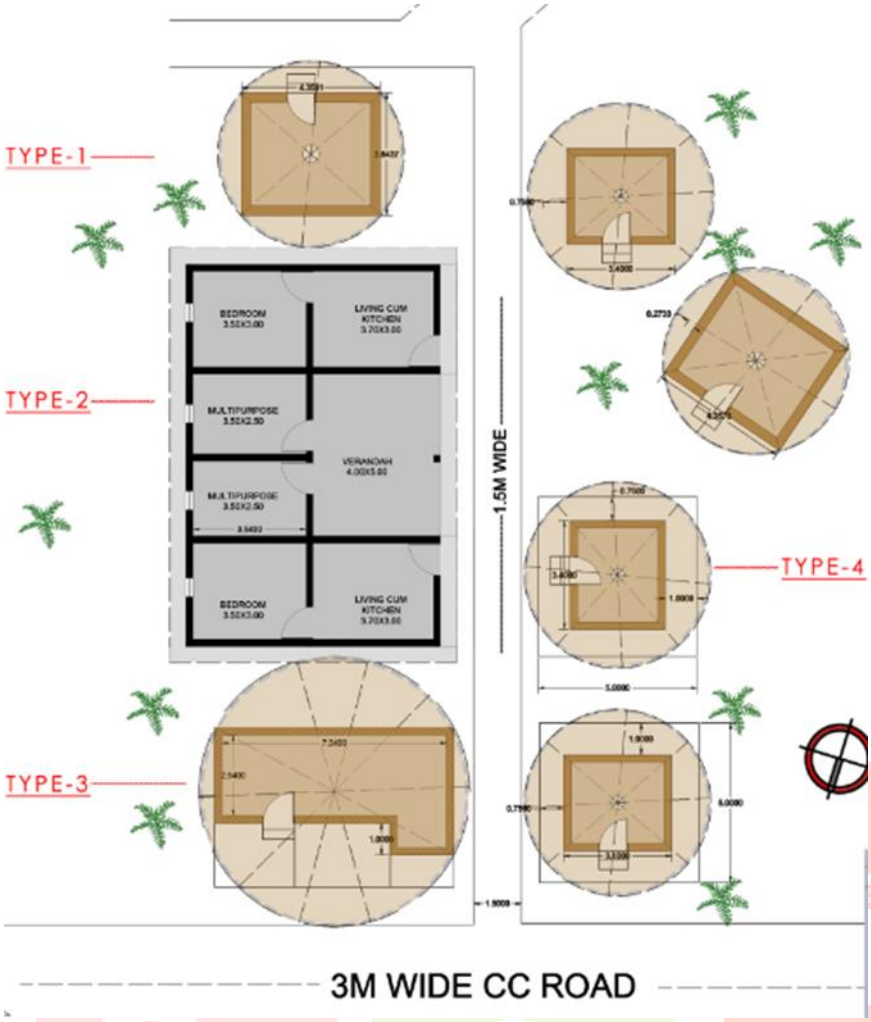


Figure 35 CLUSTER PLAN

Figure 36 KUTCHA HOUSE ELEVATION IN CLUSTER

Figure 37 INTERNAL 1.5M WIDE PASSAGE IN CLUSTER

TYPE-1 AREA: 16 Sq.m WWR: 0 HEIGHT OF STRUCTURE: 2.9 MATERIALS: Thatch, Mud, Wooden structural members FACADE AREA : NORTH - 7.84 SQ M SOUTH- 5.77 SQ M WEST-6.92 SQ M EAST-6.92 SQ M	**TYPE-2** PLINTH AREA: 117 Sq.m BUILT UP AREA: 96 Sq.m WWR: 0.07 HEIGHT OF STRUCTURE: 3.5 MATERIALS: Asbestos roof, Brick walls, RCC structural .NORTH - 26.88 SQ M SOUTH- 26.88 SQ M WEST-33.6 SQ M EAST-21.45 SQ M
TYPE-3 PLINTH AREA: 30Sq.m BUILT UP AREA: 24Sq.m WWR: 0 HEIGHT OF STRUCTURE: 2.9 MATERIALS: Thatch, Mud, Wooden structural members FACADE AREA : NORTH - 13.5 SQ M SOUTH- 11.16 SQ M WEST-5.4 SQ M EAST-7.2 SQ M	**TYPE-4** PLINTH AREA: 25Sq.m BUILT UP AREA: 10.2Sq.m WWR: 0 HEIGHT OF STRUCTURE: 2.9 MATERIALS: Thatch, Mud, Wooden structural members FACADE AREA : NORTH - 6.12 SQ M SOUTH- 4.5 SQ M WEST-5.4 SQ M EAST-5.4 SQ M

Table 5 TYPE-1,2,3,4 SPECIFICATIONS (CLUSTER LEVEL)

9.1 SOLAR RADIATION

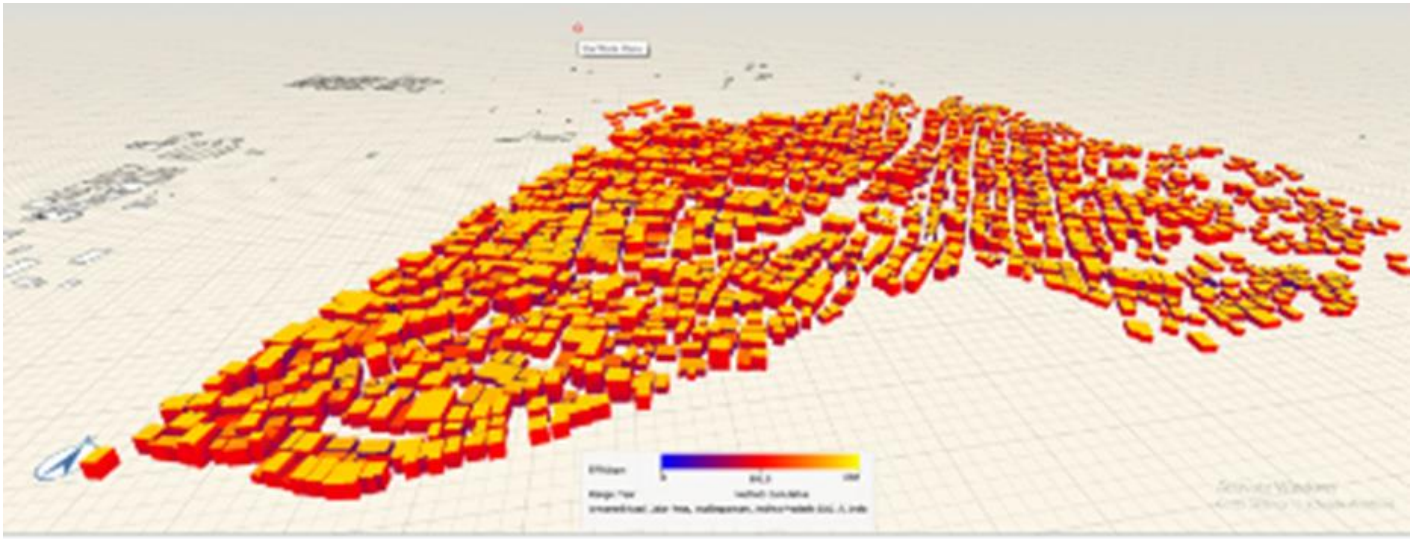


Figure 40 COMMUNITY LEVEL SOLAR RADIATION CALCULATION

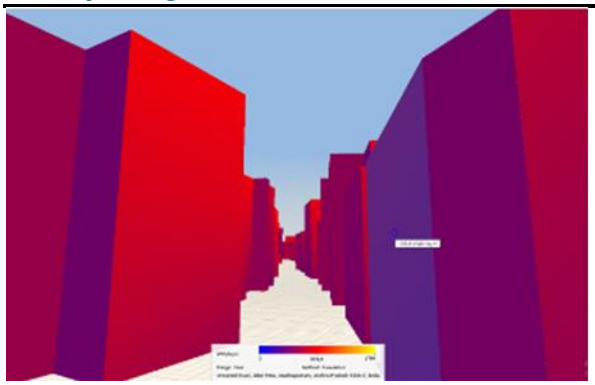


Figure 5 INTERNAL STREET LEVEL SOLAR RADIATION

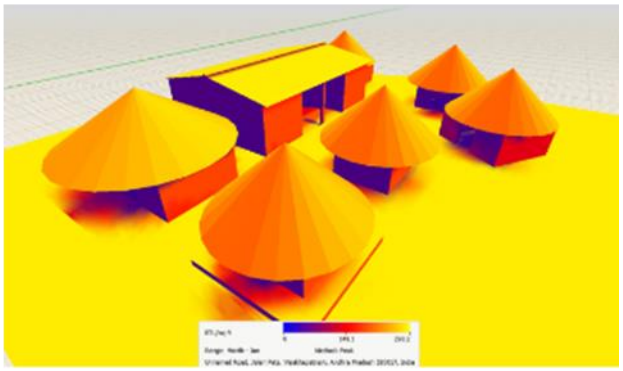


Figure 6 JUNE MONTH CUMMULATIVE

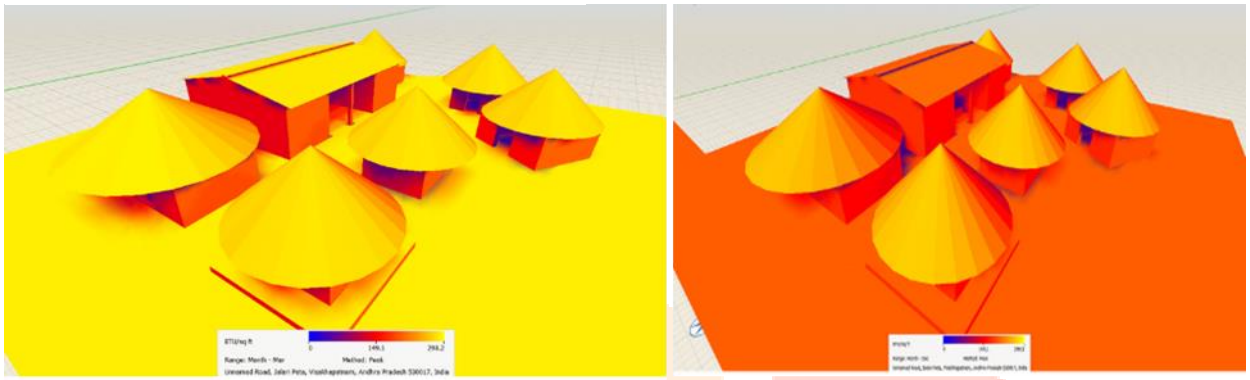


Figure 41 MARCH MONTH AND DECEMBER CUMMULATIVE

9.2 SHADOW ANALYSIS

Figure 42 SHADOW ANALYSIS

9.3 WIND ANALYSIS

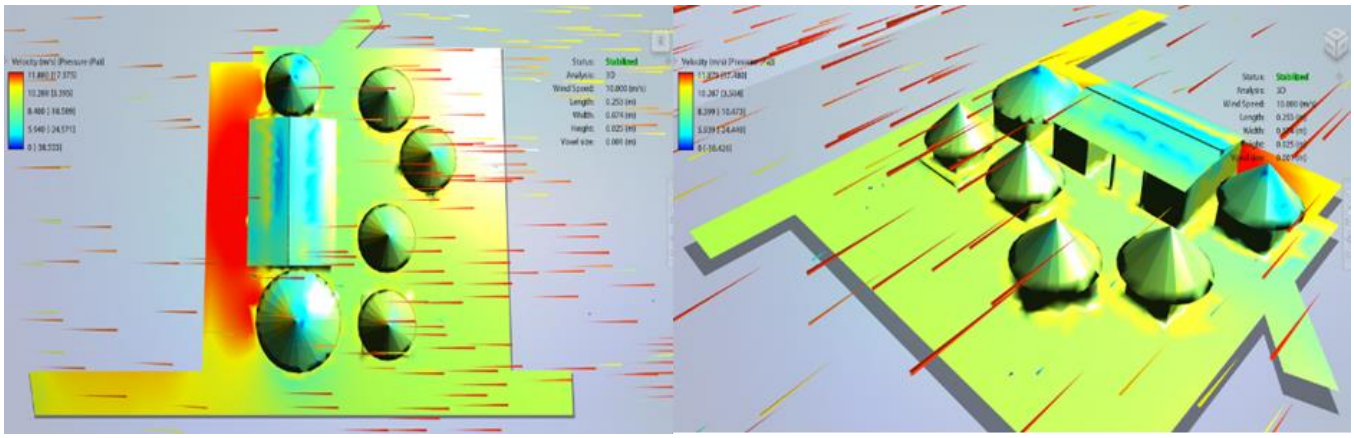


Figure 43 WIND ANALYSIS (PLAN AND VIEW)

10. INDIAN STANDARD OF LOW INCOME HOUSING [IS - 8888(PART I):1993] – GENERAL BUILDING REQUIREMENTS

10.1Plinth:
The minimum height of the plinth shall be regulated on the basis of environmental and topographical condition and higher plinth height may be required in areas prone to flooding. The height of the plinth shall be not less than 450 mm from the surrounding ground level.

10.2Size of the room:
Every dwelling unit to be provided should have at least two habitable rooms. Even if one room house is provided initially it should be capable range of adding a new second room in future. However, in case single room tenements are required to be provided where future. Additions are not possible, the carpet area of the multipurpose single room, should be at least 15.5 sqm. -in a house of 2 rooms; first room shall not be less than 9sqm with min. width of 2.5m and second room shall be not less than 6.5sqm with a minimum width of 2.1m provided the total area of both the rooms is not less than 15.5 sqm. In incremental housing the bigger room shall always be the first room.

10.3W.C and toilets:
i) Size of independent wc shall be 0.90m2 with minimum width of 90 cm

ii) Size of independent bath room shall be 1.20m2 with minimum width of 1m

iii) Size of combined bathroom and wc shall be 1.80m2 with min. width of 1m.

10.4Kitchen:
The size of a cooking alcove serving as cooking space shall not be less than 2.4 m2 with a minimum width of 1.2 m. the size of individual kitchen provided in two-roomed house shall not be less than 3.3 m2 with a minimum width of 1.5 m.

10.5Balcony:
The width of individual balcony, where provided shall not be more than l-2 m and it shall not project beyond the plot line and on roads or pathway.

10.6Minimum height:
The minimum height of room's spaces shall be as follow:

a) Habitable room: 2.6 m

b) Kitchen : 2.6 m

c) bath/W.C: 2.1 m

d) Corridor: 2.1 m

In the case of sloping roofs, the average height of roof for habitable rooms shall be 2.6 m and the minimum height at eaves shall be 2.0 m.

10.7Lighting and ventilation:
The openings through windows, ventilators and other openings for lighting and ventilation shall be as follows:

a) one-tenth of the room floor area for dry-hot climate.

b) one-sixth of the room floor area for wet-hot climate.

10.8Stairs:
The following criteria shall be adopted for internal individual staircase:

MINIMUM WIDTH

2 storeyed - straight 0.60m & 2 storeyed - winding 0.75 m

a) RISER: 20 cm, max

b) TREAD - 2 storeyed 22.5cm min & 3 storeyed or more 25cm, min

c) HEAD ROOM - the minimum clear head room shall be 2.1 m.

10.9Circulation area:
Circulation area on any floor including 'staircase shall not exceed more than 8 sqm.

10.10 Water seal latrine:
No building plan shall be approved and no building shall be deemed to have been completed and fit for human occupation unless provision is made for water seal latrine. No dry latrine shall be allowed. Where leaching pits are used, it should be constructed within the premises of the households as it would be economical as well as facilitate their cleaning.

10.11 Roads and pathways:
The area under roads and pathways in such housing projects should normally not exceed 20 percent of the total land area of the project. Access to the dwelling units, particularly where motorized vehicles are not normally expected should be by means of paved footpaths with a right of way of 6 m and a pathway of 2 m only. Where motorable access ways are not provided and pedestrian pathways are provided, the minimum right of way of such pedestrian.

10.12 Site and service schemes:
Site and services schemes shall provide for the following:

a) The complete infrastructural needs for a permanent housing, on the periphery of individual plot or a group/cluster plots.

b) A service sanitary core in the plot,

c) A skeletal structure of columns and roof or a developed plinth

d) Permission to allow temporary construction on the plot.

10.13 Water supply:
One water tap per dwelling units may be provided, where adequate drinking water supply is available. If supply is inadequate, public hydrants shall be provided. In the absence of piped water supply, hand pumps may be used for provision of water supply.

10.14 Plot area:
The minimum plot size with ground coverage not exceeding 75 percent, shall not be less than $40m^2$ in small and medium town and not less than $30m^2$ in metropolitan cities. Plot sizes below $30m^2$ but not less than 15 m^2 may be permitted in case of cluster planning, however, in such cases the ground coverage and FSI shall be 100 percent and 2 percent respectively.

11. COMPARATIVE ANALYSIS

11.1Roads and pathways:
The Roads are maximum of 4m wide in central part and other subsidiary roads are ranging around 2m-1m.

11.2Water supply:
For 1782 houses, there are only 66 taps (1:27) in community level.

11.3Plot area:
The average plot size is-32 Sqm.

11.4Plinth:
The minimum plinth height of existing dwelling units is 450mm. Some of the dwelling units have plinth height of 1000mm.

11.5Size of the room:
The room area of the smallest one room house is 10.25Sqm.

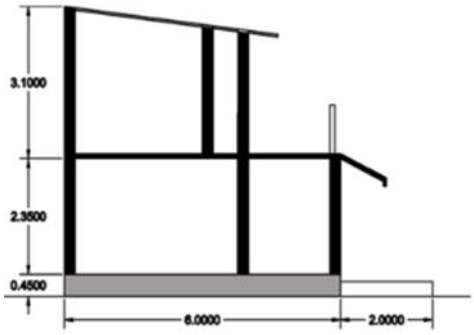


Figure 44 SECTION

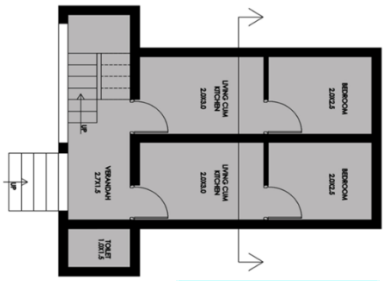


Figure 45 PLAN

11.6Minimum width of rooms is 2m in multi-room houses:

a. W.C & TOILETS

Minimum area of toilet provided is 1.5 sqm and Minimum width is kept 1m.
The single room dwelling units have toilets built outside the unit. And 40% of the total units have toilets in their site and rest 60% depend on the existing 4 community toilets.

a. KITCHEN

Most of the dwelling units have multipurpose room where they designate a space for cooking. A space of 3 sqm is used for kitchen space.

a. MINIMUM HEIGHT

The minimum room height provided 2.3m all over the house including kitchen area. The eaves of the thatched roof are at 1.8m height.

a. LIGHTING AND VENTILATION

The kutcha houses does not have windows. The pucca units have one window per room i.e. 0.6sqm of window opening per 9 sqm of floor area.

a. STAIRS

Straight - 0.75m
Riser – 0.2m
Tread – 0.3m

Figure 7 STAIRS

12. URDPFI GUIDELINES [MOUD,2015]

Comparison of projected population and present population: • Comparison of population projected and the present population.

The population of ward-17 is 26262. [2011 census]
Projected population:

S.no	Ward no :	2013	2033	2048
1	Ward no :17	30269	31586	33571

Table 6 PROJECTED POPULATION

• Population density- 225/ha

12.1Per-person land availability:
Total site area- 35 acres/ 141335 sqm.

Total built-up area- 59276 sqm.

Total open space- 82089 sqm.

Existing roads-22794 sqm.

Present day land availability- 0.0037 acre/capita.

12.2Percentage deviation from planned land-use:
There is no deviation in existing to planned land-use.

12.3Suggested density ranges:
Developed area average densities:

Settlement type	Plain area (pph)
Metropolitan cities	125-175

Table 7 DEVELOPED AREA AVG.DENSITIES

12.4Buffer zone guidelines:

COASTAL REGULATION ZONE	Coastal land up to 500m from the high tide line .land ward side and a stage of 100m along banks of creeks, estuaries.

12.5Coastal areas:
The following activities are prohibited within the CRZ: -
1. Setting up of new industries and expansion of existing industries, except those directly related to waterfront or directly needing foreshore facilities.
2. Manufacture or handling or disposal of hazardous substances.
3. Setting up and expansion of fish processing units including warehousing (excluding hatchery and natural fish drying in permitted areas).
4. Setting up and expansion of units/mechanism for disposal of waste and effluents into the watercourse.
5. Discharging of city untreated waters and effluents from industries, cities or towns and other human settlements.
6. Dumping of city or town waste for the purposes of land filling.

12.6Identify hierarchy:

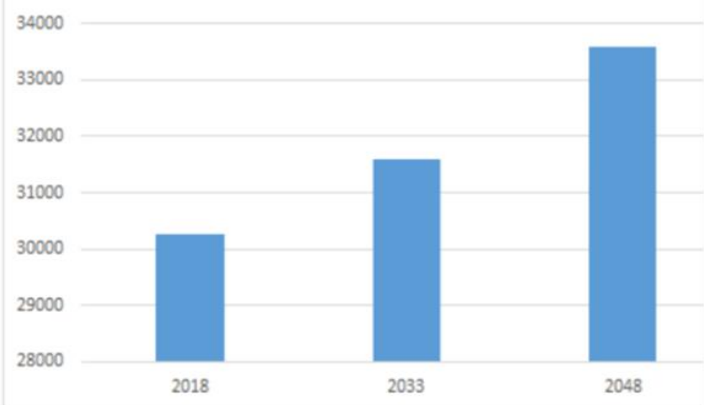


Figure 9 PROJECTEDPOPULATION GROWTH OF THE STUDY AREA

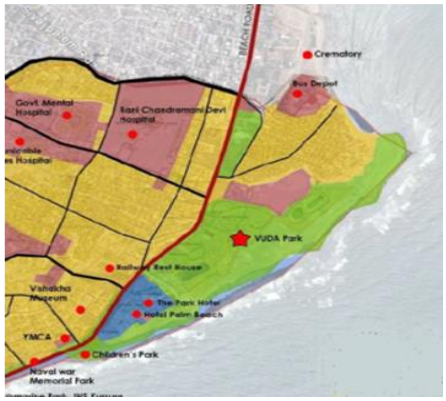


Figure 8 LANDUSEMAP

Hierarchy of Urban Development

S. No.	Planning Unit	Population
1.	Neighbourhood	5000 – 15000

Table 9 HIERARCHY OF INFRASTRUCTURE DEVELOPMENT

12.7Transportation planning:

S. No.	Road Types	Design Speed (kmph)	Space Standards (m)
1.	Local Street	10-20	12-20
2.	Access Street	15	6-15

Table 10 DESIGN CONSIDERATION OF URBAN ROADS

12.8Sewerage and sanitation:

The aim of the National Urban Sanitation Policy (NUSP), 2008 is to transform Urban India into community - driven, totally sanitized, healthy, and livable cities and towns.

FEATURES

- Cities must be open defecation free.
- Recycle and reuse of treated sewage for non-potable applications should be implemented.

Wherever possible

-Solid waste collected and disposed - off fully and safely

-Municipal sewage and storm water drainage must be safely managed.

As per CPHEEO manual, 80% of water supply may be expected to reach the sewers however it recommends designing the system by considering minimum wastewater Flow of 100 liters per capita per day.

EXISTING SITE CONDITION,

- No UGD connections
- Open drains
- Majority open defecation

JALARIPETA CURRENT GENERATION: 0.9267 mld

NEAREST PUMPING STATION: shanti ashram station (16mld capacity)

STP LOCATION: appughar stp (25mld capacity)

PUBLIC TOILETS: On roads and for open areas: @ every 1 Km, including in parks, plaza, open air theatre, swimming area, car parks, and fuel stations. Toilets shall be disabled - friendly and in 50 - 50 Ratio (M/F). Provision may be made as for Public Rooms.

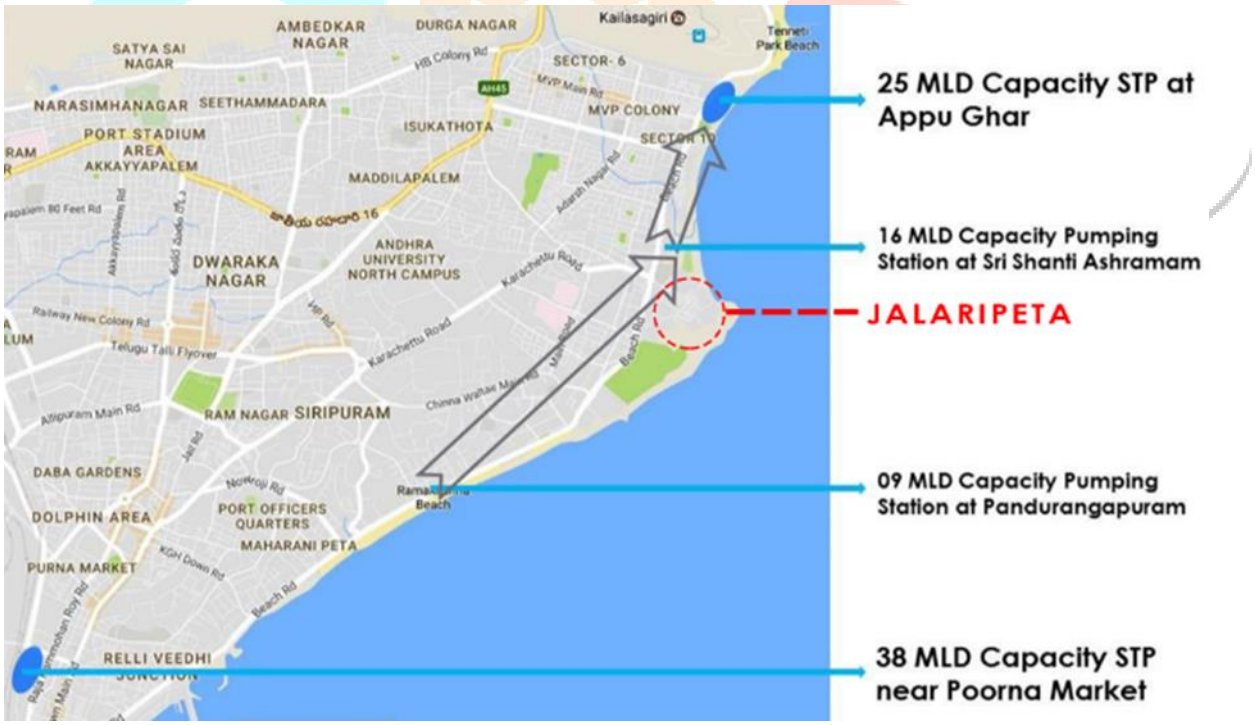


Figure 49 URBAN LEVEL SEWERAGE FLOW NETWORK FROM DIFFERENT NEIGHBOURHOODS TO APPUGHAR STP

EXISTING SITE CONDITION:

Total 4 community toilets

2 toilets: 2 male + 2 female

2 toilets: 12 male + 12 female

12.9Rainwater – runoff coefficient for stated surfaces:

S.No	Types of area	Percentage of imperviousness
1.	Commercial & industrial area	70-90
2	residential area - high density - low density	 61-75 35-60
3	Parks and undeveloped areas	10-20

Table 11 % OF IMPERVIOUSNESS

EXISTING SITE CONDITION,
- Only green cover: 200sq.m,
% of imperviousness = 99.5%
- including the open space (shore),
% of imperviousness = 58.06%

12.10 Solid waste management:

S.NO	land use type	Estimated waste generation
1	residential	0.3 to 0.6 kg / cap / day
2	commercial	0.1 to 0.2 kg / cap /day
3	Street sweepings	0.05 to 0.2 kg / cap / day
4	Institutional refuse	.05 to 0.2 kg / cap / day

Table 12 SOLID WASTE MANAGEMENT

EXISTING SITE CONDITION,
- DOOR TO DOOR COLLECTION
- WASTE SEGREGATION AT SOURCE
NO. OF DUSTBINS: 40
SOLID WASTE GENERATION : 0.25Kg/Capita/Day QUANTITY (PER CAPITA/DAY)
Total volume: 2350Kg/Day
PROCESS: Waste collected from JALARIPETA is transferred to Mini Transfer Station -1 at MUDASARLOVA (1-18Wards).

12.11 Social infrastructure education:

S. No.	Category	Student Strength	Population served per unit	Area Requirement	Other Controls
1.	Pre Primary, Nursery School		2500	0.08 ha	To be located near a park
2.	Primary School (class I to V)	500	5000 (NBC, 2005)	Area per School = 0.40 Ha a) School building area = 0.20 Ha b) Playfield Area = 0.20 Ha	Playfield area with a minimum of 18 m x 36 m to be ensured for effective play
3.	Senior Secondary School (VI to XII)	1000	7500	Area per School = 1.80 Ha (NBC, 2005) a) School building area = 0.60 Ha b) Playfield Area = 1.00 Ha c) Parking Area = 0.20 Ha	Playfield area with a minimum of 68 m x 126 m to be ensured for effective play

Table 14 AREA REQUIRED FOR DIFFERENT EDUCATIONAL INSTITUTES

Existing condition: One GVMC Primary school [900 strength] staff: 27 (ratio = 1:33) Area= 493m2

12.12 Socio-cultural:

S. No.	Category	Population served per unit	Land area requirement
1.	Anganwadi - Housing area/ cluster	5000	200-300 sq.m
2.	Community Room	5000	750 sq.m (NBC)
3.	Religious Facilities At neighbourhood / housing cluster level	5000	400 sq.m

Table 15 SOCIO CULTURAL

Existing condition: One Anganwadi (strength =300)

12.13 Open space:

S. No.	Category	Population served per unit	Area Requirement (Ha)
1.	Neighbourhood Park	15000	1

Table 16 OPEN SPACE (URDPFI)

12.14 Organized green space:

S. No.	Planning Unit	Number of Organized green spaces
1.	Neighbourhood	3 - 4 local parks and playgrounds

Table 17 ORGANIZED GREEN SPACES (URDPFI)

12.15 Safety facilities:

S. No.	Category	Distribution or Population Served per unit	Area Requirement
1.	Sub fire station/ Fire Post	Within 3-4 km radius	0.6 Ha (with essential residential accommodation)

Table 18 SAFETY FACILITIES (URDPFI)

Existing condition: The nearby fire station is about 5 km from the site (seethamdhara)

12.16 Special requirement for gender sensitive planning:

1. At the neighborhood or planning sector levels, single land use zones should be discouraged, as they tend to be “dead” or inactive as with business districts in the night or residential areas. Mixed land uses (such as mixed residential and mixed commercial uses) should be encouraged which will generate street activity throughout the day and also reduce walking distances. 2. Women are disproportionately affected by poor quality pedestrian infrastructure and increased walking distances. Walkable blocks should be promoted by limiting block sizes, providing direct, shortest non - motorized transport routes or pedestrian public right of ways.

12.17 Commercial centres:

Table 8.60: Hierarchy of Commercial Centres (NBC)

S. No.	Planning Unit	Class of Settlement	Population served	Hierarchy of Commercial Centre
1.	Neighbourhood	Small Medium Large	15000	Local shopping centre

Table 8.61: Norms for Commercial Centres

S. No.	Category	Population served per unit	Land Area Requirement
1.	Local shopping including service centre	15000	4,600 sqm

Table 19 COMMERCIAL CENTRES (URDPFI)

Existing condition: There is no local shopping Centre in the site area.

12.18 Distance from electric lines:

S. No.	Description	Vertical Distance (m)	Horizontal Distance (m)
1.	Low and medium voltage lines and service lines	2.5	1.2
2.	High voltage lines up to and including 11 kV	3.7	1.2

Table 20 DISTANCE FROM ELECTRIC LINES (URDPFI)

Existing condition: The minimum horizontal distance is not maintained.

12.19 Density norms for low income housing:

Table 9.10: Density norms for low income housing

S. No.	Type of Development	Range of Densities	Population Density(PPH)
1.	Metropolitan Cities	125-150 DUs per Ha	560 - 675

Table 21 DENSITY NORMS FOR LIG

Existing condition: The present population density is 645 PPH.

12.20 Minimum access provision for barrier free built environment:

Table 8.69: Minimum Access provisions for Barrier Free Built Environment

S. No.	Type of Building	Minimum Provision
1.	Tenement houses, row houses, apartments and town houses	A minimum of 1 unit for up to 150 units Plus minimum of 1 additional unit for every 100 units thereafter Entrances and exits to be designed for barrier free accessibility

Table 22 MINIMUM ACCESS PROVISION FOR BARRIER FREE BUILT ENVIRONMENT

Existing condition: No barrier free consideration has been taken.

12.21 Energy conservation building code roof assembly U-factor:

Table 4.4: Roof Assembly U-Factor

Climate Zone	Maximum U-factor of the overall assembly (W/m2·K)
Warm and Humid	U-0.409

Table 23 ROOF ASSEMBLY U-FACTOR

12.22 Vertical fenestration U-factor (W/M^{2}K) AND SHGC requirements:

		WWR≤40%	40% <WWR≤60%
Climate	Maximum U-factor	Maximum SHGC	Maximum SHGC
Warm and Humid	3.30	0.25	0.20

Table 24 VERTICAL FENESTRATION U-FACTOR (W/M2·K) AND SHGC REQUIREMENTS

12.23 IGBC green existing buildings:

		Credit Points
Site & Facility Management (Maximum 18 Points)		
SF Mandatory Requirement 1	**Green Policy**	**Required**
SF Mandatory Requirement 2	**Waste Collection & Disposal**	**Required**
SF Credit 1	Eco-friendly Commuting Practices: 25%, 50%	4
SF Credit 2	Eco-friendly Landscaping Practices: 50%, 75%	2
SF Credit 3.1	Heat Island Reduction, Non-roof: 50%, 75%	4
SF Credit 3.2	Heat Island Reduction, Roof: 50%, 75%	4
SF Credit 4	Outdoor Light Pollution Reduction	2
SF Credit 5	Building Operations & Maintenance	2
		18
Water Efficiency (Maximum 26 Points)		
WE Mandatory Requirement	**Water Efficient Fixtures**	**Required**
WE Credit 1	Water Efficient Fixtures: 20%,30%,40%	6
WE Credit 2	Rain Water Harvesting: 25%, 50%	4
WE Credit 3	Waste Water Treatment, 100%	4
WE Credit 4	Waste Water Reuse, 75%, 100%	4
WE Credit 5	Water Metering	4
WE Credit 6	Turf Area: 50%, 25%	4
		26

Table 25 IGBC GREEN EXISTING BUILDINGS

Energy Efficiency (Maximum 30 Points)		
EE Mandatory Requirement 1	**Eco-friendly Refrigerants & Halons**	**Required**
EE Mandatory Requirement 2	**Minimum Energy Performance**	**Required**
EE Credit 1	Improved Energy Performance : 10%, 12.5%, 15%, 17.5%, 20%, 22.5%, 25%	14
EE Credit 2	On site Renewable Energy: 2.5%, 5%, 7.5%	6
EE Credit 3	Off Site Renewable Energy: 25%, 50%, 75%	6
EE Credit 4	Energy Metering	4
		30
Health & Comfort (Maximum 14 Points)		
HC Mandatory Requirement 1	**Tobacco Smoke Control**	**Required**
HC Mandatory Requirement 2	**Fresh Air Ventilation**	**Required**
HC Credit 1	Carbon dioxide Monitoring & Control	2
HC Credit 2	Isolation of Polluting Equipment & Systems	2
HC Credit 3	Eco-friendly Housekeeping Chemicals	2
HC Credit 4	Thermal Comfort, Indoor Temperature & RH	2
HC Credit 5	Facilities for Differently Abled People	4
HC Credit 6	Occupant Well-being Facilities	2
		14
Innovation Category (Maximum 12 Points)		
INN Credit 1.1 – 1.5	Innovation Credits	10
INN Credit 2	IGBC AP	2
		12
Total		**100**

Table 26 IGBC GREEN EXISTING BUILDINGS

13. DISASTER MANAGEMENT

13.1 Desirable plan for reducing cyclone damages:

Figure 10 ROW PLANNING CREATES WIND TUNNEL EFFECTS RESULTING IN HIGHER WIND FORCES

Figure 11 ZIG ZAG PLANNING AVOIDS WIND TUNNEL EFFECT

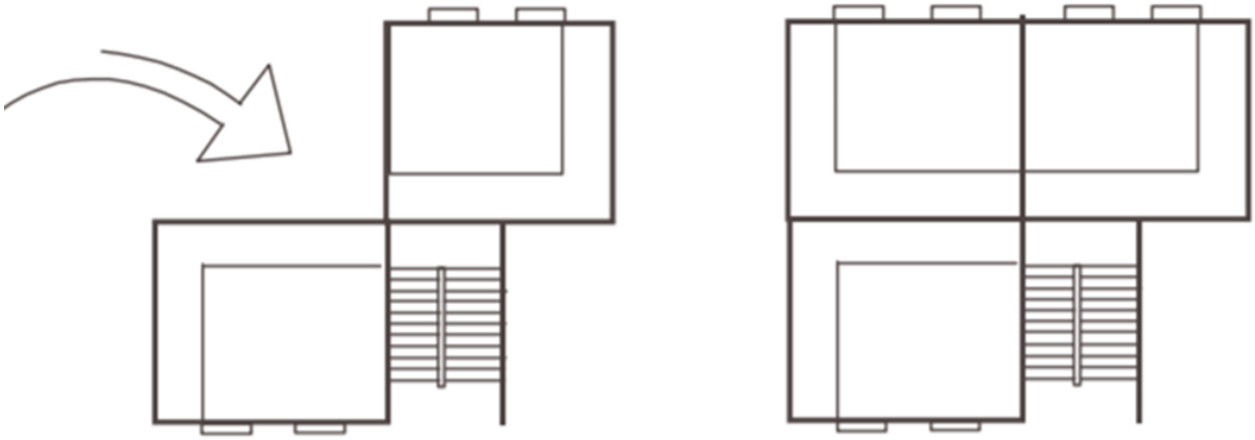


Figure 53 SYMMETRIC BUILDINGS ARE MORE STABLE

13.2Construction on raised ground/stilts to prevent inundation:

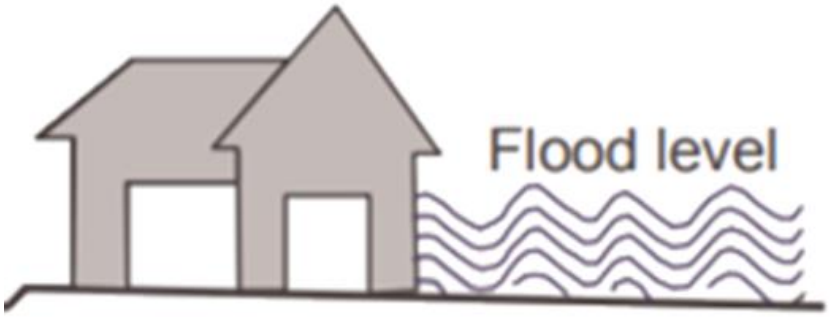


Figure 54 CONSTRUCTION AT LOW LEVEL HAS RISK OF INUNDATION

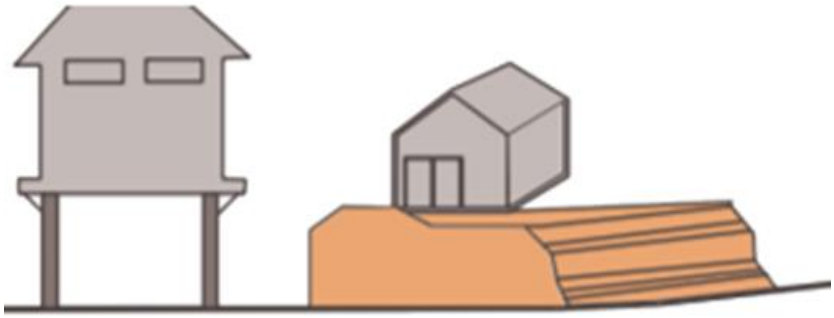


Figure 55 IN CASE OF NON-AVAILABILITY OF NATURAL ELEVATION CONSTRUCTION OF STILTS OR ARTIFICIALLY RAISED EARTH MOUND

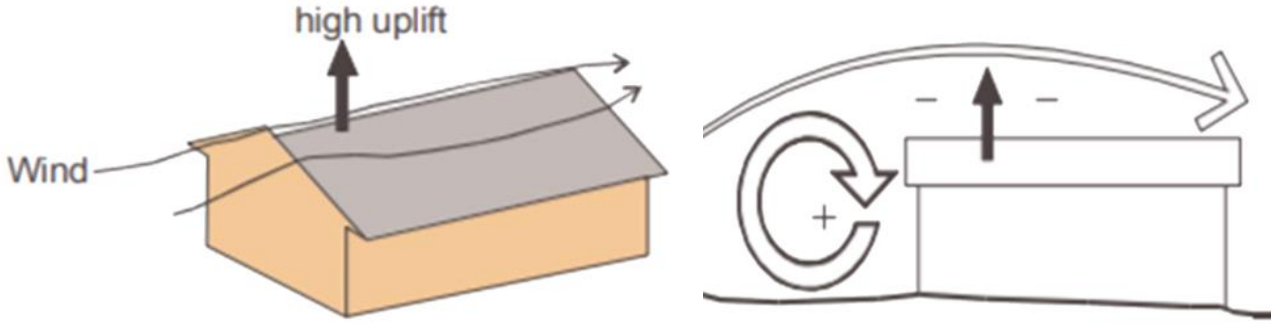


Figure 56 GABLE ROOFS GET UPLIFT

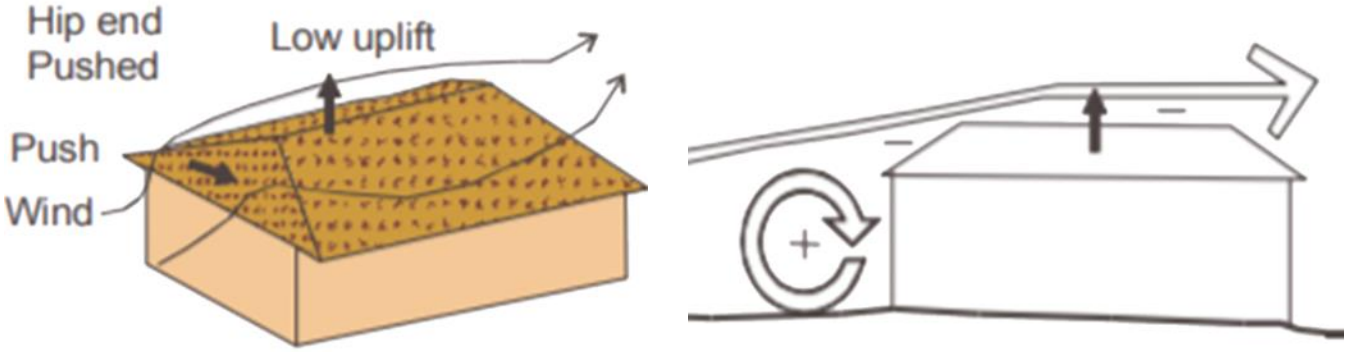


Figure 57 HIP ROOFS GETS LOWER UPLIFT

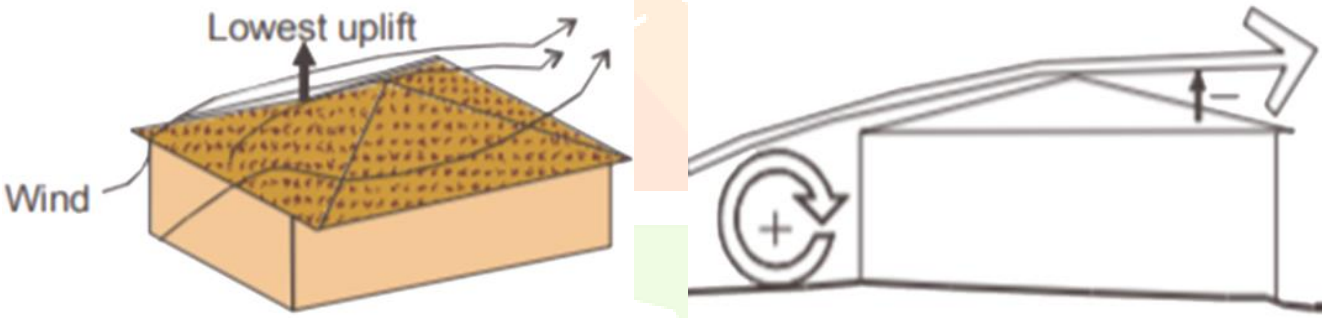


Figure 58 PYRAMIDAL ROOFS GETS LOWEST UPLIFT

14. RECOMMENDATIONS (CLUSTER LEVEL)

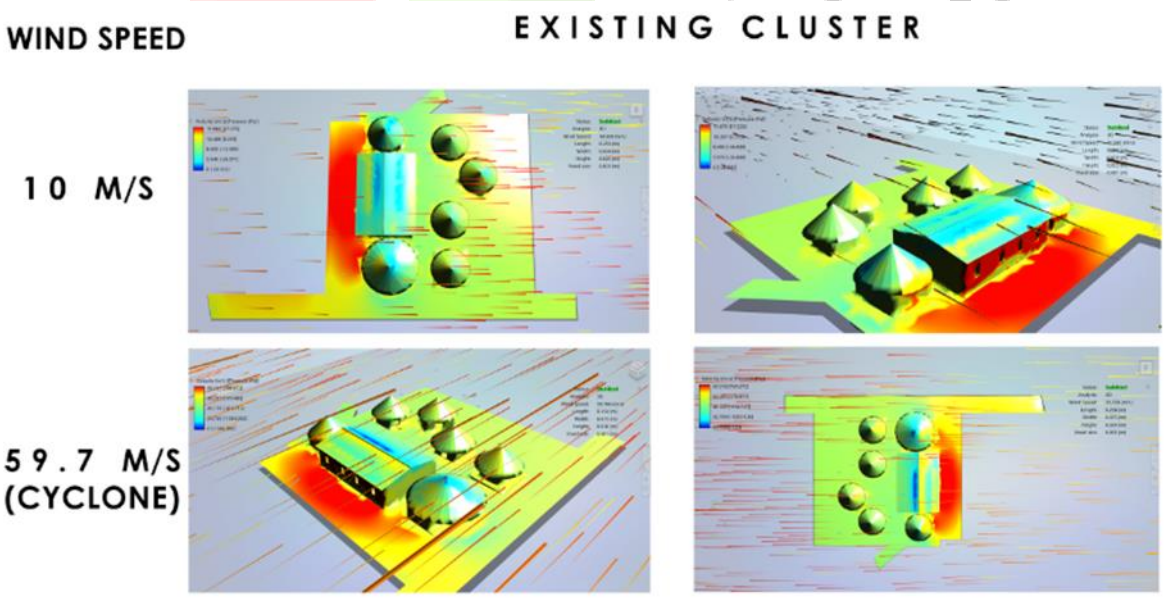


Figure 59 WIND ANALYSIS COMPARISION OF CLUSTER DURING HUD-HUD CYLCONE SPEED AND AVG.SPPED

In existing cluster, the kuchha houses have conical thatch roof and pucca house has asbestos gable roof having 240^{o} which is prone to be uplifted during cyclone.

14.1Cluster with recommended roof (retrofitting roof simulation):

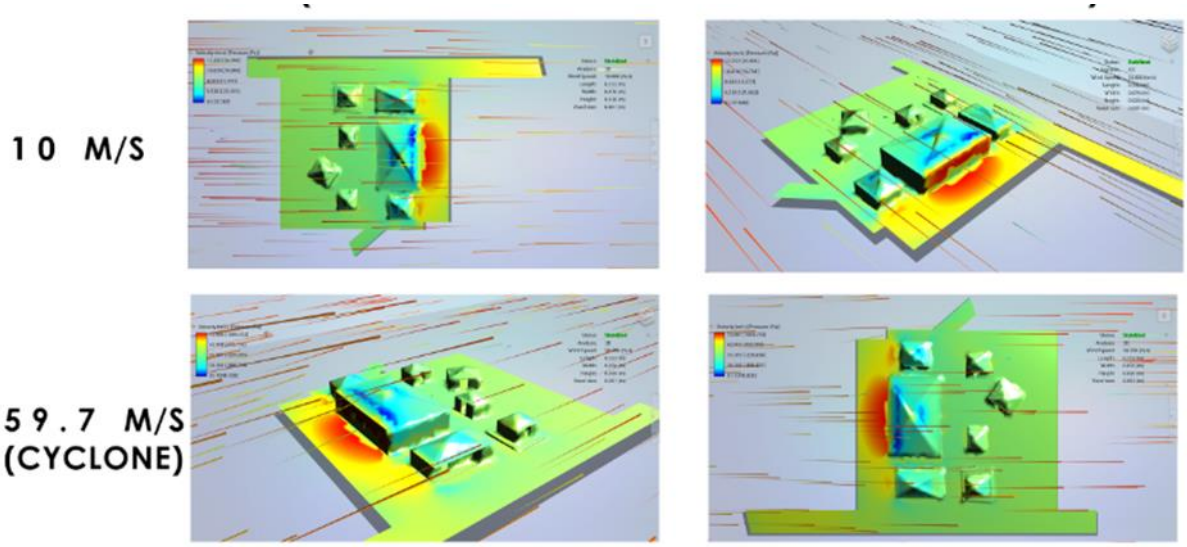


Figure 60 ROOF RETROFITTING OPTION FOR THE CLUSTER

In this cluster, the kuchha & pucca houses are retrofitted with pyramidal roof having reduced angle to 14^{o} , which have the least chance of up-lifting during cyclone.

15. PROTOTYPE PROPOSAL

15.1Evolution of form:

Figure 62 EVOLUTION OF FORM

Figure 61 GROUND FLOOR AND FIRST FLOOR PLANS

Figure 62 SECTION –AA'

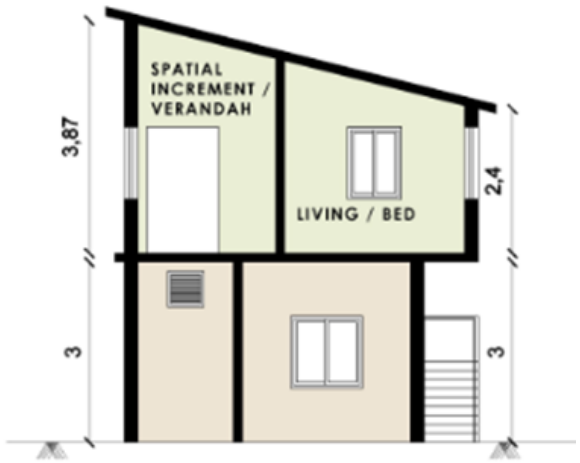


Figure 63 SECTION –BB'

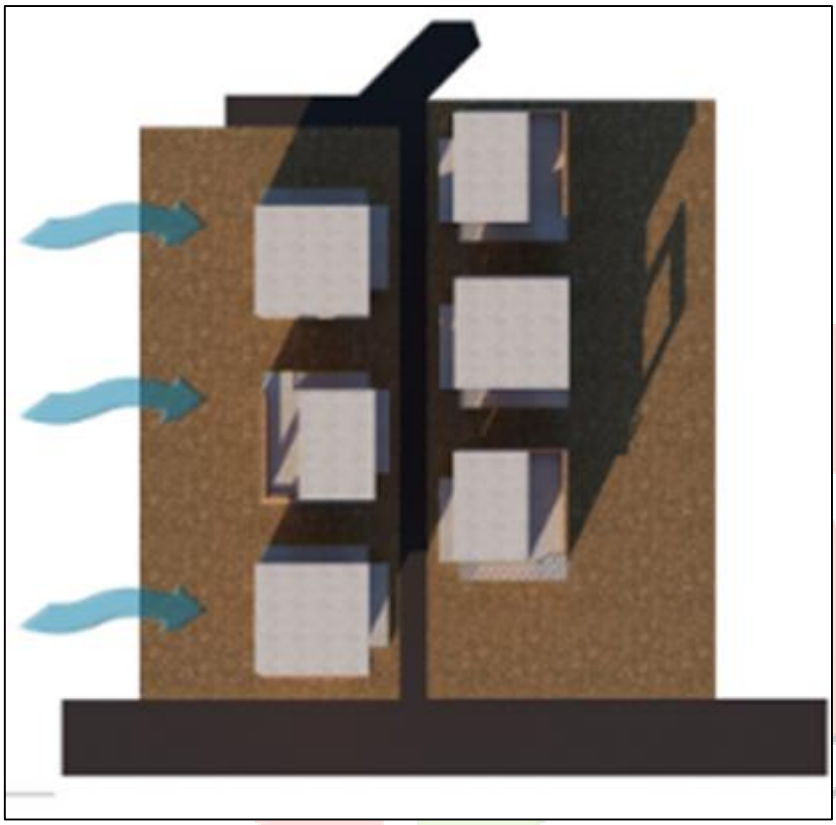


Figure 64 CLUSTER PLAN - ARRANGEMENT AVOIDING TUNNEL EFFECT

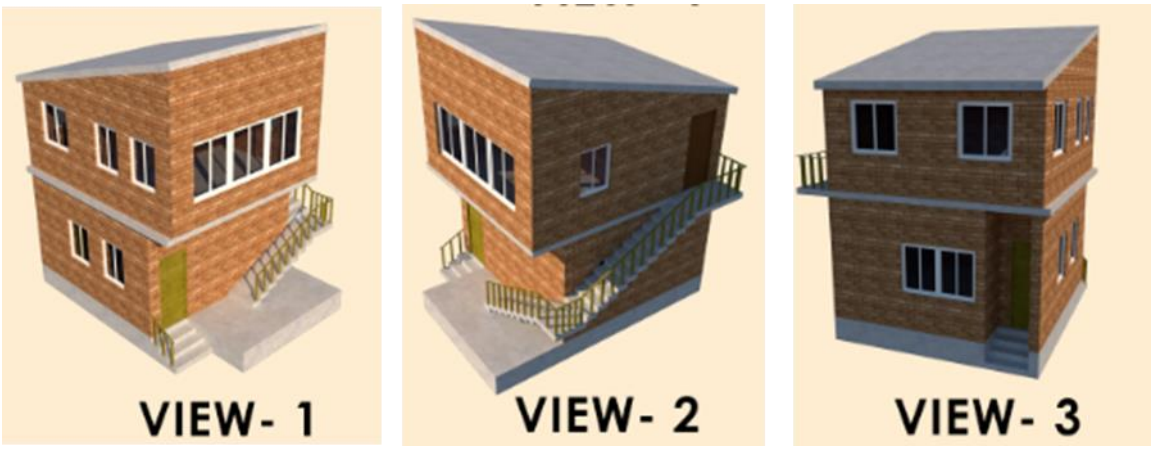


Figure 12 PROTOTYPE-1

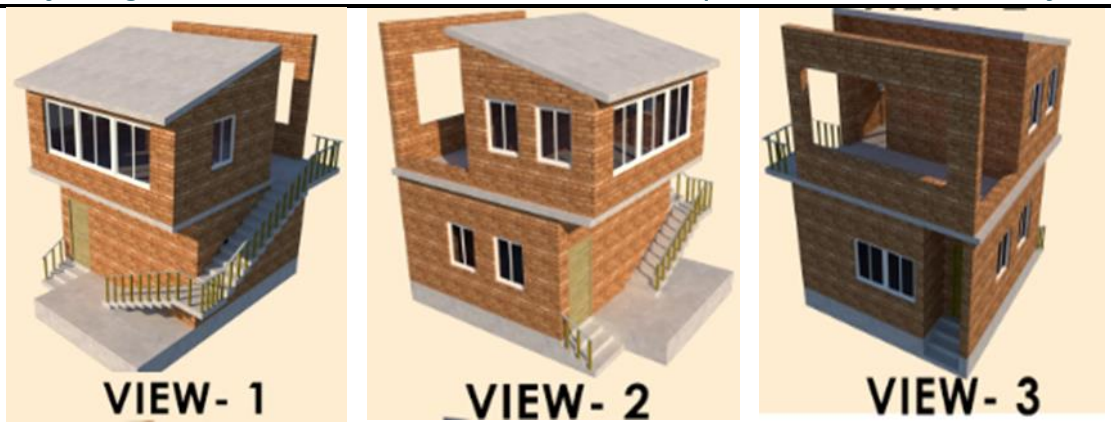


Figure 13 PROTOTYPE-2

Figure 67 CLUSTER VIEW - 1

Figure 68 CLUSTER VIEW -2

Figure 69 PROTOTYPE SPECIFICATIONS

15.2 Prototype proposal:

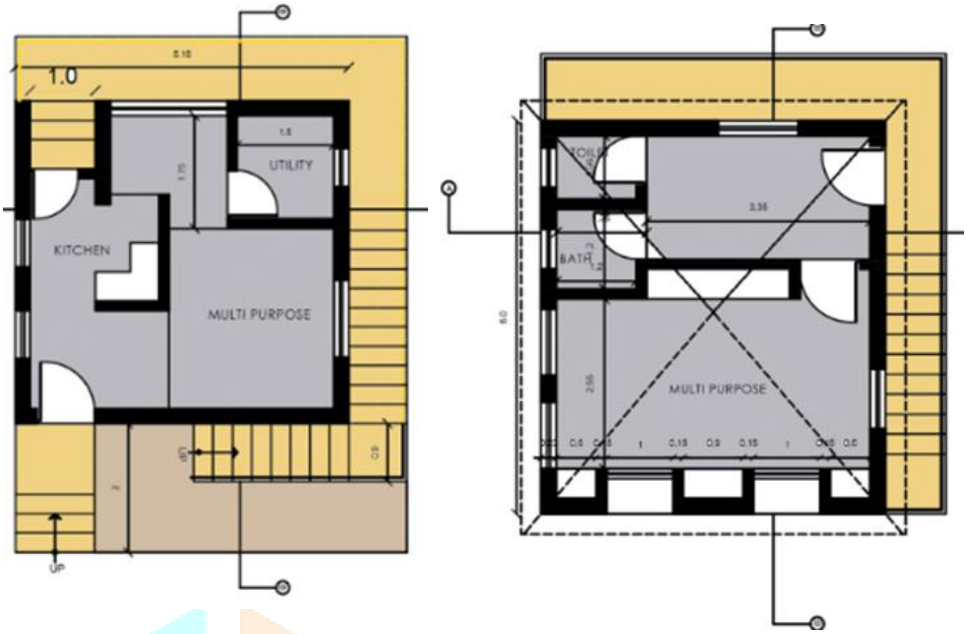


Figure 70 GROUND FLOOR AND FIRST FLOOR

Figure 71 LOW PYRAMIDAL ROOF PROTOTYPE VIEWS

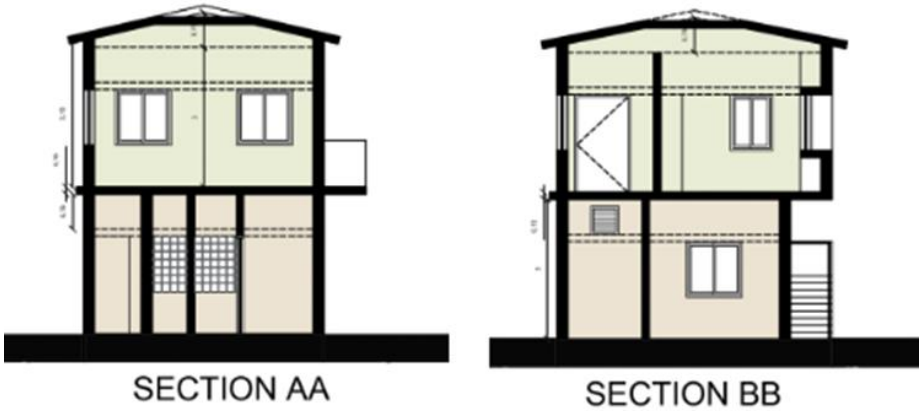


Figure 72 SECTION - AA AND SECTION - BB

Figure 73 FLAT ROOF PROTOPTYPE VIEWS

15.3 Material specification:

1. CSEB

- Earth is a local material and the soil should preferably be extracted from the site itself or not transported from too far away
- Labor costs for CSEB production amount to 40 to 45% of the total cost. This promotes endogenous development.
- It is a cost and energy effective material.
- The embodied energy of CSEB is 10.7 times less than country fired brick.
- Carbon emissions of CSEB are 12.5 times less than country fired brick.

Figure 74 CSEB BLOCK MAKING MACHINE

2. WPC

•U-VALUE– 0.3

•EMBODIED ENERGY – 45 MJ/Kg

•Resistant to rot

•Anti termite

•Low moisture absorption

15.4Wind simulation:

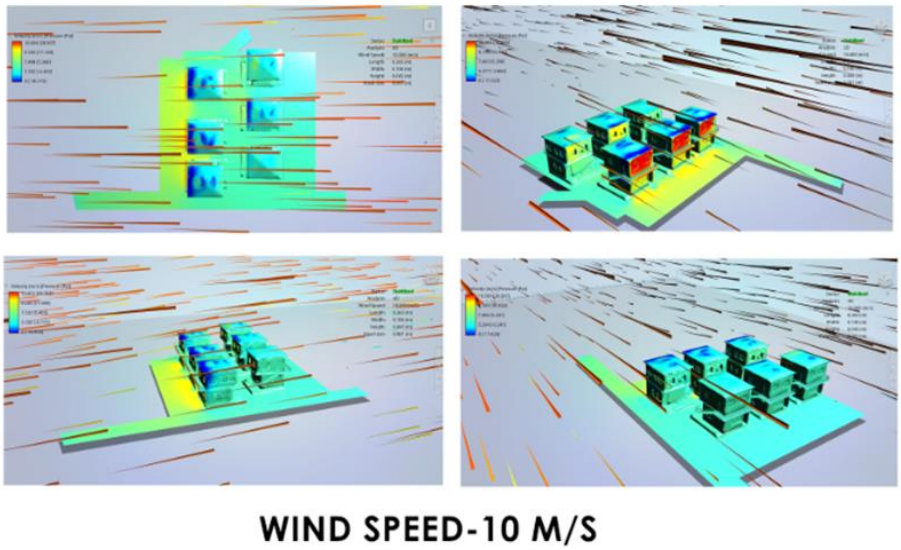


Figure 75 WIND SIMULATION OF PROPOSED CLUSTER AT 10M/S

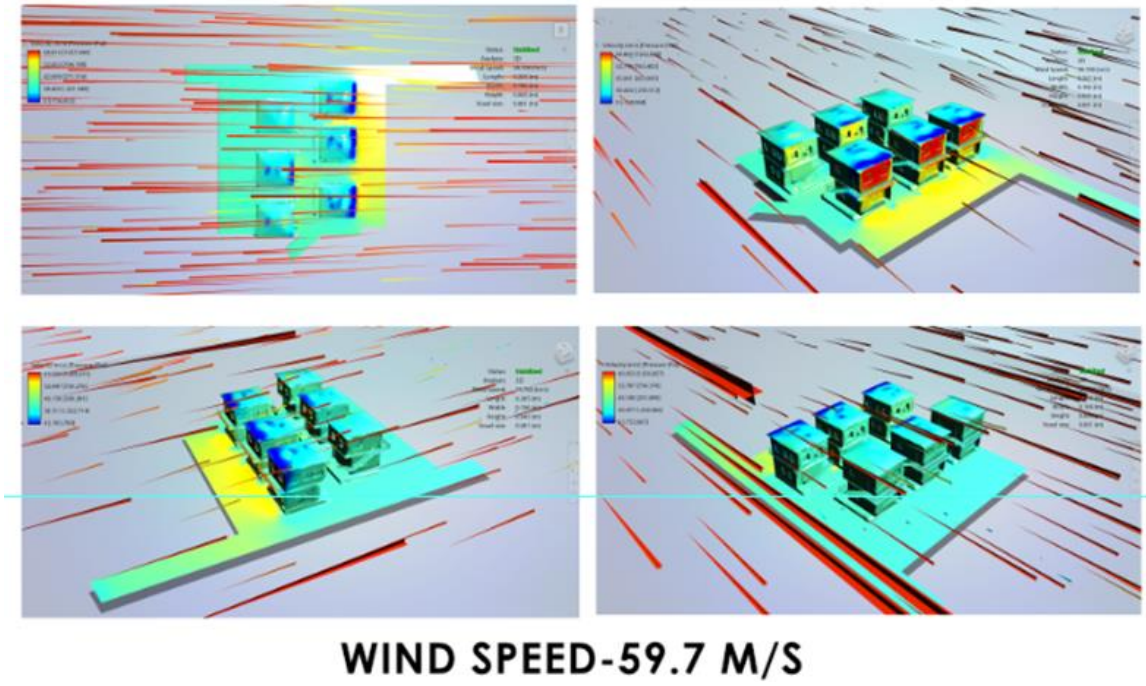


Figure 76 WIND SIMULATION OF PROPOSED CLUSTER AT 59.7M/S

15.5 Daylight simulation:

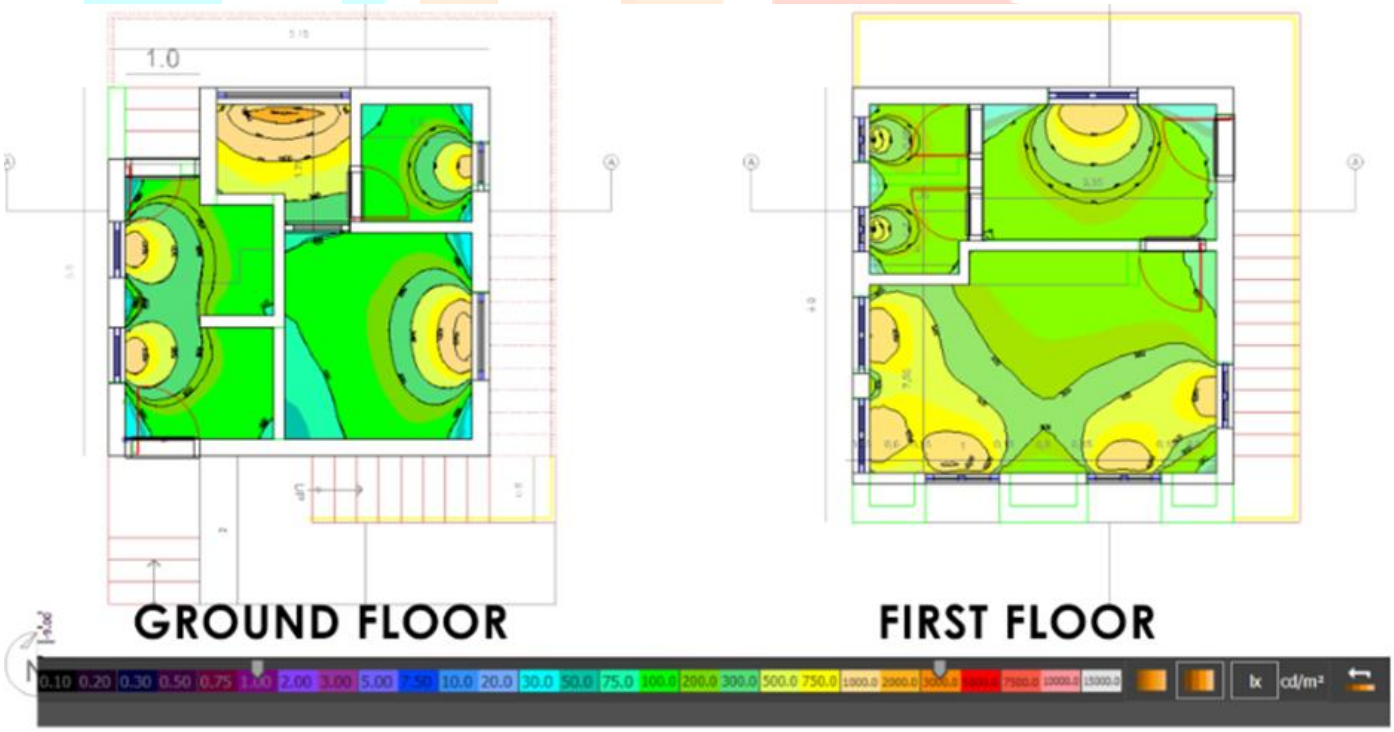


Figure 77 DAYLIGHT SIMULATION OF THE PROTOTYPE

16. RECOMMENDATIONS (CLUSTER LEVEL)

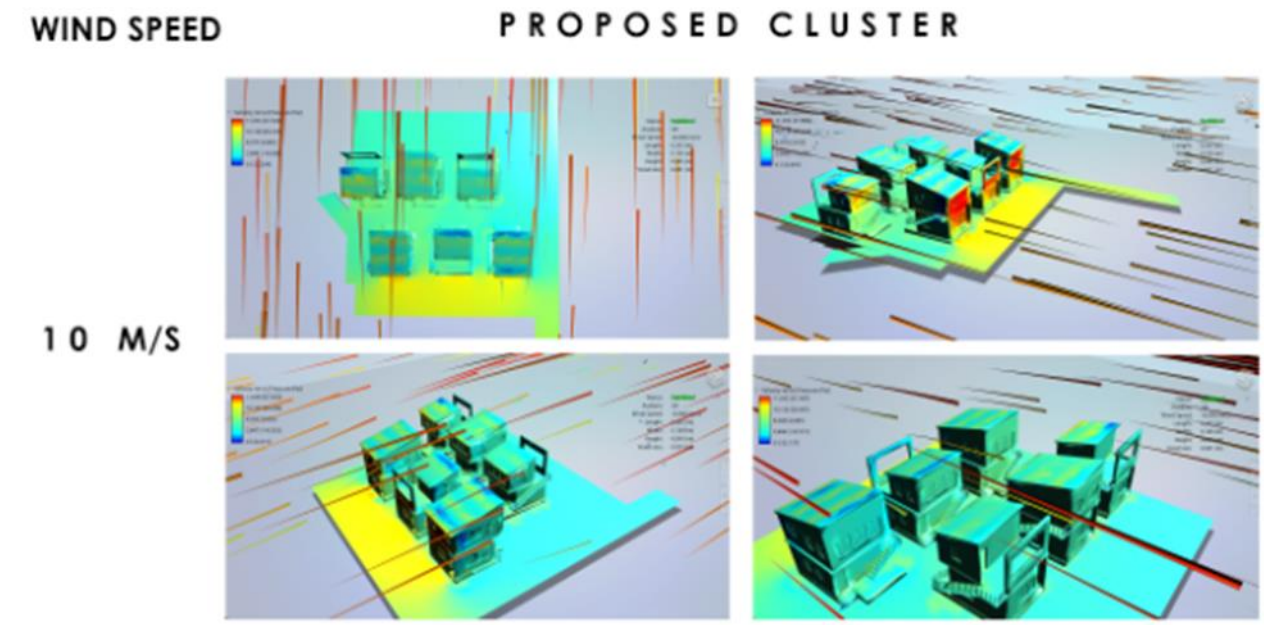


Figure 78 WIND SIMULATION AT 10M/S

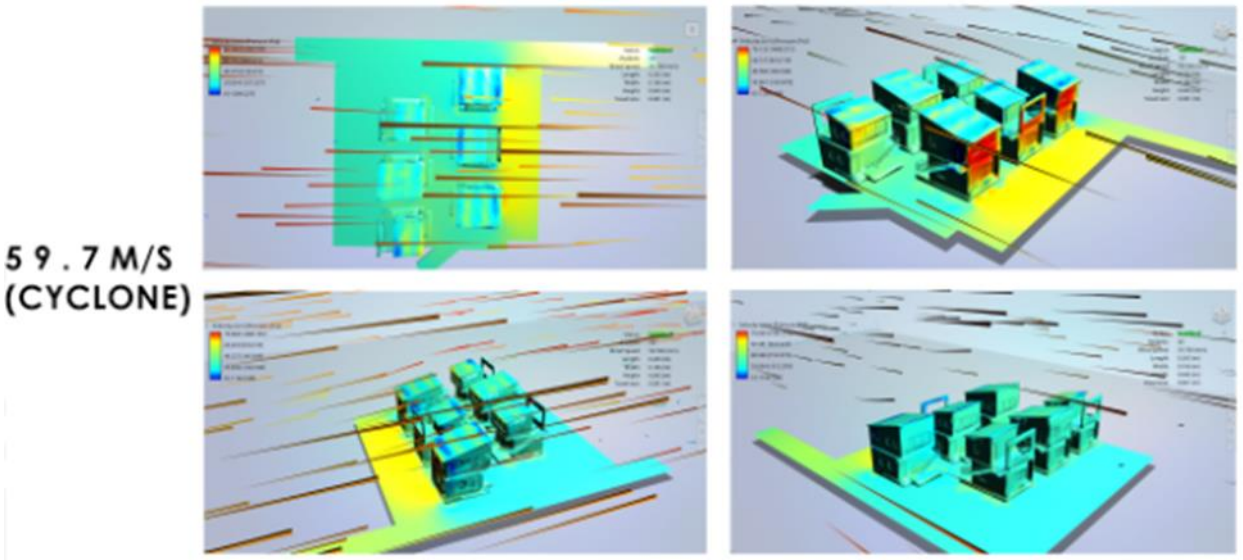


Figure 81 WIND SIMULATION OF PROPOSED CLUSTER AT 59.7M/S

In proposed cluster, the kuchha houses have been replaced by new cyclone resistant prototype which effectively deviates the wind due to the roof slope of 14 ^{o} which slopes towards windward direction. The alternate placement of units reduces the tunnel effect.

16.1Streetlight retrofit recommendations:

The AISL33100130ML/MP system comes within built Lithium Ion or Lithium Ferro Phosphate battery pack, a 30W LED giving a 3800 lumen output and a 60W Solar Panel. System comes along with a mounting bracket compatible with most standard poles allowing for easier installation.

LUMINARY	30W
LUMENS	3800
SOLAR PANEL	60W
BATTERY PACK	Li Ion/LiFeP04
SOLAR CHARGING TIME	6 hours
LIGHTING TIME	2 nights
WATERPROOF	IP65/IP66
MATERIAL	Aluminum Alloy
WORKING TEMPERATURE	-25 C to 65 C
LED WORKING LIFE	More than 50,000 hours
LED CHIP	36W (18 x 2W)
WARRANTY	2 years system
MOTION SENSOR (PIR)	YES
MODE	33% Brightness Run Mode, 100% PIR Mode

Table 27 SOLAR STREET LIGHT SPECIFICATIONS

COST

Cost of each unit- RS 14000
Total no of street lights - 205
Total cost- RS 28, 70,000

CENTRALISED SOLAR PANEL RECOMMENDATION

Total no of street lights - 205
205 x 30 w = 6150 w x 12 = 73800 w
= 73.8 kw/hr
= 73.8 units/day
Public sector, unit cost = 6 /-
73.8 x 6/- = RS 442.8/ day
Monthly= RS 13,284/-
Solar panels, recommended capacity =10 kW
1kw = 80,000/-(approx.)
10kw = 8, 00,000/-
Area requirement
1 sq.m solar panel = 8 w / day
For 10000 w area = 10000/8 = 1250 sq.m

Figure 82 CENTRALIZED SOLAR PANEL LAYOUT

16.2Laying of sewerage network in jalaripeta (ABD area):

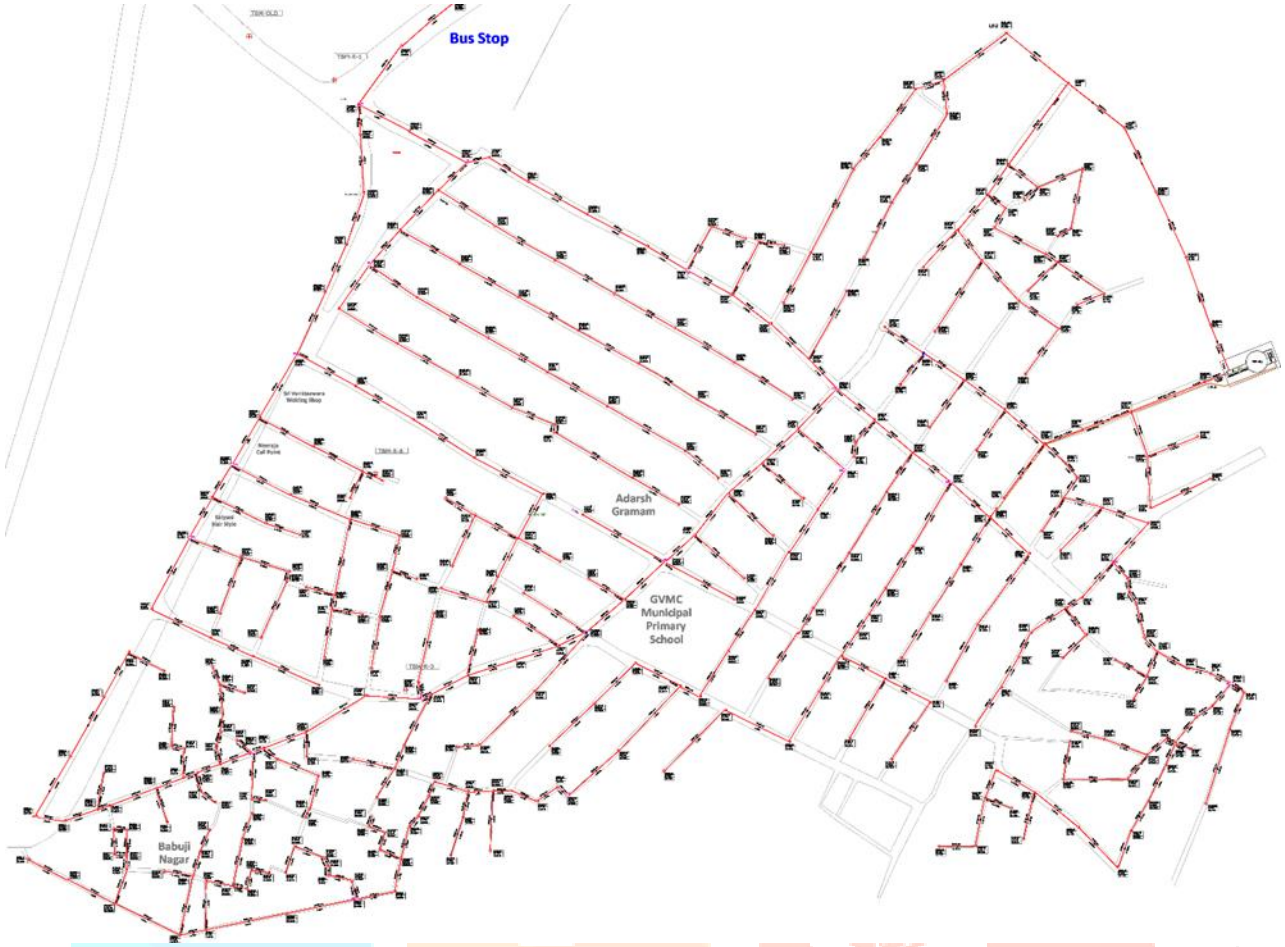


Figure 83 LAYING OF SEWERAGE NETWORK IN JALARIPETA

PROJECT STATUS

Sewer lines till the central core i.e. GVMC Primary School has been done.

Laying of sewerage network in Jalaripeta which includes a Lifting station used to pump and divert the lines from Jalaripeta to Shanti Ashram station.

End result: Once after the project completion the existing open drains are for storm water runoff to shore.

16.3Recommendation of root zone treatment for school:

TANK CALCULATION

5 lts per student in a day school demands (who sanitation standards)

Total water required= 900 x 5 = 4500 lts/ day= 4.5 cum area

BED SIZE CALCULATION

Area required = 900 sqm

Size of the bed = 66 sq m

Dimension of the bed = 6.6m x 10 m x 0.7 m

Detention time = 2-3 days

Storage tank capacity = 13500 lts

Storage tank dimension = 3.5m x 2m x 2m

Tentative location - in school premises (rear side)

16.4Recommendation of biogas:

FLEXI - BIOGAS FOR COOKING

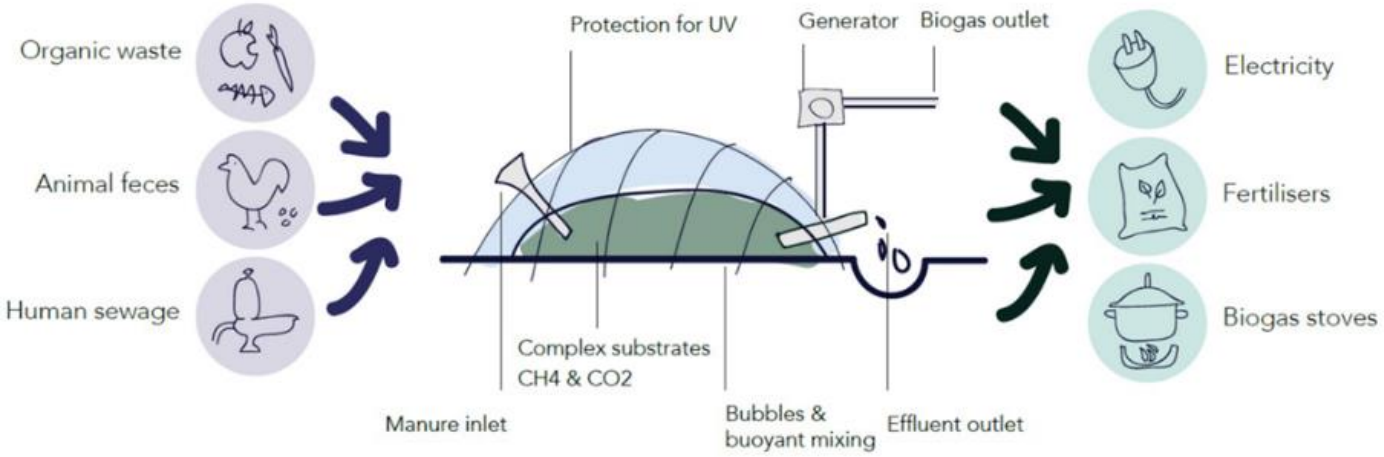


Figure 84 BIO-GAS PLANT

Biogas required per person / day = 0.12 lts
Capacity of community hall = 1000 people
Total biogas required = 120 lts/ day
Hydraulic retention time (hrt) = 7-10 days
Plant size required = 1.2 cu.m ≈ 2 cu.m capacity
Economics of flexi biogas = Rs 15000/-

Figure 85 BIO GAS LOCATION

Required gas = 120 lts = 5 cylinders
Cost = Rs 598/ cylinder
Savings per day/event = Rs 2990
Location- kalyan mandap

17. CONCLUSION

In order to develop sustainable fisherman settlement, there are four main aspects of sustainable development that should be considered, namely environment, social, economy and culture coupled with government regulations on fisherman settlement and theories about the settlement. Where in fact the fisherman settlement condition is degraded in term of environmental condition, unsolved poverty residents and rather slums condition. From the aspect of environment there needs more attention to preserve the environment by the provision of drainage and disposal system in the fish-processing and fish auctions, provision of clean water

in every home of fishermen and public facilities, the provision of telephone, gas and electricity. These basic infrastructures badly needed to support the fishermen settlement access and road network. Reduce the odors of fish waste and the fish drying process. Then, form social aspect the settlement and housing development should pay attention to the activities and habits of fishermen. The habit of fishing is different in every places, it is influenced by the endogenous culture, namely a community spaces for fishermen to stitch nets, fish auctions, spot cleaning and drying fish. While on economy aspect there is a need to provide a place that can increase the income of fishermen as fish processing production house, fish market, etc.

REFERENCES

[1] "**Guidelines for preparation of a slum free city plan of action**", Rajiv Awas Yojana, ministry of housing and urban poverty alleviation, government of India.
[2] "slum upgradation" , social welfare departments, Surat municipal corporation.
[3] Holling, c. s. (1973). **Resilience and stability of ecological systems**. Annual review of ecology and systematics, 4(1), 1–23.
[4] Immanuel, s., & Rao, g. s. (2012). **Social status of hook and line fishermen in Visakhapatnam**, fishery technology, 49 (2). 204-209.
[5] IGBC green existing buildings
[6] URDPFI GUIDELINES [MOUD, 2015]
[8] Cyclone Resistant Building Architecture -2007 BY ANKUSH AGARWAL
[9] GRIHA V.2015 Manual.