DETAIL PROJECT REPORT

VISHWAKARMA YOJNA: VIII

AN APPROACH TOWARDS RURBANISATION

Navapura Village

Ahmedabad District

PREPARED BY

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
Sharad Verma	Civil Engineering	170320106125
Doriya Jeegneshkumar Dalabhai	Civil Engineering	170320106018

L.J Institute of Engineering and Technology, Ahmedabad.

NODAL OFFICERS NAME

Prof. Parth Sinroza

YEAR: 2020-21

GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad – 382424 Gujarat

DETAIL PROJECT REPORT

ON

Vishwakarma Yojana: Phase VIII

AN APPROACH TOWARDS RURBANISATION

Navapura Village

Ahmedabad District

Prepared By

STUDENT NAME	BRANCH NAME	ENROLLMENT NO
Sharad Verma	Civil Engineering	170320106125
Doriya Jeegneshkumar Dalabhai	Civil Engineering	170320106018

L.J Institute of Engineering and Technology,
Ahmedabad.

NODAL OFFICERS NAME
Prof. Parth Sinroza

Year: 2020-21

Gujarat Technological University,

Chandkheda, Ahmedabad – 382424 Gujarat

CERTIFICATE

This is to certify that the following students of Degree/ Diploma Engineering successfully submitted

Detail Project Report for,

VILLAGE: NAVAPURA

DISTRICT: AHMEDABAD

Under

Vishwakarma Yojana: Phase-VIII

in partial fulfillment of the project offered by

GUJARAT TECHNOLOGICAL UNIVERSITY, CHANDKHEDA

during the academic year 2020-21.

This project work has been carried out by them under our supervision and guidance.

STUDENT NAME	BRANCH NAME	ENROLLMENT NO.
SHARAD VERMA	Civil	170320106125
DORIYA JEEGNESHKUMAR DALABHAI	Civil	170320106018

Date of Report Submission:	
Principal Name and Signature:	**Dr. A. C. Suthar**
VY-Nodal Officer Name and Signature:	**Prof. Parth Sinroza**
Internal(Evalutor) Guide Name and Signature:	**Prof. Parth Sinroza**
CollegeName:	**L.J Institute of Engineering and Technology,Ahmedabad**
College Stamp:	

ABSTRACT

Vishwakarma Yojana is an initiative of Government of Gujarat through Commissionerate of Technical Education which is allotted to Gujarat Technological University. This project aims to the development of rural infrastructural facilities and living standards of the rural people.The villages of "Rurban" vicinity are adopted by the engineering colleges affiliated with the Gujarat Technological University. The Engineering colleges would study the identified villages and make the recommendations on the applying of technology to realize integrated and comprehensive development, through project preparation and management.

Navapura is a village located in Daskroi takula, Ahmedabad district of Gujarat state, India in the vicinity of Ahmedabad city. It is a small village with the population of 3756. It is located 25 km towards South from District head quarters Ahmedabad. It is surrounded by Dholka Taluka towards South, Bavla Taluka towards west, Sanand Taluka towards North, Ahmadabad Taluka towards North.

As this a "rurban" village, the people are not only associated with the agricultural activities but also are adopting different vocations. Like the other villages of India this also lacks in some basic infrastructural facilities such as public transportation connectivity, primary health center, waste management system et-cetera.

To improve the basic physical and social infrastructure facilities, we proposed designs like
1) Small library
2) Bank
3) Panchayat building
4) Biogas plant and
5) Learning hub and smart play center.
6) Obelisk

There are many scopes of future development in the village. After providing basic amenities, we can bring forth some smart techniques like vertical farming, we can also propose the idea of lake revival and many others.

Keywords: Rural infrastructural facilities, Living standards, Integrated and Comprehensive Development, Smart techniques.

ACKNOWLEDGEMENT

We are highly indented to **Gujarat Technological University**, Ahmedabad for providing us such opportunity to work under Vishwakarma Yojana to get real work experience and applying our technical knowledge in the development of Villages.

We wish to express our deep sense of gratitude to **Prof.(Dr.) Navin Sheth**, **Hon'ble Vice Chancellor, Gujarat Technological University-Ahmedabad**, for his encouragement and giving us the wonderful project.

We also express our gratitude to **Dr. K.N.Kher**, **Registrar, Gujarat Technological University-Ahmedabad** for giving us complete support.

We express our sincere thanks to **Commissionerate of Technical Education, Gujarat State** for appreciating and acknowledging our work.

We express our sincere thanks to **DDO, TDO, Sarpanch, Talati and staff members of Ahmadabad** District for providing us with requisite data whenever we approached them.Especially our thanks are to all villagers and stake holders for their support during Survey.

We are also thankful to our **Dr. A C Suthar** Principal, faculties of our colleges for their encouragement and support to complete this project work. An act of gratitude is expressed to our internal guide / Evaluator / Nodal Officer, **Prof. Parth Sinroza from college L J Institute of Engineering & Technology** for their invaluable guidance,constant inspiration and active involvement in our project work.

We are also thankful to all the experts who provided us their valuable guidance during the work. We express our sincere thanks to, **Dr. Jayesh Deshkar, Hon'ble Director of Vishwakarma Yojana project and Principal, V.V.P Engineering College and Core Committee member of Vishwakarma Yojana project Prof(Dr.) Jigar Sevalia**, Professor,SCET, Surat, **Prof.K.L.Timani,** Associate Professor,VGEC, **Prof.Rena Shukla**, Associate Professor, LD Engineering College, **Prof.Y.B.Bhavsar,** Associate Professor,VGEC, **Prof. Jagruti Shah**, Assistant Professor, BVM Engineering Collegefor providing us technical knowledge of this project work.

We are also thankful to **Ms. Darshana Chauhan, Vishwakarmrma Yojana**, for all support during our work. We therefore, take this opportunity for this Project work expressing our deep gratitude and sincere thanks for her cooperation to produce this project work in the present form.
Above all we would like to thank our Parents, family members and Friends for their encouragement and support rendered in completion of the present this work.

CONTENT

LIST OF TABLES

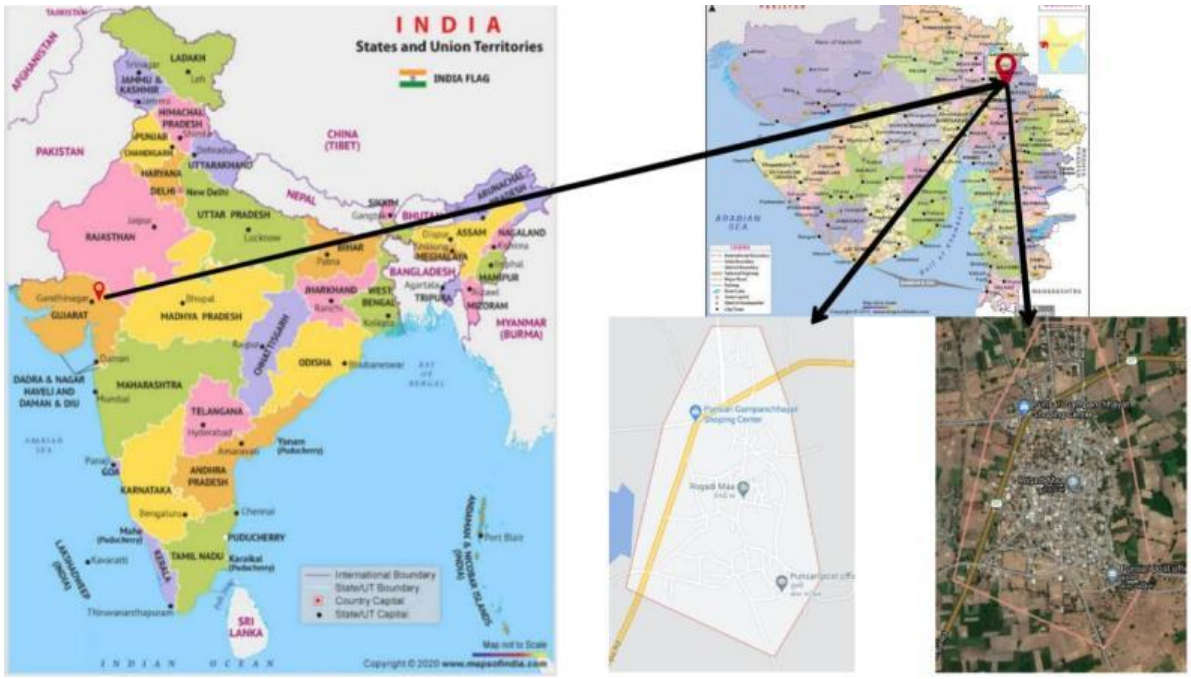
LIST OF FIGURES

Chapter 1

Ideal village visit from district of Gujarat state

1.1 Background & Study Area Location

- Punsari is a village in Gujarat State, India, situated in the district of Sabarkantha. It is known as the smartest village in India. The village is situated about 80 km from the capital of the state, Gandhinagar.
- The village follows the system of the Panchayati raj. The extent of the village is around 65 km and the land in agricultural use is 6 hectares. The facilities offered by the panchayat include the supply of local mineral water, a sewage and drainage scheme, a primary health center, banking facilities etc.



1.2 Concept : Ideal village, Normal Village

1.2.1 Objectives

(1) To carry household, photographic and techno economic survey of the village.
(2) To analyse data obtain from various departments related to village development .
(3) To carry focus group discussions with sarpanch and members of the panchayat.
(4) To carry gap analysis in the form of data presentation.
(5) To provide functional solid and liquid waste management system.
(6) To provide good basic health facilities in the allotted village.
(7) To improve the living standard of the villagers by providing them city like facilities.
(8) To provide homes with access to toilet, safe drinking water and regular power.
(9) To design proposal for infrastructural facilities as appropriate.

1.2.2 Examples / Live Case Studies of Ideal village

(1) Pothnikkad (Kerala)

- Pothnikkad village, situated in Kerala is the first in the Indian village to achieve 100% literacy rate. St. Mary's High School is the oldest high school in the village, from where many prominent people in the society have been educated. There were 17,563 residents in the village in 2011 & all are educated.

(2) Punsari (Gujarat)

- Punsari village is a located in Sabarkantha district in the state of Gujarat, India. The village islocated at about 80 km from the state capital, Gandhinagar. There has been use of new & advanced technology in education. In this village have Wi-Fi connection for all people.

Punsari comes out as an ideal village with modern urban aminities such as:

-24 × 7 power supply
-Wi-Fi connectivity
-CCTV cameras
-Pucca roads
-Mini-bus transport system etc.

Other details are given below:

- As per 2011 census of India the population of Punsari village is 5500 which has increased to 6000 in June 2012.
- There is 5 primary schools and 1 higher secondary school and 8 anganwadi centres are run in the village. The schools have 100% admission rate and 0% drop ratio. The gram panchayat has also set up a mobile library with more than 400 books mainly for primary students.
- For waste collection, in a door-to-door collection system a tractor trailer collect the waste twice a day.
- There is proper sanitation facilities in each household.
- There is a branch of Sabarkantha bank and Dena Bank in the village and most of the villagers have an account in State Bank of India.
- Punsari has 120 loudspeakers covering the whole village and people are used to listen Prabhatiya in the morning, Bhajan and Bhakti songs in the evening and important announcements like telephone bills, power bills, results of students are made through these speakers.
- CCTV cameras and monitors linked with mobile applications has been installed at key locations for safety purposes.
- There is a reverse osmosis water treatment plant to ensure the supply of clean drinking water to the villagers. It supplies a 20 litre cane to houses for a token cost of 5-6 rs.
- The gram panchayat has also started its own mini bus service inside the village which undertakes 11-12 trips per day.
- The villagers are using dung waste to generate electricity. The bio- electricity plant is also installed which supplies power to street lights and the remaining electricity is supplied to households.
- There is 66 kilowatt sub-station that supply power to the village.
- There is a WiFi facility in the village with unlimited access to the internet with the speed of 4 MBPS at just Rs.50 only, which is collected from the villagers.

1.2.3 The Idea of a Model /Smart Village

- A smart village has upgraded infrastructure and incorporating information and communication technology to provide metrics that enable all aspects of a village to be tracked and improved. It has upgraded daily touch points i.e, infrastructures than a typical village and has access to sustainable energy services.

1.2.4 Ancient history civil concept about Indian village / other countries perspective about village and its new development

- " The soul of India lives in its villages." declared M. K. Gandhi at the start of the 20th century. A village, larger than a hamlet but smaller than a town with a population usually ranging from a few hundred to a few thousand, is a clustered human settlement or community.
- The term urban village is often applied to many urban communities, even though villages are mostly located in rural areas. Villages with fixed dwellings are typically permanent; temporary villages, however, can occur.
- Moreover, as a dispersed settlement, the residences of a village are fairly similar to each other, not widely spread across the landscape. There is ample evidence to indicate that one of the important settlements in ancient India was the village.
- The Arthashastra of Kautilya suggests that village boundaries are demarcated by rivers, hills, woods, ditches, tanks, bundles or trees. He prescribed that villages should be located at distances of one or two krosha from each other (in Rajasthan, it is spelt as koss, which is the equivalent of two miles or 3,219 km) so that one village could go to the aid of the other in times of need.
- There were officials of both types of villages, called the Mahattar. A reference to a senior official named gramani, or gramik, is also available. The villages were divided according to their size during the time of Chandragupta Maurya into three categories: Jyeshtha (the largest), Madhyama (medium-sized) and Kanishtha (smaller).
- The village has been the pivot of administration in India since the earliest times. Naturally, its significance was very important in a period when communication was slow and industrialization was unknown.
- In ancient Indian life, Town played a relatively unimportant role, the Vedic hymns often prey for the prosperity of the village, but rarely for that of cities and towns.

- In the Vedic period, states were small and the importance of the town was further enhanced by this situation. There was little improvement in the situation in later times, even when kingdoms became large, because the village was the natural pivot of administration in a rural society.

1.3 SWOT analysis of Ideal village / Smart Village

1. **Strength:**
   - ✓ Water,Electricity,Drainage,Telecommunication**,**Education,Health,Library,Street lights,Rain water harvesting.
2. **Weakness**
   - ✓ Implementation of govt. Schemes,Unaccountable system**,**Utilization of funding.
3. **Threats**
   - ✓ Women Safety & Protection,Natural resources degradation,Erratic precipitation,Natural calamity.

1.4 Future prospects of Development of the Ideal village / Smart Village

- In Punsari, there can have a solar power scheme which will be a solid step towards renewable energy. The waste water management and solid waste management facilities can also be improved.

1.5 Benefits of the visits of Ideal village / Smart Village

- SWOT analysis became possible
- Realize the condition of the physical and social infrastructure
- Communication skills were improved

1.6 Civil aspects required in Ideal village / Smart Village

- Around 70% of the total population lives in villages, hence it becomes necessary to enhance quality of life in villages so that it is on a par with urban areas. And as civil engineers, *we* can do various things to make a village 'smart'.
- We have identified 10 basic amenities to enhance quality of life in villages.

(1) Individual toilets

Toilets are crucial for the healthy development of people. The overall purpose of good sanitation is to provide a healthy living environment for the villagers and to protect the local natural resources such as surface water, ground water, and soil, and provide safety and dignity for people when the urinate or defecate.

(2) Rural Roads

Improved accessibility and connectivity to rural areas will provide a vital momentum to the country's economic growth. Access to critical services and opportunities, and foster sustainable poverty reduction programs can be ensured by rural road connectivity.

(3) Provide drinking water

More than 163 million Indians - higher than the population of France+Germany - do not have access to safe drinking water. Supply of potable water in sufficient and safe sanitation practices in rural India is interconnected with the health and economic well-being of the people.

(4) Burial grounds

People from the oppressed cast do not have any place to bury their dead and are not allowed to do so in the burial sites of other communities in many parts of India. This is the reality of India, by providing a burial ground or a crematorium we can show some dignity in deaths of such communities.

(5) **Playgrounds**

Playgrounds are being sacrificed in the name of development. Playing is one of the strongest impulses in children, it is the happiest, most vital and energetic period of their life. Play is considered so important to a child's development that the UN Convention on the Rights of the child has established it as every child's right.

(6) Skill development center

Only 4.69% of the workforce have the formal vocational skills as compared to 60 to 90% in developed countries. Skill development is an important aspect of the growth and it is very important for a country like India.

(7) Roads to farm

A good agricultural network of roads will expand the distribution of agricultural goods as well as open up additional opportunities for agricultural trade. It can reduce transport cost, accelerates efficient delivery of farm inputs and enhance special agricultural production and distribution.

(8) Citizen service center

Having concurred with the department of e-governance to extend e-governance facilities each village should establish citizen service centers in their limits.

(9) Public library

It is shown that public libraries are important informational, cultural, educational and social institutions and education is one of the most significant role of it. It plays an important role in people's lives as a source of accessing information and a place for knowledge creation.

(10)Water harvesting

During the summer months, rainwater harvesting allows utilities to reduce peak demands, saving treated water for more substantial and sufficient water uses. Although rainwater can be a fantastic primary source of water for many uses and conditions, for emergency situations, it is also a great backup water supply.

Chapter 2
Literature Review – (Civil Concept)

2.1 Introduction: Urban & Rural village concept

URBAN VILLAGE CONCEPT

- An urban village is the concept of urban planning and urban design.
- These villages are known as urban village because they house the transitory population.
- Urban villages are the places where everything you need is within walking distance for example; shops, restaurants, services, etc.

RURAL VILLAGE CONCEPT

- According to the planning commission a town with a maximum population of 15000 is considered rural in nature. In this area panchayat makes all the decisions.
- The NATIONAL SAMPLE SURVEY ORGANIZATION (NSSO) define rular as an area with population density upto 400/KM2.
- Villages have clear surveyed boundaries but there is no municipal board.
- Agriculture is the main source of livelihood along with cottage industries, pottery, etc.

2.2 Importance of the Rural development

- Rural development leads to improvement in level of living, including employment, education, health and other social services.
- It helps to decrease inequality in distribution of rural incomes and in rural urban balances in incomes and economic opportunities.
- It helps in the reduction of migration rate from rural to urban areas.
- Rural developments make the rural villages more self- reliance and sustainable.
- India is the 2nd largest producer of agricultural products in the world and all credits goes to rural areas as we develop the rural areas in agricultural fields, the production of agricultural products may increases.
- In order to maintain social and geographical stability, the migration from rural to the urban areas must be stopped and this can only be possible by developing rural area of our country.
- It removes poverty from the rural areas.

2.3 Ancient Villages / Different Definition of: Rural Urban Villages

- A village, larger than a hamlet but smaller than a town with a population usually ranging from a few hundred to a few thousand, is a clustered human settlement or community.
- The term urban village is often applied to many urban communities, even though villages are mostly located in rural areas. Villages with fixed dwellings are typically permanent; temporary villages, however, can occur.
- In the past, for societies practising subsistence agriculture, and even for some non-agricultural societies, villages were a traditional type of society.
- A hamlet in Great Britain acquired the right to be called a village when a church was built. There are few towns and cities in many countries, with just a small proportion of the population living in them.

- The Industrial Revolution attracted people to work in mills and factories in greater numbers. Many villages have grown into towns and cities because of the concentration of people. This also allowed labour and crafts to be specialised, and many trades to be created. But not always in conjunction with industrialization, the process of urbanization continues.
- Historically, for sociability and protection, homes were situated together and land surrounding the living quarters was farmed. Traditional fishing villages were situated adjacent to the fishing grounds and were focused on artisan fishing.
- India is home to many cities and towns that not only have stood the test of time, but have flourished decade after decade as well. Such ancient towns and cities can be found all over India and bear witness to human civilization 's evolution.
- Let's have a look at some of these towns and cities.

(1) Harappa

- Harappa, in the eastern province of Punjab, eastern Pakistan.
- It is situated on the left bank of the now dry Ravi River, west-southwest of the town of Sahiwal, about 160 km (100 miles) southwest of Lahore. The village stands on an extensive array of mounds in which the ruins of a large city of the Indus civilization have been discovered by excavations since 1921, second in size only to Mohenjo-daro, which lies about 400 miles (644 km) to the southwest.
- Beginning in 1921, the English archaeologist Sir John Hubert Marshall initiated and directed the initial excavations at the site. His results set back knowledge of prehistoric Indian history to around 2500 BCE. The excavations revealed that Harappa was similar to Mohenjo-daro in plan, with a citadel resting on an elevated area on the town's western flank and a grid-plan layout on the eastern flank of the workers' quarters.
- A tall mud-brick rampart that had rectangular protrusions, or bastions, positioned at regular intervals, fortified the citadel. There were barrack-like blocks of workers' quarters between the citadel and the Ravi River, along with a series of circular brick floors used for pounding grain, and two rows of ventilated granary houses, 12 in all, grouped around a podium.
- The total floor space of the granaries was more than 836 square metres (9,000 square feet), closely approximating that of the original shape of the Mohenjo-daro granary. The entire architecture, controlled as it was by the citadel, indicates the near administrative control of the food supplies in the convenient vicinity of the Ravi river-highway.
- However, of the buildings of the citadel or of the town's main body itself, no intelligible remains exist.

(2) Lothal

- Another excavated site deserves special attention; this is Lothal, a small settlement founded on low-lying land on the western side of the Gulf of Khambhat near a tributary of the Sabarmati River. It appears to have acted as a trading station or port. The layout is distinctive: the site is roughly rectangular, measuring approximately 360 metres (1,180feet) on the long north-south axis and 210 metres (690 feet) on theeast-west axis.
- It was surrounded by a large brick wall, possibly to have been used for flood control. The southeastern quadrant takes the shape of a wide earth-filled brick platform, rising to a height of approximately 13 feet (4 metres). A series of other smaller platforms with intersecting air channels were constructed on this, reminiscent of the Mohenjo-daro granary, with overall dimensions of about 159 by 139 feet (48 by 42 metres).

- ✧ There were other buildings behind this block, including a row of 12 bathrooms with connected drains, also strongly reminiscent of those found at the Mohenjo-daro citadel. Houses and shops evidently made up the remaining enclosed area. A bead maker's factory and the stores of goldsmiths and coppersmiths were among the interesting findings. There was a main street running from north to south.
- ✧ A large brick basin measuring some 718 by 121 feet (219 by 37 metres) with existing brick walls of 15 feet (4.5 metres) in height was the most unexpected discovery at Lothal, however. This lay alongside the foundation on which the granary block stood, east of the village. A small sluice or spillway with a locking mechanism was located at one end of the basin.
- ✧ The excavator concluded that, by regulating the flow of water from the spillway, the basin was a port to which ships could be brought from the surrounding estuary by an artificial channel that would have been held free of silt. This view has not been widely accepted; another view is that it has provided a drinking or agricultural source of fresh water. Outside the wall's perimeter, west of the site, a cemetery was discovered.

(3) Kalibangan

- ✧ Kalibangan, which stands on the left bank of the dry bed of the Saraswati River in northern Rajasthan, is third among the excavated Harappan sites. As mentioned above, underneath the later remains lies an early Harappan settlement, and the main Harappan township has a layout remarkably similar to that of Mohenjo-daro and Harappa.
- ✧ Excavation has revealed as many as nine building phases in the lower town. A parallelogram on a plan of around 430 feet (130 metres) on the east-west axis and 850 feet (260 metres) on the north-south axis is the citadel mound. The entire site was significantly reduced by brick robbers, but the foundation courses of a precisely laid rhomboid central section with oblong bastions at each corner and smaller bastions on the north and south walls were exposed by careful excavation.
- ✧ From the south, the principal access was through a flight of stairs. Access from the north was reached by a stairway through a narrow poster, beyond which was another rhomboid portion, with an inset gateway near the riverbank in the northwest corner. They also encountered remnants of a brick wall around the lower town. A set of high brick platforms separated by narrow passages formed the central sector of the citadel.
- ✧ The upper parts of these platforms have been badly damaged, and their purpose is mysterious, but they do not seem to be the base of a granary. Standard domestic housing was present in the northern market. A short distance west of the town, a cemetery was discovered. It can be anticipated that it will significantly contribute to knowledge of the Indus civilization when the excavation of this site is written.

(4) Mohenjo-daro

- ✧ Near the right bank of the Indus in the Larkana district of Sind province lie the mounds of Mohenjo-daro. The excavations showed that deposits of alluvial silt to a depth of about 30 feet (10 metres) due to annual flooding filled the lowest level of former occupation. The lowest levels are still below the water table of the present day and are therefore largely unexcavated.
- ✧ As mentioned above, a citadel to the west and a lower town and a grid of streets to the east are the main features of Mohenjo-daro 's architecture. Enough was said of the lower city's general characteristics to make it unnecessary to say anything of the significant areas excavated in that section. However, the citadel needs more consideration.

- The English archaeologist Sir John Hubert Marshall discovered a large platform of mud brick and clay about 20 feet (6 metres) deep in the citadel, above which were six key levels of construction. The remains of the early era lie below this platform. It is possible, but not clear at all, that the platform was built to defend against floods. At the beginning of the intermediate period, both it and the great brick defensive wall around the perimeter were constructed.
- The bath floor consists of two sawed brick skins set in gypsum mortar at the edge, with a sheet of bitumen sealer sandwiched between the skins. A broad well in an adjacent room clearly supplied water, and an outlet in one corner of the bath led to a high corbeled drain disgorging on the west side of the mound. Flights of steps at either end, initially finished with timbered treads set in bitumen, entered the water.
- It is only possible to guess the meaning of this remarkable structure, but it has traditionally been thought to be associated with some kind of ritual bathing. There were groups of rooms to the north and east of the bath, which were obviously also built for some special purpose, possibly connected to the community of administrators or priests who controlled not only the city but also the great state it dominated.
- A complex of brick platforms about 5 feet (1.5 metres) high to the west of the bath, separated from each other by narrow passages, formed a podium of about 150 by 75 feet (45 by 22 metres), which Wheeler described as the foundation of a wide granary similar to that known at Harappa. Brick loading bays were situated below the granary.
- An oblong "assembly hall" was found in the southern part of the mound, having four rows of fine brick plinths, probably to take up wooden columns. A stone sculpture of a seated male figure was found in a room adjacent to this hall, and a number of large worked-stone circles, probably of some architectural significance, were nearby.
- This region seems likely to have been invested with some special meaning and may well have been a temple or related to some religious faith.

Definition of Rural Urban Villages

- A rural area is a geographic area that is located outside cities and towns, while rural areas are also known as 'village' in India. In these villages, agriculture is the chief source of livelihood along with fishing, cottage industries,pottery, etc.
- According to the Erstwhile Planning Commission of India,a settlement with a maximum population of 15,000 is considered as “Village”. Much of India’s rural population lives in nucleated villages, which most commonly have a settlement form described as shapeless agglomerate.
- Number of rural units or villages in India are approx 6, 38,588. According to 2011census, rural area has population of 68.84%,whereas urban area has population of31.16% only. In the Indian context, villages are the heart of the nation.
- Hence, for the overall development of the country the focused must be given to the grass root level, and that means the focus areas should be the Indian village.
- There is a large scale migration of the people from rural areas to urban areas, which has its own risk parameters on the urban areas,and still there are many villages in India with heavy population.
- So the main aim to smarten the villages by offering basic facilities, education,employment generation activities,technology etc.

- ✧ The concept of smartness is popular in respect and honour of human development regardless of rural or urban area, literate or illiterate in all the countries and India is not omission to it.Like many developing countries, India too is a rural dominated country.
- ✧ The idea of "Smart Village" will also attention to multiple challenges such as unplanned urbanization, under-development of villages,migration for economic pursuance, improved standard of living etc.
- ✧ As per statistics there are 676 districts in 29 states and 7Union territories in India with a total number of 6, 38,000villages. All areas which are not categorized as urban area are considered as rural area. Numbers of villages in India are approximately 6,38,588. According to 2011 census, rural area has population of 68.84%, whereas urban area has population of 31.16% only. A rural area is a geographic area that is located outside cities and towns are also known as 'village' in India.
- ✧ In Smart Villages access to sustainable energy services acts as a catalyst for development – enabling the provision of good education and health care, access to clean water, sanitation and nutrition, the growth of productive enterprises to boost incomes,and enhanced security, gender equality and democratic engagement.
- ✧ To accomplish the 'Smart Village/Ward' status, the community, individually and collectively, will be empowered to take smart decisions using smart technologies and with the support of smart manpower and by managing to be self-sufficient.

2.4 Scenario: Rural / Urban village of India population Growth

Population (in Crore)

	2001	2011	Difference
India	102.9	121.0	18.1
Rural	74.3	83.3	9.0
Urban	28.6	37.7	9.1

Source:https://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_urban_2011.pdf.

- ➢ For the first time since Independence, the absolute increase in population is more in urban areas that in rural areas.
- ➢ Rural–Urban distribution: 68.84% & 31.16%
- ➢ Level of urbanization increased from 27.81% in 2001 Census to31.16% in 2011 Census
- ➢ The proportion of rural population declined from 72.19% to 68.84%.

Growth rate of population (in %)

	1991-2001	2001-2011	Difference
India	21.5	17.6	-3.9
Rural	18.1	12.2	-5.9
Urban	31.5	31.8	+0.3

Source:https://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_urban_2011.pdf

- The slowing down of the overall growth rate of population is due to the sharp decline in the growth rate in rural areas, while the growth rate in urban areas remains almost the same.

2.5 Scenario: Rural / Urban village of Gujarat as per Census 2011 and latest

- As per Census 2011, Gujarat has a population of 6.04 Crores, an increase from 5.07 Crore in 2001. The total population of Gujarat as per 2011 Census is 60,439,692, out of which males and females are 31,491,260 and 28,948,432 respectively. As per Census 2001, total population was 50,671,017 in which males were 26,385,577 while females were 24,285,440.
- The total population growth in this decade is 19.28%, while in the previous decade it was 22.48%. The population of Gujarat consists 4.99% of India's in 2011. In 2001, it was 4.93%.

Population of Gujarat

Description	2011	2001
Approximate Population	6.04 crore	5.07 crore
Actual Population	60,439,692	50,671,017
Male	31,491,260	26,385,577
Female	28,948,432	24,285,440
Population Growth	19.28%	22.48%
Percentage of Total Population	4.99% 6.04 crore	4.93% 5.07 crore

2.6 Rural Development Issues - Concerns - Measures Issues-Concerns

- Rural development is the backbone for any country's economic development and its helps the economy to grow and sustain .Rural development is the axis of the economy involving the labor ethics impacting the potential of business in big way. It is a popular belief that economic development takes place because of rapid industrialization. But the industrial development itself cannot take place without agriculture.
- In particular, by commodity contribution and consumer contribution, agriculture contributes to economic growth. Long-term sustainable growth plans for the agriculture sector.Agriculture is unpredictable and fluctuating, as it depends on the weather conditions and the monsoon.
- This sector of economic development is important for feeding the nation and the world, although people in the urban sector have become modernised, relying more on non-vegetarian food for their survival needs. In the rural sector, people are faced with the problems of poverty and exploitation that affect the overall productivity of Indian agriculture.
- Rural Indians face the tough conditions of drought and famine that affect people's lives because they are uneducated and rely on agriculture. The challenges of undulation and insecurity are facing rural communities. People are unemployed because they lack the skills to take advantage of life opportunities. When the rural sector is educated and advanced, it is easier to do business and there is a high level of growth.
- There is a kind of relationship between economic development and rural society, which is typically intertwined since the problems of the external world influence the principles of

economic development. The government must step in the direction and rhythm of society, since its survival depends on the long-term benefits of economic, social and environmental issues linked to rural fundamentals.

- The economic climate and the non-economic environment are linked to the basic issues of the rural economy. The national and foreign conditions influence the economies. The non-economic climate is the socio-cultural environment, the physical and political environment of natural demographics. The economic elements of the rural environment have a direct effect on the Indian market for industry.
- In order to increase the value of society, the organisation must consider the needs of the rural economy and adjust according to the rural markets. The rural economic climate, since it includes rural values , ethics and culture, is a dynamic operation.
- The following elements include the adaptation of government principles to the rural environment:

a) Rural environment as a complex and dynamic strategy.
b) It involves rural people's satisfaction and loyalty.
c) Changing attitude of the rural society.
d) Focusing on continuous people service.
e) Maintain a constant updating technological changes.

Measures

Economic growth is aimed at creating a high degree of business opportunities in the rural area. All the dimensions of human growth to generate jobs, better opportunities and high connectivity potentials can be touched by the progress. Rural people must be linked to their land-related resources by agricultural production.

i. Profits & Growth

- In terms of creating options for small-scale industrial production, the government has to devise policies to clearly sell the benefits and growth to the people.

ii. Financial resources

- For the organisation's better development , government policy needs to produce money and investment. In order to create a better future, capital is the fluid that pumps the blood of growth into society.

iii. Availability of revenues and resources

- The economic development can be through the relation in terms of individual, material and money of the business needs and services to the processes.

iv. The role of government in upgrading the rural environment

- The incorporation of cross-functional areas includes rural economic growth and this offers crucial policies for reform in order to bring sustainable development to the rural sector. In order to increase overall efficiency by incorporating the different variables of the rural economic climate, the practise of using better and updated policies helps to improve performance.
- As they connect people and business, the overall economic system is influenced by the forces of action in the markets. The government must understand the needs of the people and, through project-based development, provide them with employment opportunities. The government needs to invest in education in order to improve people's empowerment and skills.

v. Role of NGOs and SHGs

- Since ancient times, voluntary social services have been an important part of our society's socio-cultural and religious ethos. The goal was to increase human capital through the promotion of non-economic factors such as education , health and nutrition, which in turn would accelerate the economic development process. The role of NGOs is cooperative as well as complementary to the state.
- As living conditions have deteriorated, the presence of NGOs assumes significance in the context of rural settings. All socio-economic issues can not be addressed by the State-NGO relationship alone; it must therefore be coordinated with all agents of social change, i.e. the state, local self-government, the private sector, academia and civil society groups.

NGOs

- By fostering contact and cooperation with state departments and also serving as catalysts to efficiently enforce different departmental schemes, NGOs may play a significant role in improving local self-government.
- The role of voluntary agencies in rural development can be to complement government efforts to uplift the poor and needy by disseminating knowledge about government-torural development schemes and programmes; make people aware of the effects of female feticides and sex ratio imbalances; mobilise community financial resources; help in upgradation of skills of rural youths for self-employment opportunities; facilitate the formation of self-help groups and micro-finance; ensure protection of women and children's rights and abolish ills of child labour; and, make available technologies in a simpler form to the rural poor.

SHGs

- It can be called a Self Help Group (SHG) if individuals, on the initiative, actina conglomeration, fulfil their individual and common needs with the primary emphasis on self-reliance. The advantages of self-help groups are based on teamwork instead of competition.
- They provide advantages for different financial services, collaborative learning, democratic and participatory culture, economies of scale, cost-effective alternatives, and a strong foundation and forum for dialogue and collaboration. SHGs, especially for the rural poor, arise from a common binding power, common need, interest and concern. It is this common binding force that makes it more powerful for SHGs to work.
- If a symbiosis between them and Panchayati Raj Institutions (PRIs) could be worked out, the productivity of SHGs will be dramatically improved. The secret to the integration of SHGs with directly elected and empowered panchayats. A structure that will allow the SHGs and the PRIs to work in collaboration and develop a framework to support each other's work is urgently required.

2.7 Various infrastructure guidelines with the Norms for Villages for the provisions of different infrastructure facilities

- ✧ Norms for Villages for the provisions of different infrastructure facilities are covered in the Smart village Techno-Economic Survey.

2.8 Other Projects / Schemes of Gujarat / Indian Government

- ➢ Villages will be backed up by the provision of basic amenities that are often only available in urban areas and a social security system.This new drive will provide more opportunities to report on exciting developments, undertake fruitful collaboration with other partners and disseminate impactful findings that can benefit off-grid communities far beyond India.

i. Major Programs in Agriculture
- ✧ National Agricultural Development Program
- ✧ Accelerated Irrigation Benefit Program
- ✧ Fertilizer Subsidy
- ✧ Bank loans, Free Electricity

ii. Major Programs to Improve Employment
- ✧ Public Distribution System
- ✧ Mahatma Gandhi National Rural Employment

iii. Guarantee Scheme
- ✧ National Food Security Bill

iv. Major Programs & Partnerships to Improve Nutrition Security
- ✧ Major Programs & Partnerships to Improve Nutrition Security
- ✧ Mid Day Meal Scheme
- ✧ Integrated Child Development Scheme (ICDS)
- ✧ Annapurna Scheme (Ministry of Rural Development) forsenior citizens
- ✧ The Nutritional Program for Adolescent Girls
- ✧ Emergency feeding program (in eight districts in Orissa)

Chapter 3
Smart (Cities/Village) Concept Idea and its Visit (Civil Concept)

3.1 Introduction: Concepts, Definitions and Practices

- The main inquiry is the thing that's implied by a 'smart city'. the arrangement is, there's no generally acknowledged meaning of a reasonable city. It implies different things to various people.
- The conceptualization of Smart City, hence, shifts from city to city and nation to nation, relying on the degree of advancement, ability to change and change, assets and yearnings of the town occupants. an astute city would have a special meaning in India than, state, Europe.
- Indeed, even in India, there's no one method of characterizing a reasonable city. Some definitional limits are needed to control urban communities inside the Mission inside the creative mind of any city tenant in India, the picture of a reasonable city contains a posting of framework and administrations that portrays their degree of desire.
- To deliver for the yearnings and wants of the residents, metropolitan organizers preferably target building up the entire metropolitan eco-framework, which is spoken to by the four mainstays of complete improvement institutional, physical, social and monetary foundation.
- This might be an extended term objective and urban communities can pursue growing such thorough framework gradually, adding on layers of 'cleverness'. In the methodology of the Smart Cities Mission, the objective is to push urban communities that give center foundation and gives a decent personal satisfaction to its residents, a spotless and maintainable climate and utilization of 'Shrewd' Solutions.
- The primary objective is on feasible and comprehensive turn of events and furthermore the thought is to show up at reduced regions, make a replicable model which can act kind of a beacon other desiring urban areas.
- The public authority's Smart Cities Mission is an intense new activity. It is expected to set models that can be rehashed both inside and outside the Smart City, catalyzing the advancement in various areas and parts of the universe of comparative Smart Cities.

The core infrastructure elements in a smart city would include:

1) adequate water supply,
2) assured electricity supply,
3) sanitation, including solid waste management,
4) efficient urban mobility and public transport,
5) affordable housing, especially for the poor,
6) robust IT connectivity and digitalization,
7) good governance, especially e-Governance and citizen participation,
8) sustainable environment,
9) safety and security of citizens, particularly women, children and the elderly,
10) health and education.

Source:http://smartcities.gov.in/content/innerpage/strategy.php

3.2 Vision-Goals, Standards and Performance Measurement Indicators

- The Smart Cities phrase is not new. It may have its roots in the late 1990's Smart Growth movement, which promoted new urban planning policies. As an example of Smart Growth, Portland (Oregon, USA) is widely known.

Vision-Goals

- Since 2005, a spread of technology firms have adopted the phrase for the implementation of complex information systems to include the operation of urban infrastructure and utilities like buildings, transportation and water, and public safety. It has since developed in the planning, growth, and operation of cities to mean almost any sort of technology-based innovation.
- Today's cities face major challenges, such as a rising population, a shortage of physical and social infrastructure, environmental and regulatory standards, diminishing tax bases and budgets, and higher costs.
- They need to learn how to recognize innovative and intelligent ways of handling urban life's complexities and issues ranging from pollution, overcrowding and urban sprawl to insufficient housing, high unemployment, resource management, conservation of the environment, and increasing crime rates.
- Housing, especially for low-income populations, infrastructure provision, and the delivery of a variety of services, including water, sanitation, education and health, are long-standing urban challenges. Growth achieved by cities is linked to their ability to holistically address urbanization-related issues and related social, environmental and economic issues, while making the most of future opportunities.
- It is possible to view the smart city concept as a framework for implementing this vision of advanced and modern urbanization. The vision of "Smart Cities" is that the urban centre of the longer term, made safe, safe, environmentally green and efficient because all structures are designed, built and maintained using advanced integrated materials, sensors, electronics and networks that are interconnected with computerized systems consisting of databases, tracking and de-connected networks.

Standards and Performance Measurement Indicators

Source:https://hub.beesmart.city/en/smart-city-indicators

- The drivers of national economic growth are cities. In urban areas, a large portion of the world's population lives, with the amount predicted to increase by up to 70% in the near future. However, urbanization may have detrimental effects on the environment and on its residents in the nascent period of a city's growth. These impacts are being felt all the more in many parts of the world, considering the rapid levels of urbanization happening today.
- As we move forward toward achieving the Sustainable Development Goals (SDGs) of the United Nations, cities are addressing these urban problems by using information and communication technology (ICTs) and emerging technologies.
- Using ICTs and digital technologies offers urban stakeholders:

1. efficiency in urban operations and services,
2. the means to improve quality of life (QoL); and
3. ways to cultivate environmental sustainability.

- However, sustainability and smartness are long-term proposals that involve thoughtful preparation and tracking and monitoring of progress. To achieve this an evidence-based approach is required that relies on appropriate high-quality data and the use of best practises.
- By definition, indicators are quantitative, qualitative or descriptive instruments that make it possible to simplify information about a complex phenomenon, such as a dynamic urban environment, into a form that is reasonably easy to use and understand. Quantification, simplification and connectivity are the three primary functions of the indicators. They reveal patterns and changes in the assessed phenomenon when regularly evaluated and tracked.
- To sum up for a number of reasons, metrics are implemented in cities. Although it is difficult for city managers to choose the most appropriate indicator system since it requires professional expertise that is generally lacking in communities, the effects of misuse may be important. Research questions 2 and 3 therefore aim to expose discrepancies in the applicability of established international city indicator criteria in order to be able to provide potential users with currently missing guidance.
- To test either urban sustainability or smartness, there are a wide range of indicator frameworks and methods. However only recently have formal systems of city metrics been adopted, and relevant science literature is surprisingly scarce. Three organizations, i.e. ISO and ITU worldwide and the alliance of the European standardization organizations CEN, CENELEC and ETSI in Europe, are carrying out similar international standardization work.
- There are currently six international city indicator criteria related to the assessment and reporting of Smart Sustainable Cities.

3.3 Technological Options

- Smart cities are cities where everything is interconnected and this relies heavily on technology. So let's look at six innovations that are key to smart cities. Technological literacy is a key to turning a city into a well-connected, safe
- and resilient smart city where knowledge is not only open but also discoverable. It is not a new phenomenon that smart cities are all about providing their people with intelligent services that can save their time and ease their lives.
- It is also about linking them to the government, where they can give the government their input as to how they want their city to be. And without technology, this goal can't be transformed into reality. Using technology, when combined with activities, authorities are able to collect city data and this intelligence, makes the cities smarter and stronger.
- Let’s have a look at such technologies without which smartness of a city can never be enhanced.

Internet of Things

- The Internet of Things is like the city's veins spread across and linking each dot. Every system that is part of a smart city needs to be linked to each other so that they can speak to each other and take decisions for themselves that allow the mega city population to manage resources in return.

- This is where the IoT comes in, offering a body of interacting devices with the ideal model that offers intelligent solutions to daily problems. In smart cities, all smart solutions are based on the Internet of things in which they are linked and intelligent enough to determine their actions.

Source:https://www.geospatialworld.net/blogs/six-technologies-crucial-for-smart-cities/

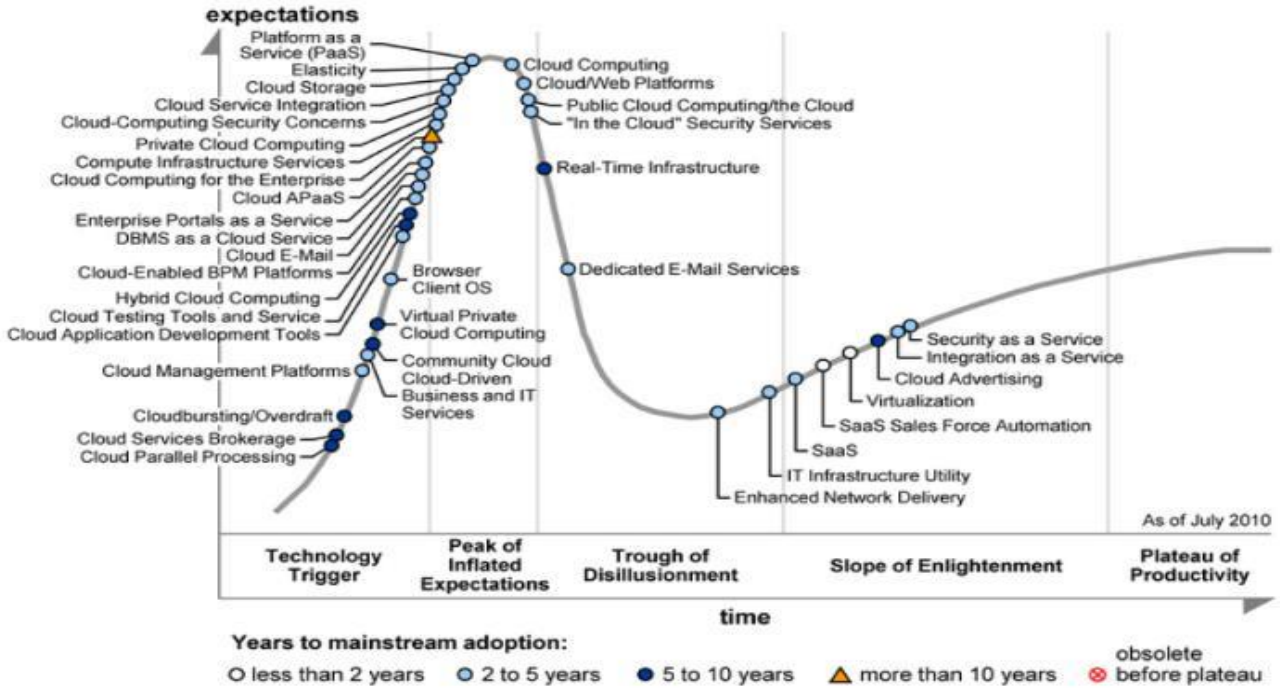
Geo spatial Technology

- Whatever is made in an exceedingly smart city has got to be correct and then to construct right a right plan is that the need which is sustainable and this needs accurate, succinct and detail data and here comes the role of Geospatial technologies which offer the underlying foundation and ultimately the material upon which solution are often built.
- It provides position which allows pinpointing exactly on the need so that better solution can be applied to it.
- In order to promote software-based solutions around intelligent infrastructure, geo spatial technology provides the required framework for data collection and transformation of observation in these collections.

Blockchain

- The Blockchain application is new to the concept of smart cities. The technology of Blockchain secures data flow. By integrating into smart cities, all city services could be better connected, while increasing protection and transparency. Blockchain is expected to impact cities in several ways through smart contracts, which assist with billing, processing transactions and maintaining facilities.
- Smart contracts are self-executing contracts directly written into lines of code with the terms of the transaction between buyer and seller. Without the need for a mediating third party, they

allow trustworthy transactions and agreements to be carried out among disparate parties, making the process simpler, cheaper and quicker.



Source:https://www.urenio.org/wp-content/uploads/2008/11/2011-eChallenges_ref_196-Roadmap-for-Smart-Cities-Publised.pdf

Artificial Intelligence

- The Smart City is a digital revolution that generates a massive amount of knowledge. These data are of no use until and until they are processed, which in return, produces data. This enormous amount of data generation brings the position of artificial intelligence that can make sense of the knowledge. AI facilitates machine-to-machine interaction through the processing and sensing of data.
- Let's take an example to understand the fascinating aspect of Artificial Intelligence in the sense of smart cities. In a system where energy spikes appear to occur, AI can learn where they normally occur and under what conditions, and this data can be used for improved power grid management. Likewise, in intelligent traffic management and health services, Artificial Intelligence also plays a part.

Sensors

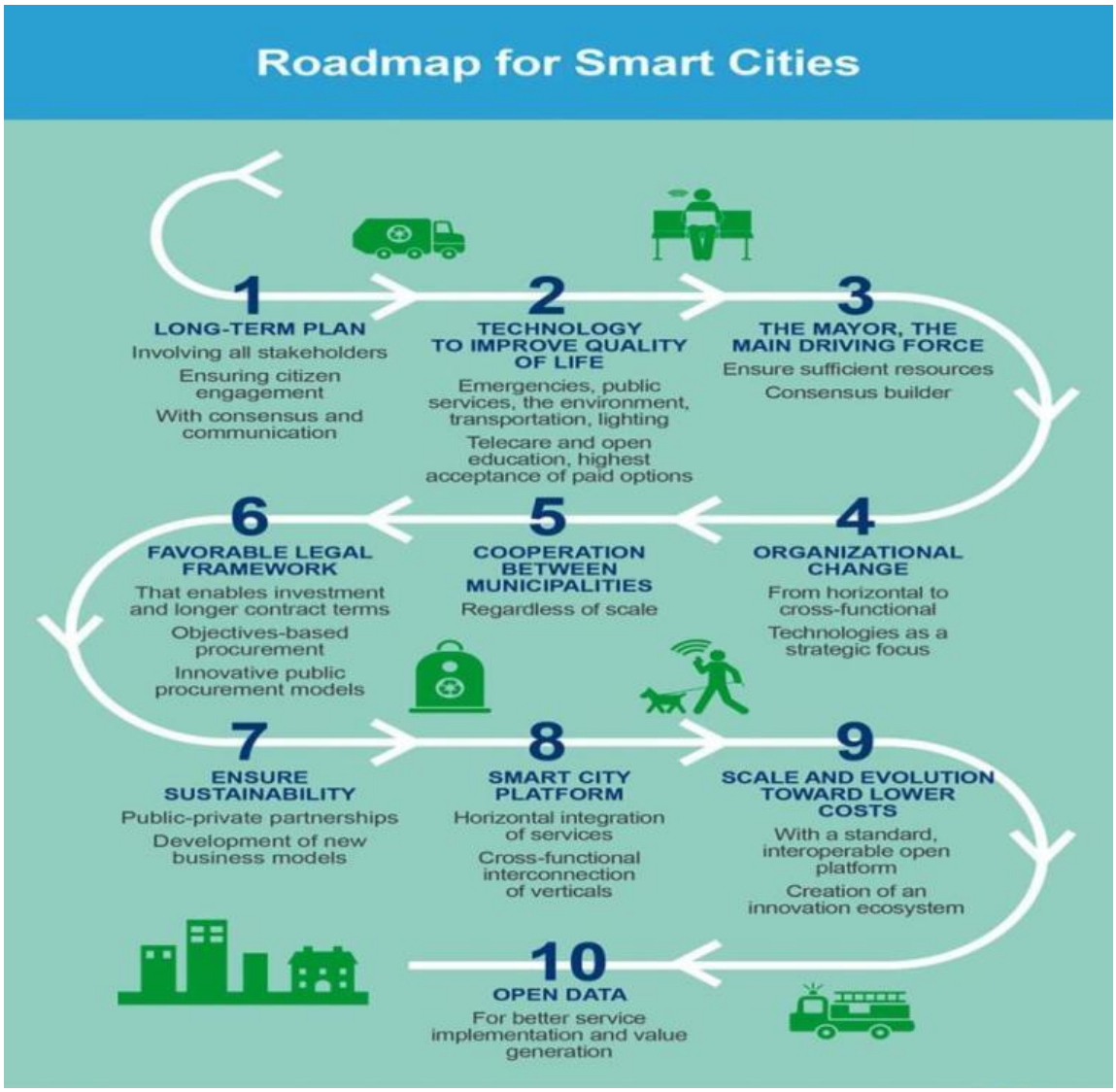
- Hidden yet pervasive elements of the urban environment are sensors. Sensors are a vital element of any smart control device. A process is improved on the basis of its environment and is usually equipped with a set of sensors which it collects the necessary data in order for a control system to be aware of its environment. To define its setting, it then uses the necessary variables and adjusts its operations accordingly.
- The availability of a multitude of different sensors and technology that is continually changing makes applications that have been unworkable in the past due to high costs and limited availability. Sensors are like converters that transform physical parameters to an electronic signal, which can be interpreted or fed into an autonomous device by humans.
- Among other things, these signals for traditional sensors include light, pressure, temperature, humidity, humidity and a number of other parameters.

Information and Communication Technology

- For a city to be wise, developing a two-way communication channel is very necessary. And this is where the role information and communication technologies comes in. ICT creates a connection between citizens and the government, where people can engage with the government and the government can create a city that its citizens choose in exchange. ICT enables the government to determine the state's demand trend and thereby create a pool of resources to manage the same online.
- In a culture, the electronic means of communication helps to establish a collective wisdom that can be used with the aid of analytics and deep learning to maximise resources.

3.4 Road Map and Safe Guards

Road map



Source:https://www.ie.edu/insights/infographics/a-road-map-for-smart-cities/

- There are many problems and dangers facing cities and counties, such as unemployment, poverty, traffic congestion, high crime rates, cyber threats, and slow bureaucratic processes for business transaction processing. The three foundations of smart-city projects that can be used to alleviate such a problem are individuals, systems and technology.

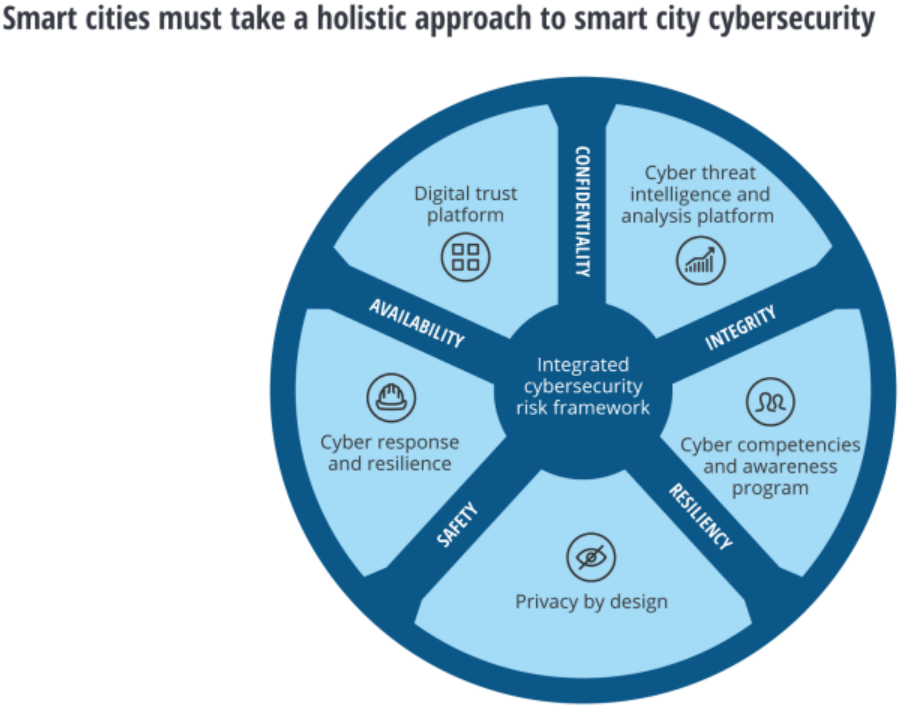
- In order to address the needs of their local populations, cities and counties should research their communities, develop policies and incorporate technical solutions. In order to build a prosperous future for their residents, local, state, and federal governments must be creative and develop a path map to resolve and provide solutions to reduce risks and challenges.
- To address many of these challenges, digital transformation is one choice that governments may rely on other options can include embracing e-government, engaging people and building resilient cities. Government officials must build a coalition to cooperate, optimize, and incorporate innovations by supporting a citywide, smart, safe, and sustainable transition to create real economic opportunities.
- Cities' infrastructure has grown through several vintages of technology that have formed, often independently, in their own course. The lack of links between its component networks, which rely on each other, often makes urban utilities and services function in a sub-optimal manner, restricting the development of new value-added services, growing transport costs, harming existing logistics chains and economic models.
- Therefore, urban planners and decision-makers are increasing their focus on lowering carbon emissions and managing resources as a way of transforming their cities into a more productive and sustainable environment. In addition to infrastructure issues, about 180,000 people transfer to towns every day, producing more than 60 million new urban dwellers every year.
- Cities must prepare for population growth and in urban development, adopt a more sustainable, effective and liveable model. New digital technologies present an opportunity to build a balance between the social, environmental and economic opportunities that smart city planning, design and construction can offer.
- A vast amount of data is already being created by the current proliferation of innovations, open data projects, and user generated content. A new city should have an atmosphere in which knowledge spreads quickly and easily, making it a forum for the distribution and active use of innovation in order to change the way it functions and the lives of people.
- It follows that the physical infrastructure of the networks running cities must become as closely integrated as they can be, able to draw on a large supply of cross-domain city data effectively.
- As end-users seek to realise the advantages of cyber-physical integration through enhanced control and resource management, the trend for device integration and data collection in the city environment is growing. Cities have increased their dependency on automated Machine-to-Machine (M2M) interactions to minimise costs, interconnect operations and integrate systems.

Safeguards

- Smart cities are not a panacea for all ills, and they have challenges of their own.
- Some of them as already stated, focus on practical issues such as financing, capability, access to relevant technology, data interoperability, technological standardization, etc. Others are political: a recent NESTA study, surveying various cities, points that many smart cities have not fulfilled their pledge, offering high costs and low returns, buy-in by national and local politicians, energy firms, and residents themselves.
- In particular, as is the case in law two other issues are German: security, by which I mean the vulnerability of data to accidental or deliberate breaches as a result of technological or organisational failures; and privacy, by which I include the sense of the right of individuals to monitor collection and processing, including further re-use, of European data protection(DP).

Security and vulnerabilities

- Cities and their infrastructure are now the most complex structures that men have ever built, interweaving them with similarly complex solutions for smart cities, relying on wireless sensor networks and automated communications systems, rendering them highly vulnerable to power failures, software errors and cyber attacks. Even a small bug can have a significant effect on infrastructure in urban areas.
- The instability and weakness of smart city systems is a widely understood phenomenon that echoes the well-known lack of protection and trustworthiness of the IoT in general and essentially derives from it.



Source:https://www2.deloitte.com/us/en/insights/focus/smart-city/making-smart-cities-cyber-secure.html

- The FTC mentions security risks as its biggest concern in its influential 2015 IoT study, both in terms of the vulnerability of IoT devices themselves, leading to their compromise or failure, and their possible use to propagate vulnerabilities across networks and other systems (the 'zombie' issue). For example, your smart, Internet-connected fridge might theoretically be hacked to send spam.

Solutions

- As part of its general privacy problem collection, the application of DP law, including PECD, to IoT protection is addressed in detail below (section V(i)).
- A basic approach to the security problem that has already been partially introduced is to require notification of security breaches. This currently applies only to telecommunications providers pursuant to Article4(2) of the Privacy and Electronic Communications Directive (PECD), but is likely to be expanded by the GDPR to all data controllers when and when it passes and is transposed.
- Data breaches of a certain degree of seriousness would have to be reported to privacy authorities, but if they have implemented appropriate security measures, data controllers will have a shield.

- The lack of global harmonization of legal security requirements in the field of global procurement is an obvious issue.
- The Budapest Cyber Crime Convention offers a bare minimum of international security regulation harmonization, but is largely aimed at facilitating global criminal law enforcement, not at fostering higher business security standards.
- Civil liability is not mandated (though art 13 allows for such to exist). It would be interesting, however to examine whether the numerous regulations to protect critical infrastructure from cyber attacks and cyber insecurity (see for example, the 2008 Directive on European Critical Infrastructures 2008/114/EC and the proposed Directive 2013/0027) could be applied to smart cities, beyond the reach of this article.
- Since 2013 or earlier, 'soft law' rather than hard law regulation of IoT protection has been on the rise in the EU.
- Notably, Spiekerman and her team developed a specialised but non-mandatory PIA protocol for RFID chip installations (essentially an early subset of the IoT) through collaboration with related industries and policymakers.
- In the future, in an appropriate global cybersecurity insurance sector, a final primary extralegal will be found. This is something that has stalled to date, and is still evolving, but could be kick started by a worldwide move to disclose mandatory security breaches.

3.5 Issues & Challenges

- Smart city projects around the world combine IT with internet-connected devices, from waste management to smart grids, which improve the management of municipalities. Smart lighting, intelligent transport networks and smart service metering for power and water are the most prevalent smart city initiatives. These technologies and integration are focused on data collection and interpretation in a sensor-centred manner.

Source:https://www.allerin.com/blog/4-challenges-faced-by-smart-cities

- However, despite the countless advantages of smart city programmes, due to specific city criteria and conflicting interpretations of implementation principles, many obstacles remain when it comes to deployment. It is possible to classify these variations into the following dimensions:

1. Coverage and availability
2. issues with technology.
3. Protection on digital.
4. Legislation and tactics.
5. Lack of trust or hesitation shown by people (lack of clarity around benefits). Funding and models for company.
6. Inter operability.
7. Compatibility.

8. Current infrastructure for services relating to electricity, water and transport.

Source:https://maximumgovernance.com/perspectives/five-challenges-to-overcome-for-smart-cities-to-happen/

- As urban populations rise and urban sprawl proliferates, problems with economic and social development are also magnified. These problems not only affect the quality of life of a community, but also bring added stress on conventional infrastructure, raising the need for austerity in terms of energy efficiency and conservation of resources.
- Smart city technology can provide a wide infrastructure buffer for city governments that allows them to survive and solve these problems in the future. Innovation in technology is the enabler that increases each smart city project's possibilities and efficiencies. Each modern technology brings an enormous pool of new opportunities with it. Because each city has its own culture and policies for infrastructure and financing, implementation of technology can differ in different ways.
- That means, however, that it is not always possible to rely on other established smart city initiatives to serve as a good blueprint. One constant is data traffic through all programmes. Although replicating projects is a challenge, compared to full-scale implementations, data collection and traffic variance between multiple city pilot projects varies greatly.
- The network exhibited major problems in a recent RootMetrics by IHS Markit test of Internet of Things (IoT) technologies in Las Vegas, also at a full-scale level. In fact, some IoT networks have not been able to provide adequate coverage to support even the simplest smart city apps. Robust communication technology is a prerequisite for success due to the ever-increasing number of sensors and their data.
- Also it is always constrained by the budget of a region. According to RootMetrics, the secret to launching any successful smart city programme is coverage and reliability across the entire city. When they begin to introduce smart city programmes, digital security is another challenge cities face. As personal data is uploaded to the cloud, it is also shared with digital devices, which share the data between multiple users in turn.
- Therefore, safeguarding this knowledge from unauthorised usage is important. The introduction of effective data security measures protects individuals, governments, research partners, universities and digital infrastructure from private and proprietary information.

3.6 Smart Infrastructure - Intelligent Traffic Management

- The ever-increasing flow of traffic contributes to traffic congestion and jams, leading to a rise in transport costs and impacting people's everyday lives. A smart traffic management system helps people to be more aware and use transport networks more efficiently, in a more organised, efficient and smarter way.
- An Intelligent Traffic Management System (ITMS) is described as a complicated application that aims to supply innovative services associated with various modes of transport and traffic management without embodying intelligence intrinsically. It helps people to be better educated and use transport networks more safely, in a very more organised, effective and smarter way.
- In the field of road transport, road networks, cars, users and traffic control, communication and information technology are used in ITMS. In order to boost the performance of road transport and traffic management, ITMS offers a helpful interface to other modes of transport.
- In developing countries like ours, due to rapid urbanisation and industrialization, migration from rural to urbanised habitats induces high population density without substantial infrastructural growth in the suburbs. Mega towns are most affected, such as New Delhi and Mumbai. The use of multimodal transport systems, including bicycles, bikes, auto rickshaws, automobiles, buses, subways, trains and pedestrians, is leading to a rapid rise in road traffic.
- This ever-increasing flow of traffic contributes to congestion and jams in traffic, leading to a rise in transport costs and impacting people's everyday lives. It causes many issues, such as waste of fuel and time, increased contamination of the air, injuries and road rage.
- This sudden rise in road traffic has been caused by a variety of other factors, including an increase in the population (leading to an increase in the number of road vehicles), inadequate road power, traffic control lights (not according to traffic density), unavailability of full and timely traffic density information on different roads, inefficient management of transport and unrestrained traffic.
- In view of this situation, the very existence of traffic makes it difficult to measure the density of road traffic on a real-time basis in order to make better traffic-related decisions and to effectively manage traffic.

Source:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- As a consequence, towns are unable to deal with these concerns. While the focus is on the construction of highways, bridges and underpasses and the development of alternative modes of

mass public transit systems, this is not adequate to tackle congestion and traffic management, which is becoming more difficult every day. There is therefore an urgent need to introduce a new method for solving these problems.

- By deploying ITMS, the answer lies in exploiting emerging technology and smart solutions. In order to provide real-time traffic control, this device will be able to monitor traffic flow and speed, which is more complex and accommodative in terms of the changing nature of traffic density.

Technologies used for ITMS

- To create ITMS, a number of technologies listed below are incorporated. Depending on the use, location and funding available, the technologies need to be selected. In addition to the availability of ultra-modern and state-of-the-art microchips, Radio Frequency Identification (RFID) and inexpensive intelligent beacon-sensing technologies, developments in the field of telecommunications and information technology are helping to improve the technological capabilities of these devices.

a) Communication technologies

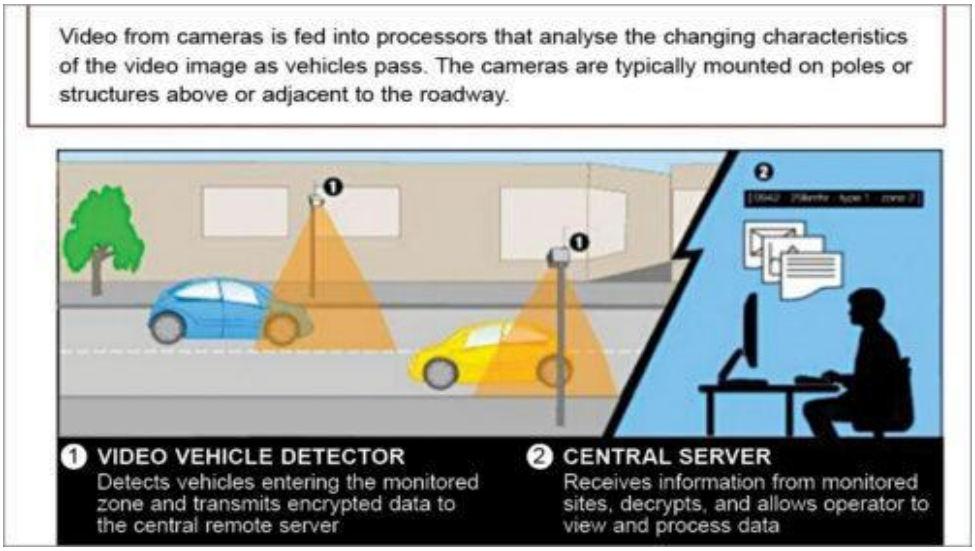
- Among the wireless communication technologies used for ITMS, the most common for short-range communication are radio communication using UHF and VHF. Longer-range communications use networks of infrastructure like Worldwide Microwave Connectivity Interoperability (WiMAX), Mobile Communications Global System (GSM) or 3G.

b) Technologies for automotive electronic systems

- These systems are used for engine control, ignition, radio, computer-on-board (car computers), telematics, in-car entertainment, navigation and related components of other control systems in automobiles. Advanced driver assistance systems such as lane-assist, speed-assist, blind spot detection, park-assist, adaptive cruise control, pre collision assist and so on may also include automotive electronic systems.
- Traffic Measurement Technologies. To obtain raw data for traffic measurement, numerous technologies are available. Data from various methods can be combined in smart ways to accurately assess the condition of the traffic. The benefits of various individual approaches are combined by a data-fusion-based approach using road-side acoustics, image and sensor data obtained.
- Cameras are usually used but new, faster and more accurate methods are now available for traffic measurement using sensors. These are less costly than sensors, are easier to set up, need less maintenance and operate under all weather conditions, including heavy rain, offering more coverage (potentially including all locations and streets).

c) Video vehicle-detection system

- The most common method of vehicle detection is traffic-flow measurement and automatic incident detection using video cameras. Cameras are placed above or adjacent to roadways on poles or structures. This is a non-intrusive traffic detection system, as it does not require inserting any components directly into the road surface or roadbed.
- Cameras feed video footage to processors that analyse the evolving features of the video images as vehicles drive by. A single processor for video-detection can simultaneously detect traffic from one to eight cameras. To familiarise the processor with the baseline background image by feeding established measurements such as distance between lane lines or camera height above the roadway as an input, the device needs some initial configuration.



Source:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- Lane-by-lane vehicle speeds, counts and lane-occupancy readings are included in the output from a video vehicle-detection system. Additional results such as gaps, headway, stopped-vehicle detection and wrong-way vehicle alarms may also be provided by certain devices.

d) Vehicle re-identification

Source:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- Sets of detectors installed along the road are required for this process. In this process, a specific serial number is detected at one location on the vehicle's number plate and then detected again (re-identified) further down the path.
- The time and speed of movement are determined by comparing the time at which the sensor pairs sense the vehicle. Bluetooth, RFID or serial numbers from electronic toll collection (ETC) transponders may be used to do this (also called toll tags).

e) GPS-based method

- The numbers of vehicles are now fitted with in-vehicle GPS or satellite navigation (satnav) systems that communicate with the provider of traffic data in two directions. To compute vehicle speeds, different location readings from these vehicles are used.

f) Smartphone-based monitoring

- To track traffic speed and density, smartphones with sensors are used. In order to find out the traffic speed and road condition, accelerometer data from smartphones used by car drivers is tracked. Smartphone audio data and GPS tagging enable the detection of traffic density and potential traffic jams.

Uses and applications

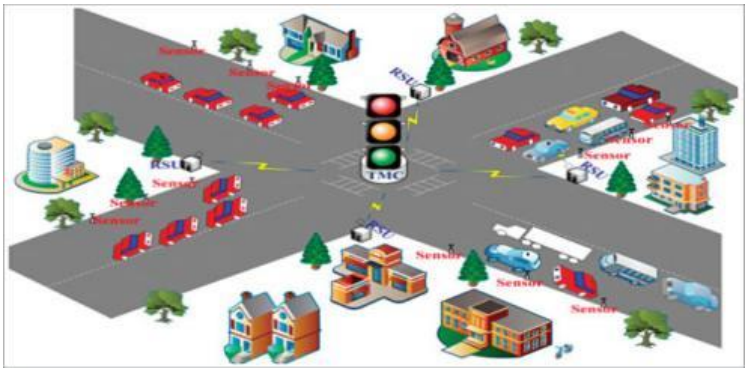
a) Automatic road enforcement

- In order to track and locate vehicles disobeying a speed limit or any other legal requirement, ITMS offers an efficient traffic-enforcement method. Based on the number plate, it automatically tickets the criminals. Traffic tickets are then emailed to the owners via e-mail.
- The system includes:

i. Speed cameras for the detection of vehicles over-speeding.
ii. To detect vehicular speed, many systems often use radar or electromagnetic loops buried in each lane of the road.
iii. Traffic light cameras are used to track vehicles approaching a stop line when displaying a red traffic light. Bus lane cameras for the detection of vehicles in bus-reserved lanes.
iv. Double white line cameras that distinguish certain lines crossing vehicles.

b) Dynamic traffic light sequencing

- Using RFID for complex sequences of traffic light circumvents or prevents issues that typically occur with systems that use techniques for image processing and beam interruption. To provide an effective time management system, RFID technology with the required algorithm and database is applied to a multi-vehicle, multi-lane and multi-road junction environment.

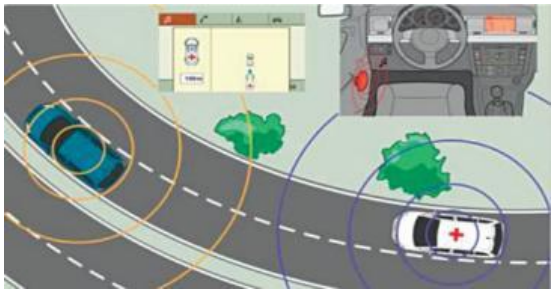


Source:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- For the passage of each column, a complex time schedule is worked out. And in the case of certain extreme examples, the dynamic sequence algorithm adapts itself. By considering the number of vehicles in - column and routing properties, the device will mimic the decision of a traffic police officer on duty.

c) Emergency vehicle notification system

- An in-vehicle e-call is generated manually by the occupant(s) of the vehicle or automatically by in-vehicle sensor activation after an accident. The e-call directly carries voice and data to the nearest emergency point (normally a public safety answering point).



Source:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- The voice call helps the occupant(s) of the vehicle to communicate with the qualified e-call operator and a minimum collection of data is sent to the e-call operator to take the appropriate action, including vehicle identification, information about the incident, time of occurrence, precise location and direction in which the vehicle was moving. For all licenced vehicle forms, e-call is a common choice in most developed countries.

How a basic ITMS works

- In order to improve organisational efficiency and reliability, the simple ITMS assists road authorities.
- This support is out there across all facets of the road network. Integrating technologies like car navigation systems, light control systems, variable signal signs, automatic number plate recognition or speed cameras, and other systems that incorporate live data and input from multiple sources, like parking guidance and data systems, weather information, bridge de-icing systems, and therefore the like are critical for managing transport problems.
- Additionally, for advanced modelling and comparison with historical baseline results, predictive techniques are used. light cycles are altered on a real-time basis supported real-time and historical data, using in place sensors or monitoring systems to retort to changing traffic conditions.
- A traffic control centre, a traffic information service centre, a cellular mobile communications system and an in vehicle terminal (GPS tracer) linked to each other through a wireless communication network are part of a clear and basic system (satellites or telecom towers). The in-vehicle terminal communicates via the cellular mobile communication system with the traffic control centre and the traffic information service centre, respectively (satellites or telecom towers).
- Data obtained by the traffic control centre assists law enforcement authorities by providing real-time data as soon as a stolen vehicle is identified, monitoring vehicle carbon emissions by synchronising to the central office pollution control database, incorporating an integrated digital system to identify traffic violations and issuing an online e-challan to vehicle owners, and providing e-challan to vehicle owners.

ITMS in India

- To start with, India has begun to take steps to prepare and initiate ITMS in metro cities. The Delhi Police is currently working on an ITMS 820 million project spanning 220 kilometres of urban roads and 240 signal intersections.
- A project in Bengaluru has been launched to further improve traffic management. It operates from a dedicated traffic control centre from where the city's traffic is remotely controlled by a team. Almost 120 cameras are tracked remotely at various junctions. Of the 300 traffic signals, 163 were connected to the control centre, most of which were triggered by cars.This means, if there's a four-second period where no vehicles meet up with, the signal automatically turns to red.
- Nearly 700 vehicle-presence intelligent camera detectors and in-road magnetic loop detectors are being mounted at various busy road junctions operated by traffic signals as part of the Mumbai City Mobility Management project. An adaptive traffic control system changes traffic signal cycles in real time to respond to changing traffic conditions, based on the information obtained from these cameras and in-road magnetic loop detectors.Once fully-operational, ATCS is expected to cut down waiting time at traffic signals by almost half.

Source:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- Integrated video sensor technology for intelligent traffic management is under trial in Chennai. One hundred traffic camera sensors have been mounted and are active at various intersections throughout the city to identify waiting vehicles.
- Under a World Bank initiative, Karnataka State Road Transport Corp. is preparing to introduce ITMS for Mysore City soon. The scope of implementation consists of a three-year cycle of design, development, testing, installation, commissioning, training, operation and facility management. 500 buses, 80 bus stops and 10 bus terminals are provided by the scheme.

Delhi Police's proposed ITMS

ITMS approved by the government of India for Delhi is largely based on AI to substantially reduce human intervention in the city's day-to-day traffic management. The project includes a traffic control and management centre, a disaster-recovery centre, an incident-detection system on expressways and adaptive signal control of intersections.

It will also involve a CCTV camera system, traffic information system, adaptive speed control on national highways, speed- and traffic-light-violation cameras, and a parking-management system. Road-based laser sensors will help in traffic classification and traffic density count, and generate a pattern of traffic movement based on traffic volume.

An adaptive traffic-control system will control traffic movement at intersections on arterial roads that usually clog up during peak hours. Road-based sensors will constantly monitor the flow of traffic and provide live data to the control room. When traffic on a stretch becomes heavy, the control room will divert vehicles approaching the congestion using variable message boards and IP-based public-address systems.

Delhi's proposed ITMS (Credit: https:// timesofindia.indiatimes.com)

Computers monitoring the traffic will leave signals green on a vehicle-heavy stretch for a longer period to clear bottlenecks. Sensors will also anticipate traffic congestion, take pre-emptive measures and post information on Facebook, Twitter, Google Map and other social network platforms about traffic snarls and road blocks.

The system will generate data relating to traffic movement in the context of time of day and weather condition for future reference. Data will then be stored in a cloud-based system accessible to police officials through a single software. The project will enable faster and efficient traffic management in case of an emergency, such as an accident, fire or a blockade.

An automatic system will be enabled by a series of cameras equipped with high-resolution number-plate-detection lenses to determine stop-line violations, lane violations, speeding, travelling without seat belts or use of a cellphone while driving. Once detected, e-challan systems will send a notice to the violator's address, and alert the violator on his or her registered cell number.

Video incident-detection cameras, proactive variable message signage and speed-control signals will help in reducing the incidence of accidents on roads.

So

urce:https://www.electronicsforu.com/market-verticals/automotive/intelligent-traffic-management-systems

- The Centre for Development of Advanced Greater Hyderabad encompasses an idea for implementing ITMS soon with an objective to support optimisation of traffic flow, reduce environmental impact, bring down road accidents, and promote efficiency in traffic and transportation operation and management. There are further projects within the pipeline across India, like implementation of ITMS in Indore, Pune, etc.

Conclusion

- ITMS could be a useful innovation that has an answer to the prevailing framework of inadequate traffic management system and its related Web structure (like toll deduction, challan because of over speeding, pollution checking service, VIP/ambulance/fire tender path clearance, vehicle theft and then on). of these issues are efficiently managed by ITMS to tackle the menace of existing traffic mis-management.
- Success of the implemented ITMS requires strong backup in terms of policy, legislation, regulation, relevant sector coordination and customary action.
- ITMS can fail to deliver the expected benefits because of failure not of technology elements, but of some institutional elements. Such systems are implemented with great success on the fast roads of developed countries just like the US, Japan and therefore the UK.
- Moreover, various researchers are working to create these traffic systems even more advanced. While India has started taking steps in planning and implementation of ITMS, our country still includes a great distance to go!

3.7 Cyber Security or any other concept

- The cities of the longer term could also be smart—but will they be cyber safe?
- As urban centers still balloon in population, many become "smart cities" through a digital transformation intended to form their residents' lives better, governance more practical and resource consumption more efficient—via the instrumentation of, well, almost everything in an exceedingly city.
- Any metropolis's traffic signals and cameras, street lights, electric and gas meters and sewers can all feed into this digital infrastructure.
- All together, the smart-city market is anticipated to exceed $1.7 trillion within the next 20 years. But the inter connectivity across the virtual and physical infrastructure that produces a wise city work also creates new and substantial cybersecurity risks. With each additional access point, sensitive data exposure vulnerabilities will expand. Smart cities may be vulnerable to numerous cyber attack techniques, like remote execution and signal jamming, further as traditional means, including malware, data manipulation and DDOS.
- There's absolute confidence the smart-city shift is emerging. At the Mobile World Congress in Barcelona in February 2017, global PwC chairman Bob Moritz said rapid urbanization mutually of the foremost important forces impacting our world today and therefore the numbers are eye-opening: 1.3 million people come in cities weekly, and with this influx, 65% of the globe population are going to be city dwelling by 2040.
- Today, the planet harbors 21 megacities of quite 10 million people each—up from just three in 1975. Urbanization is creating big gains: the highest 600 urban centers generate 60% of world GDP, which number will only grow as more people move to cities.

- Meanwhile, cities are looking to use a fusion of technologies that employment best leveraging an outsized city-scale. Innovations like mobile, Big Data, AI, robotics and therefore the Internet of Things are all transforming a large array of human interactions, including how we work, govern and interact—and the cities during which we live.
- Essentially, a wise city might be seen together gigantic, city-sized Internet of Things (IoT) device, communicating with one another and with residents' smartphones or wearables, opening and shutting virtual doors that may otherwise require locks and keys.
- The reality, however, is that a lot of of these smart-city doors are never completely locked. Rather, they're ajar—and is also alarmingly exposed to cyberattack. Indeed, absent efforts to handle, your future smart city might not actually keep you safe.

Five smart steps

- The National Institute of Standards and Technology recently established an IoT-enabled smart-cities framework to handle issues related to cybersecurity, data integration and sharing. Yet until concrete standards are agreed to, here are some important best practices for connected cities:

i. Are you policy-smart?:

- Too often with IoT, the main focus is benefits with little attention paid to risks. Creating a policy around data use and IoT data privacy at the outset can help ensure against inadvertent misuse.

ii. Protect individual identities first:

- ID management is critical across connected systems. Each connected piece of infrastructure may have different rules for providing access, some weaker than others. By synchronizing access credentialing—hence eliminating weaknesses—cities can help residents' protect their identity information.

iii. Secure information at the source:

- Each connected device starts generating data the instant it's plugged in and each second thereafter. Before a system goes live, smart-city managers must have a transparent understanding of the magnitude of the info that may be collected, yet as how it'll be used. That way, it may be better secured and appropriately encrypted from the outset, and expensive forensic and mitigation efforts could also be avoided down the road.

iv. Standardize the need to know:

- Protocols for access create boundaries although still providing the openness and functionality desired for the connected infrastructure to be effective. These protocols offer complete accountability, identifying who is using the data, ensuring they're authorized and governing that access.

v. Implement appropriate deterrents:

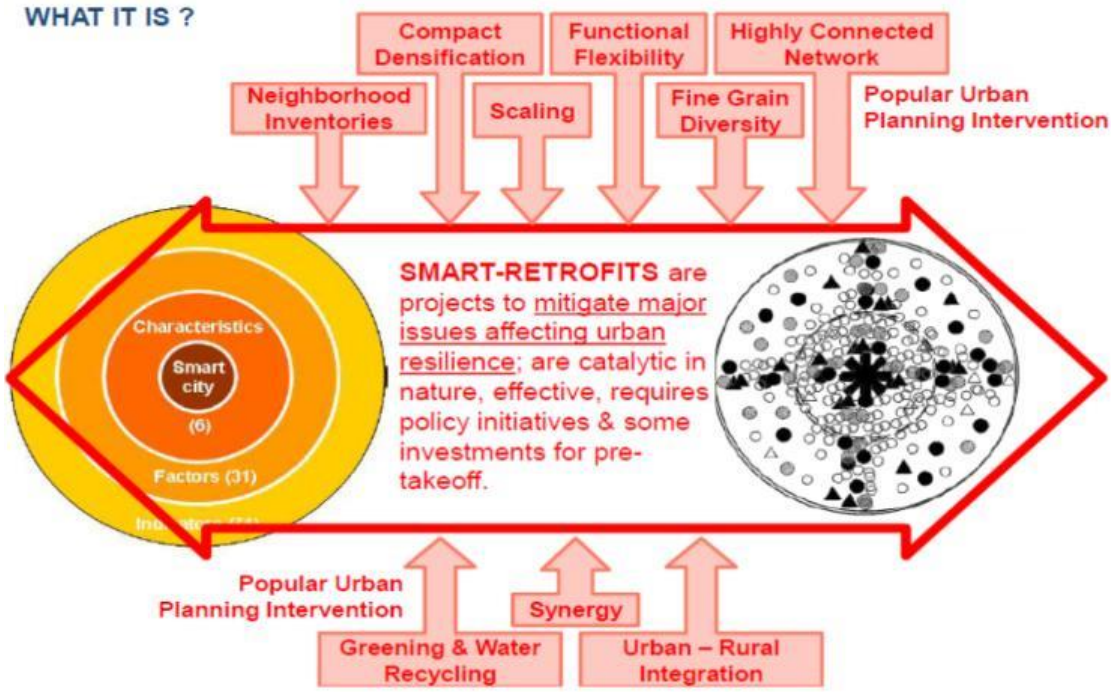
- Currently, repercussions for cybercrimes are limited and ill-defined. Sanctions, fines, prison sentences and also the US code all have to be updated to reflect the results for rule-breakers in an interconnected world.
- Yet a cyber-safe, interconnected utopia includes the correct controls with proper implementation to confirm that connected infrastructure is accessible only to the proper people at the proper time for the correct reasons.

3.8 Retrofitting- Redevelopment- Greenfield Development, District Cooling

- The strategic components of area-based development in the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering major parts of the city. Below are given the three models of Area-based smart city development:

a) Retrofitting

- Retrofitting would implement planning to achieve smart city targets in an already built-up area, along with other goals, in order to make the existing area more efficient and livable. In retrofitting, in consultation with residents, an area consisting of more than 500 acres will be identified by the city. The cities will plan a strategy to become smart, based on the current level of infrastructure services in the region defined and the residents' vision.
- Since existing structures are largely to stay intact during this model, it's expected that more intensive infrastructure service levels and an outsized number of smart applications are going to be packed into the retrofitted smart city. This strategy may additionally be completed in a very shorter time-frame, resulting in its replication in another a part of town.



Source:http://ijaerd.com/papers/finished_papers/IJAERDV03I0544643.pdf

- Retrofitting is one in every of the strategic components which when will be introduce planning in an existing built-up area, will help us to achieve several objectives for smart city like making the present area more efficient and liveable together with others. during this method, generally a vicinity over 500 acres are identified by town in consultation with citizens.
- After identification and observation of the present situation of infrastructure services within the identified area and therefore the vision of the residents, the cities will prepare a technique to become smart.
- The full process of retrofitting must be completed in an exceedingly shorter time frame, as it will lead to help and assistance in other part of city or another city of similar condition. SMART-RETROFITS are projects to mitigate major issues affecting urban resilience; are

catalytic in nature, effective, requires policy initiatives& some investments for pre-take-off. Now days, one of the most commonly method used for the retrofitting for any buildings is Green retrofitting.

b) Redevelopment

- Two samples of the redevelopment model are the Saifee Burhani Upliftment Project in Mumbai (also called the Bhendi Bazaar Project) and therefore the redevelopment of East Kidwai Nagar in Indian capital being undertaken by the National Building Construction Corporation.
- Redevelopment causes the tremendous development in infrastructure by using the mixed land use patterns and also increasing the density at the identical time. When the world is quite 50 acres , then for the sake of concerns of citizens redevelopment is adopted.

Source:http://ijaerd.com/papers/finished_papers/IJAERDV03I0544643.pdf

- For example, By implementing high ground coverage, mixed land use is done by preparing new layout for the realm. Vacant land represents both a major problem and a lovely opportunity for several central cities. Vacant land and abandoned structures impose both economic and social costs on cities and also the neighborhoods or districts in which they are located.
- On the economic side, such properties lower neighboring property values and tax revenues even as they create pressure to raise taxes to maintain service levels. Addressing the issue of vacant and abandoned land and structures, state governments play a crucial role similarly. In many cases, the flexibility to beat the problems associated with vacant properties and convert them to productive use requires legislative powers that are found only at the state level.
- Even when demand for brand new or restored land uses is sufficient for redevelopment to occur, the path to success is troubled by the displacement of previous residents and the elimination of their neighborhoods.
- The redevelopment process can create winners and losers, with the losers too often racial and ethnic minorities and also the economically disadvantaged.
- For Bhubaneswar one may recollect the redevelopment proposal as :□

I. Redevelopment Plans underway to promote compact, higher density, mixed-use living in the urban core of the city. □
II. Redevelopment of Master Canteen Chowk as Bhubaneswar‘s new Town Centre and Multi-modal Hub.

c) Greenfield Development

- Greenfield developments are required around cities so as to handle the requirements of the expanding population. One of the most famous example is that the GIFT City in Gujarat.
- Greenfield developments are required around cities so as to handle the requirements of the expanding population. from a legal perspective, the challenges in obtaining timely, effective, and affordable approvals for Greenfield residential development. In particular, we focus on the constraints on Greenfield developments (not all green fields are equal); the requirement to integrate land use planning with the availability of infrastructure; and also the opportunities provided by the Special Housing Area legislation.
- Greenfield areas are seen because the low hanging fruit in terms of providing land for urban expansion, however the truth is kind of different. there'll be no perfect sites where the conversion of land for urban use will have no effects; all areas will be constrained, and therefore the conversion of any area will have to occur within the context of compromises HAVING been made.
- One among the foremost important issues with Greenfield developments is to ensure that the development area can be appropriately served with infrastructure. Application of Smart Solutions will enable cities to use technology, information and data to improve infrastructure and services that features physical in addition as social infrastructure.
- One most famous example is the GIFT City in Gujarat. For Bhubaneswar, the constituent proposal comprise of :

i. Identification and Preparation of Town Planning Schemes as an urban growth strategy through effective management of land resources.
ii. Master planning of mixed-use integrated townships in Jagasara and Shyamapur.
iii. Some of the important determining factors about Greenfield development are:

1. Areas of land that have never been used for construction, areas of natural, often grassed, land.
2. Nothing to demolish, and no existing issues
3. Cheaper to develop
4. Demand for rural/suburban housing
5. Easier to comply with environmental standards
6. For local farmers it is profitable to sell their land on, and they have a right to do so.

d) District cooling

What is District Cooling?

- Basically, a vicinity cooling system (DCS) distributes cooling capacity within the type of chilled water or other medium from a central source to multiple buildings through a network of underground pipes to be used in space and process cooling. For this technique, a central chiller plant, a pumping station and a distribution pipeline network are required.
- Compared to conventional air-cooled air-conditioning systems and individual water-cooled air-conditioning systems utilising cooling towers, the DCS is an energy-efficient air-conditioning system since it uses 35 to 20 percent less electricity.
- In some countries that have substantial heating demand, the plant may also be designed to produce predicament to create an area Heating and Cooling System (DHCS).
- A typical DCS comprises the following components:

i. Central Chiller Plant - generate chilled water for cooling purposes.
ii. Distribution Network - distribute chilled water to buildings

iii. Consumer Substation - interface with buildings' own air-conditioning circuits.

- **Central Chiller Plant**

➢ Chilled water is generally created by compressor-driven chillers, absorption chillers or other sources such as atmospheric cooling or "free cooling" from deep lakes, rivers, aquifers or oceans at the central chiller plant.

➢ In order to take advantage of the economy of scale and also the variety of cooling demand between different buildings within a component, groups of large and energy-efficient water-cooled chillers are usually installed in an extremely central chiller factory. To reject waste heat from the central chillers, sea water condensers or H2O cooling towers are also used.

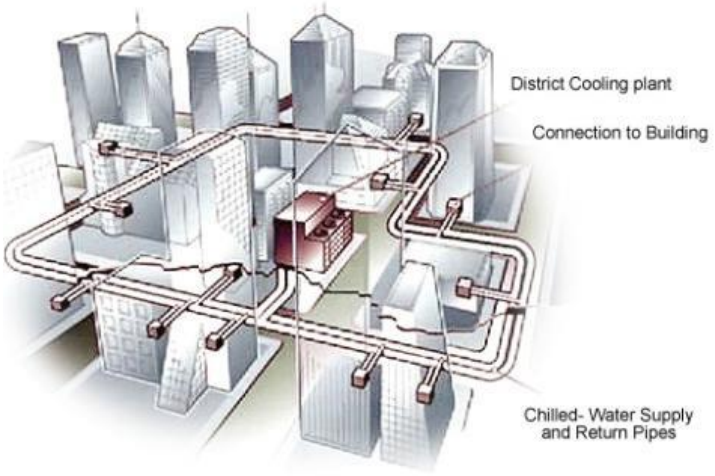
Source:https://www.emsd.gov.hk/energyland/en/building/district_cooling_sys/dcs.html

- **Distribution Network**

➢ District chilled water is delivered via supply pipes from the cooling source(s) to the user stations and is returned from the secondary chilled water systems of the building after extracting heat. Pumps distribute the chilled water by creating a pressure differential between the provision and return lines.

- **Consumer Substation**

➢ The interface between the district cooling system and therefore the building cooling system is usually stated as consumer substation. the patron substation would usually comprise of air handling units, device and chilled water piping within the building. A consumer substation is required in each user's building to attach the DCS distributed chilled sheesha to the building.



Source:https://www.emsd.gov.hk/energyland/en/building/district_cooling_sys/dcs.html

- Inside the patron substation, devices called heat exchangers are installed to transfer heat between the chilled water system of DCS and therefore the air-conditioning system of the user building. the buyer substation may well be designed for direct or indirect connection to the district cooling distribution system.
- With a direct link, the district cooling water is transmitted to terminal equipment such as air handling and fan coil units, induction units, etc. inside the house. An indirect connection utilizes one or multiple heat exchangers in between the district system and also the building system.

District Cooling in Rajkot, India

- The city of Rajkot, within the state of Gujarat, India, is that the first pre-existing city in India to tender a vicinity cooling system and therefore the first city under the govt of India's Smart Cities Mission.
- India has the biggest population facing risks because of lack of access to cooling across all settings. Cooling may be a developmental need and by 2050, India is about to be the biggest consumer of space cooling within the world.
- District cooling can help rein in the environmental effects that such development has traditionally often entailed in other nations, district cooling can provide much-needed stability and resilience to an impact system that over the coming decades will see significant increases in renewables.

Rajkot Smart City Area Masterplan (2019). Source: Rajkot Municipal Corporation

- In April 2015, Rajkot joined the District Energy in Cities Initiative, a public-private partnership led by the world organisation Environment Programme. The 2019 Climate Resilient Cities Action Plan also lists district cooling alongside other key measures to handle cooling and improve climate resilience like urban greening.
- District cooling is additionally seen as a key technology to reducing power demand – summer months in Rajkot see a 40% higher average monthly power demand, because of cooling.

District cooling plan for Smart City Area (2019). Source: Rajkot Municipal Corporation

- Like all Indian cities, Rajkot has been grappling with the COVID-19 pandemic which has focused on emergency measures to manage the spread of the virus. Now, matters is improving and Rajkot can look to large, sustainable infrastructure like district cooling, and also the local, green jobs it brings, as a key step in Building Back Better.
- Today, four years after conception, Rajkot's smart city area has begun excavation for a few of the primary district cooling pipes and therefore the first commercial cooling demand is anticipated in 18 months. because it is developed alongside other infrastructure, the town is initially investing and leading development within the network.
- UNEP and partners are supporting Rajkot to regulate their district cooling arrange to the development timetable and package the expected $49 million, 32,000 refrigeration-ton, project into an open tender for a PPP model. The project will result in cheaper more reliable cooling for the new land projects, CO2 and electricity savings of up to 50%, a major reduction in refrigerant use and reliable power for the local grid – reducing peak demand up to 30MW.

3.9 Strategic Options for Fast Development

- The Smart Cities Council, a for-profit industry-led organization, states that a sensible city harnesses information and engineering to enhance livability, workability and sustainability. In essence, a wise city uses connected sensors and data technology to boost the standard of lifetime of residents.
- The underlying idea of using technology to boost the standard of life is also simple, but it's also an abstract and partly subjective concept. an unlimited range of cities across the planet try to deploy IoT technology to reimagine urban living and are adopting an array of strategies to try to to so.

i. It starts with having a realistic plan

- The lack of a solid definition for the term "smart city" should function a reminder of the importance of getting a solid and realistic plan for transformation. If there's one lesson we are able to draw from so-called digital transformation efforts — whether or not they be within the city realm or another sector — it's that they're easier to speak about than they're to appreciate.
- Consider, for example, the story behind Songdo International downtown in South Korea, a $40 billion "ubiquitous city" with technology interwoven in everything from streets to buildings.
- Songdo boasts 19.5 million square feet of Leadership in Energy and Environmental Design (LEED)-certified building space and has no need for trash bins or garbage trucks; a pneumatic system sucks trash through underground pipes and later sorting it for recycling or disposal. Sensors spread across town gauge energy consumption, traffic and temperature.
- With roots stretching back to 2000, the town is one among the foremost technologically advanced on the earth, yet people aren't exactly lining up to maneuver there — although the town was slated to be completed by 2015.

ii. Smart cities require extensive experimentation

- One of the simplest models for studying smart cities is Singapore, which without delay embodies the potential of technocentric governance while raising questions about the degree that a wise city should surveil its citizens.
- The island nation typically ranks at or near the highest of most international rankings of smart cities. and in contrast to Songdo and Masdar City, Singapore already had an in depth

technological infrastructure before Prime Minister Lee Hsien Loong launched its smart city initiative in earnest in 2014 by deploying roughly 1,000 sensors across the island with an unspecified number to follow.

- Singapore has one in every of the most effective transportation systems within the world and was the primary nation to debut driverless taxis. additionally, Singapore has a number of the fastest internet speeds within the world and could be a pioneer in e-government initiatives.
- The island nation is one in every of the most effective examples on the world for a city as a laboratory for innovation. Unlike Songdo and Masdar City, Singapore was an existing city that already had a top quality of life — the most effective in Asia per Mercer in 2014, which was the year it launched its smart city initiative because it continues to roll out more sensors and technology, the city-state continues to rank well.
- Perhaps Singapore's smart city strategy is more about maintaining its current technological edge than it's about gaining a brand new one. Mercer ranked Singapore as having the simplest infrastructure within the world in 2017, and Singapore continues to rank at the highest of the list in many technological and quality-of-life rankings.

iii. A smart city vision should energize the private sector

- In many respects, Columbus, Ohio, is that the antithesis of Singapore: it's an "every city" that's more famous for being the house of Ohio State University and a wonderful zoo than for being a world tech hub. While town contains a quickly growing tech scene, the rationale is an emerging smart city pioneer is more rooted in its mission to use technology to assist its citizens and also the firm support of local organizations in its vision.
- The city could also potentially function a template for other cities throughout the u. s. that have smart city ambitions. When city officials entered to win the $50 million to win the 2016 U.S. Department of Transportation's Smart City Challenge, a part of the message looked as if it would be: If Columbus can become a wise city, so can other U.S. cities.
- The city's ability to seek out significant funding for its smart city initiative is probably the foremost impressive element. Ultimately, town aspires to draw in a complete of $1 billion privately financing over a four-year period. So far, the public/private partnership includes $170 million from American electrical power, which supports the city's commit to deploy a network of electrical vehicles. Other significant donors include Ohio State University (with $64 million) and therefore the state of Ohio (with another $35 million).

iv. Smart cities demand smart data

- A city isn't smart because it uses technology. A city is sensible because it uses technology to create its citizens' lives better. Building a sensible city may be a different style of endeavor than many technological projects because the demographic market is so broad — it includes, to some extent, everyone who lives there in addition as visitors. "I think plenty of individuals in smart cities forget that you simply are building a wise city for the people — for the patron — and not necessarily for the technologists," said Michael Lee Sherwood, director of data technology for town of urban center.
- Examples of this time-saving potential include everything from apps that help motorists find parking, to smart control systems that use machine learning to predict and optimize traffic patterns.
- Las Vegas, like many other cities with smart city ambitions, is transforming itself into a laboratory for smart city projects, but its specialize in data and experimentation ensures that its

experiments have a real benefit for its residents and visitors. rather than declaring that it might make all of urban center a wise city, officials there have stressed their plans with starting by transforming a downtown swath it calls "the Innovation District" and build from there.

v. Get creative when rethinking transportation

- While city planners across the globe work to rethink the age-old question of the way to best get people from point A to B, there seems to be little agreement on what the simplest path forward can be within the future. On one hand, there are the techno-optimists who aggressively push a future where autonomous vehicles rule the road, electric vehicles outnumber those fueled by gasoline, and therefore the concepts of parking and traffic fatalities — and maybe even traffic jams — begin to become irrelevant because of cutting-edge technology.
- But there might not be a one-size-fits-all solution for addressing traffic needs of the long run. City officials and planners should keep a watch on the foremost innovative projects, while taking a broad view of the long run of transportation.
- While Dubai has made headlines for becoming the primary city to check an autonomous passenger drone referred to as a Volocopter, the smart city vision is exemplary in terms of its overall strategy. the town plans to form 1 / 4 of road trips driverless by 2030.

vi. Don't downplay digital security

- It would be unfair to single out one city for its less-than-stellar cybersecurity. But town of Dallas, Texas, became an early youngster of what can fail when a prankster depart all of the municipality's 156 tornado sirens, causing some 4,000 people to dial 911. The sirens were, however, not linked to the web. The hack targeted a weakness within the siren's radio communications to form them sound.
- Security is seemingly a widespread concern for several smart city projects. A 2016 survey from Dimensional Research found that over half, or 55%, of the 203 IT professionals it asked believed their cities weren't sufficiently focused on digital security.
- Opinions were divided on which technologies were most in danger. a complete of 27% found that public Wi-Fi networks were most in danger while 18.6% found that smart grids were the foremost vulnerable targets. a complete of 12.7% said that public lighting vulnerabilities were the largest threat. Other related risks include critical infrastructure like the facility grid, water treatment facilities still as transportation networks.
- One of the chief challenges when securing ambitious smart city initiatives is devising a solid framework which will encompass an array of devices, a number of which are novel et al. may use decades-old technology. Such efforts require cybersecurity experts but it may be difficult to search out professionals like an expert in securing operational technology (OT). "If you would like five [cybersecurity professionals], you likely find yourself picking five IT people and training them on OT," said Ken Modeste, principal engineer, security and global communications at Underwriters Laboratories.

vii. Smart city initiatives should complement low-tech initiatives

- Cities aiming to become "smart" run the chance of becoming so focused on technology that they lose sight of promising initiatives that don't require connected sensors, kiosks or the other variety of widget.
- Barcelona, one in all the leading smart cities in Europe, provides an example of a city employing a mixture of high- and low-tech initiatives. observe how town is functioning to enhance its air quality.

- It keeps tabs on pollution levels by employing a system called XVPCA, which monitors and forecasts pollution levels. Barcelona is functioning on improving its air quality monitoring. it's deploying air quality sensors throughout town.
- After researchers concluded that roughly two-thirds of the nitrogen oxides within the surrounding Catalonia region came from cars, town decided to launch a low-tech initiative to cut back pollution levels; it might use "superblocks" ("superilles" in Catalan), which are square grids of up to nine city blocks that are mostly shut off to traffic.
- The conceive to convert almost 60% of city streets into superblocks has sparked protests from some drivers, but it's proven popular to several people living within the first neighborhoods laid low with the plan. Air quality sensors strewn across the town have shown significant improvements in air quality so far.
- By the tip of next year, up to 500 superilles could blanket Barcelona. town is additionally going to double the quantity of trees throughout town and increase space for parks.

3.10 India's Urban Water and Sanitation Challenges and Role of Indigenous Technologies

- Urban sanitation in India faces many challenges. Nearly 60 million people in urban areas lack access to improved sanitation arrangements, and quite two-thirds of wastewater is unchained untreated into the environment, polluting land and water bodies. to retort to those environmental and public health challenges, urban India will must address the total cycle of sanitation, i.e. universal access to toilets, with safe collection, conveyance and treatment of human excreta. This paper outlines these concerns, and highlights the necessity for specializing in access to water and also the full cycle of sanitation for the urban poor, as fundamental to addressing the sanitation challenge.
- Priorities for policy and financing for urban sanitation in India are discussed, and also the paper concludes with an examination of key policy initiatives within the last decade, assessing the extent to which these priorities are gaining attention."More Indians have mobile phones than toilets". This sensational news first made headlines in 2010 in both Indian and international media and has since been featured within the media with striking regularity.

i. The imperative to address the full water and wastewater cycle

- Lack of adequate sanitation remains a significant reason for disease in developing countries. Diarrhoea is that the second leading reason behind mortality among children under five globally, with deaths directly due to lack of adequate sanitation and associated hygiene practices. within the absence of adequate sanitation, interventions that improve water or hygiene are less effective than they'd be if sanitation were improved.
- By definition, a sanitation system must perform the following: collect and isolate excreta, safely transmit this waste, then treat this waste before reusing it or letting it enter the environment. A functional toilet performs only some of those functions: collection and isolation, temporary storage within the case of on-site systems, and partial treatment.Without concomitant attention to safe waste collection and disposal, "improved toilets" won't necessarily result in improved health outcomes – given the multiple routes through which faecal exposure takes place. Studies have shown that improved health outcomes are captivated with neighbours' access to adequate sanitation, which sanitation at the community level is important to attain health outcomes.

ii. Access to drinking water

- The deficits in sanitation become more critical within the context of the absence of reliable, safe water in Indian cities. Only a bit over 60 per cent of urban households have access to public supplies of beverage.

- Even households connected to the general public supply system receive on the average only three hours of drink supply on a daily basis, and a median of 75 litres per capita as critical the norm of 135. Most urban households in India rely on multiple sources – often separate sources for potable and non-potable uses, as is evident from case studies from several parts of India.
- The most worrisome consequence of this dependence on non-public, non-networked sources, often multiple and distant, is that the contamination of water, especially for potable uses.

iii. Household-level deficits in sanitation

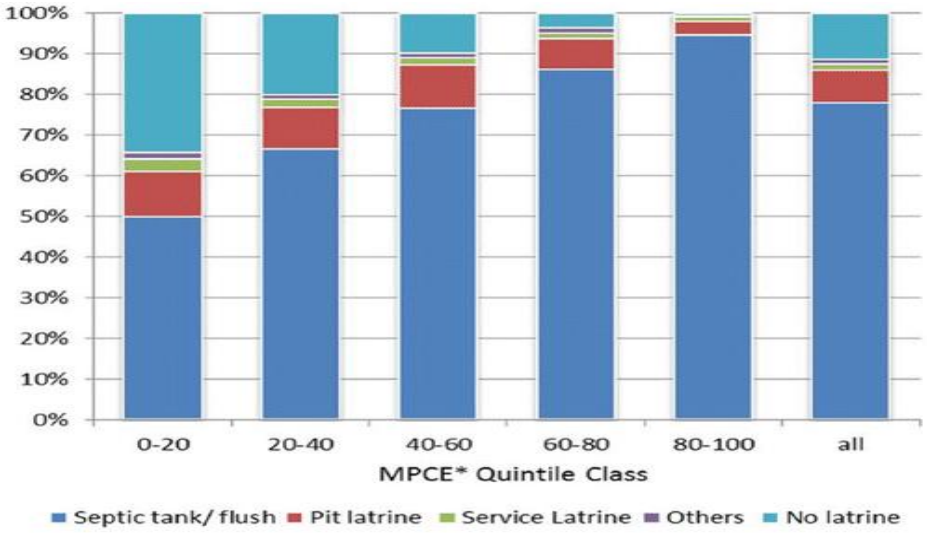
- Table 1 clearly illustrates the size of the deficit in urban sanitation at the household levels. in step with census data, 13 per cent (10 million) households resort to open defecation, and another 3 per cent or 1.8 million households have "unimproved" sanitation (unimproved pit latrines, removal of manure by humans, animals or direct flow into drainage).

Distribution of urban households by type of toilet

Type of latrine	Number of households (million)	Percentage of households
WC connected to piped sewer system	25.8	33%
WC connected to septic tank	30.1	38%
Pit latrine with slab/ventilated improved pit	5.1	6%
Unimproved pit latrine	0.5	1%
Night soil disposed into open drain/removed by humans or animals	1.3	2%
Other system	1.4	2%
Public latrine	4.7	6%
Open defecation	10.0	13%
Total	78.9	100%

SOURCE: Census of India (2011), *Houselisting and Housing Census Data*, available at http://www.censusindia.gov.in/2011census/hlo/HLO_Tables.html.

- Six per cent or around 5 million households depend on public toilets but these don't include toilets shared by neighbours. Although, the National Sample Survey Office estimates around 31% of urban households rely on shared/community/public toilets, out of which households with shared toilets account for twenty-four per cent. While urban India has made some progress over the past decade, the dearth of access to improved sanitation, particularly open defecation, poses a challenge, and desires to be addressed on a priority basis.
- These deficits don't seem to be uniformly distributed, but vary within and across cities. Within cities, access varies per socioeconomic condition. As indicated in Figure 1, over one-third of households within the lowest income category lack access to any toilets.
- There is further differentiation among the urban poor – as an example, a study has shown that the health burden on children is higher in additional vulnerable slums (depending upon tenure security, service provisioning, and socioeconomic conditions). But it's beyond the scope of the paper to explore these differences.
- In addition to the shortage of toilets, there are other less visible deficits at the household level. the primary pertains to the planning and construction of on-site systems. These systems is considered "safe" as long as they fulfil certain criteria, and in certain conditions. as an example, within the case of pit latrines, minimum distances to sources of beverage have to be maintained to avoid the chance of water contamination. within the case of septic tanks, there must be soakaways/drain fields.



SOURCE: NSSO (2010), NSS 65th Round, Housing Conditions and Amenities in India, July 2008 – June 2009, National Sample Survey Office

iv. Differentials across urban centres

- While the poor are possibly to suffer from inadequate sanitation within particular cities, the distribution of those deficits across cities is more complex. Cities in India are divided into classes per their population, and allocation of public funding across these classes is usually a matter of debate.
- Public funding has often been directed to Class I cities, particularly million-plus cities, partly thanks to their visibility. However, increasingly, there has been a call to speculate more in smaller cities with their huge service deficits. But whether to specialise in Class I cities because they're home to most of India's population, or on smaller cities due to the upper percentage of their deficits, is also a misleading dichotomy.

Distribution of open defecation households across cities by population

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Popn.	Popn. Category	No. of Cities	Popn. (million)	Percentage of Popn.	No. of HH	No. of OD HH	% of OD HH	Share of OD
Million-Plus		46	116.56	31%	24,708,210	944,119	4%	9%
Other Class I	100,000–1,000,000	458	111.18	29%	22,958,005	2,208,024	10%	22%
Class II	50,000–100,000	607	41.46	11%	8,635,358	1,331,505	15%	13%
Class III	20,000–50,000	1904	58.15	15%	12,039,395	2,508,290	21%	25%
Class IV, V, VI	Below 20,000	4911	49.65	13%	10,543,164	2,973,219	28%	30%
Grand Total			377.00	100%	78,884,132	9,965,157	13%	100%

NOTES: HH = households. OD = open defecation.
Cities refer to administrative units as reported in the census, and not urban agglomerations. There might be slight discrepancies in the number of cities falling under each size class because the census house listing and housing tables have been used. This city class system is generally used in India for public programmes and planning.

SOURCES: Census of India (2011), *Houselisting and Housing Census Data*, available at http://www.censusindia.gov.in/2011census/hlo/HLO_Tables.html; and analysis presented in IIHS (2014b), *Sustaining Policy Momentum: Urban Water Supply and Sanitation*, Rockefeller Foundation Urban Policy Papers, Indian Institute for Human Settlements.

v. Conveyance and treatment deficits

- Urban India faces an incredible shortfall in facilities for safe waste collection, conveyance and treatment – for both on-site systems and networked systems. there's limited data for waste

collection and treatment – indeed this limited data remains one in all the key concerns. Nevertheless, there are estimates for the extent of the deficits – for both on-site and networked systems.

3.11 Initiatives in village development by local self-government

Initiatives and Policies of Local Self Governments to achieve Energy Efficiency
Case Studies Udupi ZP Hirisave GP, Hassan District.

- **Scope for Energy Savings in Urban Local Bodies**

✓ Gram Panchayaths/ Taluk Panchayaths/ Zilla Panchayathsare gross root level institutions, basically these PRIs monitors and plans schemes , there's a well developed strong network .
✓ Adequate and specific budget provisions have to be created under the provisions of the KPR Act, 2003 for various energy conservation initiatives , PRIs can make their own byelaws also.
✓ Capacity Development Programs are required on energy conservations for these PRIs.
✓ GPs are licensing authorities for geographical area they will impose/insist energy conservation requirements supported the local needs.
✓ GPs pay huge electricity bills to DISCOMs, these bills are mostly associated with street lights and water system bills, 40% of energy are often saved in this area.
✓ There is a direct need to switch the road lights with efficient LED systems.
✓ There is a necessity to interchange the old water pumps and motors with efficient systems**.**

- **Initiatives for Urban Local Bodies**

✓ Town Panchayaths and city corporations requires regular energy audit supports.
✓ Technical support staff must be stregthened in each Urban Local Bodies and an avid Energy Conservation Unit have to placed a minimum of in bigger urban local bodies.
✓ The ULBs are the competent authorities to enforce all energy saving measures in their jurisdiction, they have an enforcement unit with statutory powers.
✓ DPCs can initiate more proactive measures in energy conservation.

- **IEC campaigns for Energy Savings in Urban Local Bodies**

✓ ULBs are more efficient to organize massive Energy Conservation Campaigns.
✓ ULBs can sell/promote energy efficient appliances to urban and rural households•Kitchen ventilators and windows are often distributed to the poor rural households.
✓ Urban Local Bodies can take up plantation works within the vacant lands.
✓ ULBs can constitute energy watch committees.

- **Policy initiatives**

✓ PRED, builds infrastructures to PRIs , amendment to PWD SORs is initiated, capacity development initiative undertaken for PWD and PRED.
✓ KLAC also builds infrastructures for PRIs, initiated training and capacity development for design modification to comply ECB.
✓ Initiated implementation of ECBC for Govt. buildings.

- **Reform Initiatives by Boards**

➢ Slum Board.
➢ Karnataka Housing Board.
➢ Rajiv Gandhi Rural Housing Corporation.
➢ Urban & Rural Engineering Colleges.

- Karnataka Health Restructured Development System SarvaShikshanaAbhiyanSSA.
- MMS

3.12 Smart Initiatives by District Municipal Corporation

Ahmedabad, a smart city

- Did you're thinking that that only Western cities were getting smart? Wrong! this text presents variety of smart and sustainable initiatives from Ahmedabad, the Indian city that currently ranks 32nd on the list of the world's smartest cities.
- The "Manchester of India" may be a multicultural and multifaith city within the Jaipur District, with 7 million inhabitants who add its booming industrial sector – hence the comparison with Manchester – and participate in its many cultural activities, like the Kite Festival, Raksha Bandhan, when brothers and sisters reaffirm their bonds with bracelets, and Navatri, the festival of divine female energy.
- But it's not all sunshine and roses. Like other large cities, Ahmedabad faces multiple social, economic and environmental problems.
- Let's take a look at what India is doing to show Ahmedabad into a wise city – a difficult task during this Asian republic, which continues to be an "emerging" instead of a "developed" country.

i. Digital India

- The government intends to implement over 30 modernisation and digitisation programmes to boost the event and quality of urban life. a complete of 20 cities are involved, including Ahmedabad, which is one in every of the programme's pioneers.
- More specifically, it's a framework programme which comprises nine components, including a programme for public-sector digitisation, online administrative services and public internet access. For this purpose, 150,000 post offices are converted into multifunctional centres adore the Digital Public Spaces in Brussels.

ii. Mobility

- It doesn't do to require too rosy a view, as India's infrastructure is a smaller amount developed than that of the West. However, this also means the authorities have a freer hand.
- Ahmedabad is an element of the Golden Quadrilateral, India's national road development plan, which can cost over 20 billion euros and can in time connect the sea with the Bay of Bengal via the country's four main cities: Mumbai, Delhi, Kolkata and Chennai.
- This network of major roads is gradually expanding and densifying. At now in time, it includes all conurbations with over 1,000 inhabitants, which makes travel much easier between rural and concrete areas.
- In 2009, Bus Rapid Transport (BRT) was also introduced on the city's bus network and measures like dedicated bus lanes and therefore the ability to purchase journeys prior to have improved the flow of traffic. For the nowadays, there are three "corridors" in various areas of Ahmedabad.

iii. Environment

- India is that the world's third-largest energy consumer, yet also has huge renewable-energy potential it fully intends to use.

- One example is that the Sardar Sarovar dam, which supplies four states with drink and electricity: Madhya Pradesh, Maharastra, Rajasthan and Gujarat, where Ahmedabad is found. the town has also installed smart water meters which enable people to chop their water consumption, or a minimum of manage it better.
- The city has one more asset: alternative energy, which is continually developing. At the top of 2017, Gujarat had generated no but 5537.4 MW of electricity, a powerful figure which incited the authorities to gradually fold all coal-fired power stations within the area which had been operating for over 25 years.
- The BRT system also helps finish off town, as its efficiency is reducing pollution. Other projects like the town Development Plan and therefore the Comprehensive Mobility Plan have the identical target.

3.13 Any Projects contributed working by Government / NGO / Other Digital Country concept

List of Projects as per Smart City Proposal : Ahmedabad

Sl. No.	Projects in SCP	Cost (Rs. in Crore)
	Area Based Development (ABD)	
	Retrofitting Wadaj TOZ	
1	Intermodal hub	125.00
2	Utility Network (Water, sewerage, drainage, roads, street lighting, etc)	385.00
	Redevelopment Wadaj Slum	
3	External Utility Network (Water, sewerage, drainage, roads, etc)	28.00
4	Wastewater Treatment Plant)	125.00
5	Residential & Allied Development (including internal utility network)	451.00
	Smart Features	
6	Solar Energy	22.00
7	Waste Segregation	1.00
8	Rain Water Harvesting	15.00
9	Smart Metering	26.00
10	OFC Network	2.00
11	Wifi Hotspots	1.00
12	NMT Tracks / Cycle Tracks	2.00
13	Intelligent Traffic Management	6.00
14	Smart Parking	11.00
15	Energy Efficient Street Lighting	2.00
16	Surveillance Cameras	1.00
17	Other	548.00
	Pan City	
	Smart Transit Integrated Transit Management Platform + CCPS	
18	Integrated Transit Management Platform (GPS & AVLS, PIS, etc)	90.00
19	Common Card Payment System (Smart Cards, readers, software, etc)	104.00
	Command & Control Centre, OFC Network, and Integration of Services	
20	Command & Control Centre + OFC Network connectivity	203.00
21	Surveillance Equipment & Integration, Intelligent Traffic Management	107.00
22	Integration with other services & Real Time Tracking / Monitoring	35.00

Note- *This only indicates cost of individual projects given in the SCP. The total value of SCP may additionally include other costs such as DPR preparation, PMC, O&M etc.*

Source:http://smartcities.gov.in/upload/uploadfiles/files/Ahmedabad_projects.pdf

3.14 How to implement other Countries smart village projects in Indian village context (Regarding Environment, Employment)

- In a way, Mahatma Gandhi conceptualized smart villages.
- Yet, seven decades after independence, we are nowhere near realizing Gandhi's vision of empowered villages. Rural India remains during a deplorable state.
- One reason for this can be institutional neglect.

i. Headquarters of malnourishment

- A glaring example is Harisal, alittle village in Amravati district within the western Indian state of Maharashtra.
- During my first fieldwork during this village, I learned that telephone lines and mobiles didn't work here, fatality rate rates were alarmingly high, finding meaningful employment was impossible, school dropouts were the norm, and avenues for learning skills non-existent.

ii. Last mile access

- Villagers now use Skype and WhatsApp to attach with the broader world. Encouraging alternate technologies and new business models designed for scale must be the primary step towards the digital transformation of our villages.

iii. Technology infrastructure

- It is no secret that India missed reaping the advantages of the primary, second and third industrial revolutions. Now the fourth is upon us. it might witness the fusion of physical, biological, and digital worlds with the mainstreaming of technologies like 3D printing, computing and machine learning.
- According to the globe Economic Forum, almost 90% of the world's data was created within the last two years. Going forward, the pace will only increase.
- Smart villages must be data-driven and cloud-powered. District collectors – the Indian Administrative Service officers accountable – should consider re-skilling block development officers (implementers of rural schemes) in basic data collection and analysis in order that they monitor education, healthcare, agriculture, and financial inclusion metrics.

iv. Ecosystem

- Developing an economically viable and culturally sensitive ecosystem in villages is of paramount importance. Unfortunately, direct access to the market has been a significant challenge largely because of multiple intermediaries and lack of skilled workforce.
- Almost 70% of India lives in villages where the social and economic conditions are sub-optimal. The country has often been touted as an emerging superpower while most Indians remain super poor this can be why empowering villages through technology and creating rural innovation clusters are critical to reconcile India's "super power-super poor" conundrum and realize verity potential of Digital India.

Chapter 4
About Navapura

4.1 Introduction

4.1.1 Introduction About Navapura Village

- Navapura is a village located in Daskroi takula, Ahmedabad district of Gujarat state, India in the vicinity of Ahmedabad city. It is a small village with the population of 2475. It is located 25 KM towards South from District head quarters Ahmedabad.It is surrounded by Dholka Taluka towards South, Bavla Taluka towards west, Sanand Taluka towards North, Ahmadabad Taluka towards North.

Fig. 4.1 Satellite view of Navapura

4.1.2 Justification/ need of the study

- Around 70 percent, or 750 million, of India's population lives in its 600,000 villages. In the plains or on the Deccan plateau, over 85 percent of these villages are situated. 200-250 households are in the typical village and occupy an area of 5 sq. The Km. Much of this is forest, and seeing all the houses in one or two clusters is common. Several large villages are constantly transforming into cities and market hubs as the population and the economy expand.

- Around 65 percent of the population of the state lives in rural areas. Rural residents should have the same quality of life that people living in suburban and urban areas enjoy. Furthermore the cascading impact on urban centres of poverty, unemployment, inadequate and insufficient infrastructure in rural areas are caused by slums and consequent social and economic conflicts reflected in economic inequality and urban poverty.
- Rural development, which is concerned with economic growth and social justice, thus makes it necessary to improve rural people's living standards by providing sufficient and quality social services and minimum basic needs. The new project deals with the same thing. The next two billion people are going to live in towns and villages, so we need to prepare now.
- In the next 40 years, almost all projected population growth will be consumed by developing-world cities that are unprepared for such rapid expansion. To take advantage of the many advantages cities can offer, planning needs to begin now. Though towns focus on poverty, they also offer the best way to escape it. Cities have been the engines ofeconomic development for a long time.
- Densely populated cities can be more environmentally friendly and allow more efficient service provision than sprawling communities. In cities, concepts, associations and events also produce solutions to the problems they make. By developing villages with a 'rural soul' but with all the urban facilities a city may have, Vishwakarma Yojana is one of the methods to minimize urban urban pressure and lower the migration rate.

4.1.3 Study Area (Broadly define)

- By developing villages with a 'rural soul' but with all the urban facilities a city may have, Vishwakarma Yojana is one of the methods to minimise urban urban pressure and lower the migration rate. In particular, the developmental work in villages that could be carried out as needed by the village involves physical, social and renewable infrastructure facilities.
- It is also proposed to frame 'Vishwakarma Yojana' so that engineering students of Gujarat Technological University can benefit from real work experience and at the same time apply their technical knowledge in the construction of infrastructure in rural development. For the construction of villages in 'Rurban' areas, Vishwakarma Yojana will provide a "Design to Delivery" solution.
- The developmental work in villages that could undertaken as per the need of the village in particular includes Physical infrastructure facilities (Water, Drainage, Road, Electricity, Solid waste Management, Storm Water Network, Telecommunication & Other), Social infrastructure facilities (Education, Health, Community Hall, Library, Recreation Facilities & other) and renewable energy (Rain water harvesting, Biogas plant, Solar Street lights & Other) for Sustainable development.
- Under this scheme, engineering colleges within the Gujarat Technical University will adopt the villages of the 'Rurban' district. Engineering colleges will research the villages defined and make recommendations on the application of technology, through project planning and management, to achieve integrated and comprehensive growth.

4.1.4 Objectives of the study

1. Improving productivity and therefore the income of the rural poor.

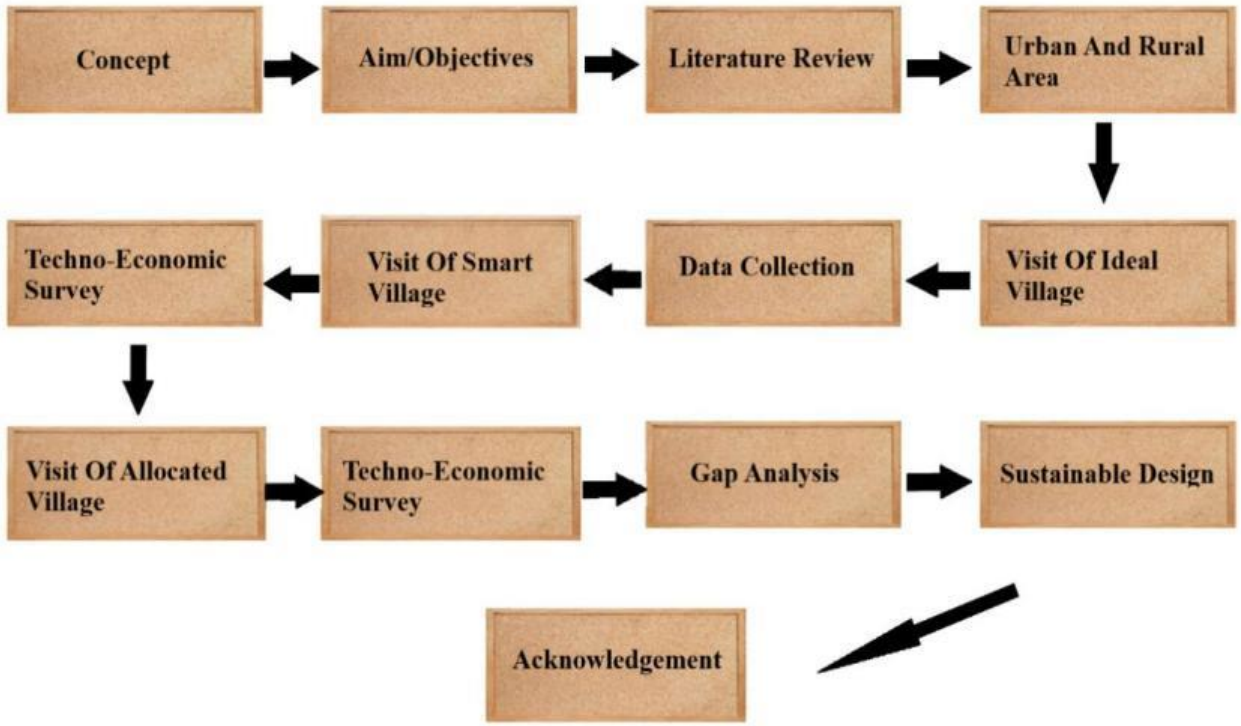
2. Ensure expanded job prospects at a quicker rate.
3. To achieve a reduction in unemployment and a substantial reduction in jobs.
4. To ensure an appreciable increase in the quality of living of the poorest parts of the population.
5. To meet some of the basic needs of people-clean drinking water, basic education, health care, rural roads, etc.
6. Strengthen and extend the coverage of integrated rural development and national rural employment programmes.
7. Rehabilitate Bonded labour.
8. Strongly promote forestry, social and agricultural forestry projects and the production of biogas and other renewable energy sources.
9. Accelerate projects for the establishment of Scheduled Castes and Scheduled Tribes.
10. Promote family planning on a voluntary basis as a movement of people.
11. Spread universal elementary education for age groups 6-14 with particular focus on girls and at the same time, engage students and voluntary organisations in programmes for the elimination of adult illiteracy.
12. Substantially expanded universal primary health care facilities and leprosy regulation, T.B. And blindness, too.

4.1.5 Scope of the Study

- Rural growth is a complex mechanism primarily concerned with rural areas. These include agricultural growth, the creation of economic and social infrastructure, fair wages as well as landless housing and housing, village planning, public health, education and functional literacy, communication, etc.
- The scope of rural development is very broad as it encompasses the totality of human life such as:

1. Management of agriculture, fisheries,forestry and natural resources.
2. Micro, small and medium scale irrigation industries Growth.
3. Creation of domestic water supplies.
4. Utilization of power and energy.
5. Education programs and facilities.
6. Health programmes and facilities.
7. Institutions of credit and finance.
8. Programs for Nutrition.
9. Human rights.
10. Religious and moral development.
11. Sport and Recreation.
12. Creation of tourism.

4.1.6 Methodology Frame Work for development of your village



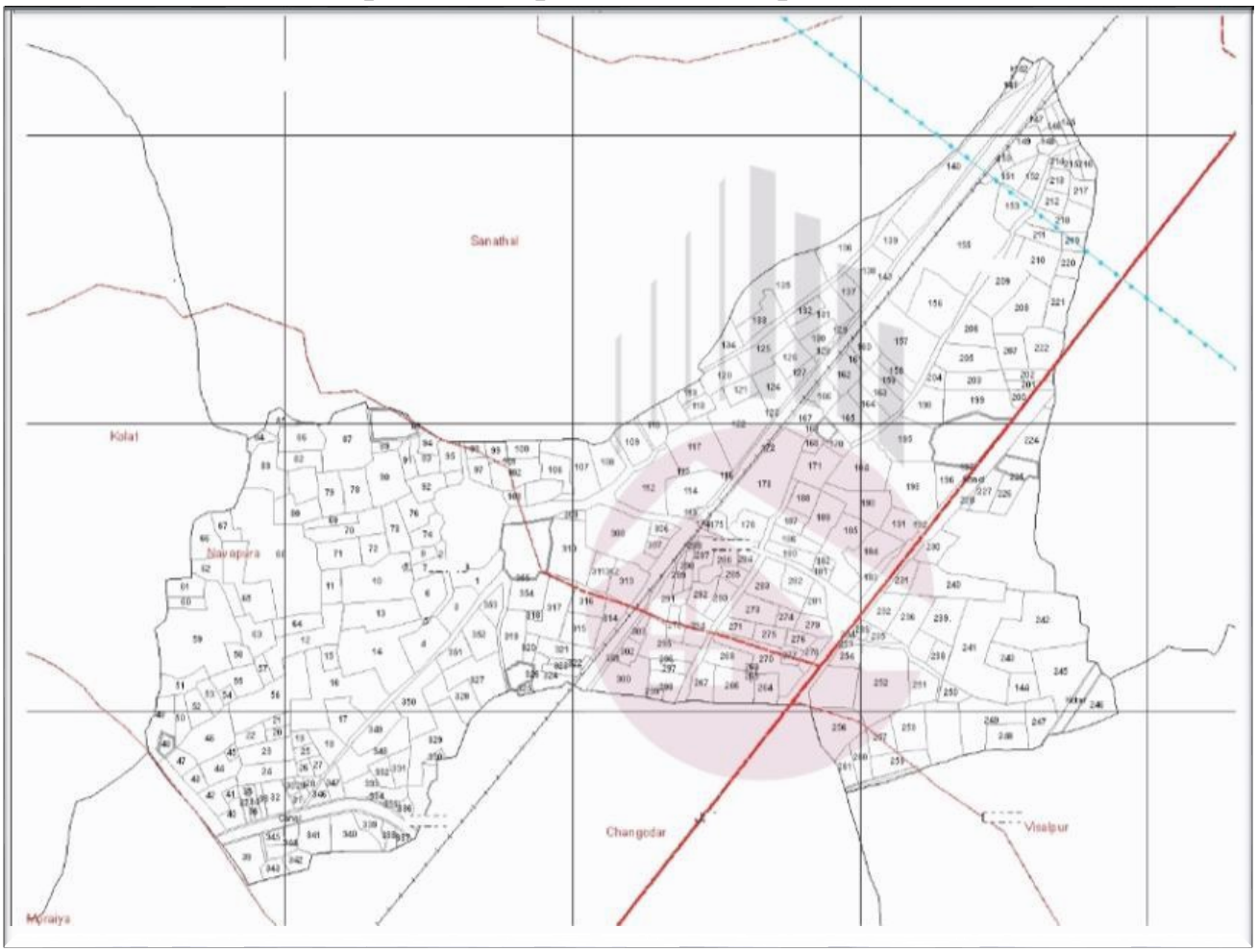
4.2 Navapura Study Area Profile

4.2.1 Study Area Location with brief History land use details

Village: Navapura
Taluka: Sanand
District: Ahmedabad
State: Gujarat
PIN code: 382425
Coordinates: 22°51'04.3"N 72°29'59.1"E
Population: 3756
Geographical area: 452-36-58 acre

Fig. 4.2 Map of Navapura

4.2.2 Base Location Map,Land Map,Gram Tal Map.



Land Map of Navapura

4.2.3 Physical & Demographical Growth

Table 4.1 Demographical growth

Sr. No.	Census	Population	Male	Female
1	2001	-	-	-
2	2011	3756	1934	1822

Table 4.2 Physical Growth

Sr no.	Description	Information/Detail
1	Area of village (approx.)	452-36-58 hectare
2	Agriculture land (approx.)	308-14-41 hectare
3	Residential area (approx.)	79-09-76 hectare
4	Waste land (approx.)	6-13-10 hectare
5	Other (approx.)	58-99-31 hectare
6	Coordinates for location	22°51'04.3"N72°29'59.1"E

4.2.4 Economic generation profile / Banks

- There are no banks or ATM facilities available in Navapura.

4.2.5 Actual Problem faced by Villagers and smart solution

- There is no health center in the village, so for any medical emergency people have to travel to the nearest hospital or health care center which is far from them.
- There is no waste water treatment and solid waste management system in the village, so whole waste water and solid is dumped into the pond, which is located in the vicinity of the village. Due to this, the water of the pond gets polluted which cause distinctive smell around it.
- There is no bank or ATM in the village.
- There is lack of sanitation in the village, they hire private workers on daily basis salary to clean the roads.

4.2.6 Social scenario -Preservation of traditions, Festivals, Cuisine

- Agricultural land is that the single most vital resource and type of property in rural society. But it is not equally distributed among people living in a selected village or region. Nor does everyone have access to land.
- In some parts of India the bulk of rural households own a minimum of some land – usually very small plots. In other areas the maximum amount as 40 to 50per cent of families do not own any land at all.
- This means that they are hooked in to agricultural labour or different kinds of labor for his or her livelihoods.This in fact implies that some families are well-to-do. the bulk live just above or below the poverty level.
- In most regions of India, because of the prevalent patrilineal kinship structure and form of inheritance, women are generally excluded from land ownership. Women are presumed to have a fair share of family property by statute. In fact, they only have restricted rights and a few have access to land only as part of a person-headed household.
- The rough correspondence between caste and sophistication means typically the upper and middle castes also had the most effective access to land and resources, and hence to power and privilege. This had important implications for the rural economy and society.
- In most regions of the country, a ‘proprietary caste’ group owns most of the resources and might command labour to figure for them. Until recently,practices like begar or free labour were prevalent in many parts of northern India. Members of low ranked caste groups had to produce labour for a set number of days per year to the village zamindar or landlord.
- Similarly, lack of resources and dependency on economic, social and political support of the landed class meant that many of the working poor were connected to landowners in 'hereditary' labour relations (bonded labour), such as the Gujarat halpati system (Breman, 1974) and the Karnataka jeeta system.
- Although such practices are abolished legally, they still exist in many areas. in an exceedingly village of northern Bihar,the majority of the landowners are Bhumihars, who are the dominant caste.

4.2.7 Migration Reasons / Trends

- People move from rural areas to urban areas within the country because of the lower income in their areas.
- Younger generation move to places where better education opportunities and better job opportunities are available.
- Lack of rural development, declining public investment in agriculture create a crisis for rural people, whereas urban areas offer higher prospects for jobs and self employment.
- Migration take place due to various reasons and they may vary from place to place and with various demographic characteristics, but the fact is that people migrate from rural to urban areas in order to get theenhanced lifestyle and to upgrade their livelihood.

4.3 Data collection of Navapura (Photograghs/Charts/Graghs/Tables)

4.3.1 Describe Methods for data collection

- Data collection is carried out in the following two stages:
  1. Primary data coolection
  2. Secondary data collection

- **Primary data collection:** It includes the visit of the allocated village, overview of the village, the collection of the data like population and village map. The meeting was organized for the Techno Economic Survey with the Sarpanch, Talati and the members of Panchayat by us.
- **Secondary Data Collection:**This includes Techno Economic Survey, in which the data like demographic details, geographical details, physical and social infrastructure details, and additional information were collected. We held a meeting with the Sarpanch, Talati and the members of the Panchayat and interviewed the villagers about the existing village condition and the scope for the development.

4.3.2 Primary details of survey

The data like demographic details, geographical details, physical and social infrastructure details, and additional information were collected.

4.3.3 Average size of the House - Geo-Tagging of House

- Average size of the house in Navapura is 5m X 7m.

4.3.4 No of Human being in One House

- Around 4-5 persons live in one household in Navapura.

4.3.5 Material available locally in the village and Material Out Sourced by the villagers

- The village contains the buildings made up mainly from RCC and bricks. The materials like wall finishes and timber are outsourced in the village.

4.3.6 Geographical Detail

Table 4.3 Physical Growth

Sr no.	Description	Information/Detail
1	Area of village (approx.)	452-36-58 hectare
2	Agriculture land (approx.)	308-14-41 hectare
3	Residential area (approx.)	79-09-76 hectare
4	Waste land (approx.)	6-13-10 hectare
5	Other (approx.)	58-99-31 hectare
6	Coordinates for location	22°51'04.3"N72°29'59.1"E

4.3.7 Demographical Detail - Cast Wise Population Details / Which ID proof using by villagers

Table 4.4 Demographical details (Caste wise)

Sr. No	Total population	SC (Female)	SC (Male)	ST (Female)	ST (Male)
1	3756	129	128	7	9

4.3.8 Occupational Detail-Occupation wise Details/Majority business

Major occupation groups in the village:

1. Farming / Agricultural
2. Animal Husbandry
3. Private Sector

4.3.9 Agricultural Details / Organic Farming / Fishery

Major crops grown in the village:

1. Paddy
2. Millet
3. Wheat

4.3.10 Physical Infrastructure Facilities - Manufacturing HUB / Ware Houses

- Currently there are no manufacturing hub or ware houses in the village.

4.3.11 Tourism development available in the village for attracting the tourist

- A pond of the village can be developed as a tourist attraction.

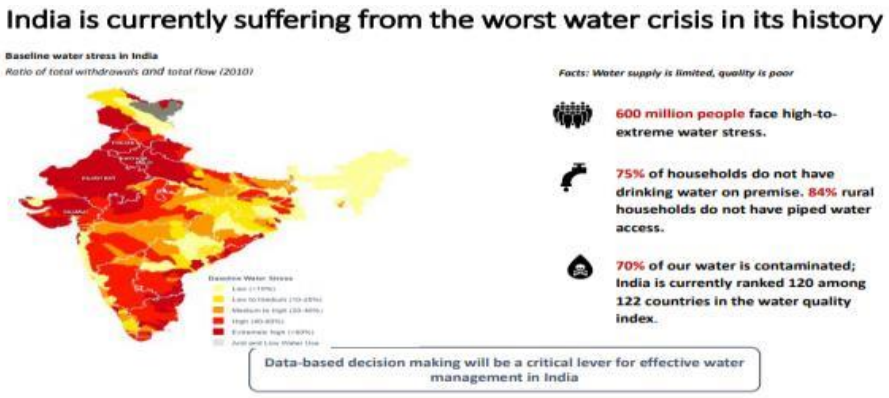
4.4 Infrastructure Details (With Existing Village Photograph)

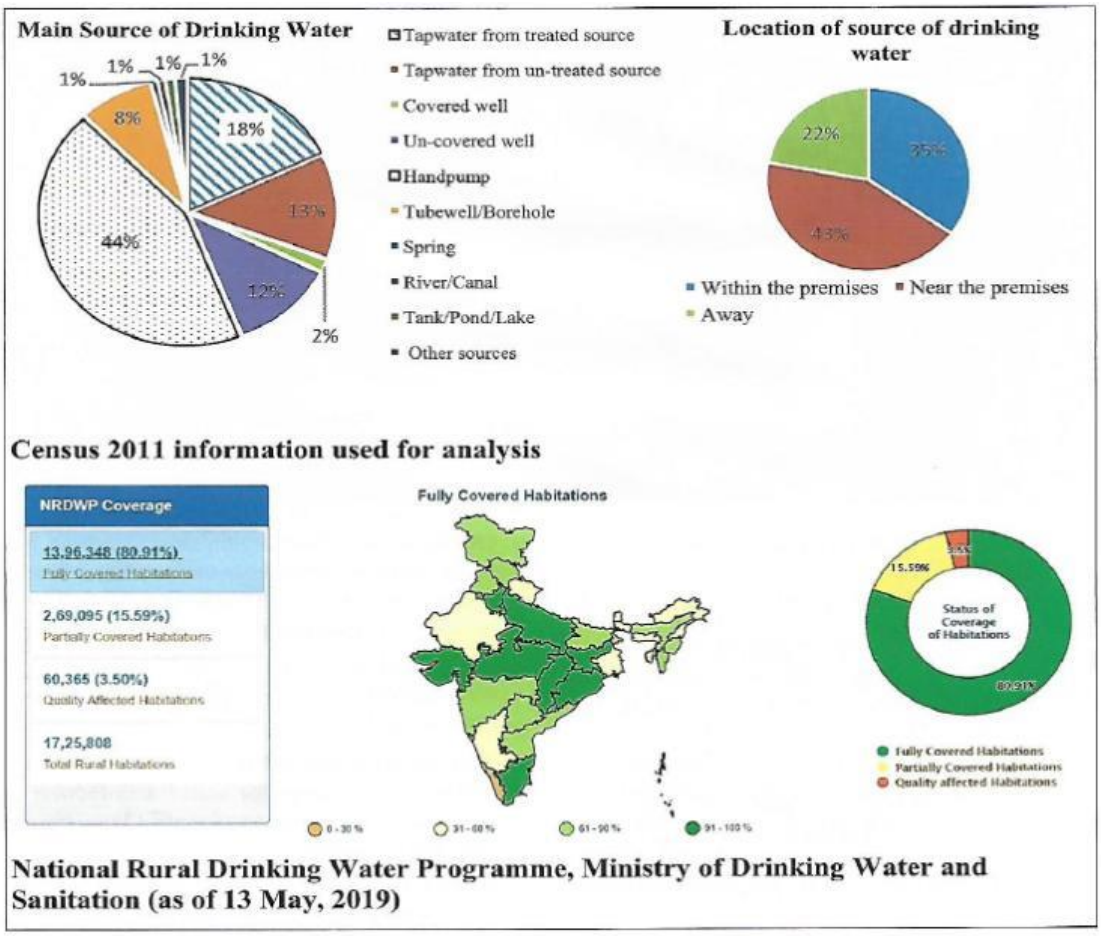
4.4.1 Drinking Water / Water Management Facilities

- The main source of the drinking water in the village is the sump which collects water from the underground aquifers and this water is supplied to the households through pipelines. We have not conducted any check on the quality parameters of the water, but villagers informed that it does not satisfy the standards.
- Because this village is situated in the vicinity of the metro city Ahmedabad, Navapura has a small private factory which supplies the mineral water at a rate of 15₹ per can. While interviewing, we got to know that a few years ago, they used to drink the water collected in the well but as time passed, it deteriorated.

Drinking Water situation in Rural India

- Supply of good quality water in adequate and healthy sanitation practises in rural areas is related to people's health and economic well-being. Water is not only necessary for drinking and cooking, but also for hygiene.
- Goal 6 of the Sustainable Development Goals 2015-2030 highlights the importance of ensuring access and sustainable water and sanitation management.
- Rural regions in India, which mainly have agricultural and domestic water requirements, face many challenges, such as water pollution and reduced availability of land, etc. Arsenic and fluoride pollution is very high in certain regions of the world.





4.4.2 Drainage Network / Sanitation Facilities

- Most of the households are connected to the sewers and the waste water is discharged directly into the lake, which need not to be done. This has created many ill effects like, the whole lake is contaminated, it produces odor, and has also disturbed the ground water quality.

Water supply and sanitation in India

- The availability of water and sanitation in India has increased considerably since 1980. Today, many people do not have access to clean water, toilets and waste systems. Various government initiatives at national state and neighbourhood level have brought about rapid changes in sanitation and drinking water supply. These numerous projects are still underway.
- In 1980, rural sanitation coverage was measured at 1% and reached 95 percent in 2018.
- Around the same time, it is seen that local government organisations responsible for infrastructure management and maintenance are weak and lack the financial support to fulfil

their functions. In addition, only two Indian cities have continuous sources of water and about 8 percent of Indians still lack access to better sanitation facilities, according to the 2018 survey.

- In India, Approximately 48.6 per cent of households in rural areas and approximately 57.5 percent in urban areas had exclusive access to the primary source of drinking water. Approximately 87.6 per cent of households in rural areas and approximately 90.9 per cent of households in urban areas had ample drinking water from the primary source in the year.
- Approximately 58.2 per cent of households in rural areas and approximately80.7 per cent in urban areas had in-house drinking water facilities.

4.4.3 Transportation & Road Network

- 95% roads in the village of the total road network are all weather roads and paver blocks are also used at many places. Most of the roads are in good condition, but they need timely maintenance. Water logging is one of the few reasons behind the poor physical condition, but still this village has a better picture as compared to other parts of India.
- There is no public transportation available currently and people use private vehicles for conveying. The village is situated at 1km distance from the SH 142, and the approach road is made up of the flexible pavement which also needs to be repaired.

Rural Road Infrastructure in India

- As per the 2011 census, rural areas account for 69 percent of India's total population. Therefore, improved connectivity and accessibility to rural areas will provide a significant impetus to the country's economic process. Development of rural infrastructure normally and rural transport infrastructure particularly is incredibly crucial in India.
- Rural road connectivity ensures access to critical services and opportunities, and fosters sustainable poverty reduction programs additionally as employment generation through industrialization in rural areas. it's estimated that 20-30 percent of the agricultural, horticultural and forest produce gets wasted due to either inadequate rural road network or poor condition of roads, which creates an impedance for transporting such commodities for the user needs.
- Rural road accounts for 60 percent of the entire road length in India. While the overall rural road length was only 3,54,530 kilometres in 1970-71, it's increased to about 24,50,559 kilometres in recent times.

- Furthermore, research suggests that public investment in infrastructure, specifically within the rehabilitation of rural roads, improves local people and market development.
- Although, studies on Indian rural roads are almost non-existent. Against this backdrop, this study analyses some past trends and present practices associated with rural transport in India. additionally, the study investigates the impact of rural road infrastructure development on socio-economic conditions of the agricultural population including the contribution to the state.

4.4.4 Housing condition

- The village consists groups of different economic classes of ultra rich to poor, hence there can be seen a vast difference between their lifestyles and living conditions. The poor, majorly from the SC, ST communities live in a simple Pucca house (some have kuchcha houses too) of 1 storey height and people of the prosperous class live in row houses or bungalows which are extended up to 4 storey.
- The materials which are mainly used to make residential buildings are cement, sand, aggregates, bricks, wood and stones.

Housing condition in rural India

- India‘s desire to become the world’s next big economic power is as real because the enormous challenges it faces in raising the social and economic well being of its rural populations consistent with Abraham George, founding father of The George Foundation, an NGO focused on poverty alleviation in South India.
- According to the Indian government and therefore the International Bank for Reconstruction and Development, but 30% of the state is poor, and 70% of the poor (225 million) board the villages. These official statistics are supported a per capita consumption expenditure of Rs. 356 ($8.70) per month, or Rs. 11.70 ($0.28) per day. This low yardstick grossly under counts the amount of poor people in rural India, and definitely doesn't reflect the living conditions for many of them.
- Development of nations is commonly judged by certain economic and social statistics compiled by national governments and major international agencies like the planet Bank and therefore the international organization.
- As an example, the GDP rate of growth now stands at 9.4% each year, far better than the but 4% experienced during the 1990s. life at birth has now improved to 64 years from 56 years 20 years ago; death rate has fallen to five.6% from 8.1%; grammar school attendance has risen to 74% from 65%, and also the adult literacy rate is 61% as compared to 50%, all during the identical period.

4.4.5 Social Infrastructure Facilities, Health, Education, Community Hall, Library

- Navapura lacks in the social infrastructure facilities like PHC, library and community hall. It doesn't have any PHC which is the highest demand of the villagers, it doesn't have any library too which is also a big concern. We will propose one PHC and a library in our report.

- The real India can be seen in Navapura where the gram Panchayat and anganwadi building need urgent repair, but the '7,8 temples' in one village are properly maintained and regulated, it proves that people don't know about social and economic welfare and they need to be aware.

4.4.6 Existing Condition of Public Buildings &Maintenance of existing Public Infrastructures

- Public buildings are not in good condition and need instant maintenance and repair.

4.4.7 Technology Mobile/ WIFI / Internet Usage Details

- There is no WI-FI facility available in the village currently, people are using their personal internet connection of private firms.

4.4.8 Sports Activity as Gram Panchayat

- The village does not have any playground for sports activities. The school contains a small ground in which the students can play games.

4.4.9 Socio-Cultural Facilities , Public Garden /Park/Playground /Pond/ Other Recreation Facilities

- Social and public infrastructural facilities need to be improved.

4.4.10 Other Facilities (e.g like foot path development-Smart toilets-Coin operated entry,self-cleansing, waterless, public building)

- There is no such facility available in the village currently.

4.5 Existing Institution like - Village Administration – Detail Profile

4.5.1 Bachat Mandali

- There is no Bachat Mandali available in the village currently.

4.5.2 Dudh Mandali

- There is no Dudh Mandali available in the village currently.

4.5.3 Mahila forum

- There is no Mahila forum available in the village currently.

4.5.4 Plantation for the Air Pollution

- People are not much aware about the usefulness of trees, and plantation programmes are not held frequently.

4.5.5 Rain Water Harvesting - Waste Water Recycling

- Currently there is no such facility available.

4.5.6 Agricultural Development

- Farmers are still cultivating in traditional manner, hence there is a vast scope of agricultural development in the village.

Chapter 5
Technical Options with Case Studies

5.1 Concept (Civil)

5.1.1 Advance Sustainable construction techniques / Practices and Quantity Surveying

Sustainable construction

- The practice of creating a healthy environment based on ecological principles is known as sustainable construction. The goal of Sustainable construction is to reduce the impact of industries on the environment by utilising sustainable development practices, employing energy efficiency and taking advantage of green technology.
- Although, in order to be more sustainable many different businesses sector are doing what they can able to do, the construction sector is unique because it has the capability to affect the way these practices are applied. This is because of the large amount of material and energy that the industry uses.

Principles of Sustainable Construction

- Sustainability is a dynamic concept. In order to achieve sustainable construction decision makers are required to be flexible and willing to modify their approaches towards the construction, it is very important to balance the basic principles of sustainability i.e. environment, economic and social aspect together.

Environment Aspect

- The environment aspects of sustainable construction are as follows:

- Increase material efficiency.
- Reduce material intensity.
- Enhance material recyclability.
- Control the use of dispersion of toxic materials.
- Reduce the energy required in transforming goods.
- Maximize the use of renewable resources.
- Consider the impact of projects on air, water, soil, plants and animals.

Economic Aspect

- The economic aspects of sustainable construction are as follows:

- Consideration of economic impact on local structures.
- Consider life cycle cost.
- Internalize external costs.
- Promote sustainable consumption by developing appropriate economic infrastructure.

Social Aspect

- The social aspects of sustainable construction are as follows:

- Promote public participation and development of appropriate institutional frameworks.
- Consider the impact of existing social framework.
- Access the impact on health and quality of life of people.

Some advance sustainable construction techniques:

- Green building.
- IoT Integrated Automated Building Systems.
- Synthetic Roof Underlayment.
- Grid Hybrid System.
- Passive Solar.
- Greywater Plumbing Systems.
- Electrochromic Glass.
- Solar Thermal Cladding etc.

Technique we want to introduce in our allocated village:

- **Green building**

➢ In broader term, green building concept involves a building which is designed, built, operated, maintained or used with objective to protect occupant health, improve employee productivity, natural resources sustainability and reduce the environmental impact.

➢ In other words the process of green building takes into account the environmental concentrations in to every stage of building construction. The process of green building focus on the design construction operation and maintenance phase and takes into account the building's overall impact on the environment.

Source:https://constructionclimatechallenge.com/2016/04/26/trends-that-are-shaping-the-future-of-green-building/

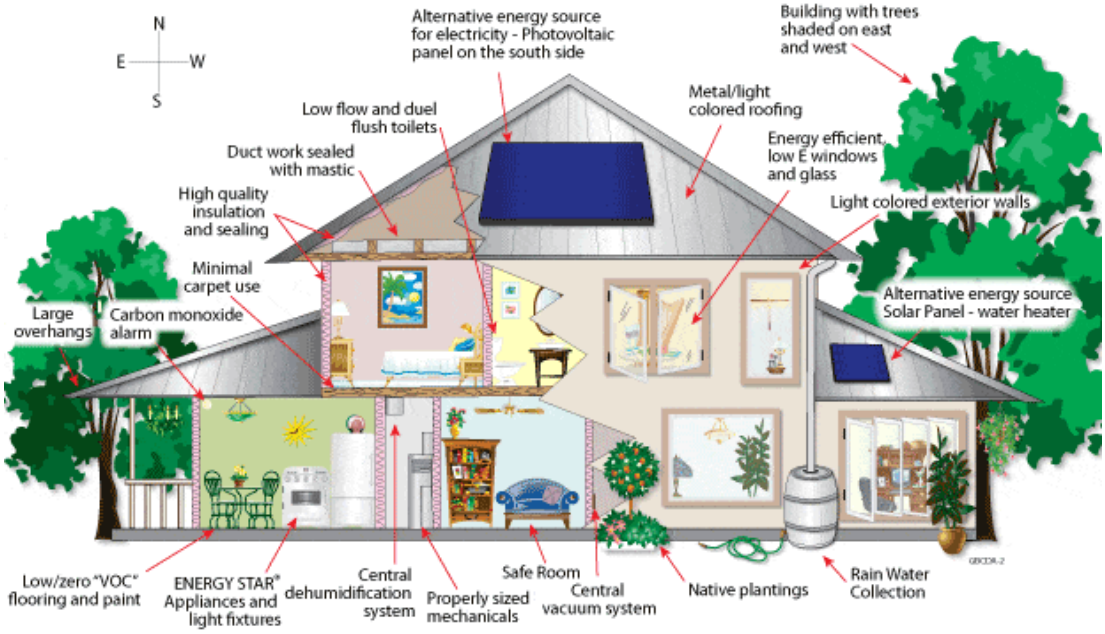
➢ The first step in the design of green buildings is the selection and use of eco-friendly material with better features then the traditional building material. The building materials are usually selected from functional technical and financial requirements.

➢ However in the last few decades the sustainability is a crucial issue and the building sector directly or indirectly causing a considerable portion of environmental deterioration and can take up the obligation to contribute to sustainable development by finding more environmentally friendly methods of construction and building.

➢ The solution of the above problem is found in new material applications recycling and reuse of used materials or use of green resources which is the right way for builder to design a sustainable

building. There for selection of construction materials that have minimum environmental impact is useful in the sustainable construction.

- Among the directions for solutions is to be found in new material applications, recycling and reuse, Sustainable production of products or use of green resources, Careful selection of eco-friendly sustainable building materials may be the fastest Way for builders to start integrating sustainable design concepts in buildings. Therefore, Selection of construction materials that have minimum Environmental burdens is useful in the sustainable development of a nation.
- The purpose of this paper is to highlight how sustainable building Material can contribute to lessen the impact of environmental degradation, and generate healthy buildings which can be sustainable to the Occupant as well as our environment.



Source:https://theconstructor.org/building/what-makes-a-building-green-green-building-concept/7327/

Use of Green Building Materials

- Perhaps the most popular sustainable construction technique is the use of green building material. These are materials sourced from renewable sources and are also recyclable when the building has reached its lifespan.
- Green building materials are typically sourced from sustainable forests (such as timber forests). They can also be produced from innovative manufacturing processes that reduce harmful emissions to the atmosphere.
- Concrete and steel are two examples of materials that are now being produced via eco-friendly manufacturing processes. Through the use of sustainable building materials, new structures will have a lower carbon footprint and better energy efficiency. The amount of waste that ends up in landfills is reduced if the building needs to be renovated/demolished in the future.

❖ Case studies:

1. Suzlon One Earth –Pune, India.

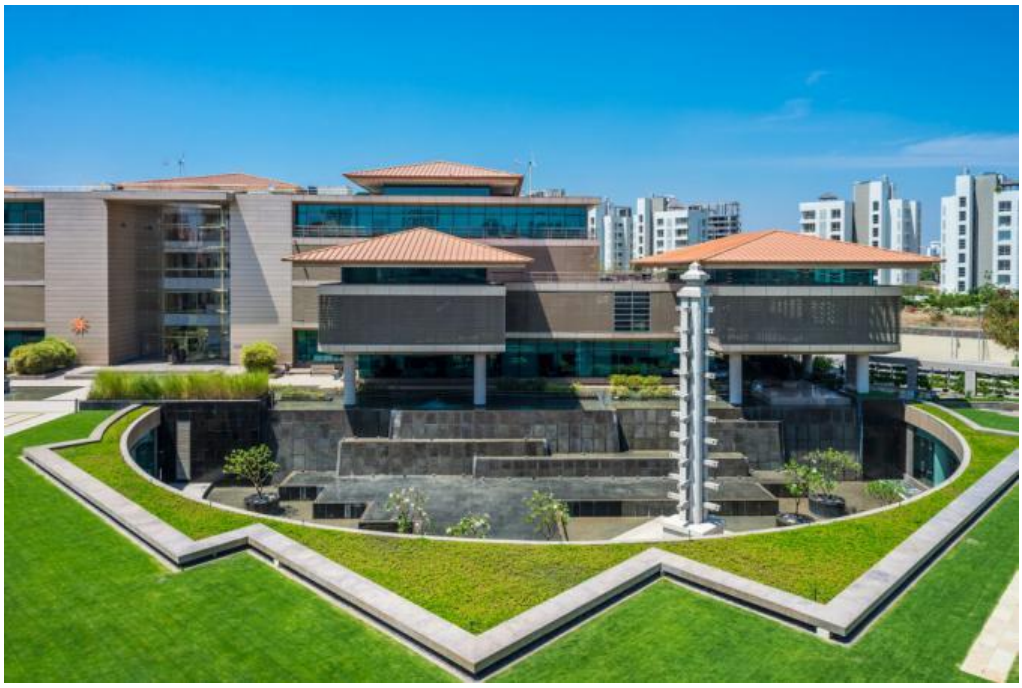
- Suzlon Energy Limited14 pledged to create the greenest office in India. The building is three levels high and is located on 10.5 acres. It achieved LEED for New Construction Platinum

certification from the India Green building Council, as well as Five-Star GRIHA(Green Rating for Integrated Habitat Assessment)certification.

- 5% (154 kilowatts) of its annual energy is generated on-site through conventional and building-integrated Photovoltaic panels (20%) and wind turbines (80%). All balance energy required for the campus is generated Through Suzlon's off-site wind turbines, making One Earth technically a zero energy project.
- Drawing clues from vernacular architecture while respecting nature and culture, the design provides 90% of The work stations with daylight and external views, allowing inhabitants to enjoy seasons and weather Conditions, and to connect with the time of the day. Aluminium louvers act as a protective skin, allowing Daylight and cross-ventilation.
- Energy is saved by employing LED lighting systems and solar water heating. 100% of sewage grey water is recycled into flushing, landscaping and air cooling systems, while 100% of Rainwater is harvested. Glass exhaust chimneys with tropical plants act as visual connectors between all Floors and allow aeration of the basement parking area.
- The focus of the complex is a central courtyard that Features a forty-metre traditional obelisk reaching out to the sky from the basement and a waterfall facing a Crescent cafeteria. This central garden plaza encourages communication, informal interaction and team Gathering amongst Suzlon's more than 1500 colleagues and provides a visual presentation for occupants And visitors.
- This corporate campus is a counterblast to prevailing glass-box architecture occurring across India and is a game changer in terms of how corporate campuses have been designed to-date in India.
- The project site was selected for the advantages of an already-developed area. It is flanked by offices of Other corporations and a high-density residential area. Given its location, the building has accessibility to Urban infrastructure and facilities, public transport, and established infrastructure for power and water Supply.
- Suzlon One Earth is a 100% renewable energy campus with both on-and off-site renewable energy that Includes wind and solar. 100% of outdoor lighting and the communication server are run on renewable Energy resources. Energy efficiency is also met through intelligent lighting occupancy sensors, efficient Envelope design featuring high-performance glazing, over-deck insulation, reduced interior light density and Day lighting optimization made possible through the use of glass cylinders and open interactive bays.
- In terms of water usage, 100% of wastewater is recycled by an on-site sewage plant and used for Landscaping, air conditioning and washroom flushing. Site landscaping features native and adapted plant Species combined with pebble drains to collect excess water.
- Together, these strategies drastically reduce Storm-water run-off. Inside, low-flow faucets, touchless urinals with bytronic sensors and concealed dual-Flush toilets conserve water.
- Around 80% of materials used in construction were regional materials from within a radius of 800 Kilometres. Additionally, around 10% of the materials are rapidly renewable, such as bamboo. 85% of Construction waste was recycled.
- To address indoor environmental quality, CO2 sensors were installed in densely-occupied spaces and near Workstations. The heating, ventilation and air conditioning (HVAC) system was designed for 30% higher Ventilation rates than American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standards.
- Suzlon One Earth strives for its occupants to be environmentally aware, socially responsible and compatible With the built space. The Synefra project team, along with the Suzlon Human

Resources team, conducted Pre-occupancy education programmes to orient tenants to the facility and explain the norms that would Need to be adopted. Suzlon has identified various processes to recognize and develop human behavioural Skills to understand and appreciate the inter-relationship between man and his biophysical surrounding, And has modified its policy at One Earth to match the infrastructure.

- The project is based upon the principle of promoting awareness about sustainability, to the extent of even Declaring the entire campus anon-smoking zone, which led many employees to drop their age-old smoking Habits. The campus is used as a communication tool to portray the interdependence of the natural and Man-made environments. Among the various communication strategies adopted at Suzlon One Earth are Green design education, green signage and green tours. The end result is an inter-disciplinary human Resource that learns about and from the environment on a continuous basis.



Source:https://www.architectural-review.com/buildings/suzlon-one-earth-pune-india-by-christopher-benninger

2. Infosys BPO Limited, Jaipur, India

- The building housing Infosys BPO Limited, the business process outsourcing subsidiary of Infosys Technologies Limited, in Jaipur, India, has a LEED Platinum rating. Built on a total floor area of 330,000 Square feet, the Infosys BPO building is one of the largest platinum rated buildings in India.
- The building was Conceived and built with a holistic approach to sustainability in five key areas: sustainable site development, Water saving, energy efficiency, materials selection and indoor environmental quality. This building is Expected to consume 30% less energy as compared to the base case building, as per ASHRAE 90.1-2004 Requirements.
- Salient features of the Infosys BPO building in Jaipur include:

i. Efficientbuilding envelope: a high performance building envelope consisting of insulated walls and Spectrally selected windows with a low window to wall ratio, reduces the total heat gain in the building.

ii. Efficient lighting & equipment: a lighting design specification of 0.65 watts per square foot achieves a 40% improvement over traditional designs. Lighting design coupled with the use of 5-star rated, energyefficient computers reduces the energy load as well as internal heat gains.
iii. Efficient air-conditioning: the air-conditioning system is equipped with multi-stage air handling units which operate on free cooling, evaporative cooling and air-conditioning modes during nights and winter, achieving more than 30% efficiency over a traditional system.
iv. Onsite renewable energy: a battery-free 250 KW roof top solar photovoltaic installation meets 7.5% of the total power requirement and takes advantage of the high solar insolation in Jaipur.
v. Low energy materials: 13% of the total material isrecycled material, thereby reducing virgin material exploitation. 80% of the total material is manufacturedlocally and over 59% of this material has also been extracted regionally, thereby reducing pollution due to transportation.
vi. Water sustainability: 57 interconnected recharge wells have been built across the campus to capture & Sequester every drop of rain water. Low flow dual-flush toilets, sensor based urinalsand other water efficient fixtures have been provided, reducing water consumption by over 40%. Sewage water is treated in a state-of-the-art Membrane Bio Reactor (MBR) plant and reused for flushing and air-conditioning. 100% of the water required for landscaping is from treated water and no potable water is used.

Remark:

- There is no such type of building(green building) in our allocated village so we are willing to introduce this technique in our allocated village(Navapura)for sustainable future development. This technique help the villagers use natural resources in a optimised way. This will also help them to improve their lifestyle and living standards.

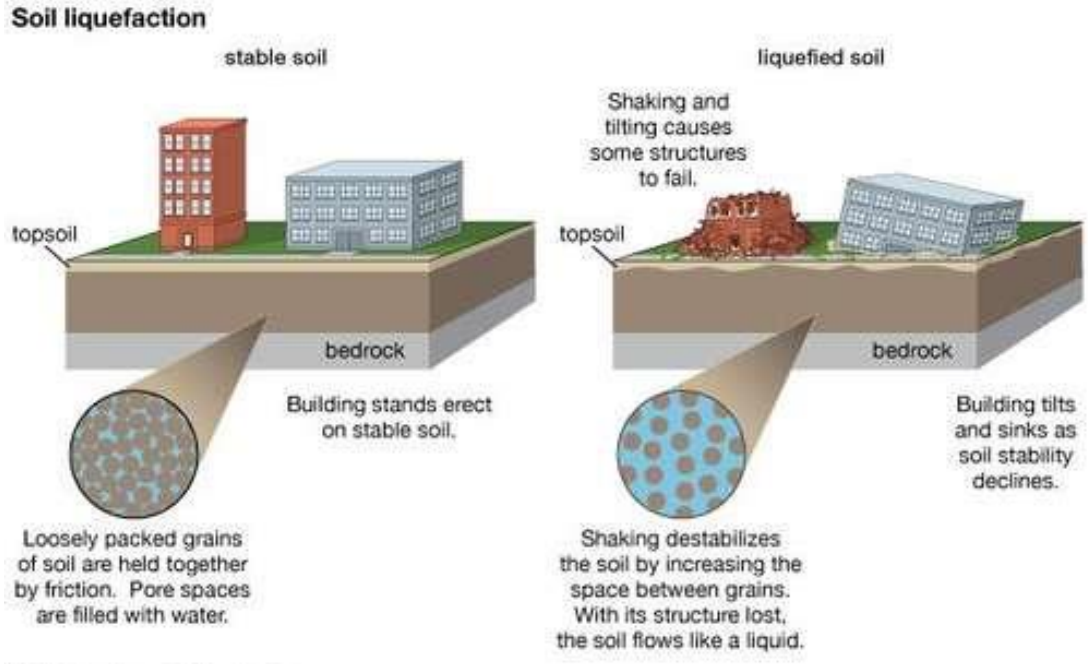
5.1.2 Soil Liquefaction

- Liquefaction is the phenomena when there is loss of strength in saturated and cohesion-less soils because of increased pore water pressures and hence reduced effective stresses due to dynamic loading.
- It is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction occurs in saturated soils and saturated soils are the soils in which the space between individual particles is completely filled with water.
- This water exerts a pressure on the soil particles that. The water pressure is however relatively low before the occurrence of earthquake. But earthquake shaking can cause the water pressure to increase to the point at which the soil particles can readily move with respect to one another.
- Although earthquakes often triggers this increase in water pressure, but activities such as blasting can also cause an increase in water pressure. When liquefaction occurs, the strength of the soil decreases and the ability of a soil deposit to support the construction above it.
- Soil liquefaction can also exert higher pressure on retaining walls, which can cause them to slide or tilt. This movement can cause destruction of structures on the ground surface and settlement of the retained soil.

Cause behind liquefaction

- It is required to recognize the conditions that exist in a soil deposit before an earthquake in order to identify liquefaction.

- Soil is basically an assemblage of many soil particles which stay in contact with many neighbouring soil. The contact forces produced by the weight of the overlying particles holds individual soil particle in its place and provide strength.
- Occurrence of liquefaction is the result of rapid load application and break down of the loose and saturated sand and the loosely-packed individual soil particles tries to move into a denser configuration.



Source:https://www.geotech.hr/en/soil-liquefaction/

- However, there is not enough time for the pore-water of the soil to be squeezed out in case of earthquake. Instead, the water is trapped and prevents the soil particles from moving closer together.
- Thus, there is an increase in water pressure which reduces the contact forces between the individual soil particles causing softening and weakening of soil deposit. In extreme conditions, the soil particles may lose contact with each other due to the increased pore-water pressure. In such cases, the soil will have very little strength, and will behave more like a liquid than a solid -hence, the name "liquefaction."

Case study of Bhuj earthquake (2001):

- A powerful earthquake rocked the western state of Gujarat in India at 08:46 hours (Indian Standard Time) on the 26th January 2001. The earthquake was estimated by USGS to have a Moment Magnitude of 7.9.
- The epicentre was reported to be near a major town called Bhuj in the Kachchh region of Gujarat.Initial reports in the media indicated extensive damage to the civil engineering structures followed by reports on loss of life on a massive scale.
- This region is known to be seismically active and has seen a majorearthquake in 1819 which had a similar magnitude to the current earthquake. That earthquake occurred along the Allah Bund fault and resulted in a major uplift of the ground surface. Ground movements of up to 9m vertically and 3.5m horizontally were reported by Bilham (1998) to have occurred due to that

earthquake. More recently a major earthquake of Moment Magnitude 7 occurred with its epicentre close to Anjar in 1956.

- In India, damages due to liquefactionon a large scale were noticed during 26 January 2001 Bhuj earthquake (Mw-7.6). Historically ground failure due to liquefaction was not well reported in India. However, a few case studieson paleo liquefaction show evidence of liquefaction in India in historic times.

Extent of earthquake damage

- The earthquake occurred in the early hours of Friday, 26th January 2001 at 08:46 hours Indian Standard Time (IST). This was the Republic day in India, which is a national holiday.
- However, schools were open due to the Republic day celebrations and several children were injured due to the collapse of school buildings. The extent of earthquake damage was immense.
- The large magnitude of the earthquake combined with the poor construction quality contributed to large scale damage to the building stock and a high number of casualties.

Source:https://indianexpress.com/article/opinion/columns/gujarat-earthquake-bhuj-quake-republic-day-4493438/

Type of damage	Extent
Number of casualties	20,000+
Number of injured	167,000
Estimated cost	5 billion US$
Number of buildings destroyed	~ 300,000
Number of buildings damaged	~ 700,000
Number of earth dams damaged	14
Area involved in landslides	~ 10,000 km2
Area involved in soil liquefaction	~ 10,000 km2

*Information collated from local newspapers

NON-STRUCTURAL PROTECTIVE WAYS AGAINST SEISMIC FORCES

a) Soil Densification

- Soil densification is the most common technique used to make soil liquefaction resistance and to increase its strength by employing techniques that can make it dense. Basic techniques used for liquefaction resistance are Vibratory and Dynamic techniques.
- Vibratory Compaction, this technique make the use of two Equipment's that is vibroflotation and vibro probe, but these Are only effective up to the depth of 30 meters. Vibroflotation(Vibratory compaction technique), this Technique involves the use of vibroflot of 2m diameter fitted With jet at top and bottom, which slowly percolates into the Soil by creating momentary quick sand conditions. Horizontal Vibrations are developed by the use of a rotating eccentric Mass and a tube is connected to of required depth to reach the Desired depth.
- This method is employed in grid pattern and Compact soil mass of 1.5m radius around the hole. Rising and Back filling is done at same time.Vibro probe(Vibratory compaction technique), this is Similar to vibroflotation method in terms of operation.
- It Consists of open tube, about 75 cm diameters, vertical Vibrations are given by vibratory pile and sometimes water Jet is also used to speed up the work. This method is effective Up to depth of 20m and radius of 1.5m. Dynamic Compaction, in this heavy weight of 6 to 36 tons Is dropped from the height of 12 to 40m in order to make the Soil dense.

b) Dissipation of pore water pressure

- Studies suggest that high water table is mainly responsible for liquefaction in soil, so it becomes extremely important to dissipate that pore water pressure. This mainly done by vertical sand drains or sand wicks, in this a hole is made into the soil which is filled with permeable material, in order to increase its permeability.Firstly, mandrel is putted into the soil with the help of hammer, after which sand drain is constructedwith help of geo-synthetic rope.Diameter of hole varies from 15-30cm, and spaced 2 to 3m apart.

c) Lowering the Ground Water Table

- Water is the main element that gives rise to liquefaction, so one must lower ground water level in order to minimize liquefaction failure. A number of techniques have been developed out of which deep wells are most popular and ditches are also used sometimes.
- Level of ditches is kept more than the level of work for proper penetration and pumps are installed at suitable locations to remove collected water. One of the limitations of this method is that it cannot be employed for clay soil. A single stage wellpoint is the elementary type but now a day's multistage well point is used and it is effective to a depth of 6 meters and above.

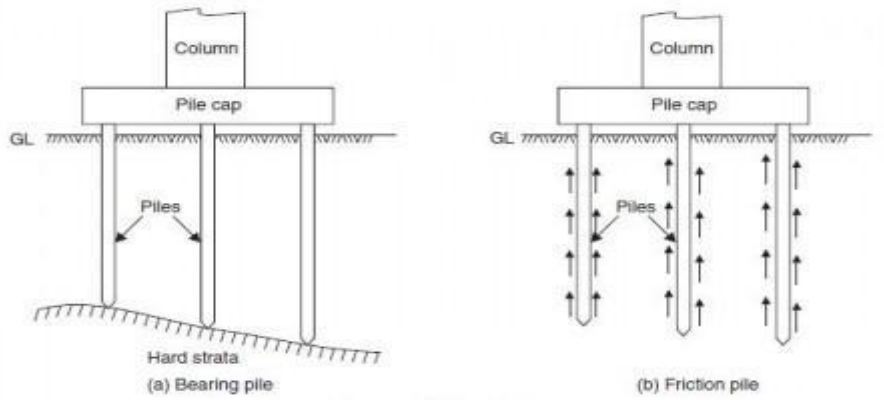
d) Shear Strain Method

- In this method diaphragm walls areconstructed to increase the performance of soil. This wall is made up of reinforced concrete, bentonite slurry is also used during excavation to support trench. Basically, 7 meter panel lengths are used but there length can vary according to the type of soil.
- Excavation is done by loading reinforcing cage filled with slurry for panel construction. After which, trench is filled withconcrete by using trench pipes.0.50m, 0.60m, 0.80m, 1.00m and 1.20m of diaphragm walls are most commonly used.

STRUCTURAL PROTECTIVE WAYS AGAINST SEISMIC FORCES

a) **Pile Foundation**

- A pile is something which is pushed into the ground and a superstructure is built on it. Wooden, concrete or steel are commonly used for the manufacturing of piles in the shape of long cylinder.
- There are mainly two type of pile foundation i.e. End bearing piles, in this case, pile is driven through loose soil to make its lower end rest on strong strata. By this mean load is transferred onto strong layer, by passing the weak layers.Friction piles, in this case, the load are transferred by friction.



Source:https://www.civilengineeringx.com/foundations/pile-foundations/

b) Revetments

- These are constructed on the banks of river to stop the percolation of water which affects the conditions favouring liquefaction.

Source:http://cdr-international.nl/investigation-and-design-study-of-revetment-remediation-works/

- Revetments make the slope of river bank stable to a great extent,and improve the stability of structures and building during earthquakes.

CONCLUSION

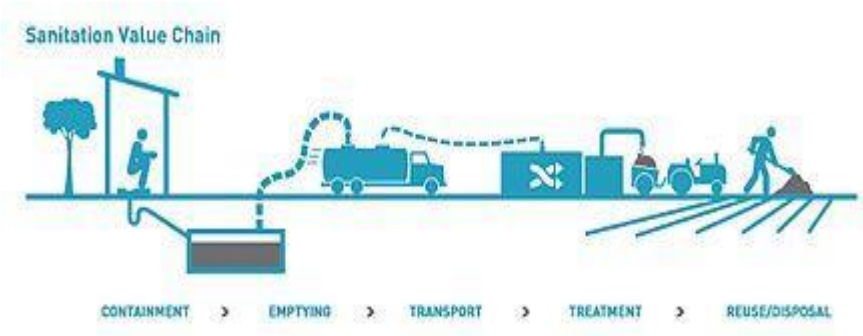
- These methods can be applied, if someone encounters highly susceptible to avoid liquefaction failure. As water is the chief element for liquefaction, so one should firstly apply dissipation of pore water pressure and lowering water table to decrease water content in soil mass.

Remark:

- There is no such problem faced by villagers of Navapura Village.

5.1.3 Sustainable Sanitation

- Sanitation is one of the most important aspects of community well-being because it protects human health, extends life spans, and is documented to provide benefits to the economy.



Source:https://en.wikipedia.org/wiki/Sustainable_sanitation

- Sanitation (e.g. toilets, latrines, mechanized wastewater treatment) is currently deployed as a way to contain and/or treat human excreta (and in some cases grey water) to protect human health and the environment.
- Sanitation means the study and application of procedures and measures designed to protect public health, as in the provision of clean water and the disposal of sewage and waste.

Issues and Challenges in Rural sanitation:

- Rural sanitation in India has been facing numerous challenges. The sheer scale of around 600 million people practicing Open defecationhas been a major challenge.
- As India is striving to be open defecation, there are issues and challengeswhich continue to be tackled by successive sanitation programmes.
- Some of them are as follows:

1. Coverage of toilets does not translate to usage of toilets.
2. Variability of location-specific issues and hence solutions would also be different.
3. Lack of water supply for toilets
4. Improper solid and liquid waste management
5. Inadequate human resources
6. Inappropriate toilet technologies
7. Integrating WASH solution for health: Unhygienic conditions and practices
8. Discrepancies between reported data and ground realities.
9. Long-term sustainability of interventions through strategies and plans for community ownership (of resources)
10. Gender Considerations

- A sustainable sanitation service is generally understood to be a system that is affordable to the community and the local government over a long term period without having adverse effects on the environment.
- Thus:Pollution is reduced to a minimum and water resources are available for future generations; and Where affordability refers to the community and the local government's ability to operate, maintain, extend and replace the infrastructure to obtain a reliable service.

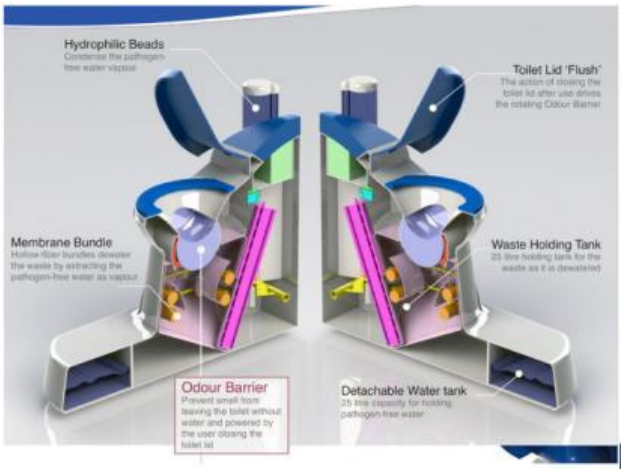
Some technologies that have helped keep Sanitation Sustainable:

1. Water-less toilets:

Source:https://www.triplepundit.com/story/2017/madagascar-waterless-toilet-may-provide-global-solution/16636

- A poverty struck continent that is struggling to keep hold of resources for the coming generation, the idea of water-less loo works fabulously. It is the perfect cost-effective solution considering the local circumstances.
- The technology is used in East-Africa's urban slums, with an incentive that invites more and more civilians to use it. The toilet collects the waste, which is converted into nutrient rich organic fertilizer, which is then sold to the local farmers. Completing the loop of sustainable activity.

2. Energy Generating Toilets:



Source:https://www.globalconstructionreview.com/innovation/power-generating-super-toiletdoesn7t-ne7ed7-mai7ns

- The waste is collected in a biodegradable film by a simple and efficient sealing technology. Exploiting the simple biological process of Anaerobic Digestion, which is basically the process of organic waste consumed by microorganisms in an oxygen-free environment, the toilet ends producing energy in the form of biogas.
- The waste is also used to produce fertilizer for plants. The Anaerobic Digestion leaves the waste in a semi-liquid form, which is then used as manure for planted crops. This was a technology that was experimented with in Madagascar.
- It turned out to be efficient, convenient, odourless, clean, and produced by-products that would give the locals an opportunity to earn profits.

3. Dehydrating Toilets:

- Dehydrating toilets are those that separate the liquid and solid waste.The container is primed with coconut husk which absorbs any liquid that falls in it. This allows the solid matter to remain dry and odourless.
- To help the decomposition process, the matter is stirred briskly. To keep the smell out, the unit has an integral fan that pulls the moisture out of the space, keeping it dry and odour-free. Such systems are mainly suitable for regions with higher average temperatures, long dry and short rainy seasons or arid climatic conditions with high evaporation rates.
- When human waste is dehydrated, the mass and volume are greatly reduced and the pathogens are starved of moisture. Urine source separation combined with dehydration of the solids can reduce the amount of waste by 90%.

4. Dry Toilet:

- The Humanure Inspired by Joseph Jenkins book, The Humanure Handbook, this toilet isn't technologically advanced, but instead depends on individual effort.Itis essentially a wooden box, with a plastic bucket within, and a toilet seat on top.
- There is also a bag of sawdust that is kept next to the unit. After you do your business, scoop the sawdust and cover the matter completely with it to avoid the foul smell. The plastic bucket is replaced every few days, whenever required and the matter is taken to the on-site composting station where it is dumped in composting bins covered with more sawdust.
- The decomposition process takes its time to form the manure that can now be used in agricultural fields. While this process is not technologically modern, it educates the people about the step-by-step process of re-use and recycle that would be beneficial to them and the environment.
- Sustainable sanitation is an approach that will keep the environment clean, leading to hygienic living conditions in the community. With every region, the challenges would be different, and therefore various technologies help in curbing those hurdles and offering incentives to the local population to use these toilets instead of defecating openly.

5.1.4 Transport Infrastructure / system

- India is one of the fastest growing countries in the world after China and needs to maintain its growth momentum in a sustainable manner to improve its overall standard of living and reduce poverty.
- Investment climate surveys like doing business in India repeatedly show that the limited and poor quality of infrastructure facilities act as a major impediment to business growth in India.Sustaining economic growth in India depends on developing quality infrastructure network all over the country.
- High transaction costs arising from inadequate and inefficient infrastructure can prevent the economy maintaining the high growth rate and realizing its full growth potential in the medium and long-term.

Transport Infrastructure in India:

In this section, a comparative view of India's shipping infrastructure vis-à-vis other nations has been provided to do an worldwide benchmarking. Transport Infrastructure in India has a proportion of 6.four in line with cent in GDP and its call for has been accelerating over the years.

Roads

An critical element of shipping infrastructure is avenue shipping. The Table-8 gives a comparative image on avenue Infrastructure in India vis-à-vis different nations. The avenue duration in step with rectangular kilometer of land region is called density of roads.

	Road density (km of road per sq. km road of land area)			Paved Road (% total)			Goods Transported (million ton-km)			Energy Consumption (% total energy consumption*)		
	1991	2001	2007	1991	2001	2007	1991	2001	2008	1991	2001	2008
India	714	1008	1171	47.3	47.7	48.3	267000	615789	978234	7	6.1	6.2
China	123	151	360	34.2	40.2	49.6	321456	620050	1256788	2	4.4	4.8
Brazil	196	203	282	8.6	5.5	5.6	-	-	975420	21.5	22.9	22.7
Russia	54	32.80	35.3	75.8	NA	80.9	-	23300	199000	6.1	5.9	6.1
Malaysia	274	218	278	71.3	77.9	81.3	-	-	-	19.5	21.7	18.5
Korea	599	607	1020	76.4	76.7	77.6	341	565	12545	12.2	12.2	12.6
Singapore	4136	4453	4710	97.1	100	100	-	-	-	12.6	10	9
Japan	3060	3214	3166	70.1	77.1	79.3	283776	313072	346420	15.1	15.5	14.2

Source: WDI, Various Years

Notes :* % total energy used in the road sector to total energy consumption in the country.

It is clear from the desk that avenue density has been growing through the years in India. For example avenue density in India stood at 714 in step with squarekm of land region in 1991, multiplied to 1008 in step with squarekm at some stage in 1991 and stood at 1171 in step with sq. km in 2007. Infact, a few of the BRIC economies, avenue density in India is pretty high. In Asia, handiest nations specifically Singapore and Japan have a higher avenue density than India. However, maximum highways in India are slim and congested with bad floor quality, and forty percentage of India‘s villages do now no longer have get entry to to all-climate roads.

	Total Road Length (_000‘km)			Passenger Carried (million passenger-km)			Vehicle (per km of road)		Passenger Car (per 1000 people)		Per Capita Consumption (kt of Oil equivalent)		
	1991	2000	2007	1991	2001	2008	2002	2007	2002	2007	1991	2001	2008
India	2350	3316	3317	767700	2075700	725100	3	6.8	7.0	15	0	0	0
China	1230	1402	3583	-	720710	1150677	9	11.9	8	22.5	0	0	0
Brazil	1661	1724	-	-	-	78000	18	22	128	158.1	0.2	0.2	0.3
Russia	892	532	-	-	-	-	28.88	104	156	206	0.3	0.3	0.3
Malaysia	56	66	-	-		-	70	73.8	211	-	0.3	0.5	0.5
Korea	58	86	102	-	-	97854	145	160.6	205	248	0.2	0.5	0.6
Singapore	2	3	3.2	-	-	-	178	207	97	113	0.5	0.5	0.5
Japan	1115	1166	1196	869123	954294	905910	63	63.5	428	325	0.5	0.6	0.6

Source: WDI, Various Years

Railways

Rail density in India is the 0.33 maximum in Asia after Japan and South Korea.Railway density in China stood at 6.fifty one in keeping with cent in 2008 compared to India‘s 21.20 in keeping with cent. The railways were recording steady increase prices withinside the freight and passenger site visitors. Goods transported with the aid of using Indian railways are the second one maximum in Asia after China.Similarly, range of passengers carried with the aid of using Indian railways is likewise on par with China indicating that railways are an essential supply of transportation to the bulk of populations (See Table-10). Overall, the increase of passenger and freight site visitors in case

of India among 1991 to 2008 is considerable at the same time as rail density is at identical level. Over the years developing call for has caused creation of loads of latest trains at the identical tracks with nearly identical assisting logistics. This has led to a compromise on safety, hygiene and additionally common performance of Indian railways.

	Railway Density (km of road per sq. km road of land area)			Goods Transported (million ton-km)			Passenger Carried (million passenger-km)		
	1991	2001	2008	1991	2001	2008	1991	2001	2008
India	21.01	21.19	21.29	250238	312371	521371	314564	457022	769956
China	5.72	6.33	6.51	1094807	1424980	2511803	282484	463660	772834
Brazil	0.58	1.47	3.48	6346	15647	276700	2521	-	-
Russia	5.24	5.24	5.13	2325881	1433600	2400000	255000	158000	175800
Malaysia	5.07	4.97	5.067	1262	1531	1350	1849	1181	2913
Korea	31.8	32.22	34.88	14369	10492	11566	31454	29288	32025
Japan	55.56	55.36	55.00	26791	21950	23032	247031	241133	255865

Source: WDI, Various Years

Airways

Aviation Industry in India is one of the quickest developing aviation industries withinside the global. With the liberalization of the Indian aviation sector, aviation enterprise in India has passed through a fast transformation however a whole lot extra is favored on this essential mode of delivery infrastructure. Freight visitors of airlines in India expanded to 1233 million ton kms in 2008 compared to best 493 million ton kms in 1991. However, nations like China, Brazil, Malaysia, Russia, Japan, Korea and Singapore have a higher freight million ton-kms in contrast with India. Similarly, the wide variety of passenger carried via way of means of airlines in India become 49.nine million in 2008 vis-à-vis 191 million in China, 58.eight million in Brazil and 97.02 million in Japan. This additionally suggests that railways and avenue delivery withinside the united states of america are extra famous for a majority of Indian populace who belong to bad and decrease center class in which as developing center earnings populace has shifted to the use of air delivery which has created each call for and deliver of air offerings withinside the united states of america. India is likewise ranked way under different nations, especially China, Singapore and Japan in registered carrier departures global wide.

	Freight (million ton-km)			Passenger Carried (million)			Registered Carrier departures world-wide*		
	1991	2001	2008	1991	2001	2008	1991	2001	2008
India	493	515	1233	10.7	16.86	49.9	117500	206690	592292
China	1009	4232	11386	19.52	72.66	191	190300	840911	1853083
Brazil	1143	1467	1807	19.15	34.28	58.8	457700	654106	647753
Russia	890	897	2399	128.8	20.30	38		329925	522577
Malaysia	763	1775	2445	11.83	16.1	22..42	145800	169840	176549
Korea	3323	6827	8726	16.90	33.71	36.1	120100	228442	250260
Singapore	2179	5774	7981	0.8	16.3		35000	72431	823465
Japan	5185	7614	8173	7.8	107.8	97.02	495800	640328	695655

Source: WDI, Various Years.

Note: * denotes domestic takeoffs and takeoffs abroad of air carriers register in the country.

Ports

India has an intensive shoreline of 7517 km, except the Andaman & Nicobar Islands. Indian ports manage round 95% of the full quantity of country‘s outside exchange and approximately 70 in step with cent in phrases of value. India has 12 main ports and 2 hundred non main ports (minor and intermediate ports) unfold throughout nine (coastal) maritime states. Total shipment quantity in million tones dealt with with the aid of using Indian ports elevated from 156 million tones in 1991 to almost 834 million tones in 2008. Infact, the shipment dealt with with the aid of using Indian ports is the second one maximum in Asia after China. The boom of shipment quantity over time is certainly considered one among maximum amongst the international locations and there may be developing stress on the present port centers ensuing in excessive pre-berthing and cargo turnaround time. Similarly box site visitors has additionally elevated drastically because 1991 to attain 6623 TEU‘s (twenty foot equal units) in 2008. However, port infrastructure in India isn't always upto worldwide requirements and India is ranked at a negative one hundred and five in a hard and fast of nations managing port site visitors (See Table-12 for details). The modernization of Indian ports desires massive sources and time certain efficient management. According to the Global competitiveness Index posted with the aid of using the World Economic Forum, India is ranked forty nine at the pleasant evaluation of a variety of indicators (see Table-13).Specifically, inspite of regard to infrastructure, India is ranked seventy six with a rating of 3.46 indicating that there may be enormous scope for similarly improvement of infrastructure centers in India inclusive of shipping infrastructure to seize up with different economies.

	Total Cargo Volume (million ton)			Container Traffic (1000 TEU*)			Quality of port Infrastructure (1 =underdeveloped and 7=developed)			
	1991	2000	2008	1991	2004	2008	2007	Rank	2009	rank
India	156	281	834	367	4332	6623	3.49	80	3.47	105
China	1530	2212	6400	1506	52741	115061	3.98	66	4.28	6.5
Brazil	383	435	735	1345	5057	6879	2.63	116	2.65	144
Russia		180	454		1369	3303	3.69	72	3.55	100
Malaysia	112	324	510	1074	11510	15742	5.73	13	5.52	18
Korea	278	527	786	2571	14363	17774	5.51	20	5.10	39
Singapore	273	313	515	6354	21329	29918	6.83	1	6.78	2
Japan	331	317	378	8782	16436	18795	5.5	17	5.17	37

Source: WDI, Various Years

Note: * Port container traffic measures the flow of containers from land to sea transport modes and vice versa, in twenty-foot equivalent units (TEUs), a standard-size container.

Transport Infrastructure Development in Japan and Lessons for India

Japan has long gone thru levels of improvement beginning from the eighteenth century.During the pre-conflict duration, Japan had each levels of import-substitution and export merchandising however the universal boom momentum among 1880 to 1940 required improved quantities of infrastructure offerings. The improved visitors, each shipment and passengers, and call for for energy, necessitated Japan to border coverage for improvement of infrastructure offerings, mainly delivery infrastructure. The shipment visitors improved on a median of 8% for fifty years earlier than the conflict as compared to 10 % for the subsequent 30 years after the conflict (Yoshida, 2000). The

growth in shipment call for additionally witnessed the moving of delivery mode from transport to railways earlier than the conflict and from railways to roads after the conflict. The alternate in choice for mode of transportation can be attributed to converting unit pricing of delivery offerings due to technological innovation and needs. The basis of infrastructure improvement in Japan virtually commenced 50 years earlier than the World War II. The duration 1980 to 1940 witnessed massive funding in infrastructure and thereby growth in infrastructure inventory. Infact, the whole shipment visitors became maximum in the course of the pre-conflict duration, mainly among 1987-1904 and 1919-1938. The extent of visitors in keeping with unit of delivery infrastructure inventory became very excessive in those periods,mainly among 1919-1938. This displays that funding in infrastructure funding became call for prompted and there has been higher utililisation of infrastructure funding. The duration among cease of the sector conflict-II and 1955, each visitors and funding bogged down ensuing in sluggish down of infrastructure inventory. However, the submit conflict duration among 1955 to 1985 became the excellent duration for transportation region because it acquired the very best funding as compared to different infrastructure sectors. The funding in infrastructure region used to be among 1 to 2.five of GDP for 3 foremost infrastructure sectors inclusive of transportation, strength and telecommunication earlier than the conflict which improved to five to 6 % of GDP among the duration 1955 to 1985. The delivery infrastructure acquired the fundamental portion (3 to 4% GDP) catering to growing call for because of revolution in vehicle region and improved motion in each visitors and passengers throughout prefectures. The non-stop excessive funding on infrastructure in the course of submit conflict duration ended in big development in infrastructure offerings. However, the call for for infrastructure region bogged down after 1980 because of sluggish down withinside the universal economic system and moving of producing bases out of Japan. Overall infrastructure improvement in Japan became now no longer uniform withinside the preliminary levels of improvement. The scarce sources had been productively applied which created unequal improvement of infrastructure.

Development of Railways

Railways changed into more and more more the desired manner of transportation all through the pre-war period. The improvement of railways commenced from Meiji authorities which emphasised on the modernization and better performance in transportation zone thru railways. The first railway commenced in 1972 with the bonds issued in London marketplace thru Oriental Bank of London. Though Meiji authorities desired to construct delivery infrastructure, the difficult economic role all through 1977 because of south western rise up compelled them to create Japan Railways Company in 1881 with non-public capital.

Thereafter, non-public zone changed into the main riding pressure for railways improvement however authorities supported the non-public zone in many methods such as:

(i) authorities subsidy on hobby fee and assured internet income for first ten years;

(ii) unfastened income of presidency lands and shopping for lands on behalf of railway companies.

(iii) financial incentives like exemption taxes etc.

With a majority of these incentives and facilitation with the aid of using the authorities, non-public zone financing to railways and railways improvement below non-public zone changed into flourishing beginning from 1980. Since those services are without delay utilized by non-public zone, it changed into viable to levy person prices and toll fees relying upon the usages. This changed into an illustration for the non-public zone to get worried in the infrastructure tasks which might be beneficial to them in addition to they could cowl their fee of presenting infrastructure services.

Road Sector

Roads region in Japan became specifically controlled with the aid of using the general public region aleven though the authorities allowed toll roads in 1871. This made manner for personal region funding in toll roads and bridges. The toll expressways are specifically below the jurisdiction of Japan Highways (JH) Corporation, which became hooked up in 1956. The JH took the function of presidency to assemble country wide toll highways and gather tolls. JH loved robust help from country wide authorities in styles of tax exemptions, toll collections strength, strength of obligatory land acquisition and monetary assist withinside the shape of presidency bonds and assure to bonds.However, JH‘s behavior of enterprise became well supervised with the aid of using country wide authorities, especially with the aid of using ministry of Land, Infrastructure and Transport. Earmarked budget for street development had been added withinside the center of fifties which acted as a prime fund raising channel for street creation. Till very recently, the street region, generally tolls roads, are controlled with the aid of using the general public region such JH, Metropolitan Expressway Public corporation, Hanshin Express manner Public Corporation etc. Unlike different evolved nations Japan does now no longer have a unified roads gadget with the aid of using which personal region handles the whole thing from creation to operation. However, authorities has created an surroundings in which in efforts were given for conventional get right of entry to to move infrastructure throughout areas either with the aid of using public region or thru giving incentives to personal region. Similar to railways and roads, airports and ports have had distinctive stages of improvement. As referred to earlier than Japan is especially evolved in those essential infrastructure in comparison to different nations and India is a ways behind. Though public region/authorities performed very critical function in improvement of airports and ports, personal region has participated actively and this is specifically because of authorities region unique regulations for infrastructure improvement.


Lessons for India

- ✓ Japan‘s improvement of infrastructure gives precise training for India especially in generation improvement and self reliance, allocation of funding to distinct infrastructure and typical coverage for green control. One of the achievement testimonies of avenue area improvement is toll pooling device which changed into brought in 1972. This changed into beneficial because the overall toll amassed changed into used for improvement of all toll roads rather than accumulating tolls for every mission on the premise of separate estimations of profitability. The top notch achievement of toll road networks in Japan changed into feasible more often than not due to toll and consumer prices.
- ✓ Under the pool device, toll quotes are same throughout distinct expressways. Though it has been criticized on the premise of pass subsidization,it helped Japan to increase avenue area throughout areas the use of the pool device. This pool device, ended in improvement of expressways which might be incorporated to national community which might be of equal first-rate. Government did now no longer ought to subsidize the street community closely because the working sales have been precise sufficient as probabilities of working value.
- ✓ Railways, specifically the trunk community, changed into more often than not created with the aid of using non-public area with robust authorities support. These are beneficial training for growing nations like India which might be suffering with finances. After privatization, the first-rate, control and performance has stepped forward substantially. Further, the function of personal area in elevating the performance of employees with none labour friction and introducing revolutionary generation is precise lesson for India.
- ✓ The deregulation of transportation area in current years has helped mobilize non-public sources and put into effect aggressive precept that ended in stepped forward offerings, decrease costs and enhance over all competitiveness. The non-public area participation in Japan has critical implications for India just like the clean reduce and bendy department of roles and responsibilities, possession and control, among non-public and public area. Like India, public area additionally owned and operated shipping infrastructure centers however frequent authorities intervention and regulations ended in dangerous trends in phrases of finance, sustainability and first-rate of offerings.
- ✓ Whenever one infrastructure area, for instance railways, below public area witnessed inefficiency and detoriation in first-rate of offerings, then non-public area changed into allowed to operate. Private area participation now no longer simplest stepped forward the performance and however additionally were given the maximum upgraded generation into

the infrastructure area. But withinside the preliminary years of personal area participation, authorities of Japan gave massive subsidies to privatization in production and working value.

- ✓ However, like Japan withinside the past, public area in India desires to have a main function in improvement of infrastructure for hundreds and all throughout distinct areas as non-public area simplest concentrates on income maximization.Generally value healing in Japan is primarily based totally on marginal value pricing that is primarily based totally on idea of green allocation of sources. The working value, that is near the marginal value is borne with the aid of using the customers withinside the styles of charges and fares in which because the constant value component is in part borne with the aid of using the non-public area supported with the aid of using the general public area. However, annual expenditure is usually financed via fares and charges which additionally consists of payments for loans inclusive of interest. Fares/consumer prices are calculated in this sort of manner that it covers the production value and operational fees over an extended length of time, (say forty to 50) years.
- ✓ The method isn't primarily based totally on annual debts however for entire length (redemption length) in which overall sales are same to overall expenditure minus subsidies. Therefore, the value healing mechanism in Japan is one of the training for India to maintain infrastructure improvement. Another lesson for India is provision of infrastructure offerings throughout all areas.Infrastructure improvement ends in growth in typical financial activities, increased productiveness and better incomes. Therefore, local disparities in infrastructure improvement additionally result in local disparities in in keeping with capita income.
- ✓ In India, there are wide disparities in infrastructure improvement and additionally in keeping with capita income. Therefore, India have to comply with the coverage like regular get entry to to infrastructure of Japan in which authorities supported backward areas for infrastructure improvement and gave massive incentives for the non-public area to take part in backward areas.

Benefits of transport infrastructure:

i. High-quality infrastructure is a precondition for the provision of efficient transport services for both freight and passenger movements, which in turn supports core economic activities and removes geographic barriers to competition.
ii. Well-functioning logistics systems facilitate trade through lowering access costs to international markets and by improving the competitiveness of domestic firms.
iii. Passenger transport connectivity enhances the productive capacity of the economy by widening and deepening labour markets and through agglomeration gains, facilitating industrial specialisation and enabling face-to-face interactions between businesses and specialised workers in high-value service sectors of the economy.
iv. Infrastructure can be an effective policy tool to address social and territorial imbalances by connecting rural and remote areas to larger centres of production and consumption, creating more economic opportunities for residents and reducing out-migration.

5.1.5 Vertical Farming

- ➢ Vertical farming is cultivating and producing crops/ plants in vertically stacked layers and vertically inclined surfaces. The entire world is on the verge of population explosion and there is a gravest challenge of feeding the population.

- The population explosion has led to the decreased per capita land.The aim of Vertical farming is to utilize each and every inch of land and space, no matter whether it is urban or rural for growing maximum possible food for the hungry population.

Source:https://globuswarwick.com/2018/04/17/vertical-farming-the-next-big-thin

- It has now emerged as a new farming technology all over the world. In India also, vertical farming is stepping in actually.Many entrepreneurs are coming forward for vertical farming with high net returns. Vertical farming can be implemented in buildings, warehouses, rooftops and balconies.

Vertical farming in India:

Source:https://www.re-nuble.com/blogs/re-nuble/why-the-adoption-of-hydroponics-in-india-is-important

- Vertical farming is limited in India at present to high value crops only. Cultivation under polyhouse and net house is done mostly in case of export oriented flowers and some vegetables. Vertical farming is also in vogue for production of disease free nursery in case of banana, sugarcane, citrus fruits and many flowering plants.
- Most common and successful vertical farming ex; mushroom cultivation. Temperature and humidity controlled condition are economically possible to be created at limited space.
- The scope of vertical farming is how ever increasing fast in India. The scheme has been reflected as one of the high priority area. Good technical and financial support is now available for establishing vertical farming units and protective agriculture.

Importance of Vertical farming:

- With population increasing in urban areas the nutritional requirements of this increasing population has to be met. People living in urban areas has very limited or no control over the supply and quality of food thus in this case organic urban farming or growing own food can be a possible solution to this problem.
- Urban agriculture has several benefits .Its not only an efficient and effective tool for making use of vacant unused open spaces in urban areas but also a way for generating income and employment and managing freshwater resources in cities.
- Its benefits are in many dimensions ranging from environmental, social to economic dimension. Environmental benefits are that its an step forward towards organic farming and prevention in use of fertilizers and pesticides, (The state of Sikkim is declared fully organic in 2016 and Orissa is taking a big way towards organic farming.) , farmland preservation, reduction in food miles, water management, climate control etc.
- Social benefits are that it can be a source of leisure activities in urban life and contribute to psychological health and mental well-being of the society. It can be tool for keeping food culture and tradition blooming.
- With people's participation it can also turn out to be an active public space along with enhancing food security in community. Economic benefits are that it enhances the food growing supply, generate income and employment and can be a reliance food growing supply in case or vertical farming.

Advantages	Disadvantages
Independent from weather conditions and season.	High expenditures for modern technology.
Artificial light enables crops to grow day and night .	Redundancy of conventional farming .
Absence of chemicals.	Need for higher qualified personnel .
Food is fresh and safe due to no transportation means.	Pollination needs to be done manually.

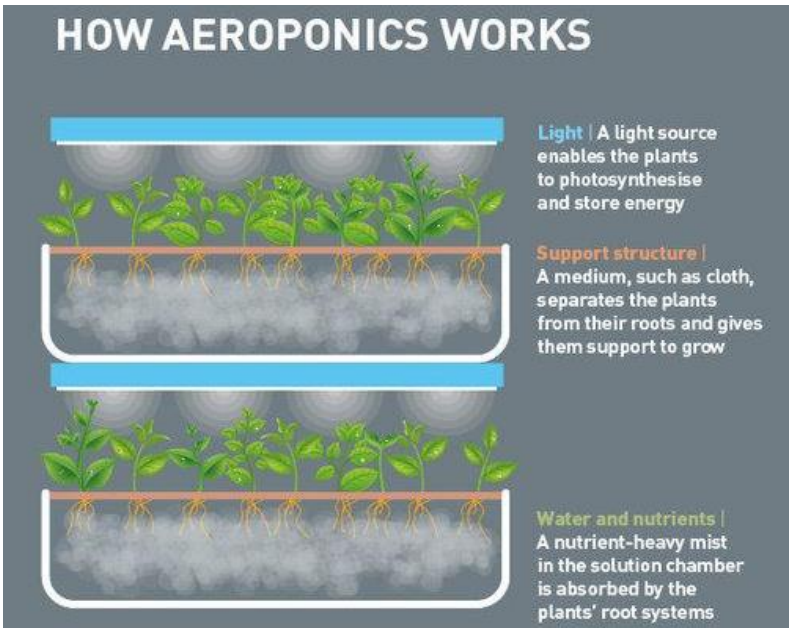
Systems of Vertical farming:

1. Hydroponics

Source:https://www.thespruce.com/beginners-guide-to-hydroponics-1939215

- It is a method of growing food in water using mineral nutrient solutions without soil.The basic advantages of this method is that it reduces soil-related cultivation problems like soil borne insects, pest and diseases.

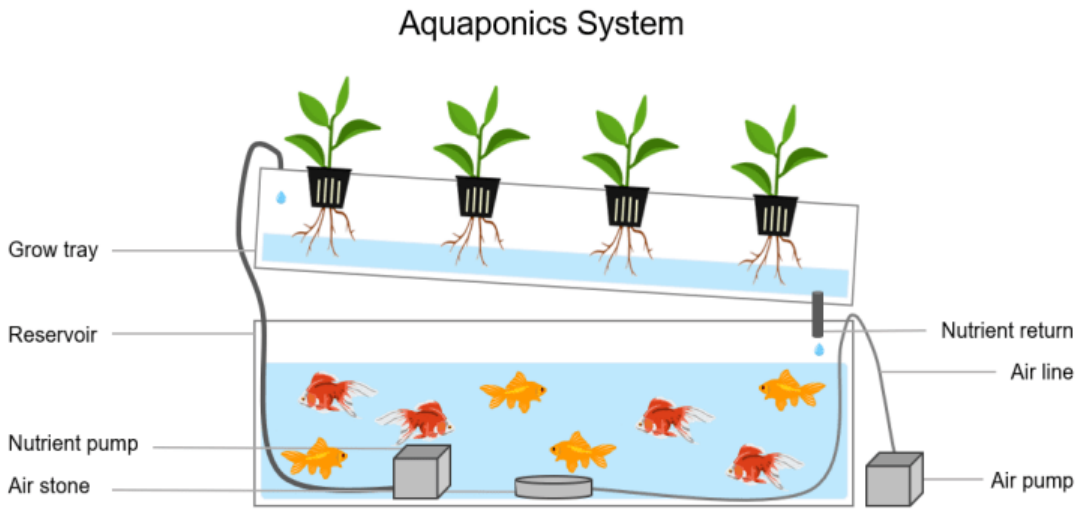
2. Aeroponics



Source:https://www.lettusgrow.com/blog/aeroponics-explanation

- In aeroponics, there is no growing medium and hence, no containers for growing crops. In aeroponics, mist or nutrient solutions are used instead of water. As the plants are tied to a support and roots are sprayed with nutrient solution, it requires very less space, very less water and no soil.

3. Aquaponics



Source:https://www.hightechgardening.com/aquaponics-diy-how-to-build-an-aquaponic-system/

- It is a bio-system that integrates recirculated aquaculture (fish farming) with hydroponic vegetable, flower, and herb production to create symbiotic relationships between the plants and the fish.
- It achieves this symbiosis through using the nutrient-rich waste from fish tanks to "fertigate" hydroponic production beds. In turn, the hydroponic beds also function as bio-filters that remove gases, acids, and chemicals, such as ammonia, nitrates, and phosphates, from the water.
- Simultaneously, the gravel beds provide habitats for nitrifying bacteria, which augment the nutrient cycling and filter water. Consequently, the freshly cleansed water can be recirculated into the fish tanks.

CASE STUDY:

- India is one of the largest producer of vegetables, fruits and many other agricultural commodities. In India, vertical farming has been introduced. ICAR experts are working on the concept of 'vertical farming' in soil-less conditions, in which food crops can be grown even on multi-storeyed buildings in metros like New Delhi, Mumbai, Kolkata and Chennai without using soil or pesticides.
- Scientists at the Bidhan Chandra Krishi Viswavidyalaya in Nadia have already had initial success in working on vertical farming hydroponically on a small scale. Small-scale adaptations of vertical farming have been seen in Nadia, West Bengal and in Punjab.
- Bidhan Chandra Krishi Vishwavidhalaya in Nadia has found initial success in growing brinjal and tomato. Punjab also has succeeded in producing potato tubers through vertical farming. Ideafarms, an Indian design-in-tech company is producing Verticalfarms grow and is preferred because their food is organic, of high quality and the supply is predictable.
- A Bengaluru based startup Greenopiais selling kits with smart self-watering pots, enriched soil and the rightseeds. The sensor-embedded pots replenish moisture in the soil on a need basis, and notify you when you need to refill water externally.
- A Mumbai based start-up firm U-Farm Technologies is using hydroponic gardening technique to customise modular farm foran individual apartment complex or for a supermarket. More and more number of start-ups in vertical farming are coming up in India.

5.1.6 Corrosion Mechanism, Prevention & Repair Measures of RCC Structure

- Corrosion is the inevitable process that occurs when refined metals return to their more stable combined forms as oxides, carbonates and sulphides. The corrosion process may be defined as the surface wastage that occurs when metals are exposed to reactive environments.
- Costs associated with corrosion damage and control can be substantial, being as much as 3.5% of the GNP of some industrial countries. Reinforced concrete structures have not been immune to the ravages of corrosion despite the protection that concrete provides to embedded steel.
- There is currently substantial controversy about the merits of the different reinforcement corrosion repair systems. By drawing on international knowledge as well as local observations, this monograph aims to explain some of the important issues. Ultimately, the efficacy of repair systems in terms of expense, risk of failure and long-term success should be evaluated.
- As such, no one device is suitable for all repairs, but it will depend on the project's type of construction, service requirements, corrosion level and financial constraints.

Corrosion mechanism and classification:

- Corrosion can be classified in different ways, such as

i. Chemical and electro chemical
ii. High temperature and low temperature
iii. Wet corrosion and dry corrosion.

- In the absence of an aqueous environment, dry corrosion typically occurs in the presence of gases and vapours, particularly at high temperatures. By analysing zinc dissolution in diluted hydrochloric acid, the electrochemical essence of corrosion can be understood.
- $Zn + 2HCl = ZnCl^2 + H^2$
  Anodic reaction is $Zn = Zn^{++} + 2e$
  with the reduction of
  $2H^+ + 2e = H^2$ at cathodic areas on the surface of zinc metal.
- Even though the fundamental mechanism of corrosion involves creation or existence of corrosion cells, there are several types or forms of corrosion that can occur
- There is a specific arrangement of anodes and cathodes in each for of corrosion, and specific patterns and locations can exist depending on the type.
- The most important types are:

i. Uniform corrosion.
ii. Galvanic corrosion, concentration cells, water line attack
iii. Pitting.
iv. Dezincification, Dealloying (selective leaching)
v. Atmospheric corrosion.
vi. Erosion corrosion
vii. Fretting
viii. Crevice corrosion; cavitation
ix. Stress corrosion, inter-granular and trans-granular corrosion, hydrogencracking and embrittlement
x. Corrosion fatigue

Corrosion control measures:

- Corrosion-induced corrosion of reinforced concrete structures occurs when the structure's environmental load is greater than the structure's capacity to resist environmental loading (environmental resistance). One can either reduce the load or increase the resistance, or a combination of both can be done.The main deterioration mechanisms (chloride-induced corrosion of rebar) focus on the reinforcement and its protection.
- There are three categories of variables that influence the corrosion process and the extent of the corrosion-induced deterioration of reinforced and pre-stressed concrete members –material, design,and environmental variables.The proper corrosion-protection strategy will vary from structure to structure.
- Some factors to be considered during the design of a structure include:

i. Intended design life of the structure.
ii. Effects of corrosion and corrosion-induced deterioration –This includes the costs due to closure (either permanent or temporary) for repair.
iii. Quality of workmanship in construction –The quality of construction entails good consolidation, proper rebar placement,sufficient concrete cover over the steel reinforcing bars, and other measures.

- Some factors to be considered when choosing a corrosion-control measure include:

i. Reliability and effectiveness of the measure.
ii. Risk of unintended side effects.
iii. Possibility of future installation of other control measures.
iv. Life expectancy of the measure.
v. Any incremental costs over the "do nothing" option.
vi. Any impacts on the cost of other elements in the structure.
vii. How aggressive the environment is where the structure will be located.

- Corrosion-protection strategies for steel reinforcing bars embedded in concrete can be grouped into four general categories: design, concrete, corrosion inhibitors, and reinforcement type.
- The design category includes such items as:

i. Concrete cover.
ii. Maximum allowable crack widths in service.
iii. Reinforcement distribution (crack control provisions).
iv. Rigid overlays (silica fume concrete, latex-modified concrete, dense concrete, polymer concrete).

- The concrete category includes such items as:

i. Water-cement ratio.
ii. Pozzolans (silica fume, fly ash, slag).
iii. Latex, epoxy, and polymer admixtures.
iv. Cement type.
v. Aggregate gradation.

- The inhibitor category includes such items as:

i. Organic corrosion inhibitors.
ii. Inorganic corrosion inhibitors.
iii. Mixed corrosion inhibitors.

- The reinforcement category includes such items as:

i. Epoxy-coated bars.
ii. Galvanized bars.
iii. Nickel-clad bars.
iv. Copper-clad bars.
v. Stainless steel-clad bars.
vi. Stainless steel bars.
vii. Corrosion-resistant alloyed bars.
viii. Non-metallic bars.

Corrosion repair in RCC structure:

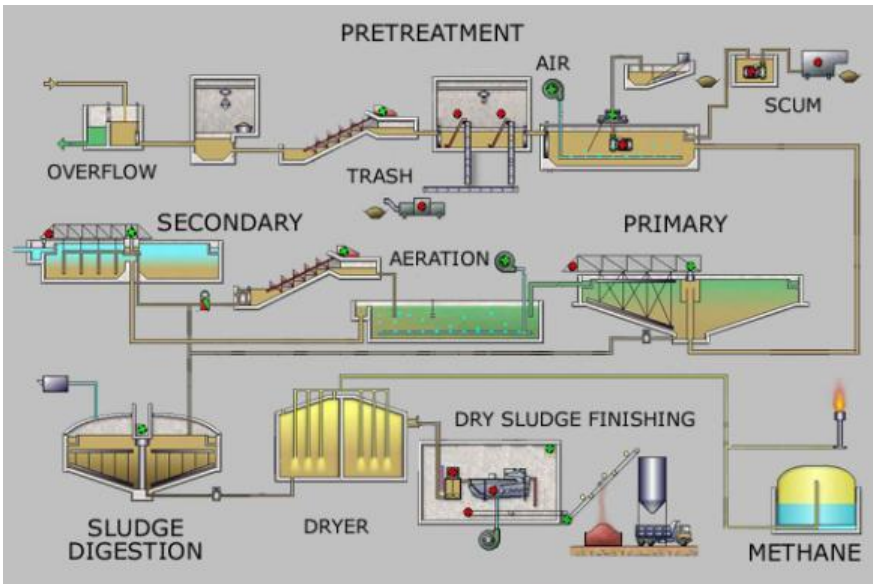
- Numerous repair options are available and new technologies continue tomake an impact in the field of concrete repairs. The suitability and cost-Effectiveness of repairs depends on the level of deterioration and specific conditions of the structure.
- ✓ Patch repairs
- ✓ Coating systems
- ✓ Migrating corrosion inhibitors
- ✓ Electrochemical techniques
- ✓ Cathodicprotection systems
- ✓ Demolition / reconstruction
- Sewage treatment is the process of removing contaminants from wastewater and household sewage water.It includes physical, biological and sometimes chemical processes to remove pollutants.
- Its purpose is to generate sewage water, called effluent, which is environmentally friendly, and solid waste, called sludge or biosolids, suitable for disposal or reuse. Reuse is mostly for agricultural purposes, but more recently, as a fuel source, sludge is being used.
- As a result of the introduction of contaminating constituents, water from the mains, used for manufacturing, farming, houses (toilets, baths, showers, kitchens, sinks), hospitals, commercial and industrial sites, is reduced in efficiency.
- Organic wastes, suspended solids, bacteria, nitrates, and phosphates are pollutants that must be removed.To make waste water acceptable for reuse or for returning to the environment, the concentration of contaminants must be reduced to a safe level, usually a standard set by the Environment Agency.
- The features of wastewater treatment systems are determined by:

i. The nature of the municipal and industrial wastes that are conveyed to them by the sewers.
ii. The amount of treatment required to keep the quality of the receiving streams and rivers.
iii. Discharges from treatment plants are usually diluted in rivers, lakes, or estuaries.

5.1.7 Sewage treatment plant

- Sewage treatment is the method of removing contaminants from waste water and household sewage water. It involves the removal of pollutants by physical, biological and sometimes chemical processes.
- Its objective is to produce sewage water, called effluent, which is environmentally safe, and solid waste, called sludge or biosolids, suitable for disposal or reuse. Reuse is often for agricultural purposes, but more recently, as a fuel source, sludge is being used.

- Water from the mains, used by manufacturing, farming, houses (toilets, baths, showers, kitchens, sinks), hospitals, commercial and industrial sites, is reduced in quality as a result of the introduction of contaminating constituents.
- Pollutants that must be eliminated are organic waste, suspended solids, bacteria, nitrates and phosphates. The concentration of pollutants must be reduced to a reasonable amount, usually a requirement set by the Environment Agency, in order to make waste water suitable for reuse or returning to the environment.
- Sewage can be treated close to where it is created (in septic tanks and their associated drain fields or sewage treatment plants), or collected and transported via a network of pipes and pump stations to a municipal treatment plant.



Source:https://en.wikipedia.org/wiki/Sewage_treatment

- The former system is gaining popularity for many new ECO towns, as 60%of the cost of mains sewerage is in the pipework to transport it to a central location and it is not sustainable. It is called ‘Decentralisation’ of sewage treatment systems.
- The characteristics of wastewater treatment systems are determined by the following: the nature of urban and industrial waste transported by the sewers to them. The amount of care needed in order to preserve the consistency of the streams and rivers receiving it. In rivers, reservoirs, or estuaries, discharges from treatment plants are usually diluted.
- They also may, after sterilisation, be used for certain types of irrigation (such as golf courses), transported to lagoons where they are evaporated, or discharged through underground outfalls into the sea.
- However, sewage water outflows from treatment works must meet effluent standards set by the Environment Agency to avoid polluting the waters that receive them.

Sewage treatment plant processes fall into two basic types:

Anaerobic Sewage Treatment

- Sewage is partially decomposed by oxygen-containing anerobic bacteria in a tank without air delivery. This results in organic matter being converted to methane, hydrogen sulphide, carbon dioxide, etc.
- It is commonly used for the treatment of waste water sludge and organic waste because it greatly reduces the volume and mass of the raw material. For heating purposes, the methane emitted by large-scale municipal anerobic sludge treatment is currently being investigated for use in homes and industry.
- Septic tanks are an example of an anerobic operation, but miniscule is the amount of methane produced by a septic tank (it is only the SLUDGE that produces methane at the bottom) that serves less than 100 people.
- In addition, septic tank effluent also contains about 70 percent of the original contaminants and if not properly vented, the process smells very badly because of the Hydrogen Sulphide. The waste produced by this method is highly polluting and can not be discharged into any water source.
- It must be discharged into the Aerobic layer of the soil (within the top metre ofthe ground) for the aerobic soil bacteria to continue the sewage treatment via the aerobic process below.

Aerobic Sewage Treatment

- In this process, aerobic bacteria digest the pollutants. To establish an aerobic bacterial colony you must provide air for the bacteria to breathe.
- Air is continuously supplied to the Biozone in a sewage treatment plant either by direct surface aeration using impellers powered by pumps whisking the surface of the liquid with air or by underwater diffused aeration using blowers to supply the air at the bottom of the tank by bubble diffusers.
- Aerobic conditions lead to an aerobic bacterial colony being established. These achieve almost full oxidation and digestion of carbon dioxide, water and nitrogen from organic matter and organic contaminants, thereby removing the above problem of odour and pollution.
- Traditional treatment of sewage water requires two or three steps, called primary, secondary and tertiary treatment.

Primary Treatment

- This is usually Anerobic. First, the solids are separated from the sewage. They settle out at the base of a primary settlement tank.By the anerobic phase, the sludge is continuously decreased in volume, resulting in a significantly reduced total mass relative to the original volume entering the system.. When it is about 30 percent of the volume of the tank, the main settlement tank has the sludge removed.

Secondary Treatment

- It's aerobics. The primary treatment liquid contains dissolved biological matter and particulate matter. By using indigenous, water-borne aerobic micro-organisms and bacteria that digest the pollutants, this is progressively turned into clean water.
- In most cases, this effluent is sufficiently clean for direct discharge into rivers.

Tertiary Treatment.

- The Environment Agency may then require a very high standard of treatment with a view to the new discharge being CLEANER than the water in the stream and to, in effect, ‘Clean it up a bit’.

- It is usually either Phosphorous or Ammoniacal Nitrogen or both that the E.A. want reduced. Tertiary treatment involves this process.
- If Ammoniacal Nitrogen is the problem, then the sewage treatment plant process must involve a nitrifying and then de-nitrification stage to convert the ammoniacal nitrogen to Nitrogen gas that harmlessly enters the atmosphere.
- Finally, the Sludge is periodically removed by tanker and taken for further processing via aerobic/anerobic processes and then disposed of or re-used, and the treated water may be discharged into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation of a golf course, green way or park. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purpose.

5.1.8 Technical Case Study of Burj Khalifa:

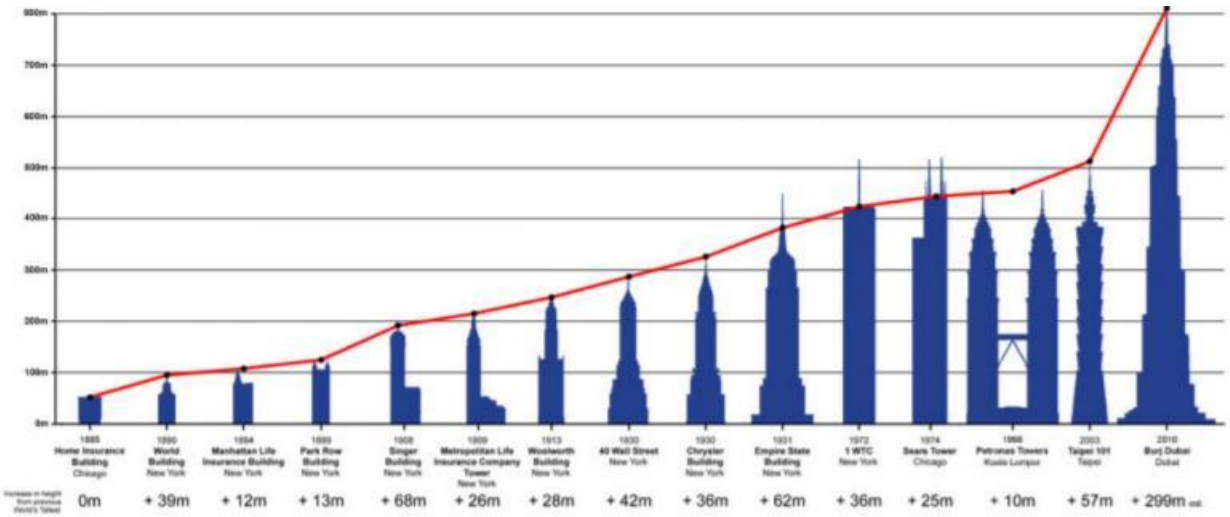
Abstract

The Burj Khalifa Tower is the world's tallest structure, passing all preceding top records this kind of task with the aid of using necessity calls for pushing modern analysis, material, production technology, and constructing structures to actually new heights. However, as this kind of constructing top has in no way earlier than been attempted, it's also essential to make sure all technology and techniques used are of sound improvement and practice. As such, the designers sought to be able to apply traditional structures, materials, and production of aerodynamic shaping and wind engineering performed a primary function withinside the architectural massing and layout of this multi-use tower, in which mitigating and taming the dynamic wind results became one of the maximum important layout standards set forth on the onset of the task layout. This paper offers quick description of the tower structural structures, specializes in the important thing problems taken into consideration in production planning of the important thing structural additives and in brief outlines the execution of one of the maximum complete architectural bureaucracy and structural in tall buildings.

Keywords: architectural forms, Burj Khalifa, structural components, dynamic wind effects.

Introduction

- As a part of normal lifestyles our society inhabits buildings. People have an inherent want for practical areas due to the fact we as a society are continually shifting forward, innovating, and searching for to enhance our manner of lifestyles.
- Looking again on records lots of years ago, the early developers completed incredible feats for his or her time: The Egyptians constructed the outstanding pyramids and the Romans have become the world's maximum effective empire through constructing aqueducts and stone roads to help their huge town and population.



- As growing expertise of construction practices flourished, so did the huge accomplishments of man. With every surprise of engineering completed the architectural bar have become better and better. Buildings have become top notch but mysterious creations to gaze upon.
- When I see a skyscraper I think about them as lovely enigmas encased in metal and concrete. Their decorate stems from in no way understanding what to expect. On the constructing's façade there may be a positive architectural appearance.But on in the structural system (name it the skeleton of the constructing that isn't always supposed to be seen) can appearance hugely specific and profoundly intriguing.
- The Burj Khalifa in Dubai is a constructing of superlatives. At 828 meters (2,717 feet), it's the tallest withinside the world, 227 meters taller than No. 2, the Makkah Clock Royal Tower in Mecca. More than double the peak of the Empire State Building, the 163-tale constructing took six years, $1.five billion, 110,000 lots of concrete, and 22 million man-hours to build. But the maximum thrilling aspect approximately it isn't any of those great data however the manner it looks: Unlike maximum supertall buildings, the Burj is pleasant to appearance at.
- It' s now no longer a workmanlike stack of boxes, just like the 442-meter Willis (née Sears) Tower in Chicago, or a postmodern historical past trinket like the Makkah Clock Tower , which resembles a Big Ben memento a person would possibly purchase at Heathrow.

Structural Design

- The general layout of the tower got here from the geometry of a desolate tract flower indigenous to the region, the Hymenocallis, which resembles many Islamic architectural schemes.
- A view of the tower may be discovered in Figure. By layout, this flower's "Y" shape, contributes to the tower's capacity to reduce wind masses and creates a easy structural plan to follow during construction. Engineers first designed and built a completely unique basis to accommodate the overlying big tower.

Lateral Load Resisting System

- The tower's lateral load resisting machine includes excessive performance, bolstered concrete ductile center partitions connected to the outdoors bolstered concrete columns via a sequence of bolstered concrete shear wall panels on the mechanical levels.
- The center partitions range in thickness from 300mm to 500mm. The center partitions are generally connected via a sequence of 800mm to 1100mm deep bolstered concrete or composite

hyperlink beams at each stage. Due to the hindrance at the hyperlink beam depth, ductile composite hyperlink beams are supplied in positive regions of the center wall machine.

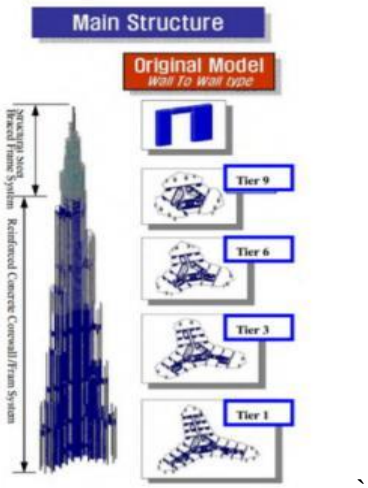
- These composite ductile hyperlink beams generally include metal shear plates, or structural metal built-up I-fashioned beams, with shear studs embedded withinside the concrete section. The hyperlink beam width generally fits the adjoining center wall thickness.

Burj Khalifa

- At the pinnacle of the middle bolstered concrete center wall, a totally tall spire tops the building, making it the tallest tower withinside the global for all categories. The lateral load resisting machine of the spire includes a diagonal structural metal bracing machine at stage 156.

Floor Framing System

The residential and lodge ground framing machine of the Tower includes 200mm to 300mm -manner strengthened concrete flat plate slabs spanning about nine meters among the outside columns and the indoors center wall.



The ground framing machine on the hints of the tower ground includes a 225mm to 250mm -manner strengthened concrete flat plate machine. The ground framing machine in the indoors center includes a manner strengthened concrete flat plate machine with beams.

Construction Sequence Analysis Procedures

- The time-dependant consequences of creep, shrinkage, the version of concrete stiffness with time, sequential loading and basis agreement had been accounted for with the aid of using reading 15 separate three-d finite-detail evaluation models, every representing a discrete time all through construction.
- At every factor in time, for every model, simplest the incremental hundreds happening in that precise time-step had been applied. Additional time steps, after construction, had been analyzed as much as 50 years.

Construction Sequence Model

- The structural responses happening at every time-step had been saved and blended in a database to permit reading the anticipated time-dependant reaction of the structure.
- Long-time period creep and shrinkage testing, over three hundred and sixty five days in duration, were performed, via way of means of the CTL Group (positioned in Skokie, IL) below agreement with Samsung, on concrete specimens to higher recognize the real conduct of the concrete applied for the project.

Compensation Methodology

- The tower is being built using each a vertical and horizontal reimbursement program. For vertical reimbursement, every tale is being built to a theoretical elevation incorporating a modest growth withinside the standard ground-to-ground peak. This vertical reimbursement changed into decided on to make certain the real peak of the structure, after the time- dependant shortening consequences of creep and shrinkage, might be more than the as-designed final peak.
- For horizontal reimbursement, the constructing is being “re-centered” with every successive middle hex center jump. The re-centering reimbursement will accurate for all gravity induced sidesway consequences (elastic, differential basis settlement, creep and shrinkage) which occur as much as the casting of every tale.

Site Logistic Plan

- The Burj Khalifa webweb page region is about 105,600m2 and encompassing the tower, the workplace annex, the pool annex, and the parking areas, divided into 3 zones (Zone A, Zone B, and Zone C). The webweb page logistic works and making plans works are continuously

evolving to reflect modern creation activities, lay-down areas, webweb page site visitors circulation, etc.

Tower Main Hoist

- Figure 6 depicts the vicinity of the primary hoists and the hoist specs. The hoists had been mounted in 3 exclusive levels following the development series of the tower. Additional Jump hoists had been mounted according with the specs proven in figure 6.

Architectural design

- The number one layout idea of the tower is an natural shape with tri-axial geometry and Spiraling increase that may be without problems visible withinside the very last layout. Additionally, conventional Islamic paperwork had been applied to enhance the tower's layout, and to comprise visible references to the tradition and records of the encompassing region. As such, the ground plan of the tower is composed of a tri-axial, "Y" fashioned plan, fashioned through having 3 separate wings related to a central core.

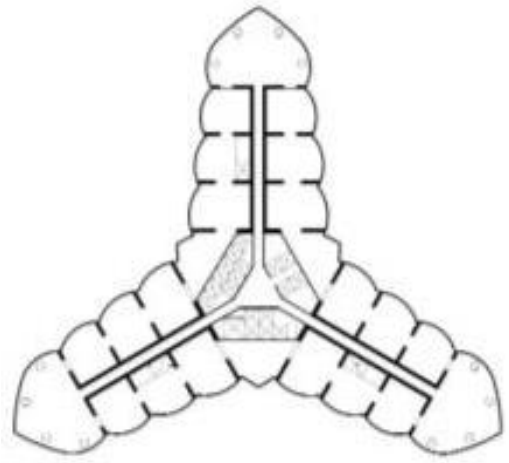
Burj Khalifa design idea

- Burj Khalifa Designed via way of means of SOM below the management of architect Adrian Smith, and hovering to 828 m (2,717 ft), Burj Khalifa in Dubai, UAE could be very narrow in shape and silhouette and presently holds the name of the tallest constructing withinside the world.According to the architect Adrian Smith, the finest supply of thought for Burj Khalifa's shape and geometry changed into a local desolate tract flower, fantastically famous and broadly cultivated in Dubai, and the filigree styles of conventional Islamic architecture.

Flower Hymenocallis

- Named "Hymeocallis," it's miles a kind of lily, is local to tropical Central America. Its flower shape is stated to have supplied the concept for the form of the Burj Dubai's floor plan. The intake figures for a constructing the dimensions of the Burj Dubai are impressive: the thermal electricity that needs to be extracted from the constructing at top instances every day might be sufficient to soften 10,000 lots of ice.

- The cooling water for the complicated comes from close by cooling plants, every of that could carrier the Burj Dubai on my own in case of emergency. The base of the constructing homes warmth exchangers and pumping stations to provide the specific consumer zones with cooling water every for the residential and in flooring, one for the workplace flooring and a similarly plant for cooling ingesting water, whose temperature can rise to 39 levels centigrade withinside the summer.

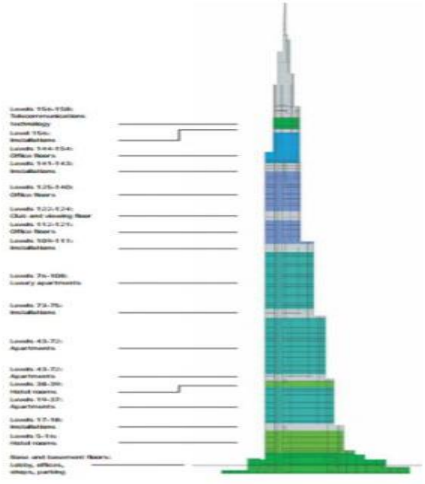


Top View of Burj Khalifa

- The Burj Dubai is one of the first homes withinside the Persian Gulf to have a eleven kV supply.
- He energy isn't always transformed to a 230 volt running voltage till it reaches the building's own transformer.
- 50 gas-insulated ABB switching devices manage the go with the drift of cutting-edge so precisely that sections of the building's complete machine may be remoted for preservation functions or to diagnose faults.
- This system is mainly appropriate to be used in high-upward push homes because it takes up so little space. As properly as this, 5 eleven kV emergency mills make sure that energy may be furnished in emergencies for protection systems, decided on lifts, strain air flow for the staircases, smoke elimination ventilators, pumps and emergency lighting.

Coordination between structure and architecture

- As illustrated above, the structure functions atriple lobed footprint, an abstraction of the Hymenocallis flower. The tower consists of 3 factors organized round a imperative middle. The modular, Y - formed shape, with setbacks alongside every of its 3 wings offers an inherently strong configuration for the shape and offers accurate ground plates for residential.
- The imperative middle emerges on the pinnacle and culminates in a sculpted spire. A Y - formed ground plan maximizes perspectives of the Persian Gulf. This has caused Creates a special concord among shape and structure.



Burj Khalifa

Structure design Inspired by the architectural structures

- The tower's Y -formed ground plan now no longer simplest has aesthetic and purposeful advantages, however also is good for presenting a high-overall performance, green structure. The structural machine for the Burj Dubai may be defined as a "buttressed-center" and includes high-overall performance concrete wall construction.
- Each of the wings buttresses the others through a six-sided valuable center, or hexagonal hub. This valuable center offers the torsional resistance of the structure, just like a closed pipe or axle. Corridor partitions make bigger from the valuable center to near the cease of every wing, terminating in thickened hammer head partitions. These hall partitions and hammerhead partitions behave just like the webs and flanges of a beam to face up to the wind shears and moments.

Construction of Burj Khalifa

Cladding of the tower

- The outside cladding of Burj Khalifa is fabricated from reflective aluminum and textured stainless-steel spandrel panels with severa small tubular fins. This layout is meant to withstand the robust wasteland warmth and sun rays better. 28,261 glass panels, each personally hand-cut, had been used withinside the outside cladding. It is anticipated that the outside temperature on the pinnacle of the constructing might be 6 °C cooler than at its base.
- The tower is supplied with 18 completely mounted song and stuck telescopic, cradle equipped, constructing upkeep gadgets. These song installed gadgets, which might be hidden whilst not in use, might be used for each window washing and outside façade upkeep. Using these, the outside can be accessed from the pinnacle right all the way down to degree seven of the tower. Under normal conditions, and whilst all constructing upkeep gadgets are in operation, it's going to take 3 to four months to easy the whole outside façade.

Conclusion

- On the 4th of January 2010, the hole rite of Burj Khalifa changed into held to celebrate the tallest guy made shape withinside the international for as a minimum the subsequent decade. This challenge has made a brand new records withinside the international of structure and engineering.
- The Burj Khalifa challenge by deciding on The modular, Y-formed shape, with setbacks alongside every of its 3 wings presents an inherently strong configuration for the shape and presents accurate ground plates for residential, Twenty-six helical stages lower the go phase of

the tower incrementally as it spirals skyward, The primary middle emerges on the pinnacle and culminates in a sculpted spire.

- An Y-formed ground plan maximizes perspectives of the Persian Gulf. Viewed from the bottom or the air, Burj Dubai is evocative of the onion domes everyday in Islamic Architecture. All the above motives had brought about Creates a unique concord among shape and structure.
- The Burj Khalifa challenge demonstrates that tall constructing machine improvement is constantly immediately related to the trendy traits in fabric technologies, structural engineering theories, wind engineering, seismic engineering, pc technologies, and creation methods.
- The Burj Khalifa challenge capitalizes at the improvements in those technologies, and in advancing the improvement of supertall homes and the artwork of structural engineering.

Chapter 6
Swatchh Bharat Abhiyan (Clean India)

6.1 Swatchhta needed in allocated village-Existing Situation with photograph

6.2 Guidelines - Implementation in allocated village with Photograph




6.3 Activities Done by Students for allocated village with Photograph

- We made the people aware about the cleanliness, health & sanitation and we did the following activities.

1. Disposed garbage appropriately.
2. Segregated Garbage.
3. Uphold Hygiene.
4. Re-Use and Re-cycle.
5. We advised not throw away cigarette butts randomly.
6. We also advised not spit and civilize those who do.
7. Report any kind of littering using social media platforms.
8. The act of cleaning itself should not be shameful or derogatory.

Chapter 7
Village condition due to Covid-19

7.1 Taken steps in allocated village related to existing situation with photograph

- The authorities put the posters in the village to spread awareness about COVID-19 disease, its symptoms and Qurantine rules.
- People are following the guidelines issued by the Ministry of Health and Family Welfare(MoHFW), Government of India.
- They are maintaining a minimum distance of 6 feet in public places as far as feasible.
- They are using face cover/masks.
- They are practicing frequent hand wash with soap even when hands are not visibly dirty.
- Alcohol based Hand sanitizers are also used by them.
- They are self monitoring their health by all and reorting any illness at the earliest to the near Hospital.

7.2 Activities Done by Students for allocated village with Photograph

- We made people aware about the COVID-19 and its symptoms and the steps they can take to avoid contraction of the disease and can prevent from further spreading by following these steps:

✓ Clean your hands often.
✓ Use soap and water, or an alcohol-based hand rub.
✓ Maintain a safe distance from anyone who is coughing or sneezing.
✓ Wear a mask when physical distancing is not possible.
✓ Don’t touch your eyes, nose or mouth.
✓ Cover your nose and mouth with your bent elbow or a tissue when you cough or sneeze.
✓ Stay home if you feel unwell.
✓ If you have a fever, cough and difficulty breathing, seek medical attention.

7.3 Any other steps taken by the students / villagers

- Villagers are taking the mandatory precautions.
- They are following home quarantine rules properly.
- Anyone who feel sick can be isolated for 14 days in quarantine center or in their own home.

Chapter 8
Sustainable Design Planning Proposal (Prototype Design)-Part-I

8.1 Design Proposals

- Sustainable design: Bio gas Plant
- Physical design: Panchayat Building
- Social design: Bank
- Socio - Cultural design: Small Library
- Smart design: Learning hub & Smart play center
- Heritage Design: Obelisk

8.1.1 Sustainable Design (Civil)

BIOGAS PLANT

What is Biogas Production?

- Biogas production has received growing attention as a project particularly in the rural areas and among small farmers. Technically, it is a process of converting animal manure and many other organic wastes into fuel and other beneficial uses.
- More specifically, biogas production has the following benefits.

1. Direct benefits to the farmers

a) Methane gas

- It is a clean fuel for cooking and lighting, (at the household level), and even running diesel engines. In short, savings in fuel expenses.

b) Fertilizer

- What remains of the manure after gas has been extracted is high quality organic fertilizer and soil conditioner. Some studies show that it increased crop yield by 10-20% compared to " undigested " ordinarily prepared compost.

c) Sanitation and Health

- Biogas production provides efficient disposal of manure - - controlling smell, water pollution, and access of flies and other disease - carrying pests to the manure. Furthermore, since biogas burns without smoke, irritation to eyes and lungs are prevented.

2. General Benefits to the Country (After biogas production will have become widespread):

a) Savings in the total economy.

- It will help conserve foreign exchange through reduced demand for kerosene, gas and com mero jal fertilizers.

a) Cleaner environment.

- This will follow as individual families and enterprises practice an efficient waste disposal system.

b) Invreased possibility for backyard animal raising.

- With blogas product ton, animal raising in the homelots can now be undertaken without the usual undesirable smell and other sanitation problems.

c) Reduced deforestation.

- In the long run, biogas would reduce demand for firewood as a primary source of fuel in the rural areas.

Design parameter

a) Selection of materials

- In Navapura, there are around - 40 Cows

- 60 Buffalo
- 3756 Humans.

b) Total solid (TS) contains calculations of organic materials Organic materials-

Solid part **:** Total solid contained in a certain amount of materials is usually used as the material unit to indicate the biogas- producing rate of the materials. Most favourable TS value desired is 08%.

c) Favourable temperature, PH value & C/N ratio for good fermentation-

Temperature**:** Mesophilic; 20c to 35c.

pH value : Neutral PH and ranges 6.8 to 7.2.

C/N ration : Ranges from 20:1 to 30:1

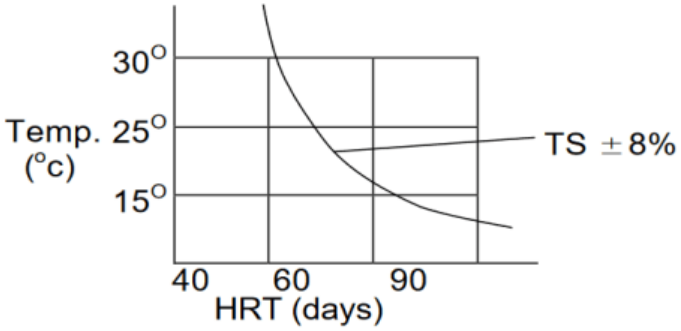
d) Table showing discharge per day, TS value of fresh discharge and water to be added to make favorable TS condition-

Kinds	Body weight(kg)	Discharge per day(kg)	TS value of fresh discharge(% by wt.)	Water to be added with fresh discharge to make the TS value 8%(kg)
Human(faeces)	62	0.128	25	0.272
(urine)	62	1.42	25	3.018
Cow(faeces)	600	22	16	37.5
(urine)	600	11	12	18
Buffalo(faeces)	600	22	16	37.5
(urine)	600	11	12	18

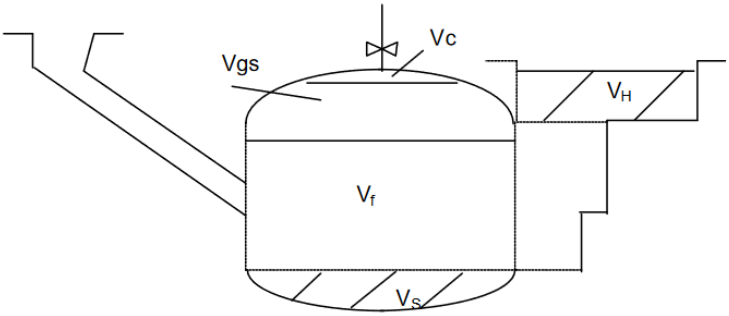
e) Hydraulic retention time (HRT)-

For Mesophilic digestion where temp. varies from 20o c to 35o C and HRT is greater than 20 days.

1. Relationship between temperature, HRT & TS value of 8%



2. Cross-section of a digester



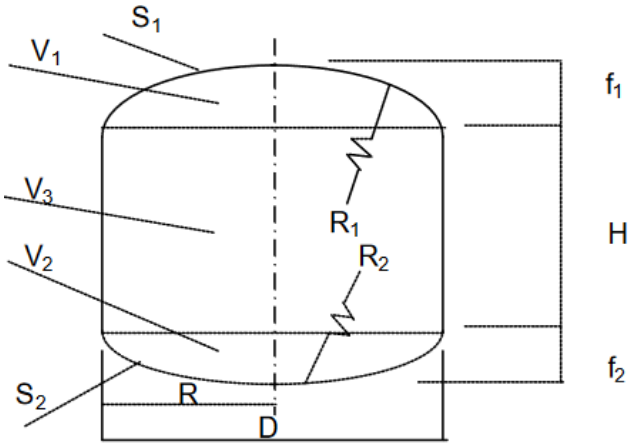
i. Volume of gas collecting chamber= Vc

ii. Volume of gas storage chamber= Vgs

iii. Volume of fermentation chamber= Vf
iv. Volume of hydraulic chamber=VH
v. Volume of sludge layer=Vs

Total volume of digester V =Vc+Vgs+Vf+Vs

3. Geometrical dimensions of the cylindrical shaped biogas digester body:



4. Assumptions

For volume	For geometrical dimensions
$Vc \leq 5\%\ V$ $Vs \leq 15\%\ V$ $Vgs + V_f = 80\%\ V$ $Vgs = V_H$ $Vgs = 0.5\ (Vgs + V_f + Vs)\ K$ Where K = Gas production rate per m^3 digester volume per day. For Bangladesh K = 0.4 m^3/m^3d.	$D=1.3078 \times V^{1/3}$ $V_1=0.0827\ D^3$ $V_2 = 0.05011\ D^3$ $V_3 = 0.3142\ D^3$ $R_1= 0.725\ D$ $R_2= 1.0625\ D$ $f_1 = D/5$ $f_2 = D/8$ $S_1 = 0.911\ D^2$ $S_2 = 0.8345\ D^2$

5. Volume calculation of digester and hydraulic chamber

- **Volume calculation of digester chamber-**

➢ In Navapura, there are around - 40 Cows
- 60 Buffalo
- 3756 Humans.

➢ Let HRT = 40 days (for temp. 30C)

Total Discharge = 40*33kg+60*33kg+3756*(0.128kg+1.42L)
= 9144.288 kg

TS of fresh discharge = 16%of 40*22kg + 12%of 40*11kg + 16%of 60*22kg + 12%of 60*11kg
+ 25%of 3756*0128kg + 25%of 3756*1.42L
= 1937.58 kg

In 8% concentration of TS (To make favourable condition)

8 kg Solid = 100 kg

Influent1 kg Solid =100 / 8 kg influent

1937.58 kg Solid = 100 x 1937.58/ 8 = 24219.65 kg Influent.

Total influent required = 24219.65 kg

Water to be added to make the discharge 8% concentration of

TS = 24219.65 kg - 9144.29 kg = 15075.36 kg

Working volume of digester = Vgs + Vf

Vgs + Vf = Q.HRT

= 24219.65 kg/day X 40 days

= 968786 kg (1000 kg = 1 m3)

= 968.79 m3

From geometrical assumptions:

Vgs + Vf = 0.80 V Or

V= 968.79/0.8 = 1210.99 m3. (Putting value Vgs + Vf = 968.79 m3)

& D = 1.3078 (V) 1/3 = 13.94 m ≅14 m

Again

$$V_3 = \frac{3.14 \times D^2 \times H}{4}$$

(Putting V_3=0.3142D3) or

$$H = \frac{4 \times 0.3142 \times D^3}{3.14 \times D^2}$$

= 5.6 m

Now we find from assumption as we know the value of 'D' & 'H'

f1 = D/5 = 5.6 /5 = 1.12 m

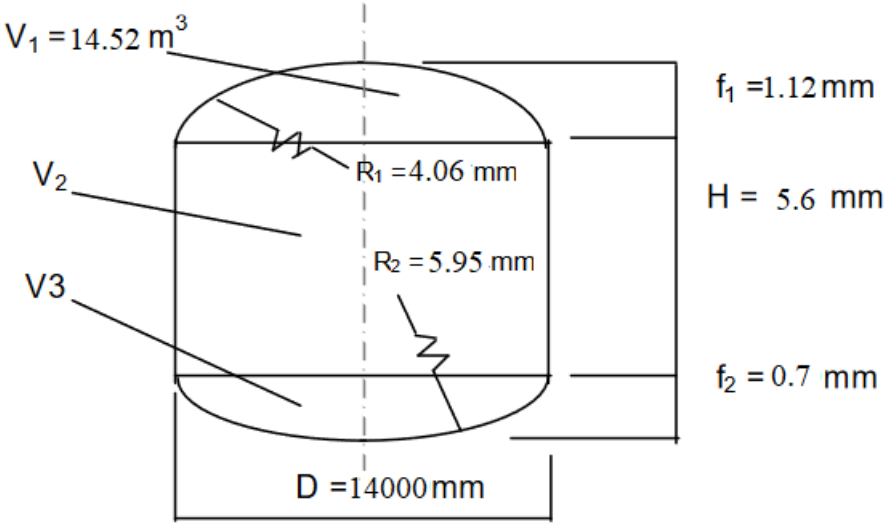
f2= D/8 = 0.70m

R1 = 0.725 D = 4.06 m

R2 = 1.0625 D = 5.95 m

V1 = 0.0827 D3 = 14.52 m^3

Vc = 0.05V = 60.55 m^3



- **Volume calculation of hydraulic chamber**

From assumptions:

$Vc = 0.05\ V = 60.55\ m^3$

Vgs = 0.50 x (Vgs + Vf + Vs) x K (Where K = Gas production rate per m3 digester vol./day)

$= 0.5 \times 100 \times 0.4 = 20\ m^3$ ----------(A)

Again,

Vgs = 50% of daily gas yield

= 0.5 x TS x gas producing rate per Kg TS

= 0.5 x (1937.58 kg x 0.16) x 0.28 m3/kg TS (See Annex- III)

$= 43.40\ m^3$---------- (B)

From **A & B let Vgs = 43.40 m3.**

$Vc + Vgs = 60.55\ m3 + 43.40\ m3 = 2079\ m^3$

Again we know that

$Vgs = V_H$

$V_H = 43.40\ m^3$

WHAT WILL WE GET?

BIO NATURAL GAS

165 600 m^3 per year [1]

Supply for **138** households [2]

OR

ELECTRICITY

629 280 kWh electric per year [1]

71.84 kW Ø CHP power

Supply for **209.76** households [2]

AND

HEAT

745 200 kWh thermal per year [1]

85.07 kW Ø gross thermal power

PLUS

HEALTHY SOILS

Organic fertilizer:**3234** tons per year

Compost by post-rotting:**1320** tons per year

CO2 COMPENSATION

396.45 tons per year [3] for electricity feed-in

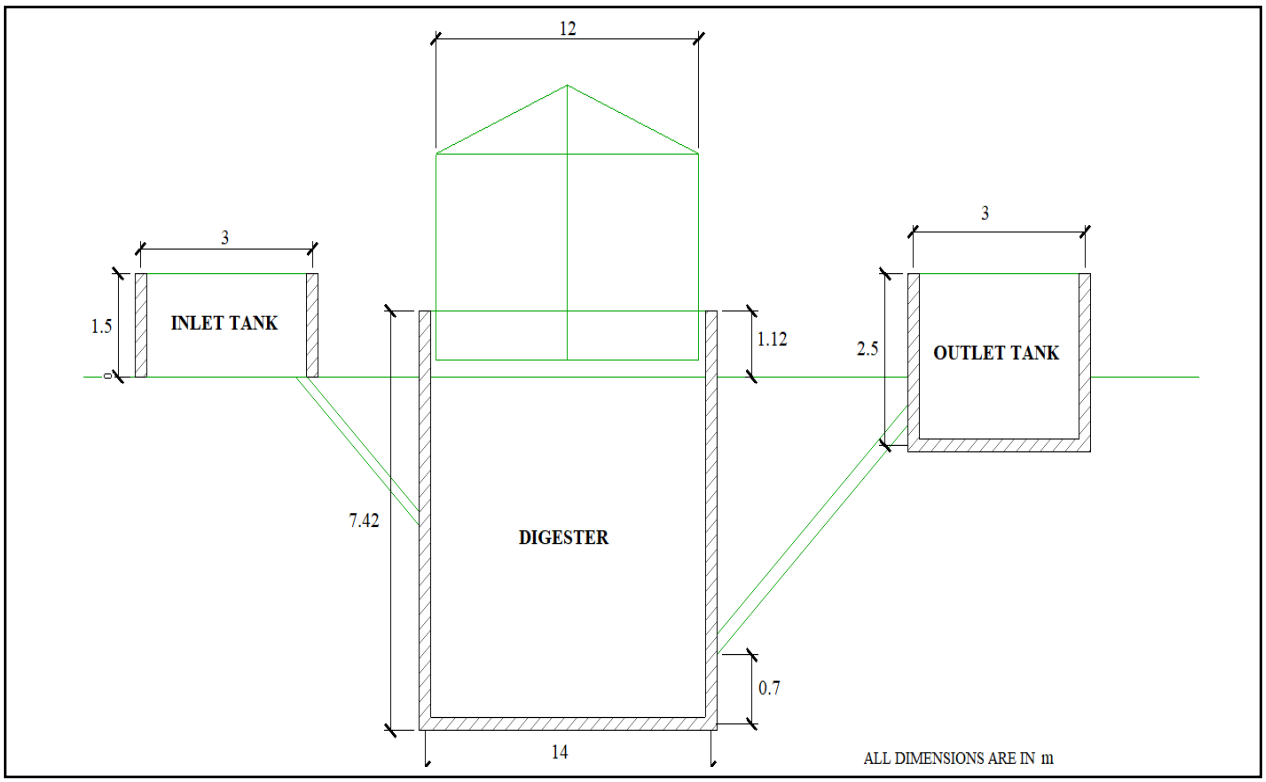
331.2 tons per year [3] for gas feed-in

Equivalent to **171.6** long distance flights [4]

MEASUREMENT SHEET							
S.No.	**Description of Items**	**Diameter(m)**	**Height(m)**	**Count(No.)**	**Volume of walls having T=0.3048m**	**Volume of Horizontal Surface H=0.4572m**	**Total Quantity(m^3)**
1.	Inlet Tank	3	1.5	1	3.871	3.232	7.103
2.	Outlet Tank	3	2.5	1	6.452	3.232	9.684
3.	Digester	14	7.42	1	97.337	70.38	167.72
4.	Gas Holder and frame			1			-
Quantity						**Total**	**185 m^3**

ABSRACT SHEET		
Sr. No.	**Description of Item**	**Estimated Cost (Rs)**
1	Construction cost	60,90,000
2	Gas holder and frame	8,000
3	Others	5,000
		61,03,000/-
	Add 5% Contingency	**+3,05,150/-**
	TOTAL	**64,08,150/-**

BIOGAS PLANT



8.1.2 Physical design (Civil)

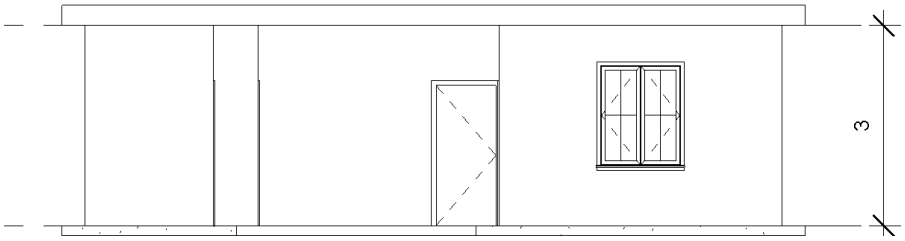
PANCHAYAT BUILDING

MEASUREMENT SHEET						
S.No.	**Description of Items**	**Length(m)**	**Width(m)**	**Height(m)**	**Count(No.)**	**Total Quantity**
1.	Roof	12	10	0.1542	1	18.228m^3
2.	Walls	63		3	-	189m^2
3.	Doors	-	1	2	5	10m^2
4.	Windows	-	1.22	1.5	7	14m^2
5.	Masonary in Superstructure	-	-	-	-	165m^2
6.	Cross Section area of Footing	-	-	-	-	0.515m^2
7.	Volume of Concrete in Footing	-	-	-	-	10.9746 m^2
8.	Volume of Excavation	63	0.762	1.2192	-	58.53m^3
9.	Masonary in Footing	-	-	-	-	21.4704 m^3
10.	Earth Filling	-	-	-	-	26.085m^3
11.	Floor	-	-	-	-	86.20m^2

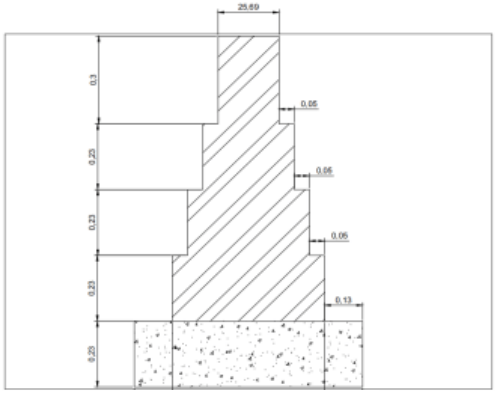
ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	058.53	m^3	150	m^3	8,780
2	Concreting in	010.97	m^3	3800	m^3	41,686

	Foundation					
3	Masonry in Foundation	021.47	m^3	4000	m^3	85,880
4	Earth Filling	026.10	m^3	80	m^3	2,088
5	Super Structure Masonry work	033.50	m^3	4000	m^3	1,34,000
6	R.C.C work	018.29	m^3	4100	m^3	74,989
7	Plaster work	330.00	m^3	280	m^3	92,400
8	Coloring	330.00	m^2	10	m^2	3,300
9	Tiles	086.20	m^2	450	m^2	38,790
10	Water tank	1	Nos	8000	Nos	8,000
						4,89,913/-
				Add 5% Contingency		**+24,496/-**
ALL ABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**5,14,409/-**

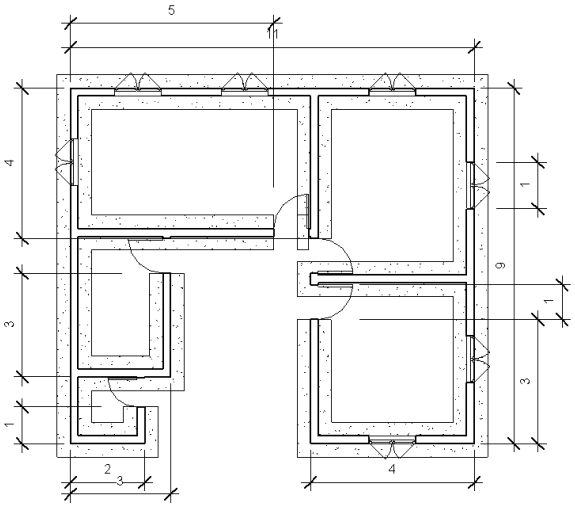
PANCHAYAT BUILDING



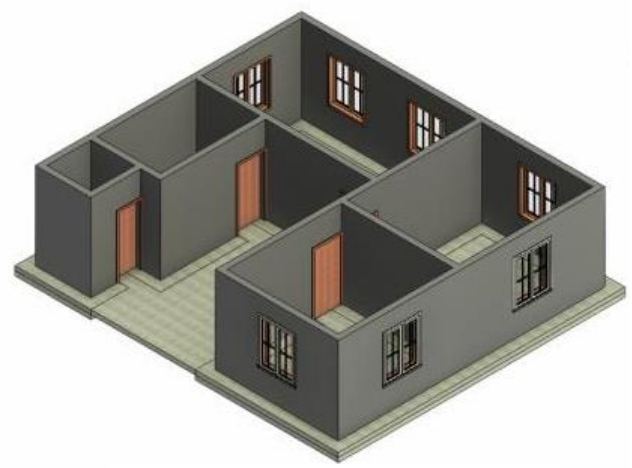
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

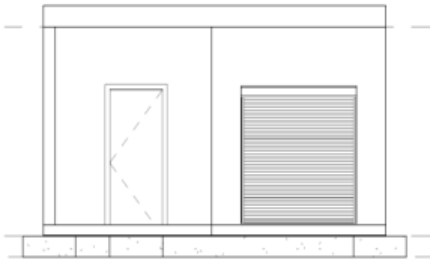
8.1.3 Social design (Civil)

BANK

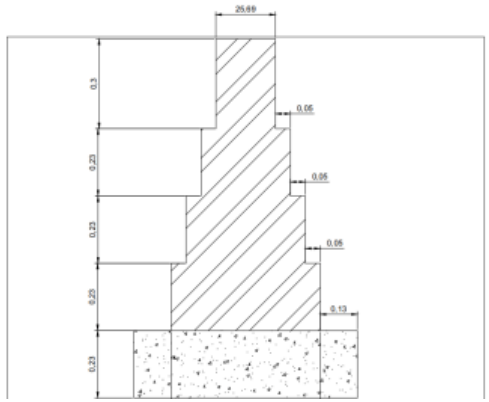
MEASUREMENT SHEET						
S.No.	**Description of Items**	**Length(m)**	**Width(m)**	**Height(m)**	**Count(No.)**	**Total Quantity**
1.	Roof	12.1,8.63,3.20	5.90,3.58	0.1524	1	9.886m^3
2.	Walls	59.29	-	3	-	117.87m^2
3.	Doors					
	D1	-	0.91	2.05	1	1.8655m^2
	D2	-	0.76	2.05	5	7.79m^2
4.	Shutter	-	2.01	1.99	1	3.99m^2
5.	Windows	-	0.86	1.05	3	2.709m^2
6.	Masonary in Superstructure	-	-	-	-	161.51m^2
7.	Cross Section area of Footing	-	-	-	-	0.515m^2
8.	Volume of Concrete in Footing	-	-	-	-	10.33m^2
9.	Volume of Excavation	59.29	0.762	1.2192	-	55.08m^3
10.	Masonary in Footing	-	-	-	-	20.2m^3
11.	Earth Filling	-	-	-	-	24.546m^3
12.	Floor	-	-	-	-	52.82m^2

ABSTARCT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	055.08	m^3	150	m^3	8,262
2	Concreting in Foundation	010.33	m^3	3800	m^3	39,254
3	Masonry in Foundation	020.20	m^3	4000	m^3	80,800
4	Earth Filling	024.55	m^3	80	m^3	1,964
5	Super Structure Masonry work	032.81	m^3	4000	m^3	1,31,240
6	R.C.C work	9.886	m^3	4100	m^3	40,533
7	Plaster work	323.01	m^2	280	m^2	904
8	Coloring	323.01	m^2	10	m^2	3,230
9	Tiles	052.82	m^2	450	m^2	23,770
10	Water tank	1	Nos	8000	Nos	8,000
						3,37,957/-
				Add 5% Contingency		**+16,898/-**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**3,54,855/-**

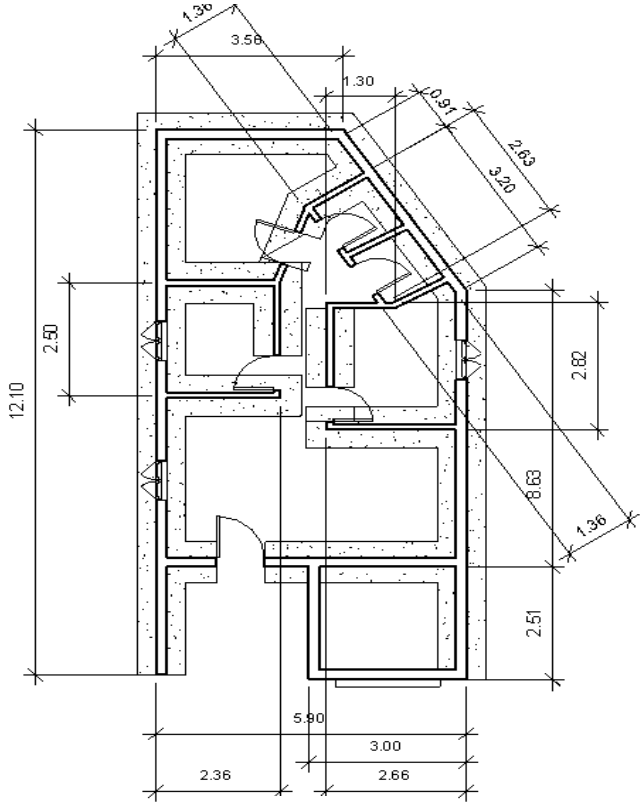
BANK



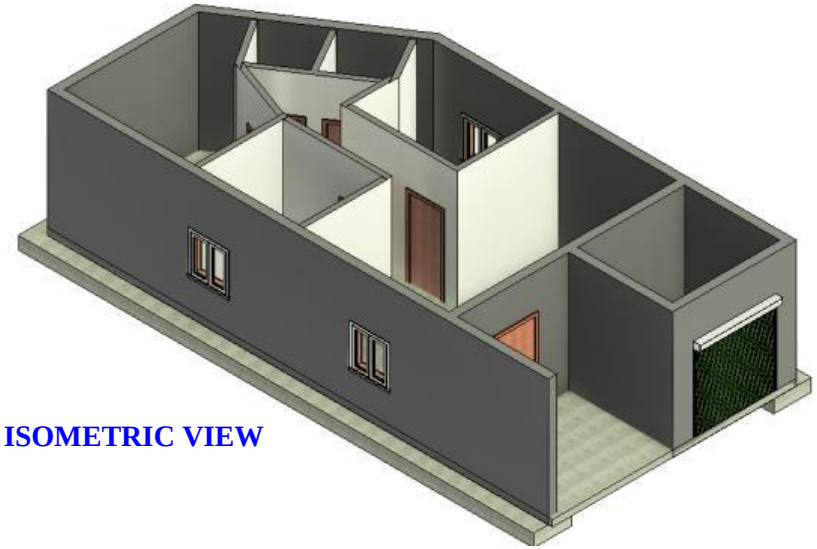
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

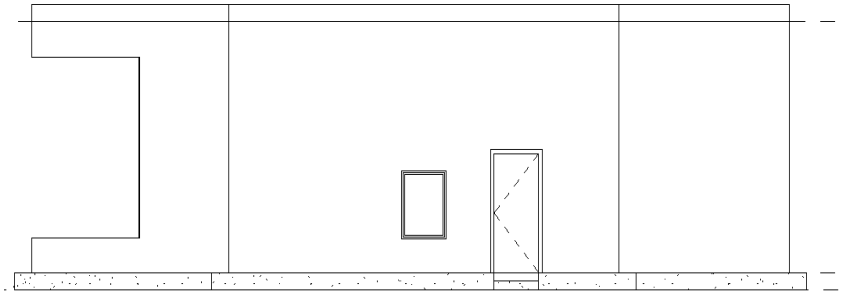
8.1.4 Socio - Cultural design (Civil)

SMALL LIBRARY

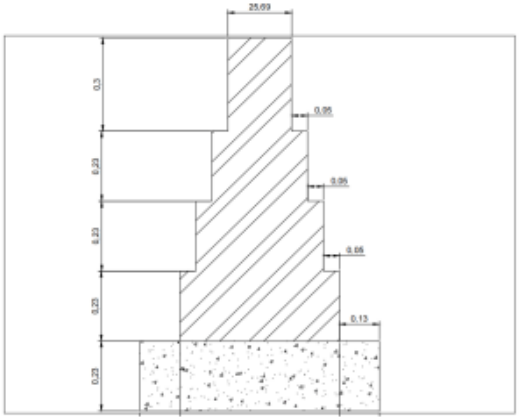
MEASUREMENT SHEET						
S.No.	**Description of Items**	**Length(m)**	**Width(m)**	**Height(m)**	**Count(No.)**	**Total Quantity**
1.	Roof	11.5,10.6	10.5	0.1542	1	22.205m^3
	Radius of Roof = 4.15m					
2.	Walls	66.65	-	4.5	-	300m^2
3.	Doors D1 D2 D3 D4	- - - - -	- 0.76 0.81 0.76 0.91	- 2.21 2.21 2.21 2.21	- 1 1 1 1	7.160m^2
4.	Windows	-	1.22	0.91	2	2.2204m^2
5.	Masonary in Superstructure	-	-	-	-	262.37m^2
6.	Cross Section area of Footing	-	-	-	-	0.515m^2
7.	Volume of Concrete in Footing	-	-	-	-	11.61m^2
8.	Volume of Excavation	66.65	0.762	1.2192	-	61.925m^3
9.	Masonary in Footing	-	-	-	-	22.72m^3
10.	Earth Filling	-	-	-	-	27.595m^3
11.	Floor	-	-	-	-	130.46m^2
12.	Window opening	9.416	-	3	1	28.25m^2

ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	061.93	m^3	150	m^3	9,290
2	Concreting in Foundation	011.61	m^3	3800	m^3	44,118
3	Masonry in Foundation	022.72	m^3	4000	m^3	90,880
4	Earth Filling	027.60	m^3	80	m^3	2,208
5	Super Structure Masonry work	053.26	m^3	4000	m^3	2,13,040
6	R.C.C work	22.20	m^3	4100	m^3	91,020
7	Plaster work	524.73	m^2	280	m^2	1,467
8	Coloring	524.73	m^2	10	m^2	5,247
9	Tiles	130.46	m^2	450	m^2	58,707
10	Water tank	1	Nos	8000	Nos	8,000
						5,23,977/-
				Add 5% Contingency		**+26,199**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**5,50,179/-**

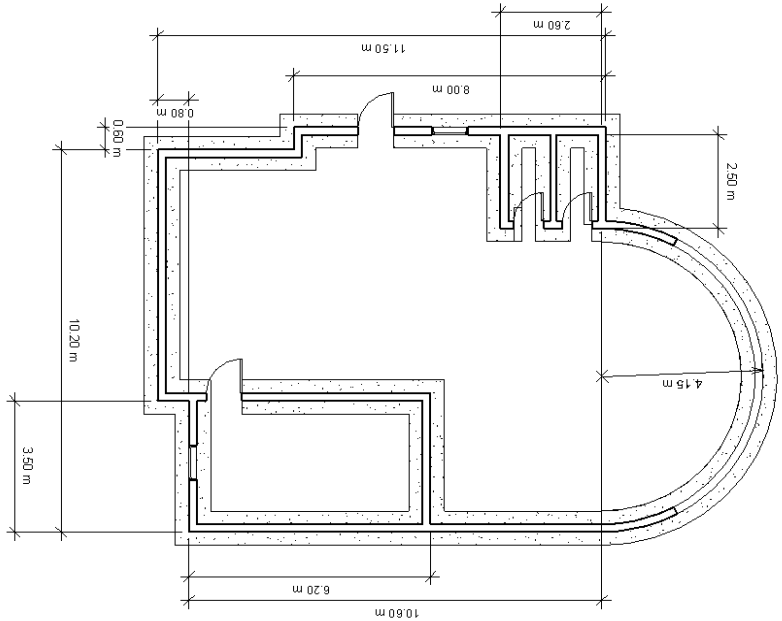
SMALL LIBRARY



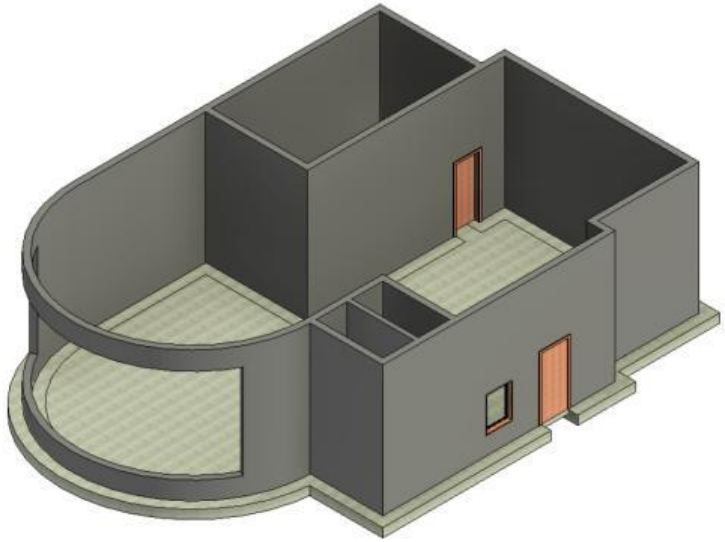
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

8.1.5 Smart Village Design (Civil)

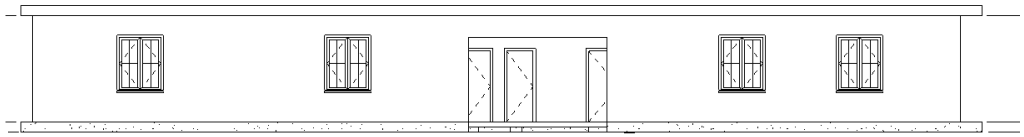
LEARNING HUB & SMART PLAY CENTRE

MEASUREMENT SHEET						
S.No.	**Description of Items**	**Length(m)**	**Width(m)**	**Height(m)**	**Count(No.)**	**Total Quantity**
1.	Roof	Area =293.03m^2		0.1542	1	45.2m^3
2.	Walls	132.03		3	-	396.09m^2
3.	Doors Main Door D1 D2	- - - -	- 4.00 1.10 0.76	- 2.00 2.05 2.05	- 1 6 3	23.1m^2
4.	Windows	-	1.22	1.66	12	24.30m^2
5.	Masonary in Superstructure	-	-	-	-	348.68m^2
6.	Cross Section area of Footing	-	-	-	-	0.515m^2
7.	Volume of Concrete in Footing	-	-	-	-	22.99m^2
8.	Volume of Excavation	132.03	0.762	1.2192	-	122.66m^3
9.	Masonary in Footing	-	-	-	-	45m^3
10.	Earth Filling	-	-	-	-	54.66m^3
11.	Floor	-	-	-	-	274.88m^2

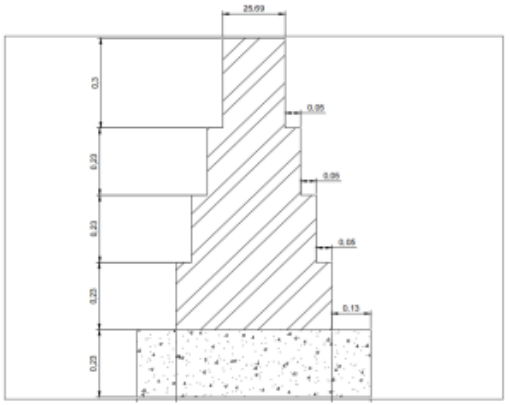
ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	122.66	m^3	150	m^3	18,400

2	Concreting in Foundation	023.00	m^3	3800	m^3	87,400
3	Masonry in Foundation	045.00	m^3	4000	m^3	1,80,000
4	Earth Filling	054.67	m^3	80	m^3	4,374
5	Super Structure Masonry work	070.78	m^3	4000	m^3	2,83,120
6	R.C.C work	045.98	m^3	4100	m^3	1,88,518
7	Plaster work	697.36	m^2	280	m^2	1,95,261
8	Coloring	697.36	m^2	10	m^2	6,974
9	Tiles	274.88	m^2	450	m^2	12,3,696
10	Water tank	1	Nos	8000	Nos	8,000
						10,95,743/-
				Add 5% Contingency		**+54,787/-**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**11,50,530/-**

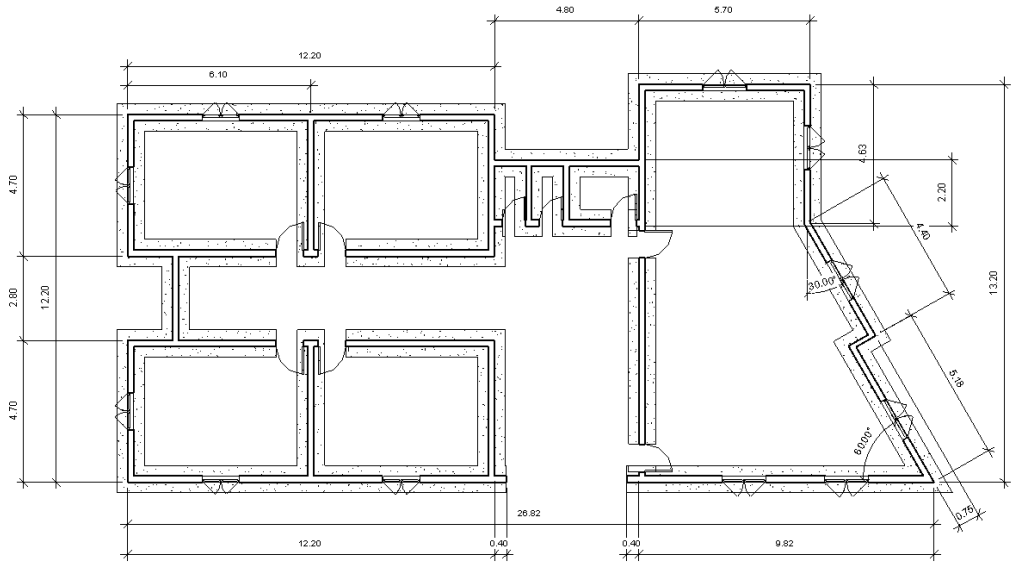
LEARNING HUB & SMART PLAY CENTRE



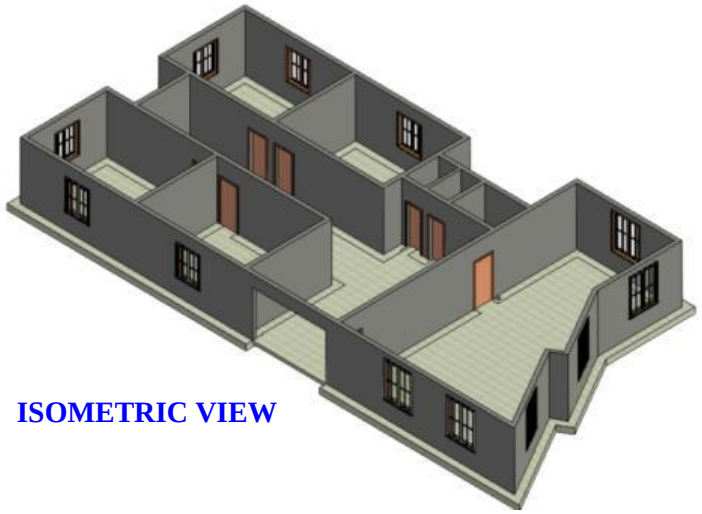
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

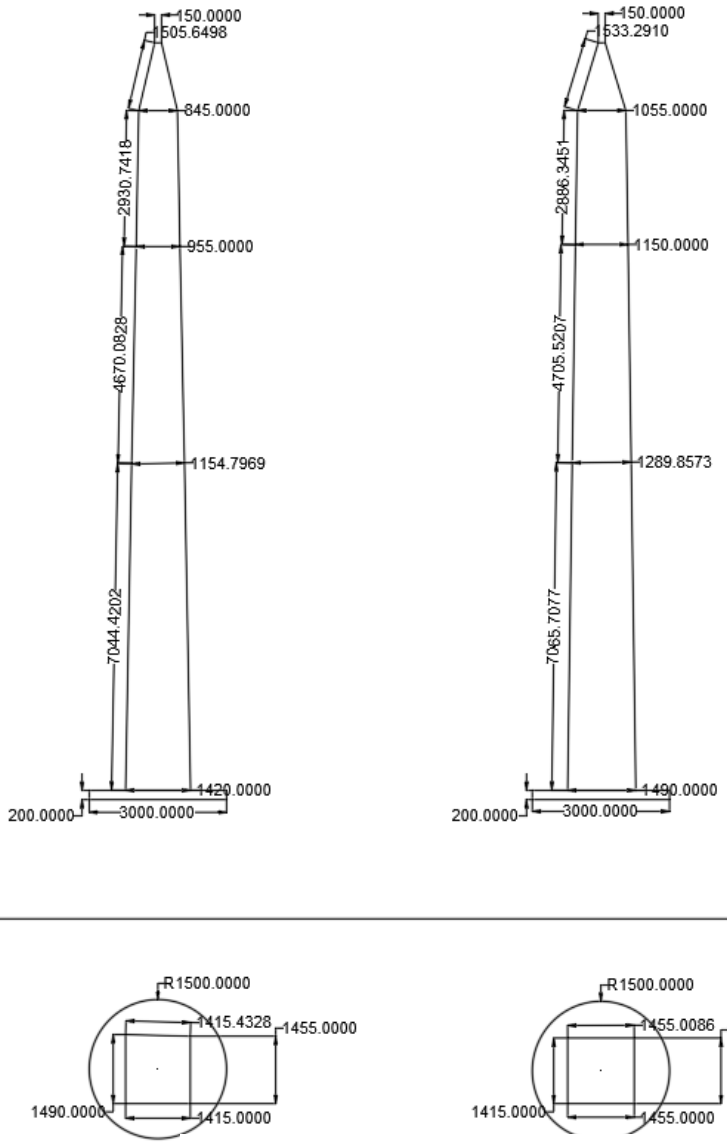
8.1.6 Heritage Design

OBELISK

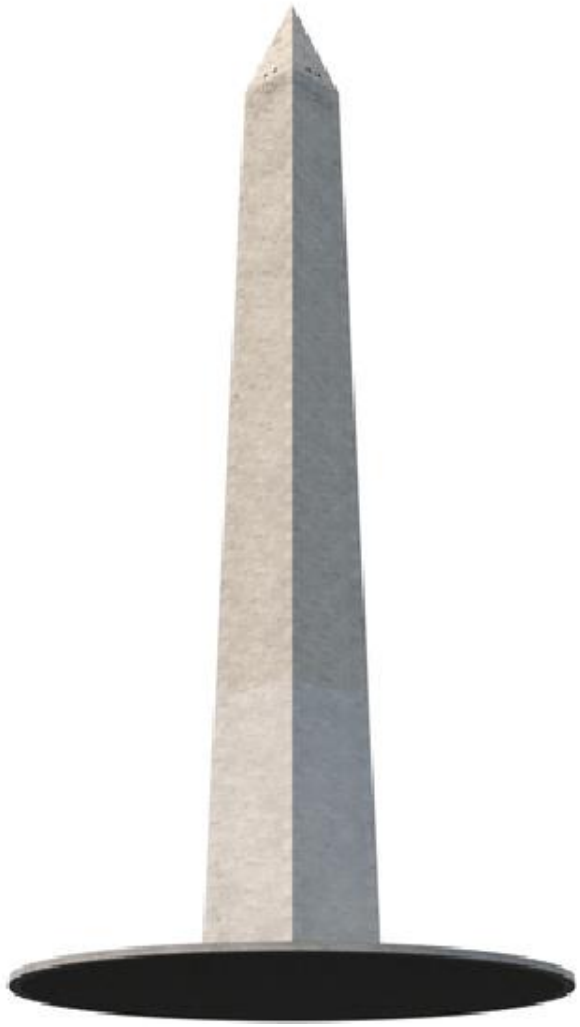
- *The obelisks of ancient Egypt represented the benben, the primordial mound upon which the god Atum stood at the creation of the world.*
- An obelisk is a stone rectangular pillar with a tapered top forming a pyramidion, set on a base, erected to commemorate an individual or event and honor the gods.
- The ancient Egyptians created the form at some point in the Early Dynastic Period (c. 3150-c. 2613 BCE) following their work in mud brick mastaba tombs and prior to the construction of the Step Pyramid of Djoser (c. 2670 BCE).
- It is thought that the earliest obelisks served as a kind of training for working in stone on monumental projects which was a necessary step toward pyramid building.While obelisks are known to have been erected as early as the 4th dynasty (c. 2575–2465 bce), no examples from that era have survived. Obelisks of the 5th dynasty's sun temples were comparatively squat (no more than 10 feet [3.3 metres] tall). The earliest surviving obelisk dates from the reign of Sesostris I (1918–1875 bce) and stands at Heliopolis, a suburb of Cairo, where once stood a temple to Re. One of a pair of obelisks erected at Karnak by Thutmose I (c. 1493–c. 1482 bce) is 80 feet (24 metres) high, square at the base, with sides of 6 feet (1.8 metres), and 143 tons in weight.

MEASUREMENT SHEET			
Sr. No.	**Height(mm)**	**Area of horizontal C/S (mm^2)**	**Volume(m^3)**
1.	0	2087027.27	-
2.	7065	1477379.66	12.53
3.	4705	1059798.34	05.94
4.	2895	0907792.95	02.85
5.	1465	0022500.00	00.52
Total Volume = 21.84			
Total Surface Area of Obelisk		$72.525m^2$	
Volume of Cylindrical Base		$01.414m^3$	

ABSTRACT SHEET	
(1) Masonry Work	= Total Volume*Cost of per m^3 Volume =21.84*4000 **=87360/-Rs**
(2) Stone cladding	=Total Surface Area*Cost of per m^2 stone work(Cost of Marble+Laying charges) =72.525*2151.68 **=156050.592/-Rs**
(3) Cylindrical Base	=Volume of RCC*Cost of per m^3 Vol^m =1.414*4100 **=5797.4/-Rs**
Total Cost of Construction	=87360+156050.592+5797.4 =**249207.992/Rs**
Total Cost of Obelisk	=Total Cost of Construction + 5%Contingency =249207.992+5% of 249207.992 =261668.3916/-Rs **=2,61,670/-Rs**



PLAN AND ELEVATION



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

8.2 Reason for Students Recommending this Design

- The main reason for recommending these designs is to fulfil the basic need of the villagers.We have made a visit to the village(Navapura) in which we interact with the Sarpanch of the village and also with local residents and gather information of the basic facilities that are required for them.
- They told us about bank and ATM facilities, panchayat building reconstruction, public health centres, student libraries, waste management solutions, etc.So we design Bank, learning hub and smart play center, panchayat building, small library and bio-gas plant in this semester i.e phase 1.We will propose rest all the designs in phase 2.

8.3 About designs Suggestions / Benefit of the villagers

- We Suggested five designs in phase 1 of this project which includes:
  - ✓ Panchayat Building
  - ✓ Bank
  - ✓ Small library
  - ✓ Bio-gas plant
  - ✓ Learning hub and smart play center
  - ✓ Obelisk

Benefits of proposed designs to the villagers:

- Villagers will have bank in their village which helps them to save their money from theft and fires. It's an easy way to save money.
- Small library will help the students in their studies by giving them access to vast variety of books which proves to be beneficial for them.
- Learning hub and smart play center will helps the villagers and their children to learn something new in learning hub and children can play games in smart play center.
- As Panchayat building is the main building in the village so it must b well maintained. The proposed design of panchayat building gives a proper work environment and space to the panchayat members
- Finally, Bio-gas plant will helps the villagers to use organic waste as an agricultural fertilizer. Biogas can be used as the fuel in the system of producing biogas from agricultural wastes and co-generating heat and electricity in a combined heat and power (CHP) plant.

Chapter 9
Proposing designs for Future Development of the Village for the PART-II Design

For future development of the Navapura Village we are going to propose following designs in phase-II which are as under:

- ✓ PHC
- ✓ Post office
- ✓ Public toilet
- ✓ Mini market
- ✓ Public garden
- ✓ R-O water plant

- There is no PHC in Navapura Village, they have to go outside the village for medical facilities. So we are going to propose PHC design in phase-II

- There are other facilities like public toilet, public garden, R-O water plant that we found missing in the village so we also going to propose designs of all these facilities in phase-II.

- There is no available infrastructure for Post office in the village so the design of this is also be propose in phase-II.

- Villagers will have bank in their village which helps them to save their money from theft and fires. It's an easy way to save money.

- Small library will help the students in their studies by giving them access to vast variety of books which proves to be beneficial for them.

- Learning hub and smart play center will helps the villagers and their children to learn something new in learning hub and children can play games in smart play center.

- As Panchayat building is the main building in the village so it must b well maintained. The proposed design of panchayat building gives a proper work environment and space to the panchayat members

- Finally, Bio-gas plant will helps the villagers to use organic waste as an agricultural fertilizer. Biogas can be used as the fuel in the system of producing biogas from agricultural wastes and co-generating heat and electricity in a combined heat and power (CHP) plant.

- With all of the smart facilities that a town has, our aim is to develop our village. This will assist to develop the village in a sustainable manner via way of means of decreasing villagers' migration and keeping off city strain from the cities. The destiny surroundings for urbanization may be sustainable via way of means of enhancing Rural India.

Chapter 10
Conclusion of Entire Village Activities of the Project

- According to techno-financial survey, we visited the Navapura village two times so as to acquire information about the village.There we have interaction with the Sarpanch and Talati of the village. Both of them gave us a superb response.

- We additionally have interaction with the villagers so as to recognize their factor of view concerning troubles confronted through them and what form of answers they want.

- We acquire numerous info like Demographical Details, Occupational Details, Physical Infrastructure, Facilities, Social Infrastructural Facilities,sustainable/Green Infrastructural Facilities,Data Collection from Village, Additional Information and Requirement,Smart Village/Heritage Details.

- After series of all of the info, we talk the nice feasible answers of troubles confronted through villagers with the Sarpanch and Talati and that they counseled us to re-innovate the Panchayat constructing as the prevailing situation of Pachayat constructing isn't so good, in addition they counseled for Bank and ATM facility in the village, a small library for the students, studying hub and clever play centre for the villagers, public fitness center, recreation/ cleansing of pond,waste control device for the village many more. Therefore,we proposed required infrastructural facilities and its designs.

- These facilities which are going to be designed in Vishwakarma Yojna Phase VIII will be helpful in raise the standard of living of villagers.

- There turned into a loss of cleanliness withinside the village. There have been no ok facilities for stable waste control at the streets of the village. We additionally proposed building a septic tank to decompose biodegradable waste. This may even assist to hold the village's cleanliness and so cleanliness will assist the villagers stay a glad and wholesome existence .

- We took permission from the sarpanch and talati to visit the village and there we interact with the villagers and aware them about the COVID-19 guidelines and preventive measures. After that we conducted the Techno-Economic survey of the allocated village.

Chapter 11
References refereed for this project

We have referred:

- ✓ Census of India.
- ✓ PPV (Professional Practices & Valuation) by ATUL Prakshan by R P Rethaliya.
- ✓ Lectures of PPV.
- ✓ Scholar.google.com
- ✓ S.O.R of Ahmedabad.
- ✓ www.wikipedia.org
- ✓ www.researchgate.net
- ✓ Google books
- ✓ Google maps
- ✓ Urban Development Plans Formulation and Implementation (UDPFI) Norms.
- ✓ vyojana.gtu.ac.in
- ✓ And some other online sources in order to clear concepts.

Chapter 12
Annexure attachment

12.1 Survey form of Ideal Village Scanned copy attachment in the report for Part-I Survey form of Ideal Village Original copy attachment in the report for Part-II

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Techno Economic Survey

For

Vishwakarma Yojana: Phase VIII

IDEAL VILLAGE SURVEY

An approach towards Rurbanisation for Village Development

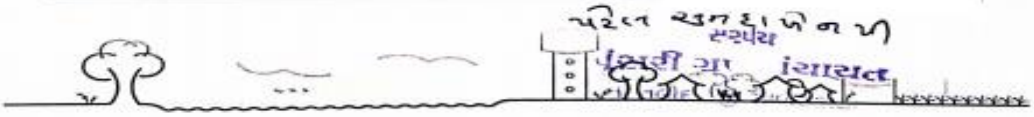
Name of Village:	Punsaroj
Name of Taluka:	Talod
Name of District:	Sabarkantha
Name of Institute:	L.J. Institute of Engg. & Tech.
Nodal Officer Name & Contact Detail:	Prof. Parth Sinroja 9601408487
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Sunandaben Patel (Sarpanch)
Date of Survey:	25-08-2020

1. **Demographical Detail:**

Sr. No.	Census	Population	Male	Female	Total House Holds
i)	2001	4681	2221	2456	1200
ii)	2011	5500	3246	2795	1450

2. **Geographical Detail:**

Sr. No.	Description	Information/Detail
i)	Area of Village (Approx.) (In Hector) Coordinates for Location:	150 ha 23.393842 , 73.113662
	Forest Area (In hect.)	2.19 - 60.45
	Agricultural Land Area (In hect.)	10.15 - 63.62
	Residential Area (In hect.)	13
	Other Area (In hect.)	4.7
	Water bodies	-
	Nearest Town with Distance:	Rajhad - 10 km



Gujarat Technological University, Ahmedabad, Gujarat

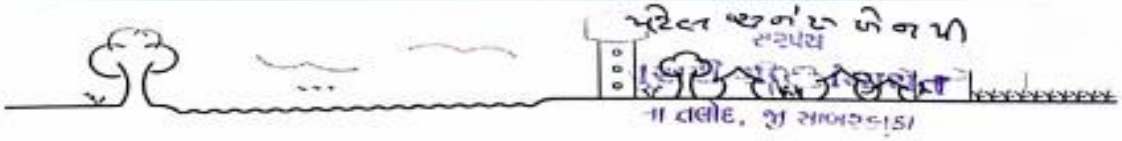
Vishwakarma Yojana: Phase VIII
Techno Economic Survey

3. **Occupational Details:**

Name of Three Major Occupation groups in Village	1. Farming 2. Private Sector 3. Others

4. **Physical Infrastructure Facilities:**

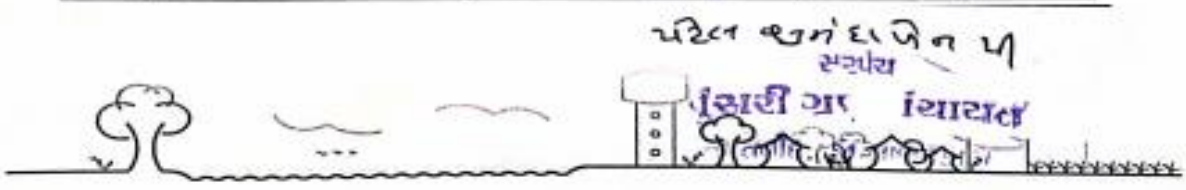
Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
	• Tap Water (Treated/ Untreated) • RO Water • Well (Covered/ Uncovered) • Hand pumps • Tube well/ Borehole • River/ Canal/ Spring/ Lake/ Pond	Tube well (12 Nos)	Y		Well - 13 nos. Bore - 12 Nos Hand Pump - 3 Nos.
Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	70,000L		
	Underground Sump	Capacity:			
Suggestions if any:	Restoration is req.				
C.	**Drainage Facility**				
	Available (Yes/ No)		Y		
Suggestions if any:					
D.	**Type of Drainage**				
	Closed/ Open		Y		Close
	If Open than Pucca / Kutchcha		-		
	Whether drain water is discharged directly in to Water bodies/ Sewer plants		Y		
Suggestions if any:					



Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

E.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	Good	Y		WBM-21-25 km
	Main road	Good	Y		CC & WBM
	Internal streets	Good	Y		CC road
	Nearest NH/SH/MDR/ODR Dist. in kms.	MDR	Y		10 km from Rajkot
Suggestions if any:					
F.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	N			20 km Talod
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)		Y		8-10 buses daily
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	Good	Y		Auto, Jeep, Private veh.
Suggestions if any:					
G.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Good	Y		24-hrs 66 kV
	Power supply for Domestic Use		Y		24-hrs
	Power supply for Agricultural Use		Y		8-hrs
	Power supply for Commercial Use		Y		24-hrs
	Road/ Street Lights		Y		



	Electrification in Government Buildings/ Schools/ Hospitals		Y		Good
	Renewable Energy Source Facilities (Y/ N)	Solar panel	Y		
	LED Facilities		Y		
Suggestions if any:					
H.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	8-Nos	Y		Good
	Location Condition	Good			
	Community Toilet (With bath/ without bath facilities)		N		
	Solid & liquid waste Disposal system available	Y			
	Any facility for Waste collection from road	Y			
Suggestions if any:					
I.	**Irrigation Facility:**				
	Main Source of Irrigation (Stream/River/ Canal/ Well/ Tube well/ Other)	Borewell			
Suggestions if any:					
J.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	100% pucca roads			

5. **Social Infrastructural Facilities:**

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

K.	**Health Facilities:**				
	Sub center/ PHC/ CHC /Government Hospital/ Child welfare & Maternity Homes (If Yes than specify No. of Beds) Condition:	24-hrs			Well maintained
	Private Clinic/Private Hospital/ Nursing Home		✓		
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
L.	**Education Facilities:**				
	Aaganwadi/ Play group	8-Nos	Y		Good
	Primary School	2-Nos	Y		350 students
	Secondary school	9-12 Std.	Y		650 students
	Higher sec. School				Well maintained
	ITI college/ vocational Training Center	Good	Y		Skill development centre
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	N			20 km Talod 20 km Modasa
	If any of the above Facility is not available in village than approx. distance from village: ..12..kms. Dhansura				
Suggestions if any:					
M.	**Socio- Culture Facilities**				
	Community Hall (With or without TV) Location:	Good	Y		

Gujarat Technological University, Ahmedabad, Gujarat

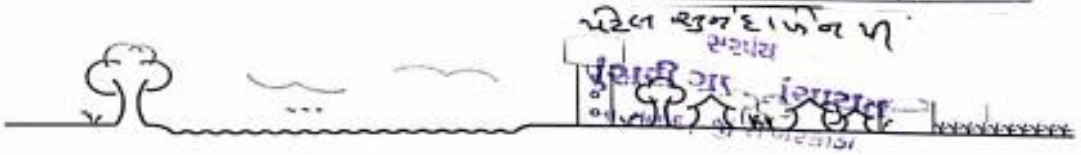
Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Condition:	Good			
	Public Library (With daily newspaper supply: Y/N) Location: Condition:	Y Mobile Van Good	Y		
	Public Garden Location: Condition:		Y		
	Village Pond Location: Condition:	1 Nos.	Y		
	Recreation Center Location: Condition:			N	
	Cinema/ Video Hall Location: Condition:			N	
	Assembly Polling Station Location: Condition:	Good	Y		
	Birth & Death Registration Office Location: Condition:		Y		

If any of the above Facility is not available in village than approx. distance from village: .....kms.

Suggestions if any:

N.	Other Facilities				
	Post-office	Good	Y		
	Telecommunication Network/ STD booth		Y		



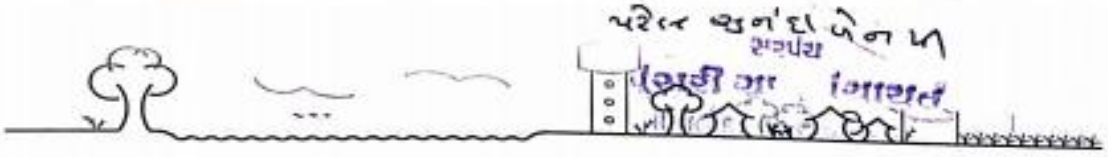
	General Market		Y		
	Shops (Public Distribution System)		Y		
	Panchayat Building	Good	Y		
	Pharmacy/Medical Shop	2 Nos.	Y		
	Bank & ATM Facility	1 No	Y		
	Agriculture Co-operative Society	2 Nos.	Y		
	Milk Co-operative Soc.	1 No	Y		
	Small Scale Industries			N	
	Internet Cafes/ Common Service Center/Wi Fi	Free Wifi	Y		
	Other Facility				
Suggestions if any:					

6. **Sustainable /Green Infrastructure Facilities:**

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
O.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	Bio-electric Plant			Electricity from solid waste (75 lakh)
P.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	Good	Yes		
Q.	Any Other				

7. **Data Collection From Village**

Village Base Map Available: Hard Copy/Soft Copy	Y



Recent Projects going on for Development of Village	N
Any NGO working for village development	3-4 Nos (NGO) on PPP buses

8. **Additional Information/ Requirement:**

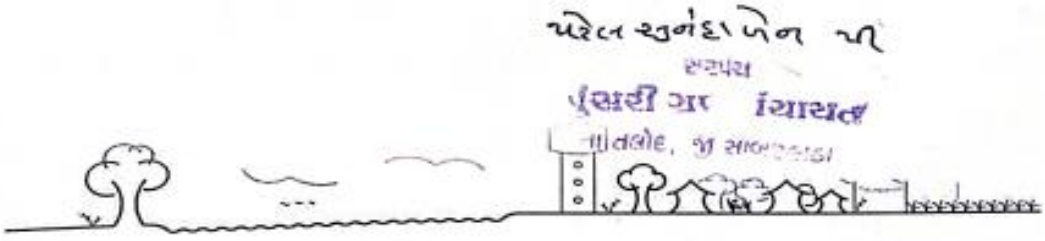
Sr. No.	Descriptions	Information/ Detail	Remarks
1.	Repair & Maintenance of Existing Public Infrastructure facilities(School Building, Health Center, Panchayat Building, Public Toilets & any other)	Fumigates everyday (All public building)	
2.	Additional Information/ Requirement		
3.	Cleaning and Fogging	Monthly	

9. **Smart Village Proposal Design**

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	Is there anything for the village enhancement possible?	Y. Maintenance of bio-electric plant	

Note: Photographs/ Video/ Drawings of all existing Infrastructure facilities & conditions should be taken by students of respective villages for their record and information.

For Any Administration queries/ Difficulties:
GTU VY Section:
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in



12.2 Survey form of Smart Village Scanned copy attachment in the report for Part-I Survey form of Smart Village Original copy attachment in the report for Part-II

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Techno Economic Survey

Vishwakarma Yojana: Phase VIII

SMART VILLAGE SURVEY

An approach towards **"Rurbanisation for Village Development"**

Name of District:	Surendranagar
Name of Taluka:	Wadhwan
Name of Village:	Kotharoiya
Name of Institute:	L. J. Institute of Engg. & Tech.
Nodal Officer Name & Contact Detail:	Prof. Parth Sinroza 9601408457
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Sarpanch, Teacher Village Dweller
Date of Survey:	29-8-2020

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001	-	-	-	-
2.	2011	3568	1657	1711	719

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	1158.5 ha 22.756286 , 71.712575
2.	Forest Area (In hect.)	22.3 ha
3.	Agricultural Land Area (In hect.)	29.42 ha
4.	Residential Area (In hect.)	29.97 ha
5.	Other Area (In hect.)	1076.81 ha
6.	Distance to the nearest railway station (in kilometers):	13 km

1

7.	Name of Nearest Town with Distance:	Wadhwan (5 kms)
8.	Distance to the nearest bus station (in kilometers):	The village has a bus station.
9.	Whether village is connected to all road for the any facility or town or City?	Yes

III. OCCUPATIONAL DETAILS:

Name of Three Major Occupation groups in Village	1. Agriculture / Farming
	2. Daily wage workers
	3. Private sector

Major crops grown in the village:	1. Cotton
	2. Groundnut
	3. Millet

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
1.	**PIPED WATER**				
	Piped Into Dwelling	Y	✓		
	Piped To Yard/Plot	Y	✓		
	Public Tap/Standpipe				
	Tube Well Or Bore Well				
2.	**DUG WELL**	N			
	Protected Well				
	Un Protected Well				
3.	**WATER FROM SPRING**	N			
	Protected Spring				
	Unprotected Spring				
	Rainwater				
	Tanker Truck				
	Cart With Small Tank				
4.	**SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/**				
	Irrigation Channel	Y			
	Bottled Water	Y	✓		
	Hand Pump				
	Other(Specify)**Lake/ Pond**				

21

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Suggestions if any:					
B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	✓		50,000 L
	Underground Sump	Capacity:			
Suggestions if any:					
C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE 1 2 B. OPEN WITH OUTLET C. OPEN WITHOUT OUTLET	Yes	✓		
Suggestions if any:					
D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	Y	✓		
	Main road	Y	✓		
	Internal streets	Y	✓		
	Nearest NH/SH/MDR/ODR Dist. in kms.	0 km SH			
Suggestions if any:					
E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	N (5 km S.nagar)	✓		
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	Y	✓		
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	All			
Suggestions if any:					
F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Y (Govt more than 6 hrs)	✓		

3

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Power supply for Domestic Use	Y	✓		(24 hrs)
	Power supply for Agricultural Use	Y			
	Power supply for Commercial Use	Y	✓		
	Road/ Street Lights	Y		✓	
	Electrification in Government Buildings/ Schools/ Hospitals	Y	✓		
	Renewable Energy Source Facilities (Y/ N)	N			
	LED Facilities	N			
Suggestions if any:					
G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	1	✓		More public toilets are req.
	Location Condition	Good			
	Community Toilet (With bath/ without bath facilities)	N			
	Solid & liquid waste Disposal system available	Y	✓		
	Any facility for Waste collection from road	Y	✓		
Suggestions if any:	2 to 3 more public toilet blocks are req.				
H.	**Main Source of Irrigation Facility:**				
	TANK/POND	Y			
	STREAM/RIVER				
	CANAL	Y	✓		
	WELL	Y			
	TUBE WELL	Y	✓		
	OTHER (SPECIFY)				
Suggestions if any:					
I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	0.3	✓		

4

V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)	Y	✓		Health care facilities need to be improved.
	Sub-Centre	Y	✓		
	PHC	Y	✓		
	BLOCK PHC	Y	✓		
	CHC/RH	N			
	District/ Govt. Hospital	N			
	Govt. Dispensary	N			
	Private Clinic	N			
	Private Hospital/	N			
	Nursing Home	N			
	AYUSH Health Facility	N			
	sonography /ultrasound facility	N			
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
K.	**Education Facilities:**				
	Aaganwadi/ Play group	Y	✓		
	Primary School	Y	✓		
	Secondary school	Y	✓		
	Higher sec. School				
	ITI college/ vocational Training Center	N			
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	N			
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				

Suggestions if any:

L.	Socio- Culture Facilities	Condition	Location	Available (YES)	Available (NO)
	Community Hall (With or without TV)	Good		Y	
	Public Library (With daily newspaper supply: Y/N)	Good		Y	
	Public Garden				N
	Village Pond				
	Recreation Center				N
	Cinema/ Video Hall				N
	Assembly Polling Station	Good		Y	
	Birth & Death Registration	Good		Y	

If any of the above Facility is not available in village than approx. distance from village: .....kms.

Suggestions if any:

M.	Other Facilities	Condition	Location	Available (YES)	Available (NO)
	Post-office	Good		Y	
	Telecommunication Network/ STD booth				N
	General Market	Good		Y	
	Shops (Public Distribution System)	Good		Y	
	Panchayat Building	Good		Y	
	Pharmacy/Medical Shop	Good		Y	
	Bank & ATM Facility	Good		Y	
	Agriculture Co-operative Society				N
	Milk Co-operative Soc.	Good		Y	
	Small Scale Industries	Good			N
	Internet Cafes/ Common Service Center/Wi Fi				N
	Youth Club				N
	Mahila Mandal				

19

	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries				2
	Other Facility				

Suggestions if any:

N.	Other Facilities	Condition		Available (YES)	Available (NO)
	1. Have these programme implemented the village?				
	2. Are there any beneficiaries in the village from the following programme?				
	3. Janani Suraksha Yojana			Y	
	4. Kishori Shakti Yojana			Y	
	5. Balika Samriddhi Yojana			Y	
	6. Mid-day Meal Programme				2
	7. Intergrated Child Development Scheme (ICDS)				2
	8. Mahila Mandal Protsahan Yojana (MMPY)				2
	9. National Food for work Programme (NFFWP)				2
	10. National Social Assistance Programme				2
	11. Sanitation Programme (SP)				2
	12. Rajiv Gandhi National Drinking Water Mission				2
	13. Swarnjayanti Gram Swarozgar Yojana				2
	14. Minimum Needs Programme (MNP)				2
	15. National Rural Employment Programme				2
	16. Employee Guarantee Scheme (EGS)				2
	17. Prime Minister Rojgar Yojana (PMRY)				2
	18. Jawahar Rozgar Yojana (JRY)				2
	19. Indira Awas Yaojna (IAY)				2
	20. Samagra Awas Yojana (SAY)				2
	21. Sanjay Gandhi Niradhar Yojana (SGNY)				2
	22. Jawahar Gram Samridhi Yojana (JGSY)				2
	23. Other (SPECIFY)				2

VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	N		✓	
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	N		✓	Bio-gas plant can be build
3.	Any Other				

VII. DATA COLLECTION FROM VILLAGE

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	illage Base Map Available: Hard Copy/Soft Copy				
2.	Recent Projects going on for Development of Village	N		✓	
3.	Any NGO working for village development	N		✓	
4.	Any natural calamity in the village during the last one year: EARTHQUAKES FLOODS CYCLONE DROUGHT LANDSLIDES AVALANCHE OTHER (SPECIFY)	N			

VIII. ADDITIONAL INFORMATION/ REQUIREMENT:

Sr. No.	Descriptions	Information/ Detail	Remarks

8

1.	Repair & Maintenance of Existing Public Infrastructure facilities, School Building Health Center Panchayat Building Public Toilets & any other	 ✓ ✓ ✓ ✓	
2.	Additional Information/ Requirement		
3.	During the last six months how many times CLEANING ..... FOGGING..... Drive was undertaken in the village?	 3 2	

IX. Smart Village / Heritage Details

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	IS THEIR ANY THING FOR THE VILLAGE ENHANCEMENT POSSIBLE ?		

Note: Photographs/ Video/ Drawings of all existing Infrastructure facilities & conditions should be taken by students of respective villages for their record and information.

For Any Administration queries/ Difficulties:
GTU VY Section
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in

ઉપસરપંચ/તલાટી-કમ-મંત્રી
સરપંચ
ઓગણીયા ગ્રામ પંચાયત

12.3 Survey form of Allocated Village Scanned copy attachment in the report for Part-I Survey form of Allocated Village Original copy attachment in the report for Part-II

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

Techno Economic Survey

Vishwakarma Yojana: Phase VIII

ALLOCATED VILLAGE SURVEY

An approach towards "Rurbanisation for Village Development"

Name of District:	Ahmedabad
Name of Taluka:	Daskroi
Name of Village:	Navapura
Name of Institute:	L J Institute of Engg. & Tech.
Nodal Officer Name & Contact Detail:	Prof. Paroth Sinroza 9601408487
Respondent Name: (Sarpanch/ Panchayat Member/ Teacher/ Gram Sevak/ Aaganwadi worker/Village dweller)	Sarpanch Panchayat member Village dweller
Date of Survey:	25-09-2020

I. DEMOGRAPHICAL DETAIL:

Sr. No.	Census	Population	Male	Female	Total Number of House Holds
1.	2001	–	–	–	–
2.	2011	3756	1934	1822	

II. GEOGRAPHICAL DETAIL:

Sr. No.	Description	Information/Detail
1.	Area of Village (Approx.) (In Hector)Coordinates for Location:	452.36 hectare
2.	Forest Area (In hect.)	
3.	Agricultural Land Area (In hect.)	308.14 hectare
4.	Residential Area (In hect.)	79.09 hectare
5.	Other Area (In hect.)	58.99 hectare
6.	Distance to the nearest railway station (in kilometers):	Ahmedabad થી 13 કિમી

સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ.
જિ. અમદાવાદ.

7.	Name of Nearest Town with Distance:	Ahmedabad - 24 km
8.	Distance to the nearest bus station (in kilometers):	Bhat bus stop - 8.2 km
9.	Whether village is connected to all road for the any facility or town or City?	Yes

III. OCCUPATIONAL DETAILS:

Name of Three Major Occupation groups in Village	1. Private sector 2. Farming / Agriculture 3. Labourers / Daily wage

Major crops grown in the village:	1. Wheat 2. Millet 3. Vegetables

IV. PHYSICAL INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Detail	Adequate	Inadequate	Remarks
A.	**Main Source of Drinking water**				
1.	**PIPED WATER** Piped Into Dwelling Piped To Yard/Plot Public Tap/Standpipe Tube Well Or Bore Well	✓	✓		
2.	**DUG WELL** Protected Well Un Protected Well				
3.	**WATER FROM SPRING** Protected Spring Unprotected Spring				
	Rainwater Tanker Truck Cart With Small Tank				
4.	**SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/** Irrigation Channel				
	Bottled Water Hand Pump	✓	✓		

સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ.
જિ. અમદાવાદ.

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Other(Specify)Lake/ Pond	✓			

Suggestions if any: The lake is highly polluted and need to be cleaned.

B.	**Water Tank Facility**				
	Overhead Tank	Capacity:	✓	✗	
	Underground Sump	Capacity:	✓	✗	

Suggestions if any:

C.	**The Type of Drainage Facility**				
	A. UNDERGROUND DRAINAGE 1	Yes		✓	

Suggestions if any:

D.	**Road Network :All Weather/ Kutchha (Gravel)/ Black Topped pucca/ WBM**				
	Village approach road	✓		✓	
	Main road	✓			
	Internal streets	✓			
	Nearest NH/SH/MDR/ODR Dist. in kms.	1.5 km SH 142	✓		

Suggestions if any:

E.	**Transport Facility**				
	Railway Station (Y/N) (If No than Nearest Rly Station---Kms)	N (Ahmedabad 24 km)			
	Bus station (Y/N) Condition: (If No than Nearest Bus Station---Kms)	N (8.2 km)		✓	
	Local Transportation (Auto/ Jeep/Chhakda/ Private Vehicles/ Other)	Proivate vehicles			

Suggestions if any:

F.	**Electricity Distribution**				
	(Y/N) Govt./ Private (Less than 6 hrs./ More Than 6 hrs)	Y (Govt, More than 6 hrs)	✓		

ચૌધરી કુલાભાઈ પ્રેમાજી
સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ.
જિ. અમદાવાદ.

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Power supply for Domestic Use	More than 6 hrs	✓		
	Power supply for Agricultural Use	8 hrs/day			
	Power supply for Commercial Use	More than 6 hrs	✓		
	Road/ Street Lights				75% village area is covered
	Electrification in Government Buildings/ Schools/ Hospitals	Y	✓		
	Renewable Energy Source Facilities (Y/ N)	N		✓	
	LED Facilities				
Suggestions if any:					
G.	**Sanitation Facility**				
	Public Latrine Blocks If available than Nos.	4		✓	Maintenance & repair is req.
	Location Condition				
	Community Toilet (With bath/ without bath facilities)	N		✓	
	Solid & liquid waste Disposal system available	Y		✓	Management is req.
	Any facility for Waste collection from road	N		✓	
Suggestions if any:					
H.	**Main Source of Irrigation Facility:**				
	TANK/POND STREAM/RIVER CANAL WELL TUBE WELL. OTHER (SPECIFY)	 ✓ ✓	 ✓ ✓		
Suggestions if any:					
I.	**Housing Condition:**				
	Kutchha/Pucca (Approx. ratio)	0.1			

4

સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ.
જિ. અમદાવાદ.

V. SOCIAL INFRASTRUCTURAL FACILITIES:

Sr. No.	Descriptions	Information/ Detail	Adequate	Inadequate	Remarks
J.	**Health Facilities:**				
	ICDS (Anganwadi)	✓	✓		Ahmedabad is the nearest city for such services.
	Sub-Centre	N		✓	
	PHC	N		✓	
	BLOCK PHC	N		✓	
	CHC/RH	N		✓	
	District/ Govt. Hospital	N		✓	
	Govt. Dispensary	N		✓	
	Private Clinic	N		✓	
	Private Hospital/	N		✓	
	Nursing Home	N		✓	
	AYUSH Health Facility	N		✓	
	sonography /ultrasound facility	N		✓	
	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
K.	**Education Facilities:**				
	Aaganwadi/ Play group	✓	✓		
	Primary School	✓	✓		
	Secondary school	✓	✓		
	Higher sec. School	N		✓	
	ITI college/ vocational Training Center	N		✓	
	Art, Commerce& Science /Polytechnic/ Engineering/ Medical/ Management/ other college facilities	N		✓	LJIET is the nearest college. (24 km)

સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ.
જિ. અમદાવાદ.

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	If any of the above Facility is not available in village than approx. distance from village: .....kms.				
Suggestions if any:					
L.	**Socio- Culture Facilities**	Condition	Location	Available (YES)	Available (NO)
	Community Hall (With or without TV)	Bad	Outside the village		~~NO~~
	Public Library (With daily newspaper supply: Y/N)	N			NO
	Public Garden				NO
	Village Pond	Polluted		YES	
	Recreation Center				NO
	Cinema/ Video Hall				NO
	Assembly Polling Station	Good	School	YES	
	Birth & Death Registration Office	Good	Panchayat	YES	
If any of the above Facility is not available in village than approx. distance from village: .....kms.					
Suggestions if any:					
M.	**Other Facilities**	Condition	Location	Available (YES)	Available (NO)
	Post-office	Bad	Centre of village	YES	
	Telecommunication Network/ STD booth				NO
	General Market				NO
	Shops (Public Distribution System)			YES	
	Panchayat Building	Very Bad		YES	
	Pharmacy/Medical Shop				NO
	Bank & ATM Facility				NO
	Agriculture Co-operative Society				NO
	Milk Co-operative Soc.			YES	
	Small Scale Industries				NO
	Internet Cafes/ Common Service Center/Wi Fi				NO
	Youth Club				NO
	Mahila Mandal				NO

9

સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ.
જિ. અમદાવાદ.

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

	Credit Cooperative Society Agricultural Cooperative Society Milk Cooperative Society Fishermen's Cooperative Society Computer Kiosk/ e-chaupal / Mills / Small Scale Industries				NO
	Other Facility				
Suggestions if any:					

N.	Other Facilities	Condition		Available (YES)	Available (NO)
	1. Have these programme implemented the village?				
	2. Are there any beneficiaries in the village from the following programme?				
	3. Janani Suraksha Yojana			YES	
	4. Kishori Shakti Yojana				
	5. Balika Samriddhi Yojana				
	6. Mid-day Meal Programme			YES	
	7. Intergrated Child Development Scheme (ICDS)				
	8. Mahila Mandal Protsahan Yojana (MMPY)				
	9. National Food for work Programme (NFFWP)				
	10. National Social Assistance Programme				
	11. Sanitation Programme (SP)				
	12. Rajiv Gandhi National Drinking Water Mission				
	13. Swarnjayanti Gram Swarozgar Yojana				
	14. Minimum Needs Programme (MNP)				
	15. National Rural Employment Programme				
	16. Employee Guarantee Scheme (EGS)				
	17. Prime Minister Rojgar Yojana (PMRY)				
	18. Jawahar Rozgar Yojana (JRY)				
	19. Indira Awas Yaojna (IAY)			YES	
	20. Samagra Awas Yojana (SAY)				
	21. Sanjay Gandhi Niradhar Yojana (SGNY)				
	22. Jawahar Gram Samridhi Yojana (JGSY)				
	23. Other (SPECIFY)				

સરપંચ
નવાપુરા ગ્રામ પંચાયત
મુ. નવાપુરા તા. સાણંદ
જિ. અમદાવાદ.

VI. SUSTAINABLE /GREEN INFRASTRUCTURE FACILITIES:

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Adoption of Non-Conventional Energy Sources/ Renewable Energy Sources	NO		✓	
2.	Bio-Gas Plant Solar Street Lights Rain Water Harvesting System	NO		✓	
3.	Any Other				

VII. DATA COLLECTION FROM VILLAGE

Sr. No.	Descriptions	Information/ Details	Adequate	Inadequate	Remarks
1.	Village Base Map Available: Hard Copy/Soft Copy			✓	Not available
2.	Recent Projects going on for Development of Village			✓	
3.	Any NGO working for village development			✓	
4.	Any natural calamity in the village during the last one year: EARTHQUAKES FLOODS CYCLONE DROUGHT LANDSLIDES AVALANCHE OTHER (SPECIFY)	–			

સરપંચ
નવાપુરા ગ્રામ પંચાયત
તા. દસ્ક્રોઇ જી. અમદાવાદ.

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Techno Economic Survey

VIII. ADDITIONAL INFORMATION/ REQUIREMENT:

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	Repair & Maintenance of Existing Public Infrastructure facilities,		
	School Building	Not req.	Not available
	Health Center		
	Panchayat Building	In very bad condn	
	Public Toilets & any other	In very bad condn	
2.	Additional Information/ Requirement		
3.	During the last six months how many times CLEANING ..... FOGGING..... Drive was undertaken in the village?		

IX. Smart Village / Heritage Details

Sr. No.	Descriptions	Information/ Detail	Remarks
1.	IS THEIR ANY THING FOR THE VILLAGE ENHANCEMENT POSSIBLE ?		

Note: Photographs/ Video/ Drawings of all existing Infrastructure facilities & conditions should be taken by students of respective villages for their record and information.

For Any Administration queries/ Difficulties:
GTU VY Section
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in

સરપંચ
નવાપુરા ગ્રામ પંચાયત
તા. દસક્રોઇ જી. અમદાવાદ

12.4 Gap Analysis of the Allocated Village

VILLAGE GAP Analysis					
Village Facilities	**Planning-commission /UDPFI Norms**	**Village Name:**	NAVAPURA		
		Population: 2475			
		Existing	**Required as per Norms**	**Smart Vilage / Cities / Heritage FutureProjection Design**	**Gap**
Social Infrastructure Facilities					
Education					
Anganwadi	Each or Per 2500 population	Y(3)		Y	NA
Primary School	Each Per 2500 population	Y		Y	NA
Secondary School	Per 7,500 population	Y		Y	NA
Higher Secondary School	Per 15,000 Population	N		N	NA
College	Per 125,000 Population	N		N	NA
Tech. Training Institute	Per 100000 Population	N		N	NA
Agriculture Research Centre	Per 100000 Population	N		N	NA
Skill Development Center	Per 100000 Population	N		Y	1
Health Facility					
Govt/Panchyat Dispensary or Sub PHC or Health Centre	Each Village	N		N	NA
Primary Health & Child Health Center	Per 20,000 population	N		N	NA (need)
Child Welfare and Maternity Home	Per 10,000 population	N		N	NA
Multispeciality Hospital	Per 100000 Population	N		N	NA
Public Latrines	1 for 50 families (if toilet is not there in home, especially for slum pockets &kutcha house)	N		Y	1
Physical Infrastructure Facilities					

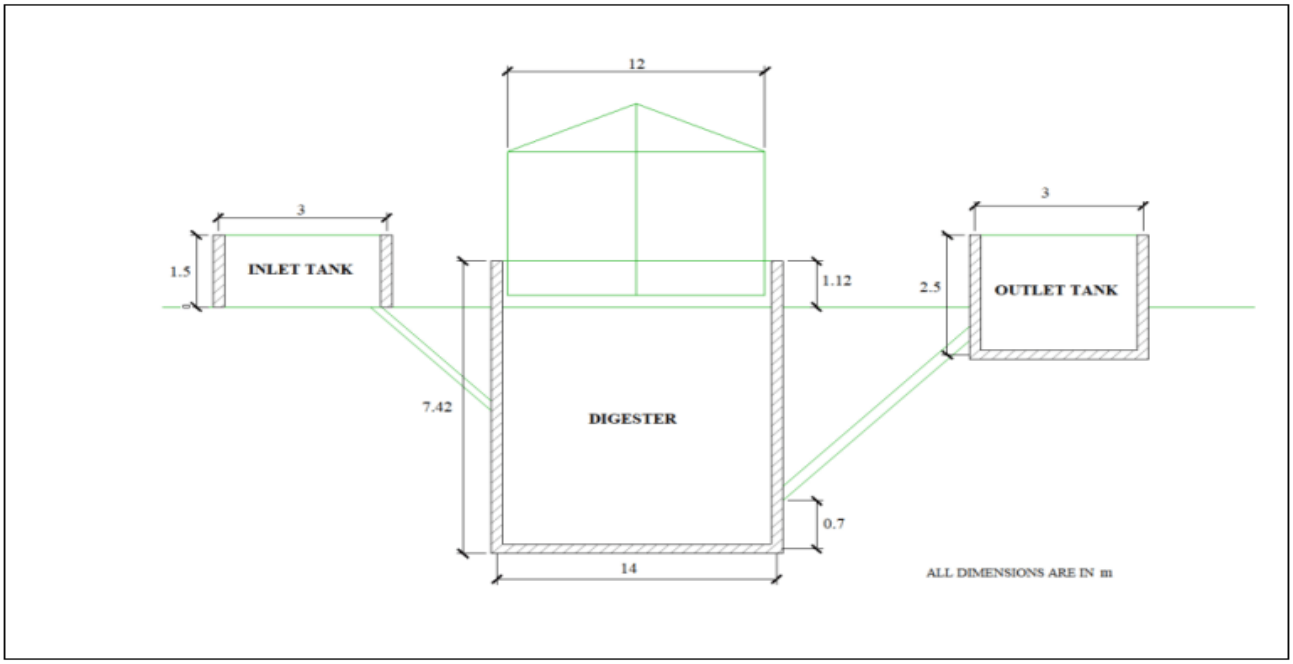
Transportation		Inadequate			
Pucca Village Approach Road	Each village	Y		Y	NA
Bus/Auto Stand provision	All Villages connected by PT (ST Bus or Auto)	N		Y	1
Drinking Water (Minimum 70 lpcd)		Adequate		Adequate	NA
Over Head Tank	1/3 of Total Demand	N		Y	1
U/G Sump	2/3 of Total Demand	Y		Y	NA
Drainage Network - Open		Adequate		Adequate	NA
Drainage Network - Cover		Adequate		Adequate	NA
Waste Management System		Inadequate		Adequate	Required
Socio- Cultural Infrastructure Facilities					
Community Hall	Per 10000 Population	N		Y	1
community hall and Public Library	Per 15000 Population	N		Y	1
Cremation Ground	Per 20,000 population	Y(POOR)		N	required
Post Office	Per 10,000 population	N		Y	1
Gram Panchayat Building	Each individual/group panchayat	Y(POOR)		Y(FAIR)	Maintenance required
APMC	Per 100000 Population	N		N	NA
Fire Station	Per 100000 Population	N		N	NA
Public Garden	Per village	N		N	NA
Police post	Per 40,000Population	N		N	NA
Electrical Design					
Electricity Network		Adequate		Adequate	
Any Smart Village Facility					
				Pond Facility	
		ESR cap	0		
		sump cap	0		
		Lat	0		

12.5 Summary Details of All the Villages Designs in Table form

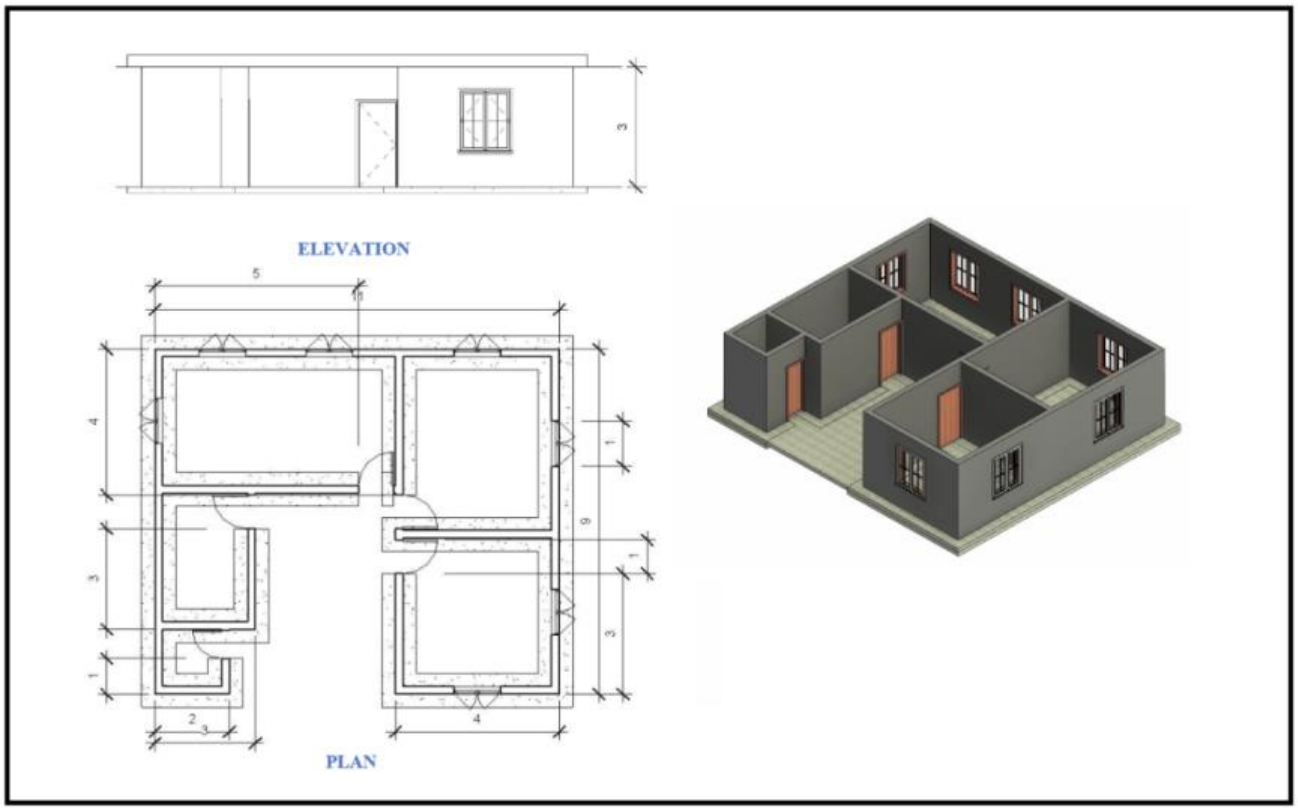
Sr. No.	Village Name	Discipline	Designs	
			Part-I	**Part-II**
1.	Navapura	Civil	Bank	PHC
			Gram Panchayat	Post Office
			Small Library	Public Toilet
			Bio-gas Plant	Mini market
			Learning Hub and Smart Play Center	BUS Stand
			Obelisk	Veterinary Hospital
2.	Moti Devti	Civil	Public Toilet	Entrance Gate
			Bus Stand	Bank
			Post Office	Anganwadi
			Step Auditorium cum Garba Chowk	Gram Panchayat
			Prayer Hall cum Meditation	Public Library
			Chabutaro	Cyber Cafe
3.	Kolat	Civil	Septic Tank	Sport Area
			Vegetable Market	Maternity Home
			PHC	Cremation Center
			Community Hall	Recreation Park
			Common Service Center	Smart Sanitation System
			Temple	

12.6 Drawings (If, required,A1,A2,A3 design is not visible then only)

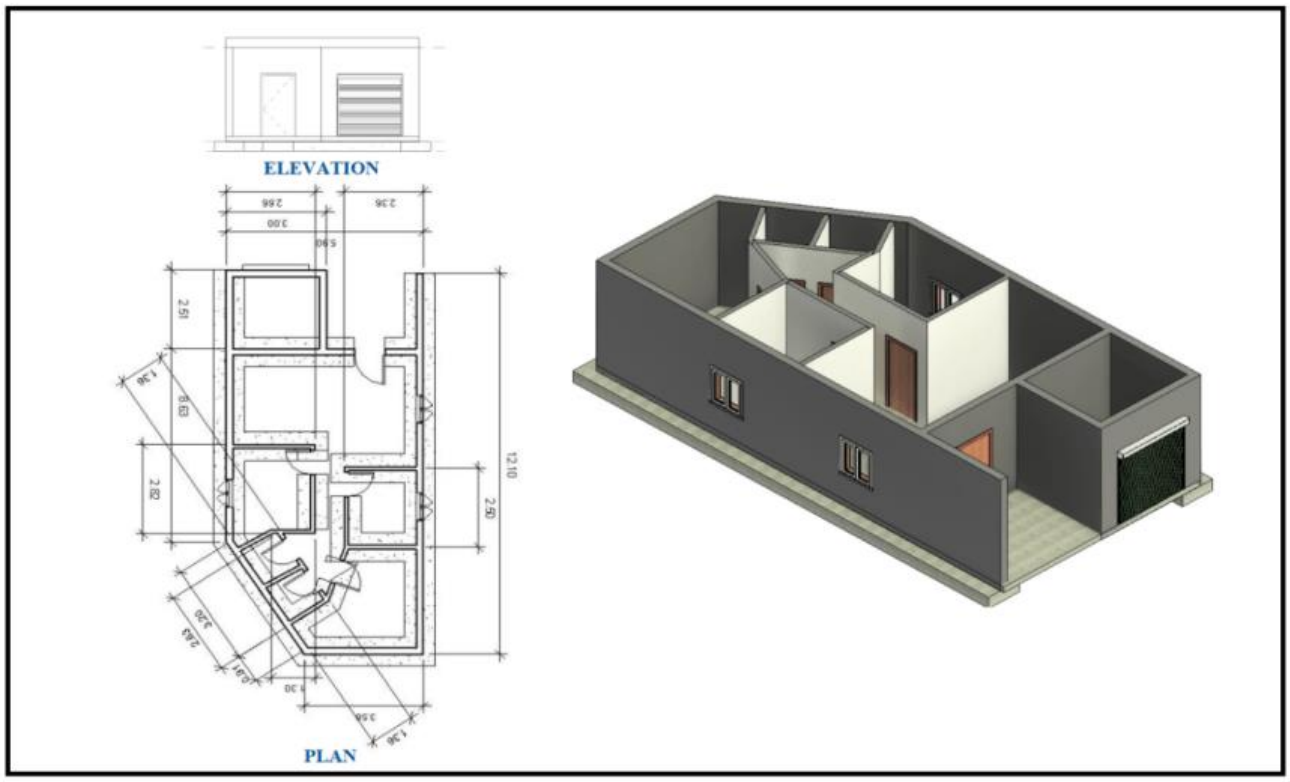
✓ **Biogas Plant**



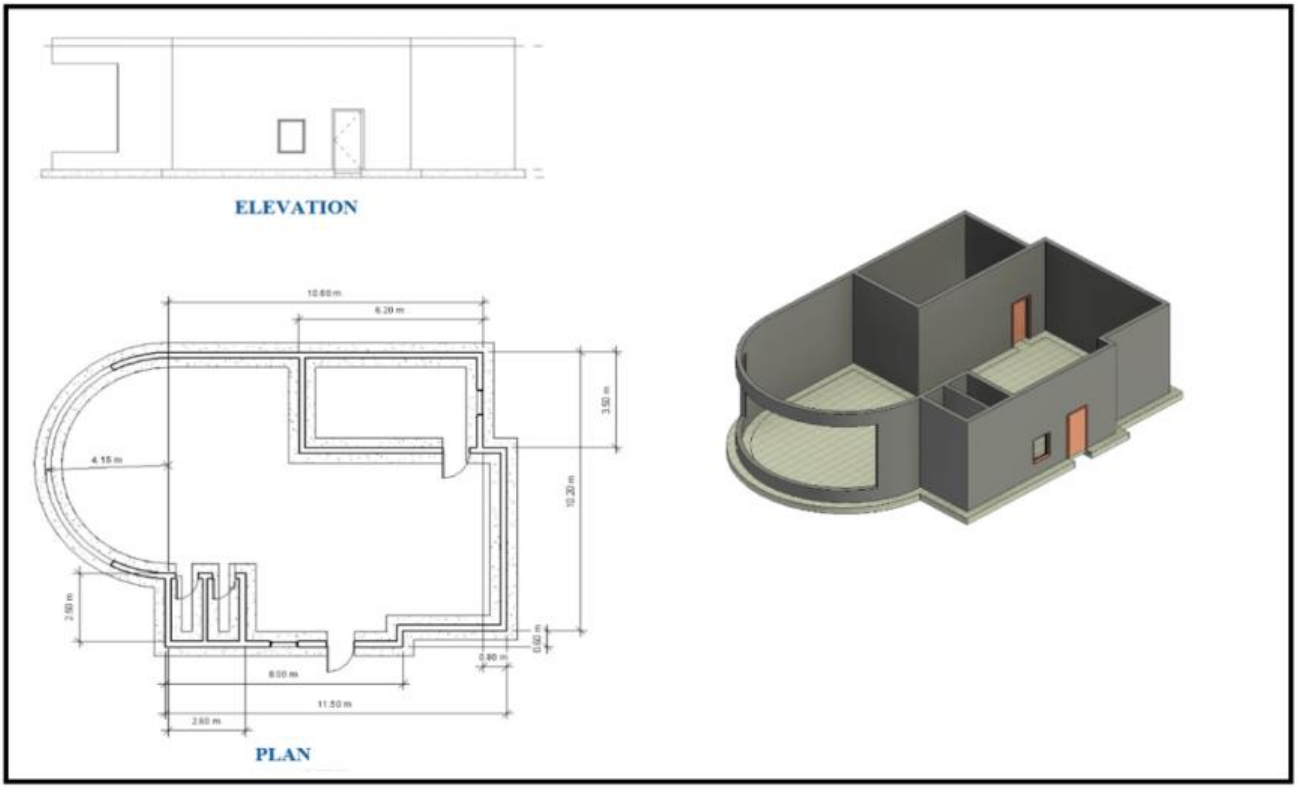
✓ **Panchayat Building**



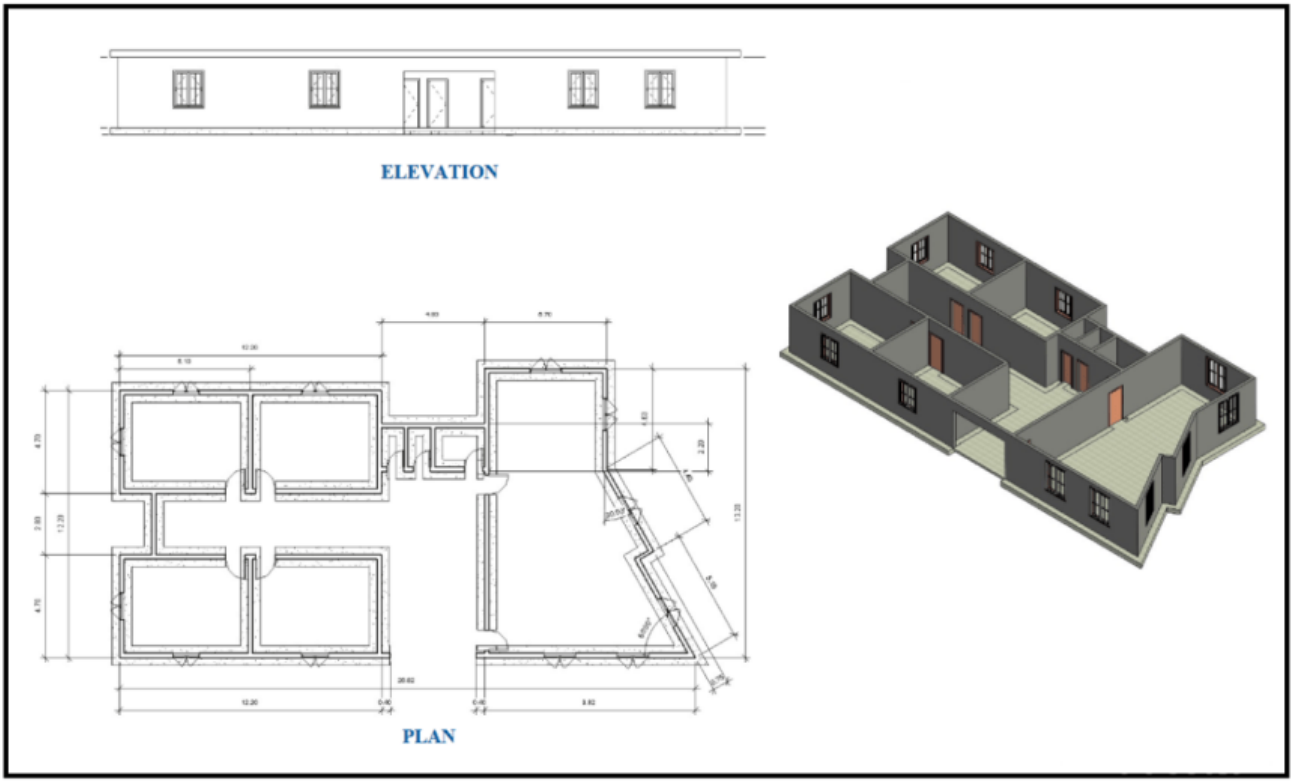
✓ **Bank**



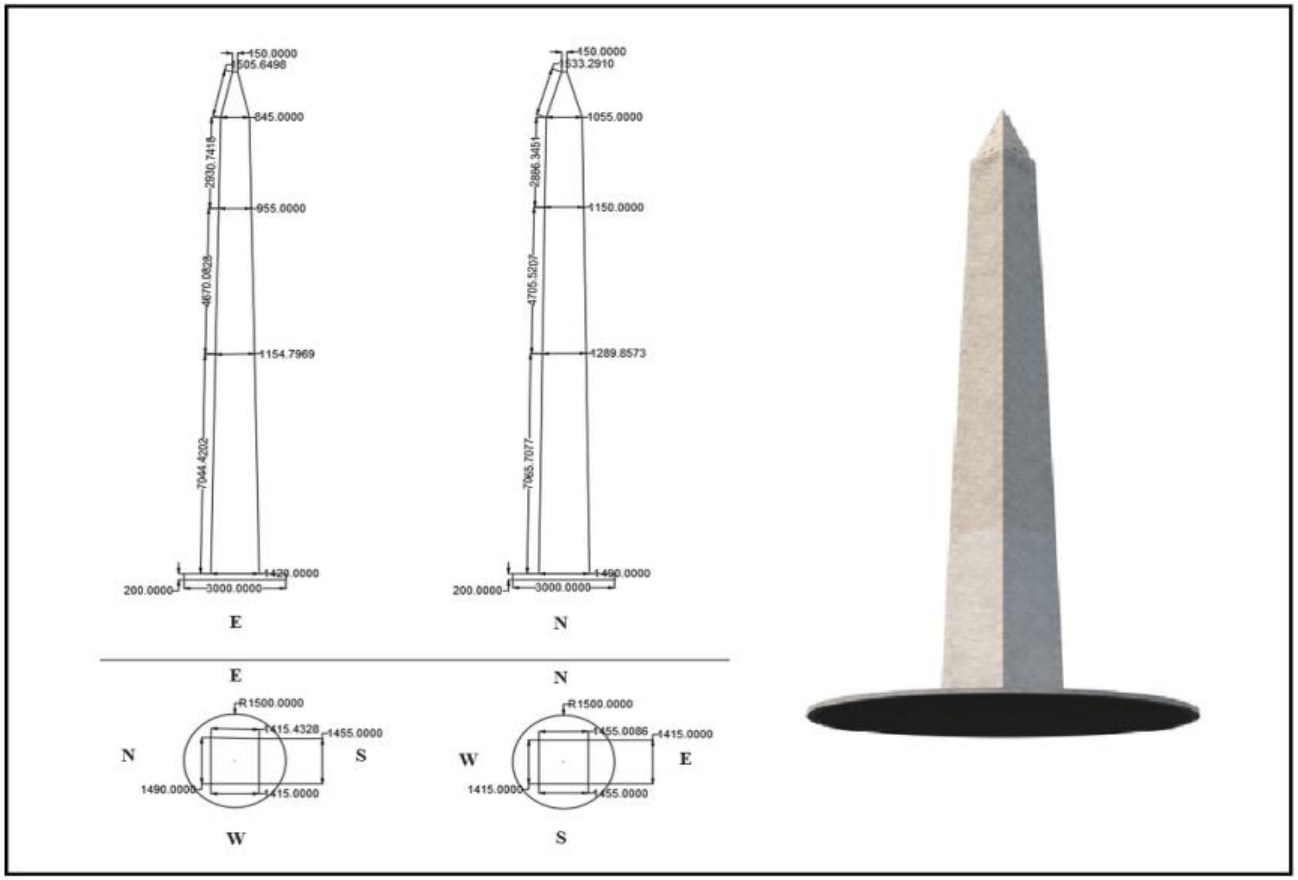
✓ **Small Library**



✓ **Learning Hub & Smart Play Centre**



✓ **Obelisk**


150.0000
505.6498
845.0000
2930.7418
955.0000
4670.0828
1154.7969
7044.4202
1429.0000
200.0000
3000.0000
E
150.0000
533.2910
1055.0000
2896.3451
1150.0000
4705.5207
1289.8573
7065.7077
1490.0000
200.0000
3000.0000
N
E
N
R1500.0000
1415.4328
1455.0000
N
S
1490.0000
1415.0000
W
R1500.0000
1455.0086
1415.0000
W
E
1415.0000
1455.0000
S

12.7 Summary of Good Photographs in Table Format (village visits, Ideal, Smart Village or any other)

12.8 Village Interaction with sarpanch Report with the photograph

- According to techno-economic survey, we visited the Navapura village twice in order to collect details about the village.
- There we interact with the Sarpanch and Talati of the village. Both of them gave us a very good response.We also interact with the villagers in order to know their point of view regarding problems faced by them and what kind of solutions they want.
- We collect several details like:

i. Demographical Details.
ii. Occupational Details.
iii. Physical Infrastructure Facilities.
iv. Social Infrastructural Facilities.
v. Sustainable/Green Infrastructural Facilities.
vi. Data Collection from Village.
vii. Additional Information and Requirement.
viii. Smart Village/Heritage Details.

- After collection of all the details, we discuss the best possible solutions of problems faced by villagers with the Sarpanch and Talati and they suggested us to re-innovate the Panchayat building as the existing condition of Pachayat building is not so good, they also suggested for Bank and ATM facility within the village, a small library for the students, learning hub and smart play centre for the villagers, public health center, recreation/ cleaning of pond,waste management system for the village many more.
- So, we propose some of the designs in phase 1 which are enlisted below:

✓ Panchayat building.
✓ Bank ATM.
✓ Small Library.
✓ Bio Gas plant.
✓ Learning Hub and Smart play center.

- Rest all the design is in on-going process and we will propose them in phase 2.

Chapter 13

From the Chapter- 9 future designs of the aspects (Feasibility, Construction, Operation and maintenance of various design options in Rural Areas along with cost with Auto CAD designs planning with any software

Design Proposals Phase II.

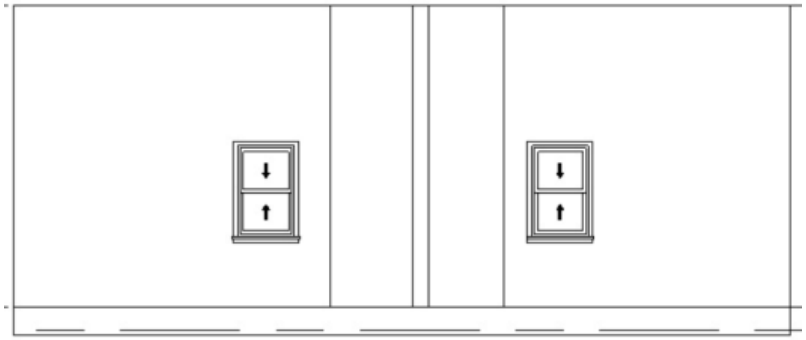
- PHC
- Public Toilet
- Post Office
- Mini Market
- Veterinary Hospital

Public Toilet

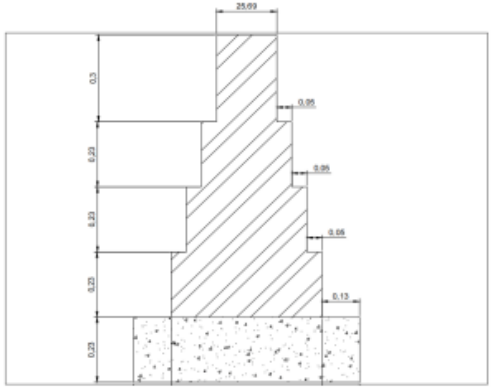
MEASUREMENT SHEET						
No	Items	L(m)	W(m)	H(m)	No of items	Total quantity
1	Roof			0.400	-	031.72m3
2	Walls	80.30	-	4.000	-	229.21m2
3	Doors					
	D1	-	0.915	2.400	5	10.98m2
	D2	-	1.200	2.400	2	05.76m2
	D3	-	0.762	2.400	2	03.66m2
4	Window					
	W1	-	0.915	1.220	2	02.262m2
	W2	-	0.750	1.220	2	01.830m2
5	Masonry in superstructure	-	-	-	-	57.247m3
6	Floor	-	-	-	-	28.710m3

ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	41.3545	m^3	150	m^3	6203.175
2	Concreting in Foundation	011.61	m^3	3800	m^3	44,118
3	Masonry in Foundation	027.72	m^3	4000	m^3	1,10,880
4	Earth Filling	031.60	m^3	80	m^3	2,480
5	Super Structure Masonry work	57.247	m^3	4000	m^3	
6	R.C.C work	24.20	m^3	4100	m^3	96,020
7	Plaster work	640.26	m^2	280	m^2	1,79,200
8	Coloring	640.26	m^2	10	m^2	6402.6
9	Tiles	130.46	m^2	450	m^2	58,707
10	Water tank	1	Nos	8000	Nos	8,000
						5,12,010/-
				Add 5% Contingency		**+25,600**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**5,37,610/-**

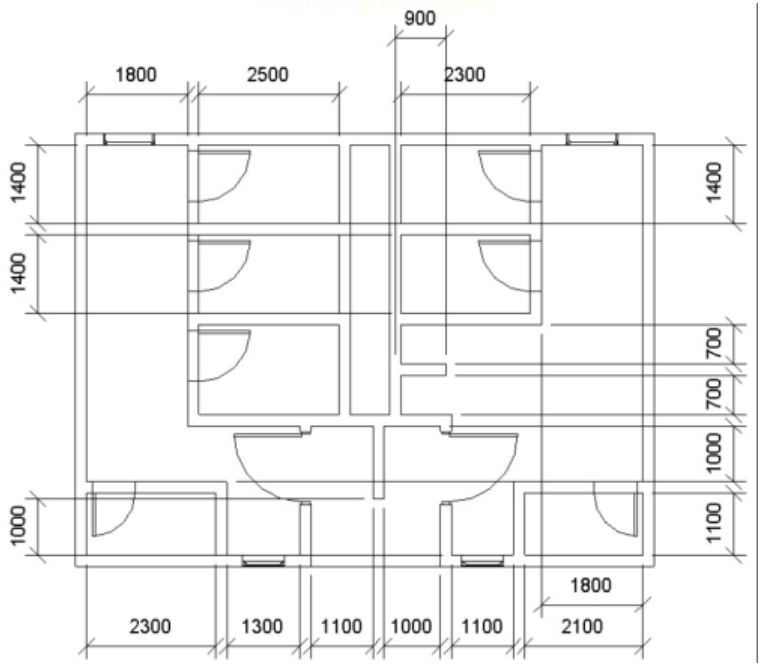
Public Toilet



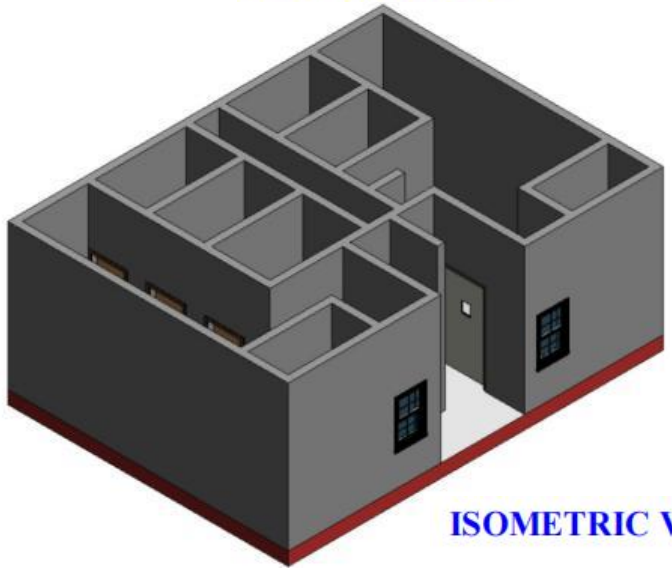
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

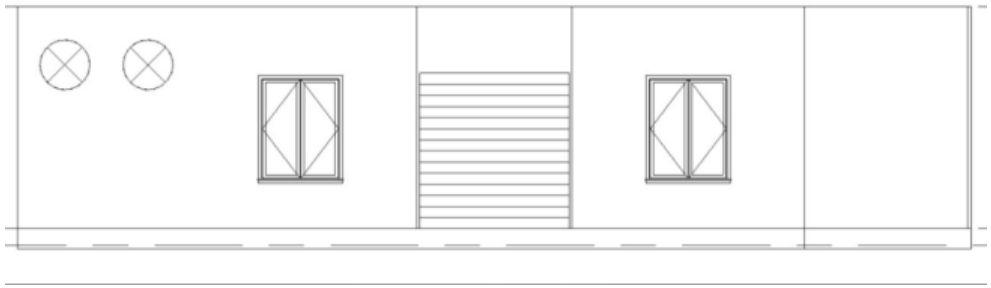
Mini Market

MEASUREMENT SHEET						
No	Items	L(m)	W(m)	H(m)	No of items	Total quantity
1	Roof			0.400	-	052.97m3
2	Walls	96.940	-	4.000	-	308.10m2
3	Doors					
	Shutter	-	3.000	2.800	4	033.60m2
	D1	-	0.915	2.130	4	007.81m2
4	Window	-	1.400	1.800	9	022.68m2
5	Masonry in superstructure	-	-	-	-	061.36m3
6	Floor	-	-	-	-	047.93m3

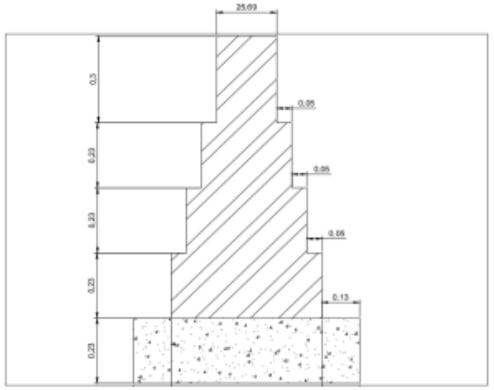
ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	061.93	m^3	150	m^3	9,290
2	Concreting in Foundation	011.61	m^3	3800	m^3	49,118
3	Masonry in Foundation	022.72	m^3	4000	m^3	1,05,250
4	Earth Filling	027.60	m^3	80	m^3	2,208
5	Super Structure Masonry work	061.36	m^3	4000	m^3	2,45,440
6	R.C.C work	22.20	m^3	4100	m^3	106,020
7	Plaster work	524.73	m^2	280	m^2	1,467
8	Coloring	524.73	m^2	10	m^2	5,247
9	Tiles	130.46	m^2	450	m^2	58,707

10	Water tank	1	Nos	8000	Nos	8,000
						6,23,977/-
Add 5% Contingency						**+31,197**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**6,54,654/-**

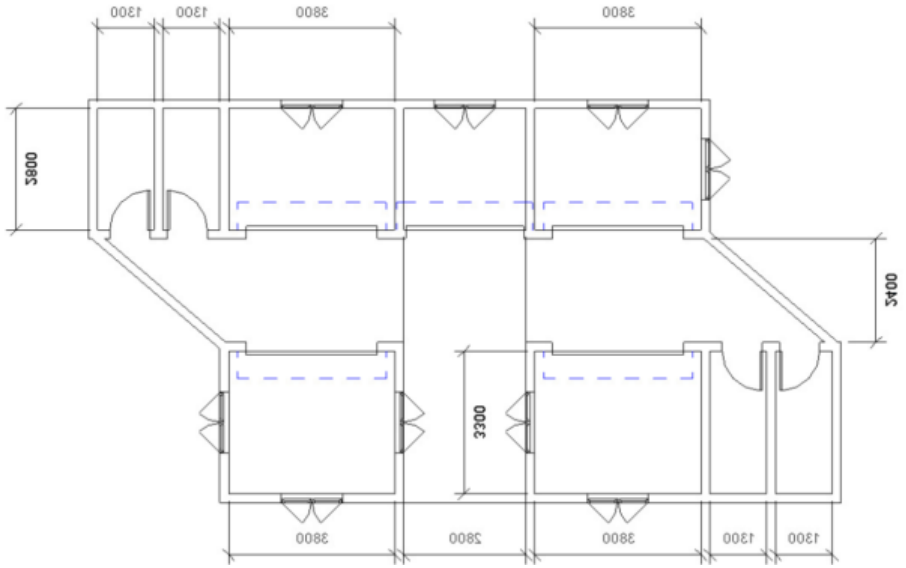
Mini Market



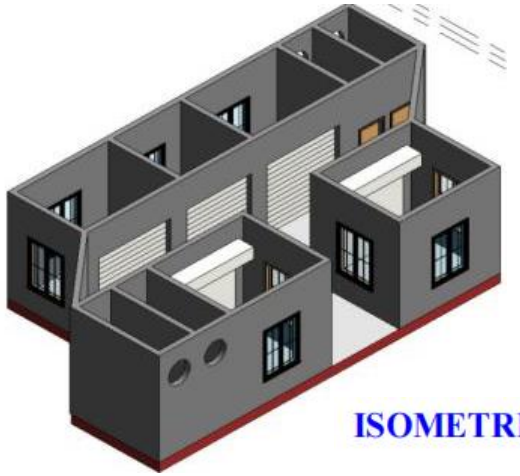
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

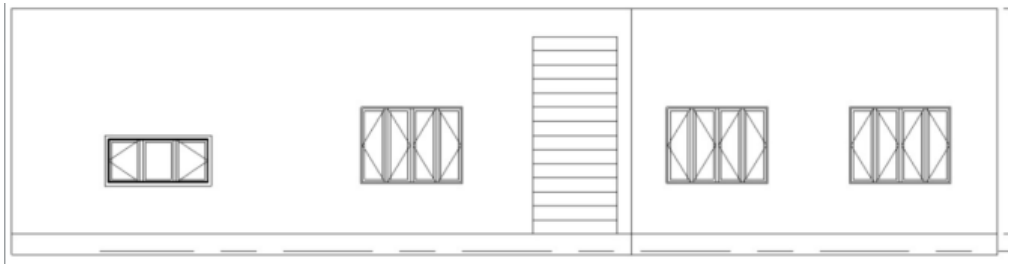
PHC

MEASUREMENT SHEET						
No	Items	L(m)	W(m)	H(m)	No of items	Total quantity
1	Roof			0.400	-	072.18m3
2	Walls	122.90	-	4.000	-	410.30m2
3	Doors					
	Shutter	-	1.500	3.500	1	005.25m2
	D1	-	1.000	2.200	8	017.60m2
	D2	-	0.750	2.000	6	009.00m2
4	Window					
	W1	-	1.800	0.800	3	004.32m2
	W2	-	1.800	1.350	6	014.58m2
	W3	-	0.750	1.200	5	004.50m2
5	Masonry in superstructure	-	-	-	-	082.05m3
6	Floor	-	-	0.362	-	065.32m3

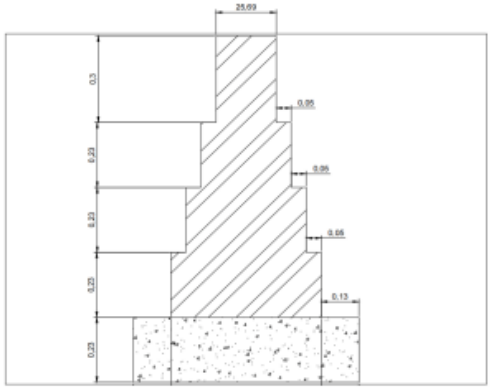
ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	061.93	m^3	150	m^3	15,290
2	Concreting in Foundation	011.61	m^3	3800	m^3	44,118
3	Masonry in Foundation	022.72	m^3	4000	m^3	1,25,423
4	Earth Filling	027.60	m^3	80	m^3	2,208
5	Super Structure Masonry work	082.05	m^3	4000	m^3	3,28,200

6	R.C.C work	22.20	m^3	4100	m^3	193,020
7	Plaster work	524.73	m^2	280	m^2	2,678
8	Coloring	524.73	m^2	10	m^2	5,247
9	Tiles	130.46	m^2	450	m^2	99,707
10	Water tank	1	Nos	8000	Nos	8,000
						7,23,977/-
				Add 5% Contingency		**+37,525**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**7,60,692/-**

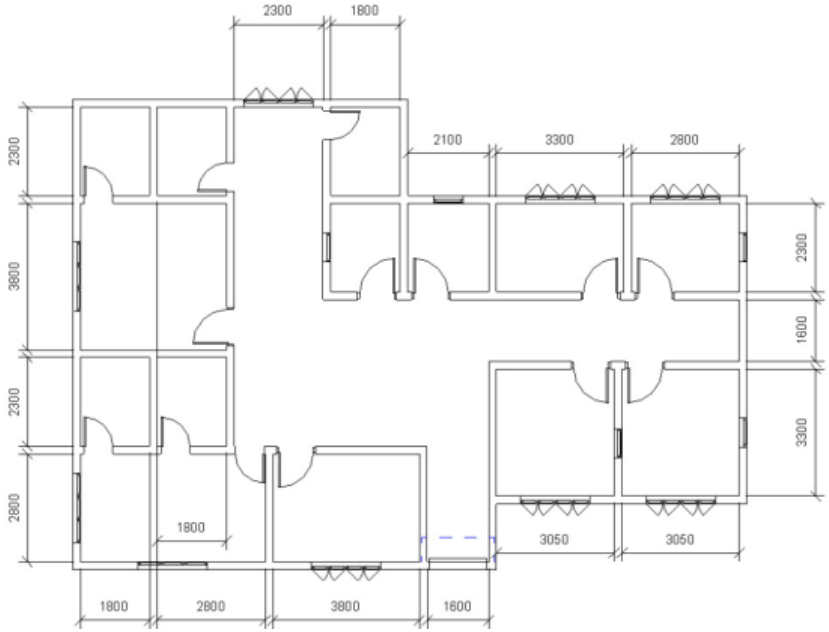
PHC



ELEVATION



FOUNDATION



PLAN

ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

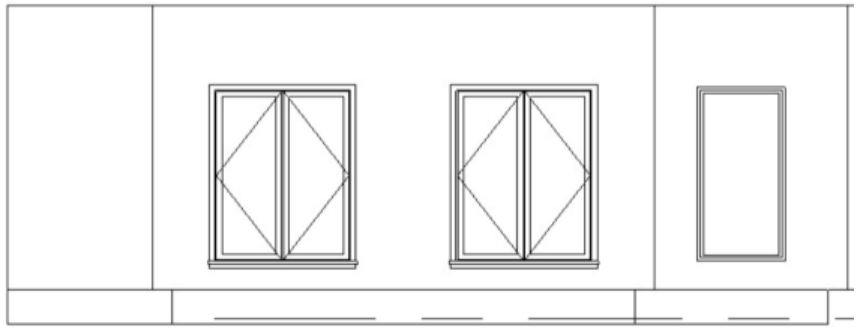
Post Office

MEASUREMENT SHEET						
No	Items	L(m)	W(m)	H(m)	No of items	Total quantity
1	Roof			0.400	-	026.84m3
2	Walls	65.00	-	4.000	-	151.04m2
3	Doors					
	D1	-	1.000	2.200	3	006.60m2
	D2	-	0.762	2.032	5	007.74m2
4	Window					
	W1	-	0.915	1.830	5	008.37m2
	W2	-	1.400	1.800	5	012.60.m2
5	Masonry in superstructure	-	-	-	-	030.30m3
6	Floor	-	-	0.362	-	024.29m3

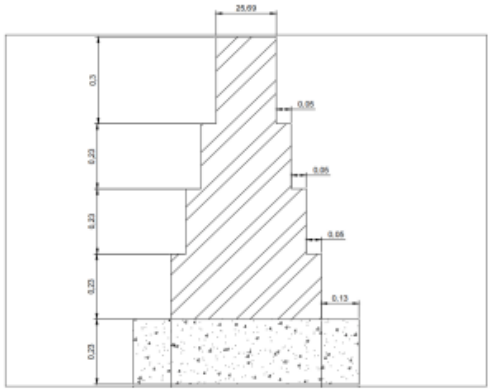
ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	061.93	m^3	150	m^3	9,290
2	Concreting in Foundation	011.61	m^3	3800	m^3	44,118
3	Masonry in Foundation	022.72	m^3	4000	m^3	90,880
4	Earth Filling	027.60	m^3	80	m^3	2,208
5	Super Structure Masonry work	30.30	m^3	4000	m^3	13,040
6	R.C.C work	22.20	m^3	4100	m^3	91,020

7	Plaster work	524.73	m^2	280	m^2	1,467
8	Coloring	524.73	m^2	10	m^2	5,247
9	Tiles	130.46	m^2	450	m^2	58,707
10	Water tank	1	Nos	8000	Nos	8,000
						2,98,989/-
Add 5% Contingency						**+15,199**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**3,14,698/-**

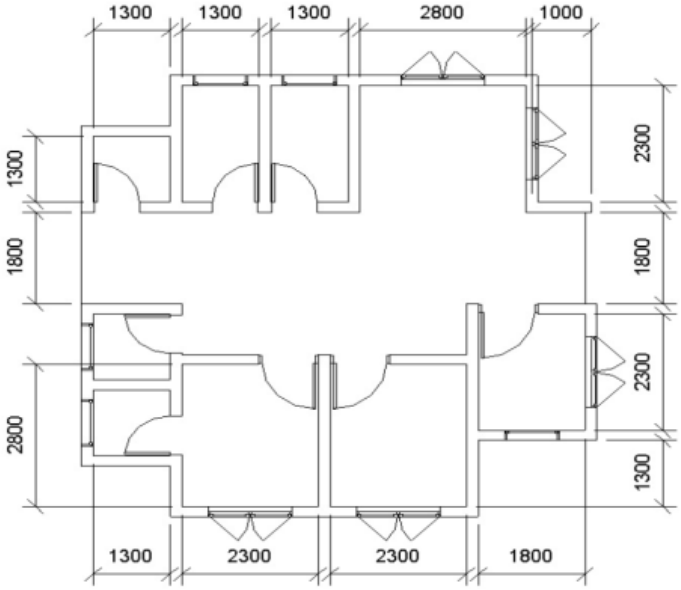
Post Office



ELEVATION



FOUNDATION



PLAN

ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

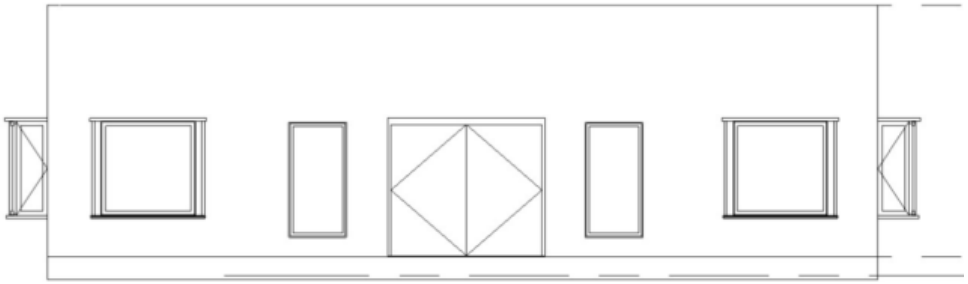
Veterinary Hospital

MEASUREMENT SHEET						
No	Items	L(m)	W(m)	H(m)	No of items	Total quantity
1	Roof			0.400	-	077.61m3
2	Walls	117.60	-	4.000	-	396.54m2
3	Doors					
	D1	-	1.150	2.500	10	028.75m2
	D2	-	0.762	2.134	02	003.25m2
	D3	-	2.500	2.200	01	005.50m2
4	Window					
	W1	-	1.500	1.500	10	022.50m2
	W2	-	0.915	1.830	04	006.70.m2
5	Masonry in superstructure	-	-	-	-	079.31m3
6	Floor	-	-	0.362	-	024.29m3

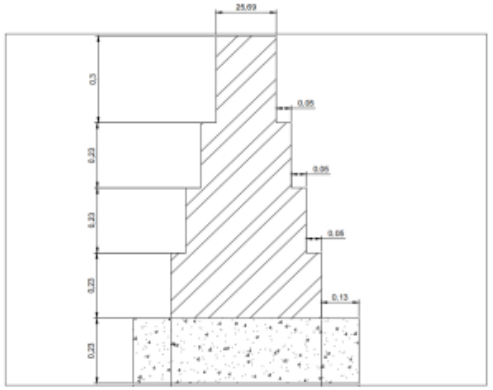
ABSTRACT SHEET						
Sr no	**Description of Item**	**Quantity**	**Unit**	**Rate(rs)**	**Per**	**Estimated Cost(Rs)**
1	Excavation for Foundation	061.93	m^3	150	m^3	13,225
2	Concreting in Foundation	011.61	m^3	3800	m^3	44,118
3	Masonry in Foundation	022.72	m^3	4000	m^3	1,90,880
4	Earth Filling	027.60	m^3	80	m^3	2,208
5	Super Structure Masonry work	079.31	m^3	4000	m^3	3,17,240

6	R.C.C work	22.20	m^3	4100	m^3	91,020
7	Plaster work	524.73	m^2	280	m^2	1,467
8	Coloring	524.73	m^2	10	m^2	5,247
9	Tiles	130.46	m^2	450	m^2	75,707
10	Water tank	1	Nos	8000	Nos	8,000
						7,64,022/-
				Add 5% Contingency		**+33,125**
ALLABOVE RATE FILLED MAY VARY DUE TO MARKET INFLATION.				**TOTAL**		**7,98,152/-**

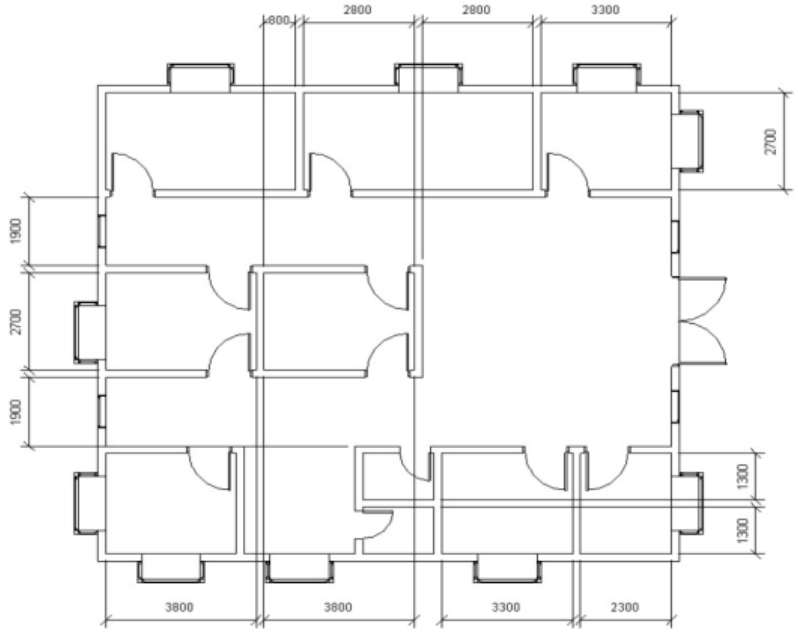
Veterinary Hospital



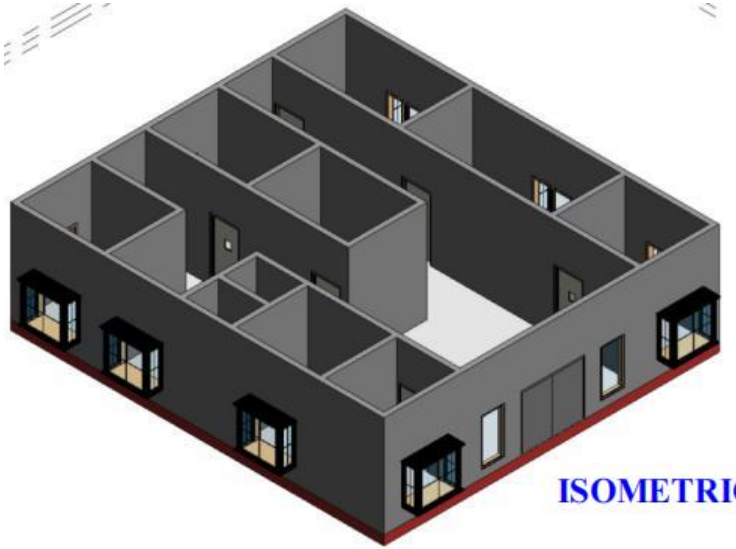
ELEVATION



FOUNDATION



PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

Chapter 14
Technical Options with Case Studies

14.1 Advanced Earthquake Resistant

Introduction

Historically, landmark structures included: heavy masonry cladding, wall curtains, and solid bracings. As the demand for taller structures increased, advanced innovative devices were incorporated into structures. The log house building at Japan's Todaiji Temple has withstood earthquakes for thousands of years (most number any structure has survived).

EARTHQUAKES are natural phenomena that are usually unpredictable. It is caused by the shifting of the earth's crust, which causes the earth to shake.

Fault plane, hypocentre, and epicentre are terms used to describe the location of a fault.

Conventional Methods

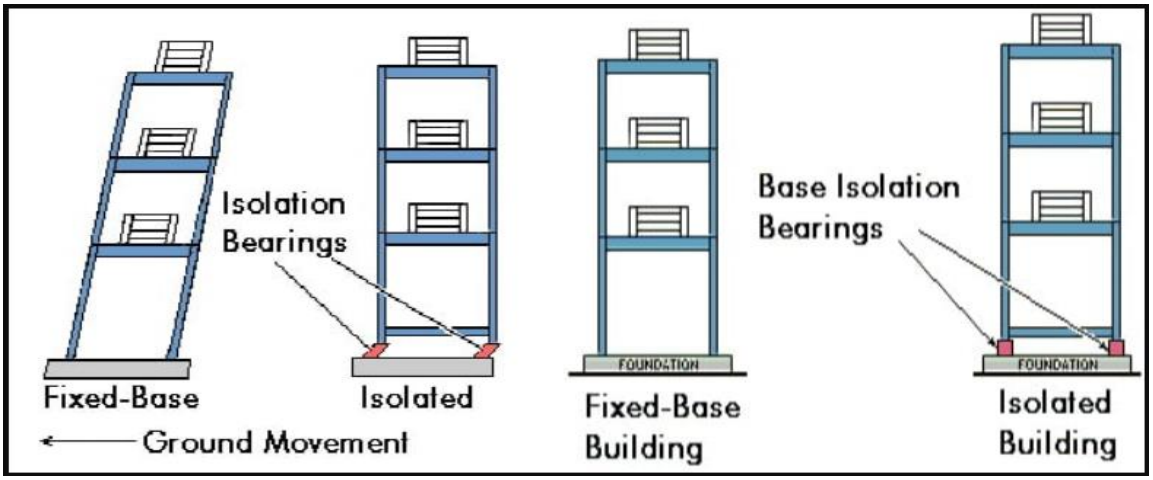
The aim is to make the structure stronger. Have stiffness and the ability to deform in an inelastic manner.

Some of the general design concepts:

- Follow current earthquake standards and codes.
- Provide strong foundation.
- Use best quality materials.
- Avoid irregular shaped structures and framing system.

Maintain integrity by providing seismic bands:

- At the plinth level of the building.
- At the levels of lintels of doors and windows.
- Vertical reinforcing bars at all wall junctions.
- Introduce shear walls to transfer seismic loads down to the bottom of foundation.



Remedial measured for soft storey buildings:

(a) bracings in columns of open ground storey

(b) Providing R.C. shear wall and

(c) Providing brick infills between columns.

Advance methods

- Rather than reinforcing the building, the basic solution is to reduce the earthquake-generated forces acting on it.
- Base isolation and energy dissipation systems are the two primary techniques.

Base Isolation Devices

- Spherical Sliding Isolation Systems
- Lead rubber bearings
- Base Isolation Devices - separate building from building foundation by bearing pads.

A set of bearing pads are installed between the building and the base to support it. Fixed foundation buildings deform and are destroyed in the event of an earthquake. Like a sail, the base isolated building rocks back and forth. Shaking can be decreased by up to 5 times.

SEISMIC DAMPERS/ ENERGY DISSIPATION DEVICES

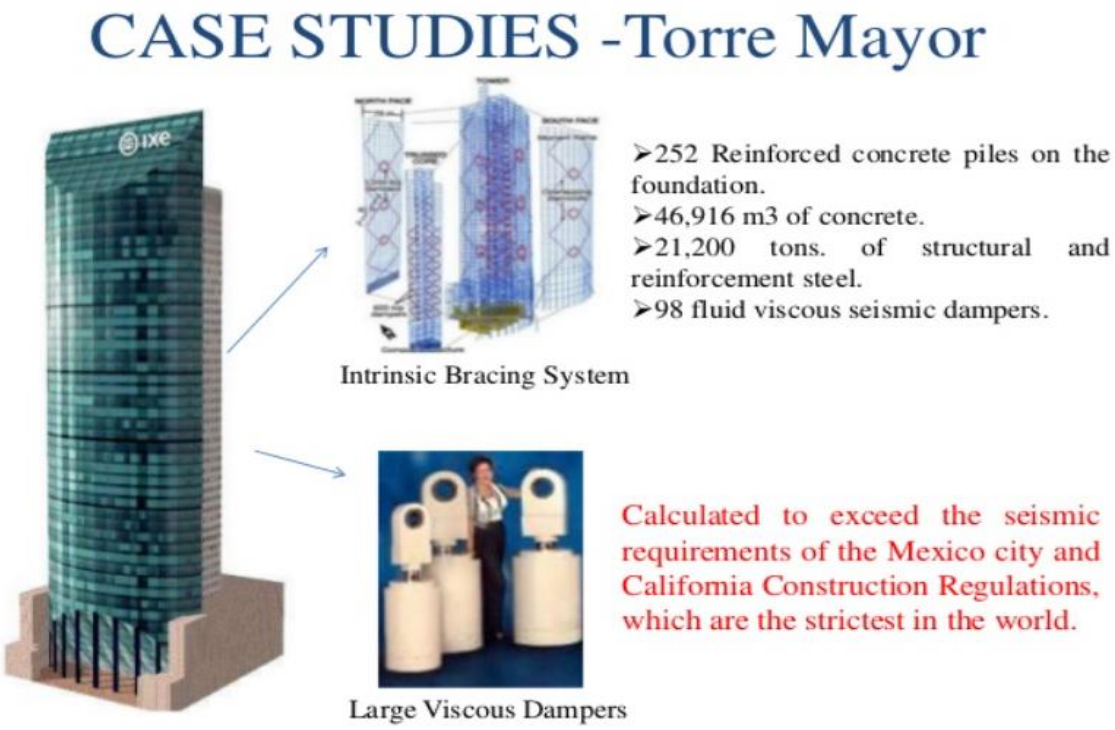
•Viscous Dampers made use of the forced flow of fluids inside the damper. The energy generated by seismic waves is absorbed by special devices installed in buildings.

•Friction Dampers use frictional forces to dissipate energy.

•Metallic Dampers use deformation of metal components within the damper to dissipate energy.

CASE STUDIES

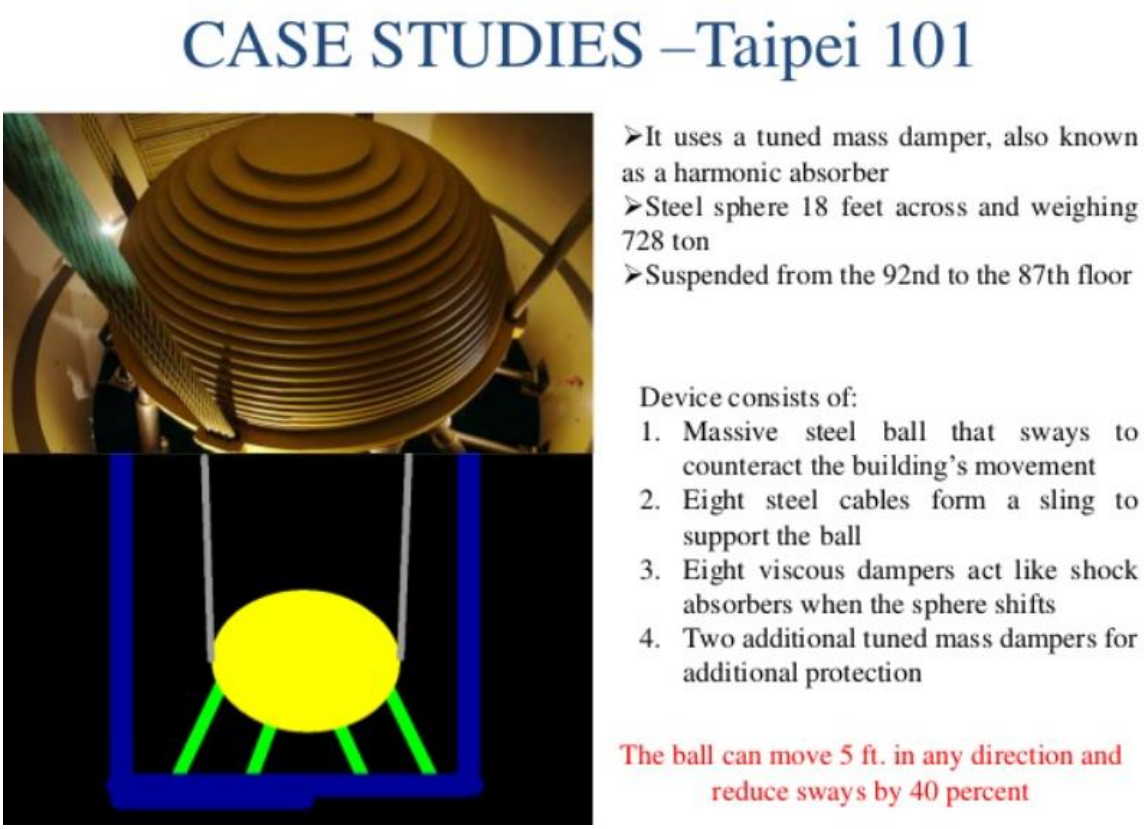
Intrinsic Bracing System of Torre Mayor Dampers for Large Viscous Fluids 98 fluid viscous seismic dampers. 252 reinforced concrete piles on the base. 46,916 m3 of concrete. 21,200 tons of structural and reinforcing steel. Calculated to meet the most stringent seismic standards in the country, including those of Mexico City and California Construction Regulations. To support vertical, horizontal, and torsional forces, the Transamerica Pyramid uses a unique truss system with X-bracing above the first floor. Horizontal X-bracing above the head to support torsional movement in the vertical direction. It staggered more than a foot during the 1989 Loma Prieta earthquake in California, but was unharmed.



TAIPEI 101

Taipei 101 is a tourist attraction in Taiwan. It employs a calibrated mass damper, also known as a harmonic absorber, which is a steel sphere 18 feet in diameter and weighing 728 tons that is suspended from the 92nd to the 87th floors. The device consists of the following components:

- A massive steel ball that sways to offset the movement of the house.
- To carry the ball, eight steel cables form a sling.
- As the sphere moves, eight viscous dampers serve as shock absorbers.
- The ball can roll 5 feet in any direction and sways are reduced by 40% thanks to two additional tuned mass dampers.



TECHNIQUES UNDER RESEARCH SHAPE MEMORY ALLOYS

Bounce back after being subjected to high loads; used in bearings, columns, beams, and connecting elements. The most popular alloys used are copper-zinc-aluminum-nickel, copper-aluminum-nickel, and nickel-titanium.

MUSSEL FIBERS TECHNIQUES UNDER RESEARCH

Elastomeric fibers combine stiffness and flexibility, allowing mussels to adhere to hard surfaces. Building materials with a similar mix of firm and flexible parts can be able to withstand high-stress forces during an earthquake. The stiff-to-flexible fiber ratio is 80:20.

TECHNIQUES UNDER RESEARCH VISCO-ELASTIC DAMPERS CST30

Two layer of high damping rubber sandwiched between steel plates absorb energy produce from vibrations.

TECHNIQUES UNDER RESEARCH VISCO-ELASTIC DAMPERS CST30

- Advantages over traditional damping system.
- Effective utilization of interior space.

- Improvement in the degree of freedom of design.
- Accepts different vibration types.
- High performance and high quality.
- Environmental friendliness.
- Maintenance free.

TECHNIQUES UNDER RESEARCH RUBBER CLOAKING DEVICE

A rubber 'cloaking system' may render buildings earthquake-resistant. Various methods may be used to bend the direction of waves. Seismic waves may be diverted as well. Cloaking is the term for this.

TECHNIQUES UNDER RESEARCH RUBBER CLOAKING DEVICE

• INSTALLATION:

The base is encircled by a concrete-and-plastic plate with concentric rings. • DETOUR: During an earthquake, the bending force deflects waves away from the building and into a stiffer ring.

• EXIT:

The bending force weakens about halfway around the plate, and the waves' forward momentum propels them back to their original course.

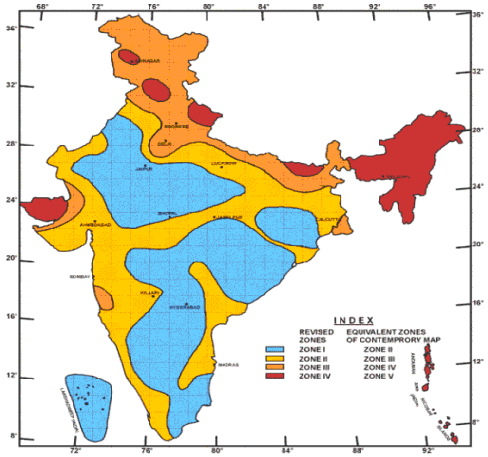
WORK ON EARTHQUAKE RESISTANCE IN INDIA

After the 1993 Killari earthquake in India, the base isolation technique was first demonstrated. Rubber base isolators sitting on hard ground were used to construct two single-story buildings. After the 2001 bhuj earthquake, the four-story bhuj hospital was constructed using a base isolation technique.

IS CODES FOR EARTHQUAKE RESISTANT DESIGN

Indian Standard Criteria For Earthquake Resistant Design of Structures, IS 1893 (Part 1), 2002 (5th revision). IS 4326, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Building (2nd revision). Indian Standard Guidelines for Improving Earthquake Resistant of Earthen Buildings, IS 13827, 1993. Indian Standard Guidelines for Improving Earthquake Resistant of Earthen Buildings. ¬IS 13828, 1993, Indian Standard Guidelines for Improving Earthquake Resistant of Low Strength Masonry Buildings. ¬IS 13920, 1993, Indian Standard Code of Practice for Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces.

SEISMIC ZONES IN INDIA



14.2 Seismic Retrofitting of Buildings

EARTHQUAKE

- An earthquake (also known as a quake, tremor or temblor)is the result of a sudden release of energy in the Earths crust that creates seismic waves.The seismicity, seismism or seismic activity of an area refers to the frequency, type and size of earthquakes experienced over a period of time.

INTRODUCTION

- Seismic retrofitting of constructions are vulnerable to earthquake. Most of the Indian building stock is vulnerable to seismic action even if located in areas that have long been considered of high seismic hazard. In the past thirty years moderate to severe earthquakes have occurred in India at intervals of 5 to 10 years. Such events have clearly shown the vulnerability of the building stock in particular and of the built environment in general• Aim is to focus on a few specific procedures which may improve the state-of-the-art practice for the evaluation of seismic vulnerability of existing reinforced concrete buildings and for their seismic retrofitting by means of innovative techniques such as base isolation and energy dissipation.

SEISMIC RETROFITTING

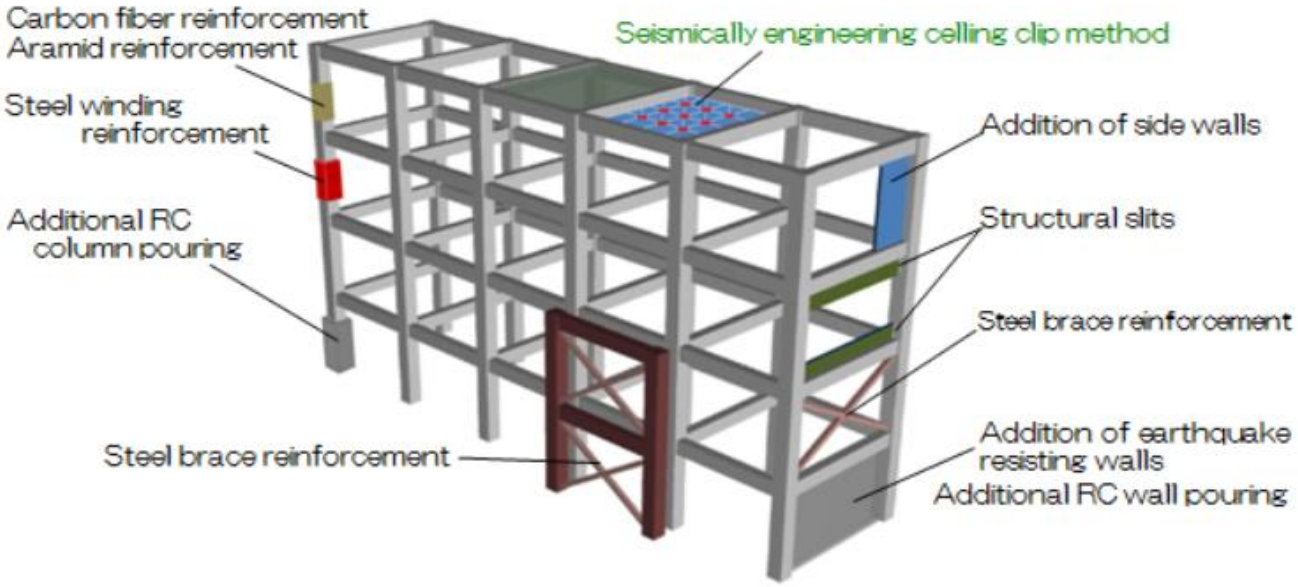
- To provide existing structures with more resistance to seismic activity due to earthquake Includes strengthening of weak connections found in the roof to wall connections, continuity ties, shear walls and roof diaphragm.

NEED FOR SEISMIC RETROFITTING

- To ensure the safety and security of a building,employees, structure functionality, machinery and inventory Essential to reduce hazard and losses from non-structural elements Predominantly concerned with structural improvement to reduce seismic hazard

SIX MORE REASONS TO SEISMIC RETROFIT

- Marketability of the building is improved
- The risk of injury and legal litigation is reduced
- Earthquake coverage
- Lenders
- Insurance companies
- Tenants



METHODS FOR SEISMIC RETROFITTING

Conventional Strengthening Methods Traditional Methods of seismic retrofitting Retrofit of structures using innovative materials Base Isolation Supplemental Energy Dissipation and Structural Control

CONVENTIONAL STRENGTHENING METHODS

- Conventional retrofitting method include addition of new structural elements to the system and enlarging the existing members. Methods such as ϖ Addition of post cast shear walls
- Additional foundation to support the shear walls to be constructed around the stairs
- Concrete jacketing of a column
- Addition of column members to vertical irregularities
- Addition of post cast shear walls

TRADITIONAL METHODS OF SEISMIC RETROFIT

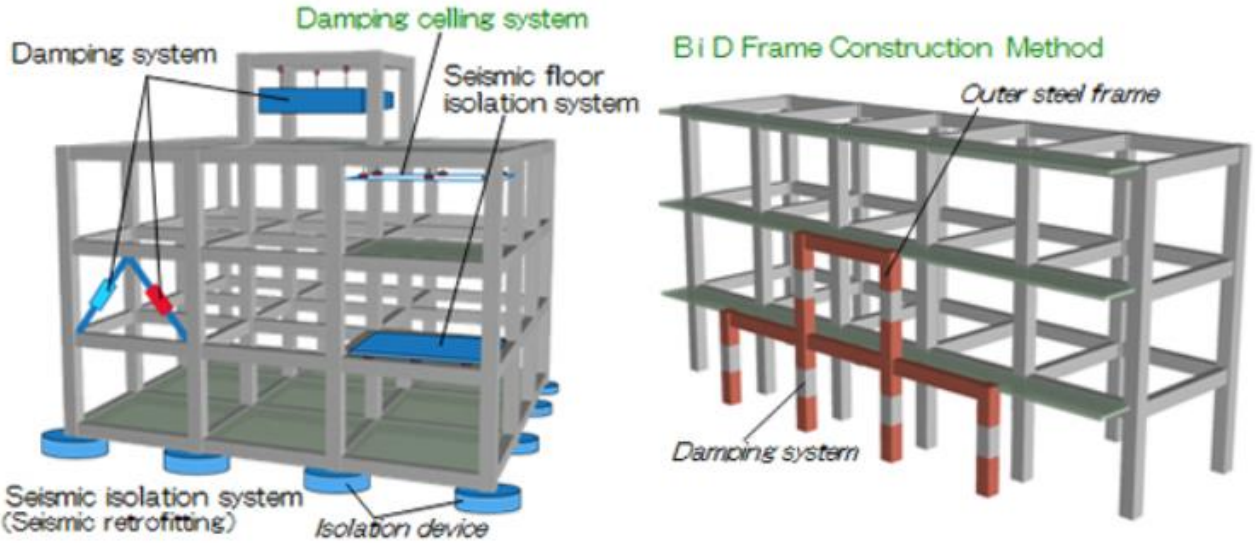
- Structural design
- Mass reduction
- Seismic Retrofitting by Mass Reduction (removal of storey)

RETROFIT OF STRUCTURES USING INNOVATIVE MATERIALS

- High Performance Concrete
- High Performance Steel
- Fibre Reinforced Plastic

BASE ISOLATION

- Placing flexible isolation systems between the foundation and the superstructure.
- Provides safety against collapse.
- Also used in the seismic retrofitting of historic structures without imparting their architectural characteristics by reducing the induced seismic forces.



SUPPLEMENTAL ENERGY DISSIPATION AND STRUCTURAL CONTROL

- Cost efficient retrofitting strategy compared to base isolation is installation of supplemental energy devices in structures as a means for passive or active structural control
- Objective of structural control is to reduce structural vibrations for improved safety and serviceability under wind and earthquake loadings.

Other methods used for seismic retrofit are:

- Carbon fiber retrofit
- Mending Application of Reinforced Sheets
- Aramid Fiber Retrofitting System
- Precast Retrofit Shear Wall System

- Pita-column Method｜Tufnes Method
- Outer-frame brace
- Taisei Anchor-less Retrofit system

INNOVATIVE APPROACHES

- Stiffness reduction
- Ductility increase
- Damage controlled structures
- Composite materials
- Active control
- Damage controlled structures=Global structure Primary structure Damping system

CONCLUSION

We considers the retrofitting of buildings vulnerable to earthquakes and briefly discuss about the traditional, conventional and innovative methods of seismic retrofitting.In conclusion it is hoped that the material presented in this paper will be useful in understanding of the earthquake engineering problems and of seismic retrofitting

14.3 Advance Practices in Construction field in Modern Material, Techniques and Equipment's

INTRODUCTION

Construction technologies and equipment have improved significantly in recent years. Advanced construction techniques and equipments, such as submerged construction, trenchless technology, and many new emerging materials, are used in advanced construction techniques and equipments to speed up the construction of any building works. As a result, we'll go over a couple of the methods and materials that were used.

UNDER WATER CONSTRUCTION

We must choose underwater construction when building bridges, dams, or any other structure where the base portion of the structure is most likely to lie underwater. Construction on water presents a number of challenges, especially in areas where the depth is significant.

Our key goal during underwater construction is to build a safe, water-free area in which to function so that the structure's structural integrity is not negatively impacted.

CLASSIFICATIONS OF UNDER WATER CONSTRUCTION

UNDER WATER CONSTRUCTION

- Construction Techniques
- Methods of placing of concrete

UNDERWATER CONSTRUCTION TECHNIQUES

Caissons are underwater building structures that consist of an airtight chamber that is open at the bottom and contains air at a sufficient pressure to keep the water out.

TYPES OF CAISSONS

- Box Caissons
- Open Caissons
- Pneumetic Caissons

COFFER DAM

A cofferdam is a form of watertight structure used to facilitate construction projects such as bridges and piers in areas that are usually submerged.

TYPES OF COFFERDAM

- Cantilever sheet piles
- Braced cofferdam
- Double wall cofferdam

- Cellular cofferdam
- Earth embankment
- Rock fill cofferdam

METHODS OF PLACING OF CONCRETE

- Tremie Method
- Pump Method
- Toggle Bags
- Bag Works

TRENCHLESS TECHNOLOGY

Trenchless technology methods include all methods of putting in or renewing underground utility systems with minimum disruption of the surface or subsurface.Trenchless technology contains various methods, materials and equipment for inspection ,utilization and rehabilitation.Trenchless technology has become popular for underground utility construction road crossings.In recent years, there has been remarkable progress in development of latest trenchless technology equipment and methods.

OBJECTIVE OF TRENCHLESS TECHNOLOGY

- Cost-effectiveness
- Ease of Design
- Production rates
- Extends underground assets
- Benefits environment

SITE INVESTIGATION

Common problems at site are,

• Loss of invert walls, ceiling because of corrosion
• Leaking joints • Settlement
• Shape deformation
• In adequate flow capacity
• Voids in embankment around and above the culvert

Hence before take the trenchless excavation work the location investigation must be made.

TRENCHLESS TECHNIQUES INPIPES

TECHNIQUES IN LAYING OF PIPES PIPE JACKING

The term pipe jacking are often wont to describe a selected installation technique also as a process applicable to other trenchless technology

AUGER BORING

If there are longer borings to be administered or if the drilling precision has got to be higher the borings are administered as guided auger borings.

MICRO TUNNELING

Pipes are jacked from a launch pit to a reception pit by means of a hydraulic jacking station within the launch pit

UTILITY TUNNELING

The Procedure consists of 4 major steps

• soil excavation.
• Soil removal.
• Segmental liner installations
• Line and grade control.

PIPE RAMMING

Pipe ramming involves the utilization of the dynamic force and energy transmitted by a percussion hammer attached to the top of a pipe.

ADVANTAGES OF TRENCHLESS TECHNOLOGY

Expenses and dates are much easier to calculate.Surface life stays mainly undisturbed.Up to 95 percent lesser load for landfills thanks to minimal excavations.Small stress for streets and traffic. Minimization of CO2 emissions.

INTRODUCTION TO MODERN CONSTRUCTION MATERIALS

Now –a- days many new innovative materials are being invented and lots of new materials are being in research. New innovative thinking and new invention is important to save lots of our valuable time and energy.

A number of the innovative materials are listed below:

MODERN CONSTRUCTION MATERIALS

- Ash bricks.
- Translucent concrete.
- Sensi tiles.
- Liquid granite.
- Carbon Nano-tubes.
- Unfired clay bricks.
- Bendable concrete.
- Richlite.
- Radient barriers.
- Transparent aluminium.
- Carbon fiber.
- Solar pannel roofing tiles.

These are the several materials utilized in advanced construction techniques and equipments like ash BRICKS,Fly ash bricks are building materials containing class c ash .In India, the ash was first utilized in rihad dam which is found at Pipri sonbhadra district in Uttar Pradesh.The composition of ash bricks are ash , lime, gypsum, sand, cement.These bricks are environment friendly and that they are often manufactured at construction site itself.

TRANSLUCENT CONCRETE

They are developed by Hungarian architect ARON LOSONCZI. It is usually same because the regular concrete, visually appealing by mixing concrete with glass fibers and thus the result was light transmitting concrete. The optical fiber within the concrete act sort of a slit and carry the sunshine across and therefore the light carried maintains its original color. it carries an equivalent amount of sunshine through it, regardless of how thick it's .

SENSI TILE

If you walk across your kitchen the ground to urge something from the refrigerator, the ground twinkles with light path that guides your way through the dark room.The concrete of the tile is embedded with acrylic optic channels that transfer the sunshine from one point to a different . As shadow move across terrazzo's surface , the sunshine channels flicker with a randomized.

LIQUID GRANITE

The fabric is light weighted and has an equivalent load bearing capacity of cement but it's made from recycled materials.Liquid granite isn't only a fire- resistant beyond 1,100 degrees celsius, it also can withstand heat for extended periods .So, it's moisture resisting properties also.

ARBON NANO-TUBES • Heralded together of the "Top ten advances in materials science" over the last 50 years, Materials Today, 2016. • Sales of carbon nano-tubes projected to exceed $2B, >103 metric tons annually within the next 4 - 7 years. • Major use – electronics and composites.

UNFIRED CLAY BRICKS

Unfired clay bricks are made from earthy materials and are air-dried rather than fired like conventional bricks.it's eco- friendly and with additional construction properties.It have the advantage of reducing the energy utilized in manufacturing and increases strength and reduces shrinkage.

BENDABLE CONCRETE

A replacement sort of fiber reinforced bendable concrete is employed in various places.This new concrete is around 500 times more immune to cracking than regular. The fibers slide within the concrete when bending occurs, providing with it's enough ton prevent breakage.

RICHLITE

it's a dense material made up of partially recycled paper and phenolic.The 70 percentage of the fabric is formed with recycled paper. it's high strength and has resistance to heat upto 350 F.

RADIENT BARRIERS

It are often applied anywhere in attic space of house. It keeps heat call at summer and warm in during winter. it's usually made from aluminum. Radient barriers are widely utilized in many areas.

TRANSPARENT ALUMINIUM it's extremely durable material with excellent optical transparency. To be used for windows, domes, plates, rods and tubes with a good range of sizes and varieties. it's excellent clarity. Outstanding strength and hardness. Cost effective advanced material solution. it's utilized in aerospace, security, defence,and energy and consumer products.

SOLAR PANNEL ROOFING TILES

It transforms the solar power into usable electricity which is required for our homes. Receives rebate from the govt for installing them. solar array roofing tiles are play a crucial role in our field or profession.

CARBON FIBRE

Carbon fiber is formed from carbon strands that are thinner than human hair. The strands are often woven together, like cloth, then which will be moulded to any shape you would possibly want. Carbon fiber is extremely strong, light weighted material. it's five times strong as steel, twice as stiff and weight is about two- thirds less.

APPLICATIONS of recent MATERIALS

Several modern construction materials have more strength, hardness, toughness and sturdiness for instance , ash bricks have these characters in comparison with normal bricks.From the above discussions the fashionable materials are mostly utilized in everywhere the planet . we will make our nation as Hi-tech using these innovative materials.

CONCLUSION

Hence the subsequent techniques like under water construction and trenchless technology or like that are very use full in today's life These new emerging building materials should get replaced with the old ones to enhance the properties of materials and helps in recycling of the materials to save lots of energy, time, money and make our country as pollution free. So more innovative materials should be created and make construction of the building simpler with more strength.

14.4 Engineering Aspects Of Soil mechanics - Environmental Impact Assessment

- **The discipline**
- Soil mechanics is that the science of equilibrium and motion of soil bodies. Here soil is thought to be the weathered material within the upper layers of the earth’s crust.The non-weathered material during this crust is denoted as rock, and its mechanics is that the discipline of rock mechanics. generally the difference between soil and rock is roughly that in soils it's possible to dig a trench with simple tools sort of a spade or even by hand. In rock this could be impossible, it must first be splintered with heavy equipment sort of a chisel, a hammer or a mechanical drilling device. The natural weathering process of rock is that under the long-term influence of sun, rain and wind, it degenerates into stones. This process is stimulated by fracturing of rock bodies by freezing and thawing of the water in small crevices within the rock. The coarse stones

that are created in mountainous areas are transported downstream by gravity, often together with water in rivers. By internal friction the stones are gradually reduced in size,so that the material becomes gradually finer: gravel, sand and eventually silt. In flowing rivers the material could even be deposited, the coarsest material at high velocities, but the finer material only at very small velocities. this means that gravel are visiting be found within the upper reaches of a river bed, and finer material like sand and silt within the lower reaches.

- **History**
- Soil mechanics has been developed within the beginning of the 20th century. The necessity for the analysis of the behavior of soils arose in many countries, often as a results of spectacular accidents, like landslides and failures of foundations. within the Netherlands the slide of a railway embankment near Weesp, in1918 gave rise to the primary systematic investigation within the field of soil mechanics, by a special commission founded by the govt. Many of the fundamental principles of soil mechanics were well-known at that point, but their combination to an engineering discipline had not yet been completed.The first important contributions to soil mechanics are thanks to Coulomb, who published a crucial treatise on the failure of soils in 1776, and to Rankine, who published a commentary on the possible states of stress in soils in 1857.In 1856 Darcy published his famous work on the permeability of soils, for the water system of town of Dijon. The principles of the mechanics of continua, including statics and strength of materials, were also well-known within the 19th century, because of the work of Newton, Cauchy, Navier and Boussinesq. The union of of these fundamentals to a coherent discipline had to attend until the 20th century. it should be mentioned that the committee to analyze the disaster near Weesp came to the conclusion that the water levels within the railway embankment had risen by sustained rainfall, which the embankment's strength was insufficient to face up to these high water pressures.
- **Why Soil Mechanics ?**
- Soil mechanics has become a definite and separate branch of engineering mechanics because soils have variety of special properties, which distinguish the fabric from other materials. Its development has also been stimulated, of course, by the wide selection of applications of soil engineering in applied science, as all structures require a sound foundation and will transfer its loads to the soil. the foremost important special properties of soils are going to be described briefly during this topic. In further discussion we're going to be treated in greater detail, concentrating on quantitative methods of research. Stiffness dependent upon stress level Many engineering materials, like metals, but also concrete and wood, exhibit linear stress-strain-behavior, a minimum of up to a particular stress level. this suggests that the deformations are going to be twice as large if the stresses are twice as large. This property is described by Hooke's law, and also the materials are called linear elastic.Soils don't satisfy this law. as an example, in compression soil becomes gradually stiffer. At the surface sand will slip easily through the fingers, but under a particular compressive stress it gains an ever increasing stiffness and strength. this can be mainly caused by the rise of the forces between the individual particles, which provides the structure of particles an increasing strength.This property is employed in lifestyle by the packaging of coffee and other granular materials by a plastic envelope, and also the application of vacuum inside the package. The package becomes very hard when the air is evacuated from it. In technology the non-linear property is employed to great advantage within the pile foundation for a building on very soft soil, underlain by a layer

of sand. within the sand below a thick deposit of sentimental clay the strain level is high, because of the burden of the clay. This makes the sand very hard and powerful, and it's possible to use large compressive forces to the piles, providing they're long enough to achieve well into the sand.

- **Shear**
- In compression soils become gradually stiffer. In shear, however, soils become gradually softer, and if the shear stresses reach a specific level, with relevance the traditional stresses, it's even possible that failure of the soil mass occurs. this implies that the slope of a sand heap, as an example in a very depot or in a very dam, can't be larger than about 30 or 40 degrees. the rationale for this can be that particles would slide over one another at greater slopes. A consequence of this phenomenon many countries in deltas of enormous rivers are very flat. it's also caused the failure of dams and embankments everywhere the globe, sometimes with very serious consequences for the local population. Especially dangerous is that in very fine materials, like clay,a steep slope is commonly possible for a few time, because of capillary pressures within the water, but after it slow these capillary pressures may vanish (perhaps due to rain), and also the slope will fail.A positive application of the failure of soils in shear is that the construction of guard rails along highways.After a collision by a vehicle the muse of the guard rail will rotate within the soil because of the big shear stresses between this foundation and therefore the soil body around it. this may dissipate large amounts of energy (into heat), creating a permanent deformation of the muse of the rail, but the passengers,and the car, is also unharmed. Of course, the guard rail must be repaired after the collision, which might relatively easily be through with the help of a significant vehicle.
- **Dilatancy**
- Shear deformations of soils often are amid volume changes. Loose sand incorporates a tendency to contract to a smaller volume, and densely packed sand can practically deform only the degree expands somewhat, making the sand looser. this can be called dilatancy, a phenomenon discovered by Reynolds, in 1885. This property causes the soil around a person's foot on the beach near the water line to be drawn dry during walking. The densely packed sand is loaded by the burden of the foot, which causes ashear deformation, which successively causes a volume expansion,which sucks in some water from the encircling soil. On the opposite hand a really loose assembly of sand particles will have an inclination to collapse when it's sheared, with a decrease of the amount. Such volume deformations is also especially dangerous when the soil is saturated with water. The tendency for volume decrease then may result in an outsized increase within the pore water pressures. Many geotechnical accidents are caused by increasing pore water pressures. During earth quakes in Japan, for example, saturated sand is typically densified in a very short time, which causes large pore pressures to develop, so the sand particles may start to float within the water. This phenomenon is termed liquefaction. within the Netherlands the sand within the channels within the Eastern Scheldt estuary was very loose, which required large densification works before the development of the storm surge barrier. Also, the sand wont to create the airport Tjek Lap Kok in Hongkong had to be densified before the development of the runways and therefore the facilities of the airport.
- **Groundwater**
- A special characteristic of soil is that water could also be present within the pores of the soil. This water contributes to the strain transfer within the soil. it's going to even be flowing with

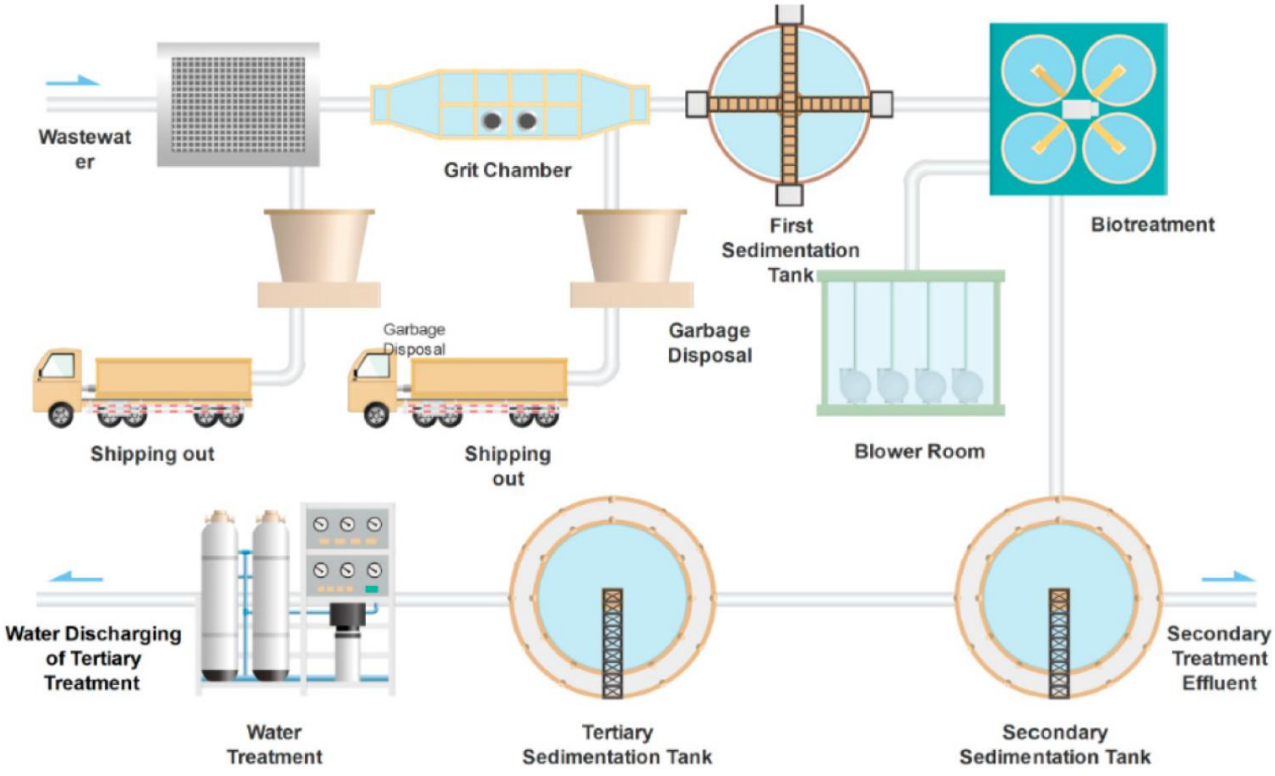
relevancy the granular particles, which creates friction stresses between the fluid and therefore the solid material. In many cases soil must be considered as a two phase material. because it In many cases the influence of the groundwater has been very large. In 1953 within the Netherlands many dikes within the south-west of the country failed because water flowed over them, penetrated the soil, so flowed through the dike, with a friction force acting upon the dike material. The force of the water on and inside the dike made the slope collapse, in order that the dike lost its water retaining capacity, and therefore the low lying land was flooded in a very short time.In other countries of the planet large dams have sometimes failed also due to rising water tables within the interior of the dam (for example, the Teton Valley Dam within the USA, within which water could enter the coarse dam material due to a leaky clay core). Even excessive rainfall may refill a dam, as happened near Aberfan in Wales in 1966, when a dam of mine tailings collapsed onto the village.

- **Variability**
- The creation of soil by ancient geological processes also means soil properties is also rather different on different locations. Even in two very close locations the soil properties is also completely different, for example when an ancient river channel has been full of sand deposits. Sometimes the course of an ancient river is traced on the surface of a soil, but often it can't be seen at the surface. When an embankment is constructed on such a soil, it is expected that the settlements will vary, depending upon the local material within the subsoil. The variability of soil properties may additionally be the results of a significant local load within the past.A global impression of the soil composition are often obtained from geological maps. These indicate the geological history and character of the soils. along with geological knowledge and skill this might provides a first indication of the soil properties. Other geological information may additionally be helpful. Large areas of Western Europe have, for example, been covered by thick layers of ice in earlier ice ages, and this implies that the soils in these areas are subject to a preload of considerable magnitude, and so maybe rather dense. An accurate determination of soil properties cannot be made of desk studies. It requires testing of the particular soils within the laboratory,using samples taken from the sector, or testing of the soil within the field (in situ).

14.5 Water Supply-Sewerage system-Waste Water- Sustainable development techniques

- **Sustainability:**
- From Principles to Evaluation Methods The idea of sustainable development may appear quite vague, fuzzy and evasive (Pearce et al. 1989). In fact, whereas sustainability is expounded to a standing of maintenance and conservation of the prevailing conditions, both in space and time and is referred to the capacity to ensure a support without causing decay, the concept of development implies, instead, an alteration and a change of actual status, then a condition of instability. This semantic conflict induces to a thought of both improvement and preservation: in substance, the effective aim of a sustainable development is that the possibility to guarantee a stronger life quality for a permanent period of your time. Without recalling the general evolution that delivered to implement the concept of sustainable development, it's worth recalling the work carried on by Meadows et al (1972), reporting to The Club of Rome to research major trends of worldwide concern at the start of ’70s of the past century. The matter isn't trivial, as we can notice a series of key points still important in to-date research. One key point is said modeling, because the work disbursed was one amongst the primary to model different variable connected

to natural and human resources, although in a very simplified manner. A second point spoken evolution over time, therefore considering the time dimension as important in designing scenarios. a 3rd element is expounded to the critiques that such model brought over itself, that in a very sense recalled the general criticism within the following years on quantitative measures as elements to provide discrete solutions to real problems. 'The limits to growth' was focused on a group of trends as accelerating industrialization, rapid increment, widespread malnutrition, depletion of nonrenewable resources and a deteriorating environment. Authors used World3 model to simulate interactions between Earth humans as systems and tried to specialize in possibilities to implement 'sustainable' – although this term wasn't used - actions that would alter growth trends among the variables considered. Although the major aim of the work meted out was to research the interactions of exponential growth with a finite set of resources and to not predict actual evolutions, criticism arose since the start from different domains. Criticism focused on different aspects of the work, namely on the bottom of information used, considered weak, moreover as a not clear procedure, because the details about the model World3 and assumption were made clear in 1974. Also, critiques were put on the shortage of consideration of technological changes within the evolutionary model, although the identical authors stated that the aim of the simplified model was to check possible interactions employing a limited set of variables which technology wasn'tconsidered, and on the mainly Malthusian assumption of the various paces in growth of population and resources.



- **Geo-computational**
- Approaches to Sustainability Nowadays, great a part of studies in environmental planning field are developed using GIS. Campagna (2005) realized a whole survey of research topics and applications of GIScience methods to sustainable spatial planning. The next step than the straightforward use of geographic information in supporting environmental planning is that the adoption of spatial simulation models which may predict the evolution of phenomena. because the use of spatial information has definitely improved the quality of knowledge assail which to base the decision-making process, the use of Geostatistics, spatial simulation and more generally geocomputation methods allows the likelihood of basing the decision-making process on predicted future scenarios. The aim of this book is to produce an summary of the most methods

and techniques adopted within the field of environmental geocomputation so as to produce a more sustainable development. The authors have deliberately avoided to have a whole dissertation on geo computation topics, because a whole illustration of the most concepts and therefore the different approaches to geocomputation have been presented during a previous book Geocomputation and concrete Planning (Murgante at al. 2009).In recent times, there's a growing attention to temperature change, particularly due to the increasing awareness of this phenomenon. it's also more evident that coastal zones can be the more damaged by these changes, ranging from the assumption that climate changes are going down, it's clear that coastal areas, with huge urbanization pressures, are most susceptible to these changes. Unfortunately,planning documents, at regional and native level, don't take under consideration this phenomenon. In the same way it's very strange that a discipline like planning which programs the territory for the long run years in great a part of cases isn't supported simulation models. Sectoral analyses, often supported surveys, don't seem to be enough to highlight the dynamics of the world. Better knowing urban and environmental changes occurred within the past, it's possible to produce better simulations predicting future scenarios. The contribution of Hansen tries to resolve both this issues adopting the model LUCIA - Land Use Change Impact Analysis (Hansen, 2007) - not to mention climate change scenarios. the mixing of LUCIA, supported cellular automata land use simulation model, with temperature change scenarios, produced detailed model of spatial dynamics identifying possible vulnerable zones and improving the decision making process. The paper by Vanegas et al. presents a comparison between a mathematical formulation and a heuristic solution method with the final word objective to develop an high performance heuristic solution ready to locate almost about optimal sites, composed by a given number of cells (raster structure): these sites must be compact and maximize cells' intrinsic multiple criteria suitability.

Chapter 15

Smart and/or Sustainable features of Chapter 8 & 13 designs, Impact on society.(For Allocated village development, villagers happiness, comfortable and for enhancement of the village) (With the Smart village development Concept As Per Your Idea And Village Visit, modern technology with innovation).With doing small changes, Period, Amount Expenditure and Benefit.

No.	Proposed Design	Priority to Implement	Amount(Rs.)
		Part-I	
1	Bank	Immediately	03,54,855/-
2	Gram Panchayat	Immediately	05,14,409/-
3	Small Library	Immediately	05,50,179/-
4	Bio-gas Plant	In 2 to 5 Years	64,08,150/-
5	Learning Hub and Smart Play Centre	In 2 to 5 Years	11,50,530/-
6	Obelisk	Long term	02,61,670/-
		Part-II	
1	PHC	Immediately	07,60,692/-
2	Public Toilet	Immediately	05,37,610/-
3	Mini Market	Immediately	06,54,654/-
4	Veterinary Hospital	In 1 to 2 Years	07,98,152/-
5	Post Office	Immediately	03,14,698/-

Chapter 16
Survey By Interviewing With Talati And/Or Sarpanch

Gujarat Technological University, Ahmedabad, Gujarat

Vishwakarma Yojana: Phase VIII
Survey with Interviewing

SURVEY BY INTERVIEWING WITH TALATI AND/OR SARPANCH

Vishwakarma Yojana: Phase VIII

ALLOCATED VILLAGE SURVEY

An approach towards **"Rurbanisation for Village Development"**

CHAPTER- 16

Sr.	Questions	Yes/ No	Remarks
1	What are the sources of income in village?	Yes	Labours, Farming
2	What are the chances of employment in village?	Yes	Agriculture
3	What are the special technical facilities in village?	No	
4	Is any debt on village dwellers?	Yes	
5	Are village people getting agricultural help?	Yes	
6	Is women health awareness Program organized in village?	Yes	
7	Are women having opportunity to work and income?	Yes	House keeping
8	Child girl education is appreciated in village?	Yes	
9	Facility of vaccination to child is available in village?	Yes	
10	Are village people aware about child vaccination and done to each and every child as per norms?	Yes	
11	Women help line number information is provided to village people?	No	
12	Is water scarcity in village? How many days per year?	No	
13	Is village under any debt?	No	
14	Is any serious issue due to debt from bank or any person happened in village?	No	
15	Is any suicide like incident observed in village due to government policy, debt or threatening?	No	
16	Is any death of patient occurred due to unavailability of medical facility in village?	Yes	
17	How many disabled (physically challenged) is observed in village? Provide list with Male/female/girl/boy with age and type of disability and reason of disability.	Yes	
18	Is village improvement is observed in comparative scenario from past to present?	Yes	
19	Is any unavoidable difficulty village people are facing? Any natural calamity is there?	No	
20	Life Living standard of girls and women is appreciated and uplifted in village?	No	

Nodal officer and students can add more questions. This is a sample. Having Minimum requirement.

Administration queries/ Difficulties:
GTU VY Section
Contact No – 079-23267588
Email ID: rurban@gtu.edu.in

Chapter 17
Irrigation / Agriculture Activities And Agro Industry, Alternate Techniques And Solution

A. Main activities

Maximum or optimum crop production can only be attained by applying the correct amount of water at the correct time. Deviation from this golden rule inevitably ends up in decreases in crop production. the number of water required is set by the evapo-transpiration rate of the crop. The timing depends on the soil's characteristics and also the rooting depth of the crop. Farmers, through years of observation and learned tradition, develop irrigation practices that are often very near the particular needs of the crop. However, each time that a farmer tries a replacement crop, a time-consuming learning process starts and, until the instant when a satisfactory level of skill is reached, a substantial crop production potential may are wasted. Farmers are responsive to this problem and it's one in all the explanations why they're often reluctant to plant crops with which they are doing not have previous experience.

This is often a characteristic problem of newly established irrigation schemes where most of the farmers have little or no experience with irrigated crops. Technical advice may be instrumental in shortening this learning process and accelerating the start of the "full production" stage of the project. Good irrigation practices include not only questions associated with when and the way much water is to be applied, but also the applying of suitable irrigation and drainage methods, the establishment of cropping patterns, the management of poor quality water and soils.

The introduction of suitable irrigation methods is a vital point that's intimately associated with the requirement for appropriate exploitation work (usually grading) and can therefore be treated in greater detail under the following sort of assistance. there's great interest among many farmers within the potential of a number of the recently developed methods: drip, mini-sprinklers, sprinklers, mechanized systems, etc. Technical advice on the suitability of those irrigation methods to a selected farm situation are often instrumental in saving labour and investment. The benefits of a rational cropping pattern are known to be many, but where water 1 s scarce they're still more relevant. In cases where farmers are allocated limited amounts of water, careful selection of the crops and therefore the planting time may cause dramatic increases within the planted area. Poor water quality can affect crop production significantly, through soil salinization and other associated problems.

The negative effects of poor water quality may be minimized or greatly increased, reckoning on the agricultural and irrigation practices used and therefore the system. the subsequent example may illustrate the point: if salinity may be a problem, the common practice of planting seeds within the centre of a single-row raised bed will place the seed exactly within the area where salts concentrate (FAO 1976). A double-row raised planting bed will offer a substantial advantage. Alternate furrow irrigation may help; and there are other alternatives. Most farmers will understand that salinity has effects on their production but would be uncertain of the irrigation practice that may help to unravel or mitigate their problem.

B. Organizational alternatives

Assistance on irrigation practices is in theory covered by the extension services acting on a national or regional scale. However, in most instances, these services are overloaded with work; they're limited in their financial resources, and often their staff don't have suitable training on irrigation

matters. In most developing countries there's but one advisor per 2000 farmers. it's obvious from this figure that it's impossible to present adequate assistance to the farmers in irrigation practices, which require considerable attention and supervision by the agent especially during the primary years of a newly irrigated area.

A more major problem is that the lack of proper technical training in irrigation matters. Most of the extension agents have a general training in agriculture, but no special training in irrigation techniques and practices. this can be appropriate for the range of duties they need to perform in areas where agriculture is rainfed but isn't adequate for irrigated agriculture. the identical applies to field assistants, who have only completed highschool plus one or two years of coaching normally agriculture. Furthermore, a number of the newly introduced extension programmes, just like the Training and Visit (T&V) system, don't seem to be similar temperament to demonstrating the benefits of improved water management practices. Because the establishment of plots to demonstrate good water management on the land of leading farmers needs close monitoring and supervision, the extension worker should be present within the area or village for several months (at least during the irrigation season). this can be contrary to the T&V system which needs that the extension staff travel regularly among pre-established villages/areas within a fortnightly rotation. A system with a rigid schedule isn't suited to providing advice on the irrigation activities mentioned above.

There is no reason why assistance with irrigation practices cannot be undertaken by extension personnel, provided that the following conditions are met:
a. the number of irrigation agents in the irrigated areas is drastically increased compared to those in rainfed areas;
b. the staff has the requisite knowledge of irrigation practices;
c. the staff is attached on a more or less permanent basis to the irrigation area;
d. suitable working means (transport, etc.)
are given them to undertake their functions.

Chapter 18
Social Activities – Any Activates Planned By Students e.g Teaching Learning activities, awareness camp, business idea for SELF HELP GROUP OR ANY OTHER

- We made people aware about the COVID-19 and its symptoms and the steps they can take to avoid contraction of the disease and can prevent from further spreading by following these steps:

✓ Clean your hands often.
✓ Use soap and water, or an alcohol-based hand rub.
✓ Maintain a safe distance from anyone who is coughing or sneezing.
✓ Wear a mask when physical distancing is not possible.
✓ Don't touch your eyes, nose or mouth.
✓ Cover your nose and mouth with your bent elbow or a tissue when you cough or sneeze.
✓ Stay home if you feel unwell.
✓ If you have a fever, cough and difficulty breathing, seek medical attention.

Mask distribution to villagers

Chapter 19
<<NAVAPURA>> SAGY Questionnaire Survey form with the Sarpanch Signature (Scanned copy attachment in the soft copy report and Original copy in hardbound report)

Village: Navapurva Gram Panchayat: Navapurva Ward No.____

Block: _____ District: Ahmedabad

State: Gujarat L S Constituency: 40 - Sanand

1. Family Identity and Size

Name of Head of Household	Chauhan Vishalbhai Bhalabhai							Male/ ~~Female~~	M
SECC Survey ID:	SEBC	Family Size	5	Over 18	3	6 to 18	2	Under 6	–

2. Category & Entitlement Details (Tick as appropriate)

Social Category[1]		✓ Life Insurance	1. All Adults 2. Some Adults 3. None	AABY	1. Yes 2. ✓No	Kisan Credit Card	Yes / ~~No~~
Poverty Status Year[2]:	1. BPL ✓ 2. ~~APL~~	✓ Health Insurance	1. All Adults 2. ✓ Some Adults 3. None	RSBY	1. Yes 2. ✓No	MGNREGS Job Card Number	N
PDS (If NFSA is not implemented)		Annapurna	Antyodaya	BPL	✓APL	Is any woman in the family member of an SHG? Yes / No	
PDS (If NFSA is implemented)		Annapurna	Antyodaya	Priority	Other		

2. Adults (above 18 years)

Name	Age	Sex M/F / O	Disability Status Y/N	Marital Status[3]	Education Status[4]	Adhaar Card (Y/ N)	Bank A/C (Y/N)	Social Security Pension[5]
Chauhan Jivaben Bhalabhai	70	F	N	Y	3rd Std	Y	Y	–
Chauhan Vishalbhai Bhalabhai	46	M	N	Y	HSC	Y	Y	–
Chauhan Tejalben Vishalbhai	40	F	N	Y	SSC	Y	Y	

3. Children from 6 years and up to 18 years

Name	Age	Sex M/F/O	Disability Y/N	Marital Code*	Level of Education: Code#	Going to School /College (Y/N)	Current Class	Computer Literate Y/N
Chauhan Harsh Vishalbhai	17	M	N	N	–	Y	–	Y
Chauhan Meetali Vishalbhai	14	F	N	N	–	Y	–	Y

4. Children below 6 years

Name	Age	Sex M/F/O	Disability Yes/No	Going to School (Y/N)	Going to AWC Y/N	De-worming Done	Fully Immu-nised Y/N	Mother's Age at the time of Child's Birth
–	–	–	–	–	–	–	–	–

[1] Scheduled Caste 1, Scheduled Tribe 2, Other Backward Castes 3, Other 4

[2] Enter the BPL Survey round being used in the Gram Panchayat for identification of BPL Families (e.g. 1997/2002/2011)

[3] Marital Status: Not Married – 1, Married – 2, Widowed – 3, Divorced/Separated – 4

[4] Level of Education: Not Literate – 01, Literate – 02, Completed Class 5 - 03, Class 8th – 04, Class 10th-05, Class 12th-06, ITI Diploma-07, Graduate-08, Post Graduate/Professional – 09 (write the highest level applicable)

[5] No Pension – 0, Old Age Pension – 1, Widow Pension – 2, Disability Pension – 3, Other Pension – 4 (mention)

SAANSAD ADARSH GRAM YOJANA (SAGY) Baseline Household Survey Questionnaire

5. Hand washing

	Always		Sometimes		Never
After use of Toilet	Soap	Other	Soap	Other	
Before Eating	Soap	Other	Soap	Other	

6. Use of Mosquito Net

Children: Yes / No Adults: Yes / No

7. Do members take Regular Physical Exercise

	Yoga	Games	Other Exercises
Adults	Yes / No	Yes / No	Yes / No
Children	Yes / No	Yes / No	Yes / No

8. Consumption of Tobacco

	Smoking	Chewing
Adults	✓	✓
Children	X	X

9. House & Homestead Data

Own House: Yes / No	No. of Rooms: 3
Type: Kutcha / Semi Pucca / Pucca	
Toilet: Private / Community / Open Defecation	
Drainage linked to House: Covered / Open / None	
Waste Collection System	Door Step / Common Point / No Collection System
Homestead Land: Yes / No	Kitchen Garden : Yes / No
Compost Pit: Individual/ Group/ None	Biogas Plant: Individual/ Group/ None

10. Source of Water (Distance from source in KMs)

Source of Water		Distance
Piped Water at Home	Yes / No	1
Community Water Tap	Yes / No	
Hand Pump (Public / Private)	Yes / No	
Open Well(Public / Private)	Yes / No	
Other (mention):		

11. Source of Lighting and Power

Electricity Connection to Household: Yes / No
Lighting: Electricity/Kerosene/Solar Power
Mention if Any Other: _____
Cooking: LPG/Biogas/Kerosene/Wood/Electricity
Mention if Any Other: _____
If cooking in Chullah: Normal/ Smokeless

12. Landholding (Acres)

1. Total	452.36	2. Cultivable Area	308.14
3. Irrigated Area	–	4. Uncultivable Area	79.09

13. Principal Occupations in the Household

Livelihood	Tick if applicable
Farming on own Land	✓
Sharecropping /Farming Leased Land	X
Animal Husbandry	X
Pisciculture	X
Fishing	X
Skilled Wage Worker	✓
Unskilled Wage Worker	✓
Salaried Employment in Government	X
Salaried Employment - Private Sector	✓
Weaving	X
Other Artisan(mention)	Job
Other Trade & Business (mention)	X

14. Migration Status

Does any member of the household migrate for Work: Yes / No. If Yes Entire Year / Seasonal

Does anyone below 18 years migrate for work: Y/N

15. Agriculture Inputs

Do you use Chemical Fertilisers	Yes/No
Do you use Chemical Insecticides	Yes/No
Do you use Chemical Weedicide	Yes/No
Do you have Soil Health Card	Yes/No
Irrigation: None/ Canal/ Tank/ Borewell/Other	
Drip or Sprinkler Irrigation: Drip /Sprinkler / None	

16. Agricultural Produce in a normal year (Top 3)

Name	Unit	Quantity
Millet	kg	100
Wheat	kg	100
Peanut	kg	200

17. Livestock Numbers

Cows: N	Bullocks: N	Calves: N
Female Buffalo: N	Male Buffalo: N	Buffalo Calves: N
Goats/ Sheep: N	Poultry/ Ducks: N	Pigs: N
Any other: Type _____		No. _____
Shelter for Livestock: Pucca / Kutcha / None		
Average Daily Production of Milk(Litres): _____		

18. What games do Children Play

19. Do children play musical instrument (mention)

Schedule Filled By:
Principal Respondent:
Date of Survey:

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

I. Basic Information

a. Gram Panchayat: Navapura

b. Block: -

c. District: Ahmedabad

d. State: Gujarat

e. Lok Sabha Constituency: 40-Sanand

f. Number of Wards in the Gram Panchayat: 10

g. Number of Villages in the Gram Panchayat: 1

h. Names of Villages: Navapura

Demographic Information

Number of Households 930 Total Population 3756 Male 1934 Female 1822

SC HHs - ST HHs - OBC HHs - Other HHs -

I. Access to Infrastructure / Facilities / Services

	Infrastructure Facilities / Services	Located within the GP Yes (Y)/No (N)	If located elsewhere (N), distance from the GP office
a.	ANM/ Health Sub Centre	N	6 km
b.	Nearest Primary Health Centre (PHC)	N	6 km
c.	Nearest Community Health Centre (CHC)	Y	6 km
d.	Nearest Post Office	Y	
e.	Nearest Bank Branch (Any)	N	10 km
f.	Nearest Bank with CBS Facility	-	-
g.	Nearest ATM	N	
h.	Nearest Primary School	Y	Inside
i.	Nearest Middle School	Y	Inside
j.	Nearest Secondary School	N	10 km
k.	Nearest Higher Secondary School / +2 College	N	10 km
l.	Nearest Graduate College	N	24 km
m	Nearest ITI / Polytechnic Centre	N	24 km
n	Kisan Seva Kendra	N	

1

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

	Infrastructure Facilities / Services	Located within the GP Yes (Y)/No (N)	If located elsewhere (N), distance from the GP office
o	Agriculture Credit Cooperative Society	Y	Inside
p	Nearest Agro Service Centre	N	6 km
p	MSP based Government Procurement Centre	N	6 km
q	Milk Cooperative /Collection Centre	Y	
r	Veterinary Care Centre	N	24 km
s	Ayurveda Centre	N	10 km
t	E – Seva Kendra	N	24 km
u	Bus Stop	N	1 km
v	Railway Station	N	24 km
w	Library	N	6 km
x	Common Service Centre	N	6 km

IV. Sports Facilities in the Gram Panchayat

a. Number of Play Grounds in the GP: Total No Public – Private –

b. Mini Stadium : No ~~Yes(Y)~~ /No (N) *(Playground with equipment and sitting arrangement)*

V. Education, ICDS

a. Number of Angan Wadi Centres: 3

b. Number of villages without Angan Wadi Centres No

Names of such villages: –

c. Schools (Number)

Primary Private: – Primary Govt.: 1

Middle Private: – Middle Govt.: 1

Secondary Private: – Secondary Govt.: –

Higher Secondary Private: – Higher Secondary Govt: –

VI. Public Distribution System

	Item	Private Contractor	Women's SHG	Gram Panchayat	Cooperative	Other (Mention)	Location in GP (mention Location)	If outside GP, Location & distance from GP HQrs)
a.	Cereal (Rice/ Wheat/ Millets)	✓	–	–	–	–	–	–
b.	Kerosene	–	–	–	–	–	–	–
c.	Other (mention)	–	–	–	–	–	–	–

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

VII. Coverage of Villages under different Facilities & Services

	Parameter	Villages Status[1]	Names of Villages Covered	Names of Villages not Covered
a.	Piped Water Supply Coverage to Villages	Covered ✓ / Not Covered	Navapura Motidevti Kolat	
b.	Hand Pump Coverage in Villages:	Covered ✓ / Not Covered	Navapura Motidevti	
c.	Coverage under Covered Drains:	Covered ✓ / Not Covered	Navapura Motidevti	
d.	Coverage under Open Drains:	Covered ✓ / Not Covered	Navapura Kolat Motidevti	
e.	Villages with Household Electricity Connection (Numbers)	Connected ✓ / Not Connected	Navapura Kolat Motidevti	

VIII. Land and Irrigation

	Private Land	Area in Acres		Common Land	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land	308.14	d.	Pasture / Grazing Land	–	g.	Check Dam	–
b.	Irrigated Land	–	e.	Forests/ Plantations	–	h.	Wells/Bore Wells	4
c.	Un-irrigated Land	79.09	f.	Other Common Land	–	i	Tanks /Ponds	1

[1] Mention the number of Villages Covered and Not Covered

Saansad Adarsh Gram Yojana (SAGY) Panchayat Details Survey Questionnaire

(Note: Please aggregate information from village level questionnaires wherever relevant)

IX. Parameters relating to Households & Institutions

		Number
a)	Number of eligible Households for pension (old age, widow, disability)	–
b)	Number of Households receiving pension (old age, widow, disability)	250
c)	Number of eligible Households who are not receiving pension	–
d)	Number of Households eligible for Ration Card	930
e)	Number of eligible HHs having ration cards	–
f)	Number of households covered under RSBY (Rashtriya Swasthya Bima Yojana)	0
g)	Number of HHs covered under AABY (Aam Aadmi Bima Yojana)	0
h)	Number of active Job Card holders under MGNREGA	0
i)	Number of Job Card holders who completed 100 days of work during 2013-14	0
j)	Number of shops selling alcohol	0
k)	Number of BPL families	532
l)	Number of landless households	0
m)	Number of IAY beneficiaries	0
n)	Number of FRA[2] beneficiaries	0
o)	Number of Community Sanitary Complexes	0
p)	Number of Households headed by single women	10
q)	Number of Households headed by physically handicapped persons	5
r)	Total number of Persons with Disability in the village	10
s)	Number of SHGs	0
t)	Number of active SHGs	0
u)	Number of SHG Federations	0
v)	Number of Youth Clubs	0
w)	Number of Bharat Nirman Volunteers	0

Name and Signature of Surveyor and Respondent'

Jegnesh Doriya Surveyor	PRI Respondent (Preferably Gram Panchayat Chairperson)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	09/06/2021 Date of Survey

[2] The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

This questionnaire should be filled for each of the villages in the selected Gram Panchayat[1]

I. Basic Information

a. Village: Navapurra
b. Ward Number: –
c. Gram Panchayat: Navapurra
d. Block: –
e. District: Ahmedabad
f. State: Gujarat
g. Lok Sabha Constituency: 40 - Sanand
h. Number of Habitations / Hamlets in the Gram Panchayat: 4 –
i. Names of Habitations / Hamlets:
–

Demographic Information

Number of Households 930 Total Population 3756 Male 1934 Female 1822

SC HHs – ST HHs – OBC HHs – Other HHs –

II. Access to Infrastructure/Amenities etc.

i.	Access to Infrastructure / Facilities / Services	Located in the Village Yes (Y)/No(N)	If located elsewhere (N), distance in kms from the village
a.	Nearest Primary School	Y	
b.	Nearest Middle School	Y	
c.	Nearest Secondary School	N	10 kem
d.	Kisan Seva Kendra	N	6 kem
e.	Milk Cooperative /Collection Centre	Y	
g.	Health Sub Centre	N	10 kem
h.	Bank	N	10 kem
i.	ATM	N	10 kem
j.	Bus Stop	N	1 kem
k.	Railway Station	N	24 kem

[1] While filling this the surveyor must collect the information from the Ward Member/s and relevant government officials

1

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

i.	Access to Infrastructure / Facilities / Services	Located in the Village Yes (Y)/No(N)	If located elsewhere (N), distance in kms from the village
l	Library	N	6 kms
m	Common Service Centre	N	10 kms
n	Veterinary Care Centre	N	24 kms

ii. Road Connectivity

a. Habitations connected by All-weather Roads *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations where not available: All

iii. Drinking Water Facilities

a.Piped Water Supply Coverage to Habitations: All *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

b.Hand Pump Coverage in Habitations: Some *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

iv. Coverage of Habitations under Waste Management System

a. Coverage under Covered Drains: All *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

b. Coverage under Open Drains: Some *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: _____

c. Coverage under Doorstep Waste Collection: *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: None

v. Coverage of Habitations under Electrification

a. Coverage under Household Connections: *(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: Some

b.Coverage under Street Lighting: All*(1-All 2-None 3-Some)*

If 3 mention the name of the habitations not covered: Some

vi. Sports Facilities in the Village

a.Number of Play Grounds in the Village (minimum size 200 square meters): _____

b.Mini Stadium : N Yes(Y) /No (N)

vii. Education, ICDS

a. Number of Anganwadi Centres: 3

c. Schools (Number)

Primary Private: – Primary Govt.: 1

Middle Private: – Middle Govt.: 1

Secondary Private: – Secondary Govt.: –

Higher Secondary Private: – Higher Secondary Govt: –

2

SAANSAD ADARSH GRAM YOJANA (SAGY) Village Details Survey Questionnaire

viii. Land Category		Area in Acres		Land Category	Area in Acres		Irrigation Structure	No.
a.	Cultivable Land	308.14	d.	Pasture / Grazing Land	-	g.	Check Dam	-
b.	Irrigated Land	-	e.	Forests/ Plnatations	-	h.	Wells/Bore Wells	4
c.	Un-irrigated Land	79.09	f.	Other Common Land	-	I	Tanks /Ponds	1

ix. Entitlement Related Parameters		
1	Number of active Job Card holders under MGNREGA	0
2	Number of active Job Card holders who have completed 100 days of work	0
3	Number of shops selling alcohol	0
4	Number of BPL families	0
5	Number of landless households	532
6	Number of IAY beneficiaries	0
7	Number of FRA beneficiaries	0
8	Number of common sanitation complexes	0
9	Number of SHGs	0
10	Number of active SHGs	0
11	Existence of SHG Federation in the Village (Yes / No)	0
12	Number of Youth Clubs	0
13	Number of Bharat Nirman Volunteers	0

Name and Signature of Surveyor and Respondent'

Jeegnesh Dominy	[illegible]		09/06/2021
Surveyor	PRI Respondent (Preferably a ward member from a ward that is fully or partially covered under the Village)	Official Respondent (Preferably seniormost Government official in the Gram Panchayat)	Date of Survey

Chapter 20
TDO-DDO-Collector email sending soft copy attachment in the report.

Gmail

Jeegnesh Doriya <jeegneshdoriya@gmail.com>

Development scenario of Navapura village, Sanand, Ahmedabad.
2 messages

Jeegnesh Doriya <jeegneshdoriya@gmail.com> Mon, Jun 21, 2021 at 9:46 PM
To: tdo-ahm@gujarat.gov.in, ddo-ahd@gujarat.gov.in
Cc: PARTH SINROZA <parth.sinroza@ljinstitutes.edu.in>

Respected Sir/Madam,

We are the students of L J Institute of Engineering & Technology, Ahmedabad affiliated to Gujarat Technological University-GTU.GTU has been assigned to Vishwakarma Yojanaa-VY in which students survey various villages and design various amenities to deliver it to them making them ideal for living better life as per requirements & village problem statements.

As a part of Vishwakarma Yojana's guidelines, we have been asked to inform all the respected officers about our project in which we have briefly notified about Navapura Village profile of issues for development and our design work for them which is as below.

Village : Navapura		**Population: 3756(As of Census 2011)**
Key Issue	**Remark**	**Design proposed**
Hygiene and Sanitation	There is no public toilet available in the village.	Public Toilet
Difficulty in Mail Services	There is no separate post office building available in the Village.	Post Office
Unemployment Rate	There is no such Institutional Facility available in the village which helps the villagers in their skill development.	Learning hub and Smart play centre
Wealth Insecurity	There is no Bank available in the village,so they have to go to Sanand for a bank facility.	Bank
Waste mismanagement	The waste management in the village is not adequate.	Biogas Plant
Illiteracy	There is no Library in the village.	Library
Economic Development & Social Justice	The condition of the gram panchayat Building is not Good.	Gram Panchayat
Lack of medical facilities	There is no PHC available in the Village, if they need any medical consultant they have to go to nearest health in sanand.	Primary Health Centre
Higher mortality rate of cattle	There is no hospital for cattles in the village.	Veterinary Centre
Sales revenue	There is no such facility available for the villagers.	Mini Market

Sr.No.	Design	Period(Months)	Expenditure(Rs)	Benefits
1.	Public Toilet	2	5,37,610/-	Better Hygiene and Sanitation
2.	Post Office	2-2.5	3,14,698/-	Affordable Mail Services
3.	Learning hub and Smart play centre	4-5	11,50,530/-	Improvement in Employment Rate
4.	Bank	3	3,54,855/-	Wealth Security
5.	Biogas Plant	-	64,08,150/-	Effective use of waste
6.	Library	3	5,50,179/-	Improvement in literacy rate
7.	Gram Panchayat	2	5,14,409/-	Economic Development & Social Justice
8.	Primary Health Centre	3	7,60,692/-	Increase in health standards
9.	Veterinary Centre	4	7,98,152/-	Lower mortality rate of cattle
10.	Mini Market	3-4	6,54,654/-	Facilitate sales
11.	Obelisk	-	2,61,670/-	Revenue Generation

Please find the attached file.
1. Detailed Project Report of Navapura Village

Best Regards,
Jeegneshkumar Doriya & Sharad Verma
U. G. Civil Engineering
L J Institute of Engineering & Technology, Ahmedabad.
Gujarat Technological University.
Email: jeegneshdoriya@gmail.com
Email: vermasharad141@gmail.com

Navapura_LJIET-Ahmedabad_DPR_VY(Phase8).pdf
11257K

Chapter 21
Comprehensive Report of entire Village

Concept of the Project

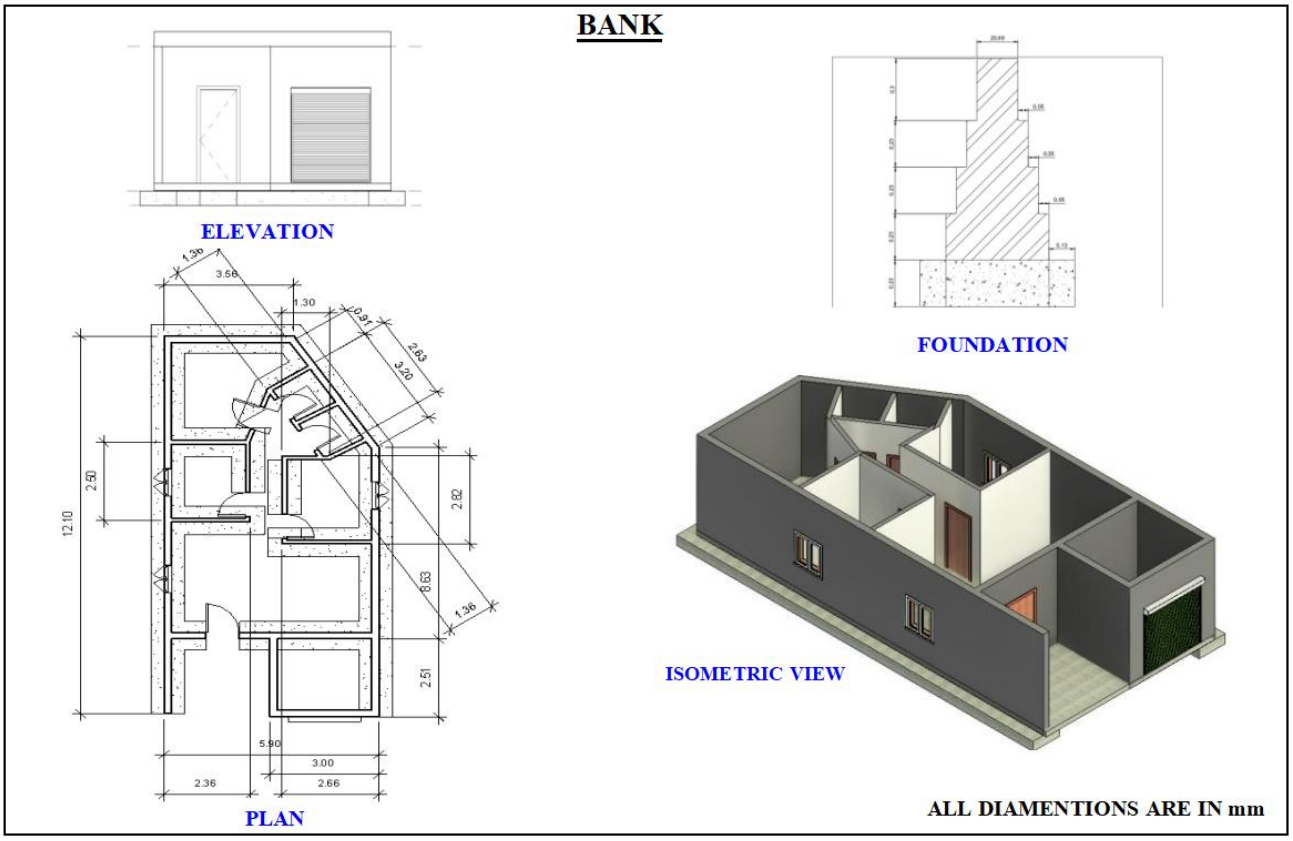
Vishwakarma Yojana is an initiative of Government of Gujarat through Commissionerate of Technical Education which is allotted to Gujarat Technological University. This project aims to the development of rural infrastructural facilities and living standards of the rural people.The villages of "Rurban" vicinity are adopted by the engineering colleges affiliated with the Gujarat Technological University. The Engineering colleges would study the identified villages and make the recommendations on the applying of technology to realize integrated and comprehensive development, through project preparation and management.

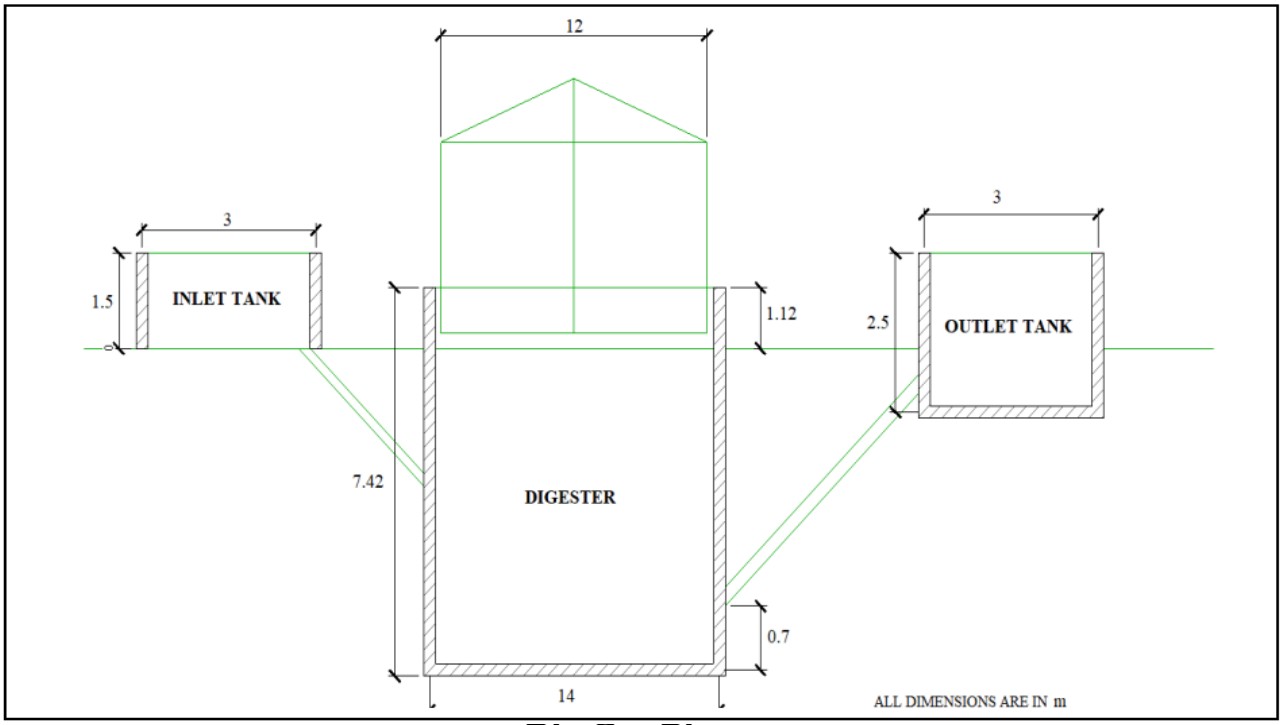
Navapura is a village located in Daskroi takula, Ahmedabad district of Gujarat state, India in the vicinity of Ahmedabad city. It is a small village with the population of 3756. It is located 25 km towards South from District head quarters Ahmedabad. It is surrounded by Dholka Taluka towards South, Bavla Taluka towards west, Sanand Taluka towards North, Ahmadabad Taluka towards North.

As this a "rurban" village, the people are not only associated with the agricultural activities but also are adopting different vocations. Like the other villages of India this also lacks in some basic infrastructural facilities such as public transportation connectivity, primary health center, waste management system et-cetera.

There are many scopes of future development in the village. After providing basic amenities, we can bring forth some smart techniques like vertical farming, we can also propose the idea of lake revival and many others.

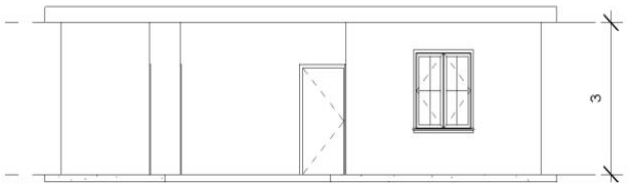
Proposed designs are given below;



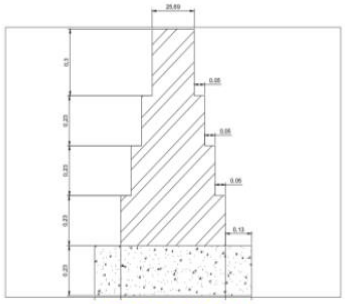


Bio Gas Plant

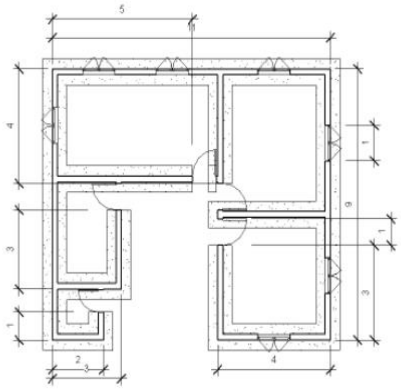
PANCHAYAT BUILDING



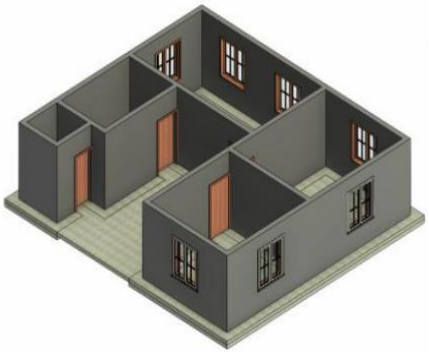
ELEVATION



FOUNDATION



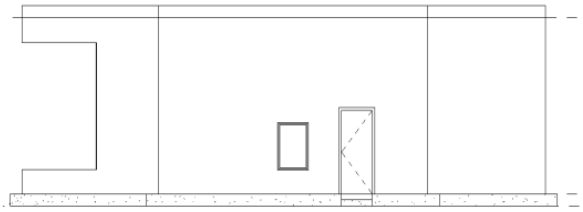
PLAN



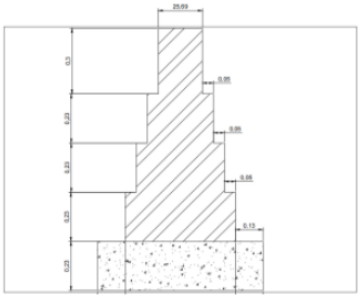
ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

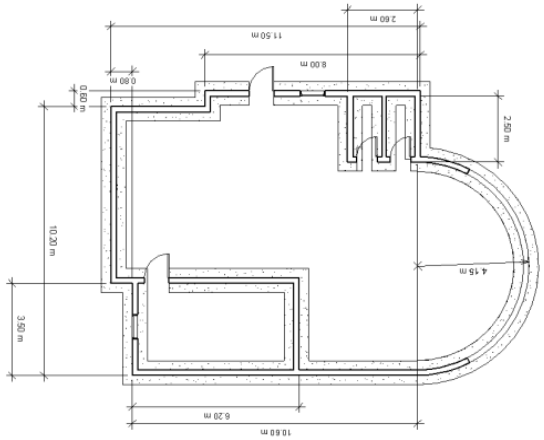
SMALL LIBRARY



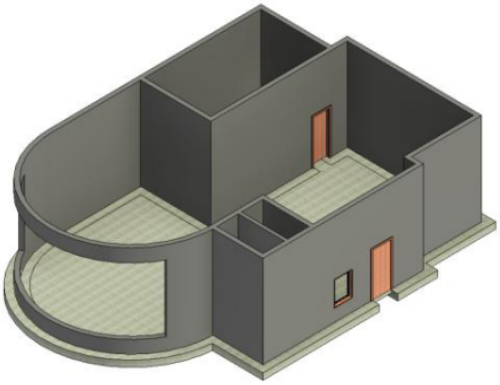
ELEVATION



FOUNDATION

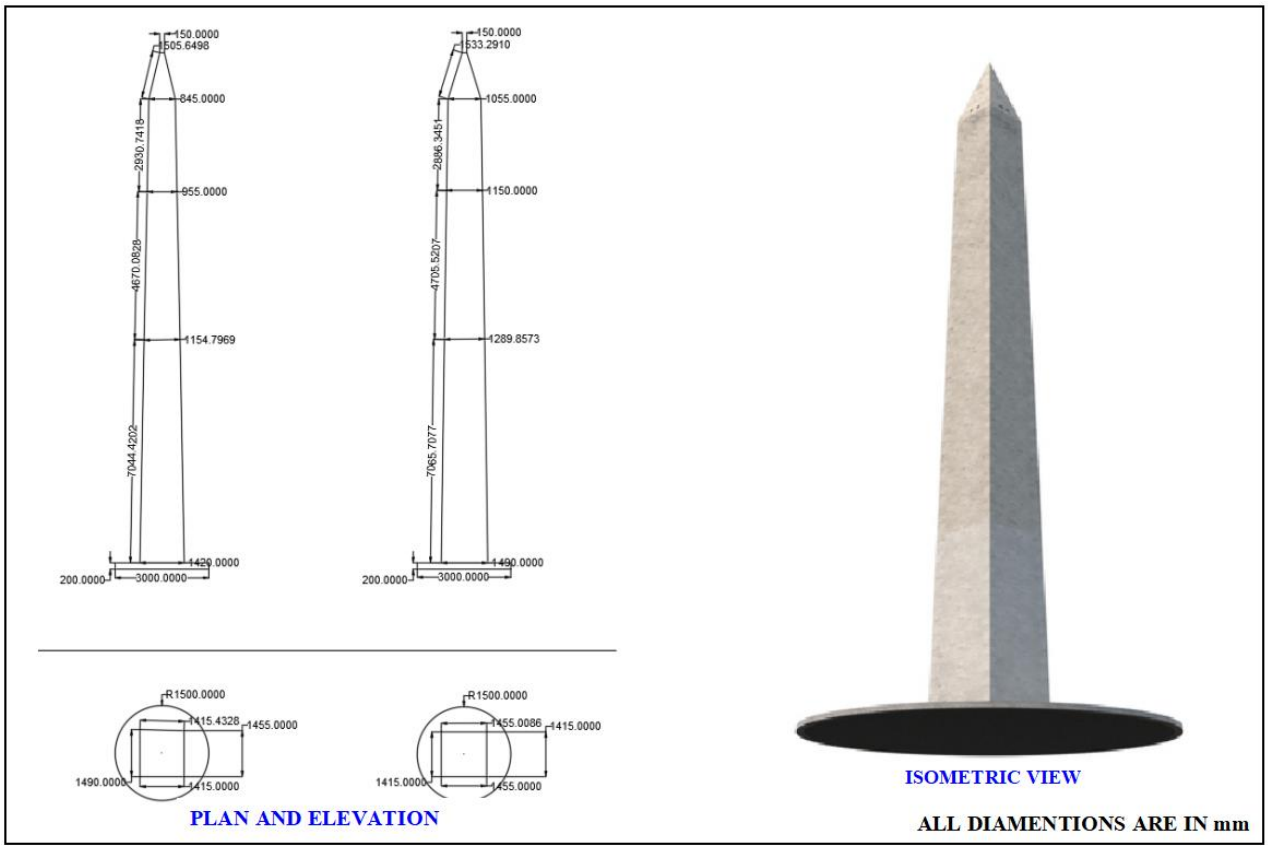


PLAN

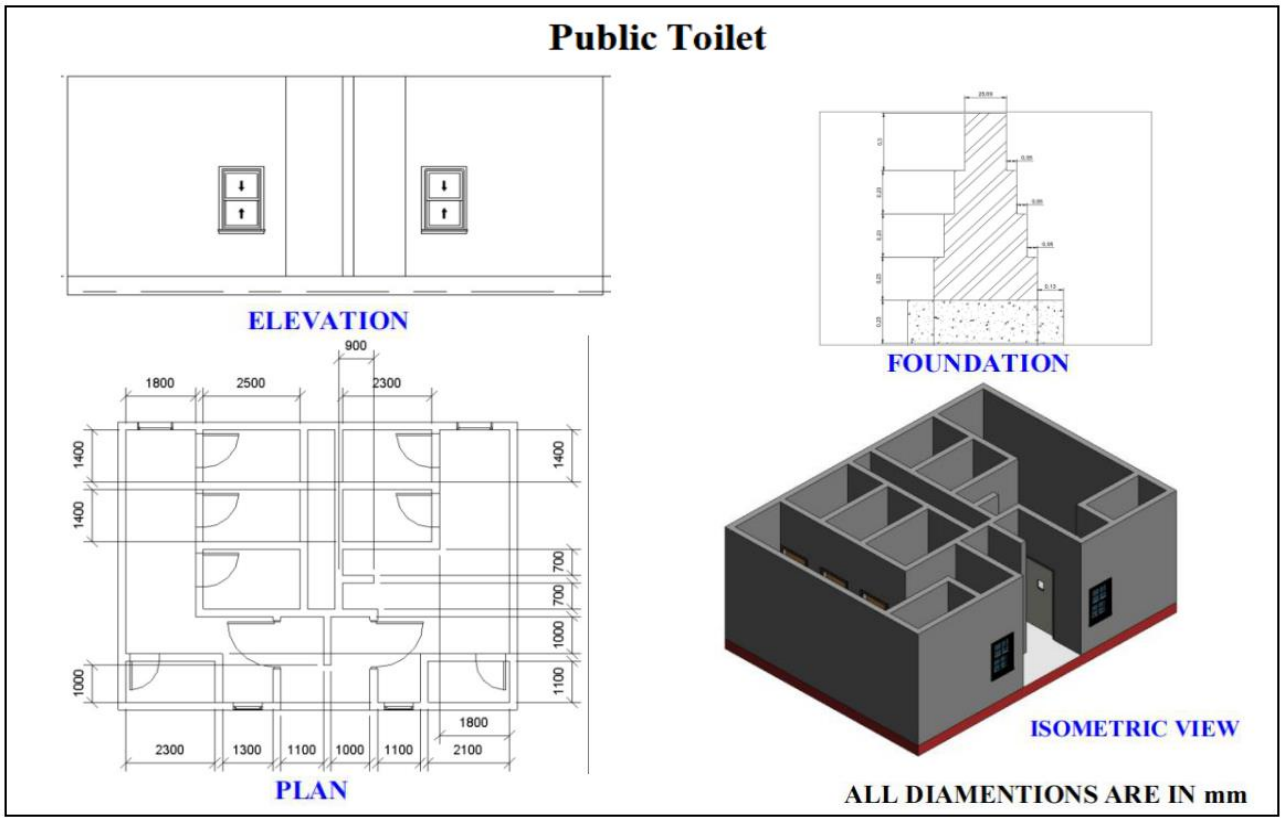


ISOMETRIC VIEW

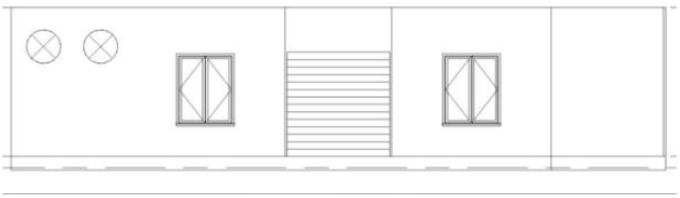
ALL DIAMENTIONS ARE IN mm


150.0000
505.6498
845.0000
2930.7418
955.0000
4670.0828
1154.7969
7044.4202
1420.0000
200.0000
3000.0000
150.0000
533.2910
1055.0000
2886.3451
1150.0000
4705.5207
1289.8573
7065.7077
1490.0000
200.0000
3000.0000
R1500.0000
1415.4328
1455.0000
1490.0000
1415.0000
R1500.0000
1455.0086
1415.0000
1415.0000
1455.0000
PLAN AND ELEVATION
ISOMETRIC VIEW
ALL DIAMENTIONS ARE IN mm

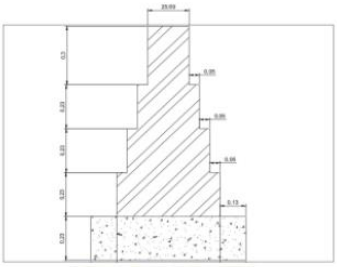
Obelisk


Public Toilet
ELEVATION
900
1800
2500
2300
1400
1400
700
700
1000
1000
1100
1800
2300
1300
1100
1000
1100
2100
PLAN
FOUNDATION
ISOMETRIC VIEW
ALL DIAMENTIONS ARE IN mm

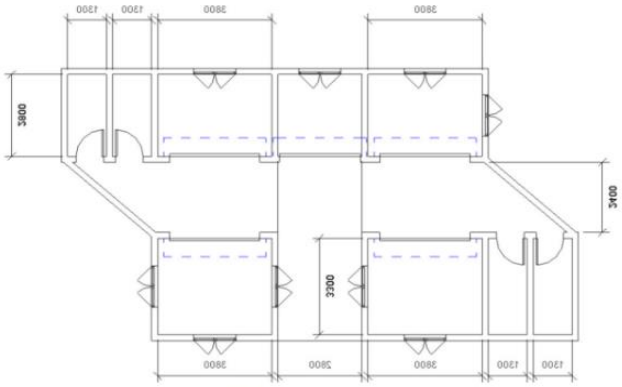
Mini Market



ELEVATION



FOUNDATION

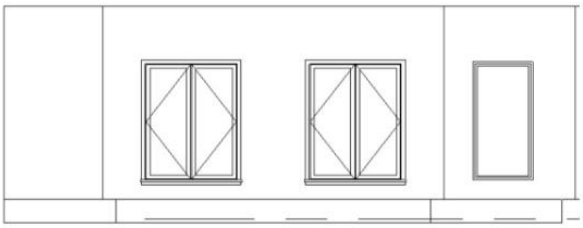


PLAN

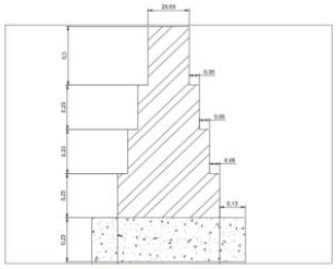
ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

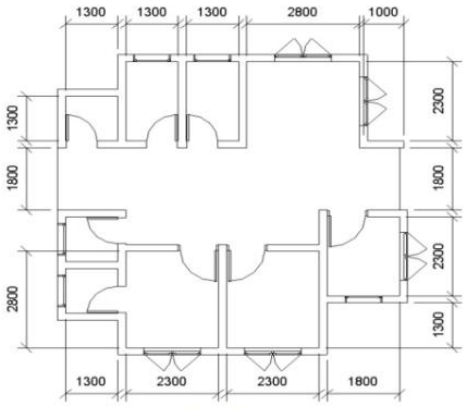
Post Office



ELEVATION



FOUNDATION

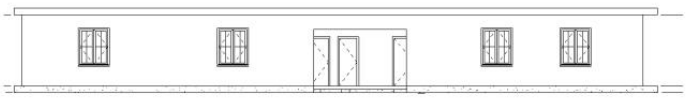


PLAN

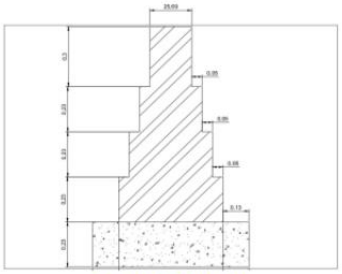
ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

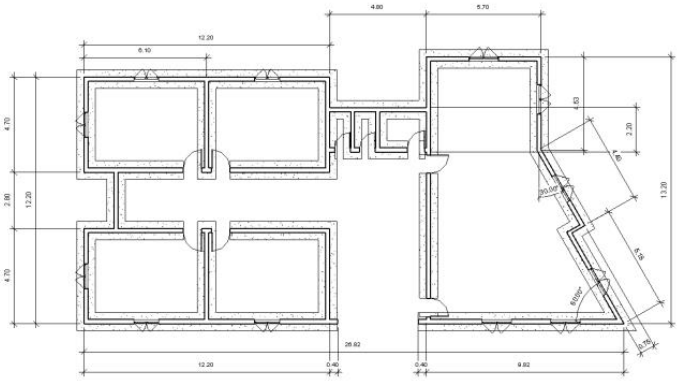
LEARNING HUB & SMART PLAY CENTRE



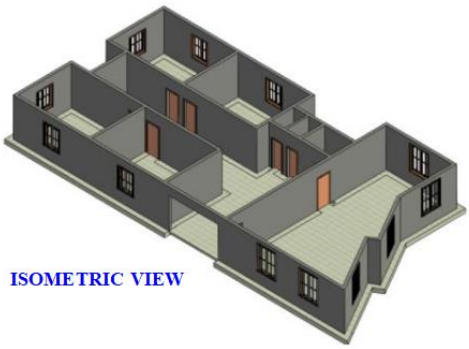
ELEVATION



FOUNDATION



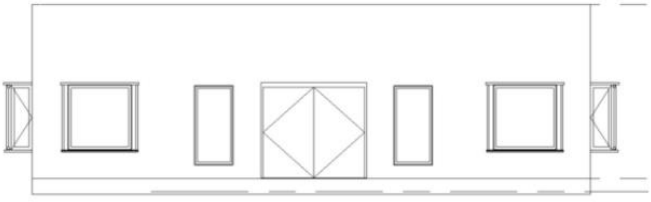
PLAN



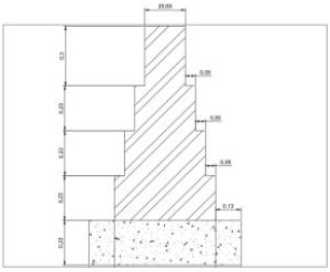
ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm

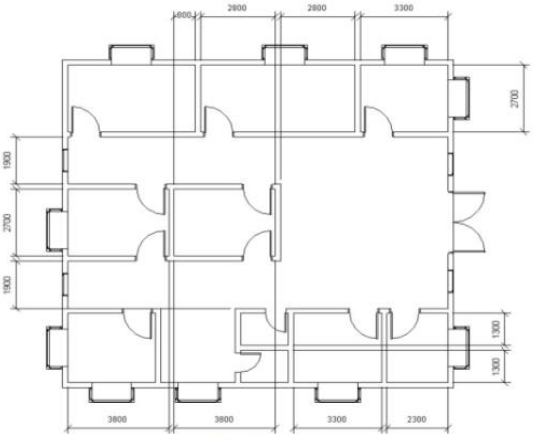
Veterinary Hospital



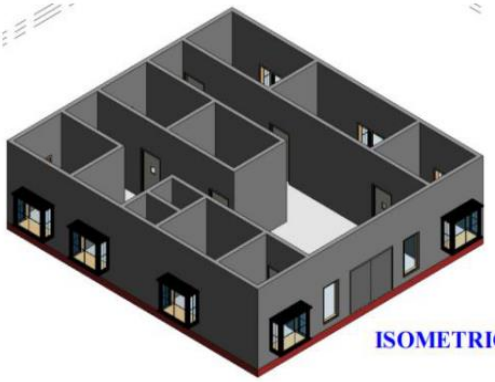
ELEVATION



FOUNDATION

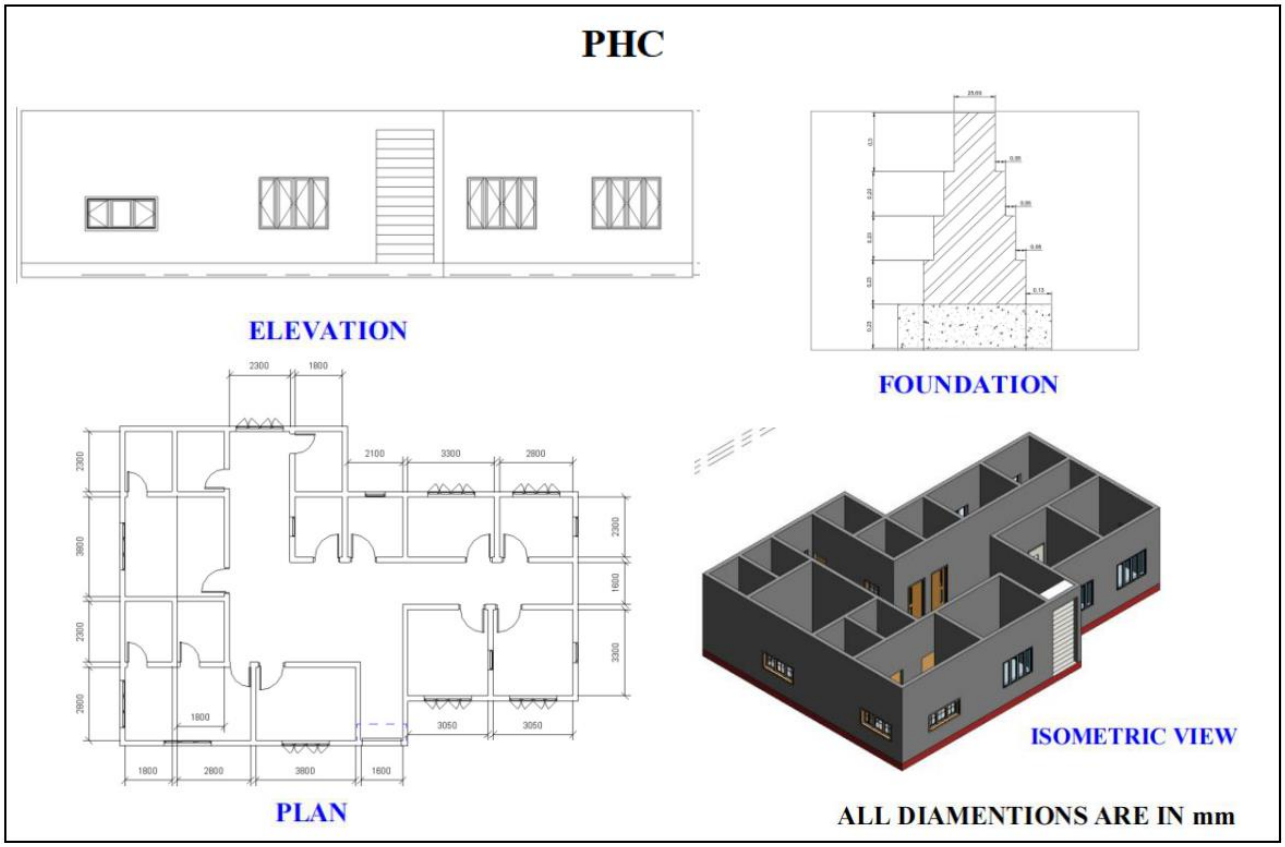


PLAN



ISOMETRIC VIEW

ALL DIAMENTIONS ARE IN mm


PHC
ELEVATION
FOUNDATION
2300
1800
2100
3300
2800
2300
3800
2300
2800
1600
3300
1800
3050
3050
1800
2800
3800
1600
PLAN
ISOMETRIC VIEW
ALL DIAMENTIONS ARE IN mm