

**Regenerative Early Educational Facility for Underrepresented Children
In Pratiksha Nagar, Mumbai**

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Abstract

Regenerative Early Educational Facility for Underrepresented Children in Pratiksha Nagar, Mumbai

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Children of all age, class, sex and region deserve an equal opportunity to good quality education. Research shows that investing in early education reaps long term socio-economic benefits for a country. This makes early education all the more important for sub-developed countries. Studies show that the primary reason for high drop-out rate in India is due to the lack of good quality educational facilities for the lower income groups. This thesis studies an existing not-for-profit educational facility, working towards providing equal opportunities for low-income group families of the nearby informal settlements. While the social impact is large, due to shortage on space, the outreach has plateaued. This calls for a need to grow in size and quality, to match the ever-growing demand for services and psychological needs of its users. The physical environment of a learning space has an impact on students' achievements. This thesis questions 'what makes good quality educational facilities in sub-developed countries' and through travel research in India and South-East Asia, charts out factors that contribute to making successful spaces for children. Using these factors as core requirement, the design approach involves a back and forth process between psychological, cultural, social, economic and environmental considerations. It strives to be regenerative not just in terms of green building technologies but also in terms of regenerating the social standing of its occupants.

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A close-up photograph of a hand holding a green object, possibly a pen or pencil, in front of a white shelf. The shelf is cluttered with various items, including a grey bag, a green object, and a stack of papers. The background is a plain wall.

1.0 INTRODUCTION

“The child will find out about himself if the environment in which he lives helps him to do so. If the parents and teachers are really concerned that the young person should discover what he is, they won’t compel him, they will create an environment in which he will come to know himself.”

- J.M. Krishnamurti

1.0 INTRODUCTION

Since children spend a considerable part of their day at school, their school environment plays a big role in impacting their health, productivity, comfort, and ability to concentrate and retain information. In India, the government has invested in increasing the number of schools in order to meet the population rise and also to make education easily accessible to children of all regions, caste, class and sex. While the number of children enrolling in schools has increased over the last few years, the rate of dropout is quite high. The reason for the high dropout rate is the low quality of education. Vision 2030 for higher education in India aims to provide better quality of education.

The current learning facilities are not conducive for the growth and productivity of children in India. While some schools provide healthy environment and high quality infrastructure, this is limited to a selected few from the high-income group. Children from informal settlements are left with no choice but to study in unhealthy environments with high density, low teacher to student ratio, insufficient access to daylight and fresh air, absence of safe open playgrounds, and insufficient food for healthy growth. Educational facilities are the foundation for the socio-economic development of India. Children from all backgrounds should have equal opportunity to get good quality education in healthy learning environments.

Children coming from informal settlements often have difficult home lives and require a safe refuge where their hidden potential can be explored. As such the physical environment of their educational facility plays a key



Fig. 1.1 Inside Pratiksha Nagar



Fig. 1.2 Inside a typical unit in an informal settlement



Fig. 1.3 Government-run educational facilities for lower-income groups (Source: mid-day.com, 2013)

role in their growth, comfort, health, creativity and ability to learn new things and retain information.

Children are known to be able to learn and retain maximum information up until the age of five. Therefore, early education plays a crucial role in setting a strong base for children. The investments on early education facilities by the government is lacking and this task is usually taken up by private individuals or NGOs. One such organization is the Ramkrishna Sarada Samiti in Mumbai which works towards improving opportunities and consequently the quality of life of families living in informal settlements.

1.1 ABOUT MUMBAI

LOCATION

Mumbai is located on the western coast of India at coordinate 18.96° North and 72.82° East. A major part of Mumbai sits on the old island of Salsette which was originally a group of seven islands, reclaimed to form the Island of Greater Mumbai.

AREA

Greater Mumbai is under the administration of Brihanmumbai Municipal Corporation (BMC). The total area spans 169 square miles. The bigger Mumbai Metropolitan Region covers an extensive area of about 1,681 square miles.



Fig. 1.4 Aerial view of Mumbai (Source: Anand Dhakan, 2013)

ELEVATION

Most of Mumbai is relatively low lying and flat with only Northern Mumbai (Salsette) being hilly. Many parts of the city lie just above sea level, with elevations ranging from 33 feet to 49 feet. The city has an average elevation of 46 feet.

SOIL

The soil cover in the city is predominantly sandy due to its proximity to the sea. In the suburbs, the soil cover is largely alluvial and loamy. The underlying rock of the region is composed of black Deccan basalt.

SEISMIC ZONE

Mumbai sits on a seismically active zone owing to the presence of 23 fault lines in the vicinity. The area is classified as a Seismic Zone III region, which means an earthquake of up to magnitude 6.5 on the Richter-scale.

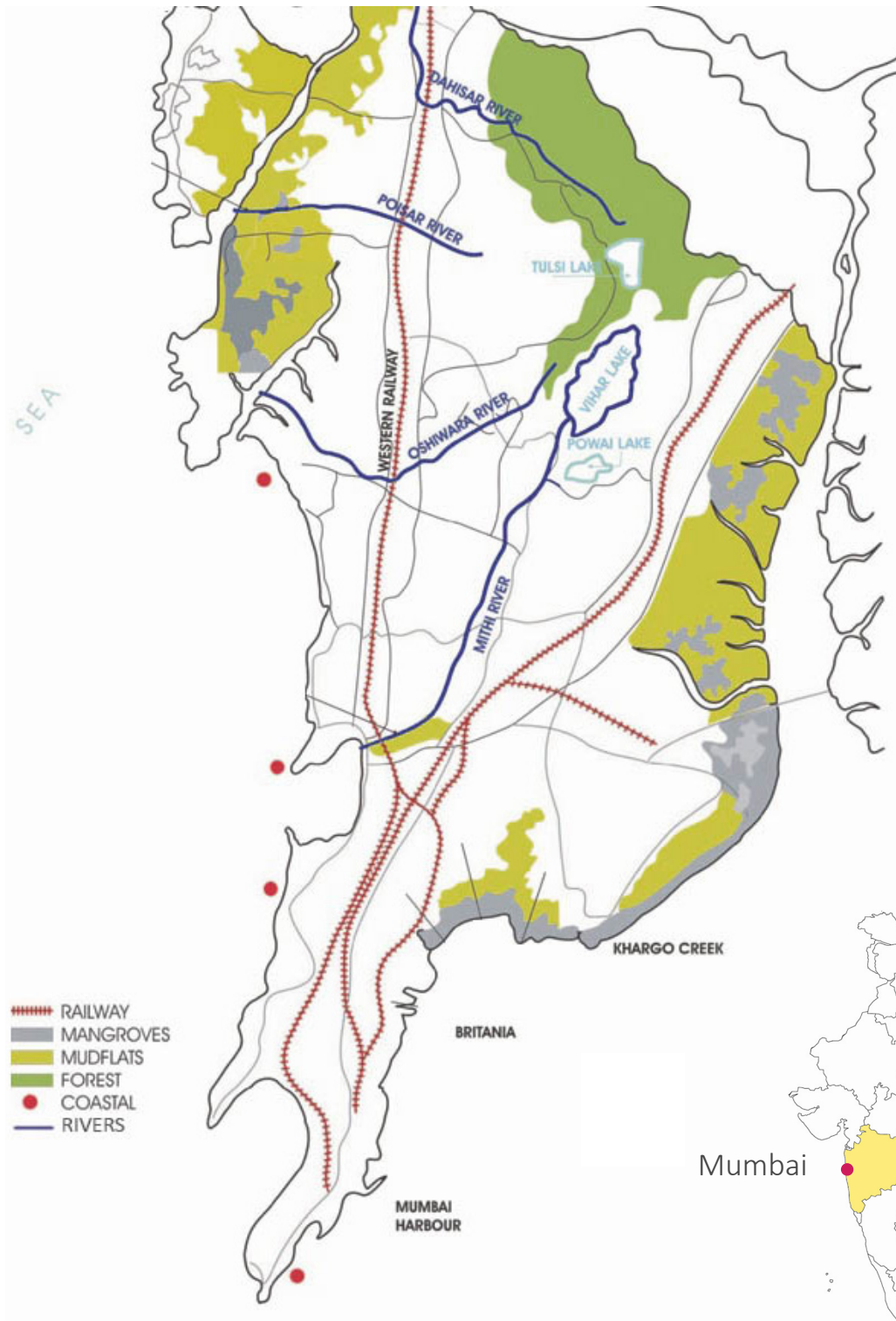


Fig. 1.5. Map of Mumbai with green lands and rivers (Source: dm.mcgm.gov.in)



Fig. 1.6. Mumbai with respect to India (Source: Bruce Jones Design Inc. 2010)

CLIMATE ANALYSIS

As per the Köppen climate classification, Mumbai has a tropical wet and dry climate. The city does not experience distinct seasons, but the climate can broadly be classified into two main seasons—the humid season and the dry season. Usually, the period between October to May is relatively dry. The city gets southwest monsoon rains beginning June to end September with peak rains occurring in July. Occasionally, northeast monsoon showers occur in October and November. The maximum annual rainfall ever recorded was 135.9 in. in 1954. The highest rainfall recorded in a single day was 37.17 inches on 26 July 2005. The average total annual rainfall is 84.51 inches in the Island City, and 96.73 inches in the suburbs. (Mumbai on the net, 2010) Most of Mumbai is hard-paved leaving almost no scope for rainwater percolation. Since Mumbai is along a sea coast, in situations where heavy rainfall and high tide coincide, runoff water has nowhere to go which leads to floods, like the flood of 26th July 2005.

The average annual temperature is 81.0 °F and the average annual precipitation is 85.31 inches. In the Island City, the average maximum temperature is 88.2 °F, while the average minimum temperature is 74.7 °F. In the suburbs, the daily mean maximum temperature range from 84.4 °F to 91.9 °F, while the daily mean minimum temperature ranges from 61.3 °F to 79.2 °F. The record high is 104.4 °F on 28 March 1982, and the record low is 45.3 °F on 27 January 1962. (Mumbai on the net, 2010)

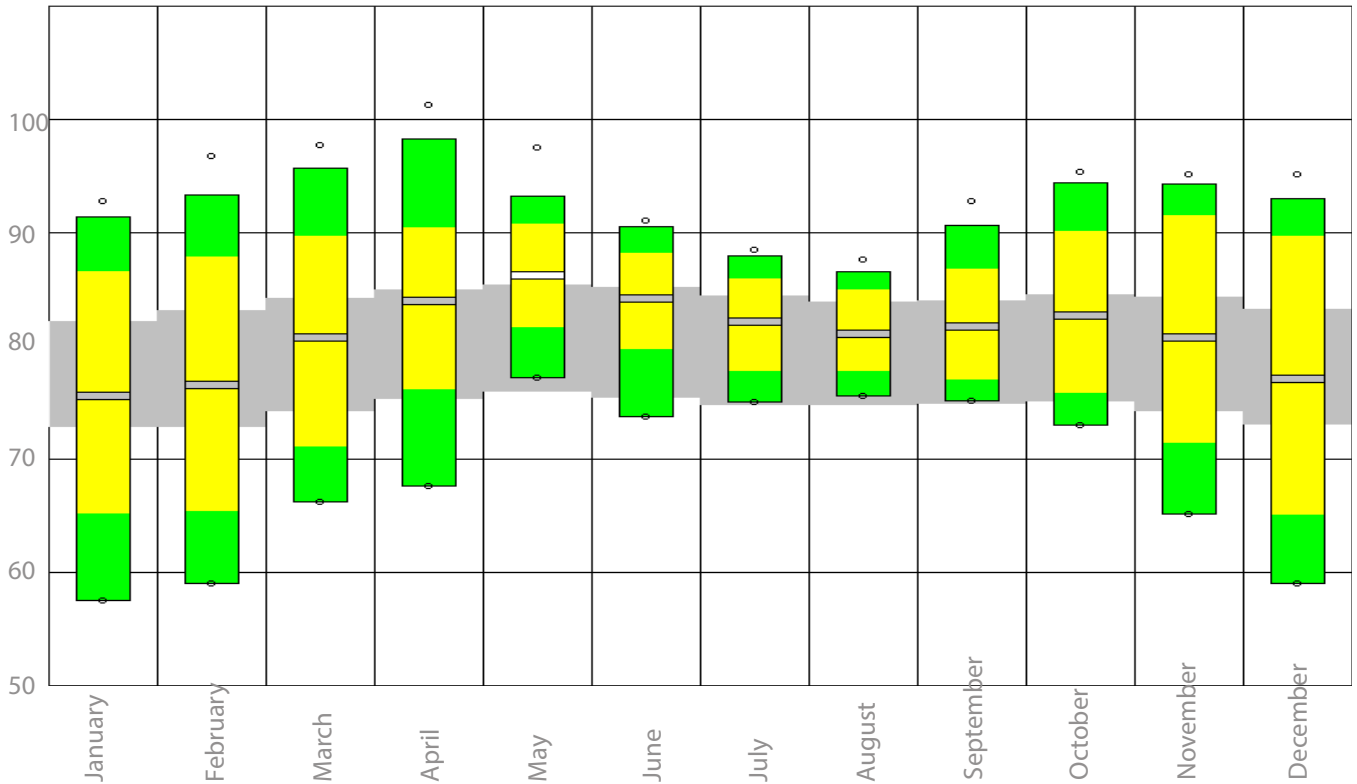


Fig. 1.7. Average temperature (°F) graph for Mumbai (Source: Climate Consultant)

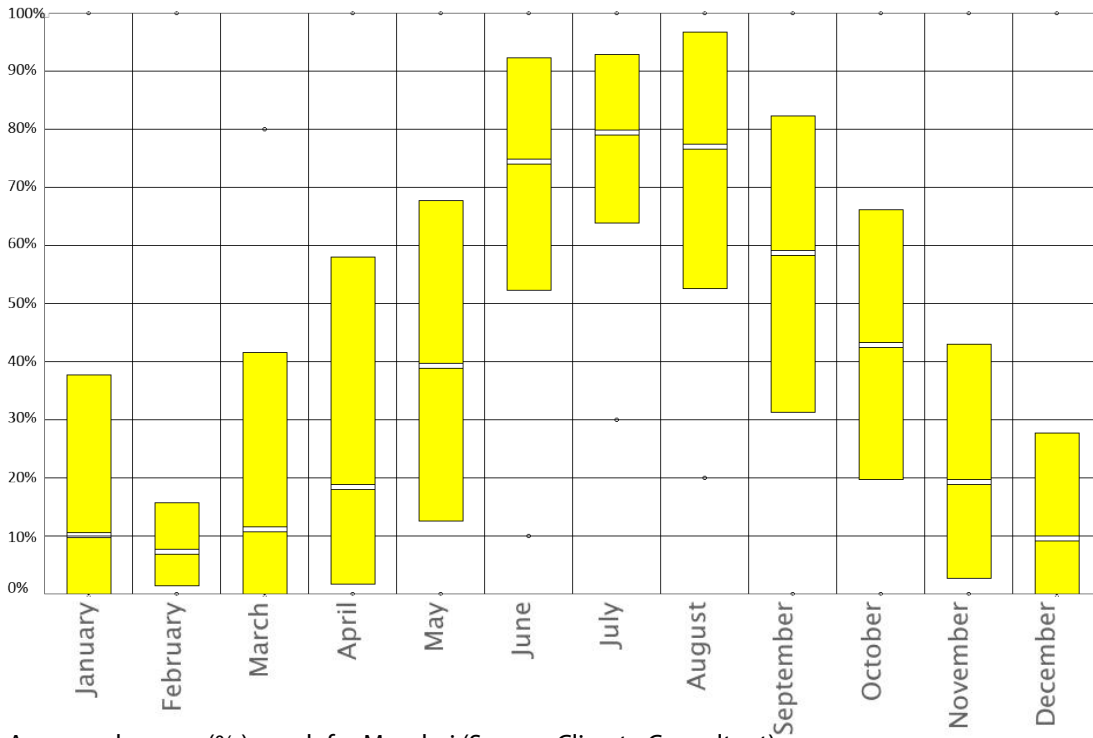


Fig. 1.8. Average skycover (%) graph for Mumbai (Source: Climate Consultant)



1.9. Floods in Mumbai on 26th July 2015
Source: STR/AFP



1.10. Typical monsoon day in Mumbai
Source: The Economic Times

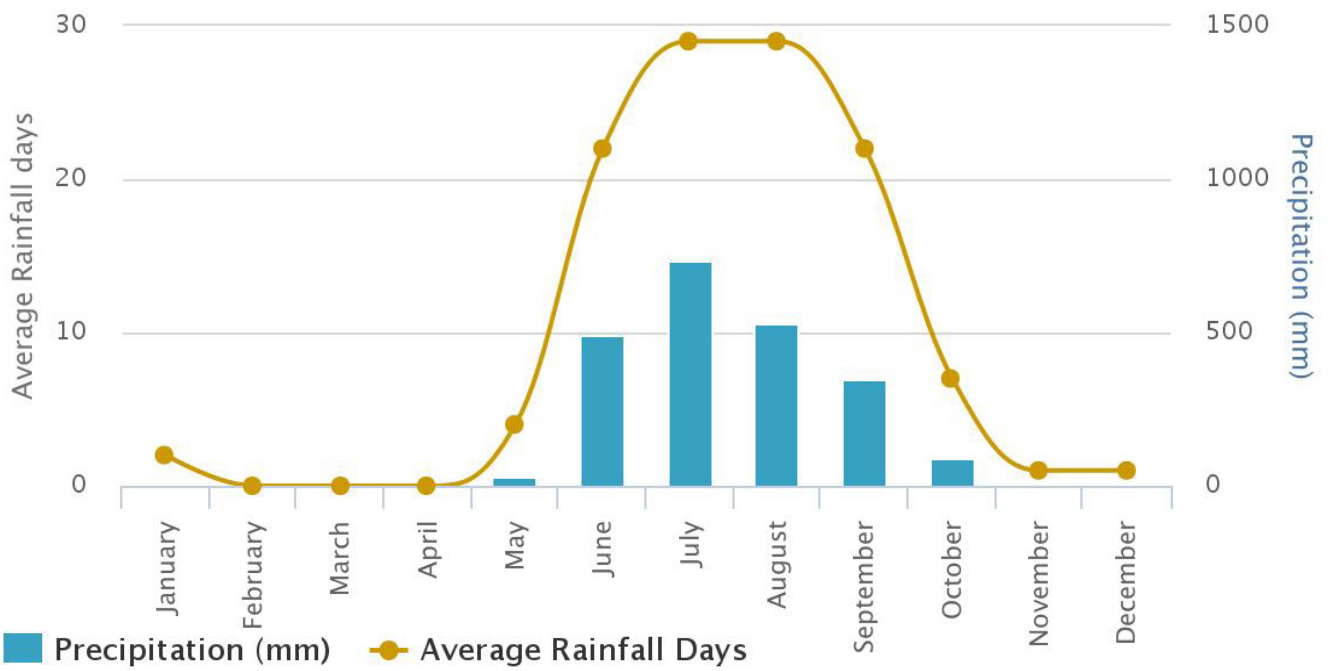


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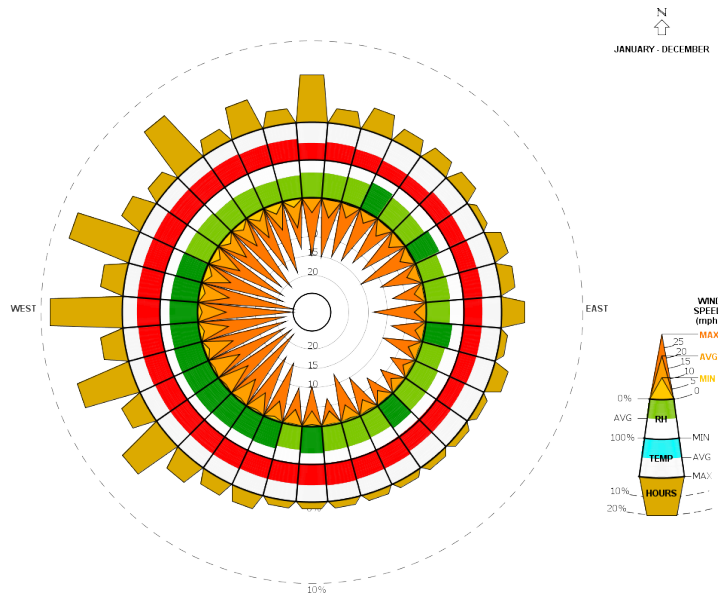


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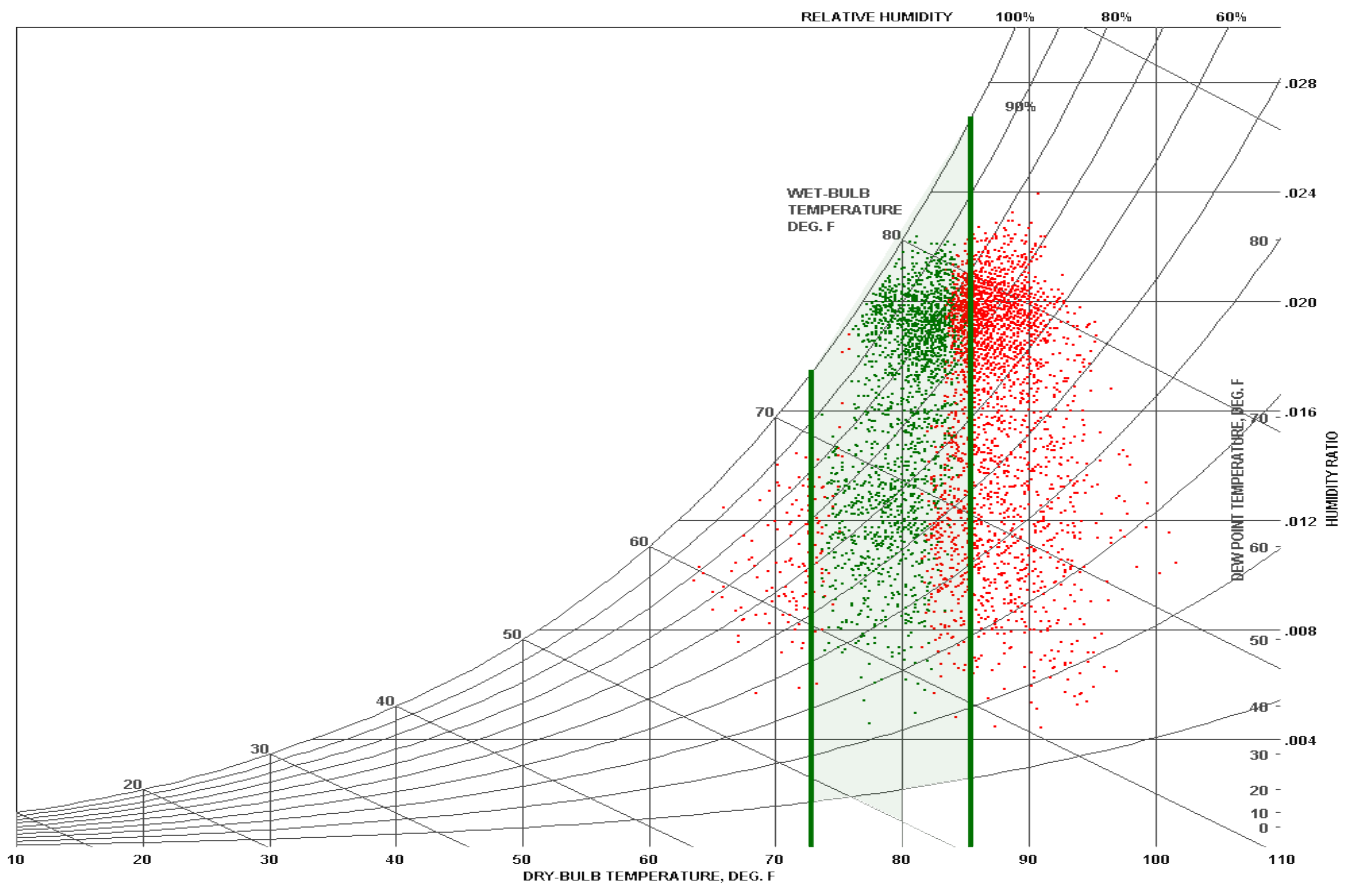


Fig. 1.13. Psychrometric chart for Mumbai showing comfort range by providing ventilation (Source: Climate Consultant)

1.2 INFORMAL SETTLEMENTS OF MUMBAI

Mumbai has three primary railway lines running along its length - Western Line, Central Line and Harbor Line. Informal communities filled the interstitial spaces, growing between the railway tracks and factories and along the wetlands areas that are most difficult to build upon. As Indian cities have grown, informal housing communities or slums have proliferated to meet the needs of rural migrants. Self-built communities in India are effective because they grant low-income individuals admittance into a larger economy by offering affordable housing in close proximity to income sources.

These informal communities grow organically and at an exponential pace as more and more rural inhabitants move to the city to find opportunities. In most families, only one parent brings in the money while the other parent is usually responsible for children's upbringing. The monthly household income of a family typically ranges between \$100 - \$150 with most men working as drivers, mechanics, office clerks or businessmen, while the women are either homemakers or domestic help in the neighboring buildings.

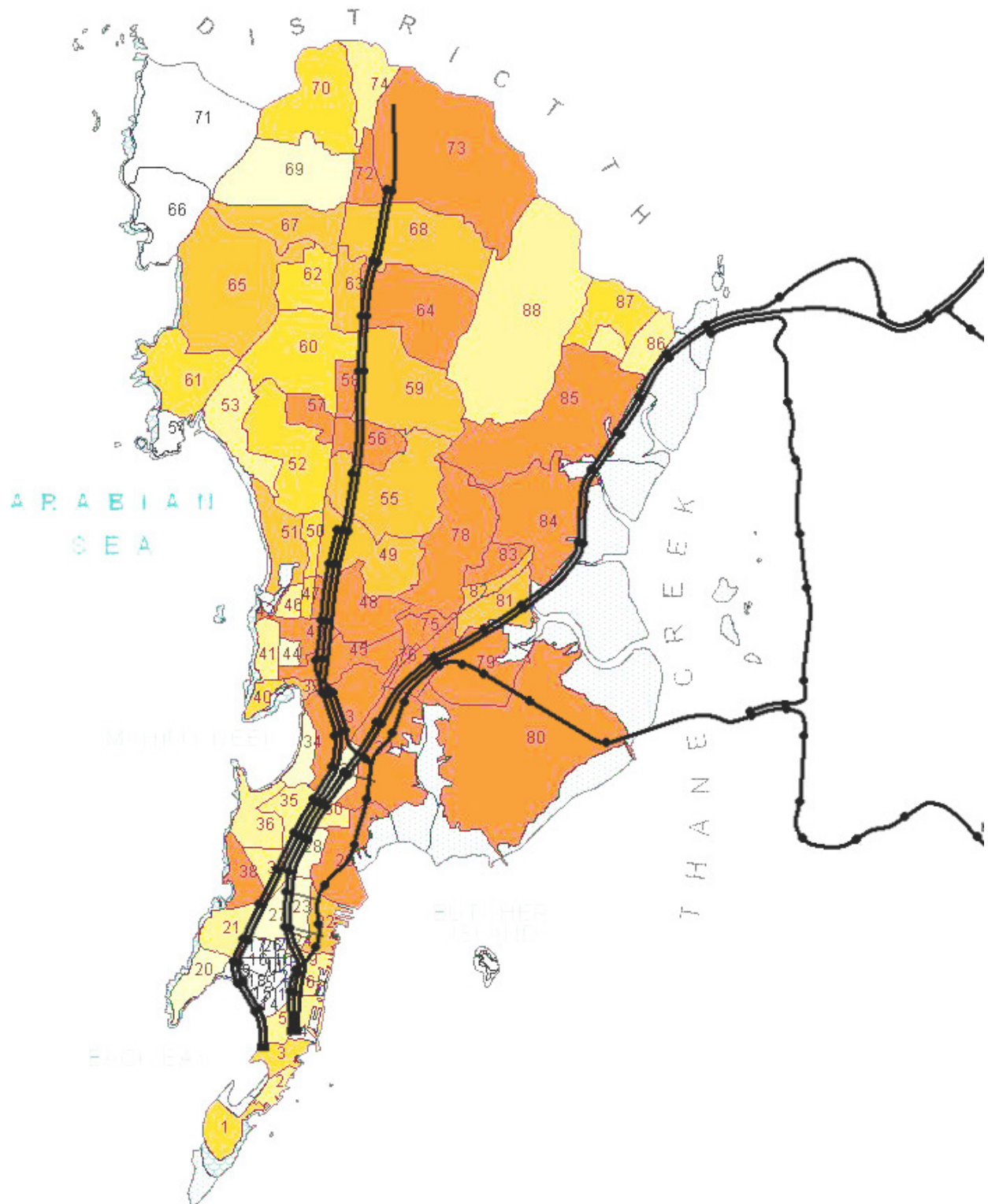


Fig. 1.14. Map of Mumbai showing concentration of informal settlements by ward

The ever increasing size of informal settlements is making the living conditions inside the homes of the slum dwellers unhealthy with insufficient natural light and fresh air to breathe. Since these are informal settlements, there isn't effective drainage and water supply provided, making the in-between spaces a breeding ground for mosquitoes which cause malaria, dengue and other air-borne and water-borne diseases.

CONDITION OF CHILDREN IN INFORMAL SETTLEMENTS

Children from informal settlements go to nearby Municipal run schools where the conditions aren't very different from their homes. The classes are crowded with poor teacher to student ratio. Children do not get the care that they need and are often neglected. These informal settlements are dense and tightly packed together with narrow access to homes. The homes receive little to almost no sunlight or fresh air. Lack of sunlight leads to vitamin deficiencies and unhealthy environment causes children to fall ill frequently which eventually leads to missed school days.

Large density and narrow pathways do not give children sufficient open space to play, restricting healthy growth. There are several not-for-profit organizations that are working closely with these children to provide them with food, education, medical facilities and improving the living conditions of slum dwellers. One such organization is the Ram Krishna Sarada Samiti.



Fig. 1.15. Aerial View of an informal settlement in Mumbai (Source: ILTWMT, 2013)



Fig. 1.16. View of an Informal settlement



Fig. 1.17. In-between walkways of informal settlements



Fig. 1.18. Children in informal settlements



Fig. 1.19. Inside a unit in an informal settlement



Fig. 1.20. Wider walkways in informal settlements



Fig. 1.21. Children in informal settlements



Fig. 1.22. Children in informal settlements



Fig. 1.23. Children playing in an informal settlement

1.3 RAMKRISHNA SARADA SAMITI

A group of young women, some of them doctors, with the support of Ramkrishna Mission, started a free medical service for the poor in Kherwadi, Mumbai, from 1968 to 1975. In 1974, they obtained land on lease from MHADA and constructed the RKSS building in Pratiksha Nagar, Sion, Mumbai, which was inaugurated in 1976. The site for the facility was intentionally chosen close to the Pratiksha Nagar informal settlements since they aimed to serve families that were otherwise underrepresented and did not have access to equal opportunities and resources.

They started with providing medical treatment to the families. The facility has grown over the years and various services have been added to the list. Their three broad objectives are Health, Education and Vocational Training. Under each of these broad facilities, they have various more services provided.

1.3.1 EDUCATION

A. Early education

A team consisting of one full-time teacher, one part-time teacher and one helper runs the early education program in two shifts, two hours each, five days a week. The first shift, consisting of 30 children between the ages of 3-4 years begins at 9:00am and the second shift which consists of 60 children, begins at 11:30am. It is further divided into two batches - one batch for children between the ages of 4-5 years and another batch for children between the ages of 5-6 years. A typical day in the early education facility begins with prayer assembly, followed by common



Fig. 1.24. Ramkrishna Sarada Samiti (RKSS) building

group activities, then focused group teaching and ends with play. This facility is provided to the children at a minimal annual fee of less than \$10 per child.

B. Free-tutoring after-school hours

The center provides free educational and instructional support through trained teachers for children between the ages of 6 to 15 years who attend 'public' schools run by the municipality. These children are grouped in smaller batches of 20 children per shift. It has been noticed that children through personal training and instructional support grasp and understand their classroom work better. Public schools don't have the wherewithal to provide personalized instructional support. Along with other subjects, the children are trained to fluently converse in English. Also, a library and reading room facility have been initiated which includes books, picture books, and comics, in English, Hindi and Marathi.

C. Workshops

Children coming in for tutoring can also register for various different workshops like dance, pottery, computer training and yoga. Volunteers come in to train the children at no cost to them.

These facilities are provided to encourage children to go 'back to school' with pride. These children also participate in street plays and help carry out awareness drives in the community about important issues like hygiene, infectious diseases, water conservation, balanced diet, etc.



Fig. 1.25. Early educational facility at RKSS



Fig. 1.26. After-school tutoring at RKSS



Fig. 1.27. Pottery workshop at RKSS
Source: www.facebook.com/RkssTrust

1.3.2 VOCATIONAL TRAINING

RKSS trains its teachers and clinic staff in computers. Through them, they train all the eligible girls, boys and women in the community, which helps reduce the digital divide. In Feb 2010, they started a certificate course in computers for young boys and girls to help them procure jobs as office clerks, computer operators, account clerks, POS staff, etc. Volunteers come in to train women of nearby settlements in various different skills like tailoring, making fabric bags, terracotta jewelry, beautician training, etc. at a minimal fee. At the end of each training program, the women receive a certificate which helps them seek a job. These women, otherwise housewives, are now enabled to contribute to the family income through these vocational training programs. This helps them share the financial responsibility of the family which is typically borne by a single earning member. This in turn makes their position in the house less vulnerable. They are better respected by their families and the community. The center also helps them seek work and organizes exhibitions where the women can sell their products and procure more work.

1.3.3 HEALTH

A. Free Medical Check-up

Started by a group of lady doctors who would come in a few times a week for a couple of hours each day, the medical service has now grown considerably with volunteer doctors coming in during the first half of the day, all days of the week. Families from nearby neighborhoods can register with the health centre at a minimal cost of ₹25 for free medical advice from qualified and experienced doctors. Every year 5,000 new



Fig. 1.28. Vocational training class at RKSS



Fig. 1.29. Annual exhibition hosted by RKSS
Source: www.facebook.com/RkssTrust

patients and old patients are registered. Free medicines are also provided to patients based on the prescription of the doctors. The facility has tied up with hospitals to send their trainee nurses to the center for an internship program.

This helps in mitigating the suffering of the poor especially of the neglected sections in the squatter community – women and old patients. The Samiti wishes to provide medical grants, on a case by case basis, to those who can't afford it and the needy community members who may be chronic patients afflicted with asthma, orthopedic or cardiac problems, AIDS, cancer, and terminal illnesses. However, current budgets don't provide for medical aid.

B. Nurse Aid Training Program

Women and young girls are provided basic nurse aid training and receive a certificate at the end of their program. These women in turn provide their service to the health facility.

C. Counseling and Awareness Drive

The doctors and nurses run an awareness drive about prevalent diseases like malaria, dengue, tuberculosis, etc. They are educated about the precautionary measures, causes, symptoms and cure of these diseases. Women are counseled on simple hygiene and family planning.



Fig. 1.30. Medical check-up facility at RKSS (Source: Ramkrishna Sarada Samiti, 2014)



Fig. 1.31. Nurse aid training program at RKSS (Source: Ramkrishna Sarada Samiti, 2016)

1.4 NEED FOR EXPANSION

All these facilities take place under one roof - in the multi-purpose room in shifts through the day.

The number of students enrolled at the Center is increasing by the year, primarily through word of mouth. Currently there are 150 children enrolled in the early education and free tutoring program with about 100 more children on the waiting list. More volunteers are coming in and hosting varied workshops for the children and women of the center.

With the increasing interest and enrollment numbers, the center is looking to expand in the near future. There has been funding coming in from individual donors and some corporate firms. However, it isn't sufficient to expand all at once.

PRIMARY PROVISIONS FOR EXPANSION

1| MORE SPACE

Additional space divided into more number of flexible classrooms is required to accommodate the increasing demand and improve square footage requirement per child.

2| BETTER QUALITY CLASSROOM SPACES

Classroom design should encourage students to explore their creativity and imagination. The space should feel comfortable and home-like to help children feel safe when away from home. Thermal and visual comfort are extremely important to improve performance and reduce off-task behavior.



Fig. 1.32. Inside the multi-purpose room at RKSS



Fig. 1.33. Inside the multi-purpose room at RKSS

3| OUTDOOR PLAY SPACES

Coming from difficult home environments, these children and women require spaces that are a pleasant change from their home. The facility should lend itself as a place where they can relax and interact with nature.

4| NEED TO GROW THEIR OWN FOOD

The center provides milk and bananas as nutritional supplements for the under nourished children who need dietary assistance for healthy growth of the body. However, this is dependent on donations. Providing the resources on site to grow their own food could address this issue without relying on inconsistent external funds.

5| NEED TO CONSERVE WATER

Mumbai receives heavy rains (about 95 inches) during its monsoon months from June to September with the rest of the year dry. This leads to frequent floods in the monsoon and droughts in summer. A local solution to this problem would be to store rain water during monsoons and use it in summer when there is water shortage.

6| REDUCE ENERGY CONSUMPTION

One way of reducing the maintenance cost of running the center would be to make it energy efficient. Passive lighting and ventilation help in reducing the overall energy consumption while also eliminating the cost of running air conditioners, coolers and electric lights.



Fig. 1.34. Children planting a tree at RKSS (Source: Ramkrishna Sarada Samiti, 2016)



Fig. 1.35. Monsoons in Mumbai (Source: STR/AFP)





2.0 RESEARCH

“Tell me and I forget. Show me and I remember. Involve me and I understand.”

– Chinese proverb

2.1 UNDERLYING ISSUE

1990 to 2010, school going population in India grew by 60% from 190,000,000 to 300,000,000. Huge investments were made to improve access to education, encouraging families to enroll their children in schools and making provision for this increased school-going population. Investment in education grew 15 times with eight lakh new schools and 50 lakh new teachers. India's gross enrollment ratio (GER) in elementary school rose from 79 percent in 1990 to 93 percent in 2010. There are still a few pockets of students who don't go to school but most receive at least primary school education.

The dropout rate is still high since the government investment was directed towards the quantity and not quality. The dropout rate is higher at secondary school level.

The government invests less than 2% of its budget on quality-focused processes and interventions.

There are some privately owned schools with high quality of education. However, these are expensive and not affordable for the mass population. School consolidation is one way of improving quality of schools with more investment per school.

By 2030, it is estimated that India will have the highest population in the world, become the third largest economy and have the youngest population in the world with a median age of 32.

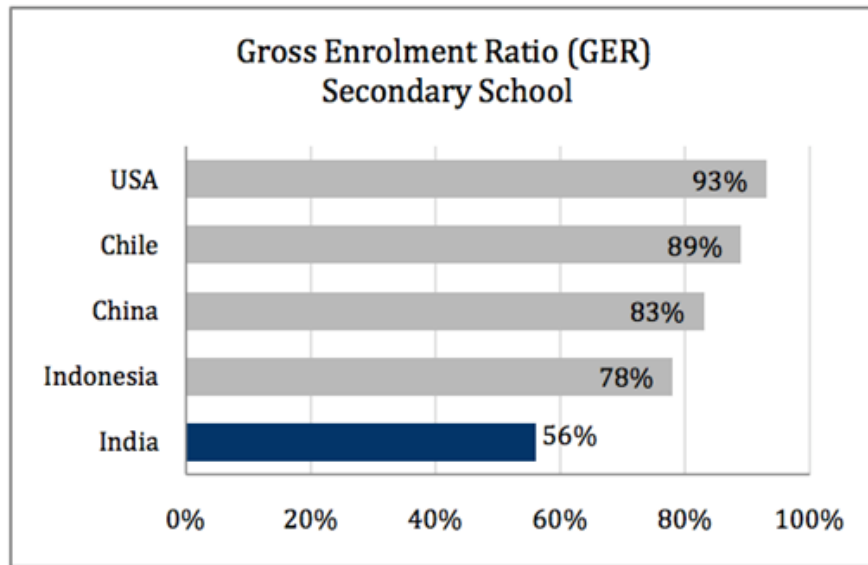


Fig. 2.1. Gross Enrolment Ratio (GER) of Secondary School

Source: CSF Analysis based on SEMIS 2010-2011, Census 2011, School Enrollment, Secondary(% gross) World Bank 2010

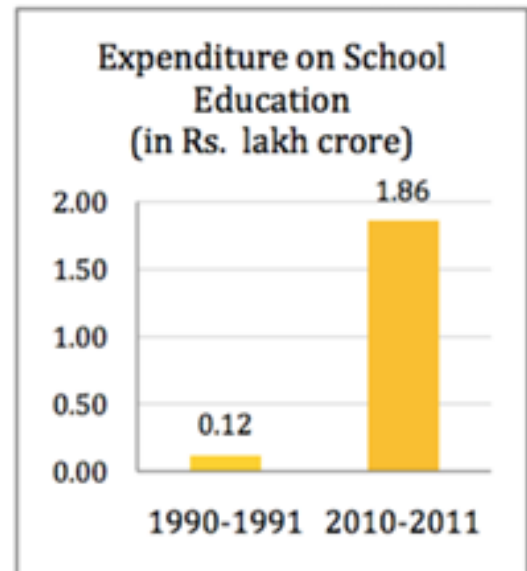
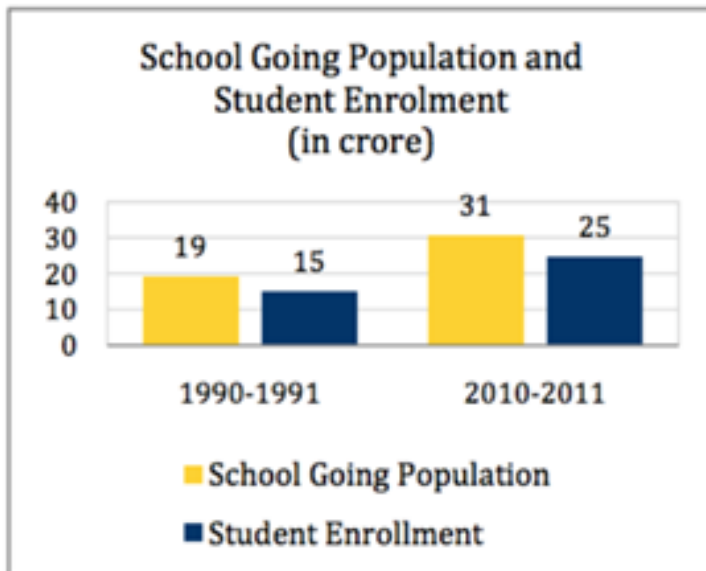


Fig. 2.2. MHRD Educational Statistics at a Glance, 2013 and DISE and SEMIS 2010-2011

To bring down the drop-out rate and increase the literacy rate, the Federation of Indian Chambers of Commerce and Industry (FICCI) Higher Education Committee has endeavored to create the 'Vision 2030' for higher education in India. Their aim is to make India an acknowledged leader in providing large-scale affordable access to high-quality university education and become a role model for tens of other developing economies. The government is setting aside funds for improving the quality and curriculum of higher education.

Taking off from the government's scheme to improve the quality of higher education in India, this thesis explores how the quality of preschool education can be improved. How can India become an acknowledged leader in providing affordable access to high quality early education facilities? Currently there is a lack of affordable preschool facilities and children do not receive the appropriate care or training when their minds are capable of learning the most. This makes the need for early education crucial. It is important to carefully plan and ensure a well-functioning and prosperous early education system. Some of the areas that need to be taken into consideration are:

1| **FACULTY** - In India, the Reggio Emilia teaching philosophy is relatively new with only a few schools following its teaching methods. Therefore, a strong curriculum for the training of teachers needs to be established.

2. **OPEN PLAY AREAS** - Children coming from informal settlements often do not have large open spaces to play and typically play in the

narrow dark alleys of their settlements. Early educational facilities need to provide large open play spaces not only for the children enrolled at the facility but also for the community involved.

3. NUTRITION- Often, children living in informal settlements come from households where the family income is meager and the children are sometimes malnourished. Educational facilities should provide nourishment to the children enrolled. Providing resources to grow their own food may be one way of solving this problem.

4. REGENERATIVE ARCHITECTURE- Using lessons from the Living Building Challenge and Architecture 2030, it is not sufficient to build a project that is merely less bad but moves beyond to become truly regenerative. The project should cater to the region's climate and natural conditions. It should strive to improve the quality of life of its users and the nearby community. It should aim to be as self-sustaining as possible in terms of lighting, water, food and energy. It should aim to achieve a net-zero impact on the environment.

5. ENVIRONMENTAL QUALITY- An environment that provides acoustic, visual and thermal comfort. Since some of the children come from difficult home lives, the facility should provide a safe refuge where they feel secure and at home - an environment that enhances play, adventure and investigation. A place where adults and children feel the connection with their environment and learn to respect and promote a greener world.

6. MODULAR DESIGN (TO BE BUILT IN PHASES)- The proposed educational facility should be able to expand as per demand. For non-profit organizations, funding usually becomes available in parts and therefore, the project should be planned in phases. As such, it would be more effective to design a modular structure that can grow incrementally with time.

7. FLEXIBLE SPACES- In order to maximize the available enclosed space on the restricted site area, the classrooms should be designed to be flexible to accommodate different group sizes, ages and functions. Different groups should be able to use the facility at different times in the day.

8. REPLICABLE - The modules should be designed such that centers around the country that are looking for a base example, can use it to adapt to the different climates and topographies.

10. REGULATIONS AND GUIDELINES- Currently, India does not have set guidelines and regulations for childcare centers. Individuals run these facilities from the basement of their homes. Often the spaces tend to be unhealthy, overly dense and with insufficient staff. Basic regulations and guidelines need to be set for the design of future childcare facilities.

INADEQUATE INFRASTRUCTURE, LACK OF STAFF AFFECT CRÈCHES EVEN AS DEMAND SURGES

With more women opting to return to their jobs after childbirth, the demand for child day care centres (crèches) has increased. There is good patronage for the crèches, whether government-sponsored or run by individuals. But is there a regulatory mechanism to monitor them and how prepared are they to tackle emergencies?

K. Shanmugavelayutham, Convener of Tamil Nadu Forum for Crèche and Childcare Services (TN-FORCES), says approximately 1,700 anganwadis and 300 voluntary organisations, including the Indian Council for Child Welfare, Women Voluntary Service, Women Indian Association and Guild of Service, are running day care centres with government support. Under the Rajiv Gandhi National Crèche programme, the State Social Welfare Board has tied up with non-governmental organisations to run the crèches. At a centre on Greenways Road, 75 children are currently on rolls, with three teachers and three attendants to take care of them. "We run it like a school. We ask for the immunisation card and take a deposit," said one of the teachers.

Some anganwadis in South Chennai have ventilated rooms but more children are also enrolled. In one instance, merging two crèches has resulted in 50 children in a space meant for 25. "Due to the lack of space, some of the children have had to eat inside the kitchen, which is unsafe as we have gas stoves," said an anganwadi helper. Since schools reopened, some older children have moved on, which has eased the pressure a bit. The anganwadi workers, including teachers are also overworked, underlining the need for more helpers. A teacher from a centre in Ambattur says, "I have not had a helper in almost a year and I have paid out of my own pocket to hire one." Aruna Krishnan, Manager-Development Support, CRY said, "The conditions in North Chennai are much worse. They have serious infrastructure problems and children will end up contracting diseases if they go into those centres."

Crèches are available in Central and State government offices and women police stations but the role of a majority of these centres is mere custodial care of the children in their centres. Most of those employed in these centres have picked up the skills of caring for children from home. The private crèches run with the sponsorship of government organisations face another dilemma. A notice at the crèche in Madras High Court appeals to patrons to pay up arrears, even as the Women Lawyers' Association is seeking sponsors to air-condition the bedroom for the children. The centre in the Institute of Social Paediatrics, Government Stanley Hospital, offers a different service. Mothers who are visiting the hospital with more than one child can leave the healthy child in the custody of a teacher while taking the sick child to the doctor. On an average, 50 toddlers are kept occupied at the facility on any working day for around half-an-hour at least. Deepa, who works in a State government department in Ezhilagam, leaves her six-month-old son in the centre behind her office. "My mother died two months ago. My mother-in-law offered to take care of my son but she lives in Madurai and I don't want to be so far away from him. This is the only option," says Deepa. She packs a hamper, including diapers, wipes, clothes and food, and leaves her child in the care of two helpers at the centre. She visits him during her lunch break. Crèche attendant H. Kodhai says it was established 30 years ago and receives around 20 children at any given time. Her salary depends on the number of children she tends to. The well-ventilated building is under the Public Works Department's purview but the cracks on the wall have not been repaired, though minor repairs are taken care of, the women say.

Working parents who opt for private players look for features and amenities tailored to their needs. "In a private day care centre I know I can demand service," says Twinkle Xavier, mother of a three-and-half-year old. "We did not want an air conditioned environment in the play school and wanted it to be close to my home. We looked for a ratio of one teacher to five kids and a good learning environment," she adds.

Although there are a large number of centres, there is also a need for more. For instance, of the three industrial estates in the city, only Ambattur has a crèche. As the need increases, childcare activists are representing to the government to set up a regulatory body to check the mushrooming number of crèches and ensure physical and emotional health of the children.

(With inputs from Liffy Thomas, Sowmiya Ashok and R. Sujatha)

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THE TIMES OF INDIA

Govt directive puts preschool, daycare centres in tough spot

TNN | Oct 4, 2013, 06.40 AM IST

KOZHIKODE: With the government of India recently clearing the Early Childhood Care and Education (ECCE) policy, not many creches, daycare centres and government-run anganwadis in the district will be in a position to continue operations. Conditions including staff-kid ratio, space-child ratio and other regulations, which are part of ECCE were cleared by the Union cabinet on September 20.

As per the policy, a maximum of 30 children may be accommodated in a classroom measuring 35 sq m. Besides, outdoor space of 30 sq m and separate section for cooking nutritional meals should be provided at all private and government-run preschools.

As of now there are no regulations to monitor the standards of preschool centres in the district. This includes 50 private-run day care centres, over 2,900 anganwadis and more than 150 kindergartens operating out of limited spaces and sans qualified caregivers. Most centres, heavily depended upon by employed parents, do not follow any standard ratio between the number of children admitted and staffers on duty.

"As yet, we have received no information on the new government policy. If such a policy comes into existence, it would be impossible to continue running this centre," said Rajima Sreejith, a city-based woman who runs a daycare at home. I started this centre three years ago and it would not be financially viable for me to shift the centre to another building with more space, she added. At present, she accommodates 11 tots aged between 8 months and three years.

Most home-based daycare centres face a similar situation, as they accommodate kids at their own home. Many charge Rs 1,000 - 2,000 for the service.

The condition of many unrecognized kindergartens is also not different. As of now, many individuals have started kindergartens at their own houses and in rented buildings without necessary facilities, said an official with the district social justice office.

The situation will be worse with government-run anganwadis as many operate out of single rooms without proper protection from the rain and the sun. Other mandates of the policy-including first aid services, safe drinking water, child-friendly toilets, caregiver-student ratio of 1:20 for children between 3-6 years and 1:10 for those younger than three-are also not followed in a majority of anganwadis or daycare centres.

"Funds allotted to anganwadis is less and buildings for running these centres are allotted by local bodies. Most of the time, anganwadis operate from dilapidated rooms," said a Child Development Project officer (CDPO), who is in charge of monitoring anganwadis.

However, the CDPO, who did not wish to be identified, exuded confidence that the move to convert AWCs to Vibrant Early Child Development Centres would bring some much needed change.

Meanwhile, parents are happy about the new regulations. Rajesh Mathew, whose wife had to quit her job to look after their child in the absence of a hygienic daycare feels the government should have introduced this policy earlier. "This is important for the upbringing of a healthy generation, especially when most mothers today chose to work", he added.

NEED FOR CODES AND STANDARDS

While there are standards set for early educational facilities in India, they are not strictly followed. Early educational facilities are operated out of basements or garages with high student density and limited access to daylight and fresh air. These children have no access to nature during the crucial years of their growth and learning. Often the teachers are overworked and frustrated. Children are ignored and especially children with special needs are not given the care they need. Different children progress at a different pace with some who excel at the standardized education system while others are left behind feeling lost.

Early educational systems need standardization of teacher to student ratio, square footage area per student, number of students per classroom, access to daylight, fresh air and a requirement for outdoor play area.



Fig. 2.3. Flexible play space (Source: Community Playthings, 2015)

2.2 IMPACT OF PHYSICAL ENVIRONMENT ON LEARNING

Previous research has proven that the physical environment has an effect on student's ability to perform better. The physical environment can be describes as a 'silent curriculum' and understanding the physical environment is important for enhanced education of children. (Taylor & Vlastos, 2009) By physical environment, one means factors such as lighting, color, acoustics, temperature, seating arrangements, space and crowding, and living kinds such as plants and animals.

The different elements of the physical environment of a classroom can have different performance effects on a child. Sufficient space for classroom supplies, furniture arrangement, and designed spaces for large and small group activities can provide an optimal learning environment.

1. VISUAL ENVIRONMENT

Lighting, color and personal displays elements have a psychological effect on children.

- a. Research shows that appropriate lighting improves academic results, reduces off-task behavior and plays a significant role in children's achievements.
- b. Color has an influence on moods, judgment, and behavior, thus validating the importance of assessing color in the classroom. (Sleeman & Rockwell,1981)
- c. Personal displays help in increasing student self-esteem. (Maxwell & Chmielewski, 2008)



Fig. 2.4. Connection with the natural world (Source: Community Playthings, 2015)

2. ACOUSTIC ENVIRONMENT

A study where internal noise was superimposed with external noise, it was found that the performance on classroom tasks drastically declined. (Dockrell & Shield, 2004)

3. THERMAL ENVIRONMENT

The findings on thermal environment of classrooms shows that children have a different comfort temperature range than adults, stress induced by thermal discomfort affect learning and growth of children, and indoor temperature significantly affect children's problem solving ability.

4. LIVING ENVIRONMENT

Plants and animals have proven to have a positive impact on children's learning abilities. While plants help to increase comfort and friendliness within a classroom, it also reduces mental fatigue and stress among children. Animals improve classroom harmony and communication, while reducing aggression and hyperactivity.

Studies on student satisfaction with their classroom environment showed that students were consistently less satisfied as they moved to a higher grade level. Additionally, students' have lower academic achievements when they perceive their environment as more difficult. (La Roque, 2008)



Fig. 2.5. Furniture arrangement for common classroom activities (Source: Community Playthings)



Fig. 2.6. Flexible furniture arrangement (Source: Community Playthings)



Fig. 2.7. Group activities (Source: Community Playthings)

FURNITURE ARRANGEMENT

Different learning strategies require different furniture or spatial arrangement. Today, schools like to focus more on experiential learning involving group work and hands-on work which requires a flexible arrangement in comparison to the old row arrangement. Children like order and they participate in arranging the space to a set order. In order to foster engagement with learning materials and enhance children's concept of order, the space and objects in the classroom need to be organized.

The philosophy of Regio Emilia says that the environment needs to constantly change and adapt like a living organism to inform and engage the students.

The traditional approach to classroom seating was to arrange individual desks in rows. Recently, however, many teachers are placing the chairs in clusters, circles, u-shaped patterns, or a combination of the three (Bonus & Riordan, 1998). Today, researchers are investigating the effects of tables in the classroom instead of personal desks (Taylor, 2009). Tables allow the classroom to empower the student to own what they are learning. The "power" shifts from the teacher in front of the classroom, to placing more responsibility on the student and the table group. If a teacher desired the students to be in discussion they should be in clusters, whereas if the teacher desired individual on-task work the students should be in rows. Overall the teacher needs to become flexible with how the seats in the classroom are arranged.



Fig. 2.8 Lighting design for early educational facilities (Source: Concordia)

SPATIAL DENSITY

High-density classroom conditions lead to increased aggression, hostility, movement, and distraction. Decreased social interactions were also found to be a result of a high-density environment. It was also shown that persistent exposure to a high-density environment resulted in lower academic achievement. (Moore & Lackney, 1994) The positive effects of low-density classrooms have equally profound effects on student's behavior and achievement. Children in a low-density environment showed greater participation, positive student and teacher attitudes, an increased sense of friendship, and higher achievement levels (Spencer & Blades, 2006).

LIGHTING

Classroom lighting is composed of imperceptible light, illumination at a student's desk, illumination and glare from projection screens, and pattern glare from windows. The amount and quality of light required is directly proportional to the type of task being performed. Light levels between 100lux to 2000 lux falls in the comfort range. Light levels below 100 lux means a space is too dark and above 2000 lux indicates a glare concern. This basic concept informed teachers that their students need different lighting environments for different educational tasks, and allowed teachers to prepare the lighting environment according to the task. Concentrated, bright light against dark backdrops caused continuous adjustment of eye muscles, which leads to eye fatigue.- Another important fact is that student work areas should never be directly illuminated due to the reflected glare that is produced. This glare negatively affected speed and quality of children's performance and



Fig. 2.9. Use of color in educational facilities (Source: Mahlum Architects Inc.)

resulted in fatigue and poor retention. (Sleeman & Rockwell, 1981).

COLOR

In addition to lighting, a classroom's use of color also must be considered in order to create the optimal learning environment. Research has shown that warm colors such as red, orange, and yellow promote action-oriented activities. On the other hand, cool colors such as green and blue were found to help facilitate quiet, peaceful learning activities (Sleeman & Rockwell, 1981). The use of nature's colors, such as green and brown tones, created a comfortable and relaxed classroom environment.



Fig. 2.10. Classroom opening into the open green play space



Fig. 2.11. Inside a typical classroom at the Panyaden School

2.3 CASE STUDIES

1. PANYADEN SCHOOL

Location: Chiang Mai, Thailand

Architect: Chiangmai Life Construction (CLC)

Area: 53,800 sqft

Number of children: 375

Year built:2010

The CLC architects' vision for the school was to provide a peaceful atmosphere which is close to nature, to culminate a sense of responsibility towards the environment and to have a low carbon footprint. Therefore earth/clay, stones and bamboo were chosen as the primary material for construction with walls built from rammed earth or adobe bricks and roofs built from layers of treated bamboo. (www.bamboo-earth-architecture-construction.com/portfolio-item/panyaden-school)

The school does not require mechanical systems due to its passive ventilation and solar design. Earth is a natural insulator against heat, cold and noise. Bamboo roofs too have an insulation property and have vents in them to facilitate air circulation. Skylights, window configuration and small glass openings in the wall help brighten up the space with daylight alone, eliminating the need for electric lights on clear days.

The school is designed keeping children's needs in mind. Small glass openings embedded in the walls creates the effect of a cluster of stars - a play of brilliants. Brightly colored curtains adds an element of visual interest. Dens are created in the rammed earth partition walls between classrooms which are a favorite amongst the children as a space to break



Fig. 2.12. Undulating walls and sheltered walkway



Fig. 2.13. Inside a typical toilet block



Fig. 2.14. Daylighting of dark interior spaces

away. Rammed earth floor can be used as a medium to encourage children to express their thoughts and creativity without causing any permanent damage to the architecture. Although the roof at its center is relatively high, the overall scale of a classroom is brought down through well designed window pattern and low roof eaves. Each classroom has its own toilets which can be accessed from within the classrooms and designed so that the teacher can make sure the child is alright. The property of materials makes it possible to create curved surfaces. The architects wanted to use this material property while designing for children by creating meandering pathways which add to a fun spatial experience. All classrooms are arranged around green play spaces. The classroom edge facing these play spaces are designed to create a smooth transition between the inside and outside, both, visually and physically.



Fig. 2.15. Waiting area (left) and classroom blocks (right)



Fig. 2.16. Roof plate over classrooms which enclose a courtyard within



Fig. 2.17. Window configuration of classrooms

2. FARMING KINDERGARTEN

Location: Bien Hoa, Vietnam

Architect: Vo Trong Nghia Architects

Area: 40,900 sqft

Number of children: 500

Year built: 2013

The Farming Kindergarten caters to the factory workers of Pou Chen shoe manufacturing company enabling the women to continue their job at the factory without worrying about their children. The kindergarten is exclusively open to the children of these factory workers, making a great social impact. (www.archdaily.com/566580/farming-kindergarten-vo-trong-nghia-architects)

With the fast rate of urbanization in Vietnam, children are deprived of open green spaces and connection with nature. The design was developed as a triple-ring shape drawn with a single stroke, which encircles three courtyards secured with peripheral classroom blocks. The roof is one continuous sloping plate providing a space to grow food which become a part of experiential learning and can also be used as an open-to-sky play space. The roof plate starts at ground level providing access from the courtyards and spirals upwards creating a pathway to the upper level classrooms and roof farms. All occupied interior spaces are placed below this roof. Narrow floor plates and operable windows on two sides facilitate cross ventilation and natural lighting. Glare control is managed through fins around the outer layer of the loops. This also helps conceal compressors and ducts while allowing indirect light to enter the interior



Fig. 2.18. Visual Connection between spaces



Fig. 2.19. Inside the gymnasium



Fig. 2.20. Roof farms



Fig. 2.21. Outer vertical fins

spaces. Additionally, energy efficient design solutions like green roof as insulation, green facade as shading and solar water heating have been used. Children are taught the value of sustainable living by exposing and enhancing these elements of high performance. Grey water from the nearby factory is used for irrigating the farms and used in toilet flushes. Different spaces and levels are physically and visually well connected through design interventions.



Fig. 2.22. Looking at roof farms, classrooms and courtyard



Fig. 2.23. The Green School



Fig. 2.24. Inside the kindergarten classroom



Fig. 2.25. Children drawing on the floor

3. GREEN SCHOOL

Location: Bali, Indonesia

Architect: Ibuku

Number of children: 400

Year built: 2008

John and Cynthia Hardy had a vision to build a school where the students could have a learning environment in which they could be closely connected with nature, learn through experiencing hand-on, be inspired to be creative, innovative and become green leaders. That's how the idea of the Green School was conceived. They wanted the school to be built with the most environmentally friendly material and bamboo was the obvious choice. The entire school is built in bamboo including the structural system, the infill and the furniture. The design-build team that was formed during the process of construction of the Green School is what ultimately led to the formation of Ibuku. Many of the design principles and construction techniques used today were developed during the construction of the school. (buku.com/keyprojects/green-school)

The architects developed a student-centric school design. Classrooms have no walls in order to connect children with their natural surroundings at all times. Children learn from their surroundings. 'If a gecko comes into the classroom then that becomes the topic of the day' - as explained by a teacher at the school. Children learn to grow their own food, tend to the domestic animals on site and understand the importance of living a sustainable life, all as a part of the school curriculum. Outdoor play spaces



Fig. 2.26. Furniture arrangement inside a kindergarten classroom



Fig. 2.27. Outdoor play space



Fig. 2.28. Roof form and skylight of one classroom block

provide a medium for children to explore their imagination.

The classroom roof has a steep slope. It is high at the center with a skylight to naturally light up the interior space with the eaves at human height to protect against heavy rains and direct sunlight. Children feel the intimacy of the space through scaled down furniture size and low fences at the periphery of the classrooms. Flexible furniture can be moved around for different activities. The classroom is divided into different regions, each with a unique function like reading, taking a break or resting, eating, etc. Bamboo has a good insulation property and the floor is made of rammed earth which maintains a comfortable temperature indoors whether it is too hot or too cold outside. Acoustic isolation is achieved by having classrooms as stand-alone pods.



Fig. 2.29. Heritage School (Source:Madhav Joshi and Associates, 2012)



Fig. 2.30. Inside a typical laboratory block

4. HERITAGE SCHOOL

Location: Pune, India

Architect: Madhav Joshi

Area: 66,740 sq.ft

Number of children: 240

The school has two parts; residential cluster and academic cluster. The residential cluster comprises of 10 dormitories, 5 studio apartments for warden, residence for the principal and student's center. The academic cluster consists of 14 classrooms, 3 laboratories, 2 teacher's rooms and 2 toilet blocks. Catering Center with dining hall & adequate service areas have been provided. The un-built space defines the fabric of the built. System of parallel bays grows in one direction suitably to contain different functions and curved roof forms give the necessary volume. This project is Green building by design where 'solar passive architecture' has been celebrated with aesthetic sense. Positioning of buildings respecting the terrain, parceling the building into small foot prints, creating mutual shading building surfaces, thick building envelope, natural ventilation using 'stack effect', maximizing daylight using skylights, thermally insulated roofs with terracotta tiles has been incorporated right from the design inception stage. Landscaping has been an integral part of space making. The sun, shade, shadow, rain, breeze, trees, fruits, flowers, fragrances, birds and now pets set forth a pleasant interactive ambience for 'a complete learning' experience of the student. (Madhav Joshi, 2012)



Fig. 2.31. Stairs winding around vaulted boarding school blocks



Fig. 2.32. Inside a typical classroom



Fig. 2.33. Inside the student center

The school is built using local stone. The modular nature of the blocks allows for the same module to be used for different functions. The transition from inside to outside is successful with windows on both sides of the room providing a visual connect at all times. Also green spaces weave into the circulation corridor with opening between blocks that provide physical access to the open green spaces. Circulation space weaves between different blocks and has punctures in the ceiling intermittently to allow daylight to brighten the space below. Rain water is collected through these vaulted roofs and channelized to a gutter which has spouts that drop water directly on to vegetation or permeable pebbled patches. The modular form makes it easier to be replicated. The sturdy form makes it easy to maintain.



Fig. 2.34. Aerial View of Heritage School (Source: Madhav Joshi and Associates)



Fig. 2.35. Exterior view of Casa Rana (Source: Made in Earth ONLUS, 2014)



Fig. 2.36. Bamboo envelope around house



Fig. 2.37. Living room during a cultural event (Source: Made in Earth ONLUS, 2014)

5. CASA RANA

Location: Tiruvannamalai, India

Architect: Made in Earth

Area: 1615 sqft

Number of children: 30

Number of staff: 2

Year built: 2013

Casa Rana is a Terre De Homme Core (TDH Core) project. Situated in the midst of nature, Casa Rana provides a loving home to abandoned or parentless young girls. They host about fifteen HIV-positive children who along with other children are engaged in vocational training and educational activities.

Casa Rana is made of five brightly colored boxes between two two monolithic concrete slabs, the raised plinth and the walkable roof. The colored boxes house all the functions like three dormitories, mummy's bedroom and office, shared bathrooms, living room and kitchen. The residual interior space between the boxes are used as gathering and distributive spaces. The living room does not consist of chairs or sofas, providing open space for the girls to play freely or perform during cultural events, without constraining their freedom. The home is a successful example of architecture that can be aesthetically pleasing while still being cost-effective. (www.madeinearth.it/casa-rana)

The interiors are thermally comfortable almost all year round. Brightly colored towers protrude through the roof, bringing in daylight through skylights and facilitate natural ventilation through stack effect. A bamboo

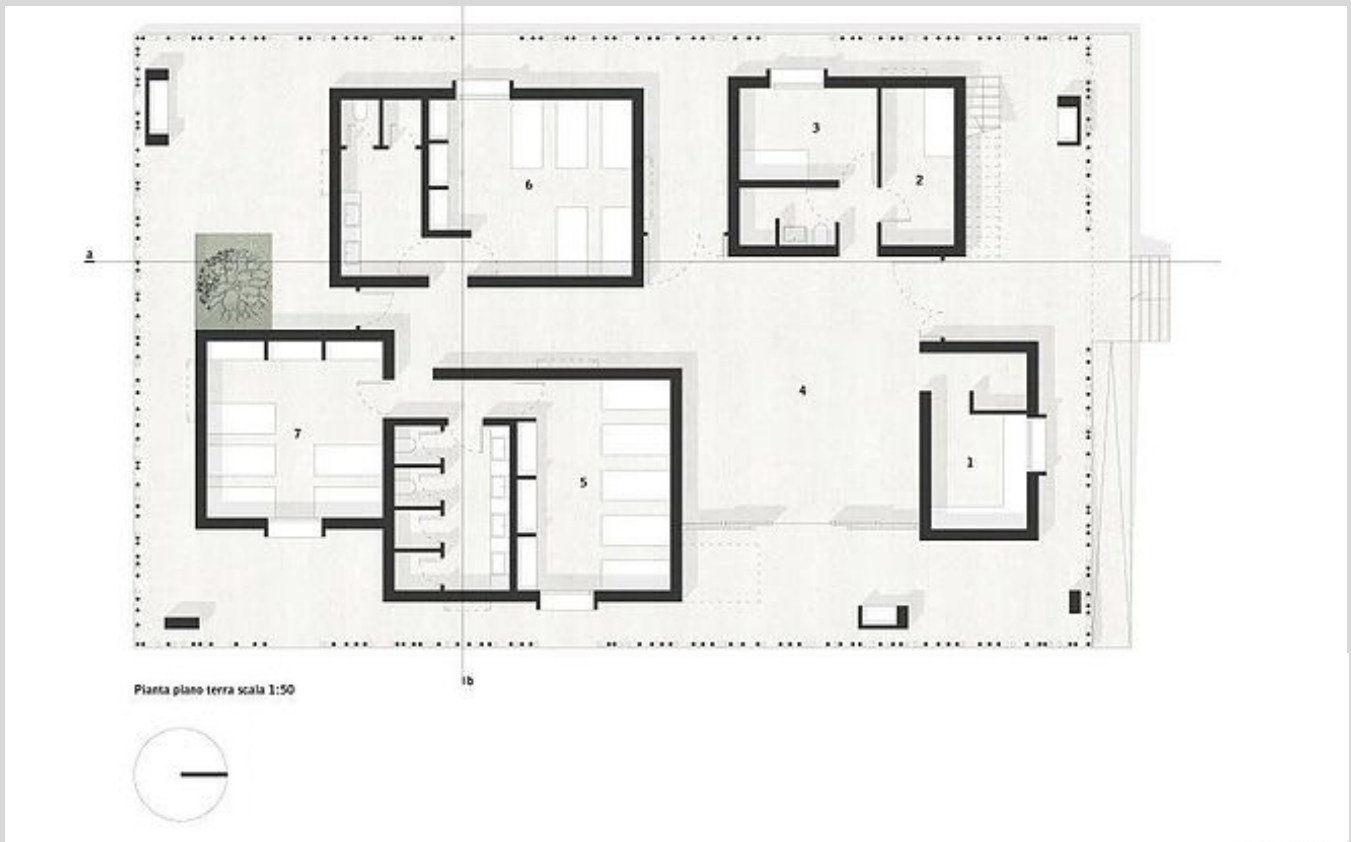


Fig. 2.38. Plan of Casa Rana (Source: Made in Earth ONLUS, 2014)



Fig. 2.39. Elevation and section through Casa Rana (Source: Made in Earth ONLUS, 2014)

curtain wall envelopes the house, providing a shaded transitional space between the inside and outside. The layout is designed to make children feel protected and free to play, while the house mother can also be aware of their activities. While the rooms can be differentiated from the outside by their color, the rooms are painted white on the inside to provide a calming sleeping environment. The bedrooms are rather closed off and have smaller window openings but provide security which is of utmost importance when designing a safe space for young girls. The social impact is large with children that are happy and healthy. The children take pride in their home and this culminates within them, a sense of responsibility towards their house.



Fig. 2.40. Inside a dorm room



Fig. 2.41. Vellore House



Fig. 2.42. Living room at Vellore House

6. VELLORE HOUSE

Location: Vellore, India

Architect: Made in Earth

Area: 3930 sqft

Number of children: 30

Number of staff: 3

Year built: 2015

Another TDH Core project, the Vellore House hosts about thirty abandoned and parentless young boys. The house is designed as one solid mass from the outside which is made up of five volumes, arranged such that they enclose two courtyards within. The dorm rooms, Mummy's room, kitchen, toilets, computer room and office are housed in the five volumes. The living room is at the center of the house under a wide flat roof with two open-to-sky courtyards on either sides. The house is designed to make the children feel protected and free to play, while the mummy can watch over them. (www.madeinearth.it/vellore-house)

The house is located a little away from the city center, in the midst of nature. Although the house seems inward focused, the design successfully provides connection with nature through large outdoor play spaces and the courtyards within the building walls, provide connection with nature at all times. Also the transition between inside and outside is done successfully leading one from a fully enclosed space to a semi enclosed space to a fully open space. Screened brick walls and courtyards facilitate effective natural cross ventilation through the interior spaces providing thermally comfortable indoor temperature. Also interior



Fig. 2.43. Inside a dorm room

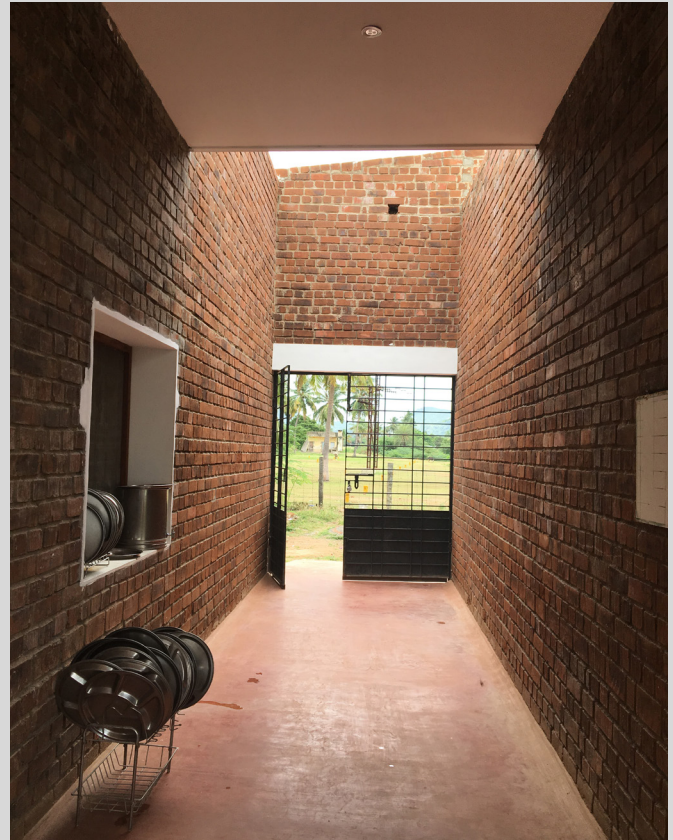


Fig. 2.44. Back entrance



Fig. 2.45. Looking at the central living room from courtyard

spaces do not require electric light during the day since the house is well lit with natural light coming through the courtyards. The construction is simple and makes use of locally available materials which makes the project cost-effective.

The children have a sense of pride and belonging towards their home. The social impact made is large.



Fig. 2.46. Section through Vellore House (Source: Made in Earth ONLUS, 2014)

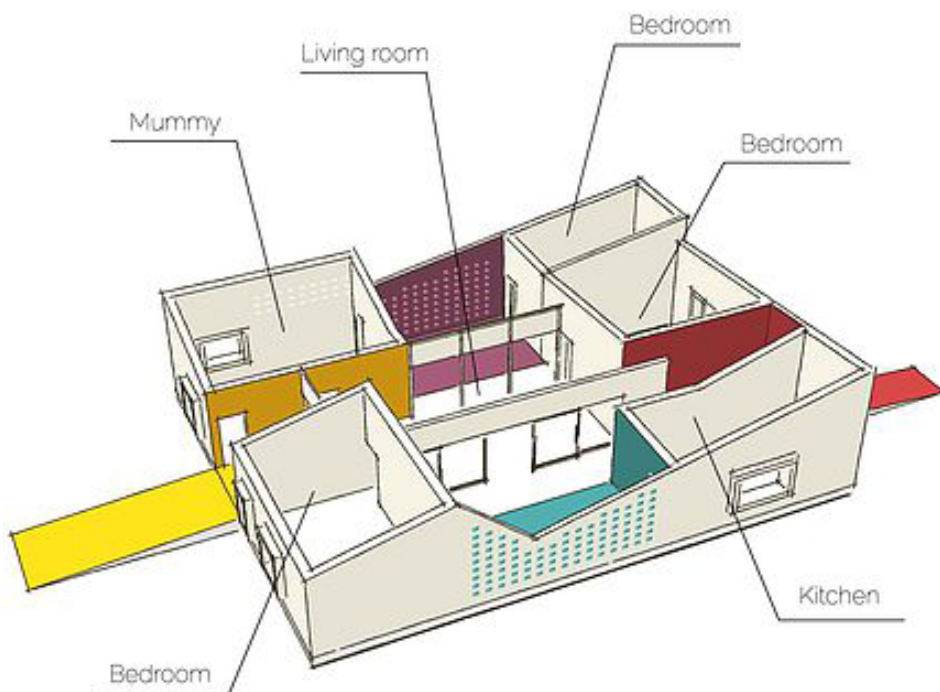


Fig. 2.47. Axonometric Plan View of Vellore House (Source: Made in Earth ONLUS, 2014)



Fig. 2.48. Denise Louie Education Center (Source: Environmental Works)



Fig. 2.49. Inside a typical classroom

7. DENISE LOUIE EDUCATION CENTER BEACON HILL

Location: Seattle, USA

Architect: Environmental Works

Area: 8,100 sqft

Number of children: 91

Year built: 2005

Denise Louie Education Center was built by adding about 1,200 sqft of new construction to an existing mixed-use building. The facility consists of four classrooms that provide multi-cultural care for children between the ages of 3-5 years. The second floor of the building houses the family counseling and support facility with offices and meeting rooms. A parking lot adjacent to the site has been converted into a large open play area for the children of the education center. (eworks.org/projects/denise-louie-education-center)

The facility has a humble architectural quality owing to its adaptive-reuse nature. However, the interior spaces follow a student-centric design solution. The window sills are brought low and made wide to provide a space for children to sit and look out. Also, smaller windows look into the corridor to provide relief while still not causing a distraction during classroom activities. Daylighting was a challenge and it is resolved by providing large vertical windows to the outside, on one end of the classroom and higher windows looking into the corridor at the other end. A skylight is provided to bring top light into the darker parts of the classroom. The corridor is well lit with natural light coming in from vertical side windows and skylights.



Fig. 2.50. Window configuration



Fig. 2.51. Corridor storage



Fig. 2.52. Open place space



Fig. 2.53. Connection between rooms

Two classrooms share a toilet block which has an entrance on both sides to provide access to each of the classrooms. Also the classrooms are visually connected. Corridor space is efficiently used with storage spaces for children. Furniture arrangement is flexible to allow for different activities through the day. The scale of sinks and storage units is lowered to provide easy access for children.



Fig. 2.54. Vellore House - Sense of pride



Fig. 2.55. Casa Rana - Sense of pride



Fig. 2.56. Green School - physical environment as a learning medium



Fig. 2.57. Denise Louie - Daylighting design

2.4 LESSONS LEARNT

1 | Projects like Casa Rana and Vellore House, while low cost, are aesthetically beautiful projects, creating a sense of pride amongst its occupants. The children identify with the space as their home and therefore feel a sense of ownership/responsibility towards it.

2 | The modularity of the Heritage School makes it possible to build the school in phases as and when the need arises. For projects where budget is a constraint, phasing the project can be valuable.

3 | It's important that an architect's vision aligns with that of its occupants. Children's needs can sometimes be different from an architect's vision for the project and it is important as an architect to find a way to bridge this gap. The green school is successful in the way where it treats the physical environment as a medium for the children to explore their creativity. While the Vellore House is a very successful project in itself, the white walls in the living space make it difficult to maintain and children have to be prohibited from playing with ball, leaning against it or drawing on it.

4 | The precedents studied above are successful with their passive design strategies, where in spite of tropical hot climate, these spaces are maintaining thermally comfortable interior temperature without relying on mechanical systems. Using stack and cross ventilation with mechanical fans are effective ways to improve ventilation within the spaces.



Fig. 2.58. Heritage School - Passive Ventilation



Fig. 2.59. Green School - Daylighting design



Fig. 2.60. Casa Rana - Connection with nature



Fig. 2.61. Heritage School - Daylighting design

5 | The heritage school has a successful daylighting design where the classrooms have even distribution of daylight owing to the vaulted form and height of the ceiling. Also with Denise Louie Education Center, the back of the classrooms is well lit using sky lights and windows looking into the corridor which also brings in top and side light. The green school, in spite of its high roof and large overhangs, allows diffused light to come in from skylights in the roof.

6 | When designing for children, the scale plays an important role in the perception of play spaces versus intimate spaces. In the Panyaden School, although the roof is high at the center, the scale is successfully brought down in other parts with low eaves and fenestration configuration. Denise Louie Education Center brings windows sills down to children's height and the Green School uses furnitures that are at children's height to keep the scale low.

7 | Flexible furniture allows for the same space to be used for various different functions like in the case of Panyaden School, Green School and Denise Louie Education Center. It is typical to sit on the floor in asian culture. In Casa Rana and Vellore House, the common living space does not have chairs or sofas allowing the children to play and run about without hurting themselves or breaking furniture. As part of the culture, children should be encouraged to sit on the floor and use the space as they like without worrying about obstacles.



Fig. 2.62. Denise Louie - Window scale



Fig. 2.63. Green School - Flexible furniture



Fig. 2.64. Casa Rana - Use of colors



Fig. 2.65. Panyaden School - Use of colors



Fig. 2.66. Heritage School - Connection with nature



Fig. 2.67. - Green School - Connection with nature

8 | Casa Rana has a different color for each dorm room and this helps the girls feel a sense of ownership towards their room. The rooms are painted white on the inside to keep it soft and relaxing. The Panyaden school also uses color successfully to add visual interest through brightly colored curtains. Color can be used as a strong tool for visual interest, way finding and exploring creativity.

9 | Farming in the Green School along with tending to cattle is a great way of experiential learning. Also, allowing the children to experience the different seasons while sitting inside their classroom teaches them a lot by mere experience. Allowing animals to come into the classroom space gives great scope for learning about a new topic. The Farming Kindergarten also encourages learning through doing and does so by providing easy access to farming roof patches.

10 | It is important for humans to be connected with nature. In urban areas, this is becoming increasingly rare and we need to bring our children closer to nature while also teaching them the value of preserving nature. The Green School works on this ideal and does a great job of bringing the children in the midst of nature. The Panyaden School, Farming Kindergarten, Casa Rana, Vellore House and Heritage School are all successful in bringing the children closer to nature and encouraging an interaction.





3.0 THESIS PROPOSAL

"Free the child's potential, and you will transform him into the world."

- Maria Montessori

3.1 DESIGN OBJECTIVES

Adapting the lessons learned from travel research to the social context of this thesis issue, the design objectives can be divided into three broad categories - Social, Economic and Environmental with each of these further sub-divided to form eleven design objectives.

1 | SENSE OF IDENTITY

Children enjoy being in a space more if they can connect with it emotionally. They feel a sense of responsibility towards their space when they believe that the space belongs to them and take pride in it.

2 | LOW COST OF CONSTRUCTIONS AND MAINTENANCE

The architect's vision of what is aesthetically beautiful can sometimes create spaces that are difficult to maintain by its occupants. Especially when dealing with children, it helps to keep in mind that while rules and regulation are important, the architect should design spaces that do not restrict children's creativity and freedom.

3 | PHASED CONSTRUCTION

For a facility that is dependent on funds for growth, it helps to phase the project. The facility can continue to grow as and when funds come in or as the need for more space arises.

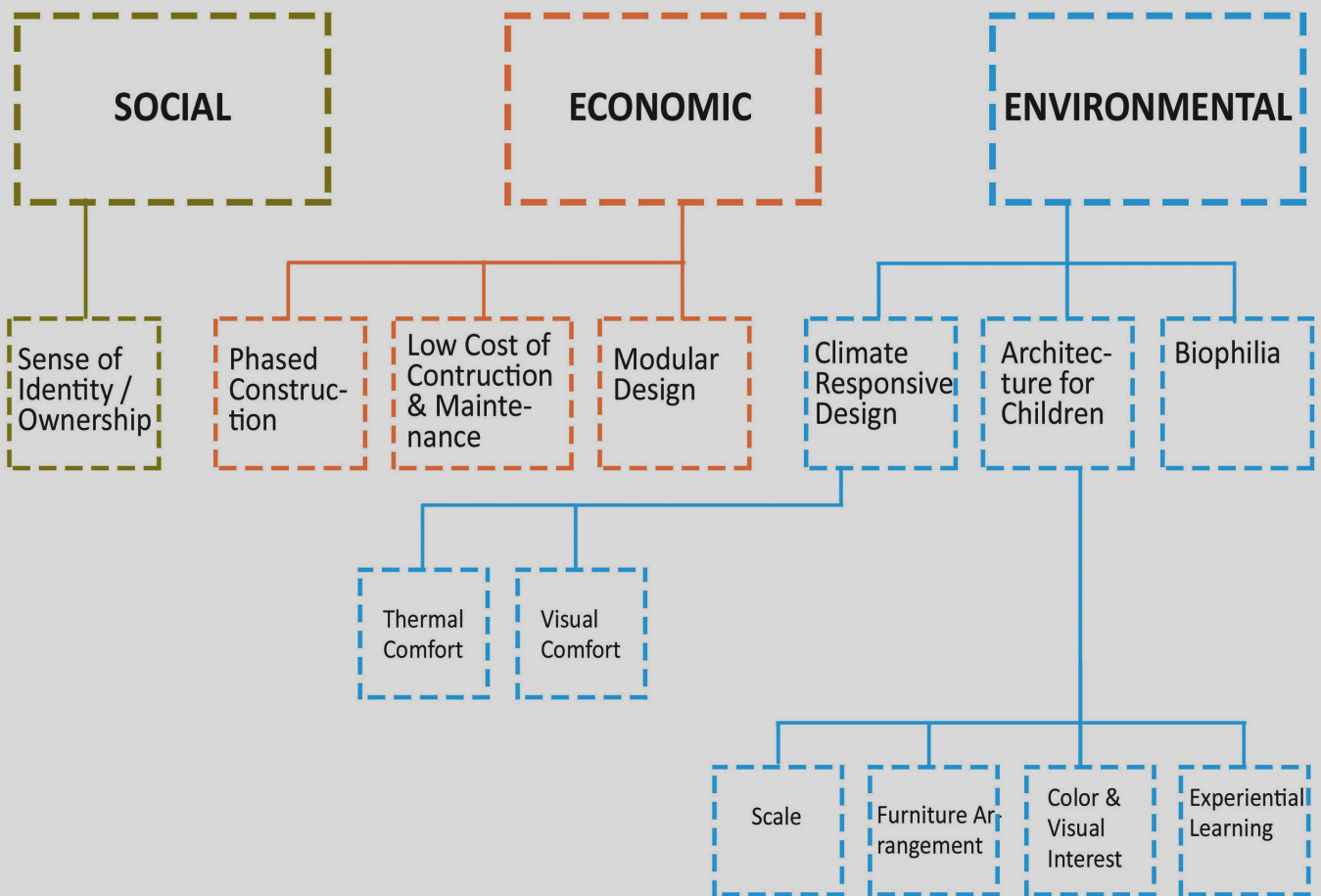


Fig. 3.1. Design objectives chart

4 | MODULAR CONSTRUCTION

Modular design allows for easy incremental growth of a project in the future, without the architect's intervention while not compromising on the original vision for the project. Also models like these can be replicated in other parts of the country with similar needs and can be built by the local community itself.

5 | THERMAL COMFORT

When the occupants are almost always thermally comfortable in a space without even being aware that their space is designed for thermal comfort, is when we can say that the architecture is successful in improving the overall experience of its occupants. Children can concentrate better in class when they are thermally comfortable.

6. VISUAL COMFORT

Well-lit spaces make concentration in class easier. Well day-lit spaces keep the overall mood in the class attentive and cheerful.

7. SCALE

Bringing down the scale for children creates a better spatial experience and keeps them feeling more protected.

8. FURNITURE ARRANGEMENT

Flexible furniture allows different activities to take place in the same space thus making it adaptable to different functions.

9. VISUAL INTEREST / COLOR

Color if used correctly can improve the imagination and productivity of children. It also adds interest to a classroom space which can otherwise tend to get a little dull.

10. EXPERIENTIAL LEARNING

Designing a school keeping the teaching philosophy and curriculum in mind can provide a school that works well for both, children and teachers. As per 'Regio Emilia', the classroom is a 'silent teacher.' How can the environment shape the child and in turn, how can the child influence the leaning environment?

11. BIOPHILIA

A space is well thought of when the transition between the inside and outside is seamless. Playtime is the favorite part of a child's day, when he/she is out in the open. Therefore connection to nature and to the outside is crucial to designing successful spaces for children.

3.2 PROPOSAL

With a deeper understanding of what makes some spaces for children more successful than others through interview with architects, children and teachers, design an educational facility that symbolizes a safe haven for children who otherwise live in a very troubled urban setting.

A place where they belong, own, are responsible for, can be free, explore their creativity without constraints, push the limit of their imagination - all while feeling secure, taken care of and valued. A place where they grow to their full potential without worries or fears. A place where they can truly be themselves and feel appreciated.

The renewed educational facility aims to be all these things and more for the children and women of the community who are seeking a better life and a brighter future.

Integrating the lessons learned from travel research with the social, cultural and economic needs of the Pratiksha Nagar community, designing an education facility that can support the existing facility and accommodate for future growth both in quantity and quality. Through this project, providing a module adhering to certain basic guidelines and standards that can adapted or replicated in other parts of the country where the need arises. Consequently, spreading the reach to improve the quality of lives in the most remote parts of the country.

Along with improving human performance, the facility shall be a high performance building in itself by adopting energy efficient design strategies, eliminating the need for large energy consuming elements like mechanical heating, cooling and air-conditioning system through maximizing natural ventilation and shading, reducing electric lighting by maximizing daylighting, reducing wastage of water by effective conservation of rain water and growing food on-site to improve the nutrition requirement of the students.



Fig. 3.2. A child playing at the Green School





4.0 ARCHITECTURAL RESPONSE

"It is not the clay the potter throws that gives the jar its usefulness, but the space within."

*- Lao Tzu
(ancient Chinese philosopher and writer)*

4.0 ARCHITECTURAL RESPONSE

4.1 EXISTING FACILITY

SITE LOCATION

Pratiksha Nagar Informal Settlement lies to the East of RamKrishna Sarada Samiti (RKSS). Buildings surrounding the site are mostly Maharashtra Housing and Area Development Authority (MHADA) buildings.



Fig. 4.1. Map of Mumbai (Source: Google Maps)

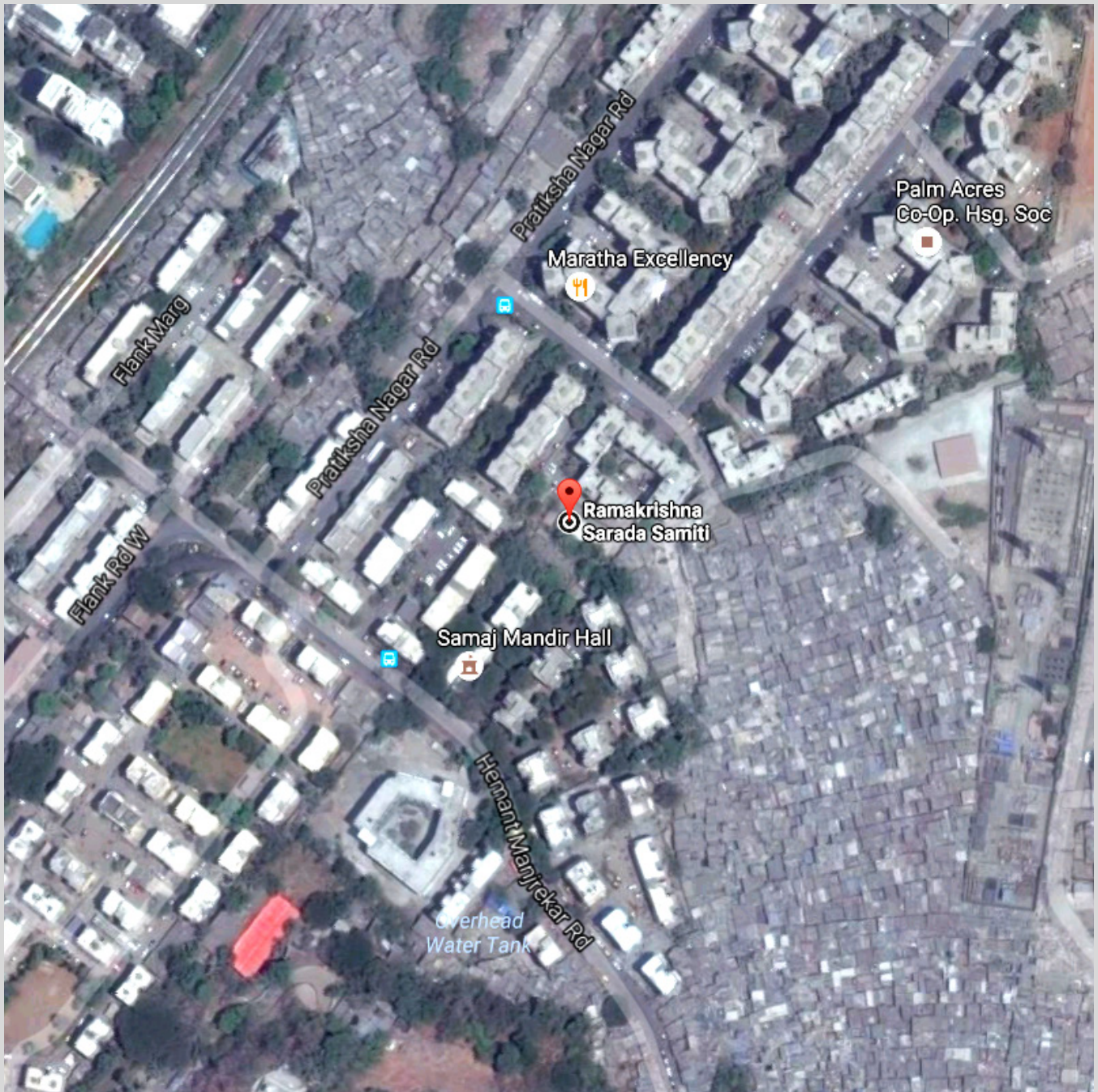


Fig. 4.2 RamKishna Sarada Samiti (RKSS) and its surroundings (Source: Google Earth)

WARD MAP OF MUMBAI - RKSS LIES IN F/NORTH WARD

Area
5.4 square miles
 Population
528,767
 Households
121,347
 Density per sq. mile
97,920
 Slum Population
3,08,400

AMENITIES

6 Railway Stations
4 BEST Depots
1 Municipal Hospitals
6 Municipal Dispensaries
7 Municipal Health Posts
69 Private Hospitals & Nursing Homes
366.5 MT per day Garbage Generation

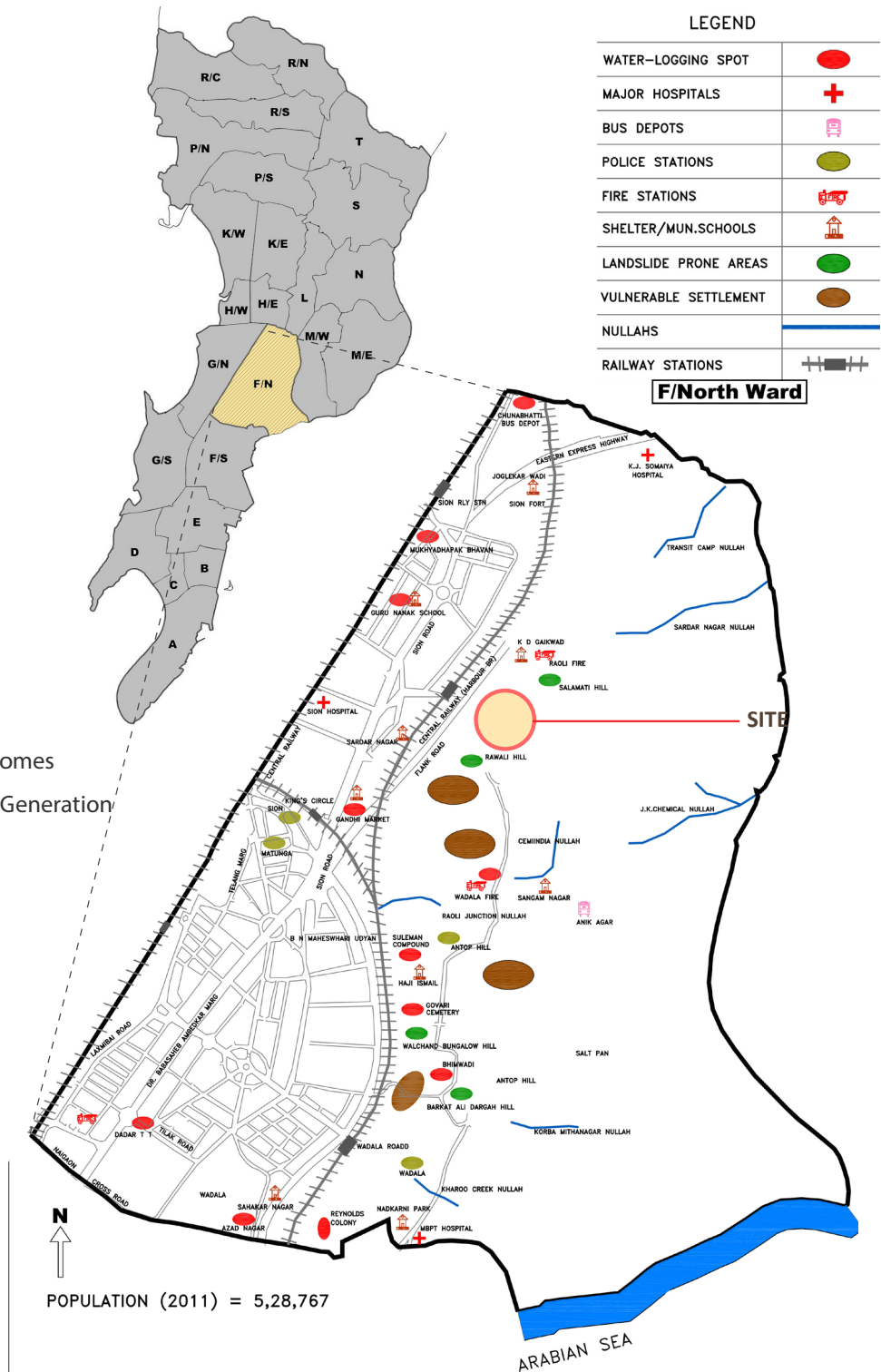


Fig. 4.3. Map of F/North Ward
 Source: Development Plan of Mumbai

DEVELOPMENT PLAN OF F/NORTH WARD



Fig. 4.4. Development Plan sheet of F/North Ward, Mumbai
Source: Development Plans of Mumbai

SITE SURROUNDINGS

Entrance

Pratiksha Nagar Road

MIG MHADA Housing Society

LIG MHADA Housing Society

Temple

MHADA Chawls

Society Office & Pump Room

Existing Facility

Chaitanya Housing Society

Panchpushpa Housing Society

Pratiksha Nagar

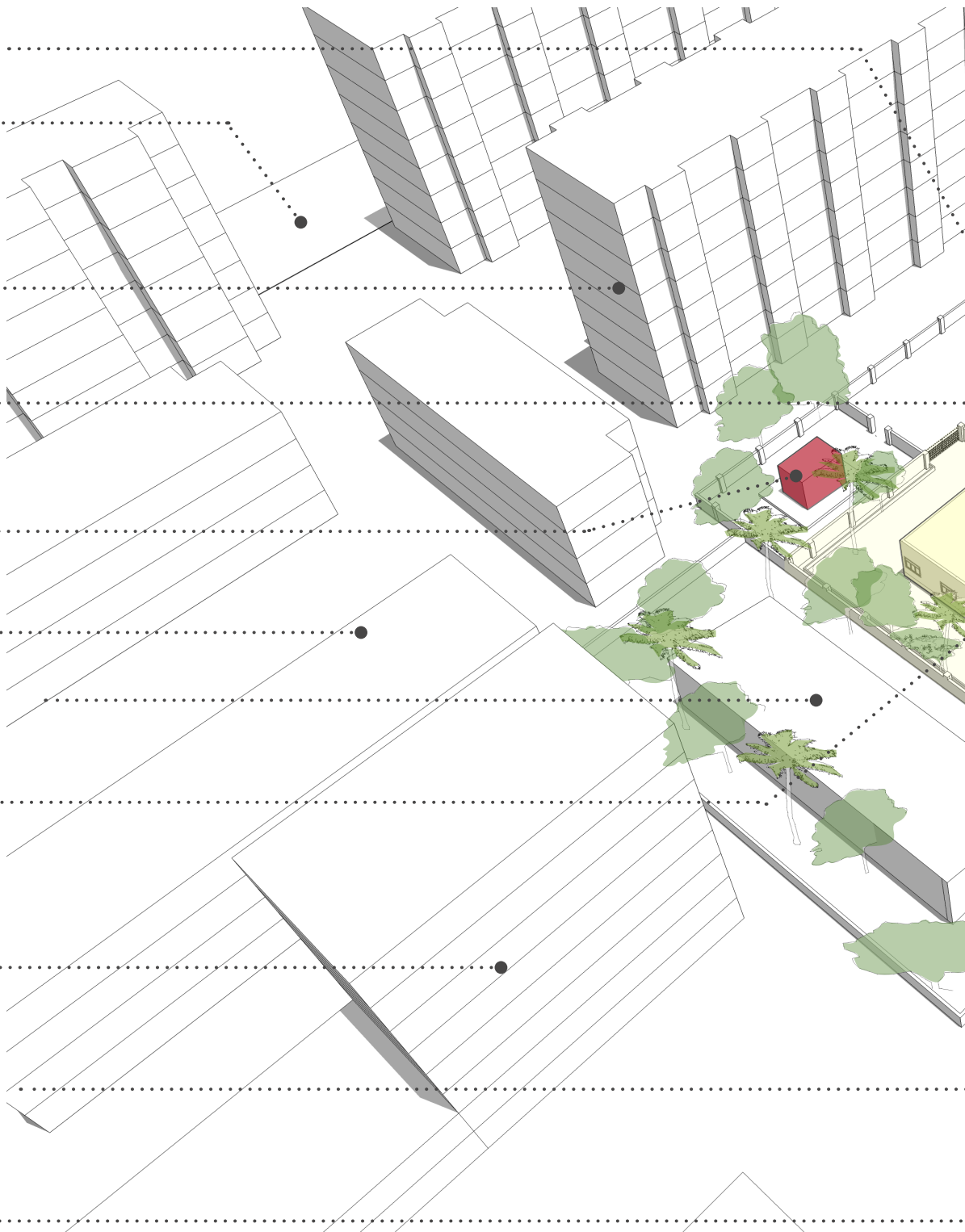
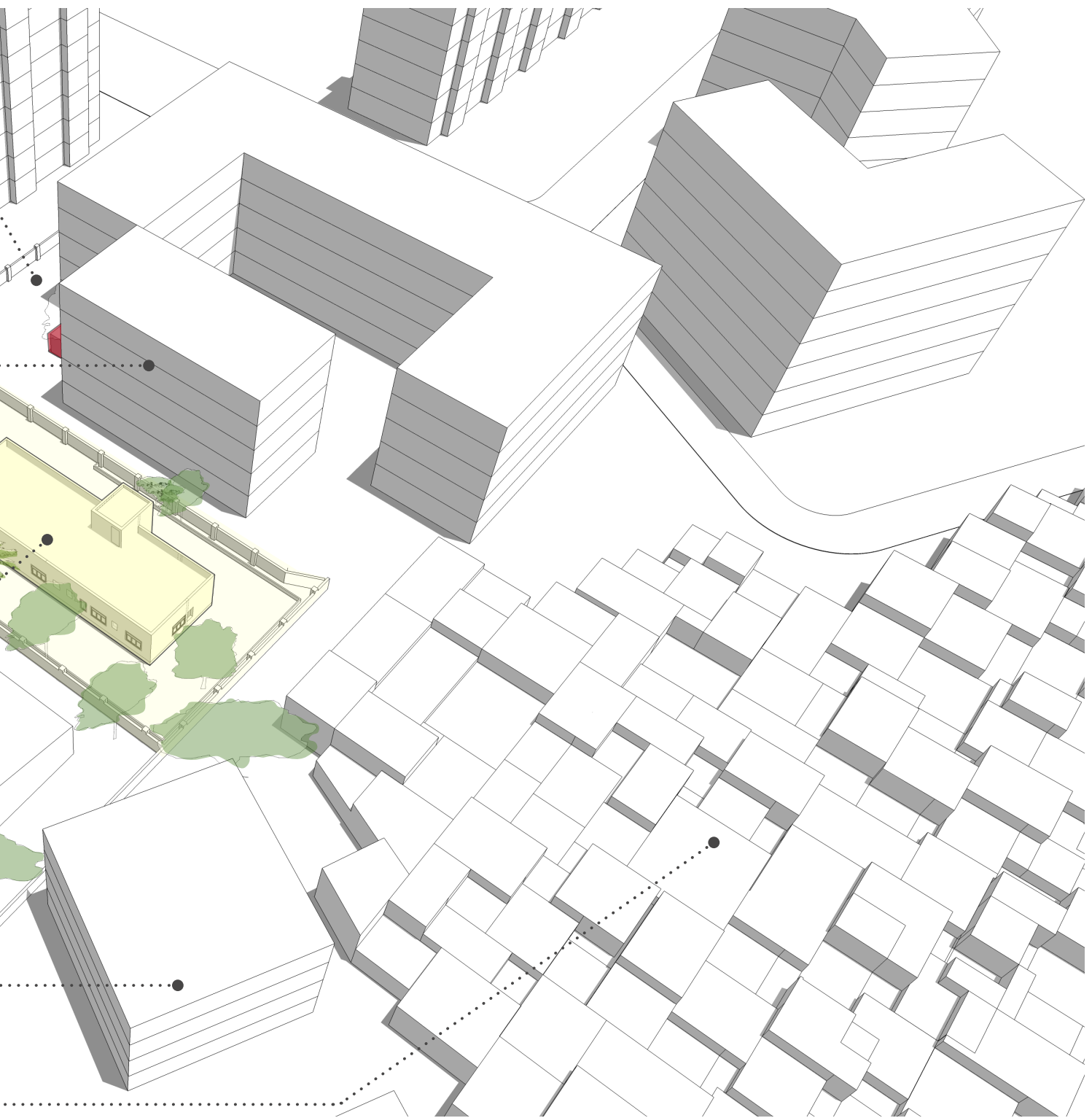


Fig. 4.5 Axonometric View of existing site



EDGE CONDITIONS



Fig. 4.6 Axonometric view of existing site

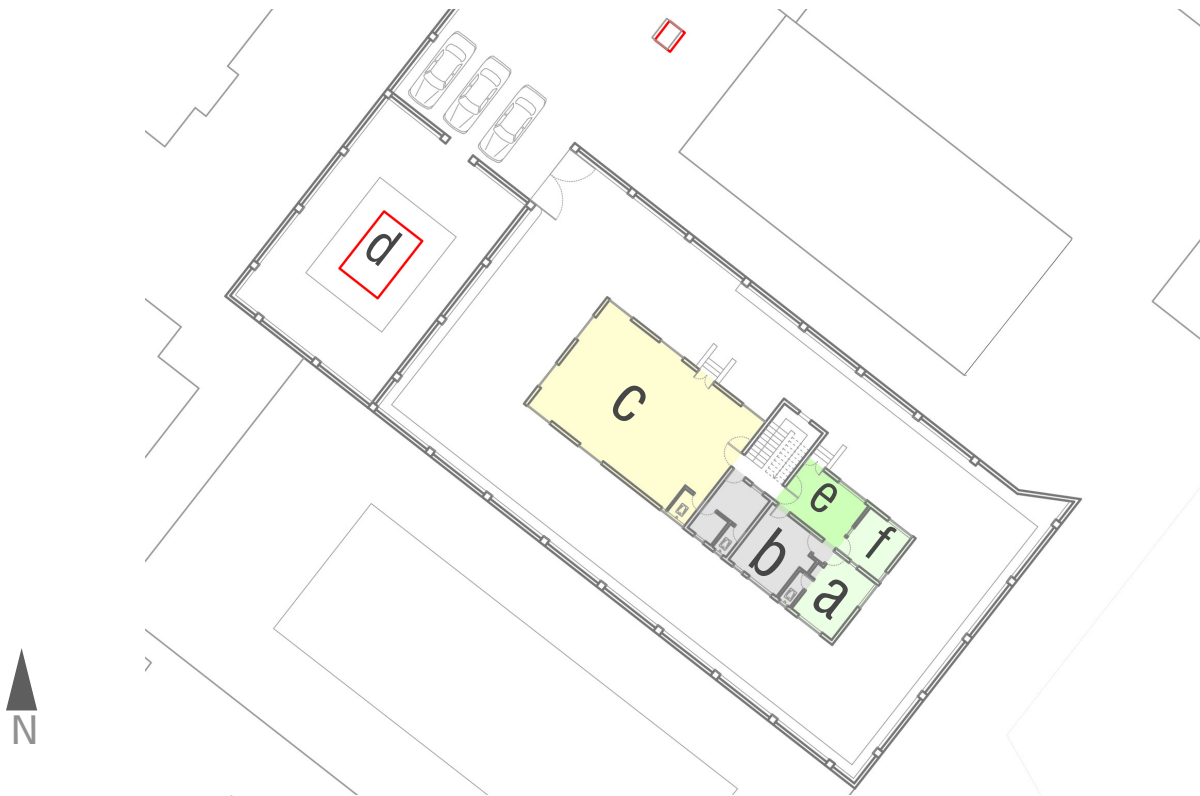


Fig. 4.10 Key Plan of existing site



Fig. 4.7 North West Edge Condition



Fig. 4.8 North East Edge Condition



Fig. 4.9 East Edge Condition

4.1.5 EXISTING BUILDING INTERIORS

A. DIRECTOR'S OFFICE



Fig. 4.11. Director's Office

B. MULTIPURPOSE ROOM



Fig. 4.12. Multipurpose room

C. MULTIPURPOSE ROOM



Fig. 4.13. Early Education facility



D. TEMPLE

Fig. 4.14. Temple on site



E. PATIENT WAITING AREA

Fig. 4.15. Patient waiting area



F. MEDICAL CHECK UP ROOM

Fig. 4.16. Medical ckeck-up room

4.2 PROGRAM DEVELOPMENT

4.2.1 OCCUPANCY CHART- WEEKDAYS

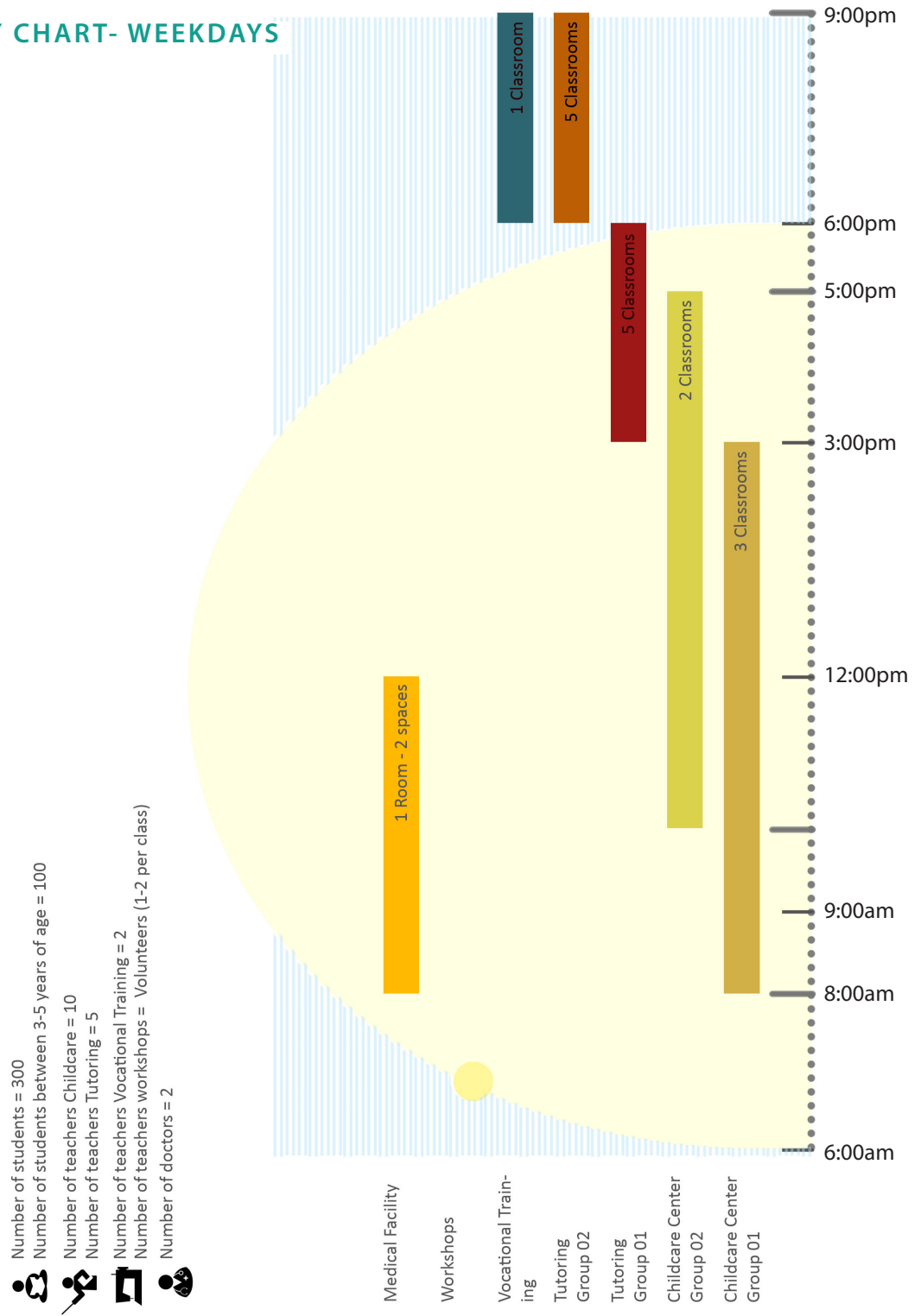


Fig. 4.17. Occupancy chart on weekdays

OCCUPANCY CHART- WEEKENDS

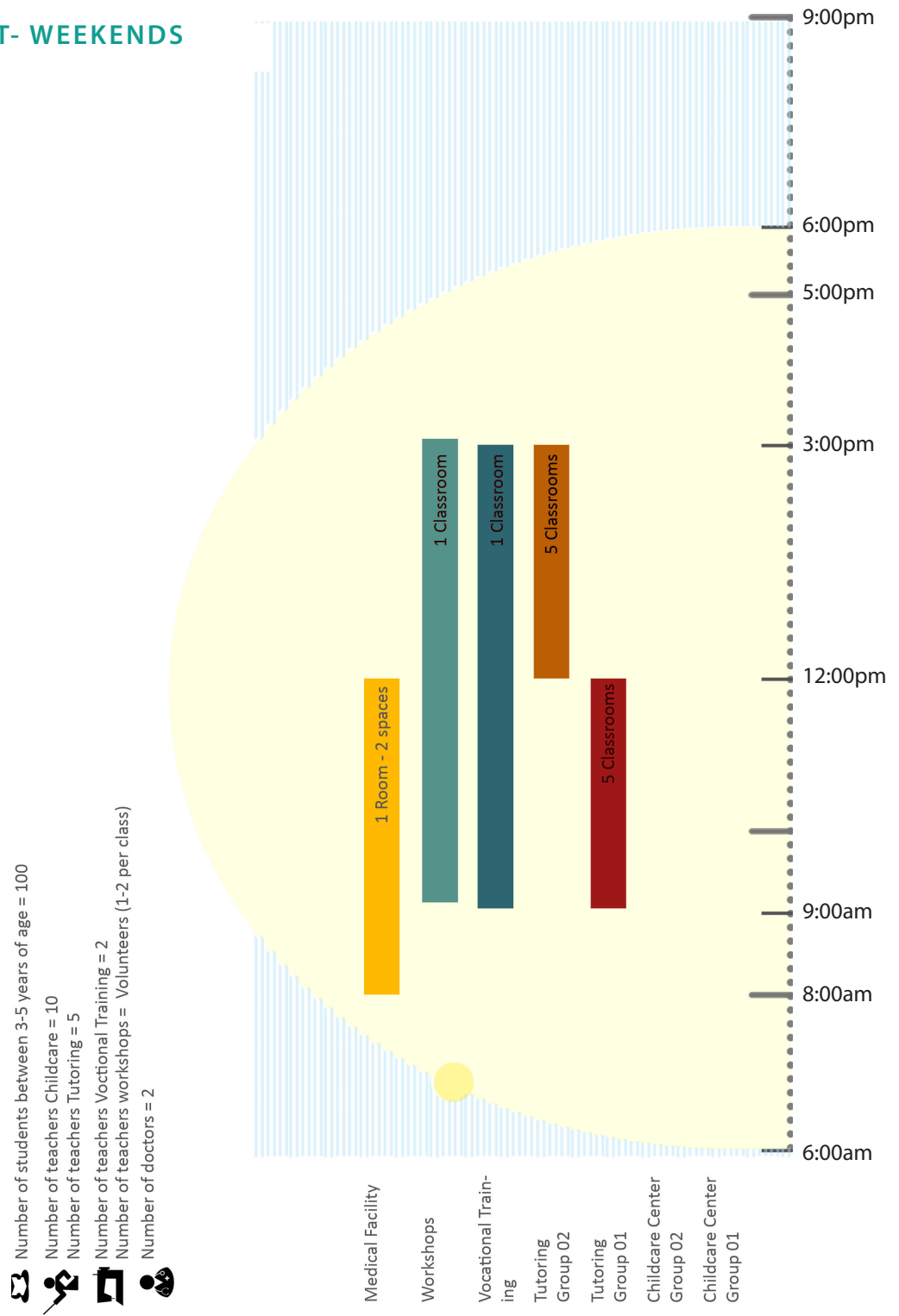


Fig. 4.18. Occupancy chart on weekends

4.2.2 PROGRAM DESCRIPTION

Existing Plot Area

10,500 sq. ft (70ft x 150ft)

Existing Building Area

2,700 sq.ft (30ft x 90ft)

Proposed Plot Area

8,000 sq.ft (120ft x 150ft)

Proposed Building Area

11,530 sq.ft

CLASSROOMS - 8 NOS.

Functions as an early educational facility during the day and tutoring classrooms in the evenings and on weekends. Furniture or arrangement to be flexible in order to accommodate children of ages 3-5 and also 6-15.

OUTDOOR ACTIVITY SPACE

Activity spaces can be an extension to the classrooms and situated in a quieter/private zone of the facility. It can double as an assembly space. The activity spaces should have ample tree cover for shade.

VOCATIONAL ROOM - 1 NOS.

Used by women of the community who are enrolled at the center to learn sewing, pottery, bag making, etc. Functions purely for the purpose of vocational training on weekdays as well as weekends. Different day allotted for different activities.

STORAGE UNITS

Storage spaces to be provided for children enrolled into the early education program. Provided within the classrooms or in close proximity. Additional storage to be provided for the women enrolled into the vocational program to store their in-progress work. Storage units to be provided within the Vocational Room.

MEDICAL CHECK-UP ROOM

Space for 2 doctors and 2 patient beds. Storage to be provided within the room. The room to include refrigerator space and basic, over-the-counter drug storage unit. The facility functions as a general medical clinic. No surgeries or operations performed at the center.

LIBRARY

Can be used to store books for the educational advancement of children. Can double as a computer room during computer training program.

DIRECTOR'S OFFICE

The director's office to consist of work table and chairs. Should have access both, from inside the educational facility for students and outside for visitors.

STAFF LOUNGE

A space for staff to rest between classes and do their after-class work. Open to the staff all year round.

STAFF STORAGE SPACE

Storage space to be provided within the staff lounge. Can be used for children's work and additional units for staff's personal use.

TOILETS

Physically disconnected but visually connected to enable teachers to keep track of a child for security reasons. Separate toilets for boys and girls. Window to the outside for exhaust.

Additional toilets for adults that can be used by the staff, doctors, volunteers, patients and women in the vocational center.

KITCHEN

Kitchen space used for storage of food donated for the children in the early education and tutoring program. Kitchen to be used for heating, refrigeration and distribution of food. In India, on festivals and auspicious occasions, bulk food is cooked and donated to organizations like these. The kitchen use will be maximized on these days.

JANITOR

Space to keep cleaning equipment and changing area for helpers.

WAITING AREA

A common waiting area for patients visiting the medical centre and visitors coming to meet the director. An additional waiting space for parents to pick-up and drop-off their children.

CIRCULATION

To be minimized or have multi-purpose uses. Separate entrance for the educational facility and public facilities. Private access to have restricted gated entrance and public access to be open-to-all.

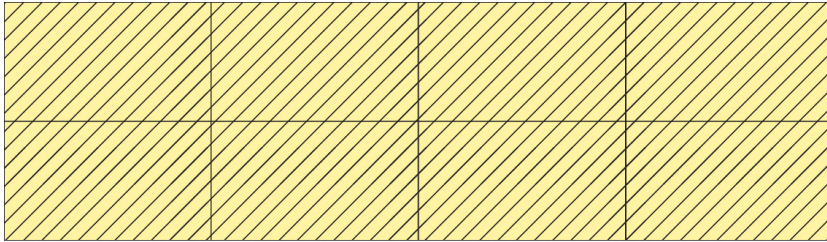
WATER STORAGE

Run-off water stored during monsoons can be used during hot summer months

4.2.3 AREA DISTRIBUTION

Classrooms

660sf x 8units = 5280sf



Outdoor Activity Space

1320sf



Vocational Training

660sf



Medical Clinic

200sf



Waiting Area

100sf



Staff Room

350sf



Director's Office

30sf



Toilets

500sf



Kitchen

300sf



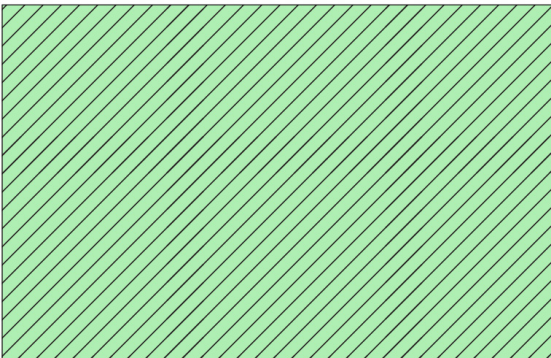
Janitor

30sf



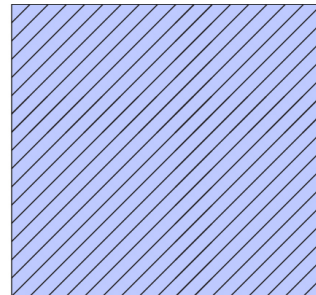
Play Area

5500sf



Circulation

2600sf



4.3 CONCEPT DEVELOPMENT

4.3.1. EXISTING SITE ELEMENTS

Put the relationship first and then figure out how to fit everything else around it.

– Joyce Fetteroll

Temple

Proposed Additional Site Area

Existing Site Area

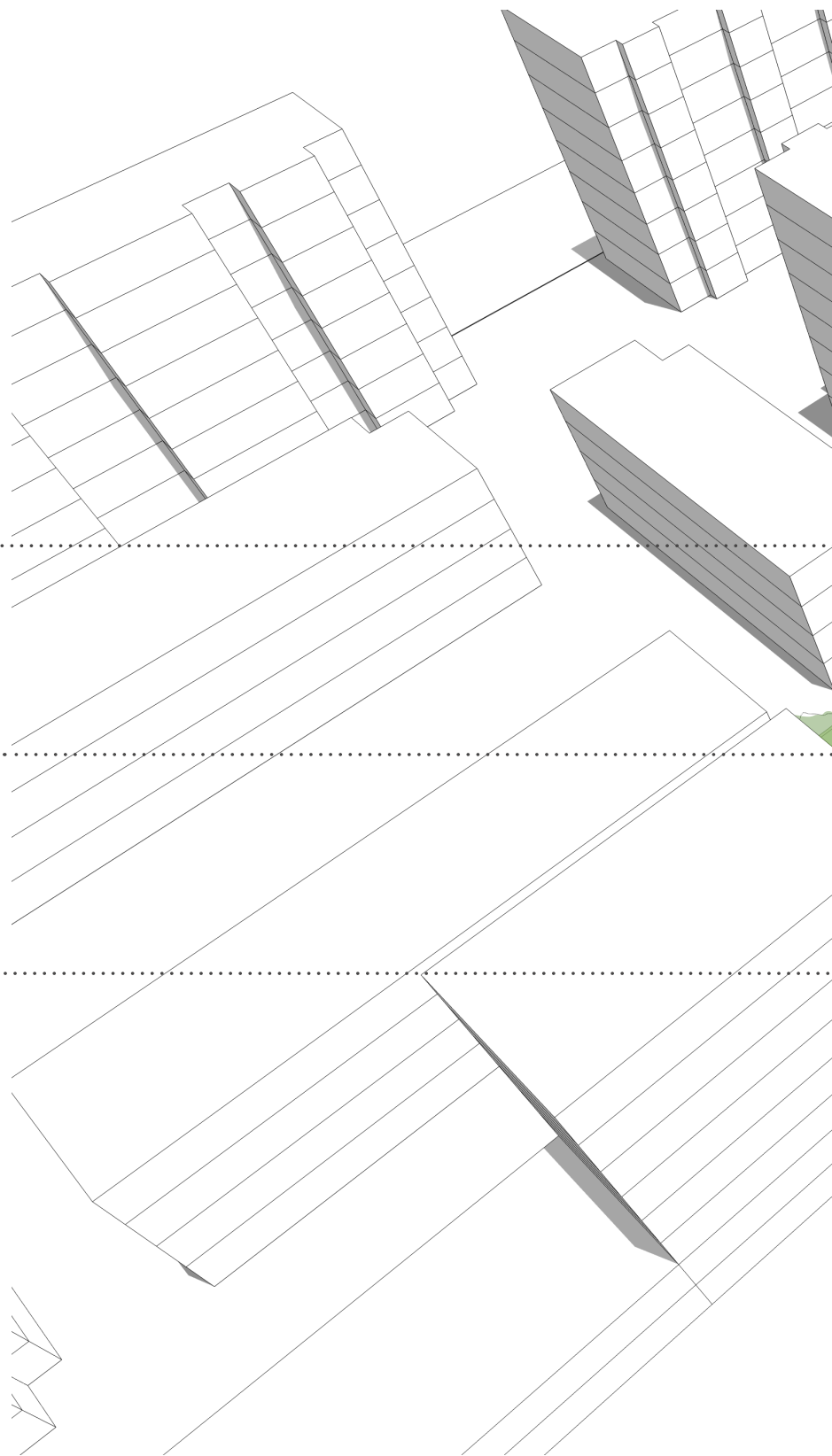


Fig. 4.19. Aerial View of proposed site



4.3.2. CONCEPT EVOLUTION

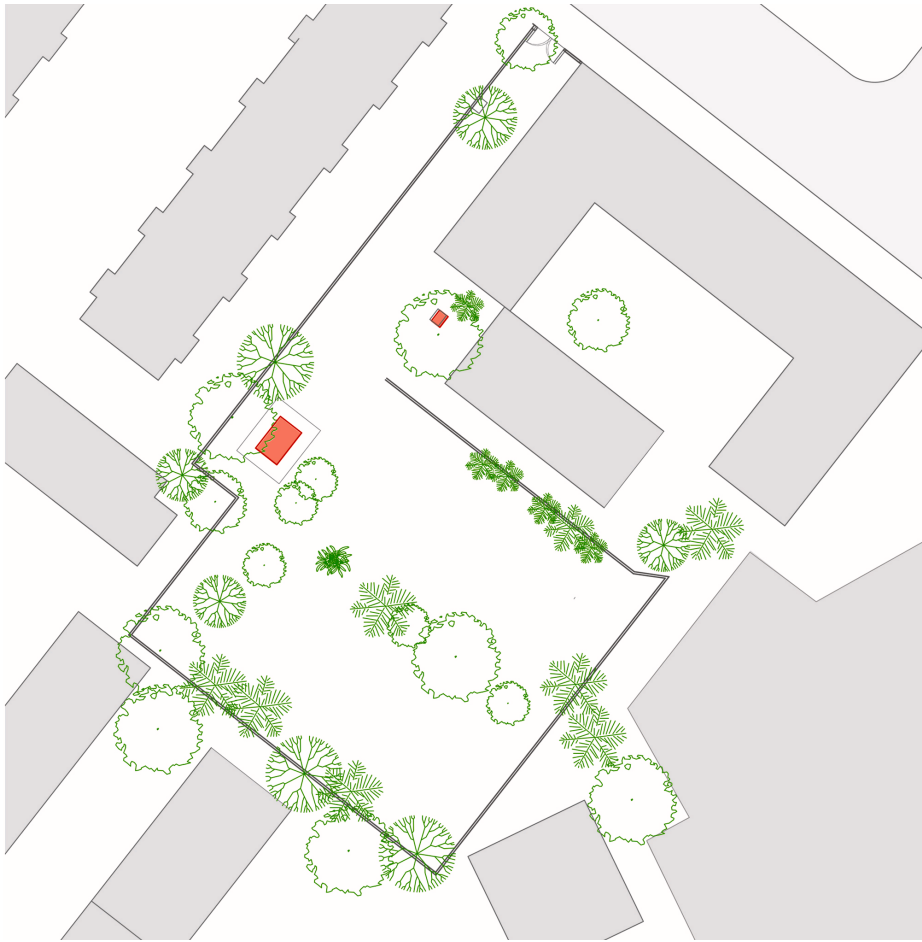


Fig. 4.20. Proposed site without existing buildings

1| PRESERVING EXISTING TREES AND TEMPLES

Existing buildings on site will be demolished due to their poor condition. The remaining site elements are trees, temples and boundary wall. Trees are important to the project since the aim of the renewed facility is to connect children with nature - a basic experience that they lack in their homes. Also, preserving existing trees teaches the children the value of preserving green spaces in the city which are otherwise rapidly diminishing.

Temples function as a social magnet bringing the community in to the site. This will inform more families about the public facilities available to them at RKSS, which in turn can create a wider impact on the community than at present.

The boundary wall is maintained for security reasons and also because it's a norm to demarcate properties with boundary walls.

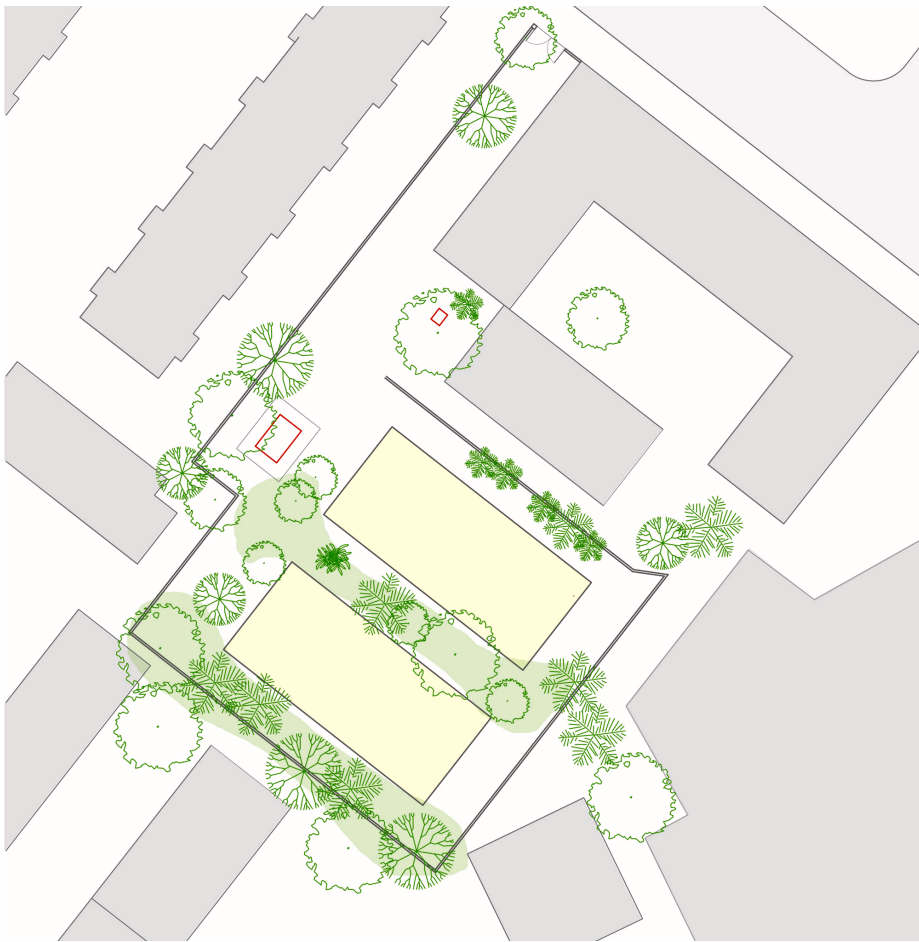


Fig. 4.21. Distributing masses and introducing green oasis

2| GREEN OASIS + MASS DISTRIBUTION

Distributing the total required mass into two blocks to fill in the leftover space between trees. The patch of existing trees along with new trees signifies a green oasis which is an extension to the classrooms. The oasis can be used for circulation, outdoor play and gathering space - it forms the heart of the facility.

The aim is to have all the function inward looking into this green oasis instead of looking outwards into an opaque boundary wall and tall unpleasant buildings. This helps provide an experience that is pleasantly different from what the children already have.

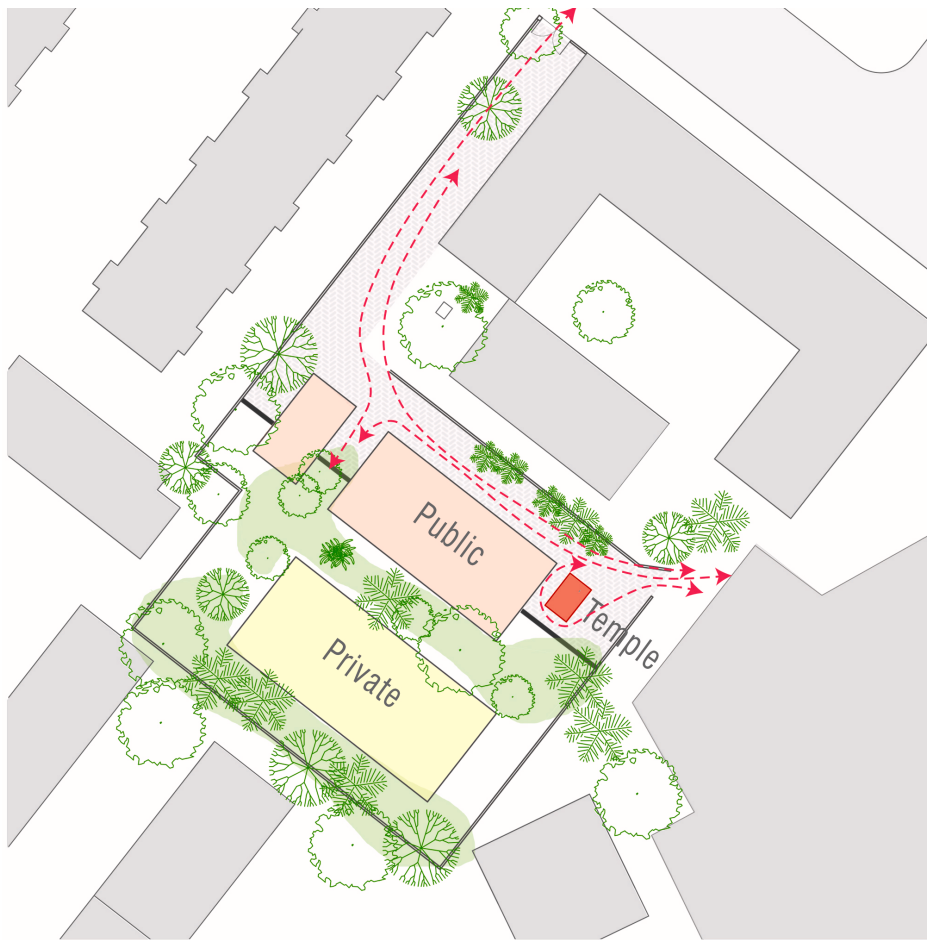


Fig. 4.22. Separating public from private

3| COMMUNITY ACCESS - PUBLIC VS. PRIVATE

By creating an opening in the boundary wall between the proposed site and Pratiksha Nagar, the northern edge of this site can be transformed into a community corridor which allows free public movement. In addition, the temple is repositioned towards this new community access to encourage more people into the site. This is done with the purpose of creating a sense of identity with the facility amongst the community.

Separating the public function from the private. The private educational functions can be secured off from general public access with a trellis boundary partition. This allows for visual connection through and through while still separating the two physically.



Fig. 4.23. Staggering and separating built masses

4| STAGGERED + SEPARATED BLOCKS

Mumbai is situated in a tropical zone, along the sea coast, with high levels of humidity. In order to create thermally comfortable interior spaces, the building needs to breathe - requires effective ventilation. Staggered and separated blocks provide more surface area to the building for natural cross ventilation while still responding to the angled boundary wall.

The soft boundary partition and green oasis can be re-organized to respond to this shift, thus transforming the oasis into an undulating rhythmic green corridor.

4.4 MODULE CONFIGURATION

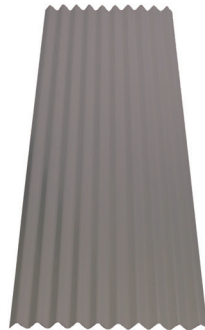
INCREMENTAL GROWTH

- Modular construction enables project to be built in phases
- Educational facility can grow as and when funds are available
- Incremental growth can accommodate for an increasing demand over time
- Kit-of-parts makes future construction easier without compromising on the vision for the educational facility
- Kit-of-parts also makes it possible for the community to be involved in future phases of construction

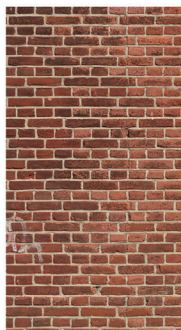
KIT OF PARTS



1. Exposed re-inforced concrete framework



2. Corrugated steel sheet painted dark grey



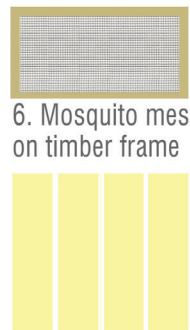
3. Exposed brick wall with punched openings



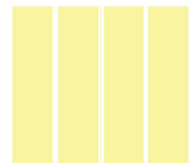
4. Kadappa stone flooring tiles



5. Timber frame with clear glass and iron guard rails

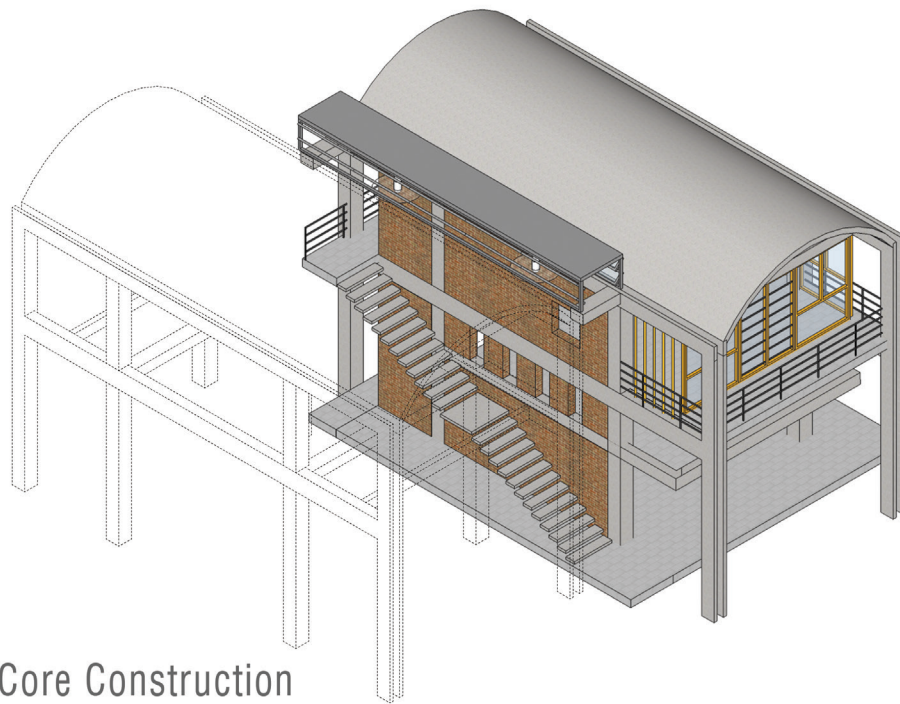


6. Mosquito mesh on timber frame

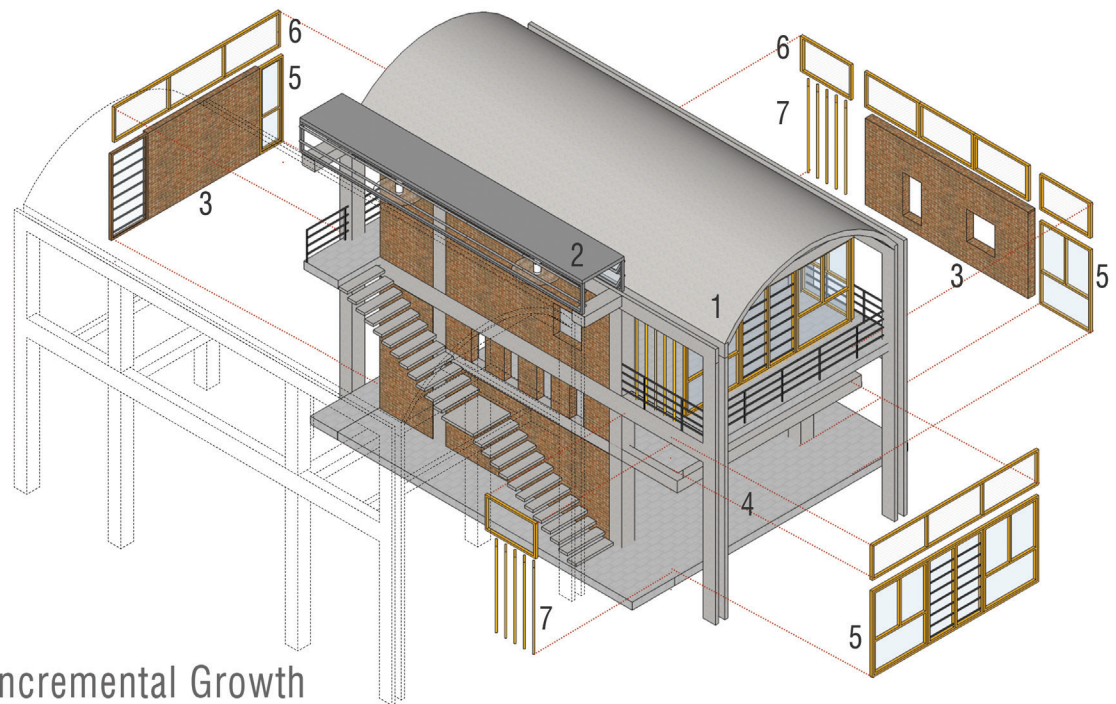


7. Brightly painted manually adjustable timber fins

Fig. 4.24. Kit -of-Parts



Core Construction



Incremental Growth

Fig. 4.25. Core Construction versus incremental growth

4.5 DESIGN DRAWINGS

GROUND FLOOR PLAN



Fig. 4.26. Ground Floor Plan

FIRST FLOOR PLAN

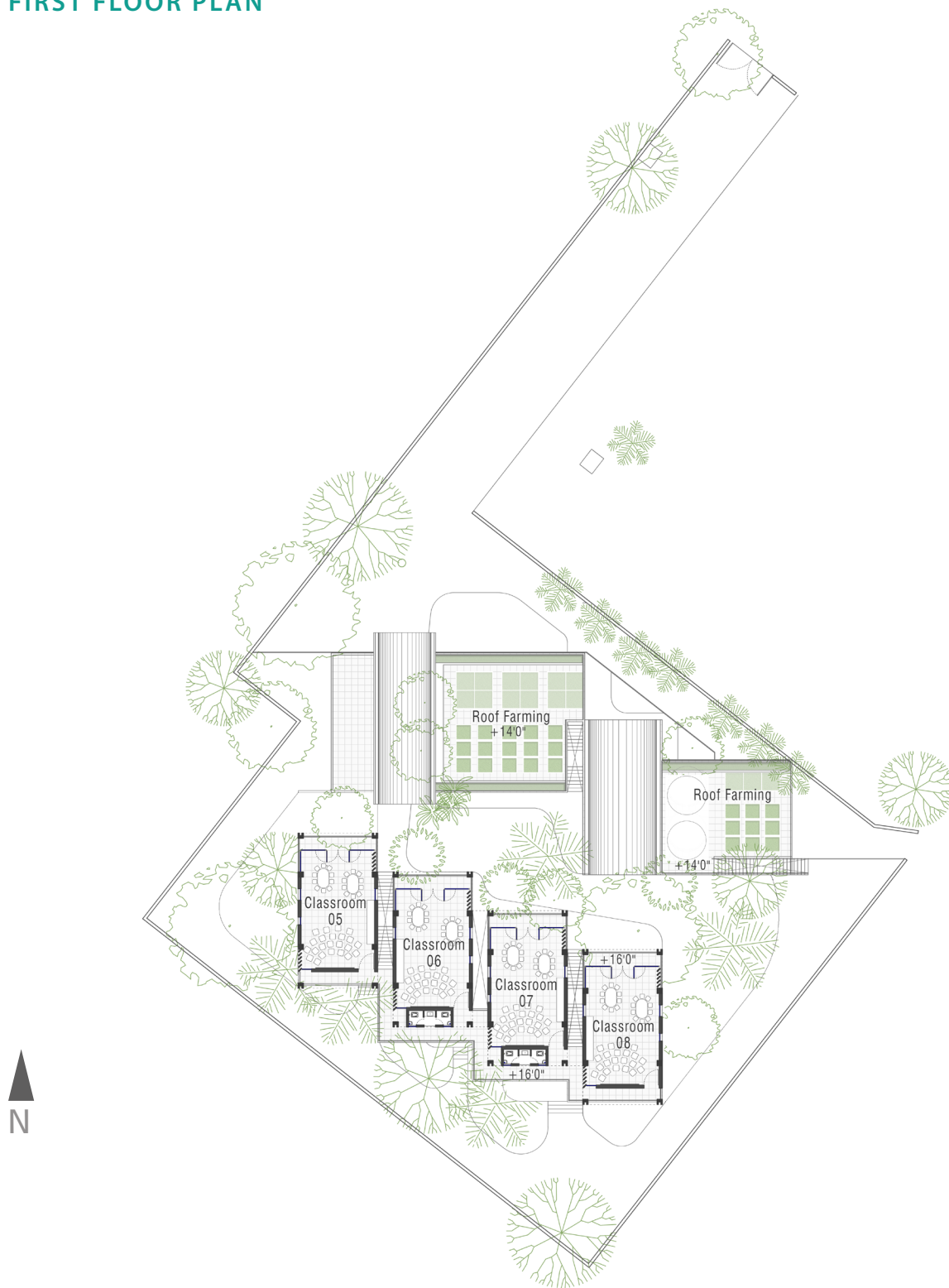


Fig. 4.26. First Floor Plan



Fig. 4.28. Axonometric View of Proposed Facility



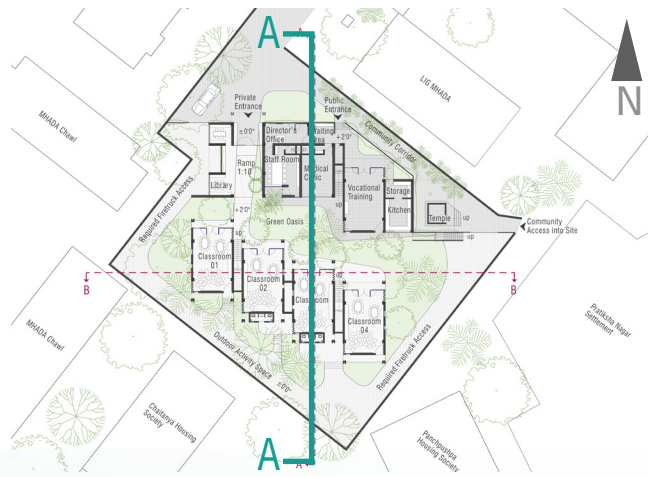
SECTION AA

Cutting along the length of the classroom and medical facility

Showing connection between classroom interiors, green oasis, roof farm and community corridor



Fig. 4.29. Section AA



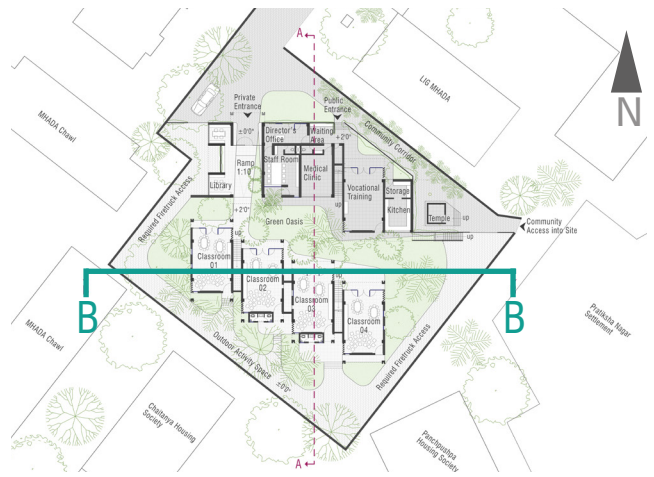
SECTION BB

Cutting through the classroom blocks

Showing spatial quality of classrooms, scale, materiality and visual connection to the outside



Fig. 4.30. Section BB



NORTH ELEVATION

Showing trellis partition, north fenestration configuration, public and private entrance

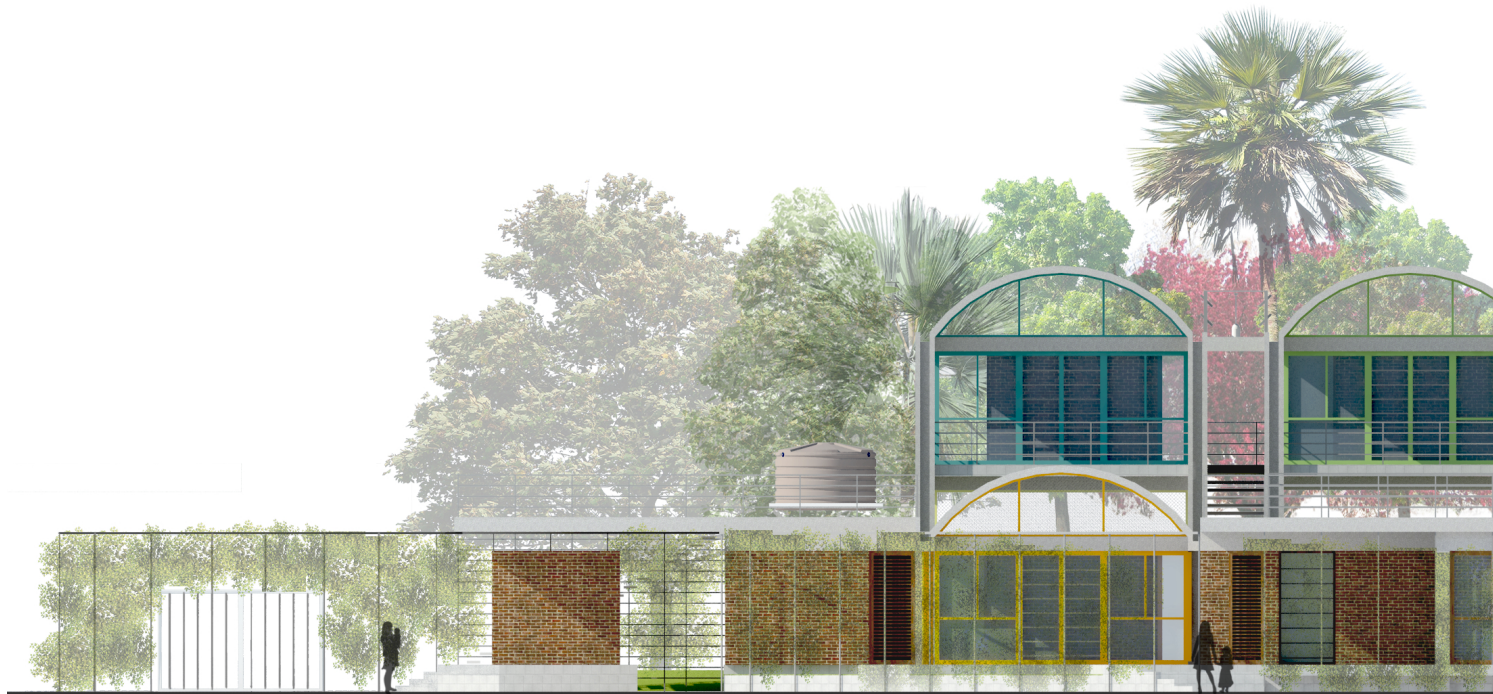


Fig. 4.31. North Elevation



WEST ELEVATION

Colored fins help in way finding and adding visual interest for children

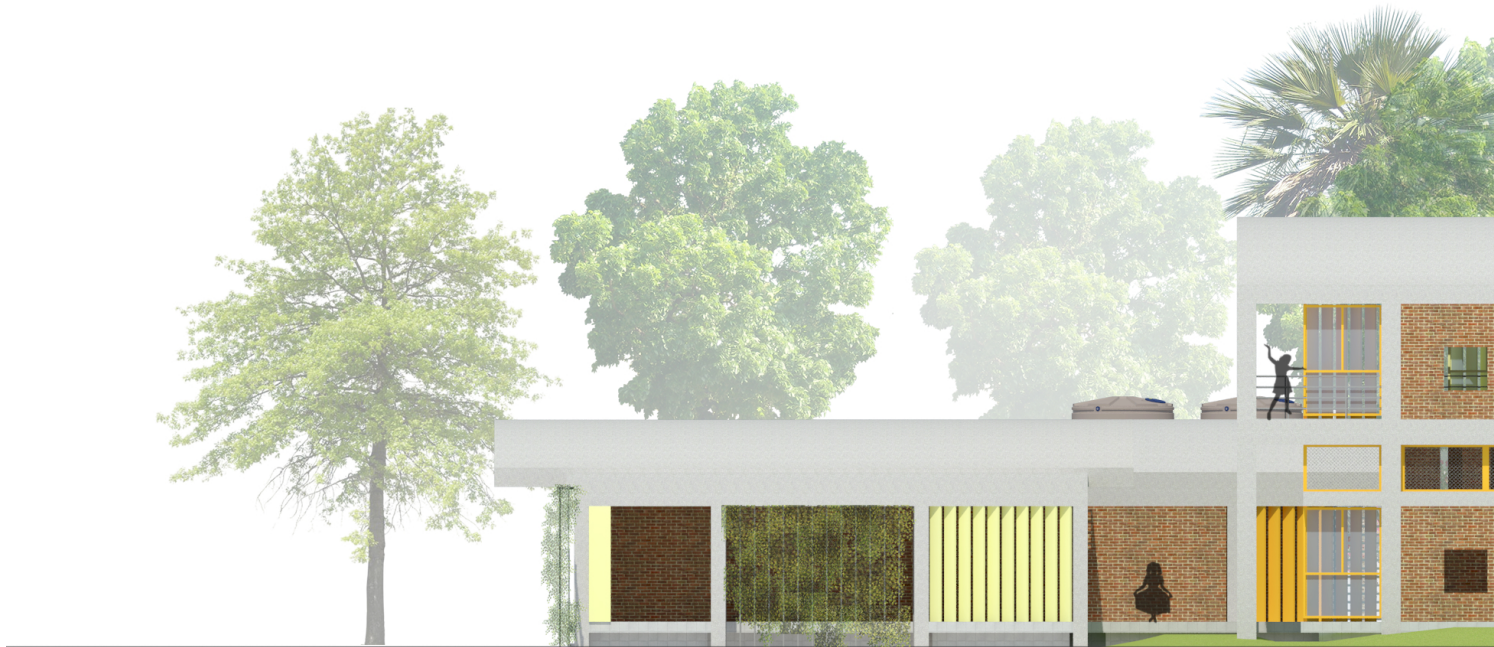


Fig. 4.32. West Elevation

SOUTH ELEVATION

Back entrance to classrooms



Fig. 4.33. South Elevation



4.6 ENVIRONMENTAL CONSIDERATIONS

WATER | FLOODING+CONSERVATION

1. Building plate raised to protect interiors during floods
2. Permeable groundscape allows rainwater to percolate
3. Vaulted Roof allows rainwater to run off
4. Gutters collect and channelize the water towards downspouts
5. Downspouts carry rainwater to underground tank
6. 50,000 gallon capacity underground rainwater collection tank
7. Water supply for irrigation and roof farms

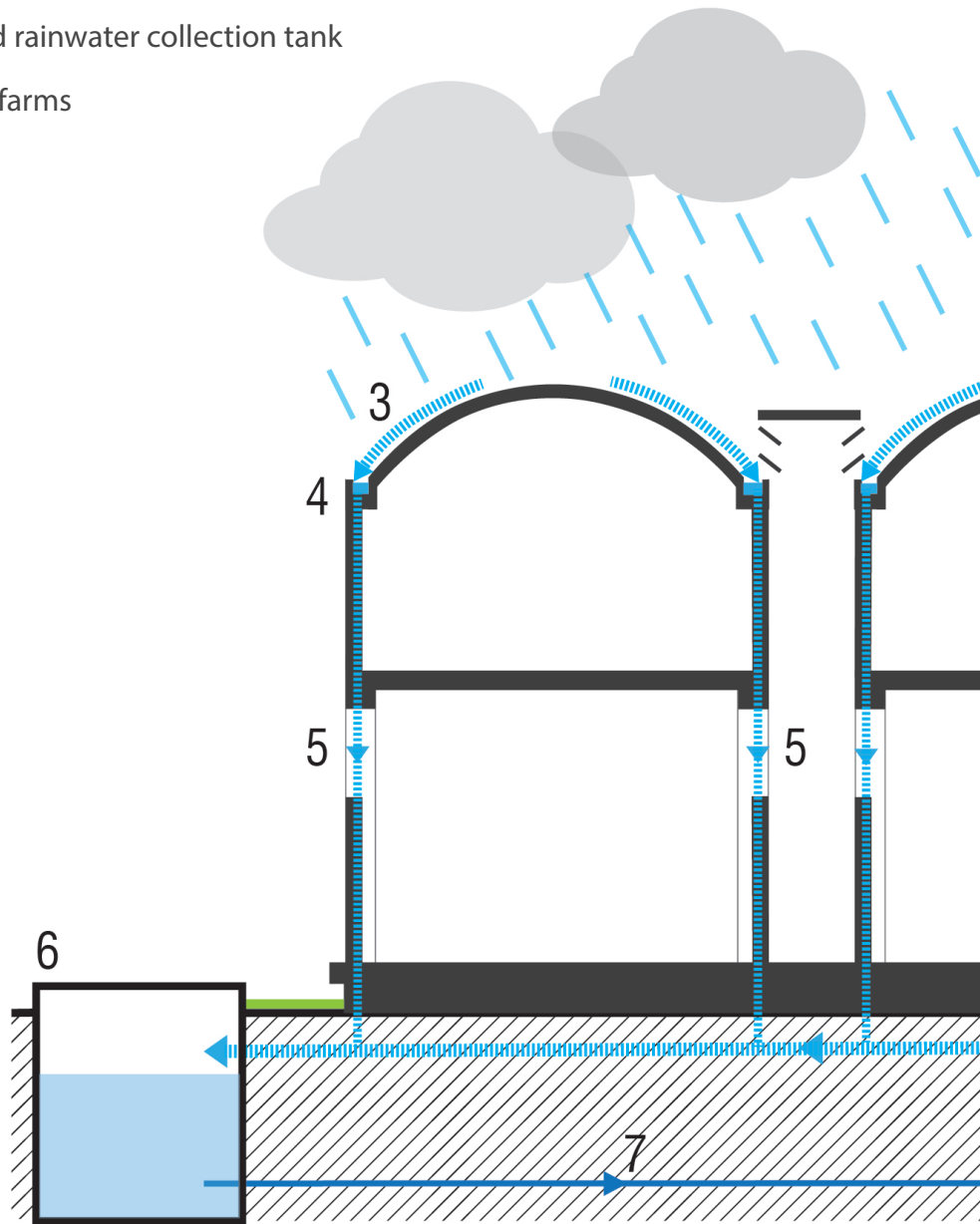


Fig. 4.34. Water management on site

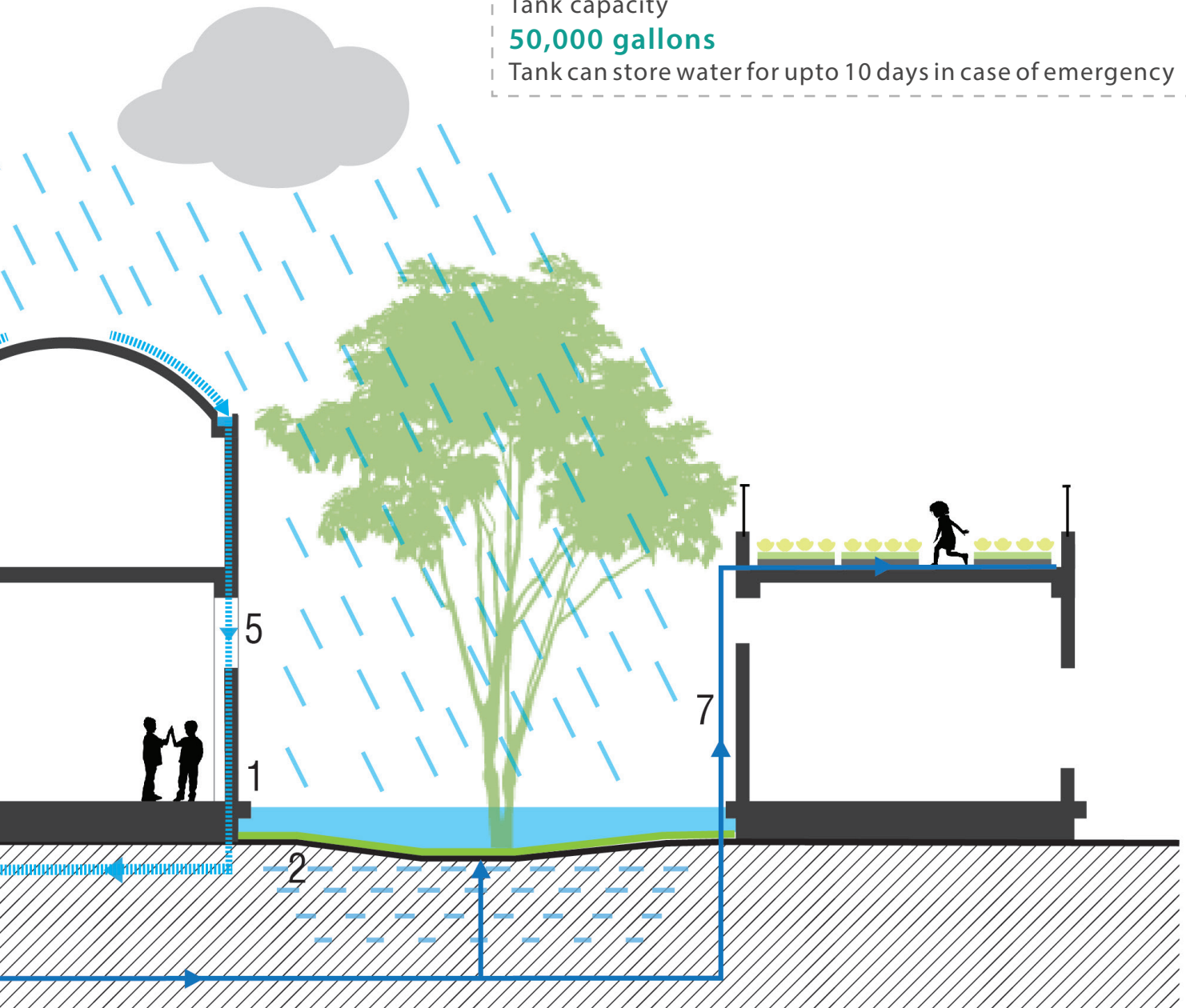
Average annual rainfall in Mumbai
95.35 inches

Rainwater received on site annually
1,240,000 gallons

Water requirement per day
5000 gallons

Tank capacity
50,000 gallons

Tank can store water for upto 10 days in case of emergency



WIND | VENTILATION

1. Manually adjustable fins enable cross ventilation
2. Operable punched windows as fresh air inlets and outlets
3. High ceiling allows hot air to rise and escape through the openings on either ends of the room
4. Air Circulation through stack effect
5. Mechanical fans to force air movement through the building

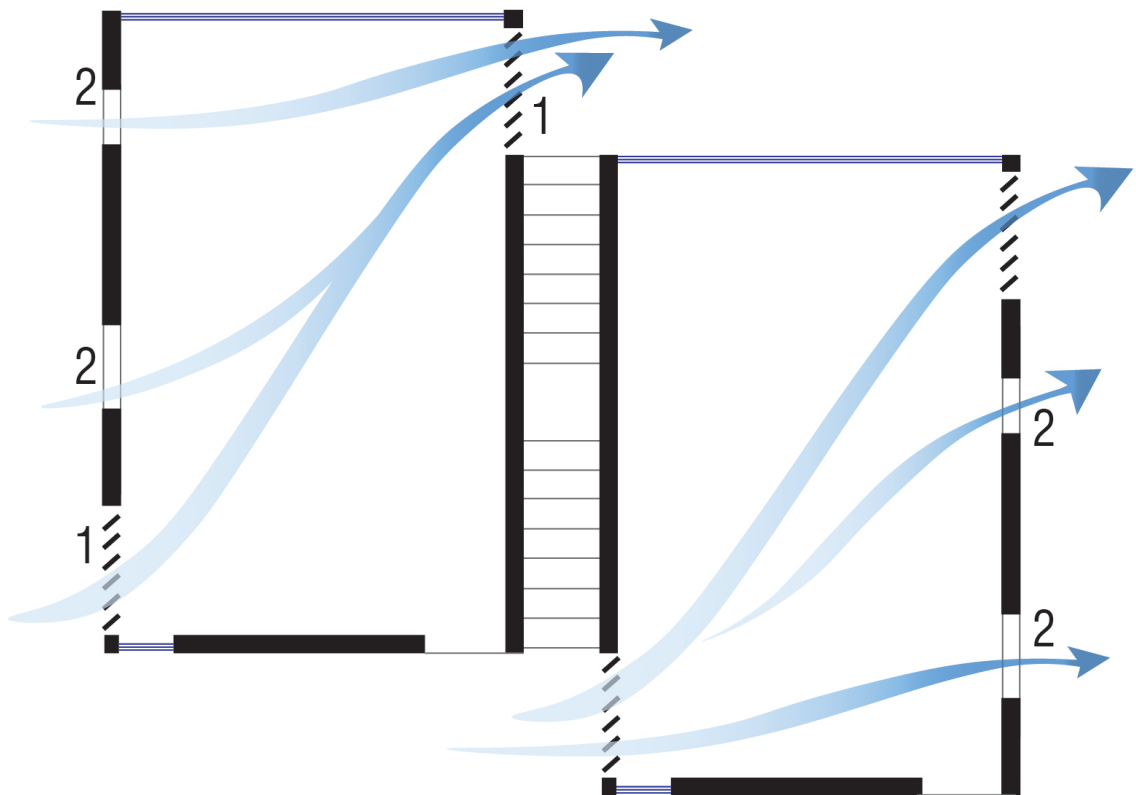


Fig. 4.35. Cross ventilation diagram - Plan

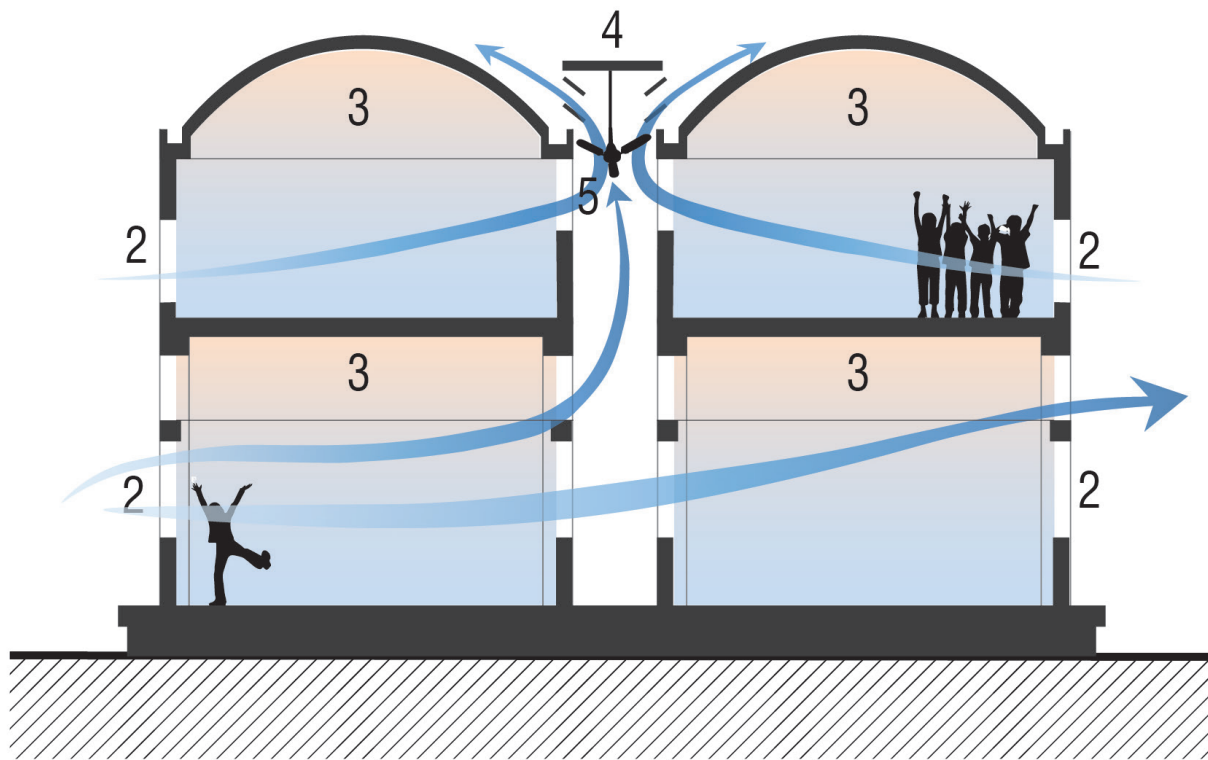
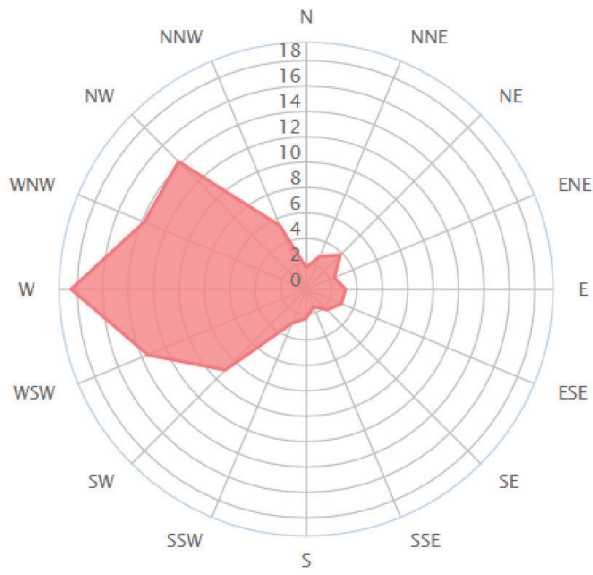


Fig. 4.36. Stack ventilation diagram - Section

SUN | SHADING + DAYLIGHTING

1. Large transparent windows on north facade to daylight the classroom using diffused light
2. Overhangs, 4ft deep to prevent interiors from direct sun in the south and shield against rain
3. Mosquito net to allow daylighting and ventilation
4. Smaller openings on south facade to reduce heat gain

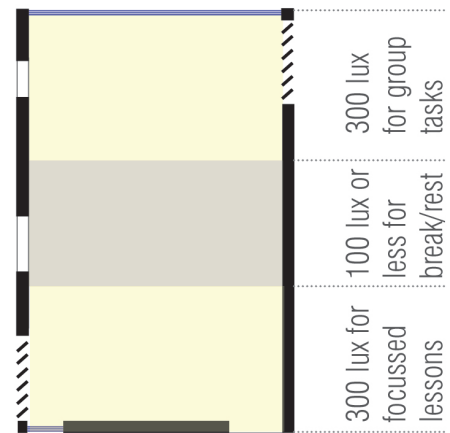


Fig. 4.37. Daylighting criteria

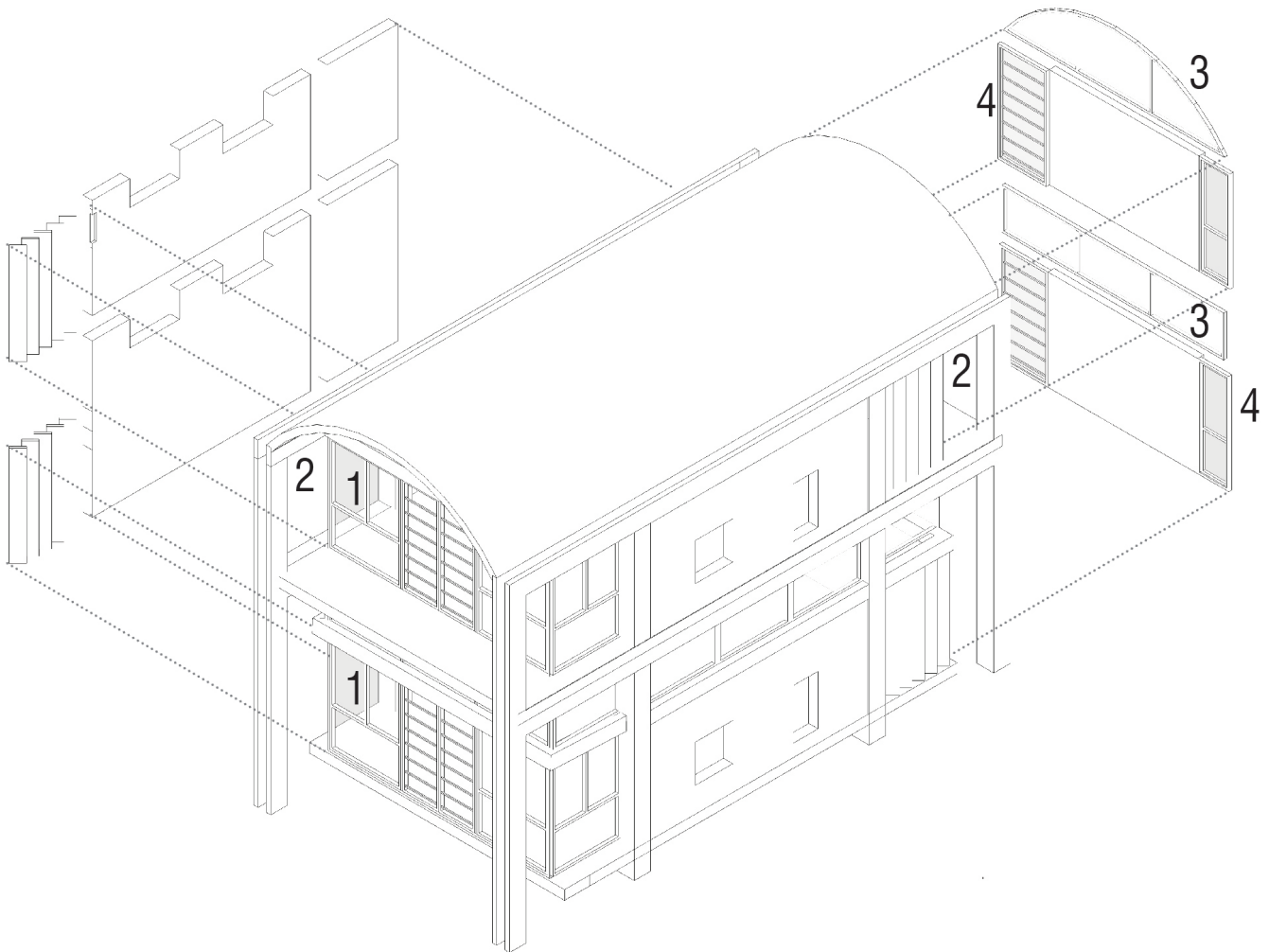
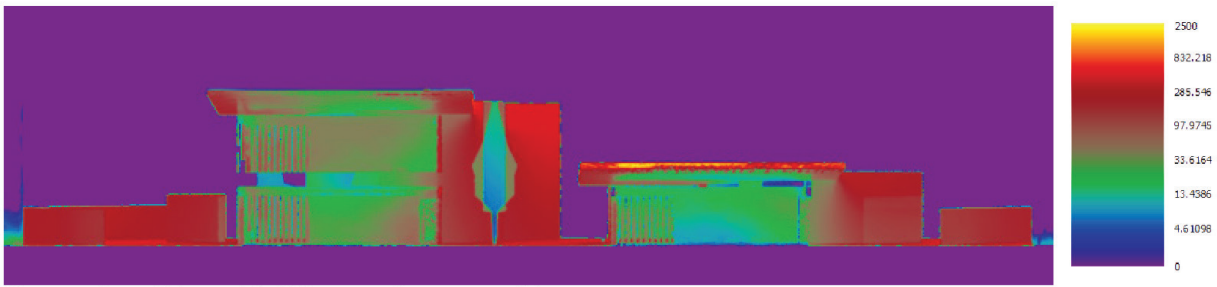
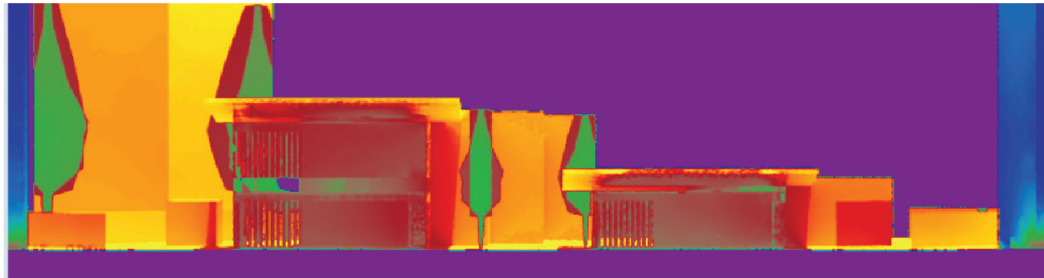


Fig. 4.38. Axonometric View of a typical module



December 21 at 12:00pm - Overcast Sky



June 21 at 12:00pm - Clear Sky

Fig. 4.39. Luminance maps - Section AA

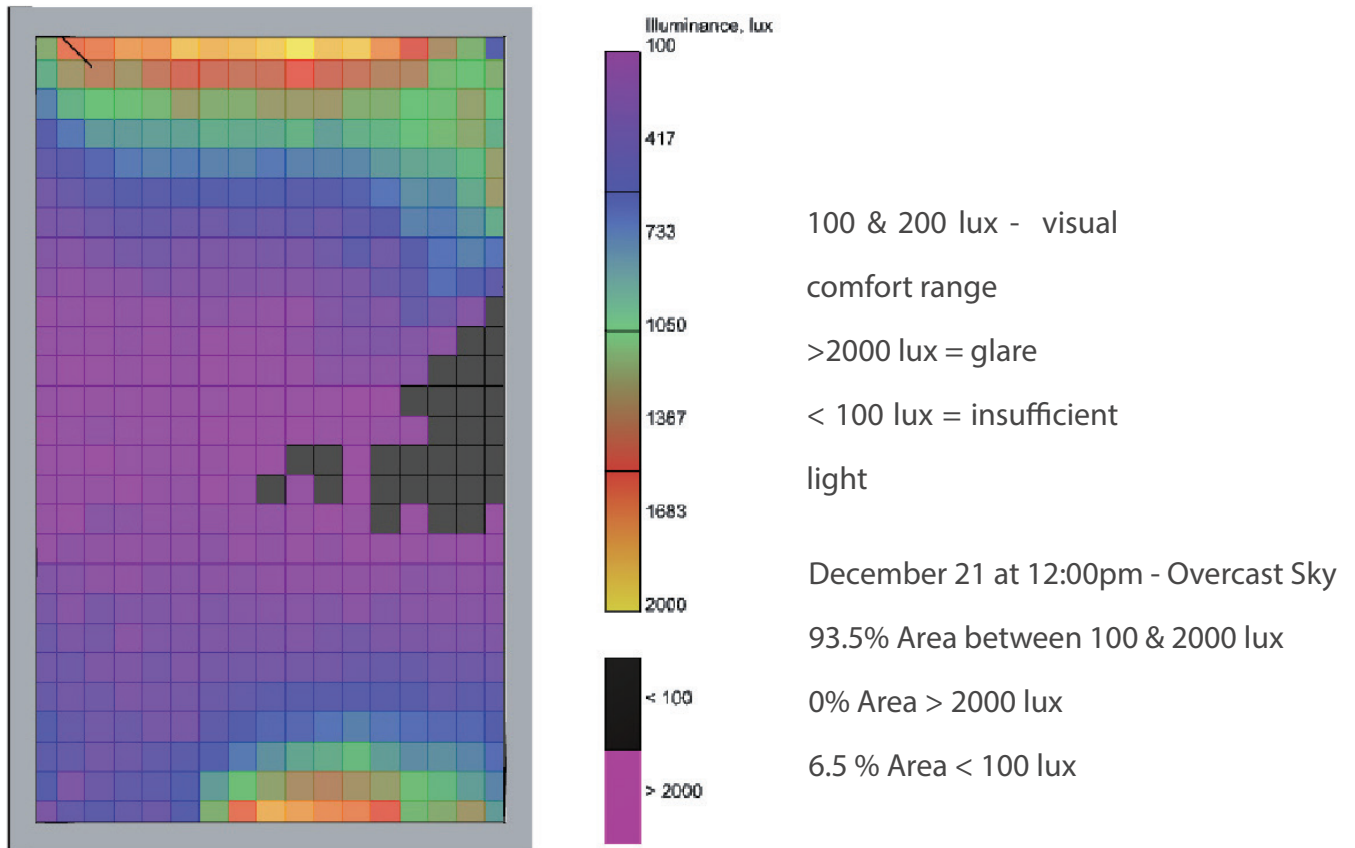


Fig. 4.40. Illuminance map - Plan

EARTH | BIOPHILIA

1. Visual connection with nature
2. Shade from trees improves thermal comfo
3. Provides fresh air to breathe
4. Roof farming helps grow food for the cent
5. Experiential learning
6. Permeable groundscape helps in flood-pro
7. Trellis functions as soft security barrier

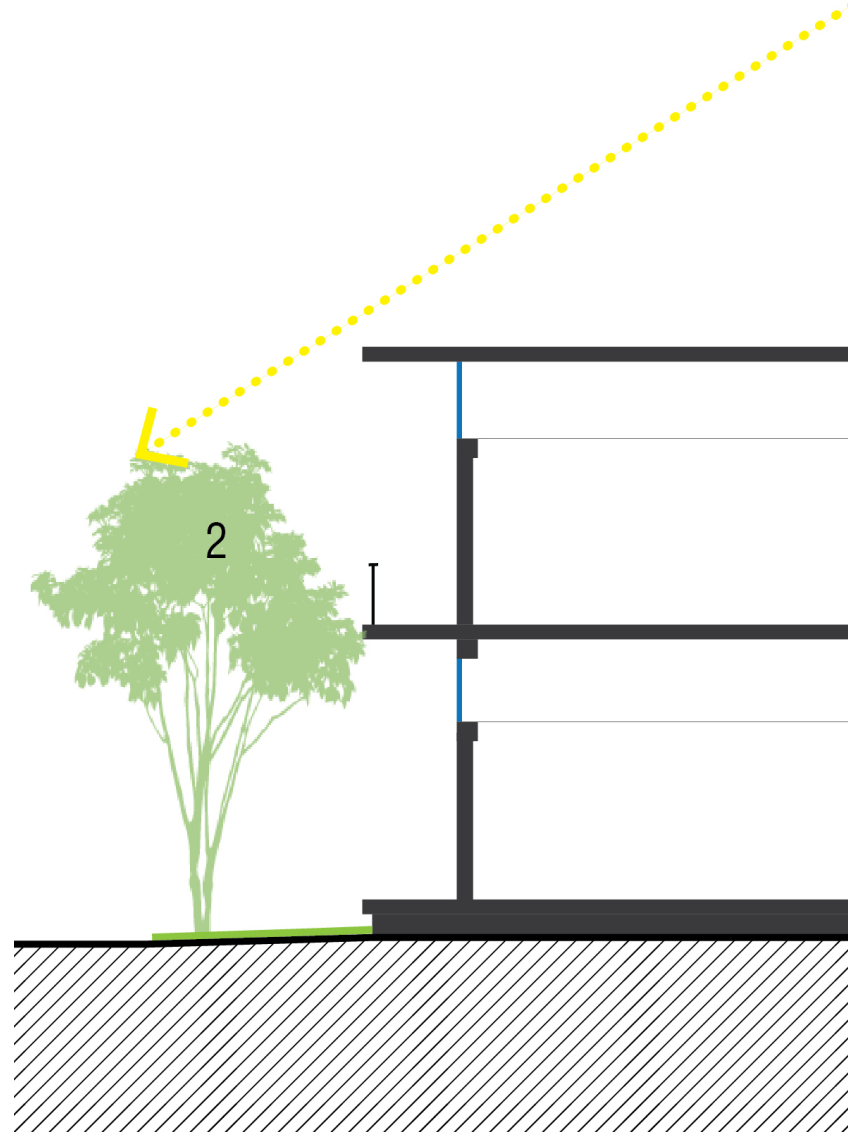
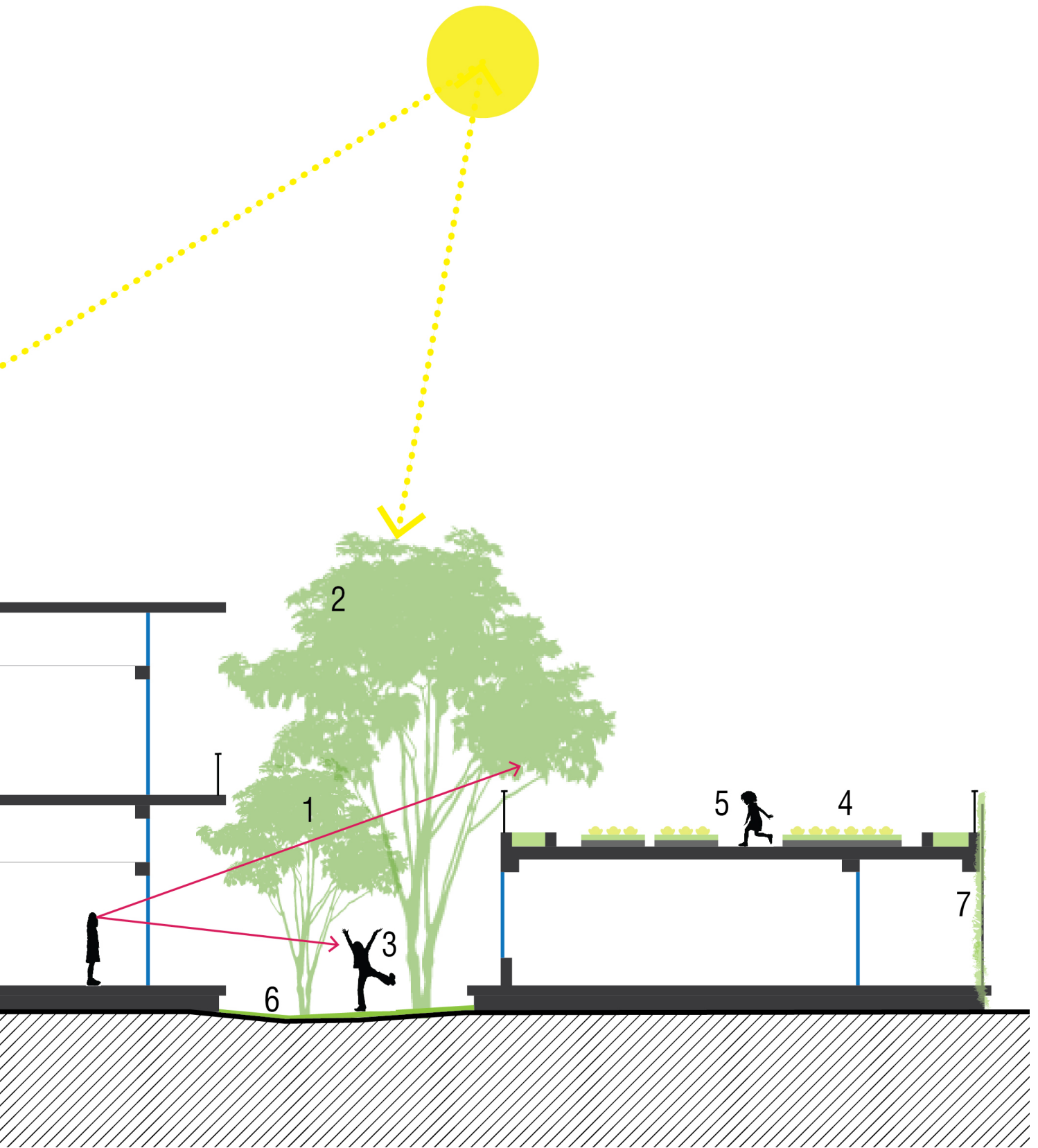


Fig. 4.41. Section AA showing vegetation



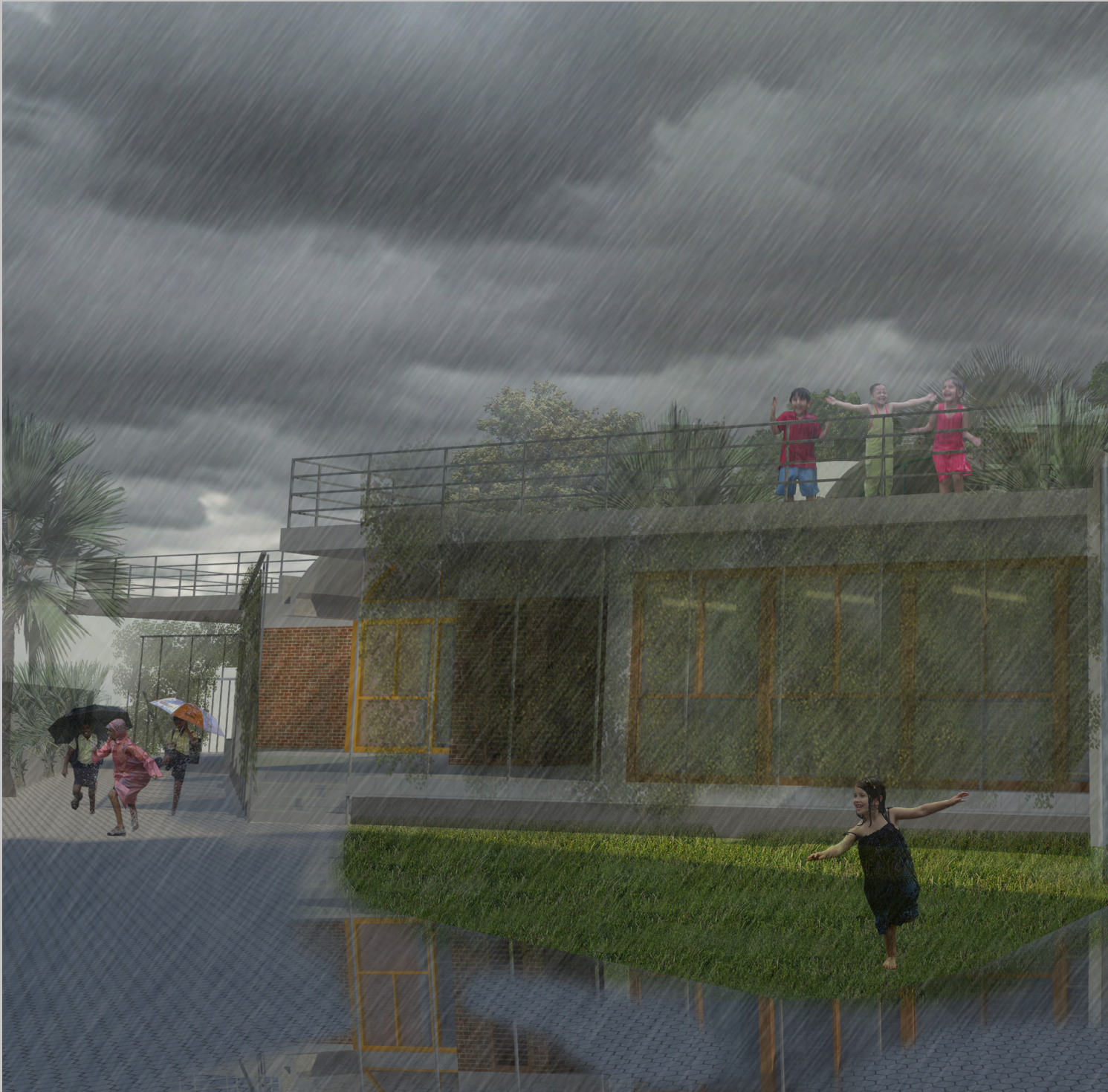


Fig. 4.42. Entrance View





Fig. 4.43. Looking back at green oasis





Fig. 4.44. Looking back at classroom blocks from roof farm





Fig. 4.45. Back Entrance to classroom blocks





Fig. 4.46. Inside a typical classroom at upper level





A photograph of three children standing outdoors. The child on the left is wearing a purple patterned shirt. The child in the middle is wearing a pink shirt with floral patterns and is smiling. The child on the right is wearing a red and white striped shirt with a yellow collar and is also smiling. They are standing in front of several vertical wooden poles. The background shows green trees and a clear sky.

5.0 CONCLUSION

"The most effective kind of education is that a child should play amongst lovely things"

- Plato

5.0 CONCLUSION

The re-design of RKSS does not merely regenerate its physical quality but also regenerates the quality of life of its occupants.

Through careful research on the impact of the physical environment on children's performance, documenting good quality early educational facilities in sub-developed countries, establishing an in-depth understanding of social, cultural and economic background of the users, a list of factors that would contribute to the successful re-design of this educational facility were laid out.

Through thoughtful planning, the project was brought closer to the community, children were put in the midst of a green oasis as their physical learning environment, a curriculum of learning by doing through architectural interventions was enforced, in addition consideration was given to climate-responsive design strategies at all stages of design development.

Generally sustainable learning environments focus on "green building" technologies and ignore other aspects of sustainability such as social development. While designing this project, it was important to thoroughly understand the role of the social environment and then to work on how the physical environment could be structured to support learning.

This responsive design approach understood the transactional relationship between learners and their learning environment and that sustainable design does not merely signify the integration of green principles, but rather how the learning environment – social and physical – can contribute to the development of the learner.



Fig. 5.1. Before



Fig. 5.2. After

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