SIR JAGADISH CHANDRA BOSE MEMORIAL COMPLEX AND CENTRE FOR INNOVATION

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Abstract

Acharya Jagadish Chandra Bose was a man ahead of his time. He accomplished and surpassed many hurdles and deviated many laws of science. He was known for being a polymath and established Calcutta Bose Institute. Born in Rarikhal village currently situated in Munshiganj zilla, Sreenagar thana.

Still the las remaining architecture of his life remains with negligence. In such a context I have proposed to develop a Memorial Complex to be introduced which will have a Museum and a Science practicing platform, an innovation center. Through this built environment the scientist's passion and vision of work for the country and for the global community will be elevated and will be continued to a greater scale.

Concurrent situation of Bangladesh addresses the lack of practice and opportunity to practice science and experiments. The Global Innovation Index declared our country to be least innovative country and the further understanding. For this kind of a state of market where the scholars are dealing with brain drain and while the market is orienting experiments and researches such a platform will be beneficial for our growth. With the knowledge of Acharya J. C. Bose along with the innovation center for practice experiments and showcase them to the world it has the potential to be the regional hub for science and research.

Chapter 1 : INTRODUCTION

1.1. Project Introduction
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1.1 Project Introduction

Sir J. C. Bose contributed in scientific exploration as our countrymen and his innovations and exploration lead the path of modern plant neurology. Many of us don't know how he managed these break throughs. As he was a polymath got the multi-diverse understanding of various fields and accumulated all of them to achieve truth. He accomplished being physicist, botanist, biophysicist, archaeologist and one of the early writers of science fiction (first science fiction writer in Bengal). Born 10th November 1858 in Munshi-Ganj, Bengal presidency (present day Bangladesh), graduated from St. Xavier's College, Calcutta. Later went to University of London to study Medicine where he couldn't complete as fell ill. Then he continued his research with Nobel Laureate Lord Rayleigh at Cambridge then returned to India. As we all know the controversies of Marconi getting all the credit for Radio system due to patent ship of his invention. Bose's work in radio microwave optics specifically directed towards studying how it was working rather creating a device of communication was unintended. His other inventions like Cresco-graph, seasonal impact on plants where chemical inhibitors on plant stimuli and the effect of temperature. From his life it is clear that his vast understanding of multi paradigms and subjects gave him the ability to think in a connective manner. He died 23rd November 1937 where he laid the foundations of experimental science in Indian subcontinent.

Now, for the purpose of such architecture is to understand the envisions and progressions of J. C. Bose. In today's world we thrive to make our lives better with modern interventions and ideas and this man contributed in such paradigm. To continue his legacy and journey of exploration such project is needed. In our country science and invention are quite a bit are in poor state for lack of funding and proper learning environment. The learning centre can also contribute to this cause not only enhancing our country but also in global scale. Furthermore, history should be preserved and cherished to our betterment and thus we can actually contribute as a global citizen. The first man sparked fire created this modern life and we would turn static if we stop being curious and explorative.

1.2 Project Brief

Memorial complex suggests a physical build environment for the purpose. It may be built for recalling an incidental value, a person's memoranda, great historical achievements, etc. As my project is on a great man who not just laid a path for us but also contributed as a global citizen. Such work and accomplishment need progression and continuation. A memorial complex with museum, library, public occasional gathering for innovation fair, research facilities for enthusiasts, professionals, entrepreneurs can actually provide a hub like built environment for further development and progression. As the man who laid the

path of such exploration is the main source of inspiration led to a decision to take the site at his birthplace. Around 30 km away from the capital Dhaka his birthplace at Bikrampur, Srinagar thana to be specific lies very close to the banks of Padma river. According to G. Patrick in his book The Life and Work of Sir Jagadish C. Bose stated that he spent his early education and childhood here in Bikrampur played a great role to give shape to such prodigy. Site was chosen on an existing institute and school named after J.C. Bose. Erected on 1921 this institute is almost getting lost in time failing to preserve the ideas and essence of his work. Consisting of around 6 acres of land with diverse natural formations like mounds and ponds enclosed with lush green, the place is without any debate the perfect place to hold such architecture and will help to create needed environment.

1.3 Programs

Architecture to hold the memory and essence of Sir J. C. Bose, his life work thoughts, growth, understanding, philosophy. Such environment can be achieved through holistic public place and concentrative learning centre. The idea of having the memorial complex with adequate functions like galleries, libraries, interaction zone, historical preservation of Bengal development and such holds the past. On the other hand the innovation centre focuses on the ongoing development not in an academic manner but more public oriented. A place showcasing current scientific explorations giving them a platform to flourish and progress with the acknowledgment of the outer world. For a brief idea innovation centre may hold laboratories, seminar halls, entrepreneurship and start-ups space, dormitories to facilitate enthusiasts coming from long distance.

1.4 Background of the project

This project may seem like a new idea rather is a new image of the old one. Currently the institute is only a local school just holding Sir J. C. Bose name on it. Museum part is completely abandoned and currently being used as a dump zone. His own residence is being processed as an archaeological site holding heritage value yet to pass. All of these situations are giving negative impact on the mere existence of such figure. “Another birthday of great scientist Sir Jagadish Chandra Bose is set to pass off today silently.”

(Correspondent Munshiganj, 2006). Such a man should not die like that, as he dedicated his whole life for his countryman. Bengal renaissance happened in 19th century and this man was one of the major part of it in this specific sector.

1.5 Project Rationale

A place is static and hold memory in history. There are many ways to assure preservation and continuation of philosophy, progression and hold one's work and acknowledge. But there is no better way to do it without architecture. We symbolise memories and essence of the purpose into physical built environment. The previous architecture had a static tendency of preservation which had a lacking in spreading motivation and inspiration to the end user. Now to enhance the situation and coming out of the looping paradigm to an all accessible holistic built environment. It will hold the past and the present as will give a platform to all the new science explorers and enthusiasts not only in local context but also in international platform. "For on one hand Bose is the first Indian of modern times who has done distinguished work in science, and his life story is thus at once of interest to his scientific contemporaries in other countries and of encouragement and impulse to his countrymen." (Geddes, 1920). Such an acknowledgement was visible even to a foreign writer and botanist that it should be cherished by us surely.

1.6 Aim of the Project

To simply put this project would create an awareness in all of us that our man had done such work to get inspired in their own explorations. As we were engulfed by the treacherous paradigm of racism and oppression, we have a long demoralising history of our own which we cherish more often, rather we should acknowledge the beauty of all these matters happened in time fighting against such situations. Sir J. C. Bose had such inspiring life that we could follow as an example in our further life and continue his legacy. Also, the place would be a hub for us and the world where it would act like stage to show everyone the power of innovation, exploration, and creativity.

- A Complex for dedicated innovation.
- Junction for entrepreneurs, business mans, companies with explorers, inventors, innovators, scientists, enthusiasts along with public affiliation.

- A place or environment to facilitate such exploratory notions and intentions.
- Creating secluded space for inventors and scientists.
- Learn to innovate and explore from schooling
- Hub for the whole country for scientific innovation purpose
- Global landmark for such purpose
- Local progression through indigenous innovation approach

Chapter 2 : Literature Review

2.1Historical overview

2.2Life and Work of Sir J. C. Bose

2.3Contextual overview

2.4Image of the Memorial Complex

2.5Archeological perspective

2.6Understanding Innovation center

2.1 Historical Overview

Bengal renaissance, generated in 19th century had a great influence in progression of holistic Indian culture. Awareness in cultural aspects resulted in a social as well as intellectual awakening. Many philosophical changes in religious, social, economic conditions helped this region to come out of many orthodoxies. Those men and their thinking behind the uprising were Rabindranath Tagore, Sir J. C. Bose, Raja Ram Mohon Roy, etc. They are the pioneer of such movement. Their Kindle is still lighting the fire of our very existence to this day. As for a tangible result of such work refers to all the cutting edge inventions of the first generation of Bengali scientists like Sir J. C. Bose. His legacy was duly carried by the second generation that saw the emergence of Satyendranath Bose who developed two theories of quantum mechanics alongside Einstein. How fatal is it that very few of our countrymen know about such accomplishment and contribution denying this man's legacy? (Munim, 2011) "Internationally renowned cosmologist Prof Jamal Nazrul Islam was one of the three Bangalee scientists who made fundamental contributions to the world science, poet Abul Momen said at a commemorative meeting. He said the two others were Sir Jagadish Chandra Bose and Satyendranath Bose. Why this fact of three should continue rather many more to be added is much more appreciable. As per scientific exploration and findings contributing in global progression Sir J. C. Bose Discovered and invented almost hundred individual breakthroughs. Almost all of them are kept and preserved in J.C. Bose Institute in Calcuatta, India.

2.2 Life and Work of Sir J. C. Bose

2.2.1 Childhood and Early Education

Sir J.C. Bose Born in Rarikhal, Bikrampur, Munshiganj and lived with his parents until he was eight years of age. He had a younger sister and also enlightened like him. His father was an empowered man who worked for the British government. Sir J. C. Bose was encouraged to study in the traditional manner as his father had a belief in culture and root. He was sent to local school in Faridpur until entrance exam.

2.2.2 College Days, England

At sixteen Jagadish passed from St. Xavier's College; where he fell under the influence which determined his turning to physics, rather than natural history. Father Lafont as a professor of physics influenced young Jagadish.

2.2.3 Early Struggles

2.2.4 Inventions

Research on Radio

The Scottish hypothetical physicist James Maxwell scientifically anticipated the presence of electromagnetic radiation of differing wavelengths, however he kicked the bucket in 1879 preceding his expectation was tentatively confirmed. Somewhere in the range of 1886 and 1888, German physicist Heinrich Hertz distributed the aftereffects of his examinations on electromagnetism, which demonstrated the presence of electromagnetic waves in free space. Accordingly, English physicist Oliver Cabin, who had additionally been looking into electromagnetism, directed a memorial address in August 1894 (after Hertz's demise) on the semi optical nature of "Hertzian waves" (radio waves) and showed their similitude to light and vision including reflection and transmission at separations up to 50 meters. Hotel's work was distributed in book shape and grabbed the eye of researchers in various nations, incorporating Bose in India.

The principal momentous part of Bose's subsequent microwave examine was that he lessened the waves to the millimetre level (around 5 mm wavelength). He understood the hindrances of long waves for concentrate their light-like properties.

Amid a November 1894 (or 1895[22]) open show at Town Lobby of Kolkata, Bose lighted black powder and rang a chime at a separation utilizing millimeter extend wavelength microwaves. Lieutenant Representative Sir William Mackenzie saw Bose's exhibition in the Kolkata Town Corridor. Bose wrote in a Bengali article, Adrisya Alok (Imperceptible Light), "The undetectable light can without much of a stretch go through block dividers, structures and so forth. Consequently, messages can be transmitted by methods for it without the intercession of wires."

Bose's first logical paper, "On polarization of electric beams by twofold refracting precious stones" was conveyed to the Asiatic Culture of Bengal in May 1895, inside a time of Cabin's

paper. His second paper was imparted to the Regal Society of London by Ruler Rayleigh in October 1895. In December 1895, the London diary Circuit tester (Vol. 36) distributed Bose's paper, "On another electro-polariscope". Around then, the word coherer, authored by Cabin, was utilized as a part of the English-talking world for Hertzian wave recipients or identifiers. The Circuit tester promptly remarked on Bose's coherer. (December 1895). The Englishman (18 January 1896) cited from the Circuit repairman and remarked as takes after:

Should Teacher Bose prevail with regards to consummating and licensing his 'Coherer', we may in time observe the entire arrangement of drift lighting all through the traversable world altered by a Bengali researcher working independent in our Administration School Lab. Bose wanted to "culminate his coherer" yet never thought of protecting it. Graph of microwave collector and transmitter device, from Bose's 1897 paper.

Bose went to London on an address visit in 1896 and met Italian designer Guglielmo Marconi, who had been building up a radio wave remote telecommunication framework for over multi year and was endeavouring to showcase it to the English post benefit. In a meeting, Bose communicated his lack of engagement in business telecommunication and proposed others utilize his examination work. In 1899, Bose declared the improvement of an "iron-mercury-press coherer with phone indicator" in a paper displayed at the Imperial Society, London. Bondyopadhyay, P.K. (January 1998).

Development

Bose' work in radio microwave optics was particularly coordinated towards concentrate the idea of the wonder and was not an endeavour to form radio into a correspondence medium. His examinations occurred amid this same period (from late 1894 on) when Guglielmo Marconi was making leaps forward on a radio framework particularly intended for remote telegraphy and others were finding useful applications for radio waves, for example, Russian physicist Alexander Stepanovich Popov radio wave base lightning indicator, likewise roused by Hotel's experiment. In spite of the fact that Bose's work was not identified with correspondence he, similar to Cabin and other research centre experimenters, presumably had an effect on different designers attempting to create radio as interchanges medium.

Bose was not intrigued by licensing his work and straightforwardly uncovered the task of his galena precious stone identifier in his addresses. A companion in the US induced him to take out a US patent on his indicator yet he didn't effectively seek after it and enabled it to lapse." Emerson, D. T. (1997)

Bose was the first to utilize a semiconductor intersection to distinguish radio waves, and he concocted different now-ordinary microwave components. In 1954, Pearson and Brattain offered need to Bose for the utilization of a semi-directing precious stone as an indicator of radio waves. actually, additionally work at millimetre wavelengths was nearly non-existent for the accompanying 50 years. In 1897, Bose portrayed to the Imperial Establishment in London his exploration did in Kolkata at millimetre wavelengths. He utilized waveguides, horn receiving wires, dielectric focal points, different polarisers and even semiconductors at frequencies as high as 60 GHz. A lot of his unique hardware is still in presence, particularly at the Bose Organization in Kolkata. A 1.3 mm multi-pillar beneficiary presently being used on the NRAO 12 Meter Telescope, Arizona, US, joins ideas from his unique 1897 papers.

Sir Nevill Mott, Nobel Laureate in 1977 for his own particular commitments to strong state hardware, commented that "J.C. Bose was no less than 60 years comparatively radical. Truth be told, he had foreseen the presence of P-sort and N-type semiconductors." Emerson, D. T. (1997)

Metal fatigue and Cell response study

Fatigue response analysis was another achievement of J. C. Bose where he compared metals with organic tissue in plants. This research laid the path towards discovering and deviating scientist’s focus towards organic matter as both the cell and metal showed similar responses and the cell showed cyclic responses as per living organism. He Noted and demonstrated similarity in reduction of elasticity between cold metal wires and organic cells. Gutenberg.org (3 August 2006)

2.2.5 Philosophical contribution

Young Jagadish was enlightened with philosophy from his early childhood. From naturalistic perspective to phenomenologist approach passed on to him through his grand parents and

parents. A quaint reminiscence of child grandmother. A devout soul, often in prayer, she was wont daily to model in clay, to concentrate her devotions, an image of Shiva: and this, after worship and offering of flowers, was thrown back to earth- an evidence, we may note in passing, that 'idolatry is not so idolatrous as we are often told, but may be purely symbolic. This well-kneaded clay was valued by the children for their fewer spiritual efforts; and little Jagadish won't to wait patiently until worship was over, and he could claim the image, no longer sacred, for modelling of playthings. But one day the devotion was unusually longer. Jagadish ran off with the image beforehand while his grandmother got shocked, later had to deal with the offender rather gently and brahmins, poor were fed, and other expiatory rites performed. (Geddes, P. 1920)

Acharya J. C. Bose was the first science fiction writer. He wrote few short stories too. One of his short stories was "Palatak Tufan". Jagadish was later considered as a polymath where he had multilateral understanding of various subjects in a connective manner. He not only was a physicist also biologist, botanist, writer, archaeologist, microbiologist.

Figure 2.2.6.1: Image of J. C. Bose. Maloney, D (January 19, 2016)

2.4. Image of the Memorial Complex

Death is something that nobody wants, however as it is a characteristic marvel you essentially can't maintain a strategic distance from it. Passing of individuals who are near you or of another person whom you know continually bring torment. In any case, rather than being passionate you have to deal with the demise of a man legitimately. As indicated by Tyron Edwards, "Calm and genuine sensitivity is regularly the most welcome and effective encouragement to the harassed".

Being sensitive and sympathetic towards the demise individual, dedications can be very valuable. The word 'memorial' gets from the Latin 'memos' which actually signifies 'mindful'. Accordingly, with commemorations the recollections related with the demised individual dependably stay with us in various ways.

Remembrances likewise fill in as a perpetual record for who and what is to come and genealogy. Memorials permit family, companions and the network to think about their past age.

Burial grounds offer the open door for you to set your remembrances in stone or bronze for who and what is to come, fulfilling a quick need and saving our legacy. At the point when remembrances are put in the incineration ground, you can feel the nearness of the expires. It isn't important to spend a fortune on purchasing commemorations. You can purchase an unobtrusive or an excessive one relying on your financial plan and inclinations.

To close, demise comes thumping on each entryway, and you are left with no decision yet to grieve quietly while life passes away. In any case, now you can give your friends and family the benefit of being respected and associated with ages to accompany remembrances.

2.5. Archaeological perspective

Archaeology department of Bangladesh has recognised Sir J. C. Bose’s own house as an Archaeological site since 1974. Later there was no initiative for such historical site. The building is holding its breath and almost getting destroyed due to lack of maintenance. Concurrent government has taken some initiative and planning to develop the site and preserve the building but no progressive work has been done yet. From 1921 J. C. Bose institution and college was established around the site. Where they have almost forgot and completely ignored such

archaeological and historical landmark. Recently two new buildings were erected just 7 feet away from the old building denying all the law.

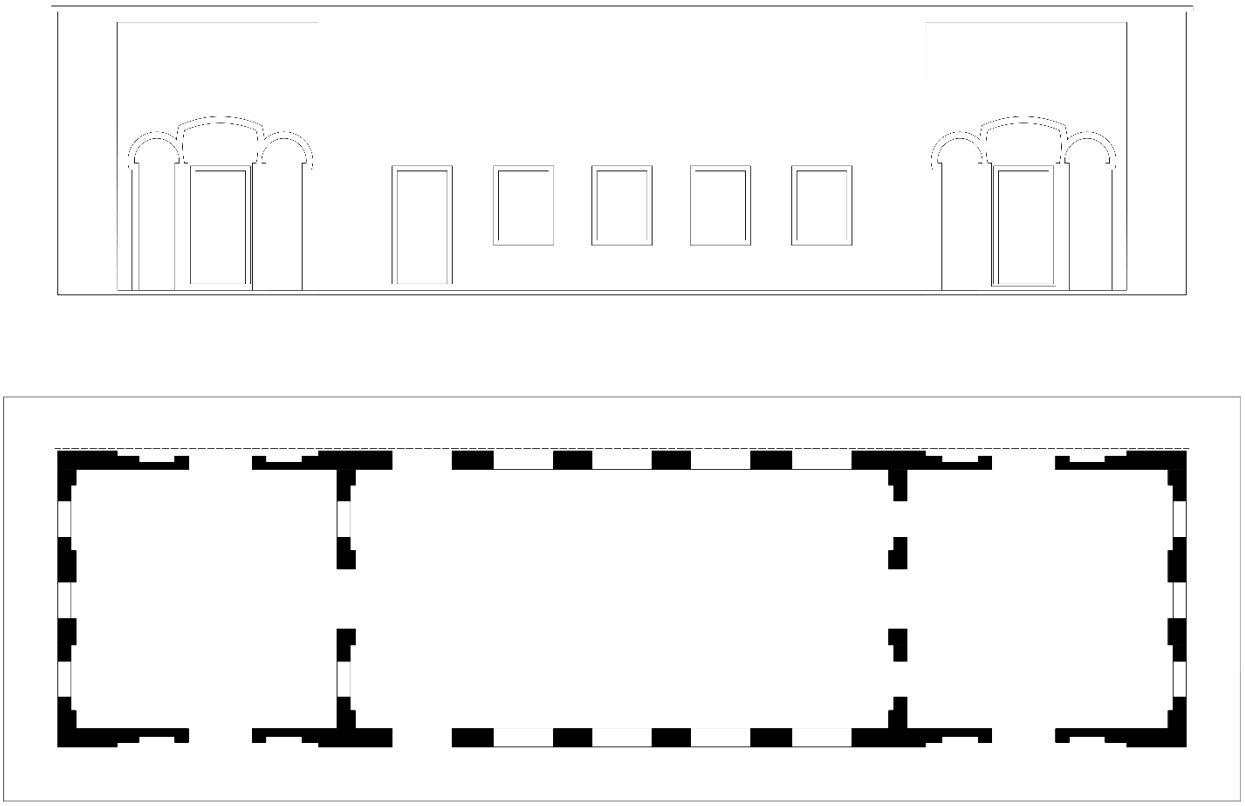


Figure 2.5.1: Showing J. C. Bose's own house front elevation and plan. Islam, N. (August 7, 2018).

2.6. Understanding Innovation Centre

Innovation centre conglomerate innovation, Research, development with consumer market stability, new business possibilities, entrepreneurship, young firms. Innovation centre can be dedicated to one focus or can act like a hub for all. It can be centre which binds utopia and reality. Innovation centre can facilitate with adequate infrastructure. The system should approach to new independent innovators rather waiting for them to access the service. Promotion and motivating young is also a motive of such architecture.

Chapter 3 : SITE AND CONTEXT ANALYSIS

3.1 Background of the Site

3.1.1 Geographical

Sreenagar is located at 23.5361°N 90.2917°E. It is located in between Dhaka Mawa highway. Starting from Dhaka south point departure Zatrabari towards mawa, a bypass route taken from Sonbari will lead to rarikhal mainroad. J.C. Bose Complex situated just beside the road. Almost all of the roads are pitched and will produce a smooth journey. Sreenagar Upazila is under Munshiganj district

Figure: 3.1.3.1 showing Sreenagar Upazila boundary and zonal boundary lines and road network

3.1.2 Socio-Cultural

Sreenagar has 36344 households in it. Sreenagar Upazila (munshiganj district) area 202.98 sq km, located in between 23°27' and 23°38' north latitudes and in between 90°10' and 90°22' east longitudes. It is bounded by serajdikhan and nawabganj (dhaka) upazilas on the north, lohajang and shibchar upazilas on the south, Serajdikhan and Lohajang upazilas on the east, Nawabganj and dohar upazilas on the west.

Population Total 228771; male 114878, female 113893; Muslim 203366, Hindu 25338, Buddhist 38, Christian 16 and others 13.

Water bodies Main rivers: padma, ichamati.

Administration Sreenagar Thana was turned into an upazila in 1983.

Literacy rate and educational institutions Average literacy 52.6%; male 54.1%, female 52.2%. Educational institutions: college 4, vocational institute 1, secondary school 22, primary school 96, madrasa 31. Noted educational institutions: Hasara KK High School (1879), Bhagyakul Harendra Lal High School (1900), Beltali GJ High School (1901), Kukutia KK Institution (1904), Sholaghar AKSK Multilateral High School (1925), Baghra Swarup Chandra Pilot High School (1920), Rarikhal JG Basu Institution and College (1921), Rushdi High School (1924).

Cultural organisations Library 1, club 303, cinema hall 3, stadium 1.

Main sources of income Agriculture 36.12%, non-agricultural labourer 2.47%, industry 1.99%, commerce 23.60%, transport and communication 2.97%, service 12.83%, construction 3.01%, religious service 0.21%, rent and remittance 6.96% and others 9.84%. collected from Bangladesh Population Census 2001, Bangladesh Bureau of Statistics; Cultural survey report of Sreenagar Upazila 2007.

3.1.3 Climatic

Sreenagar upazila situated near the bank of Padma has mostly alluvial land formation created form flood siltation. It is under monsoon climatic zone where the land is extremely flood prone and has a unique architectural style to deal with such condition. In the figures shown below in 3.1.3.2 to 3.1.3.4 clearly seen that the site is under flood prone zone, average rainfall of 1500-2000 mm and 3 to 10 meters from the sea level shown in contour map. The land formation for settlement are made along the road networking with every household holding a pond attached gives climatic benefit from extreme heat and water source for daily use. Flood is acknowledged in this zone where heavy siltation happen and land filling are done using this natural phenomenon in three to four years of time.

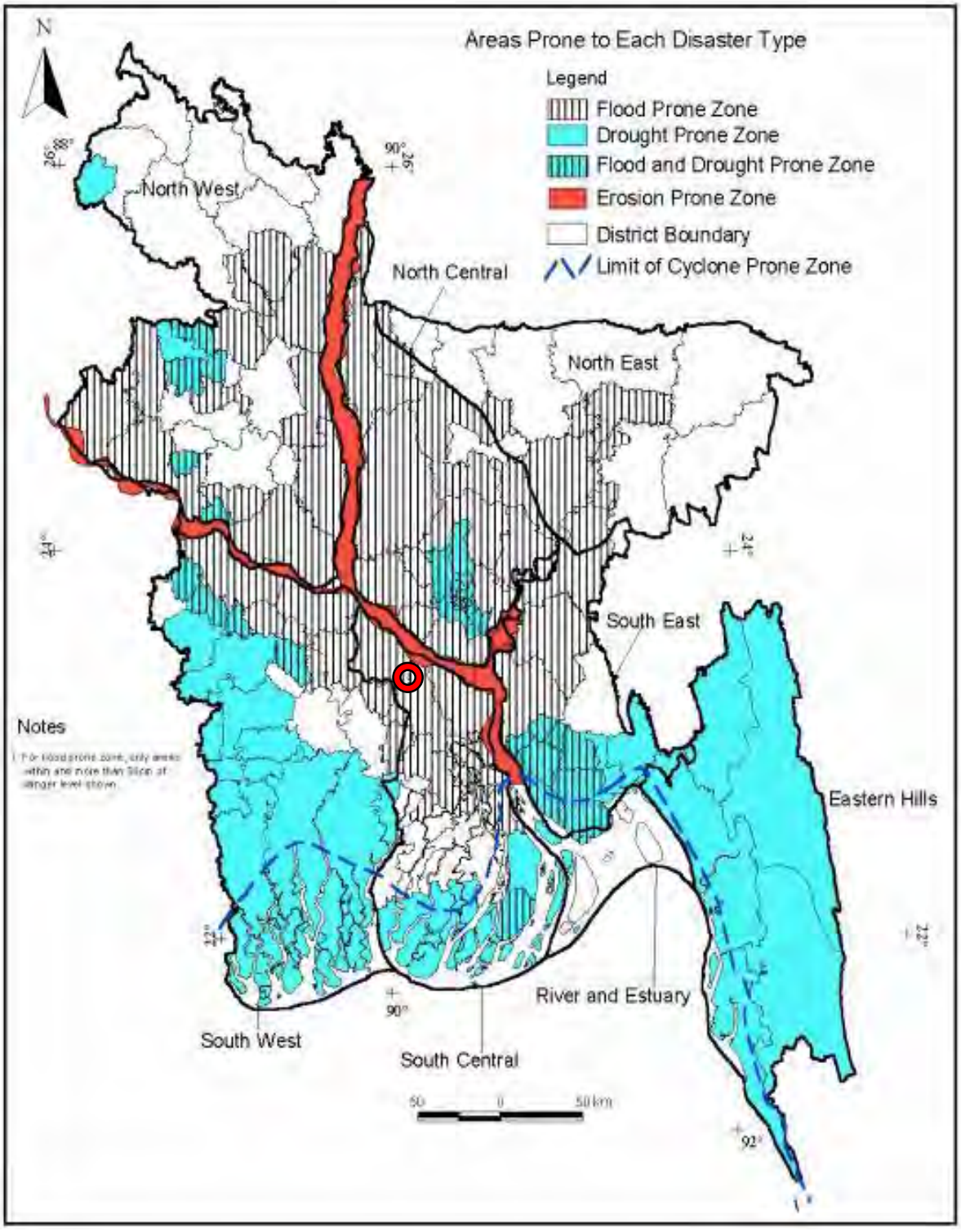


Figure: 3.1.3.2 showing Bangladesh map prone to disaster and Site position, Banglapedia

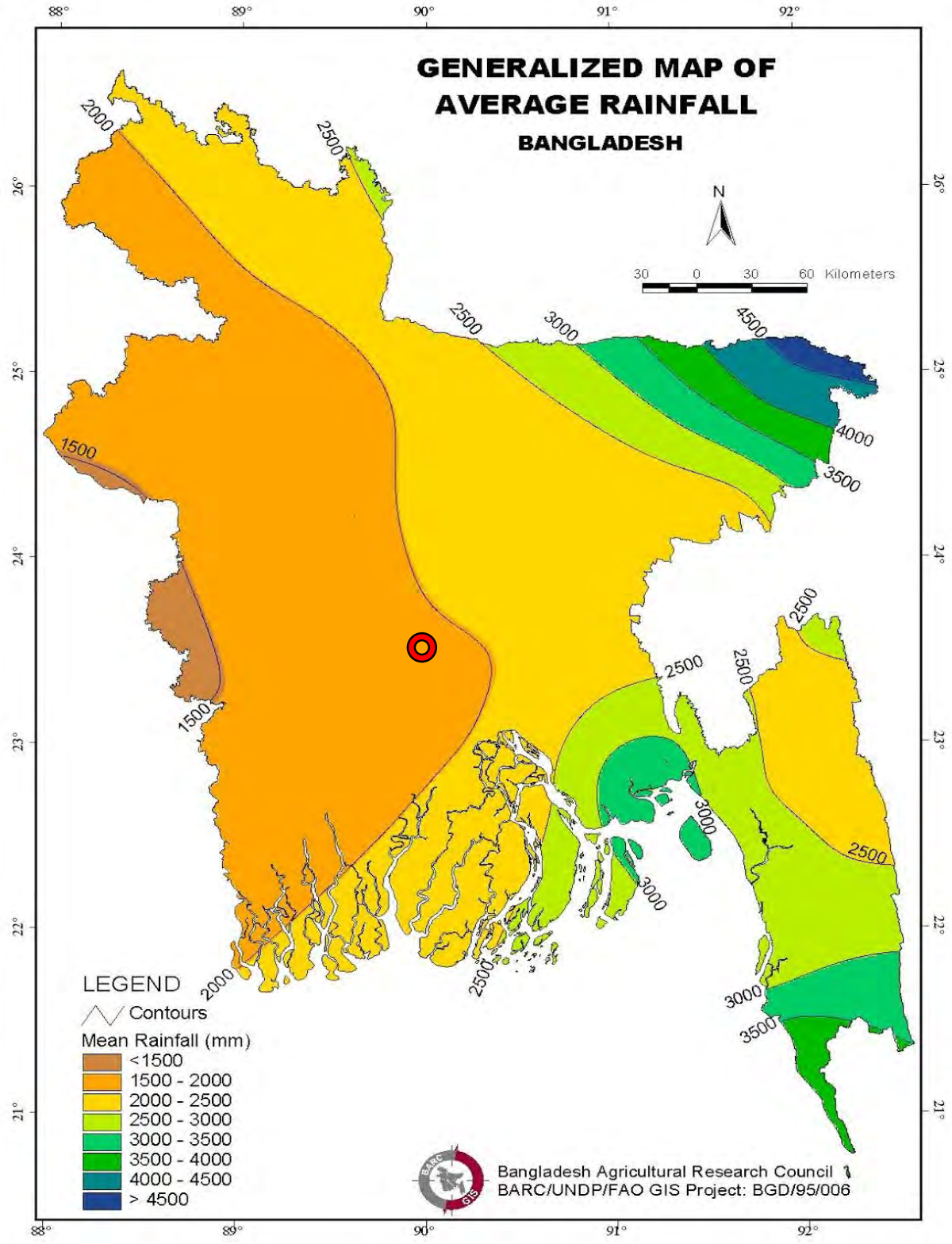


Figure: 3.1.3.3 showing Bangladesh map Average rainfall and Site position, Banglapedia

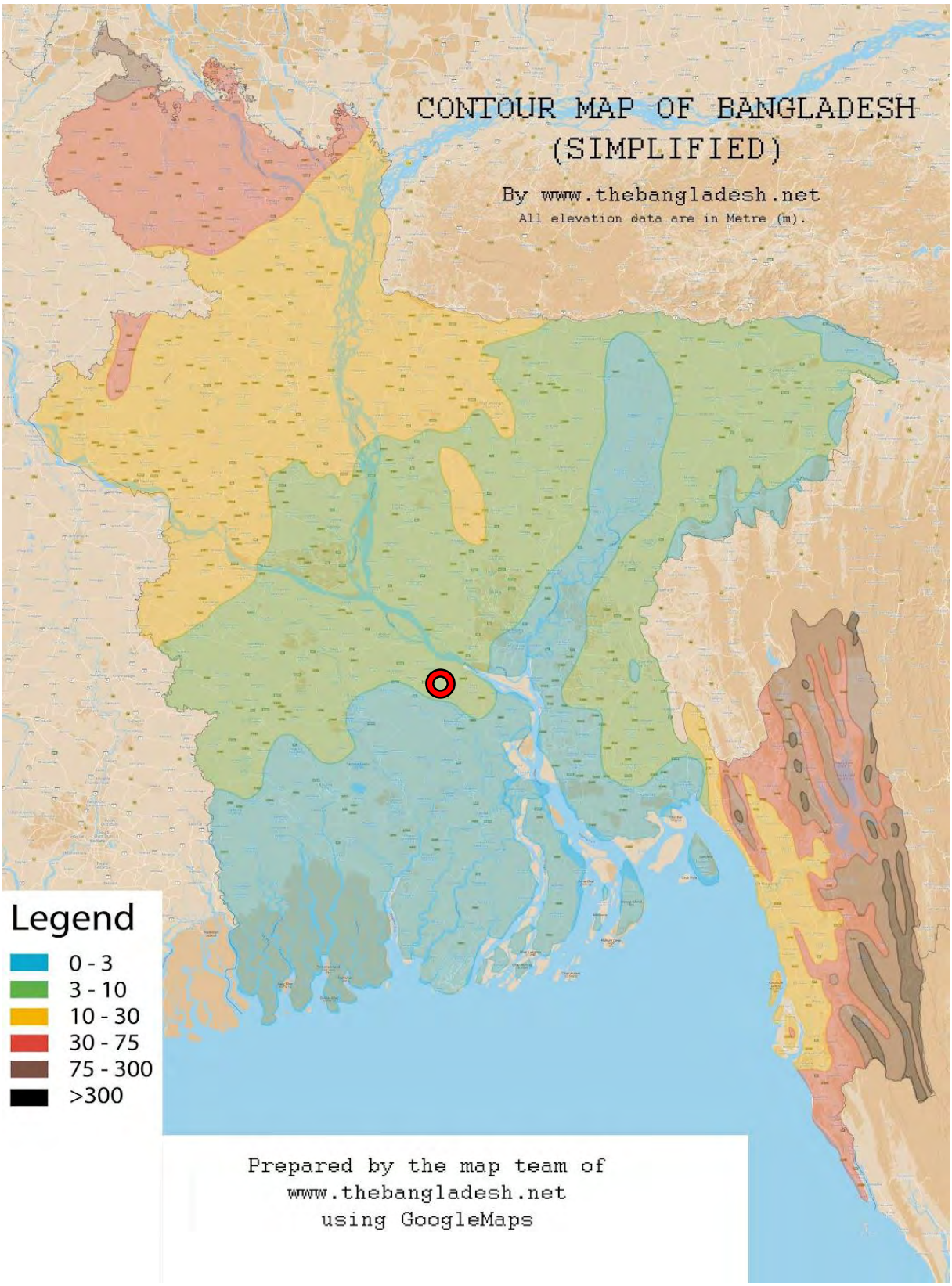


Figure: 3.1.3.3 showing Bangladesh Contour map simplified and Site Position, banglapedia

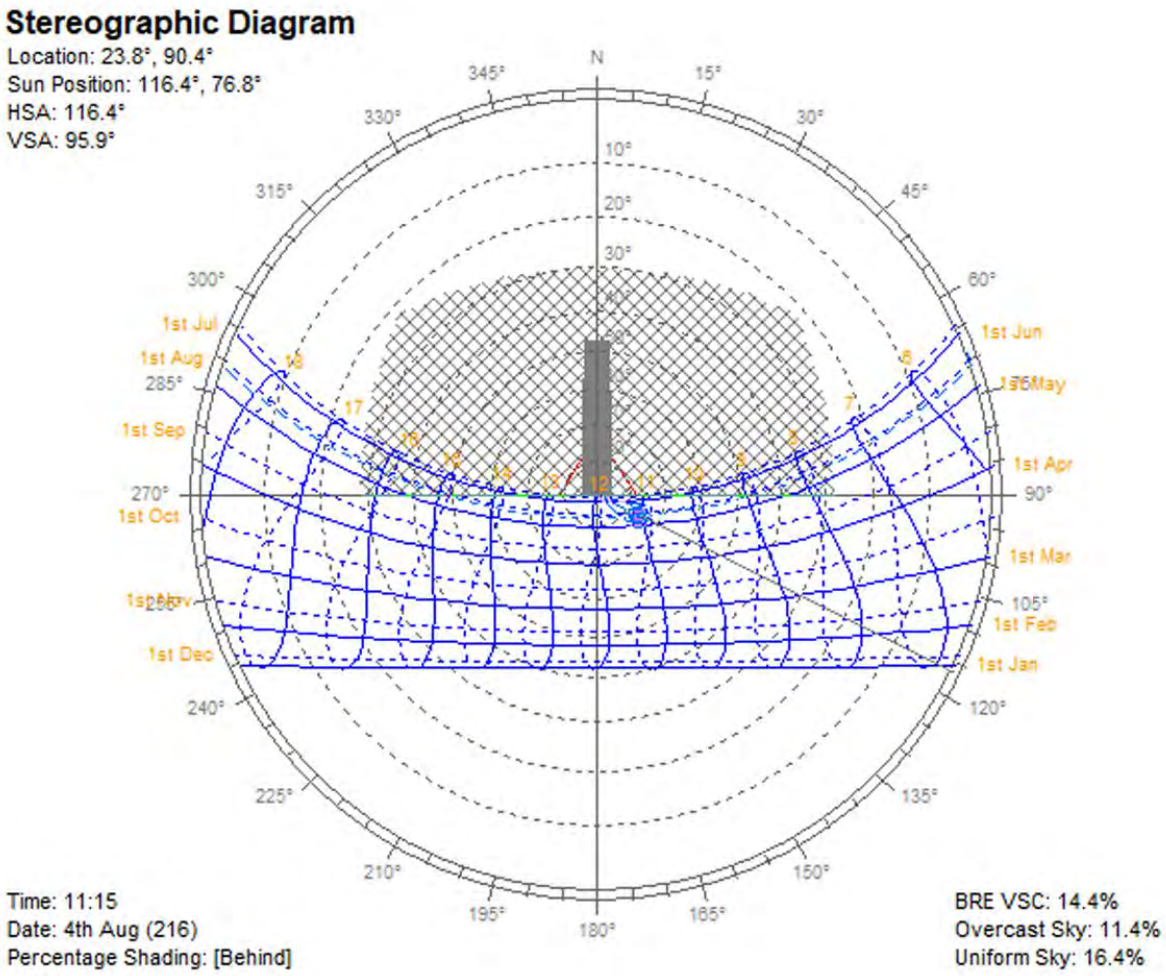


Figure: 3.1.3.4 showing stereographic Diagram of solar positioning and shadow cast using ECOTECT ANALYSIS, Nurul. August 4, 2018.

From this Diagram its clearly visible that the sun has a high altitude in summer time almost hitting the 90 degrees. Winter days are shorter and sun altitude is low to 70 degrees where its needed. This diagram was created based on weather data and simulated in ECOTECT ANALYSIS software on the day of August 4, 2018. As per the data such analysis can be produced for any day of the year. Even can be read and found desired information from the diagram itself. The circular outer ring is the azimuth angle, vertical line holding angles are for sun altitude, circles inside the outer one is altitude lines, blue line is yearly sun path. Central hatched area shows the possible shadow casting and possible spread area. Vertical blue curve lines are solar anomaly showing day positioning deviation.

3.1.4 Historical

Historically rich, Sreenagar Upazila was once a main vantage point of business. When it was all India it was under Bengal presidency and had all sort of development. Bengal renaissance had a major play in changing and developing the area form just a business center point to a mini city. Bikrampur had its advantage as per its connectivity to the water route. Later social development happened and schools and colleges were created for enlightenment purpose. Sir J.C. Bose institute and college was also a specification to such development. Later after the Continental division and new country formation the cultural state of this area had changed as many of the influential settlers migrated to India. After the liberation war this place had another change and was developing as a rural region. In 1974 J.C. Bose complex was introduced to this land to conglomerate the contribution of such man. But it stayed in its idea only with almost no progression to the thinking and the place until now.

3.2 Site at a glance

Sir J.C. Bose Complex located at Rarikhal, Dhaka-Dohar Highway, Sreenagar, Munshiganj. Sir Jagadish Chandra Bose (30 November 1858 – 23 November 1937). Born in Mymensingh- "Bengal Presidency" during the British Raj meaning Bikrampur (now in Munshiganj, Dhaka). His early life was started in Kolkata, but his paternal house is still there in Rarikhal, Sreenagar, Munshiganj. Now, his birthplace has turned into a park like memorial complex. Surrounded by low cultivating land and distributed settlements mostly this area acts as a rural one. Road Networking are minimal and straight with adjacent connection to different entries. From the road the site is divided or recessed around seventy feet holding two large ponds. One site is the college erected in 1921 named after Sir J. C. Bose. Another one is the Memorial complex with park. Both having around 4 acres of each land area. Cumulative eight acre in total. Adjoining road is the Dhaka to Dohar primary road and two secondary road leading to inner village areas. All of them are pitched and well connected. All of the roads are on an average 15 to 20 feet above form fields which are 3 to 4 feet above from water level. Site is three KM away from the main village centre. Site is surrounded by residential and agricultural plots. Accessibility of the site is clear and easy. Has the possibility to be a centre of the area.

Figure: 3.2.i Map view Showing site position and Road Network placement. (Author, 2018)

3.2.1 Location of the Site

From the bypass taken from shonbari bus stand the site can be found on the straight path followed. The spine road known as Dhaka dohar highway grid no R820 will take any visitor to the destination.

Sir Jagadish Chandra Bose Complex 23.518630, 90.250020

Sir Jogdish Chandra Bosu Institution & College 23.518787, 90.248980

3.2.2 Site Analysis

Site has been analyzed on various aspects like geological condition, land distribution, land formation, human settlement and zoning. There is a direct access through a primary road and internal road network is also visible. All of the settlement zone is high land elevated at the same road elevation. Other areas are low land used for agriculture. High land price and more land owner has distributed all low lands in a dense grid. Every settlement has a water pond adjacent to it. Historically the pond was to serve daily water use for settlers later tube well insertion defected the purpose. Now most of the ponds are for fishing and sometimes for having an extra resource.

The existing site

Figure 3.2.2.1: site Computer Aided drawing with primary road network with secondary and tertiary road networking.

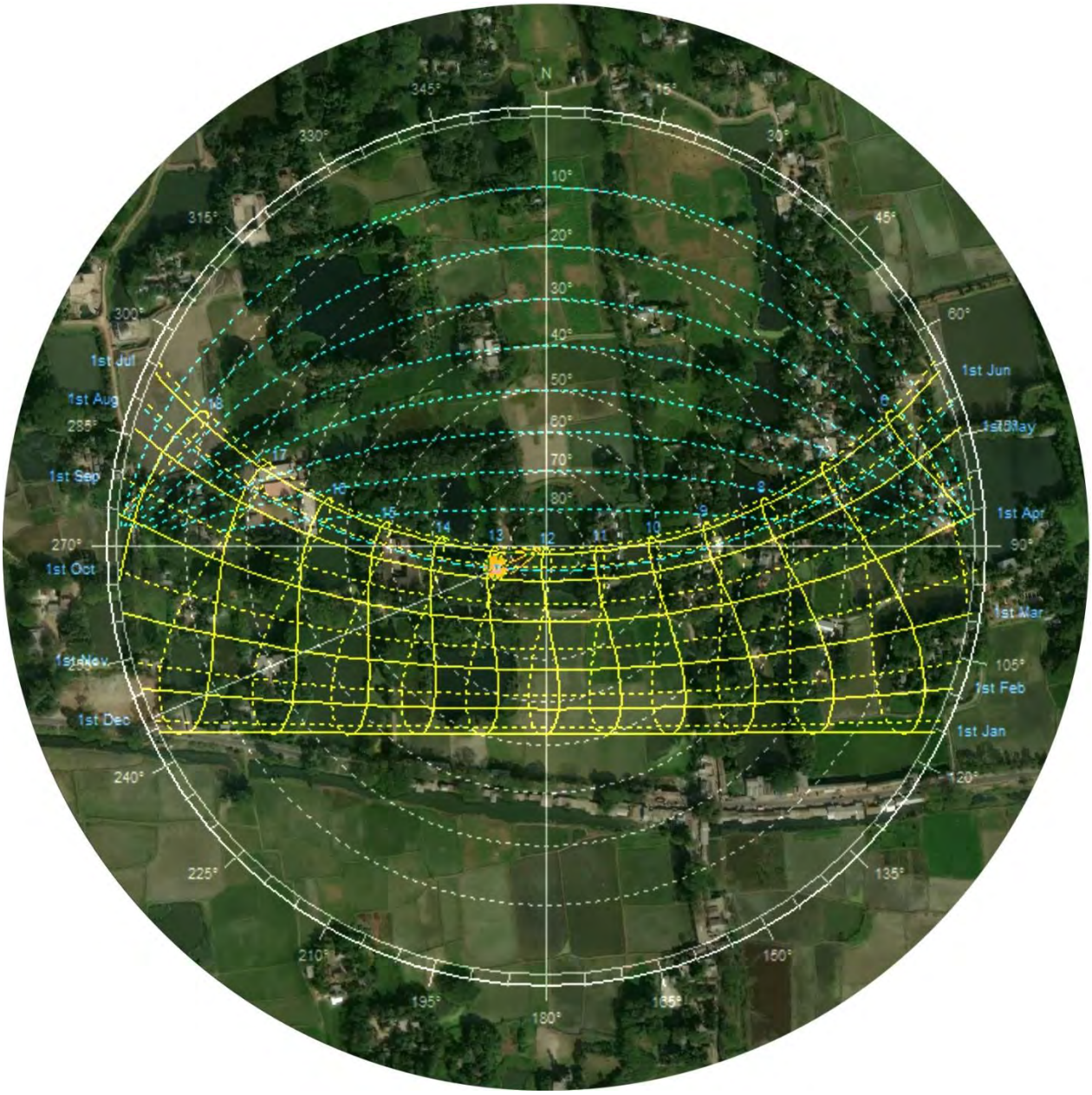
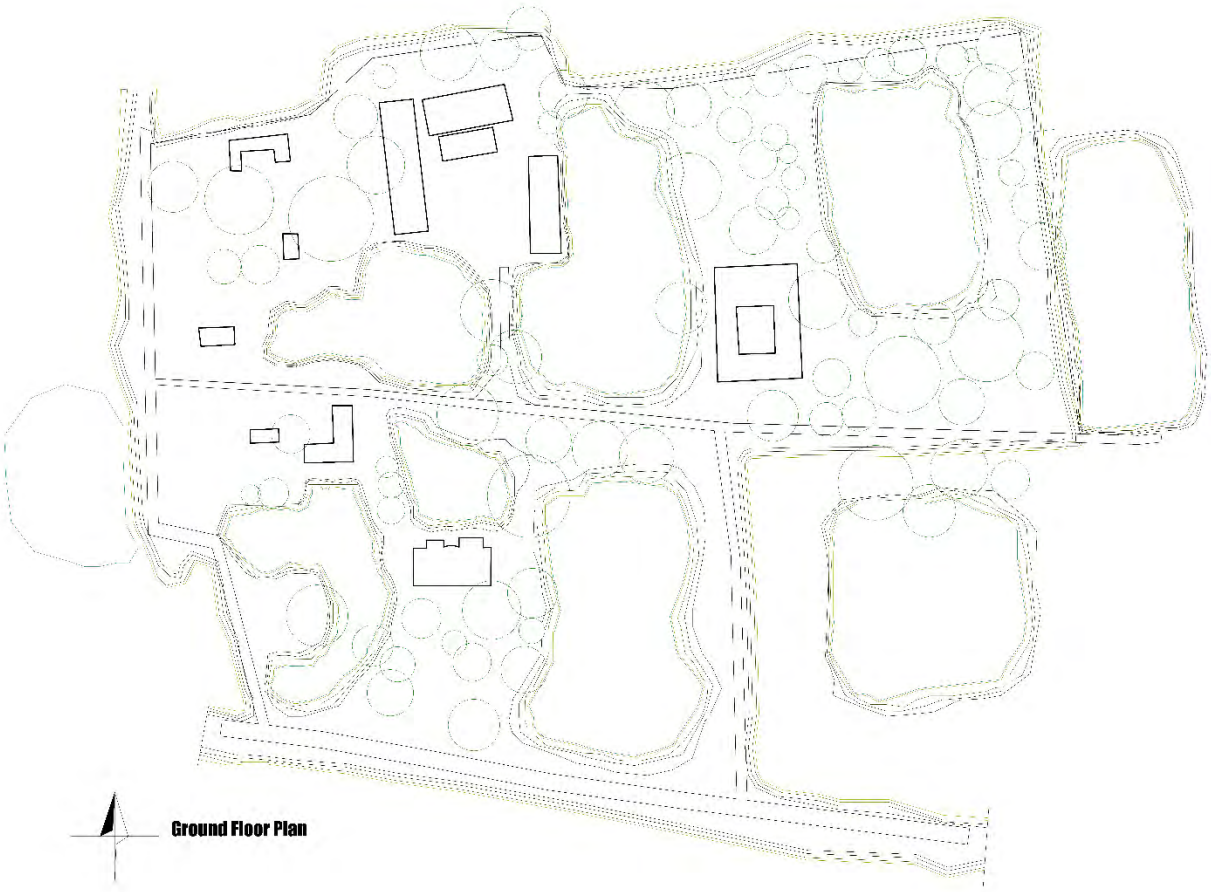


Figure 3.2.2.1: showing site and solar orientation and stereographic diagram of it. Digital Globe, 2018


Ground Floor Plan

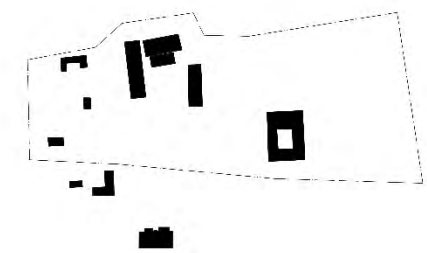
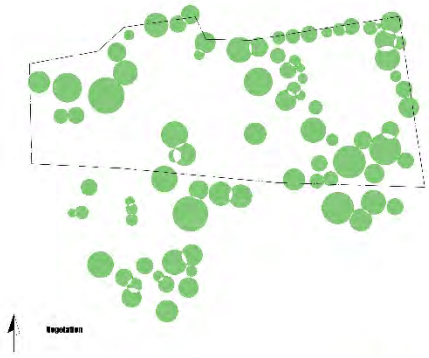
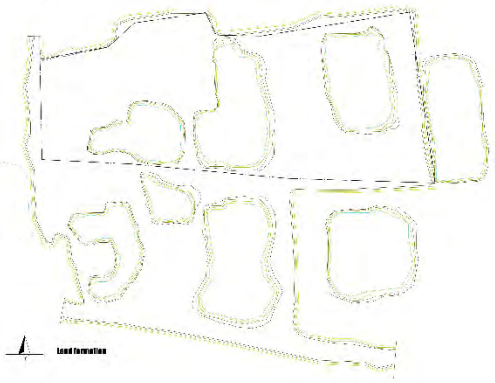


Figure Ground


Vegetation


Road
Accessibility


Land formation

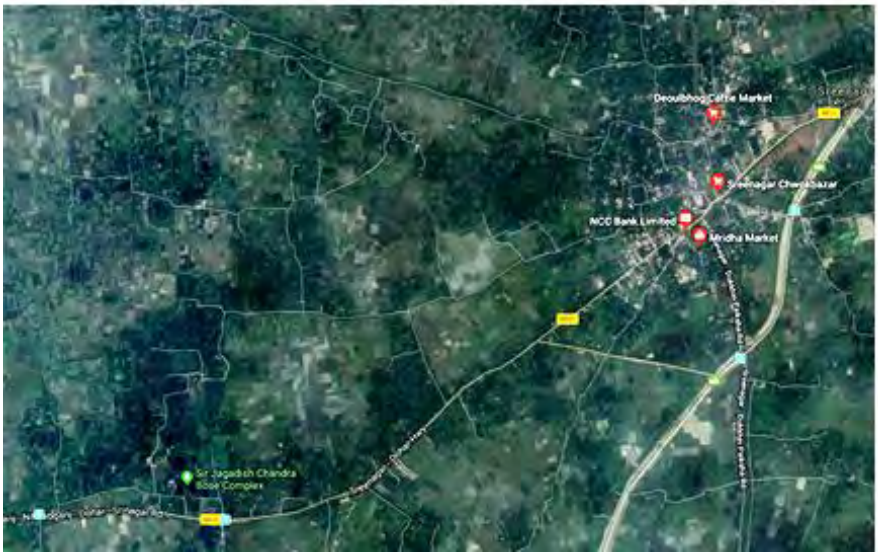
3.2.3 Context Analysis

Figure 3.2.3.1: showing the Existing fabric and networking. Islam, N. (August 7, 2018)

Sreenagar Upazila is clearely visualized as the centre of development. Almost at the intersection of the Highway route the primary spine runs through. Almost 70% of the land is agricultural land and natural and no settlements are found. Major and minor networking forms a well like land formation where all of the settlements are near accebility. Water ponds are one of the indicators of Human settelements for settlement growth identifier. As per its adjesency to Padma river All of the agricultural lands are low lands allowing to be flooded. Rest of the land area are higher and above flood plane. To understand rural development and distribution all of the settelments use minimal raod networking as per high land security cost and linear settlement distribtion.

All the banks position and economic hub identification through geolocation survey

All the temples distribution



All the market places for Public Economic transaction

All the Educational Institutions

All the Mosques

All the supportive Hospitals

3.3 Site Images

Images are taken to understand current site situation and built environment. From these we clearly see that the existing structure is almost immobilized and the complex is used rather as a park than memorial complex. The old structure, parental house of sir J.C. Bose is covered with paint where the inside is completely destroyed. The heritage stands in the middle of the college campus in an almost non-existing manner. Lastly the museum is just a 8X8 feet room having only images and copied writeups.

Figure 3.3.1: Showing the key map for the site images taken and to visualize. Islam, N. (August 5, 2018)

Figure 3.3.2: showing J. C. Bose's parental house with front façade colored and interior destroyed.

Islam, N. (August 5, 2018)

Figure 3.3.3: showing entry door from top left to park in the top right and interior of the museum in the bottom, Islam, N. (August 5, 2018).

3.4 SWOT Analysis

Strength

- Good transportation system, easily accessible;
- Site is located at the primary road;
- Many Educational Institutions;
- Many Departmental stores;
- Medical centre/ Hospital near the site;
- Calm and quite area;
- Omni directional view and natural vista;

Weakness

Limited land area for built form;

Site surrounding not yet properly developed;

Infrastructural development yet to happen;

Flood prone zone;

Opportunities

The Site is easily accessible. So, it has the potential of becoming a good Built environment;

With time the area surrounding the site will be very developed with all necessary facilities;

It can facilitate the area with new facilities.

Threats

The time it will take for the development of the surrounding area;

Cost to develop such rural area;

Flood threat;

Less permeability, concentrated development.

Chapter 4 : Program Analysis

4.1 Proposed Programs

Rationale of the Program

Developed Program

Maximum Ground Coverage

Functional Flow of the Programs

4.1 Proposed Programs

From Understanding the ideology such functions are proposed to capture to create desired built environment.

- Memorial complex
- Museum
- Historical timeline
- Workshop
- Platform for philosophy of science
- Junior scientist creation program
- Fiction writing or writing skill development.
- School
- Laboratories
- Science showcasing platform
- International platform for access
- Dormitories
- Botanical garden
- Continuing his legacy functions
- Learning centre holds classroom

4.2 Rationale of the Program

The complex constitutes with two major functional approach with a Memorial Complex and a centre for innovation. Memorial complex shall hold and preserve all of Sir J.C. Bose's Work and his life History. It shall also showcase Bengali scientists and their achievements in comparison to worlds perspective of development. The Centre for Innovation will provide adequate resources to develop and thrive not just to create or innovate, rather such actions will help to make the next generation of scientists in the field and provide them in the economic chain. Major three types of program are identified where the dedicated Memorial complex, Innovation centre and public affiliation zone.

4.3 Developed Program

4.3.1 Memorial Complex

Sir J.C. Bose's own house shall be converted as museum to hold and showcase his work. Memorial complex having adjacent block holding functions like Galleries, Historical journey through time, Archive, practical showcasing of J.C. Bose's apparatus. History of Bengal renaissance focusing on Bengal scientific progression. Interrelation with other aspects of life with science, impact of previous scientific achievements, local and global context.

4.3.2 Innovation Centre

Innovation also referred as new idea or view which solves an issue. It is also viewed as the application of better solving. It can meet new requirements, unarticulated needs, or existing market needs. Innovation is something original which effects the allover chain of life. There is an opposition state of innovation is **exnovation.**"A prime example of innovation involved the explosive boom of Silicon Valley startups out of the Stanford Industrial Park. In 1957, dissatisfied employees of Shockley Semiconductor, the company of Nobel laureate and co-inventor of the transistor William Shockley, left to form an independent firm, Fairchild Semiconductor." (D. mountain, 2006)

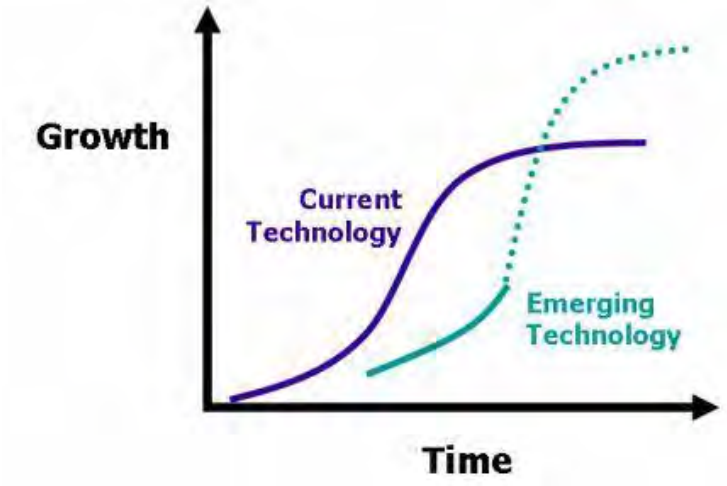


Figure 4.2.2.1 Growth, Time, Innovation relation shown in graph**,** Mountain, D. (2006)

4.3.2.1 Motives

1. Innovation centre enables the environment for inventors and innovators

   For our country Bangladesh to come out of being a consumer of services from developed world, we need to invest on all those creativities sprawling in every corner of the country. Lewett in his article entitled "A study on the Creation of Innovation Centres in Developing Countries" focuses:

   The developing Country's Government should sponsor and support the program to the extent possible, e.g. through provision of a financial incentive (award) to select program participants, provision and seed money for promising inventions. (Lewett, 1998:31)

2. Innovation centres are providers of assistance

3. Possible Contribution to the school

Innovation centres intellectual property offices can make adequate contribution to the school curriculum to ensure children are introduced to basic of commerce, industry and intellectual property at an early stage. BCSIR already helps in this aspect organizing inter school science fair every year.

programs	nos	Square footage	total sft	people served
Class rooms 1-8	8	600	4800	200
Class rooms 9-12	4	600	2400	100
Teachers room	2	1000	2000	25
admin office	8	50	400	16
principles room	1	80	80	1
toilet	10	40	400	342
total			10080	342

programs	nos	Square footage	total sft	people served
gallery (history)	2	1000	2000	100
Gallery (achievements)	2	600	1200	80
Gallery (interntional)	1	1000	1000	80
Archive	1	800	800	50
innovation practice	1	500	500	30
information zone	1	300	300	20
media room	1	400	400	20
national inventions	1	800	800	80
admin office	8	50	400	16
principles room	1	80	80	1
toilet	10	40	400	477
total			7480	477

programs	nos	Square footage	total sft	people served
Laboratory (Natural Product Division)	2	600	1200	20
laboratory (Food and Fruit Research Division)	2	600	1200	20
Laboratory (Fuel Research Division)	1	600	600	20
Laboratory (Glass and Ceramic Research Division)	1	500	500	10
Laboratory (Leather Research Division)	1	500	500	10
information zone	1	300	300	10
media room	1	400	400	20
Small Library	1	800	800	80
workshop	3	1200	3600	80
admin office	8	50	400	16
principles room	1	80	80	1
toilet	15	40	600	287
total			9580	477

programs	nos	Square footage	total sft	people served
Library	1	2000	2000	200
auditorium	1	4000	4000	200
Parking (bus+car)	15	100	1500	25
plaza	0	0	0	0
Botanical Garden	0	0	0	0
toilet	4	40	160	425
total			7660	425

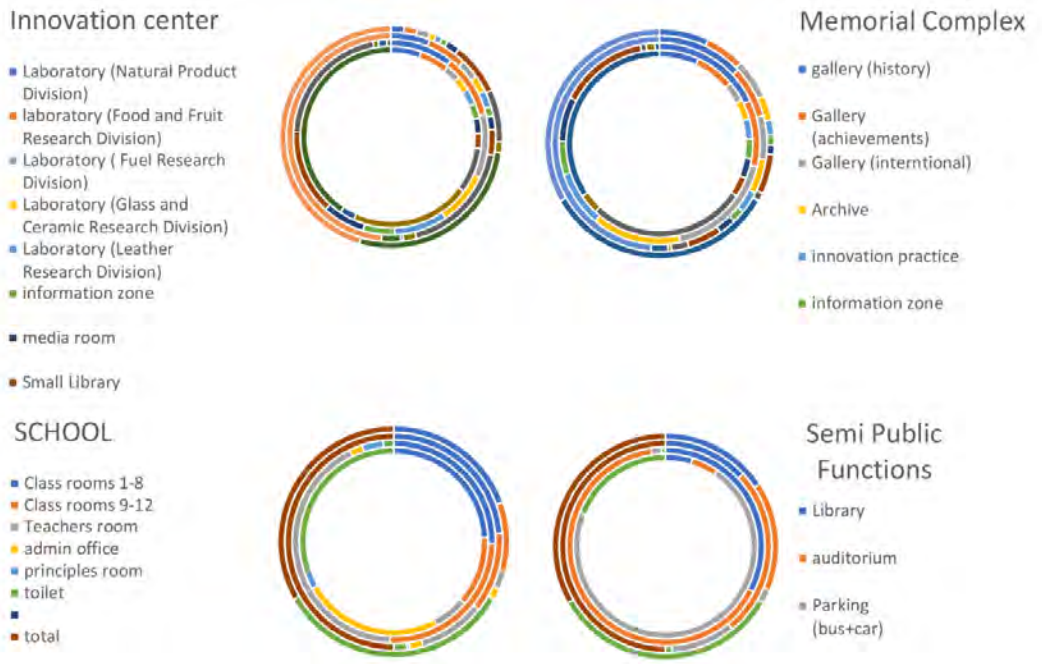


Figure 4.3.1: Showing Program Chart, Program relation. Islam, N. (August 8 2018)

Chapter 5 : Case Study

5.1 Local Case Study

5.1.1 BCSIR

5.2 International Case Study

5.2.1 Innovation Center UC - Anacleto Angelini / Alejandro Aravena | ELEMENTAL

5.2.2 Akademgordok, Siberia, Russia

5.1 Local Case Study

5.1.1 BCSIR

5.1.1.1 Overview

Bangladesh Council of Scientific and Industrial Research (BCSIR) the leading multidisciplinary Public Research Institute (PRI) of the country commenced its magnificent journey as the 'East Regional Laboratories' of the Pakistan Council of Scientific and Industrial Research (PCSIR) in January 1955 in the premises of the Polytechnic Institute at Tejgaon, Dhaka. Dr. muhammad qudrat-i-khuda, the scientist and educationist, conceived the idea and took initiative for establishing such a laboratory in this part of the continent. At the beginning, this regional multidisciplinary research unit had five-research divisions-viz. **Natural Product Division, Food and Fruit Research Division, Fuel Research Division, Glass and Ceramic Research Division, and Leather Research Division.**

Figure 5.1.1.i: BCSIR Building Entry view enclosed with two admin building (Banglapedia, website, 2003)

giving emphasis on the technological aspects later, a new research division named 'Division of Engineering and Process Development' was introduced and previous five divisions were renamed as: Division of Natural Products, Division of Food Science and Technology, Division of Fuel and Petrochemical Science and Technology, Division of Glass and Ceramics Technology, and Division of Leather Science and Technology. Dr. Muhammad Qudart-i-Khuda,

was appointed as the founder Director of the East Regional Laboratories and under his focused leadership and guidance this laboratory continued its forward journey. (Banglapedia, 2015).

BCSIR has focused on the following missions to accomplish the vision 2021 of concurrent Bangladesh Government (Awami league):

1. Conduct, promote and co-ordinate market driven scientific and industrial research;
2. Reschedule organizational set-up/organogram, ordinance, by-laws and regulations to meet the demand of vision 2021;
3. Get all laboratories accredited to cater the needs of the local market as well as the export market in addition to training up various research and analytical laboratories of the country;
4. Create and sustain a congenial atmosphere to flourish R&D activities in the country and
5. Generate income to replenish 25% of the total expenditure of BCSIR.

These statements clearly stating the current situation and possible outcome of such Research Institution where most of focuses are open ended. There is no specific development goal shown or taken by the government rather tasks are given to produce better economic chain.

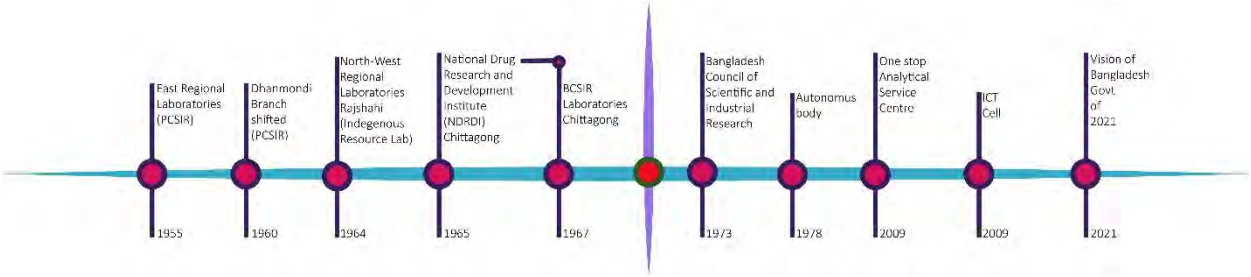


Figure 5.1.1.ii: Showing the Timeline of progression and Development of Research sectors Islam, N. (2008, August 2)

5.1.1.2 Findings of the study of this project leads to

1. Socio economic development goals are clear and loud;
2. Research and development is clearly found;
3. Self-generated economy to support its own spine;
4. Multi-lateral system and collaboration with other institutions like

   Bangladesh University of Engineering and Technology

   Rajshahi University of Engineering and Technology

   Khulna University of Engineering and Technology

   Chittagong University of Engineering and Technology

   Shahjalal University of Science and Technology

   International Rice Research Institute

   Institute for Jute Research
5. Investing 1% of GDP can increase 5% of total GDP growth according to 2006 to 2008 Budget report.
6. BCSIR collaborating with ADP has been implementing development projects to achieve
   - Physical infrastructural development
   - Establishing new institutes, laboratories and centers
   - Expand research activities under ADP so far ~50 projects accomplished
7. Science and Technology research ad newly emerged entrepreneurs showing lack of interest to collaborate with this facility which is slowing down and even sometimes cutting down its growth possibility.
8. Identified as non-autonomous facility governed and financed by the governmental authorities as per the framed organogram of 1978.
9. No independent decision-taking capacity is given to BCSIR authority and reserved by the minister cabinet.

5.2.1 Innovation Center UC - Anacleto Angelini / Alejandro Aravena | ELEMENTAL

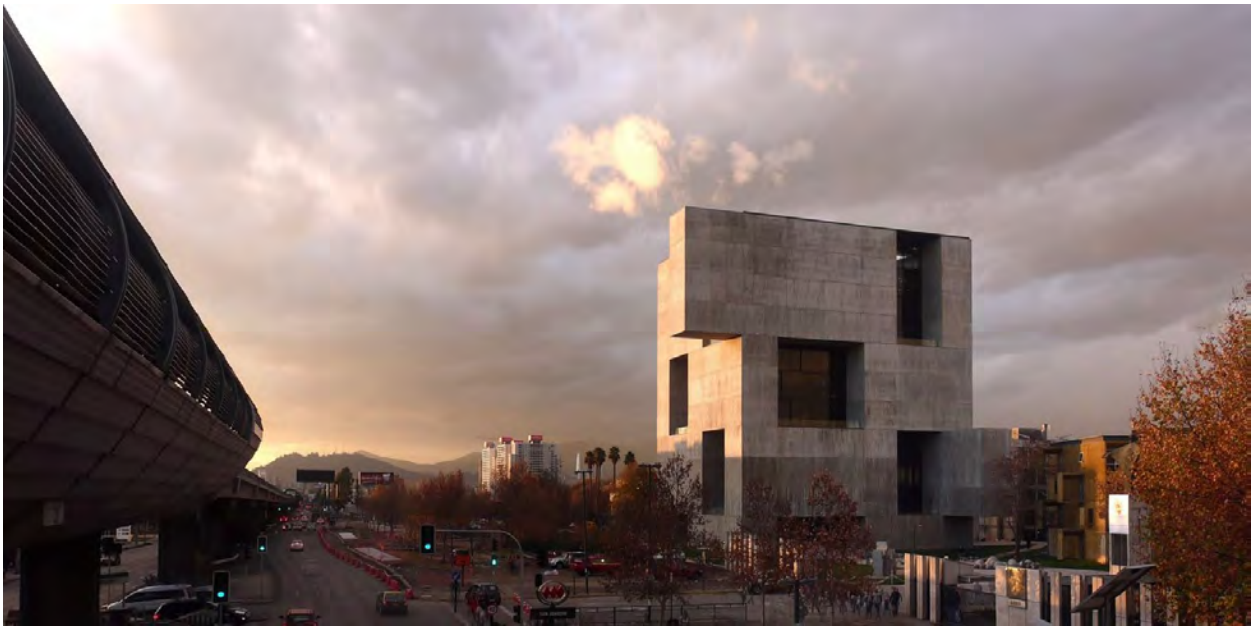
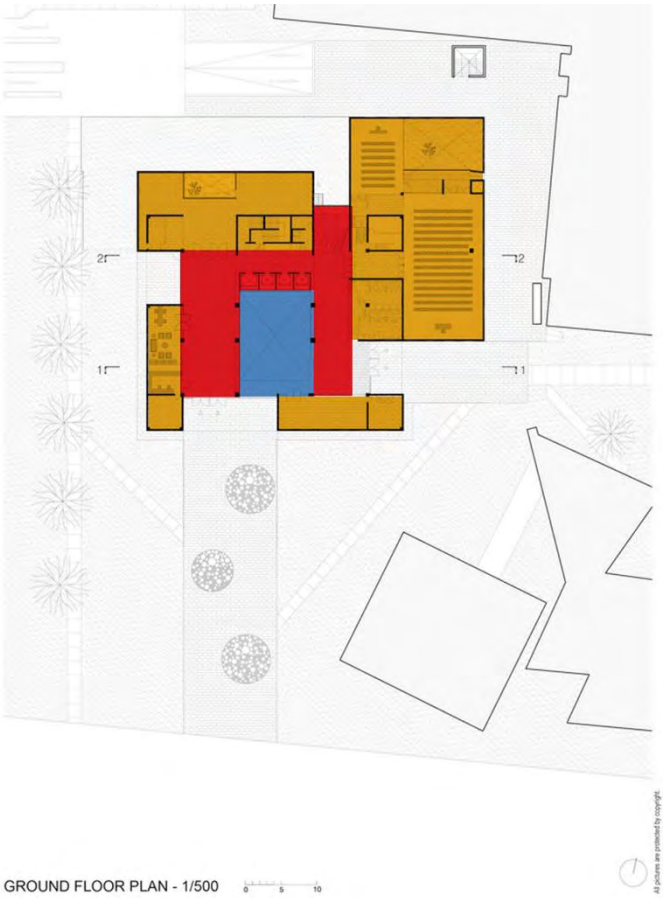
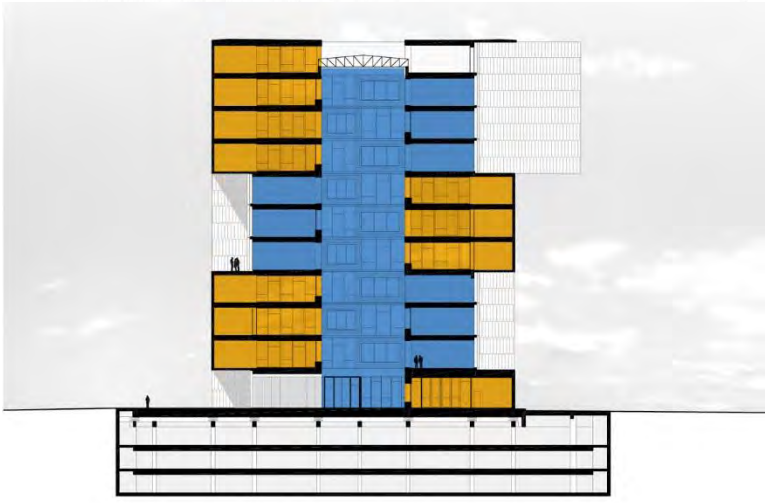


FIGURE 5.2.2.1: Innovation center UC, (Nina Vidic, 2014 September 22)

A Vision seen by Angelini group where businesses and companies merge with ideas of inventors also inventions with researchers. To contribute to the process of transferring know-how, identifying business opportunities, adding value to existing resources or patent registration to improve the country's competitiveness and consequently its development was the main aim. In this project the group could ensure four forms of work. Formal and Informal works crossed and a Matrix to identify individual and collective ways of encountering people. Face to face encounters and connectivity is acknowledged more often while designing the spaces as it encourages creativity and knowledge. A transparent continuous Atrium connecting most of the verticality creating singular space signifies the connectivity. The Building not only performs for the people or user but also acts towards environmental issues where character of the form was taken from environmental understanding. To encourage such functional statement the form should act as a contemporary look. It not only creates frames towards view also elegant cutting of form made it stand out in the urban context too. As Santiago has been populated with glass and recent global warming has created more problem as per heat gain issue of a surface. Now The solid void composition truly reduces heat gain and also cools shaded spaces are cooler outdoor spaces to hang out even in the day. By doing so 120 KW/m2/year average electrical consumption reduced to 45KW/m2/year. The atrium Holds large amount of air volume which helps internal cooling.

FIGURE 5.2.2.2: Ground Floor Plan & Section (ELEMENTAL, 2014 September 22)





SECTION - 1/500 0 5 10

Enclosed Function
Circulation
Continuous Open Atrium

Programs

Auditorium

Seminar Room

Waiting Room

Core

Services

Open Garden

Reception

Atrium

Outdoor plaza

Pedestrian

Adjacent Massing

Service Block

5.2.2 Akademgordok (Russian: “Academic Town”), Siberia, Russia

5.2.2.1 Overview

scientific research city located near Novosibirsk at the northeast corner of the Novosibirsk Reservoir, south-central Russia. Akademgorodok is home to numerous research institutes and is the seat of the Siberian Branch of the Russian Academy of Sciences. It is, after Moscow and St. Petersburg, the third most important research and educational center in Russia. (Josephson, 2018)

Research and education facilities in Akademgorodok

- Kutateladze Institute of Thermal Physics
- Nikolaev Institute of Inorganic Chemistry
- Boreskov Institute of Catalysis
- Vorozhtsov Institute of Organic chemistry
- Budker Institute of Nuclear Physics
- Ershov Institute of Informatics Systems
- Institute of Informatics and Mathematical Geophysics
- Institute of Chemical Biology and Fundamental Medicine
- Institute of Cytology and Genetics
- Institute of Molecular and Cellular Biology
- Sobolev Institute of Mathematics
- United Institute of Geology, Geophysics and Mineralogy
- Institute of Automation and Electrometry
- Institute of Semiconductors Physics
- Institute of Theoretical and Applied Mechanics
- Institute of Chemical Kinetics and Combustion
- Lavrentyev Institute of Hydrodynamics
- Institute of History of Siberian Branch of the Russian Academy of Sciences
- Institute of Philology
- Institute of Philosophy and Law
- Institute of Laser Physics
- Central Siberian Botanical Garden
- Institute of Solid State Chemistry and Mechanochemistry
- Research Institute of Circulation Pathology
- Institute of Economics and Industrial Engineering
- Presidium of the Siberian Division of the

5.2.2.2 Ideology

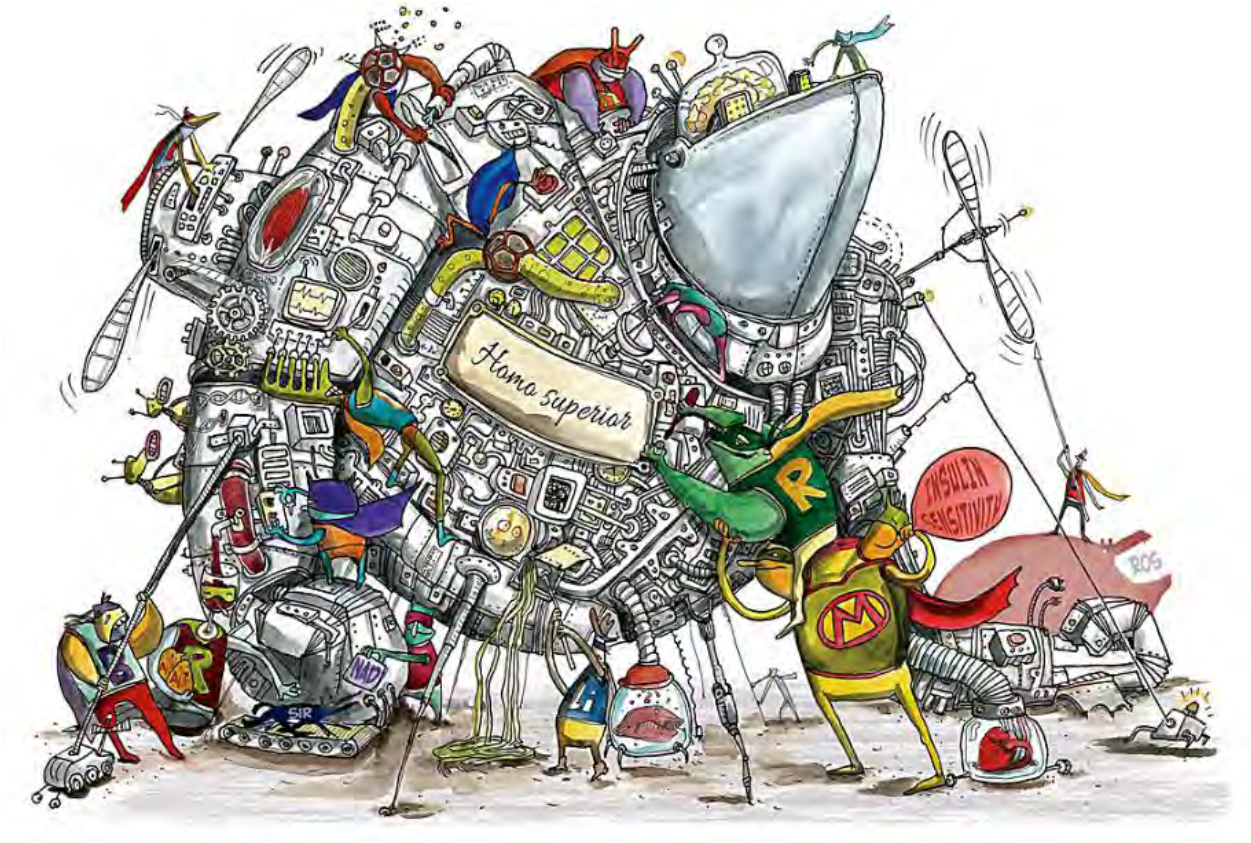


Figure 5.2.2.ii: All sectors working together to create homo superior. Scientific animation laboratory. Olga. (2016, March 28).

Akademgordok was founded in 1957 under the auspices of the Academy of Sciences of the USSR. Mikhail A. Lavrentyev, a mathematician was the first chairman played a great role in establishment of such place. It was home to 65,000 scientists and their families and was a hub for all its kind.

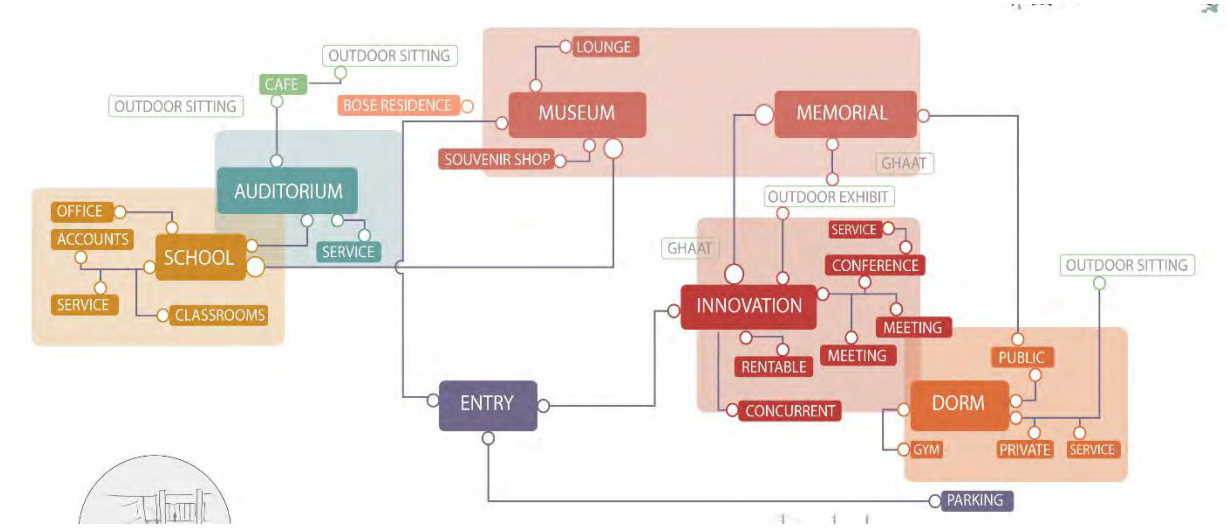
In soviet time Ph.D. degree holders under Russia system were privileged to have food supply and even delivery system known as (doktorskiy zakz). Despite being eligible many of the scientists refused it on moral ground.

As of 2015, 300 companies had been set up since 2011, employing about 9,000 people and generating 17bn roubles (£175M) annually. (Wainwright, 2016)

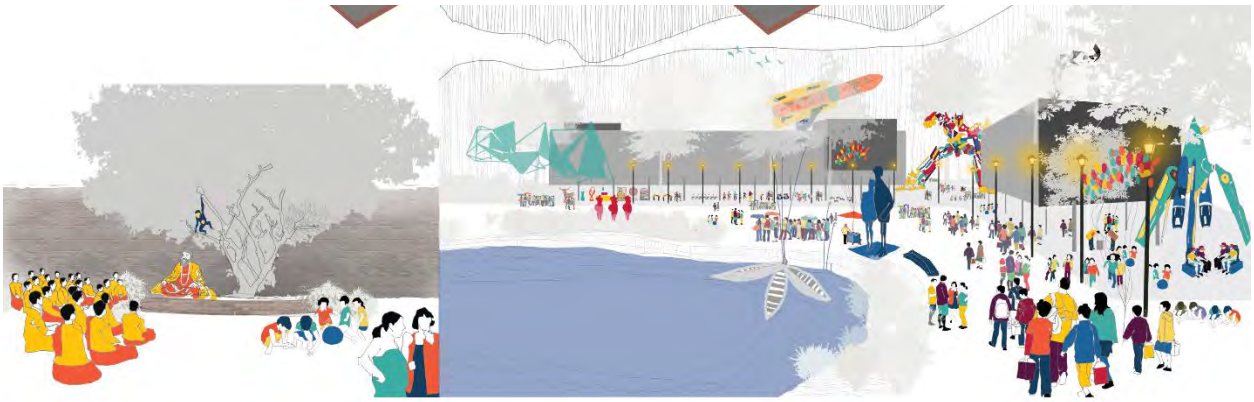
This place is also known as “Silicon Forest”. A much larger technology center in the former Soviet Union is the Skolkovo Innovation Center. The country experienced a wave of euphoria following the death of Stalin, in a period that is referred to as the "Thaw." At this time, the Soviets firmly believed in the infinite superiority of science, and the exceptional mission of scholars. (Moskalenko, 2018)

A place binding almost every aspect of knowledge and exploration in a physical format where acknowledging bilateral system of knowledge sharing, gathering, exploring happens. It truly shows the image of a science city where it not only nurtures the search for truth but ensures all the minimum living conditions in a physical format. A perfect seclusion for all those people who craves for such condition. A heaven for scientists, we may call it.

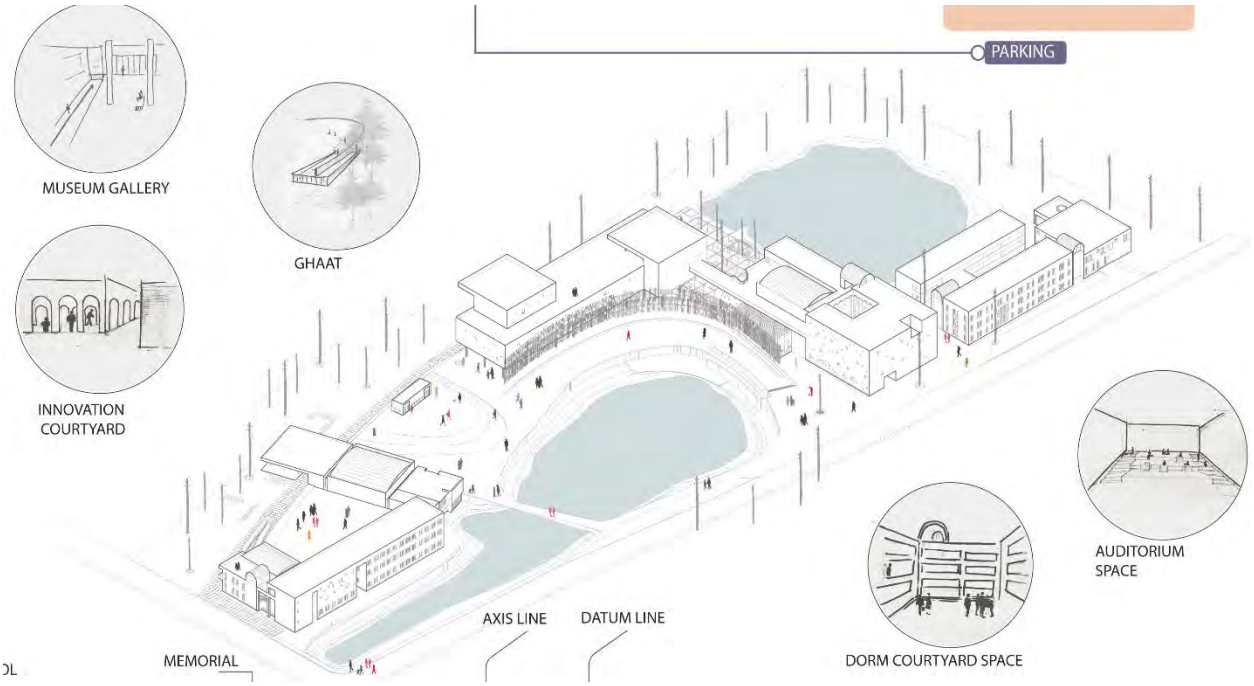
Chapter 6: Design Development



Program formulation according to the site zoning and placement. All four types of functions have individually clustered with adequate functions needed. Site consideration and design of the land.

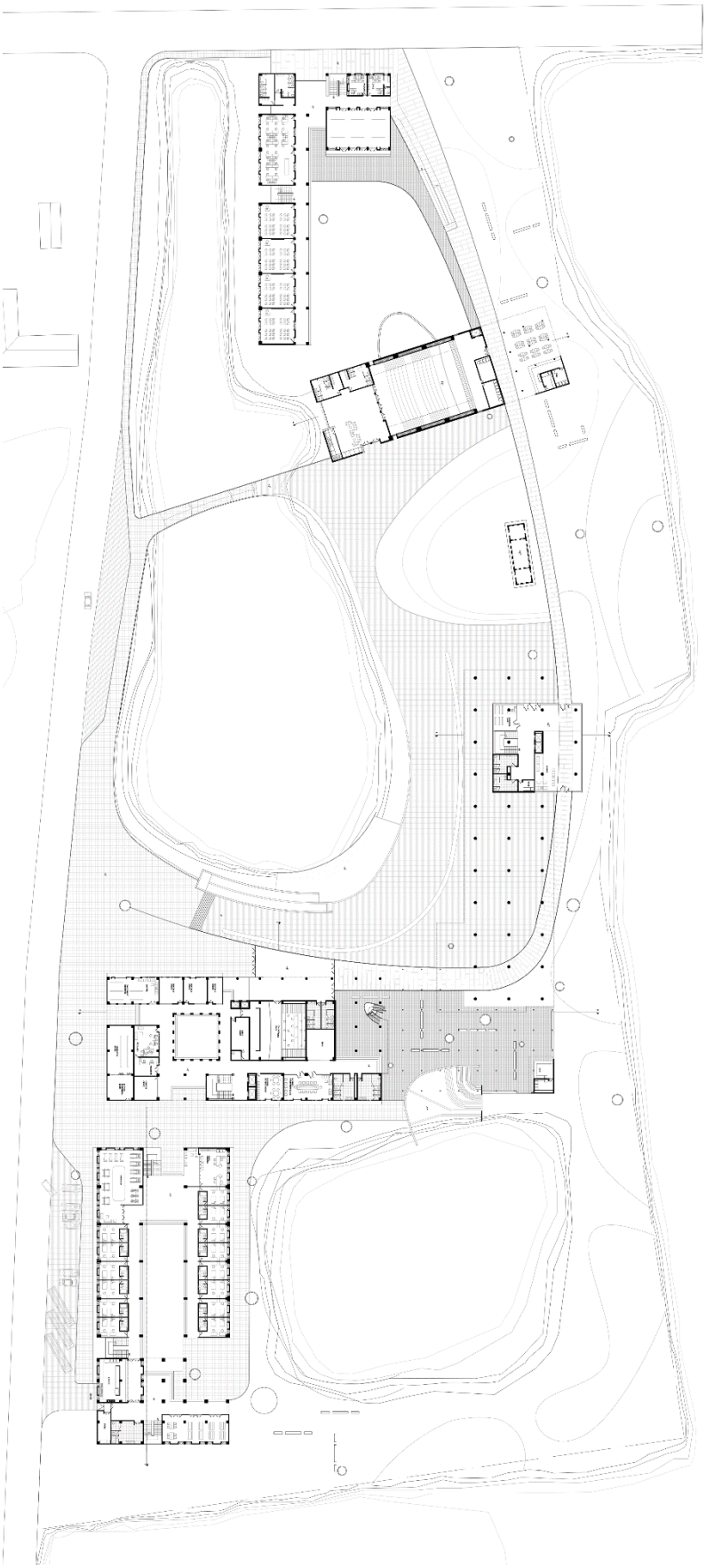


Envisioned spaces for the complex.

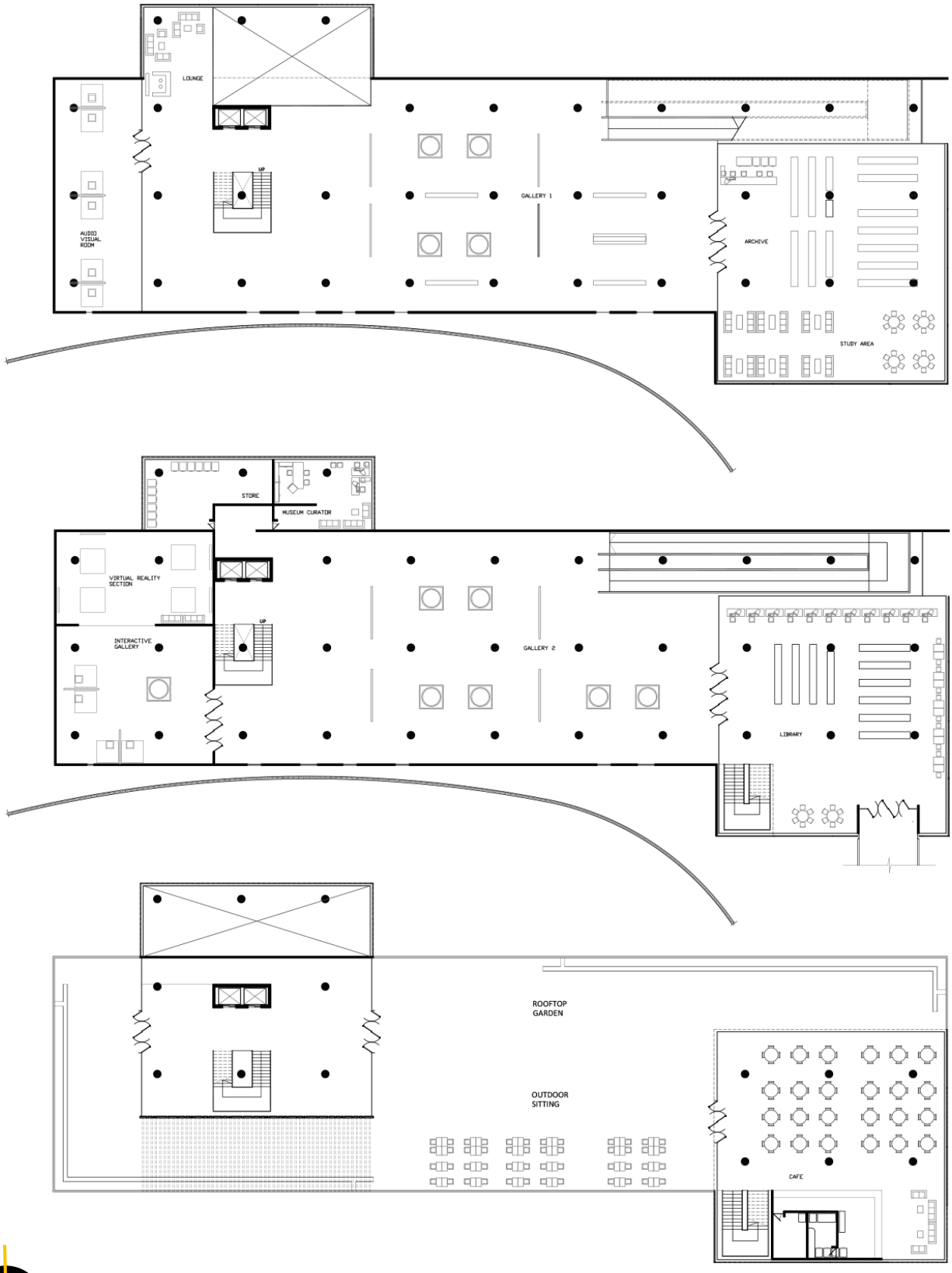


Axonometric view showing the final design outcome.

The four type of function has been placed on the site maintaining a chain. A datum line was used where the buildings laced with it. The z form of the museum and the dorm formation ensured privacy for the dorm and the innovation center placed north to south vertically gave to faces one for the public zone and the other for the more secluded one. The front water body was enhanced and edged properly for maintenance and adequate landscaping along with public access to the water has been ensured.

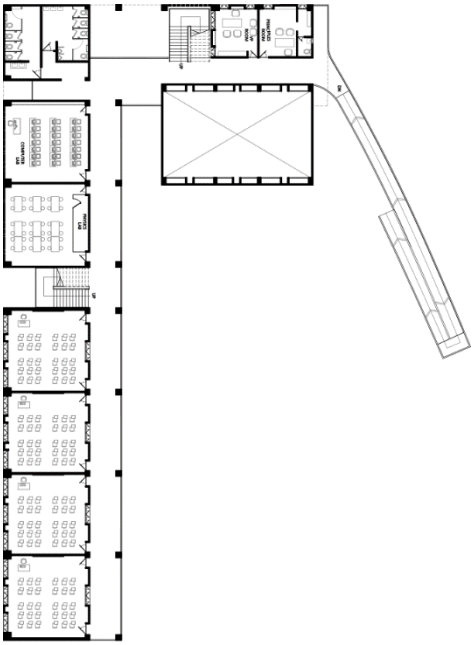


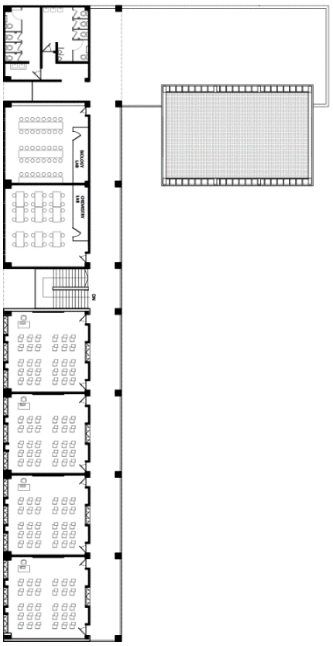
Ground Floor Plan



From top to bottom First Floor, second Floor, Roof Floor.

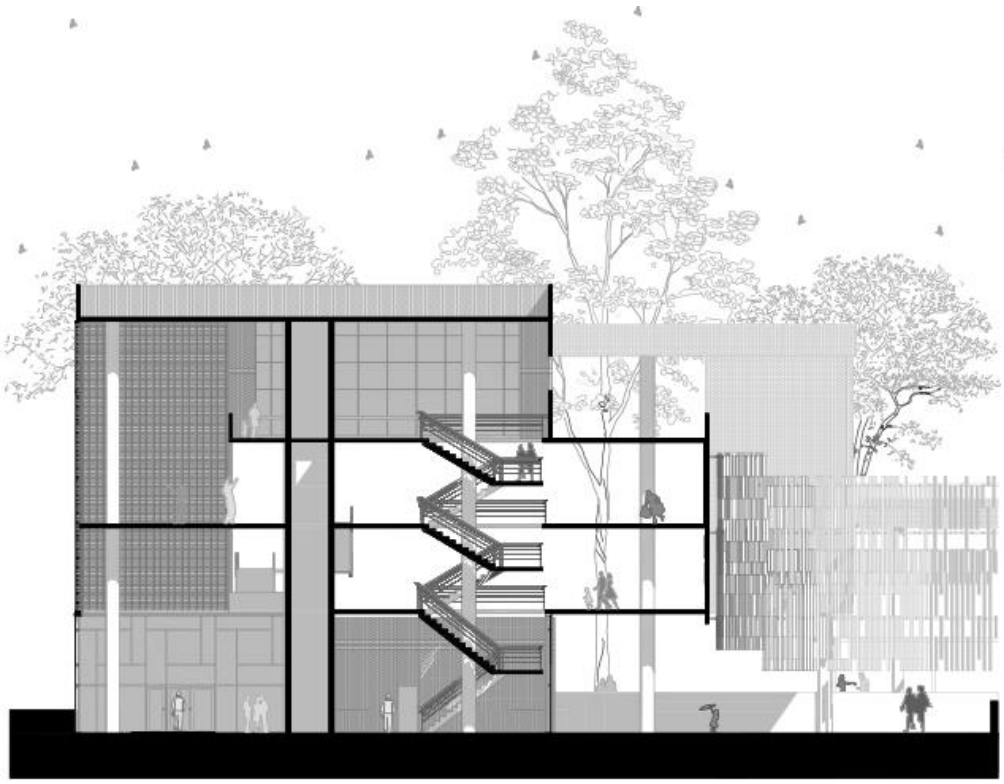
From top to bottom First Floor, second Floor, Roof Floor.



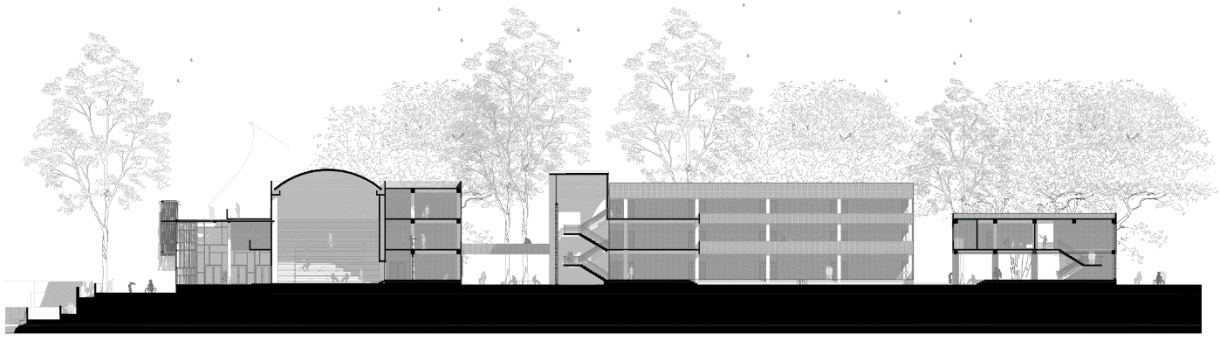


From top to Bottom First Floor, Second Floor

From Top to Bottom First Floor, Second Floor



Section AA’ (Museum section)



Section BB’ (Innovation and Dorm section)

Form Top left to right Section CC' Section DD' (Innovation longitudinal section), Bottom South Elevation

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