National Gene Bank, Ganakbari, Ashulia.

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ARC 512

Seminar II

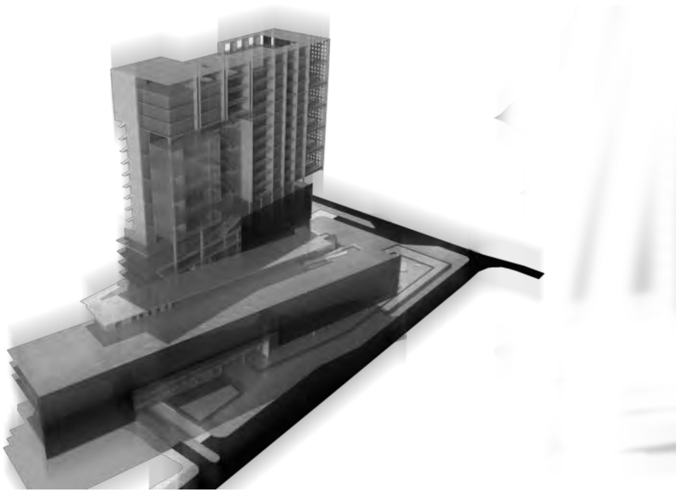
Submitted in partial fulfillment of the requirements

For the degree of Bachelor of Architecture

Department of Architecture

BRAC University

FALL 2018



“I believe that architecture has the power to inspire, to elevate the spirit, to feed both the mind and body. It is for me the most public of the arts.”

___ RICHARD MEIER.

Abstract

As a developing country Bangladesh, need opportunity to have a proper place for genetical research and a gene bank. In almost every developed country there is a gene bank, which serves the nation in various way.

The Gene Bank will contribute to human resource development, public awareness, and guidelines and principles on the use of the gene pool. It will preserve seed, planting materials, semen, embryo, egg, sperm, cell, chromosomes and DNA, RNA, protein of plants, animals, fishes and microbes for various durations.

ACKNOWLEDGEMENT

At first, I would like to thank almighty Allah. And then I would like to thank my parents, my sister and other family members for their patience and unconditional support.

Secondly, I would like to thank my faculty for giving me the chance to work on this project. Without their support it was quite difficult to work in this project.

Last but not least, my seniors, my friends, my juniors who helped me in a direct and indirect way.

TABLE OF CONTENT

Chapter 6 Design Development

6.1 Introduction

6.2 Initial Ideas

6.3 Concept

6.4 Zoning

6.7 Final Design

References

Chapter 1 Introduction

1.1 Background of the Project

1.2 Project Introduction

1.3 Project Brief

1.4 Programme

1.5 Problem Statement

CHAPTER 1 Introduction

1.1 Background of the Project

In 1984, for the first time, a project proposal for establishment of a biotech research institute was presented to the government. In the long run, the activities of the National Institute of Biotechnology were started on 12 May 1999 through a development project. Research on genetics become more successful in last few years. Inventing the genome sequence of '**Tosha Jute**' by Dr. Maqsudul Alam in June, 2010 was the successful step for the biotech research on Bangladesh.

Conserving the genetic diversity of our crops, landraces and related wild species is essential to ensure future plant breeders can access this variation, especially in view of increased food demand by a growing world population and climate change.

Gene banks are repositories where biological material is collected, stored, catalogued and made available for redistribution.

The main role of plant gene banks is to preserve genetic diversity, in the form of seeds or cuttings in the case of plants reproduced vegetative, and subsequently make this material, together with associated information, available for future use in research and plant breeding.

Gene banks are sometimes also referred to as an ex-situ conservation facility (because biological materials are conserved outside their natural habitat). (What is a gene bank? – B4FA, n.d.)

1.2 Project Introduction

National Institute of Biotechnology (NIB) was established in Ganakbari of Savar in the year 1999, in order to build skilled human resources in the specialized research institute and biotechnology related to biotechnology. Simultaneously, biotechnology is engaged in coordination with all types of biotechnology, making public awareness, adopting genetically modified standards and certification of standards, formulation of policies, linking with local and international organizations, and all related issues. All activities of this organization are being conducted according to 'National Institute of Biotechnology Act 2010' and 'National Institute of Biotechnology (Officers and Employees) Employment Regulation 2011'. In the National Institute of Biotechnology, six research departments, namely Animal, Environmental, Fisheries, Microbial, Molecular and Plant Biotechnology, are engaged in research in agriculture, environment, industry and health. Under the supervision of NIB researchers, the postgraduate students of the university are given the opportunity to do theses on biotechnology. In addition, undergraduate, postgraduate students, university teachers, researchers of research and industrial institutes are being trained regularly.

NIB has already started the process of establishing a National Gene Bank. Besides, plans have been taken to establish GMO testing and certification laboratory, forging materials used for research and for the storage of chemicals and biotechnology training institutes.

Planning Minister AHM Mustafa Kamal said, “The National Economic Council's Executive Committee (ECNEC) has approved the project of establishing a ‘national gene bank'. 460 crore taka will be spent on the entire government funding.” He also said that, the project of Bangladesh National Institute of Biotechnology and Public

Works Department under the Ministry of Science and Technology will be implemented from March 2018 to June 2021.

1.3 Project Brief

Government Allocated 460 crore taka to build National Gene Bank at Ganakbari, Ashulia on a 3 acre of land beside the National Institute of Biotechnology.

Client of this project is "National Institute of Biotechnology"

1.4 Programme

The main program of this project is to provide advance research facilities on genetical research and preserving the genetical resources.

The given programs are-

a) Administrative *Facilities*

b) Animal Genetic Resources

c) Fisheries Genetic Resources

d) Microbial Genetic Resources

e) Plant Genetic Resources

f) Administration Procurement

g) Account Branch

h) Engineering Wing

i) Database Wing

j) HRD

k) Library and Information

1.5 Problem Statement

Genetic resources conservation and sustainable use are pre-requisites for sustainable agricultural development and food security. They are used as sources of valuable genes to develop new cultivars resistant and tolerant to major biotic and abiotic stresses. They can be also adopted in the rehabilitation of degraded ecosystems. Bangladesh is in a natural calamities prone area. The way nature behaves in our country is quite unpredictable. On the other hand beside the climate, its culture is so diverse. Having a highly dense population is a problem for our country to provide adequate food and other primary needs. Scientist are doing genetical research to provide a high quality and a huge amount of food to feed the nation. They are doing research to grow hybrid crops, fish, vegetables etc. To help this kind of research and to preserve the history of genetical research almost every country has its own gene bank to preserve its own culture and history of its biological research. To provide a sustainable agricultural development and food security we need a proper gene bank.

Chapter 2 Literature Review

2.1 History of Plant Gene banks and Global PGR Collections

2.2 What is Genebank?

2.3 Types of Genebank

2.4 How Genebank Works?

2.5 History of Genebank in Bangladesh

CHAPTER 2 Literature Review

2.1 HISTORY OF PLANT GENEBANKS AND GLOBAL PGR COLLECTIONS

Hereditary protection of yields in genebanks is a moderately ongoing marvel (since the 1960s) in the time span of horticultural history (~12,000 years before display) (Plucknett et al. 1987). It was provoked by the need of researchers who required a consistent and dependable supply of germplasm, and did not have any desire to rely upon plant investigation trips alone. The Russian Plant Explorer, Geneticist and Raiser, Nikolai Ivanovich Vavilov and numerous others found the significance of hereditary decent variety in reproducing high yielding assortments and to defeat distinctive yield decreasing components. Vavilov set up the 'All-Union Institute of Plant Industry', Leningrad (St Petersburg) in the 1920s, which was the primary genebank. In any case, first and foremost, seeds were kept at surrounding temperature and must be developed out each year. It was just in 1958 that the National Seed Storage Laboratory, Fort Collins, Colorado, was built up by the US Department of Agriculture (USDA). It was the principal national genebank that put away gathering of every single significant product from everywhere throughout the world at low temperature (Plucknett et al. 1987). The idea of regulated worldwide accumulations and genebank protection of plant hereditary assets (PGR) was started and brought the issue into center by the FAO in the 1960s. A 'Specialized Meeting on Plant Exploration furthermore, Conservation' was co-facilitated in 1967 by the FAO and the International Biological Program (IBP) to assess the threat of misfortune in trim hereditary assorted variety and characterize a worldwide methodology for preservation of PGR. In this manner, a FAO 'Board of Experts on Plant Exploration and Introduction' met four times in 1969, 1970, 1973 and 1974; which prescribed, in addition to other things, the foundation of an arrangement of genebanks for long haul preservation of PGR (Dhillon and Agrawal 2004). All the while, formation of Global Agricultural Research Centers (IARC) to convey out research on vital yields to battle craving and nourishment shortage additionally happened in a similar period. The IARCs were upheld by national governments and subsidizing organizations for example, Ford Foundation and Rockefeller. A Consultative Gathering on International Agricultural Research (CGIAR) was built up in 1971 as a willful relationship of contributors supporting the then existing four IARCs (IRRI, CIMMYT, CIAT and IITA), and for advancement of manageable horticulture for nourishment security in the creating nations. Right now, the CGIAR underpins 16 IARCs. The CGIAR has played a key part in universal PGR arrange through its ex situ accumulations in different IARC genebanks. The real movement of gathering and protection of PGR was initiated by the International Board of Plant Genetic Resources (IBPGR), Rome, Italy, and a CGIAR accomplice set up in 1974. The IBPGR was rechristened in 1992 as the International Plant Hereditary Resources Institute (IPGRI) and again renamed as Biodiversity International in 2008. Other than the CGIAR numerous local and national systems exist which connect genebanks around the world. The preservation of PGR has picked up essentially in significance and is currently acknowledged as a fundamental obligation of national governments. This is shown by the amazing number of countries which have endorsed the Convention on Biological Diversity (CBD1993) and supported the International Treaty on Plant Genetic Assets for Food and Agriculture (ITPGRFA 2004), or both. The first and second reports on the State of the World's Plant Genetic Resources for Food and Agriculture give a complete and real record of PGR status at the worldwide level (FAO 1998, 2010). Today, more than 1,750 genebanks have been built up around the world, with 7.4 million increases kept up as ex situ accumulations in either seed banks, field accumulations, and in vitro and cryopreservation conditions. Out of these, 89% are held in national genebanks furthermore, 130 genebanks hold in excess of 10,000 increases (FAO 2010). It is critical to take note of that as much as 45% of germplasm is held by just 7 nations. About portion of all promotions kept up in ex situ accumulations are progressed cultivars or reproducers' lines, while a little more than 33% of them are made up via landraces, or old cultivars, and about 15% are wild relatives of harvest species, weedy plants or wild plants. Just 33% of all increases are described. There is clearly a hole in the accumulations with respect to minor crops and underutilized species, specifically landraces and wild relatives of harvests from the separate yields focuses of assorted variety and development are underrepresented in genebanks. Albeit supposedly finished spoke to, an extensive piece of the hereditary decent variety of significant nourishment crops is put away in ex situ accumulations. The correct extent is as yet indeterminate, yet gauges propose that over 70% of the hereditary decent variety of some 200-300 yields is now saved in genebanks (Khoury et al. 2010). What's more there are more than 2 500 botanic greenery enclosures keeping up tests of approximately 80 000 plant species (FAO 2010). In any case, recovery of genebank increases remains a noteworthy issue, debilitating accumulations (FAO 1998). In the previous decade there have been huge propels made in recovering accumulations in danger, to a limited extent because of endeavours made by the Global Crop Diversity Trust (CGDT) in supporting recovery projects of universally critical need genebank accumulations for 22 need crops for which trim particular recovery rules have as of late been created (Khoury et al. 2010). According to worldwide Genebank Standards of the FAO, each genebank ought to have arrangement of preservation of security copies of conceivably special germplasm at a far off put a long way from the area of the genebank. This is required for readiness in unanticipated and outrageous circumstances such as atomic or common war, psychological oppressor’s interruptions or some other cataclysmic disappointment. At the worldwide level, the 'Svalbard Global Seed Vault (SGSV)', is a best in class office worked inside a mountain in a man-made passage on the solidified Norwegian island of Spitsbergen, 1 307 km from North Pole. The zone's permafrost keeps the vault underneath the point of solidification of water and the seeds are secured by 1-meter thick dividers of steel-fortified cement. The SGSV was dispatched in 2008. The normal temperature is about - 6°C, and - 20°C temperature is kept up with the assistance of intensity move down. It has an ability to store 3.5 million promotions. Right now, 774 601 examples are stored at SGSV by 53 genebanks, evaluated to cover in excess of 33% of the comprehensively particular increases of 156 product genera put away in genebanks (Westengen et al. 2013). The foundation of the SGSV fills in as a definitive security net for seeds tests from the world's most essential accumulations (Khoury et al. 2010).

According to Professor Shah M. Faruque the program coordinator of Microbiology and Biotechnology of BRAC University, purpose of a Gene bank can vary. In some countries gene bank means seed bank, in some countries it contains the gene of every person of that country, which preserves in a much secured way for future research to find the genetical behaviour of the gene or to find any rare viruses. He also said that British gene bank preserves the genetical data of around 67 million inhabitants. Genebank must have to be a highly secured place with a limited amount of entry permission. One can use the database with a valid permission to do research. But the agricultural genebank or seed bank is much more available to research. Plant genetic resources (PGR) are raw materials that are the storehouse of valuable traits, which have been used for tailoring new and better crops since the beginning of agriculture. The importance of PGR has increased in contemporary times, to meet the challenges of the future such as adapting crops for changing climatic conditions and combating abiotic/biotic stresses. Due to anthropogenic activities and several other factors, valuable genetic diversity is under threat. In such a situation, the role of genebanks has become of paramount importance, providing a safe method of ex situ conservation of genetic resources. Genebanks have the primary responsibility of collecting, regenerating, conserving, characterizing, evaluating, documenting, distributing the germplasm. Additionally, they also provide security by maintaining 'safety duplicates' of unique and important genetic resources. To carry out all the activities efficiently and cost-effectively, uniform and high standards are required at international level. The Commission on Genetic Resources for Food and 9 Agriculture (CGRFA) of the United Nations Food and Agriculture Organization (FAO) in its Fourteenth Session held in Rome, Italy, on 18 April, 2013, endorsed and adopted the revision of Genebank Standards (http:// www.fao.org/docrep/meeting/027/mf804e.pdf), previously published in 1994 (FAO/IPGRI 1994). These standards are meant to ensure that plant genetic resources for food and agriculture (PGRFA) are conserved in genebanks under recognized and appropriately uniform conditions, based on current technological and scientific knowledge (Tyagi and Agrawal 2013). Simply defined, genebanks are places where either seeds are conserved at low temperature and moisture, or whole plants/plant propagules are conserved in field or culture vessels or in cryovials (Tyagi and Agrawal 2013). The new international standards are expected to help genebanks worldwide to conserve crop diversity holistically in a more efficient, safe and cost-effective manner.

2.2 What is Gene Bank?

Gene banks are a type of biorepository which preserve genetic material. For plants, this could be by freezing cuttings from the plant, or stocking the seeds

People save money in banks, in case of an emergency. Genetic banks serve a similar purpose for farmers and scientists who work to conserve rare plants and animals. Researchers or farmers can withdraw samples from these “gene” banks to help rebuild populations of rare plant varieties and animal breeds or to help increase genetic diversity within species.

2.3 TYPES OF GENE BANK

1. Seed Bank - A seed bank preserves dried seeds by storing them at a very low temperature.

2. Tissue Bank- In this technique, buds, protocorm and meristematic cells are preserved through particular light and temperature arrangements in a nutrient medium.

3. Cryo Bank - In this technique, a seed or embryo is preserved at very low temperatures. It is usually preserved in liquid nitrogen at -196 °C

4. Pollen Bank - This is a method in which pollen grains are stored.

5. Field gene Bank - This is a method of planting plants for the conservation of genes.

6. Sperm Bank- A sperm bank, semen bank is a facility or enterprise that collects and store human sperm

7. Ova Bank - Ova bank or egg cell bank is a facility that collects and store human ova primarily from the ova donors. (A biorepository is a biological materials repository that collects, processes, stores, and distributes bio specimens to support future scientific investigation)

2.4 HOW GENE BANK WORKS?

While early humans depended on a variety of scavenged plant and animal resources, we've since reached the point where massive fields support a single food crop that feeds millions. This puts our food supply in a very delicate situation. If climate change introduces new pests or renders an area inhospitable to a former boom crop and if disease or natural and man-made disasters wipe it out – backup will be needed.

By storing the genes behind these crops, we provide ourselves with a backup -- money in the bank, so to speak.

The concept of stockpiling plant genes is nothing new. Farmers have stored away seeds to ensure future harvests for thousands of years.

Today, seed banks all over the world work to chronicle and store the genetic blueprints for crops, especially those that are vital food crops. Some of these are government-owned, others are operated by private and international organizations.(Lamb, 2018)

2.5 HISTORY OF GENE BANK IN BANGLADESH

There are three gene banks with limited facilities in three Agricultural Research - Bangladesh rice research institute (BRRI) - Bangladesh agricultural research institute (BARI) - Bangladesh jute research institute (BJRI) The National Institute of Biotechnology under the Ministry of Science and Technology is establishing an oncampus National Gene Bank at Savar, Dhaka, Bangladesh. The National Gene Bank will

1) Establish a central source of plants, animals, fishes, microbes and biodiversity components

2) Provide the collected samples and information to various research and development institutes and users.

Moreover, the Gene Bank will contribute to human resource development, public awareness, and guidelines and principles on the use of the gene pool. It will preserve seed, planting materials, semen, embryo, egg, sperm, cell, chromosomes and DNA, RNA, protein of plants, animals, fishes and microbes for various durations.

Chapter 3 Site Appraisal

3.1 Site Surroundings

3.2 SWOT Analysis

3.3 Site Images

CHAPTER 3 Site Appraisal

3.1 Site Surroundings

National Genebank is a project under the surveillance of National Institute of Biotechnology. Which is situated in Ganakbari, Ashulia. This is a natural site with a natural water body. This site is situated beside the BEPZ. Total site area is 3 acres. There is different ways to go to the site. A secondary and a tertiary road directly connected to the site. The secondary road comes to the site from Sreepur Bus Stop. And the other way is from talpotti road by rickshaw.

Fig: 3.1 Bipayl, Savar (Google Map)

Fig: 3.2 Road Network to the site (Google Map)

Fig: 3.3 Site Location (Google Map)

3.2 SWOT Analysis

When it comes to the strength of this project, the site is one of the strong part of this project. Cause the site is situated in a suburban area. Far away from the urban chaos. Which is very necessary for a research institute.

Weakness of this site is the suburban location. It's very far from the primary road and there is no direct access of public transportation like bus. The access road is very narrow to enter bus.

The opportunity of this site is the natural site surroundings. It has a natural water body with a huge amount of natural resources that I can incorporate in my design.

And the threat of this project is, this is an institute with a highly secured and controlled access. Where public access is not welcoming.

3.3 Site Images

Fig: 3.4 Panoramic view of NIB (Fahim, F.S, 2018)

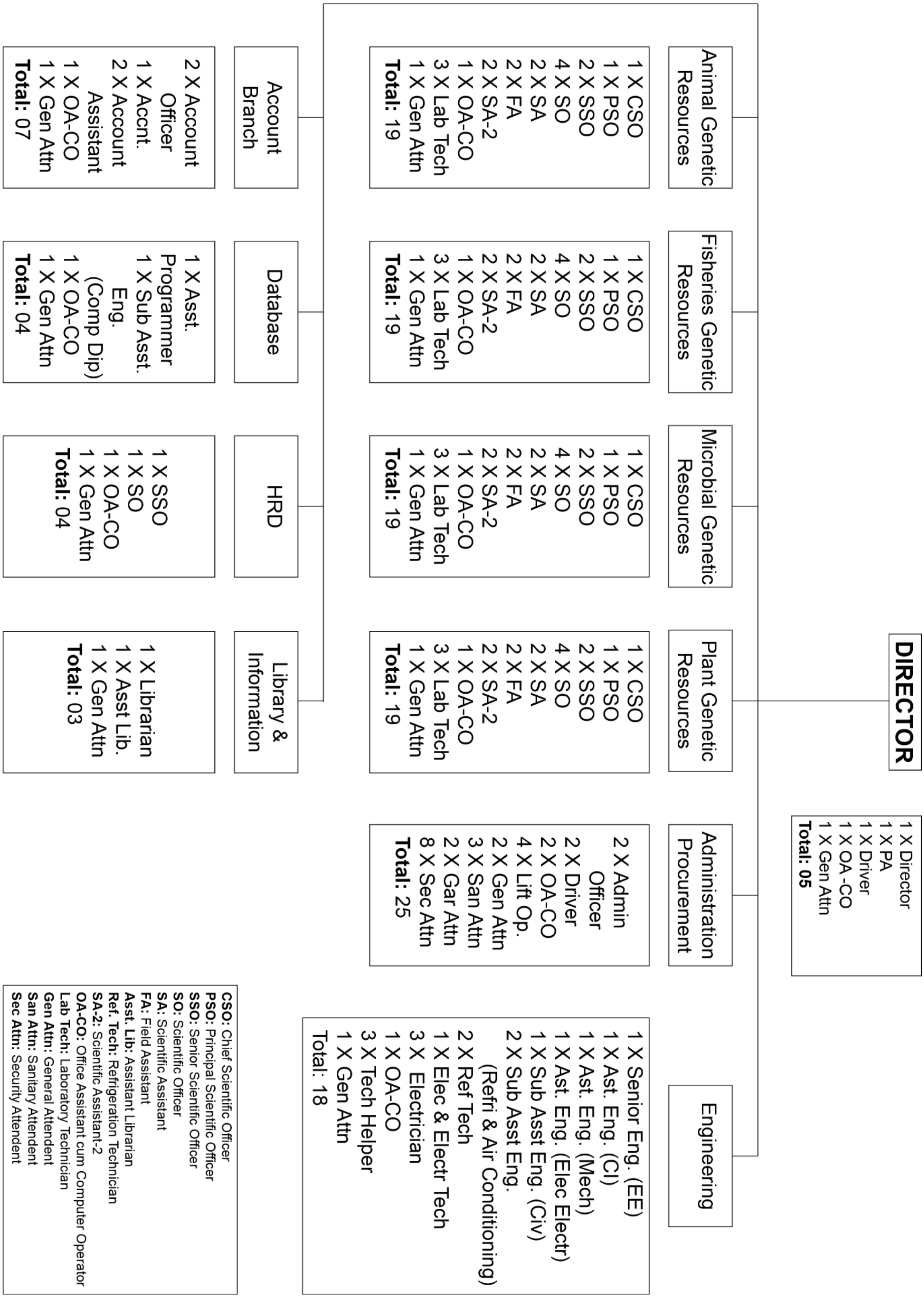
Fig: 3.5 Present condition of Site (Fahim, F.S, 2018)

Fig: 3.6 Driveway on the north of the site (Fahim, F.S, 2018)

Fig: 3.6 Driveway on the north of the site (Fahim, F.S, 2018)

Chapter 4 Programme and Development

CHAPTER 4 Programme and Development



Proposed Program for Establishment of National Gene Bank

A) Laboratory cum Office Building

Sl No.	Floor Name	Status
14.	Human Genetic resources Division	
13.	Forest Genetic resources Division	
12.	Invertebrate Genetic Resources Division	
11.	Marine Genetic Resources Division	
10.	Insect Genetic Resources Division	
9.	Microbial Genetic Resources Division	
8.	Fisheries Genetic Resources Division	
7.	Animal Genetic Resources Division	
6.	Plant Genetic Resources Division	
5.	Central High-tech Lab | Plant growth chamber	
4.	Administration (Director, Admin, Accounts, Engineering and Database) Division	
3.	Exhibition Hall	

2.	Human Resources Development and Library & Information Division	
1.	Conference Hall	
Underground	Parking	

2. Room Plan for Conference Hall

Sl No.	Facilities		
1.	Reception with Open space		Conference Hall: 250 Person
2.	Sitting Room (VIP, 30 Person Attached toilet		Conference Materials Storage room
3.	Tea Room		Toilet for Male
4.	Meeting Room (VIP); 40 Person; Attach toilet		Toilet for Female
5.	Sitting Room (General) 50 person		Open Space/Lounge for Poster Presentation, etc.
6.	Meeting Room (General) 50 Person; Attach toilet		
7.	Dining Hall/ Cafeteria 50 Person		
8.	Storage Room		
9.	Storage Room		
10.	Staff Room		
11.	Kitchen		
12.	Cleaning and Washing Room		

2. Room Plan for Human Resource Development (HRD) and Library & IT Sections

Sl No.	Facilities		
13.	Senior Scientific Officer; G:8		Class Room- 1 30 person
14.	Scientific Officer; G:9		Class Room-2 40 person
15.	Office Room for HRD		Class room-3 50 person
16.	Snacks/Tea Room for HRD		Multimedia class room 40 person
17.	Staff Room for HRD		Lobby/Lounge for HRD
18.	Store Room for HRD		Library
19.	Common Toilet for Male		Reading Room
20.	Common Toilet for Female		Computer Laboratory
21.	Waiting Room; 20 person		Store Room for Library
22.	Librarian; G: 9		Staff Room for Library
23.	Office Room for Library		

3. Room Plan for Exhibition Hall

Sl No.	Facilities		
1.	Visitor’s Guidance Room		Souvenir shop
2.	Rest/Snacks Corner		Fisheries Museum
3.	Store Room		Aquarium

4.	Store Room		Microbial Culture Museum
5.	Staff Room		Insect/ Invertebrate Museum
6.	Toilet for Male		Marine resources Museum
7.	Toilet for Female		Plant resources Museum
8.	Prayer Room for Male 50 person capacity		Animal Resources Museum
9.	Prayer Room for Female 20 person capacity		Forest Genetic Resources
			Space for Recreation activity

4. Room plan for Director, Admin, Accounts, Engineering & Database Section:

Sl No.	Facilities		
1.	Director Grade: 2 attached toilets		Meeting room 40 persons
2.	PA to Director Grade: 10 Office Room		Senior Engineer (Electrical and Electronics) Grade: 6
3.	Snacks/ Tea Room		Assistant Engineer (EE) Grade: 9
4.	Admin Officer; Grade: 9		Assistant Engineer (Civil) Grade: 9
5.	Admin Officer; Grade: 9		Assistant Engineer (Mechanical) Grade: 9
6.	Office Room (OA Cum Computer Operator); Grade: 16		Sub-Assistant Engineer (Civil); Grade:10
7.	Store room		Sub-Assistant Engineer (Refrigeration and Air Conditioning); Grade: 10

8.	Staff room		Sun-Assistant Engineer (Refrigeration and Air Conditioning); Grade: 10
9.	Toilet for male		Office rom (OA cum Computer Operator); Grade: 16
10.	Toilet for female		Assistant Programmer; Grade: 9
11.	Account Officer; Grade: 9		Sub-Assistant Engineer (Computer Diploma); Grade: 10
12.	Account Officer; Grade: 9		Office (OA cum Computer operator); Grade 16
13.	Accountant; Grade: 12		Server Room
14.	Account Assistant; Grade: 13		Workshop
15.	Office (OA cum Computer); Grade 16		Storage room for IT
16.	PABX Room		Storage Room for Engineering

5. Laboratory: Room Plan for Central Lab & Growth Chamber

Sl No.	Facilities		
1.	Master Mix Lab-360sft		Growth Chamber-540sft
2.	Thermal Cycling Lab-360sft		Growth Chamber-540sft
3.	Electrophoresis & Gel Doc lab -360sft		Inoculation Lab-360sft
4.	High-Tech Lab-540sft		Proteomics Lab-360sft
5.	Analytical Lab-540sft		Cleaning and Washing Lab-270sft
6.	Metabolomics Lab-360sft		Sitting Room-360sft
7.	Radioactive Materials Lab-180sft		Support Lab-360sft
8.	Dark Lab-180sft		Store for Temp Sensitive Chemicals-

			180sft
9.	Common Toilet for Male		Staff Room-180sft
10.	Common Toilet for female		Store Room-180sft
11.	Sitting Room-180sft		Sequencing Lab-270sft

6. Plant Genetic Resources Division

7. Animal Genetic Resources Division

8. Fisheries Genetic Resources Division

9. Microbial Genetic Resources Division

10. Insect Genetic Resources Division

11. Marine Genetic Resources Division

12. Invertebrate Genetic Resources Division

13. Forest Genetic Resources Division

14. Human Genetic Resources Division

Chapter 5 Case Studies

5.1 Local and International Case Studies

5.1.1 Gene Bank at Bangladesh Rice Research Institute (BRRI), Gazipur

5.1.2 SALK INSTITUTE, California.

CHAPTER 5 Case Studies

5.1 Local and International Case Studies

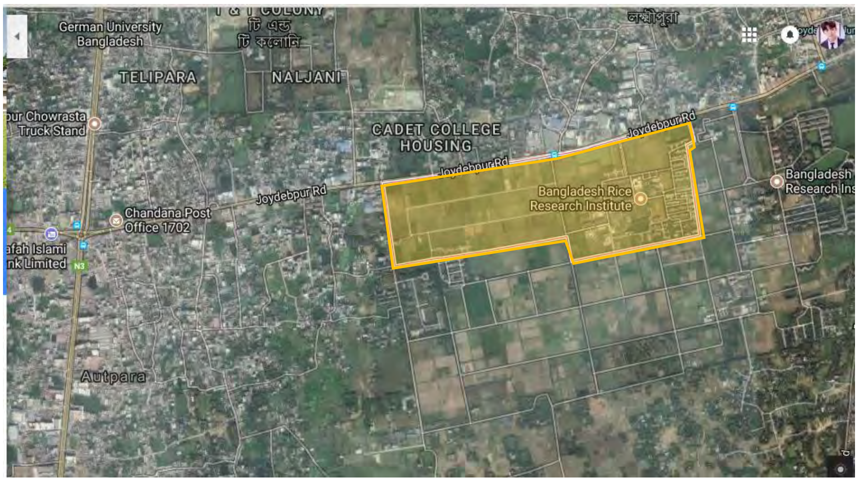
5.1.1 Gene Bank at Bangladesh Rice Research Institute (BRRI), Gazipur

5.1.1.1 Project Information

LOCATION: GAZIPUR, DHAKA, BANGLADESH

ARCHITECT: Shah Mohammod Hasannuzzaman

- 36 km from Dhaka
- 2 km from Gazipur ChowRasta
- The institute, formerly known as the East Pakistan Rice Research Institute (EPRRI), was established on October 1, 1970 at Joydebpur.
- The institute operates with 19 research divisions, 3 support service divisions and 8 sections, with a total manpower of 673, of them, 249 are scientists.



The institute is equipped with modern research facilities that include **laboratories**, **greenhouses** and **experimental fields**.

BRRI has a modern germplasm bank, **twenty major laboratories**, **ten greenhouses, ten net houses** and a 76.83-ha experimental farm at its headquarter at Gazipur.

5.1.1.2 Vision

Development of rice varieties and production technologies for sustainable food Security.

5.1.1.3 Vision

1. Supporting to achieve sustainable food security through rice research and technology development.

2. Climate friendly rice technology development as resources are declining.

3. Improving institutional capacity for research and development.

5.1.1.4 Research Division

1. Plant Breeding
2. Hybrid Rice
3. Biotechnology
4. Genetic Resource & Seed
5. Grain Quality & Nutrition
6. Agronomy

7. Soil Science
8. Irrigation & Water Management
9. Plant Physiology
10. Plant Pathology
11. Entomology
12. Rice Farming System
13. Farm Machinery and Post-Harvest Technology
14. Workshop Machinery and Maintenance
15. Agricultural Economics
16. Agricultural Statistics
17. Farm Management
18. Adaptive Research
19. Training

5.1.1.5 RICE GENEBANK AND SEED LABORATORY

This building is situated at south-west corner of the area. The Rice gene bank of BRRI has a total number of 8700 varieties including 125 wild samples preserved here.

5.1.1.6 SHORT-TERM STORAGE

1. Seeds are stored in 20-22 degree temperature.
2. 150-200g seed in a brown paper bag.
3. RH from 50%-60% and seed moisture from 10%-12%.

4. Seeds can be viable from 3 to 5 years in this condition.
5. 90sqm floor area to store 15000 accessions.
6. Seed exchange, duplicates shorting and rejuvenation are done from here.

5.1.1.7 MEDIUM-TERM STORAGE

1. 21 refrigerators are used for germplasms conservation.
2. Temperature is 0-5 degree, seed moisture 8-10%.
3. Viability – 10 -15 years.
4. Stored in air tight laminated aluminum foil in a glass jar with silica gel.
5. 50g seeds are stored in each accession.
6. Storage capacity is around 10000 accessions.

5.1.1.8 LONG-TERM STORAGE

1. This facilities has been started in 2007 which has 225 sqft area and 2000 cft volume.
2. The temperature is constantly maintained from -20 degree to 1 degree.
3. The longevity of seed sample is 50-100 years.
4. The capacity of this storage is 22000 packets, 400gm/packet.
5. Seed moisture is below 8%.

5.1.1.9 FINDINGS

1. Since the gene bank was opened in 2007, technologically it is not that advanced and updated.
2. There is space limitation at the storage.
3. The whole process of controlling temperature and Humidity time to time is being operated manually after checking several times – which can be harmful for the samples.

5.1.2 SALK INSTITUTE, California.

5.1.2.1 Background of the Project

The Jonas Salk Institute for Biological Studies, built on a high coastal site in La Jolla, California from 1959-1965, is considered by Wiseman to be the "single image [that] conveys to the public what Louis Kahn accomplished as an architect" (2007). The building was born of a collaboration between Kahn and his client, Jonas Salk, a man with "a romantic vision of human potential that matched his own" (Wiseman 2007). Kahn is even quoted as saying "[Salk] listened to me more carefully than I did to myself" (Quoted in Wiseman 2007).

In regards to the function of the building, Salk required a hundred thousand square feet, divided into ten equal laboratory spaces, but also added that he "would like to be able to invite Picasso to the laboratories" (Quoted in Wiseman 2007). The site offered beautiful views of the Pacific Ocean which Kahn would keep in mind through the design process. The finished plan consists of two buildings with five laboratory wings each, mirrored over a central courtyard with a single water feature running its length.

Image Source: ArchDaily

5.1.2.2 Exterior

The foremost aspect of the exterior of the Salk Institute is its reinforced concrete construction. Kahn was more than masterful in his use of concrete for the institute, even experimenting with several types and mixtures before settling on a final product. Special attention was paid to the board-forming process and the forms the process left in the concrete. In contrast, the less modern materials of marble and wood were used for the courtyard and office screens, respectively. Viewing the North or South elevations, one can see how the nearly symmetrical plan and repetition of five monolithic rectilinear forms can evoke images of classical columns. The sheer size and imposing forms evoke the monumental feel Kahn was intentionally trying to express in his architecture. Additionally, the symmetry of the plan reflects an embracing of certain pre-Modern ideas.

The idea for the open plaza or “façade to the sky” actually came from Kahn’s contemporary, Luis Barragan. This relationship of the plaza to the sky and its magnificent view of the Pacific are often compared to the villas of Rome or a Greek temple on the Aegean (Wiseman 2007). The very presence of a space with no true function other than contemplation or enjoyment in itself was very anti-Modern.

5.1.2.3 Interior

Perhaps the most non-Modern feature of Kahn’s interior of the Salk Institute is the use of warmer wood in contrast to the brutal concrete used on the exterior. While most of the interior surfaces are also exposed concrete, Kahn introduces Burmese teak wall screens and oak furnishings as a sort of organic contrast to the man-made concrete material (Wiseman 2007).

Kahn’s concept of servant and served space is “lent a new quality in the Salk Institute” (Gast 2001). Not only are there service cores on the North and South ends of the buildings to house stairs, restrooms, and the like, but there are even entire floors dedicated to separating the mechanical considerations of a building from the laboratory space. The way spaces are located within the floor plan recalls the way Palladio’s Villa Rotunda used the same rectangular form for every room. Kahn uses the same five service towers and five study towers on the exterior and courtyard edges of the building, respectively. He even places the lab spaces in the center in a similar way to the round central area of the Villa Rotunda.

Chapter 6 Design Development

6.1 Introduction

6.2 Initial Ideas

6.3 Zoning

6.4 Final Design

Chapter 6 Design Development

6.1 Introduction

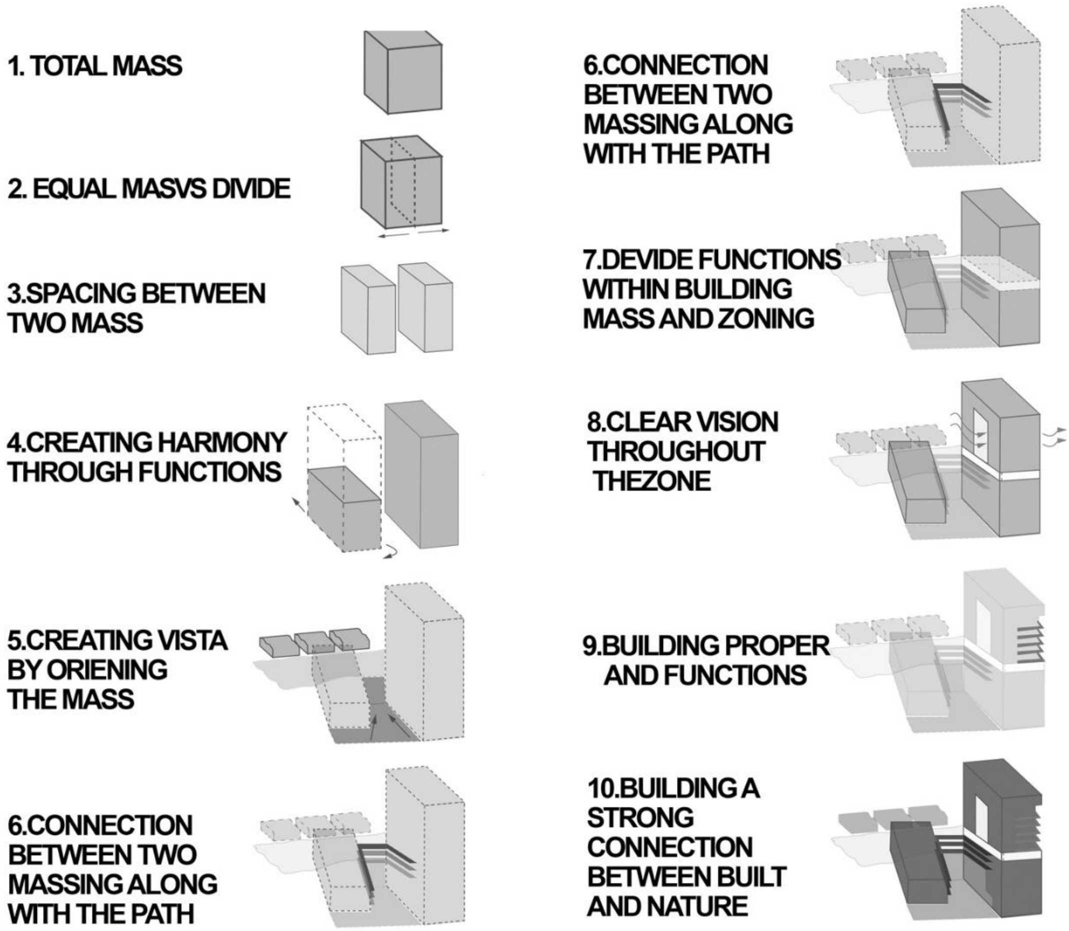
Designing is a process that requires constant referring to the site's environment and its basic needs. To achieve an organic project, context of the site, its forces are needed to be considered. Identification of the core function and requirement of the project is very important in order to do complete justice with the design.

6.2 Initial Ideas

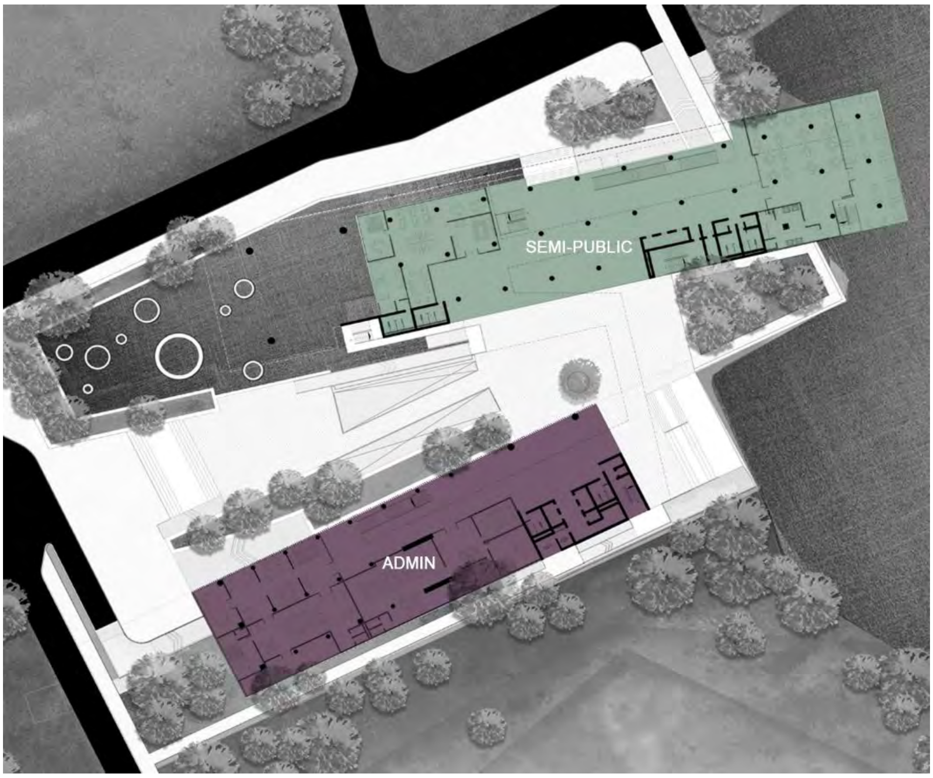
As genebank is a very introvert project and not so close to public, I designed this project by placing the functions in a right place.

I placed the public space under the main building in basement. There were two situation that helps me to take the decision to place the public exhibition space beneath the ground. First of all there was a proposal of an aquarium, which normally takes a huge amount of load which I wanted to pass direct to the ground and I wanted to welcome natural lights through the aquarium which will reduce the load of electricity and other non-renewable energy.

6.3 Zoning



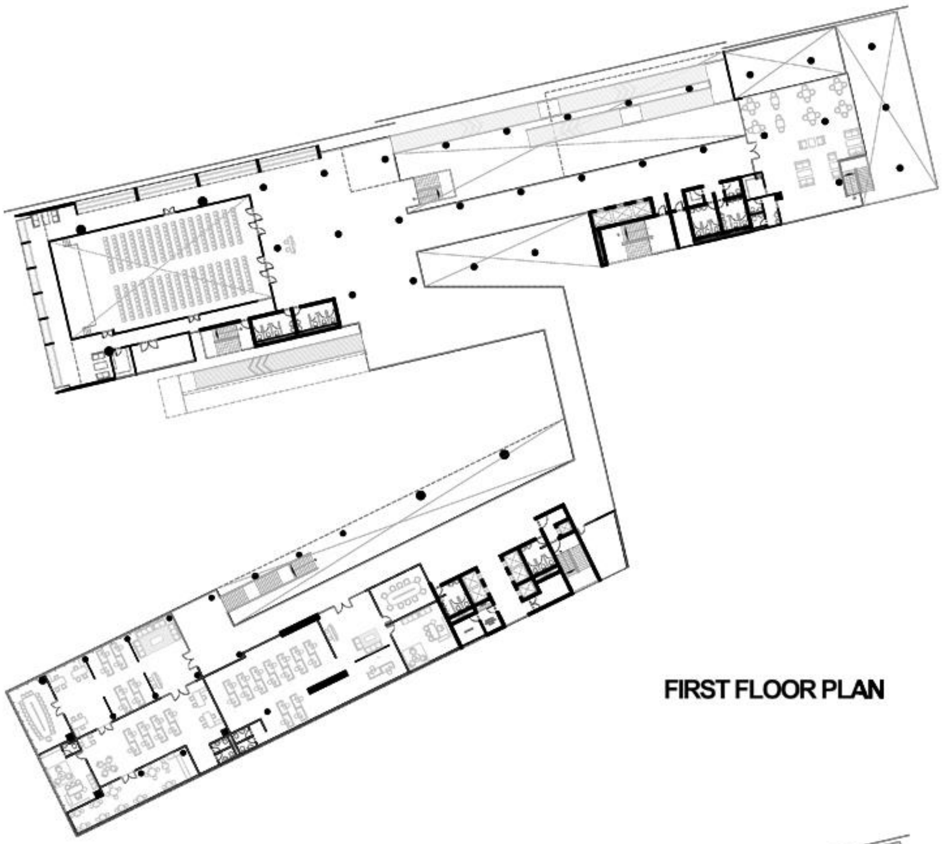
I wanted to let the people enjoy the ground level which has a natural and a designed shallow water body. I placed minimum programs on the ground.


SEMI-PUBLIC
ADMIN

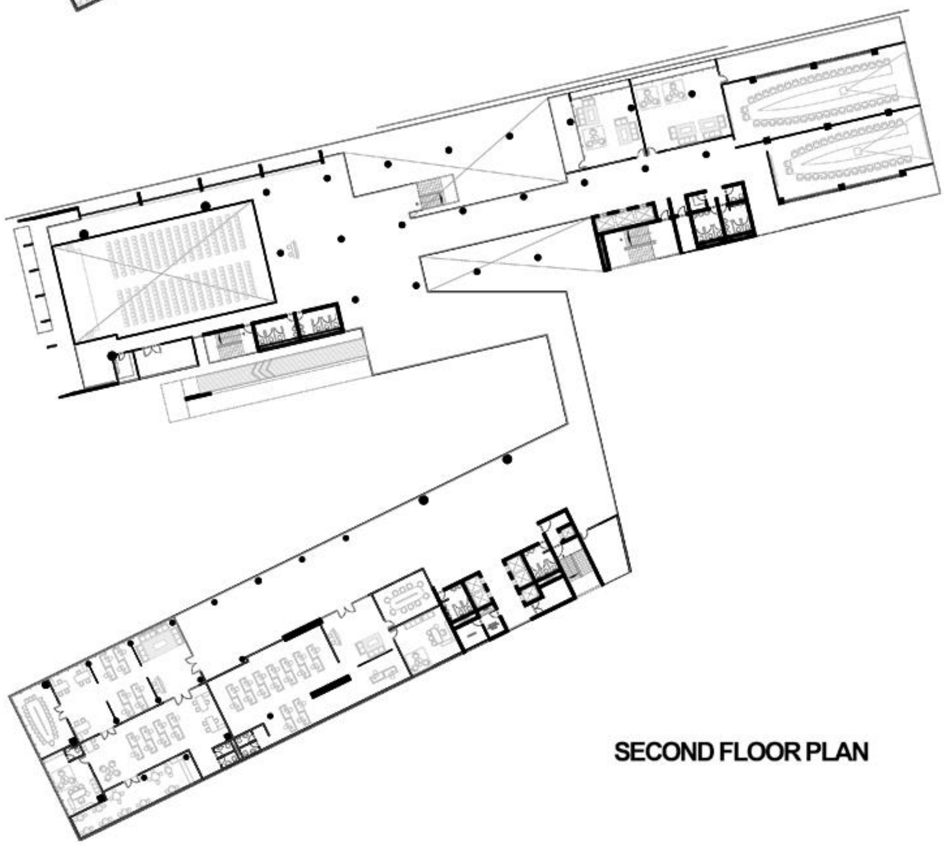

PUBLIC RELATED FUNCTIONS
GENEBANK RELATED FUNCTIONS

6.4 Final Design

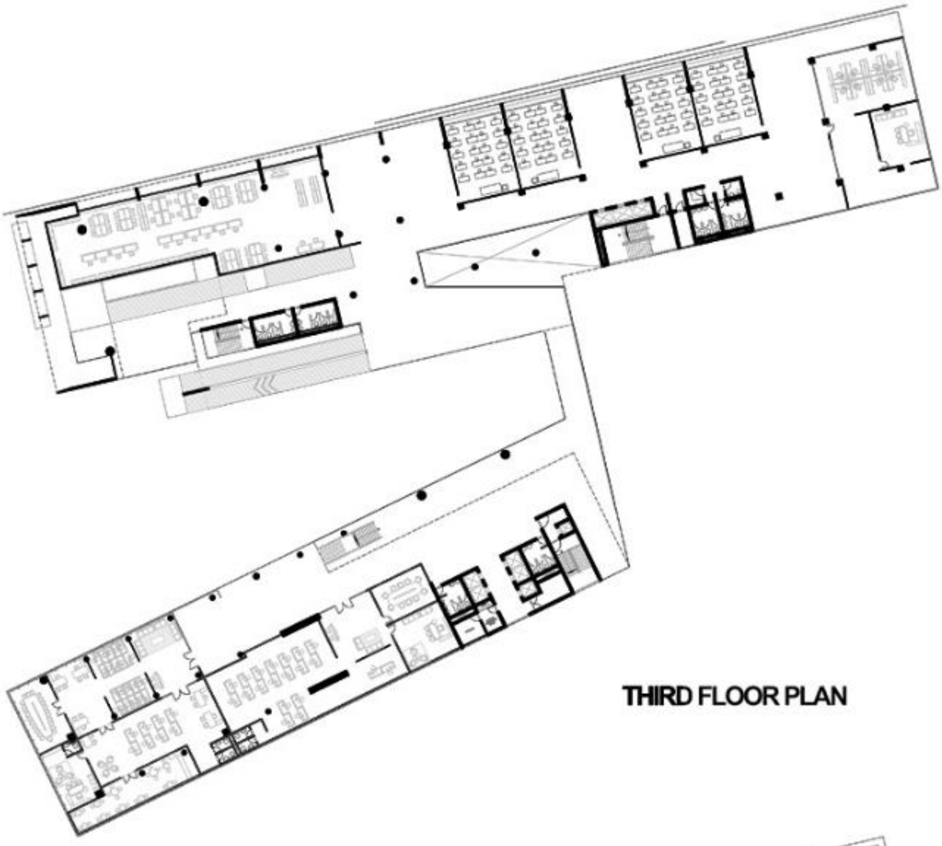
Master plan



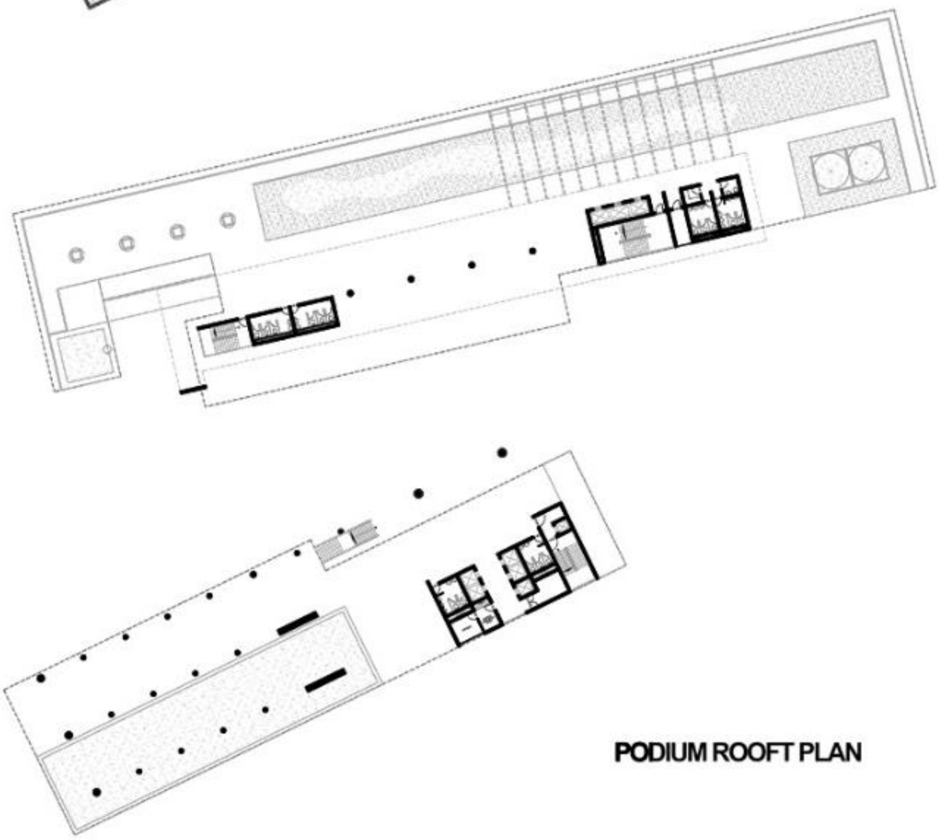
FIRST FLOOR PLAN



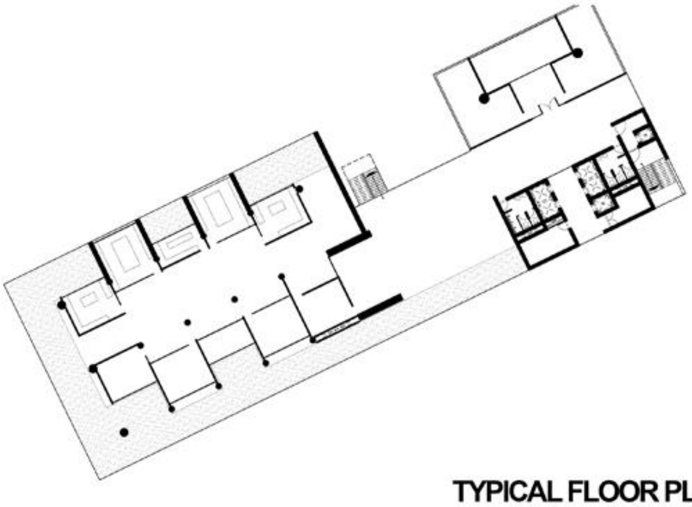
SECOND FLOOR PLAN



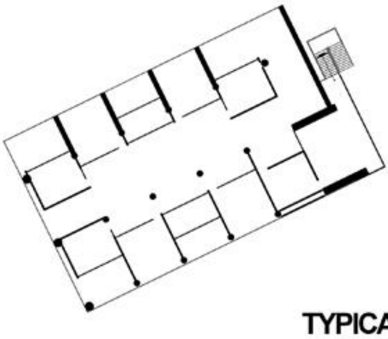
THIRD FLOOR PLAN



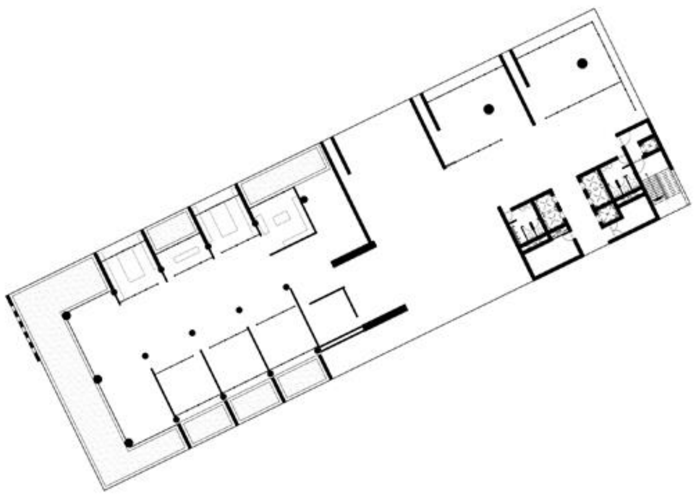
PODIUM ROOFT PLAN



TYPICAL FLOOR PLAN 1



TYPICAL FLOOR PLAN 2

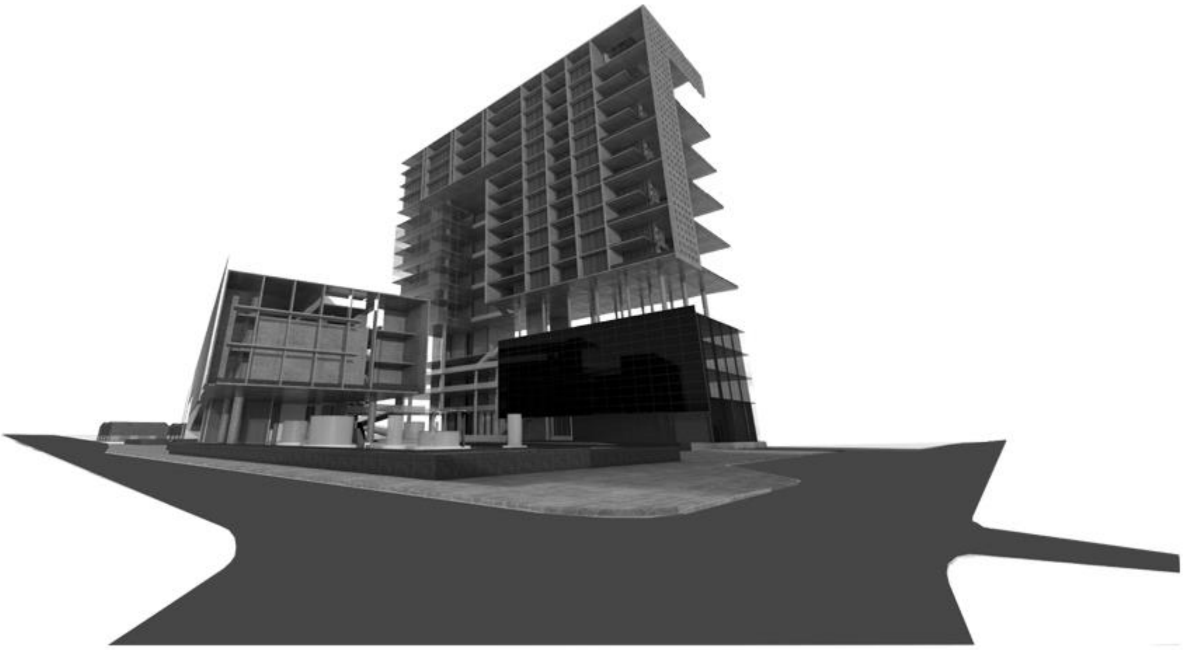


TYPICAL FLOOR PLAN 3


NORTH ELEVATION
SECTION AA'

WEST ELEVATION

SECTION BB'



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