LOYOLA COLLEGE OF SOCIAL SCIENCES
THIRUVANANTHAPURAM

Criteria 3- Research, Innovations and Extension

3.2- Innovation Ecosystem

3.2.1 Institution has created an ecosystem for innovations and has initiatives for creation and transfer of knowledge

3.2.1-10: Elevated Atlantis

THE ELEVATED ATLANTIS

A Project Aimed at Sustainable and Eco-Friendly Housing

DEPARTMENT OF PERSONNEL MANAGEMENT

LOYOLA COLLEGE OF SOCIAL SCIENCES
SREEKARYAM, TRIVANDRUM- 695017
Kerala
2018-2020

Elevated Atlantis

The concept of Elevated Atlantis and the entire **Business Plan** was conceptualized, visualized and materialized by a group of 4 post-graduate students (Harikrishnan, Mebin James, Rahul A & Sanu Wilson) pursuing **Masters in Human Resource Management** (2018 – 2020 Batch) from **Loyola College of Social Science, Trivandrum**. For management students, participating in intercollegiate management fests is a way of honing their skills and proving their mettle in this challenging and competitive environment.

As an institution with a long-standing legacy of churning out skilled professionals with commitment towards society and responsibility towards their respective domains, Loyola College of Social Sciences has always stood at the forefront of academics, ethos and values. So, when the opportunity for participating in a Business Plan Competition was provided to these young chaps, there was no second thought as everyone swung into action. The required guidance and support were given by **Dr Aby Tellas**, who has specialized in **Marketing Management** over his years of teaching career.

The concept was to make eco-friendly and sustainable housing for the flood-affected regions in and around Kerala. In 2018, the state saw a flash flood that lasted a month and had a devastating effect on the population. Many lost their livelihoods, and many lost their homes. For many, a house is a dream come true and once in a life asset. The floods revealed the vulnerability of many areas across the state, especially the ones close to the backwaters and coastal regions. Reconstructing a house might not be a feasible solution as if the floods strike again, the house will be again submerged. That was the point from where the team started thinking of an alternative solution that is cheap, robust and easy on the pocket of an individual. The idea was presented in front of the Head of the Department, **Dr Prakash Pillai R** and other faculty. A rough draft of the business plan along with a working model was made. The same was evaluated by the faculty on the basis of their expertise.

From the feedbacks obtained, again, we went back to the drawing board to reconstruct the business plan and the working model. By the time we perfected the same, the due date for sending the final draft to **Monti International Institute of Management Studies**, Angadipuram, Kerala had come. As the last exercise to perfect the whole work, the team went on to have an open defense from the

entire batch of students pursuing **MA HRM in Loyola College of Social Sciences**. By answering the queries and doubts of the whole two batches, the team got the confidence and vigor to participate in the upcoming Business Plan Competition. During the management, we got the opportunity to interact with students from different institutions across the country. From them, we learnt a lot, and we shared our insights too. It was a very rewarding moment for the team, the student fraternity and the institution when Loyola College of Social Sciences was declared as the winners of the business plan competition, and the trophy was handed over by the then **Calicut University Vice-Chancellor**. The stride never stopped there. Then we got the opportunity to participate in similar Business Plan Competitions conducted as part of the management fests organized by **St. Berchmans College**, Changanassery, Kerala and **Saintgits Institute of Management** Kottayam, Kerala. In all these competitions, Loyola College of Social Sciences emerged as the winners. It was an honorary moment to see the name of college going up the leaderboards, and the efforts, support and guidance we received started yielding. With the milestones the team achieved during the academic year 2018 - 2020, the junior batches began preparing themselves and participated and emerged as winners in management fests conducted by premier intuitions in and around the district before the pandemic began.

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securing the First/~~Second prize~~ in the Business Plan (PG) .....

Event held during SIMTHESIS 12.0, the National Level Management Fest, organised by Saintgits Institute of Management, Kottayam, on 16th & 17th January 2020.

Dr. Elgin Alexander
Faculty Coordinator

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the event Business Plan *under*

Meridian 2k19, All India Level Management Fest

on 28th September 2019

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Dr. Umesh Neelakantan
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Nueva Empresa 2019

National Level Business Plan Competition

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Certificate of Merit

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has ~~participated~~/secured First Prize in the National Level Business Plan Competition, Nueva Empresa -2019, organised by Berchmans Institute of Management Studies, SB College, Changanacherry, on 25th October 2019

Dr. Jacob Mathew
Principal

Dr. Stephen Mathews
Director

BERCHMANS INSTITUTE OF MANAGEMENT STUDIES · ST. BERCHMANS AUTONOMOUS COLLEGE · CHANGANACHERRY · B.I.M.S

Dr. Siby Joseph K
Head of the Department

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Executive Summary

India is a country with a very diverse geography ranging from snowcapped mountains to flat lands. The total land area of the nation is around 3,287,263 sq. kms. The current population of the nation as per records from 2017 is around 133.92 crores. The India Meteorological Department in its recent studies revealed that about 13% of the habitable land is prone to severe flooding and cyclonic events at the wake of recent floods in several parts of the nation.

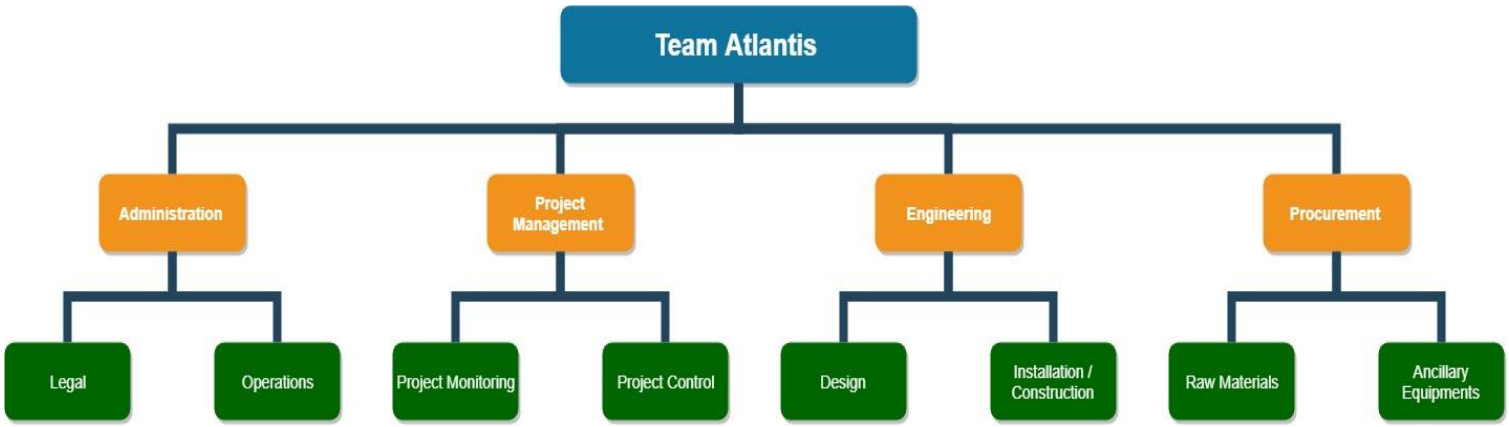
Based on the recent happenings around 9 states are affected by flash floods and rapid draughts due to climatic fluctuations. These floods occur without any early warnings as they are unpredictable and their nature can be studied up to a certain extent only. The outcome of these floods are destructions to life, livelihood, property, landscape and infrastructure. Large number of people are displaced from their homes as the places where their homes were located are submerged by overflowing waterbodies.

The Project aims at developing & designing a viable and equitable housing project, implementing the project in flood affected areas, evaluating the adherence to performance parameters and continuously improving the design over the life cycle of the project. The idea behind the project is to help the poor as well as the weaker sections of the society to build back from the rubble left behind by the floods. The project is titled as "**The Elevated Atlantis**". Atlantis is the name of the Fictional Ocean Kingdom.

The project is aimed at a variety of stakeholders ranging from governments of various states to construction firms that are ready to take up such a relevant, economically bearable, socially viable and environmentally sustainable project to help rebuild the nation.

Organizational Plan

The basic organizational structure is that of a small startup firm with fewer number of individuals. The founding members of the firm will handle 4 core areas of the firm who themselves hold the chair of authority.



Due to limitations in resources and the need to expand the capacity of the firm the plan is to go for a joint venture with construction firms on a regional basis. This will help the firm to:

- Access more resources
- Reach greater capacity
- Get technical expertise
- Access established markets
- Develop innovative ideas
- Deal with regional legal obligations
- Better acceptability in regional markets
- Financial aides and resource sharing
- Increased flexibility in operations

Products / Services Offered

The product on offer is a pre-fabricated modular housing platform for the lackluster and poor socio-economic sections of the society who are struggling to rebuild their homes lost in floods and those who face the impact of frequent floods in their area of living.

The idea for developing the project came from the traditional house boats used in Kerala's Alappuzha Districts for attracting tourists. Earlier these were used for transportation of goods and people across water bodies of the state. Commonly known by the name "Kettuvallam", these were sometimes used by nomadic families as their homes.

These modular homes can be constructed at sight and can be placed on the allocated land of the customer. The container house with required facilities will be placed on top of a barge that floats when water starts flowing underneath it. The main advantage over fixed pillar supported houses constructed by the government and various construction firms is that the change in water level will not submerge the house and the floating height is

dynamic in nature. They will have anchorages at all four corners to reduce the **Swing Circle** of the property. These anchorages can be controlled from the top of the barge using an **Anchor Pulley** manually. The project also comes with a host of features like **On Board Sewage Treatment** to prevent the release of effluents into the surrounding at times of floods and a self-energy sufficient roof mounted solar panels for power generation at times of floods when electricity gets interrupted.

Other services provided by the firm will be:

- Project Viability Studies
- Consultations
- Technology Sharing
- Customized Project Up taking
- Panel installation in existing households
- STP installation in existing households

Town and Country Planning Authority of India under the Central Government and State-wide Municipal Corporations are looking for sustainable projects that are bearable and viable to implement with the available budget.

Entrepreneurial Team

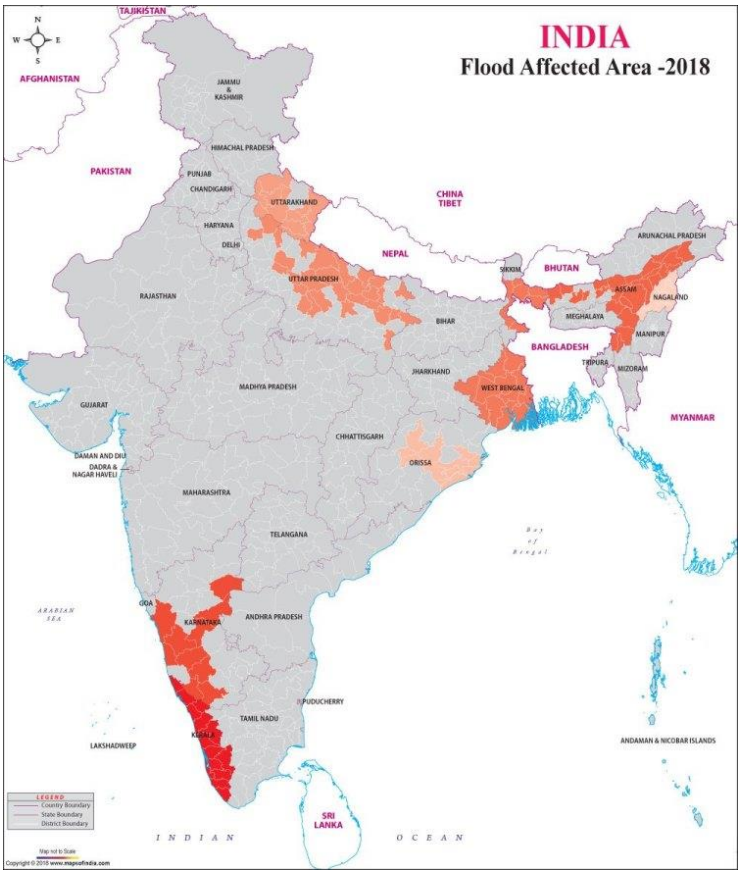
The Entrepreneurial Team consist of the four founding members of the project and the organization. All four are from different backgrounds having varied experiences in past. Based on the educational qualifications the team has:

- Procurement Lead: Mebin James (BBA + HRM)
- Administration Lead: Sanu Wilson (Sociology + HRM)
- Project Management: Hari Krishnan (Sociology + Automobile Engineering + HRM)
- Engineering: Rahul (Mechanical Engineering + Design + HRM)

The idea behind the project was put forward by the team during a brain storming session held internally as part of the discussions associated with a session in **"Urban Planning & Sustainable Development"** by the Head of The Department Personnel Management, Dr. Prakash Pillai.

The theme of the discussion was rehabilitation of flood displaced people in an economically bearable, socially viable and economically sustainable way.

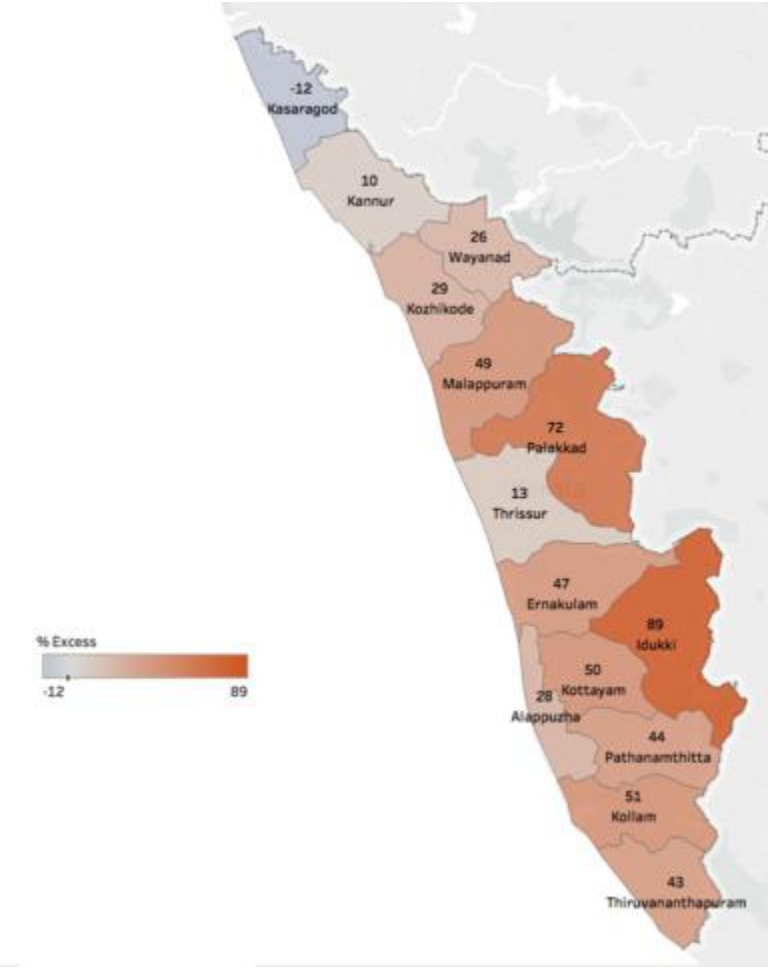
Target Market



The above shown geographical map of India clearly demarcates the flood affected areas in 2019. This includes the states of:

- Andhra Pradesh
- Odisha
- Kerala
- Gujrat
- Goa
- Tamil Nadu
- Maharashtra
- Karnataka
- Madhya Pradesh

If we are considering the case of our home state Kerala, almost all major districts were flooded to a large extent which saw a radical increase in the rate of rainfall which increased the water level in almost all the dams exponentially.



According to the Hydromet Division of Indian Meteorological Department the percentage increase in rainfall compared to average rainfall over the years was

District	Rainfall (mm)	Normal (mm)	% increase
Alappuzha	1648.1	1309.5	20.54%
Ernakulam	2305.9	1606.0	43.58%
Idukki	3211.1	1749.1	83.58%
Kannur	2450.9	2234.9	9.66%

District	Rainfall (mm)	Normal (mm)	% increase
Kasaragod	2549.94	2489.1	-2.44%
Kollam	1427.3	985.4	44.84%
Kottayam	2137.6	1452.6	32.04%
Kozhikode	2796.4	2156.5	22.80%
Malappuram	2529.8	1687.3	49.93%
Palakkad	2135.0	1254.2	70.22%
Pathanamthitta	1762.7	1287.5	36.90%
Thiruvananthapuram	920.8	643.0	43.07%
Thrissur	1894.5	1738.2	8.99%
Wayanad	2676.8	2167.2	23.51%
Kerala (Total)	2226.4	1620.0	37.43%

From the data available it is clear that Alappuzha, Ernakulam, Malappuram, Kozhikode, Wayanad, Idukki, Thrissur, Palakkad were the most affected in terms of flood.

As an Initial Start in implementing the project, the target market has been identified by proper Segmentation of the wide array of customers and then choosing a promising group of customers.

It includes:

- Construction firms looking for an innovative project
- NGO’s & NPO’s specializing in developmental activities
- The State Government
- CSR Teams of Industries

Market Analysis / Industry Analysis

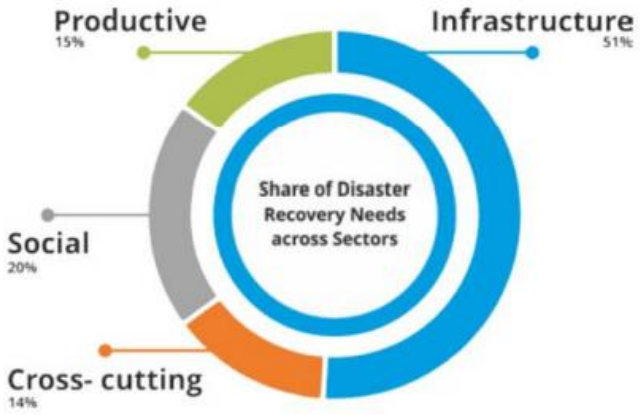
According to Kerala State Disaster Management Authority, there are two major hazards that Kerala is facing and will face in future. They are

- Extreme Precipitation and Flooding
- Landslides

Among other risks and hazards studied by the authority, these two are categorized as

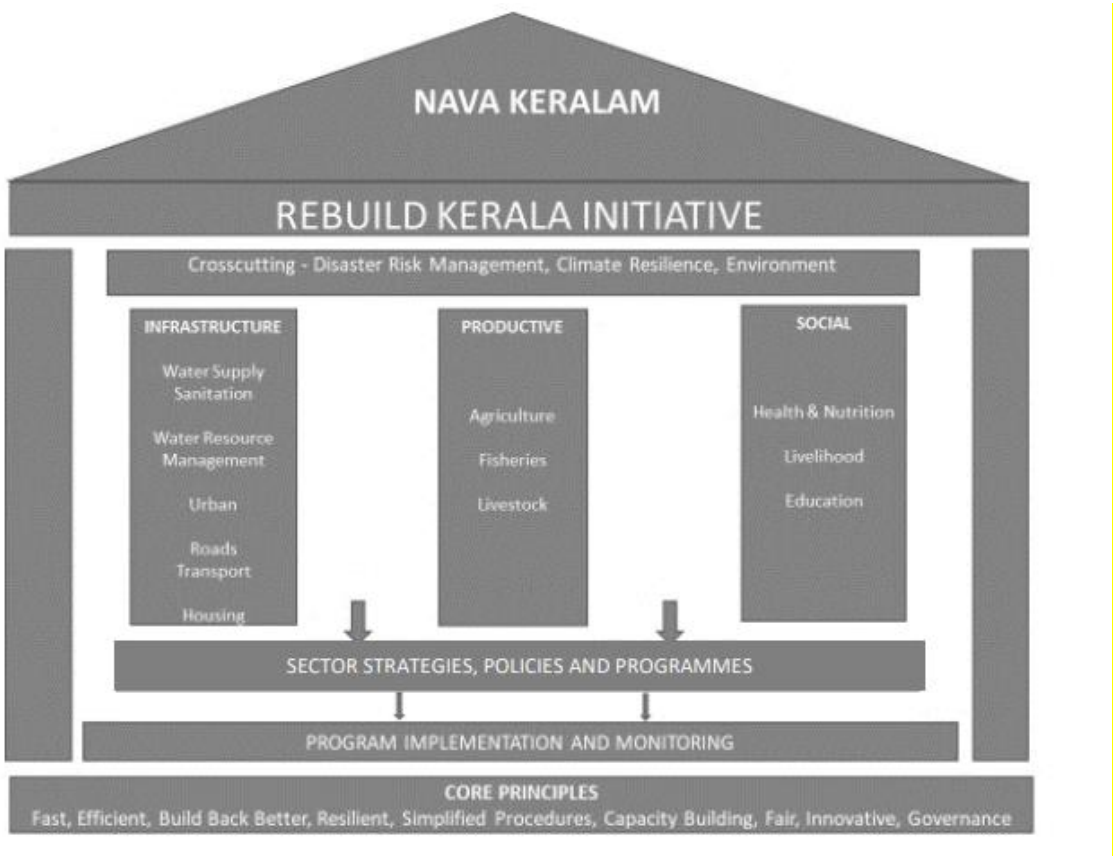
- Highly Exposed
- High Potential Impact
- High Risk

According to the data available the number of taluks prone to floods stands at 75 and those affected by landslides stands at 50. This translates to around 6,789.5 $km^2$and 77,95,816 people affected by floods and 5,619.7 km^2 and 27,99,482 people affected by landslides.



Based on the Share of Disaster Effects Chart, it is clear that more than 50% of the impact was on infrastructure. The mental trauma and shock caused by the unprecedented floods on the people of the state was so devastating.

Housing and Land Settlements suffered a damage of around 5027 crores with an additional 1383 crores of assets are listed as total loss. Thus, the total effect of damage stands at 6410 crores and it was estimated that 5443 crores is required to rebuild the lost settlements.



The Project "**The Elevated Atlantis**" will be concentrating on the Housing aspect of the **Nava Keralam** Initiative. The government has set up Green Technology Centre under Local Self Government Institutions to Rebuild a Sustainable Kerala by Shifting the households into green technologies.

Climate projections (IPCC AR5) have predicted a sea level rise of 1.8 - 2 mm by 2030. Studies have revealed that about 169 sq.km. would be inundated due to a one metre increase sea level in and around Kochi region. Kuttanad region is expected to be severely affected by this sea level rise. This has major implications on the habitations – their houses, their livelihoods and related activities - in and around the Kuttanad region that is

expected to be submerged. With the expected increase in rainfall intensity, a number of coastal cities would also be prone to water logging and flooding.

Recently the first batches of houses that were constructed under Rebuild Kerala Mission in 2018 was put through its paces during the 2019 floods. The government constructed houses was able to withstand the water due to its elevated structure.

The house stays elevated and thus helps the inhabitants to stay safe from the flooding surroundings. But the question regarding this form of construction is “What happens if the water level rises above the expected or calculated figures?”

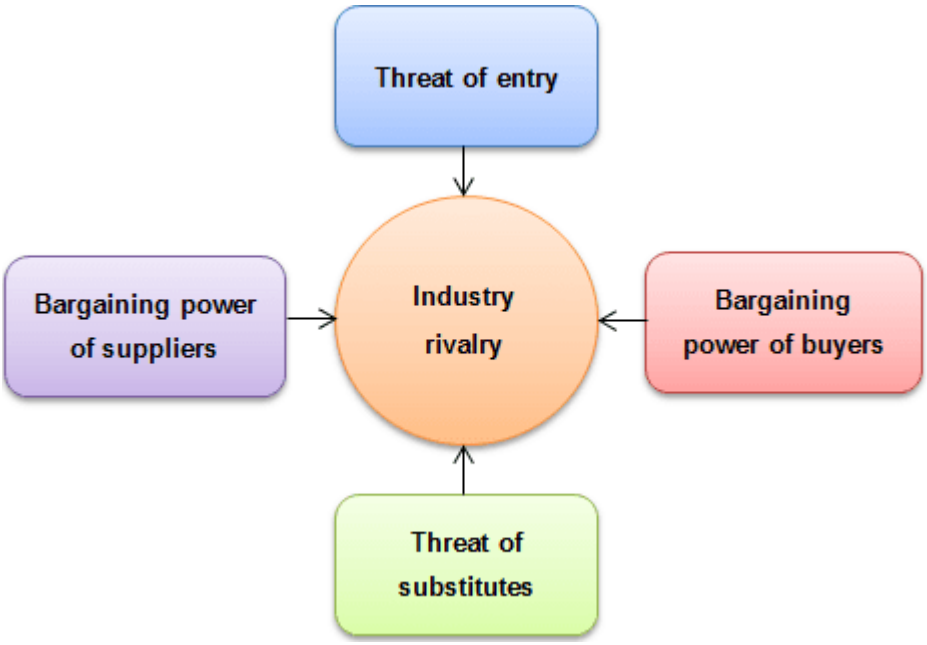
Thus, arises the need for a structure that adapts to its surrounding conditions. No other firm or organization in the state provides such a solution as of now due to the complexity and the attitude of people towards housing.

The design is simple and easy to install but the factor that was hindering the product launch was the attitude of the people, who always look at housing as an esteem factor and not as a shelter. This makes the people concentrate more on the aesthetic aspects rather than looking at the functionality of the structure.

The current scenario in Kerala is ideal for the launch of the product as Kerala is seen as one of the most modern and conscious market in the entire nation.

Competition Analysis

Competition for the project was studied using **Porter's Five Forces Model**



Threat of New Entry

Since the market that is being targeted is Kerala at present and since there is a need for a sustainable project that can save the lives and livelihood of millions in the flood affected parts of the states in a socially viable and economically bearable manner, the threat of entry is bare minimal as per current studies.

But the initiation and implementation phase of the project face tough competition due to existing projects of Elevated Housing on Pillars that are being implemented and are proving to be a success in various parts of the state. But the point was the proposed project becomes valid is when we think of the degree of "Future Proofing" in these projects.

Bargaining Power of Suppliers

Since the purchase of the components and raw materials are totally done in a “scatter format” which leaves less clue to the vendor regarding the output of their sale, there is no chance that the suppliers have the upper hand in bargaining. Also, the raw materials are commonly available in abundance on all regions. If some shortage is faced at some point of time, its possible to reschedule the tasks and operate from another location. If the government or associated authorities are supporting the project, then funds in the form of Grants and Subsidies can be reaped, which further reduces the cost on the company.

Bargaining Power of Buyers

As we all know the buyers are the ultimate factors that decide the success or failure of a firm. The consumer market in Kerala is totally price conscious and expect more value over what they have paid for. Considering this in mind, the idea is to inform and educate the customer base at the beginning about the project and its viability. This will reduce their higher degree of expectation and help them look into the functionality and sustainability in the long run.

This will clearly reduce the need for bargaining as the cost of implementing the project will be informed in advance so that adequate financing can be done to establish the project.

If the consumer is an NGO/NPO/Government, the proposed project is different from the existing projects with a valid **extenuating factor** that distinguish it from other projects. Thus, the idea alone can be sold or the project along with can be implemented by the firm by means of Open Tendering through the associated authorities.

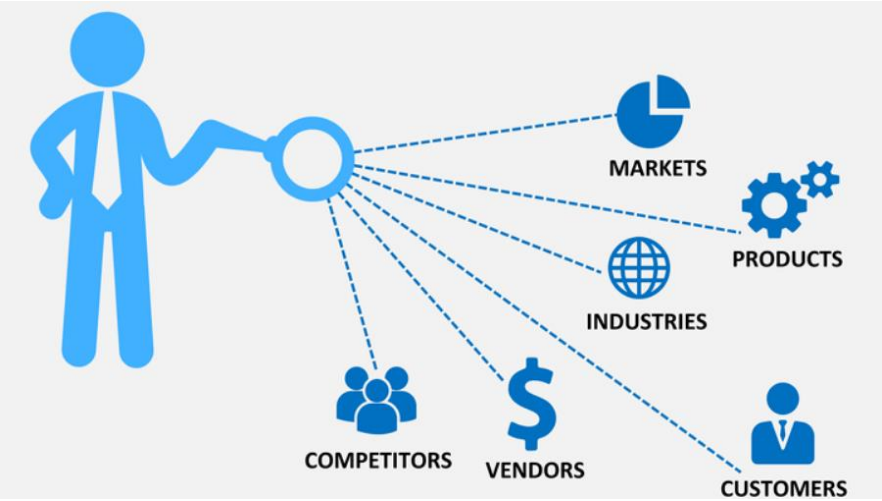
Threat of Substitutes / Industry Rivalry

Threat from substitutes arises when a similar product or service is available from the competitor at a comparable price with comparable satisfactory effect or utility from the product. Since the project on offer has an extenuating factor from the existing projects, it's clear that the market will have a positive outlook over the project.

But there are threats of imitation by other firms. To prevent that the same project must be patented and the firm has to be trademarked. This will help in preventing imitation by other businesses.

Based on the Competition Analysis, the Business can be deemed "**Attractive**" with

- High Barriers to Entry
- Weak Suppliers Bargaining Power
- Weak Buyers Bargaining Power
- No Substitute Product that Offer the same Utility
- Weak Competition



Marketing Plan

Marketing the project in a product – price conscious market like Kerala requires careful pitching of the product plan and support structure. Depending upon the degree of acceptance from various stakeholders associated with the project it is possible to launch the product in three formats.

1. A standalone project that is fully financed and implemented by a builder or a construction firm
2. A mass market project that is funded and supported by the government / NGO / NPO / Industry CSR
3. A project that can be funded by an investor and implemented by Team Atlantis under licensing

Financing and implementing the project will be smooth if and only if the customer, end user and the various stakeholders feel the need for such a project. In all three cases it is very important to inform and enlighten the customer regarding

- Functionality
- Reliability
- Adaptability
- Customizability
- Economy
- Sustainability
- Technology

Operations, Technology and Inputs

The entire project revolves around the basic principle of **Flotation.** To achieve this feature the entire super structure that is modular in nature is constructed on top of a mini platform barge that stays afloat by means of pontoons. The array and number of pontoons is decided on the basis of the load of the superstructure. To prevent damage to theses pontoons, each will be placed inside a hollow casing.

These pontoons by itself are rugged and robust, still in order to ensure that additional level of safety blanket at times of natural calamities casing or adequate guarding is required.

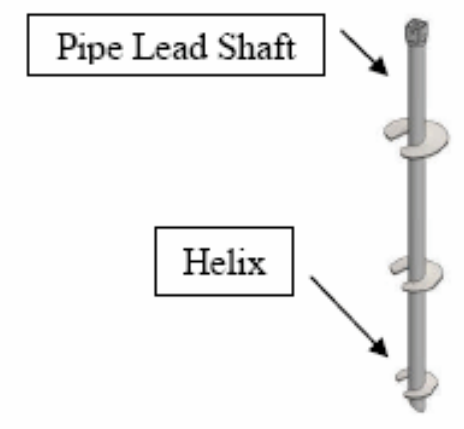
The project uses a modular structure that consists of prefabricated components or units that are transported and assembled on-site to form the complete building. The choices are EIFS (Exterior Insulation & Finish System) Panels or Decommissioned Shipping Containers that are excellent for modular construction purposes. Shipping Container Panels are strong, durable, stackable, cuttable, movable, modular, plentiful and relatively cheap.

Advantages of Using EIFS Panels / Shipping Container

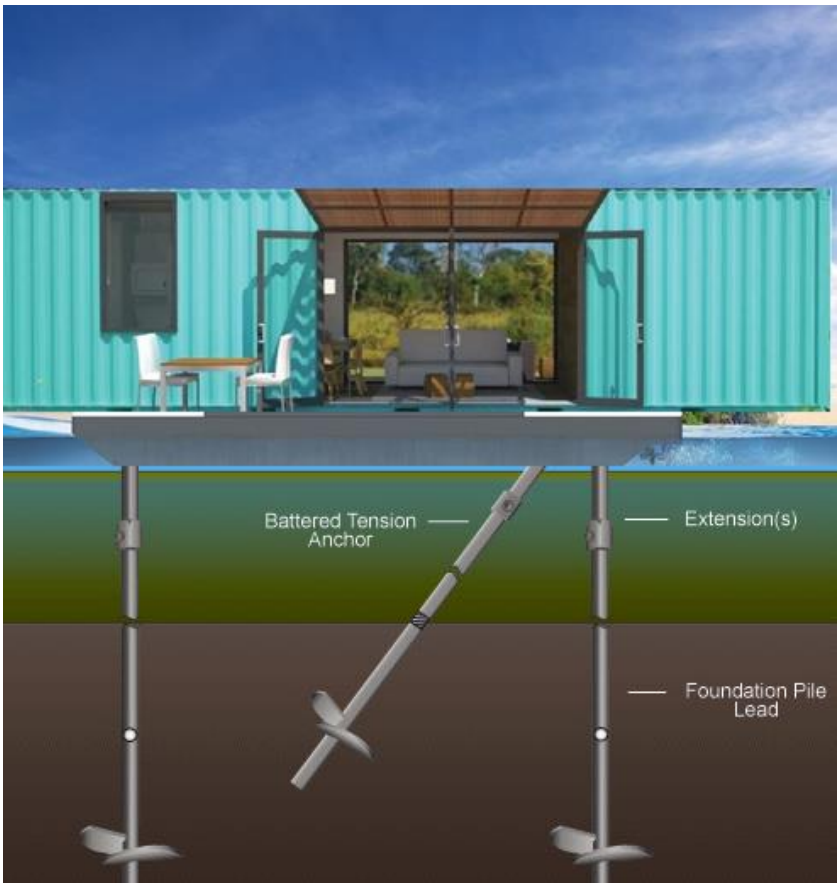
- Eco Friendly
- Low Cost
- Availability
- Easy Transportation
- Less Labour Intensive
- Highly Customizable
- Repairable
- Strength
- Durability

Due to the immense trade hubs in India and China it is often cheaper to buy new containers in Asia. Therefore, new applications are sought for the used containers like housing. The use of containers as a building material has grown in popularity over the past several years.

Generally, there are two basic principles for making floating houses. First is the pontoon principle in which one makes a solid platform, lighter than the water and the other based on the ship/barge in which a hollow concrete box is created which is open on the top. The pontoon principle has the benefit of its use in shallow water, compared to the hollow concrete box while the concrete box has the benefit of higher space utilization within as a part of the building.



The required location is identified and the structure is constructed after **Mooring** at all four corners to avoid swing of the structure during severe water flow underneath the structure. It also prevents the houses from colliding with each other.



Sewage Treatment in Floatation

Onboard treatment technology has developed significantly over the past two decades for No Discharge Zones. So, it is important for the project to be ecofriendly and less polluting in nature when it is in dry land as well as when it is in floatation.

The technology is borrowed from a US based company named **Raritan**. The sewage is pumped, on a flush-by-flush basis, into the first of two treatment chambers, and macerated into fine particles. Electricity (from rare-earth titanium electrodes with a proprietary coating) is introduced into the salt water, which separates the sodium from the chloride, creating free-standing chlorine ions, which neutralizes and disinfects the waste. At the end of the electric charge, the sodium and chloride recombine naturally within the unit so no chemicals are discharged. The particles then move into the second chamber during the next flush where the process is repeated. When discharged, the effluent particulate can best be described as light dust.

Electrification

In addition to being ecofriendly the project needs to be sustainable in some way or the other. During floods when the electricity supply gets disrupted, use of roof mounted solar panels can help the occupants to stay safe at all point of time. This facility can be used even during normal weather conditions generating enough electricity to run the house appliances and lightings. The equipment's can be procured from **ANERT** under government subsidy. Since the roof of the container remains free at all time, the space can be well utilized to assemble a solar panel unit.

Financial Plan

The project requires initial funding that can be procured from the interested parties or stakeholders. Financing of the project can be done through a variety of methods.

1. **CSR Funds of Industries**
   Firms looking forward to invest in projects as part of their Corporate Social Responsibility can fund this project as is socially relevant and environmentally sustainable.

2. **Kerala Startup Mission**
   Being an entrepreneurial project, the state government will have an interest over the project as the state facing its worst nightmares over the last 2 years. The project being economically viable and bearable in all ways will surely attract the authorities.

3. **Private Construction Firms**
   Private Construction firms looking forward to do an innovative project or invest in such a startup firm can surely be an investor for the project and can even deal with advanced technical know how's, infrastructure and resource sharing.

4. **Crowd Funding / Angel Investment**
   With the inception of the idea, there are possibilities that people across the globe might have an interest over the project with such social relevance, sustainability and innovation.

Cost of the Project

- Fiber Reinforced Plastic Pontoons with a load rating of 450kgm^{-2} will cost around 5,000/- INR. On an average a Pontoon Platform require about 8-12 Pontoons. Thus, the cost will vary between 40,000 – 60,000/- INR

- The platform and super structure are placed over 1x2x0.05-inch rectangular channel which costs based on the tonnage of the procurement

- A used but a mint condition shipping container from a nearby port in Cochin or Tuticorin can be procured for a cost of under 60,000 INR (40ft long, 8ft wide & 8.6ft high)

- The interior and other associated ancillary equipment's can be fixed on the basis of the customer requirements. For the same interior designers and specialists in regional construction firms can be employed.

- Raritan Sells Type 1 Waste Treatment at a price of 1231 USD which translates to around 1,40,000 INR. But the same system, with a slight bulk size is available with **BIOROCK** in India. A custom product that is **Made in India** can significantly reduce the cost.

- ANERT also offers Portable Bio Gas Plants that can be incorporated to the Raritan or Bio Rock components to generate Bio Gas from the waste compounds. The cost of one unit from Chemi Industries is 18,100 INR.

Average solar irradiation in **KERALA** state is **1266.52** W / sq.m

1kWp solar rooftop plant will generate on an average over the year **5.0** kWh of electricity per day (considering 5.5 sunshine hours)

1. Size of Power Plant	
Feasible Plant size as per your **Roof Top Area** :	**1.5** kW
2. Cost of the Plant :	
MNRE current Benchmark Cost :	Rs. **60000** Rs. / kW
Without subsidy (Based on current MNRE benchmark) :	Rs. **90000**
With subsidy **30** % (Based on current MNRE benchmark) :	Rs. **63000**
3. Total Electricity Generation from Solar Plant :	
Annual :	**2250** kWh
Life-Time (25 years):	**56250** kWh
4) Financial Savings :	
a) Tariff @ Rs. 8 / kWh (for top slab of traffic) - No increase assumed over 25 years :	
Monthly :	Rs. **1500**
Annually :	Rs. **18000**
Life-Time (25 years) :	Rs. **450000**

Carbon dioxide emissions mitigated is	**46** tonnes.
This installation will be equivalent to planting	**74** Teak trees over the life time. (Data from IISc)

Disclaimer: The calculation is indicative in nature. Generation may vary from location to location.