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# Research and Understanding the Problem

DEP302 : Systems Design Project

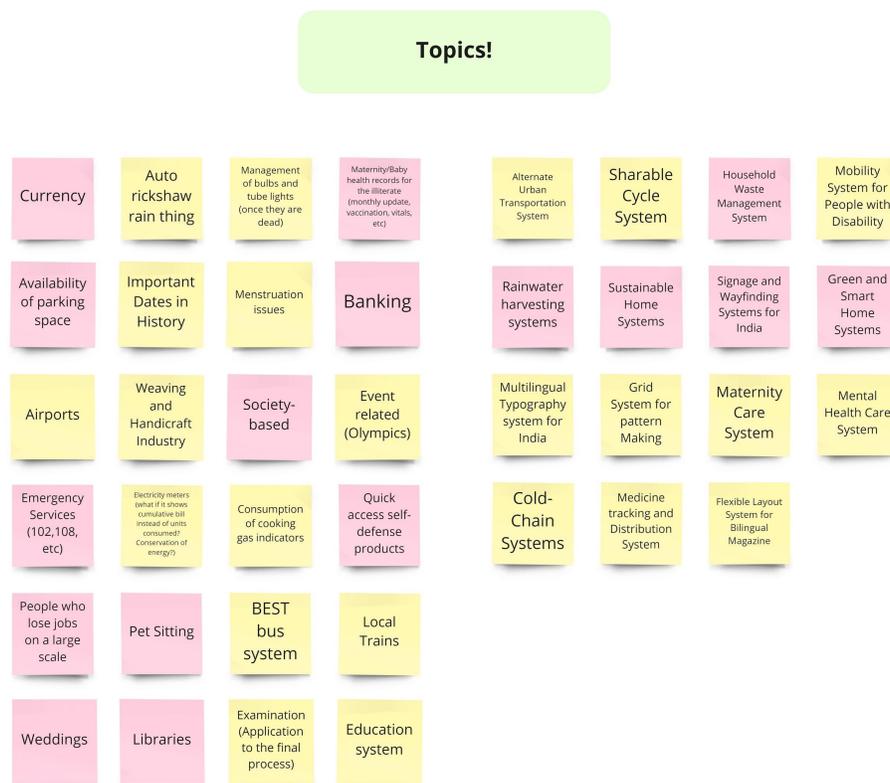
**Padma | Report 01**

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This report summarizes the work that we have done and the progress that we have made regarding our Systems Design Project over the past week (15/03/2021 - 21/03/2021). The main focus was to find, research and understand the problem that we were going ahead with.

## 1. Hunting for our Area of Focus

For the first couple of days, we looked up projects and videos explaining what a system basically is, and what exactly is the system design process. Once we got a basic understanding of the kind of areas we should look at and the type of research we should do, we started hunting for our areas of focus. At the end of the day, we compiled a list of 39 topics including the 15 suggested topics in the brief.



### 1.1 Thought Process

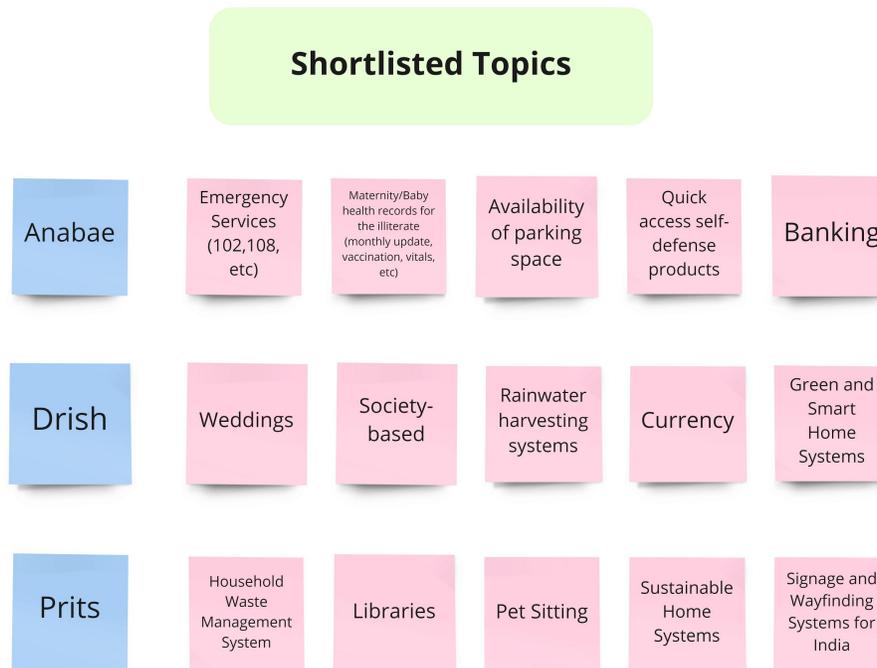
#### 1.1.1 Time Table

A Time Table was of great importance since we had a fully packed timeline to follow and putting something off would mean that the whole schedule would have to be adjusted. So we made ourselves a timetable for the week and tried our best to stick to it.

#### 1.1.2 Picking Favourites!

Out of the 39, we picked 15 of our favorite topics and assigned five each to each of us. We did

surface-level research on each of the 15 topics and explained the assigned five to the rest of the team.



### 1.1.3 The Research

The research was pretty basic at this point. We started out with mind maps for each of our topics and came up with as many sub-topics as possible for each category. This helped us look at each aspect of our topic. We mainly looked at existing alternatives and the problems, if any within the system. We grouped these insights and linked references to understand the weightage of these problems. We later explained each of our five topics to the rest of the team. Here is a synopsis of our findings on each topic.

#### - **Emergency Services**

- Helpline numbers are inconsistent throughout the country
- Numerous amount of helplines, more than one can remember
- Lack of awareness on how to contact an emergency service
- Huge population in India, non-stop emergency calls
- Seekers asked to call a different number instead of redirecting
- Easily get confused even if the numbers are looked up: eg Disaster management and earthquake/flood have different numbers
- Sub-optimal response time and calls not being attended
- The response time of the caller and that of the service provider are long

Even though the topic was pretty interesting and the problems were solid, there was very little information available on the internet regarding emergency services in India. Even if

we could, we didn't have a defined source to get first-hand information from as none of us had contacts who are in the field and even if we did, they would always be on their toes because that is the kind of work they do.

- **Availability of Parking Spaces**

- Lack of indicating safe lines on the road
- Won't know about the availability until you take one round
- Careless Drivers take up excess area for parking
- Available space may not be enough
- Two-wheelers and four-wheelers require separate parking areas on roadsides
- Parking opposite to the U-Turn divider holes
- Only those who are familiar with the place know it's kind of parking area
- Hard to visualize the distance between the footpath and the wheel
- Breaking Parking Rules not strict enough in less urban areas

Existing solutions mainly included a person for guidance, guidelines on the roads, and the parking assist feature in new cars. This was a pretty common problem that everyone faces and pretty relevant given the current scenario where people refrain from using public transportation.

- **Banking**

- Some situations demand a visit to the bank
- Unnecessary overload of information to the customers on the forms
- Bad online Customer Service and changing rules
- Lunch break of most banks coincide with the lunch break of the working people
- Having multiple ATMs in a given vicinity, good or bad?
- Unreliable Token Systems
- Lack of proper maintenance and updating of websites
- Hard for the old people to visit banks for dealings and unaware of how to use tech
- Banks in multistoried buildings without lift services
- A large number of people visiting, lack of waiting area

Most of the problems that we came across regarding banks were easily solvable with a quick update to their existing online services. The rest called for improvement in infrastructure, but all Indian Banks are already fully packed?!

- **Quick Self Defense**

- How quick access are the products that already exist?
- How do you ensure the product is with you at an easily accessible place at all times?
- Keychains exist, but what if it's attached to a bag or something?
- Is there a self-defense system for animal attacks at all?

- What happens when the attacker strips you of the self-defense products?
- Multiple person attacks are usually planned
- So many aspects even within a two-minute time frame
- Should the possession of products related to self-defense be a secret or not?
- What if the attacker uses the very product to harm you?
- How do you escape Bondage?
- Working women and all the single ladies and kids are more prone to attacks

This field was already well worked on, with a bunch of products and solutions already out in the market. The main problem here was that whatever is out there has not reached everyone in need of them, neither are they aware of the fact that they need these products. And if at all they are in possession of something for defense, they will go into shock and not be able to use the weapon at the time of an attack.

- **Maternal/Baby Health of the Illiterate**

- People in Rural areas keep having babies
- Child mortality is partly due to a lack of awareness in certain regions
- People still unsure of what pregnant people are allowed to do and not
- Poverty is another major factor
- Premature and prolonged labor was reported more by mothers in villages
- The possibility of treatment for infertility is unknown to a lot
- Traveling aids. Most skip visiting a hospital because of the additional cost of a taxi
- Unaware of contraceptives; have babies even are old and prone to risk
- The illiterate only know what they are told by the medical officials that they visit rarely

There are a bunch of aspects to this area to focus on, but it seemed very hard to get first-hand information given the current situation.

- **Libraries (urban perspective)**

- Public libraries were knowledge centres
- information was not very accessible earlier
- now information/knowledge becomes obsolete very quickly
- books aren't the best medium
- Libraries act as a repository of old books, preserve local literature, but old books are not accessible to public to avoid wear and tear
- Librarian
- Community/ public knowledge centres equivalent in current changing times - different media, new types of interaction etc
- books are being digitized by the day and all the info is available right at our fingertips. We are moving away from books whether we like it or not and in that

case what happens to the tens of thousands of books already available that may have obsolete information?

- Library as an ambiance (silent, atmosphere, good for concentration etc)
- funds for library

#### - **Pet Sitting**

- Travelling with pets - don't know about the local pet stores or vets nearby
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- Over time people develop relations with the vets and pet sitters in their locality
- There are multiple facilities people use like pet hostels, individual pet sitters, organisations that manage pet sitters etc
- Pet hostels and even organisations don't have branches everywhere and hence not accessible to many
- People rely on their neighbours or relatives to take care of their pet. At times this is not possible
- People also find it difficult to trust individuals who volunteer to be pet sitters
- A lot of vet students do pet sitting as a side source of income
- Can become a source of income to other pet loving individuals with proper training etc and forming a network

#### - **Sustainable Home Systems**

- Energy and resource consumption - people aren't conscious - Gas, water, electricity, fuel, etc
- Use of renewable energy - solar, biogas, etc
- Lots of sustainable solutions/approaches are available but people don't use them. Why?
- Sustainable solutions are mainly focused towards individual houses. How can a group/society/housing complex be sustainable collectively
- Urban farming/gardening - growing locally - transport costs saved - fuel saved
- Household waste management practices of recycling, segregation - no motivation
- people give newspapers to raddi wala or old things to kabadi wala - get money
- House materials - resources used - cost to env - construction demolition
- Cooling system and ventilation - natural ventilation
- Rain water harvesting
- Long lasting furniture or nature friendly furniture
- Modular house - multifunctionality - saving resources

## - **Household Waste Management**

- Different types of waste - organic, dry, kitchen waste, toilet waste etc
- Waste water from the bathroom, washbasin can be reused?
- No motivation for people to follow segregation - there needs to be a change in behavior/attitude/lifestyle
- Even if some members in a housing society follow segregation but the society doesn't have separate bins, the waste would get mixed. So it has to be a collective effort
- Various renewable energy - biogas, solar, etc
- Raggpickers play an important role in segregation in india
- *Raddi walas* and *kabadi walas* recycle waste - people give them things for some money
- Organic composting and urban farming
- Minimising waste production at source
- Sustainable packaging - bigger size packs or better materials etc
- Dustbins - Many rooms - different purposes - kitchen - bedroom - washroom etc
- Drainage System

## - **Signage and Wayfinding - Indian Road Network**

- No unified system of road network signages
- Municipal markets - vary random
- Name of roads are of little help to find the directions to important locations nearby
- have to rely on google maps to understand your location
- Lot of traffic and so lot of pollution and dust
- India is very populated
- Diverse nation - many cultures - each state has a different aesthetic and speciality and language and script
- Indian-ness

## - **Weddings**

- Weddings can be categorised based on culture, state/region and economic status.
- Most of the components come under traditions/rituals, wedding planning and the people involved
- Us Indians tend to spend a lot on weddings irrespective of the budget constraints.
- Hence, the wedding industry in India seems the most profitable while in comparison to other countries.
- While most of these are based on urban india, the struggles of weddings in rural india is quite a different story.
- The common problems faced during weddings are lengthy guest lists, annoying relatives, food wastage, and the worst, not setting a proper budget (overspending)

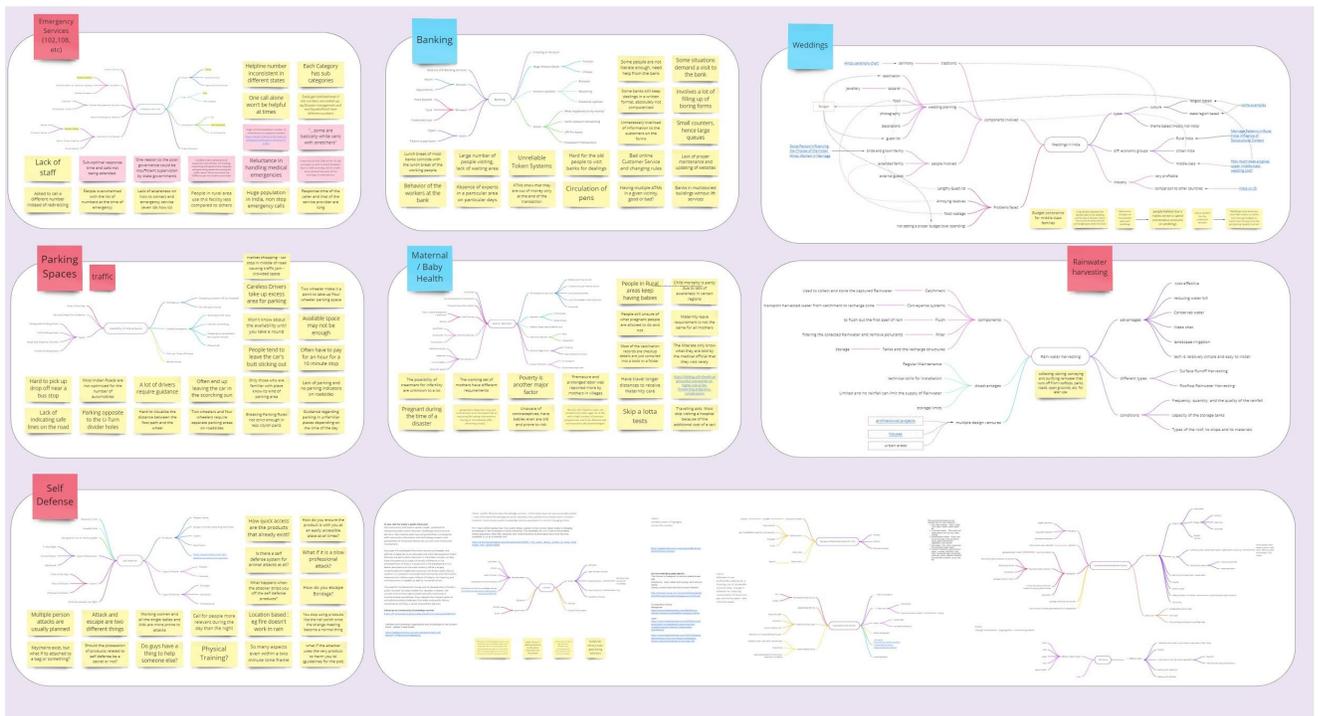
- We would have to consider behavioral changes as to how us indians approach weddings (people think that it makes sense to spend tremendous amounts on it).
- It has also become a status symbol for respective families involved.

**Rainwater harvesting**

- It is basically the collecting, storing, conveying and purifying of rainwater that runs off from rooftops, parks, roads, open grounds, etc. for later use.
- The main aspect that we discovered was how it could be implemented as a part of our daily lifestyle and as a society in the name of sustainability.
- There are multiple projects (mostly architecture related) on how it has been incorporated into modern buildings and open areas.
- Of course it has its own limitations and necessities (and steps that would help set up the process) and are mentioned in the mindmap.

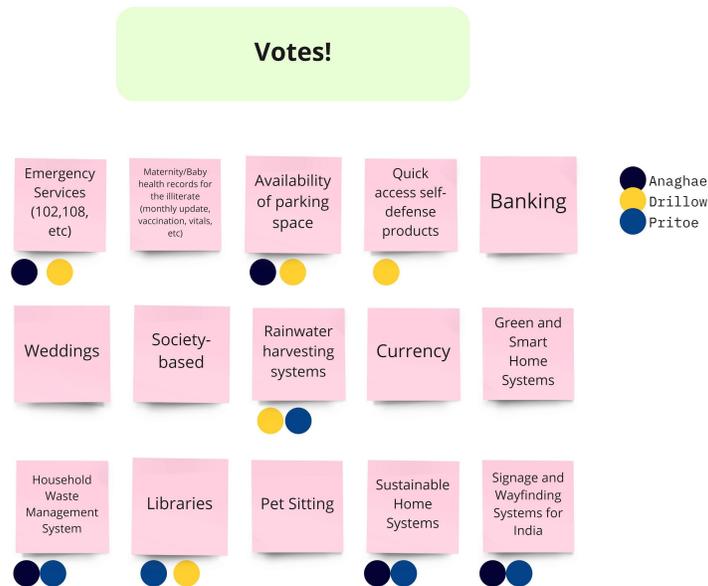
**Currency**

- Research based on currency mostly involved the recent changes because of demonetization, the decisions behind it and why certain combinations make more sense.
- We also looked into the official rbi website to learn more about how our indian currency has involved over time, how they're manufactured and taken care of, and different ways transactions take place in urban and rural india separately.



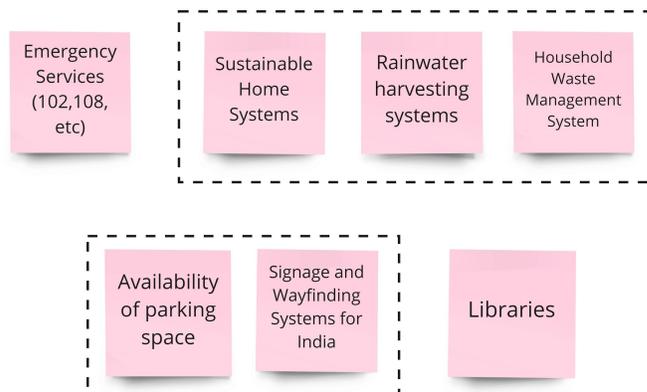
### 1.1.4 Dot Voting

To choose our final area of focus, the three of us decided that each of us pick our top five favorite areas from the mind maps that we had created. We did have common favorites, which made our process slightly easier. After the voting session, we narrowed our list of topics down from 15 topics to seven. They were Emergency Services, A Parking System for the Country, Sustainable Home Systems, Libraries, Rainwater Harvesting Systems, Signages and Wayfinding for India, and Household Waste Management Systems.



At this point, we realized that Some of our favorite systems fell under the same category. For example, Sustainable Home Systems, Rainwater Harvesting Systems, and Household Waste

### Further Shortlisted Topics



Management Systems come under one category, and Parking Systems for the Country and Signages and Wayfinding for India could come under another since they are interrelated.

## **1.2 Feedback Session on Thursday**

- Sustainable Home Systems seem to be a good idea
- Take a large scale into consideration, maybe 200 families
- The sustainability aspect of an apartment seems interesting
- Reimagine huge sustainable societies
- Thinking of systems from a time point of view

### **1.2.1 Some suggestions and direction about the sustainable housing complex**

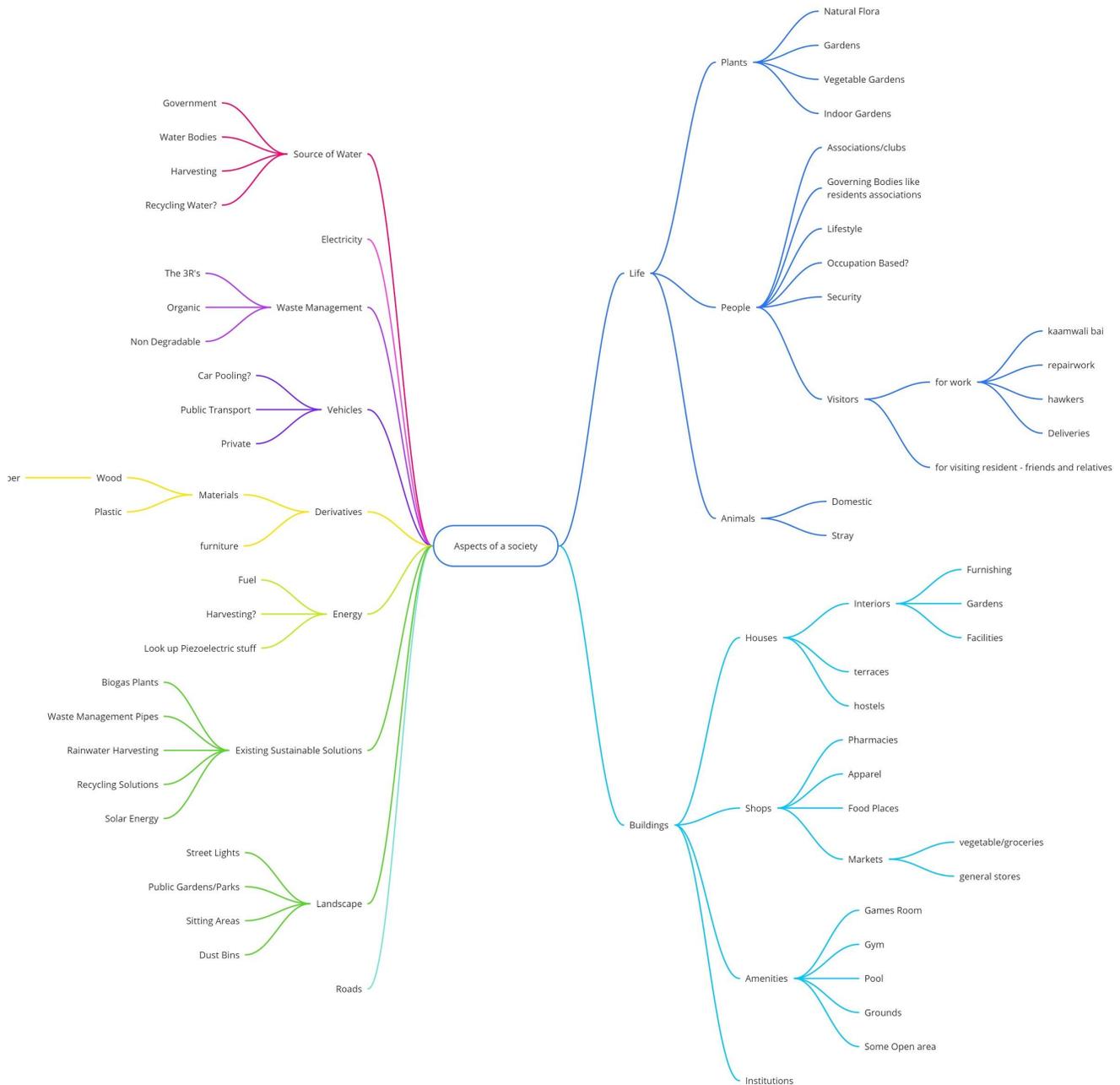
- Various factors apart from waste management like electric vehicles, etc in sustainability
- Interconnected behaviors that affect each other and factors of interdependency
- Economics concept of externality - increasing utility for one might diminish utility for other  
eg- smoking gives pleasure to one person but passive smokers only get harm from it
- Effects get magnified when the scale is large and so the nature of it can change drastically

# Topic chosen based on Feedback : Sustainable Home Systems

## 2. Thorough Research in order to understand the Area of Focus

### 2.1 Mapping the aspects of a Society

We realised that beating around the bush was not helping so we decided to dig deeper. We created a Mind Map which maps out aspects of an existing society, which we could build up on to create a better, sustainable one. We broke down each aspect to get the most basic elements of a society.



## 2.2 Research on Individual Aspects of a Society

### - Existing Sustainable Solutions

- Most stressed areas : Build, Water and Energy Conservation and Waste Management
- Prefab houses are factory made houses which can be assembled and are cheaper
- Using Recycled materials for construction would bring about a tremendous change
- Passive House buildings allow for heating and cooling related energy savings of up to 90% compared with typical building stock.
- The Use of Zero VOC Paints keep the air quality liveable
- More efficient water systems
- Sustainable alternatives to build components like organic wallpaper
- Most sustainable home solutions come at a huge initial cost

#### *Thoughts*

- *Imo, at this point I think it is nicer to look at the future, a new society instead of building up on an existing one*
- *How is our thing going to be different from all these existing alternatives?*

### - Energy

- Find out more about how Tidal, Geothermal and Wind energies can be applied
- Biomass seems like promising Source of energy
- Gyms that can power themselves already exist
- The mechanical torches! Can something of this sort work for some basic aspect like lighting? Cycles? Cycling can charge your phone?
- Sparking some minor changes in lifestyle can lead to tremendous conservation of energy like using energy efficient appliances and using electricity only for necessity
- Replacing Fossil Fuel Powered Cars? Solar powered and electric cars?

#### *Thoughts*

- *What are new innovative uses that we can come up with which make better use of Solar energy and Biomass energy?*

### - Landscape

- Alternatives to cement like decomposed granite prevent water run off to a certain extent
- Plants alone, offer a bunch of opportunities
- Sustainable Materials could be used for the simplest of aspects, like the stone path to your doorstep
- More aspects of the society should be aimed at serving multiple functions at a time.

- For example, certain plants serve beauty, shade, wood, air purification, soil erosion, nutrient replenishing etc., at the same time. Similarly A lot of products aimed at rainwater harvesting and other materials like decomposed granite help conserve water while serving the aesthetics of the landscape at the same time.
- Sustainable lighting can also be used as outdoor lighting adds to light pollution. Lighting which adds less to light pollution are available in the market and such kinds of lights can be used to light gardens and other landscaped areas.
- Alternatives to lawn like artificial grass help save unnecessary wastage of water and are maintenance free.

### ***Thoughts***

- *How can something add to beauty as well as serve a purpose?*
- *Can electricity be eliminated for Night street lighting?*

### **- Plants**

- Potted Plants can be rotated, within and between indoors and outdoors.
- Come with an added advantage of portability, can even be hung, hence saving space
- National Wildlife Federation encourages the use of reduced lawn making more room for shrubs, in turn encouraging the flora wildlife
- Planting of Plants native to the location aids to lush growth at a lower maintenance
- Certain plants serve beauty, shade, wood, air purification, soil erosion, nutrient replenishing etc., at the same time
- Medicinal plants can be grown at home for maybe a quick homemade Ayurvedic panacea

### ***Thoughts***

- *Can the growing of plants be any more sustainable than efficient irrigation methods and planting?*

### **- Vehicles**

- The number of Vehicles in the world are unnecessarily high
- People still hold on to old cars which cause a lot of pollution
- Lots of Measures available to reduce carbon footprint. People don't follow any of that and it is not lack of awareness
- Some measures to reduce carbon footprint from vehicles are yet to be reality, like a universal switch to electric cars, even though they are fully functioning in some places.
- It is hard to change people's mindset, including ours, when it comes to a point where they have to choose between convenience and sustainability

### ***Thoughts***

- *How can one get the world to go back to a world where the number of vehicles at a given time are less?*
- *So many alternatives already exist, but why does no one practice them?*
- *How do you get the society to take up measures to reduce carbon footprint?*
- *What would be the most ideal solution to this metal world on wheels problem?*

## - **People**

### *Residents*

- People used to commute to work each day - People don't like commuting to work as it takes up too much time especially in metro cities
- Work from home now - would people live away from the cities - those who can work from home - many people are going to different holiday destinations and working from there right now - How will life change in this aspect in the future?
- If people are working from home, the home system would also transform gradually and architecture would also incorporate that
- There is decreased social interaction between people
- Various categorisation possible - children, young adults, middle aged, old people, people with disabilities and special needs
- All aspects of daily lifestyle of residents need to be considered and how it fits into the system

### *People who work to make life better for people in the society and earn a living from it*

- Some societies have intercom facilities. The security guard informs the resident to anticipate the visit of the person visiting for their security. At times they do this even before letting the person enter
- Some of these visit regularly like Newspaper man, househelp ladies (kaamwali bai), etc while other are irregular like hawkers, postman, delivery guys, repairwork
- Some societies do not allow hawkers to enter the complex for security reasons and to avoid disturbance to the residents
- Watchmen generally live in the society and keep a watch on things like who is visiting, collecting and keeping parcels, circulating notices, etc as well as do things like turning on the pump at the time of supply of water. They may not be the best at handling conflict/security concerns the way security guards can who are trained specially for security and guarding
- People have letterboxes at the bottom of the apartment sometimes
- Postman go on cycles or walking - nearest post office
- Sometimes go till the house also - drop inside door

## - **Animals**

- We mostly divided them into domestic and stray. Eg: dogs, birds, even rodents.

- Considering how these animals are currently fed, which is either from garbage or when offered to them by some of us (strays).
  - Even domestic ones seem to have it easier now that their existence has come under its owner, although we could look at all of these owners as a whole and what issues they face for their pet, for example, pooping on the sidewalk (which also impacts people living in nearby houses).
  - But for let's say, birds and even insects and rodents, is it right to resent them and not have them around because we do not certainly enjoy their company.
  - What about disease causing and fear inducing creatures, we can't entirely eliminate them, what do we have to offer to them as a society?
- **Houses**
    - We categorised houses into different kinds based on architecture, structure based, even function based and the kind of residents living.
    - They would involve apartments, rental services, even hostels etc.
    - It would also involve considering individual components present in a house, like separate rooms; interiors, and additional spaces like terrace, gardens and other facilities.
    - The sustainable options here could involve looking into alternate construction materials, even structure-wise, to make sure less of that material is used.
    - We could also consider space occupied by an individual or a group (namely families) to make sure to house around 200 families in a more sustainable manner.
- **Amenities**
    - The amenities that a complex has depends on the class of people residing there because the more the amenities, the more is the monthly maintenance bill.
    - A lot of rebuilt apartments of considerable size have the gym facility. Some even have a swimming pool which is on the terrace or mid terrace mostly. In case of a new project maybe they plan it on the ground. There are a lot of restrictions placed during redevelopment of an existing complex.
    - There are technologies of gyms that convert mechanical energy into other forms of energy. As well as walkways built with piezoelectric material as a concept can be looked at. Piezoelectric material converts pressure/force into electric current
    - New style of natural gyms - exercise among nature can be of multifunctional nature that can take multiple forms saving resources and fulfilling multiple purposes
    - In the redeveloped apartments in urban areas, terraces also have other things - water tanks are now shifted to the bottom instead of on the top and the terrace is utilised for various activities. The terrace is an open space and open spaces are not found in cities.

- Some people put up solar panels on their terrace- tv dishes are also put up on the terrace. There are often multiple because different people use different - cable guy still provides tv and you don't need to put up your individual dish for that.
  - On terraces of some buildings mobile phone towers are erected.
  - Underground parking is becoming common and more and more societies are planned considering underground space to maximise space available
  - Underground space can't be used for residential purposes but can be used for other purposes
  - People start various clubs/groups within the society - this is especially common within the homemaker women and senior citizens
  - Various cultural events are celebrated on festivals or special occasions as a society gathering
- **Shops**
    - There are a variety of shops and market places that are present to serve all our needs like for apparels, food, vegetables, medical requirements and general stores etc.
    - While a lot of these shops are present in the housing complex itself if it is too big, the rest of them are present close to it in nearby areas.
    - The main point is for people (residents) to have easy access to them wherever necessary.
- **Waste Management**
    - Municipality collects waste from each society.
    - If a housing society follows segregation, there is a separate municipality truck that collects it. You have to inform them about this - incentive for societies to follow segregation
    - Paani foundation's water cup competition encouraged people to solve the water problem for themselves
    - Swachh Bharat Abhiyan also encouraged people to pay attention to cleanliness of their surroundings
    - There is possibility of using biogas plant if availability of space - but people need to be encouraged to segregate even for that
    - The garbage collecting man/woman is responsible for the cleanliness aspect. They collect waste from all the houses in large bins and keep near the entrance of their respective society in the morning the municipality truck collects waste from the entrance of each society - if someone fails to give their waste to the lady, they will have to go to the nearest public bin to throw waste or if the society has a waste bin they can throw there.
    - Some people collect plastic wrappers/ newspapers and give it to the raddi wala. Raddi walas and rag pickers play an important role in segregation and recycling in India

- Composting and urban farming is also possible

*Waste management solutions followed in other countries:*

- Reducing waste produced - disposing off or reusing
- Using dried leaves as manure or in biogas plant
- Charging for more waste produced - some towns in new jersey do that
- Toxicity - awareness about chemicals used in detergents etc
- Materials exchange or donation - if someone wants to dispose off something - someone else might want to use it - scrap
- Waste generated by fliers and advertisements reduced by digital boards

### **2.3 Findings**

- Most of the Existing Sustainable Solutions come at a huge cost of installation
- Most of the solutions focus on the sustainability aspect of a single house rather than a society on a large scale
- The areas of intervention range from creating minor changes in lifestyle to switching to a completely new system in certain areas
- Even though a lot of sustainable alternatives exist at multiple levels, people are not willing to sacrifice convenience and their inherited lifestyle for saving the environment
- There is no motivation/incentive for people to adopt sustainable practices.  
For example, various competitions like Paani Foundation's Water Cup Challenge encouraged people to solve the water problem for their village
- Availability of space is a concern in urban cities which can be a hindrance for setting up sustainable like biogas plants or solar panels
- The pandemic has changed the way people live. How will this affect future housing?

### **2.4 Questions to Self**

- Do we design an ideal society for a better future?
- Or do we suggest improvements to an existing society to make it more sustainable?
- If the latter, do we focus on a society that is familiar to the three of us?
- How is our project going to be different from all these existing alternatives?

### **2.5 Plan for the Next Week**

- Doing further in depth research
- Understanding how various activities are carried out
- Mapping the interactions
- Understanding breakdowns in the systems