



Forest Hub is a wood innovation centre bringing researchers, students, businesses and local residents together to collaborate and share their passion and knowledge to build healthier and more sustainable urban city. Forest Hub also provides local community with a space to connect with nature – both indoors and outdoors along with private and spacious studios designed for multiple uses.

The concept focuses on sustainable and innovative design solutions by using Biomimicry where biological strategies are being used to improve building's energy efficiency and create a multi-sensory forest-like journey that would bring the user closer to nature.



## Sustainable

Design goes beyond sustainable material choice where it explores historical building's existing opportunities using Biomimicry to create an energy-efficient space and reduce carbon emissions. Forest Hub proposes a balanced restoration sustaining Roundhouse's historical footprint in Birmingham and treating environment with the same respect.

## Innovative

Forest Hub is an innovative space integrated with mobile application designed to educate users about sustainable wood sourcing and production as well as assure a seamless journey and experience. Additionally, it allows the users to adjust and control interior lighting to meet their needs and help creating more relaxing atmosphere and reduce stress.

## User-focussed

Design puts the user and his needs in the centre - collected data analysis helped identifying key health and performance priorities of the user in order to develop design strategies and goals that could improve users' experience and health. Combination of interactive mobile application together with biophilic design patterns helps to bring the user closer to nature.



## Location

The Roundhouse is located at the junction of Sheepcote and St Vincent Streets. The site is situated near Birmingham Canal offering a range of ways to reach the premises. It is 10 minutes' walk away from train stations, shopping malls and universities.

1/4

of adults living in West Midlands are experiencing mental health issues

Nearly a quarter of adults living in West Midlands are experiencing mental health issues.

The ONS well-being survey show that the well-being rate of Central Birmingham is below the national average.

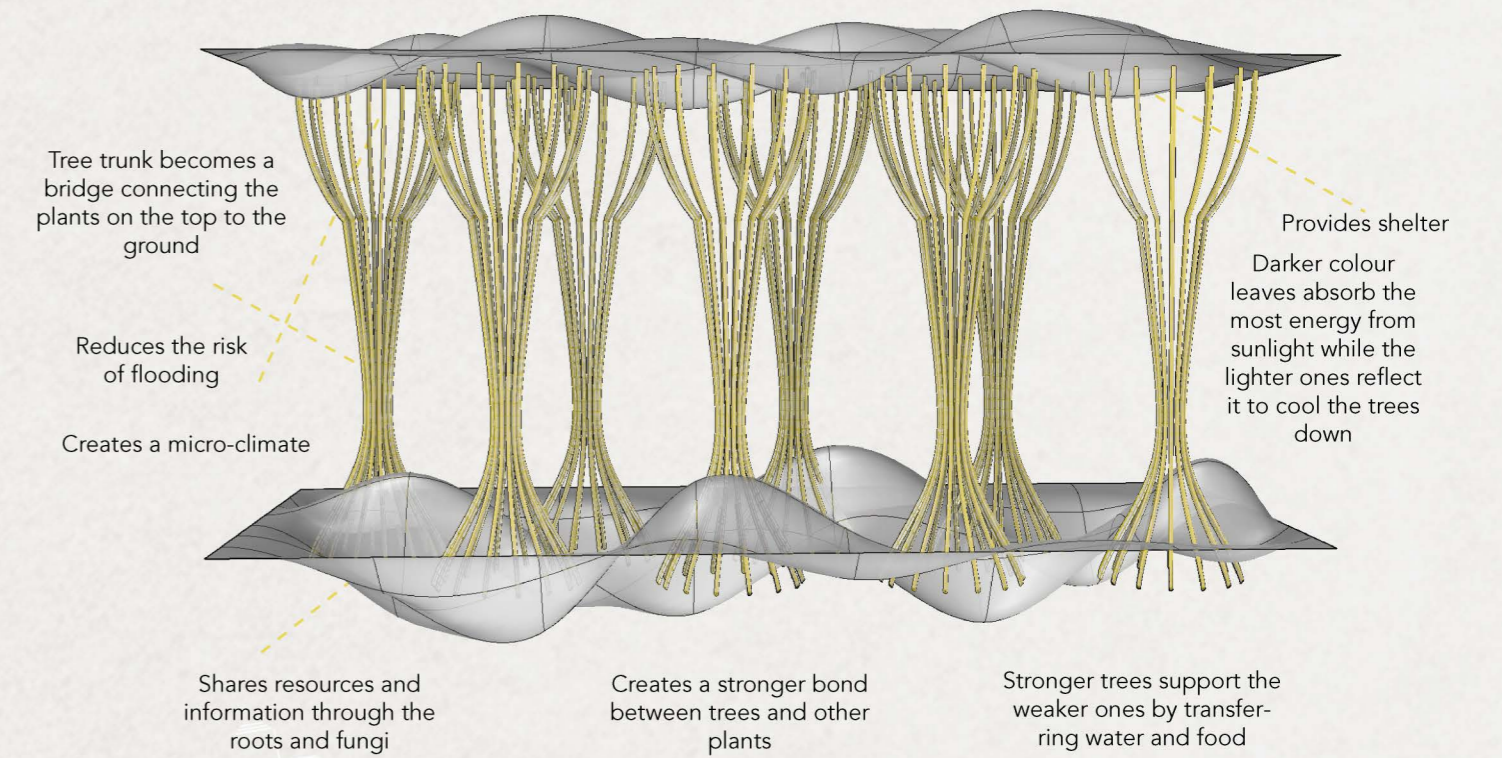
## Bringing user closer to nature

With evolving urbanization humans continue to build themselves out of the nature. This becomes a threat to climate, biodiversity and our physical and mental health. By introducing biophilic design in our indoor and outdoor spaces we could rebuild relationship with nature and mitigate climate change.

There is an urgency for good quality of green spaces to improve residents' health and well-being – learning, recreation, exercise.

## Mimicking nature

Biomimicry plays a key role in the design by forming the concept, informing material selection and most importantly it is being used to solve problems within the building and create more healthy environment for humans. Applying principals and key functions of the tree canopy to create the building's own micro-climate and strategy that would help regulate temperature and humidity levels as well as provide a comfortable and safe space.



## Key Interventions



REPAIRING - roof, load bearing timber posts, timber trusses.



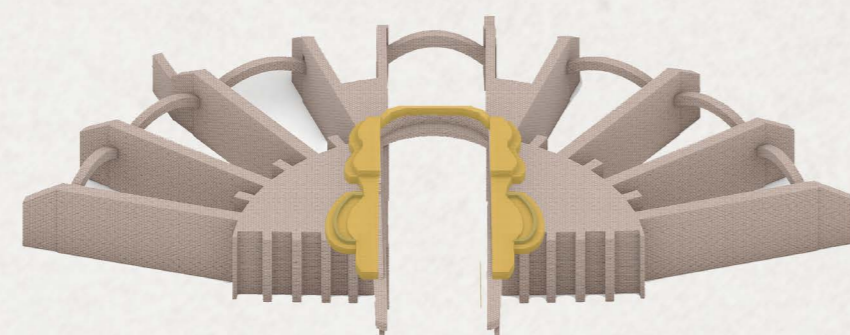
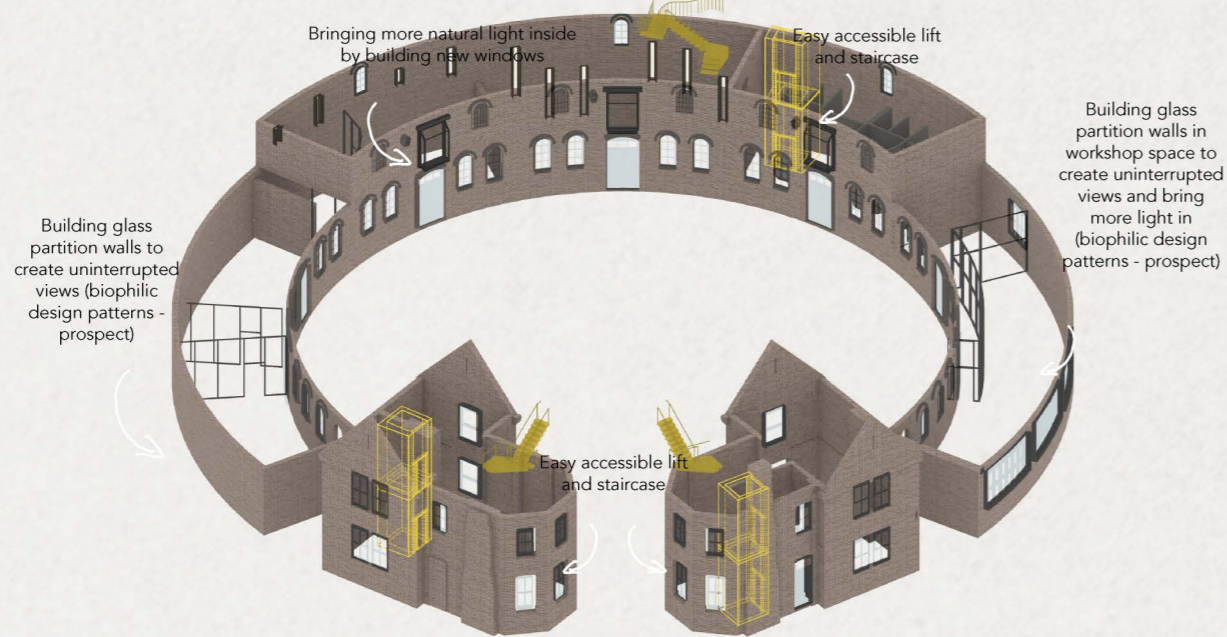
BUILDING GREENER CITY - creating an outdoor green space with integrated water recycling system for cleaner and healthier environment.



REUSING - any waste timber was reusing to build new staircases.



IMPROVING BUILDING'S ENERGY EFFICIENCY - new windows were built on South facade to introduce more natural light and connect the user with nature.



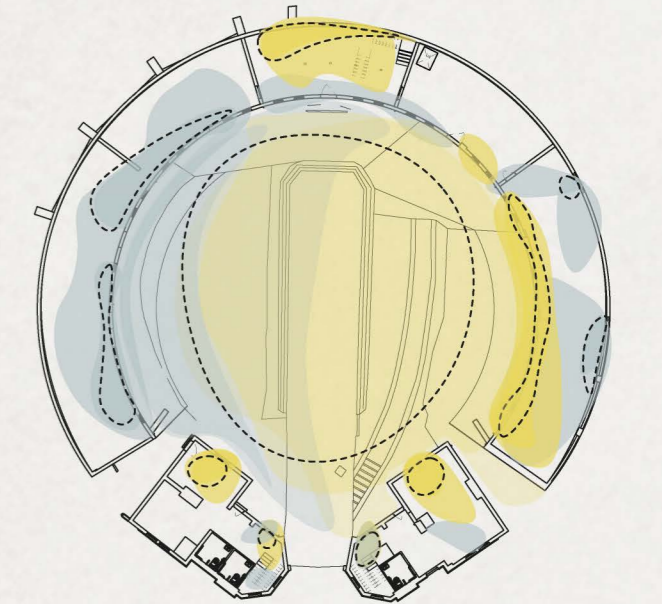
## Improving energy performance

Restoration and reuse of existing historical buildings can also be a great opportunity to save embodied carbon emissions – renovation and reuse projects typically save between 50-75% of embodied carbon emissions compared to the construction of new building.

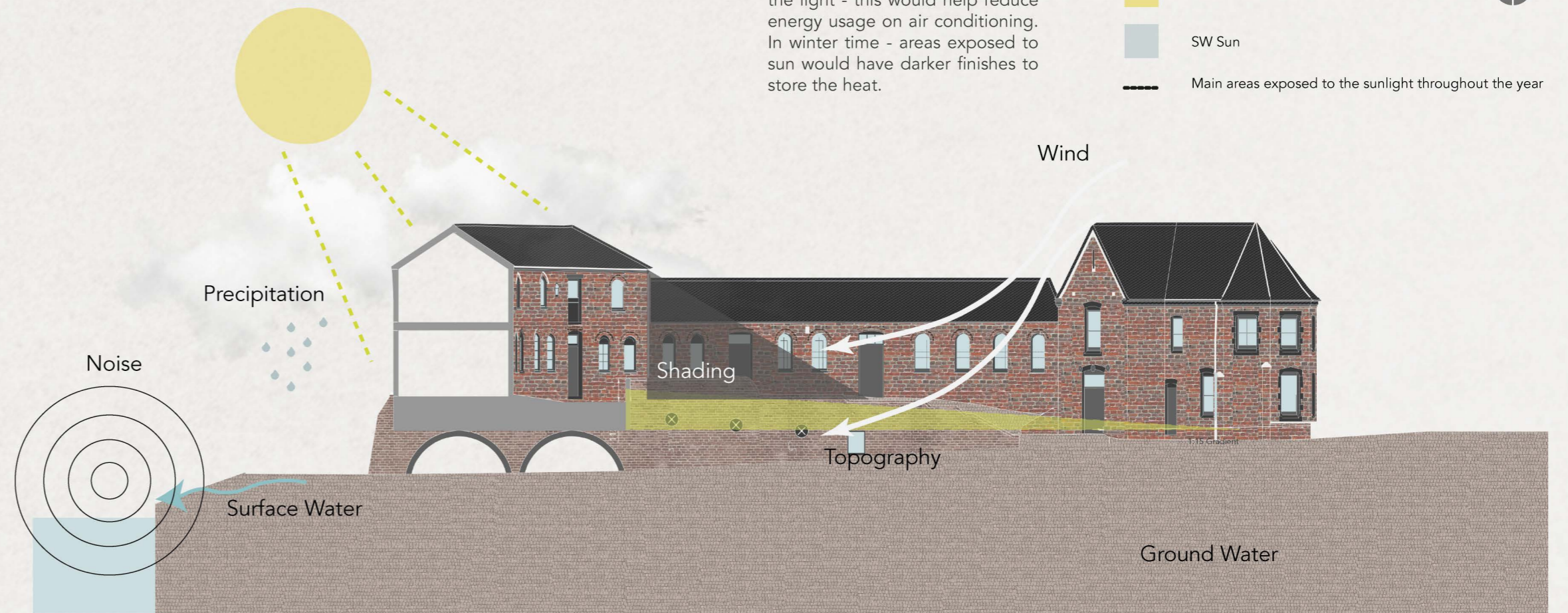
The goal of this design is finding the balance where the historical aspects of the building work with innovative interventions harmoniously. This includes protecting existing fabrics and structures where possible in order to save the energy and carbon emissions released during the construction phase.

## Sun path analysis

Identifying key sun-exposed areas of the Roundhouse during winter and summer time helped me build a strategy where environmental conditions would dictate my material selection and space division techniques. For example, areas that get exposed to sun during summer would have lighter surfaces that reflect rather than absorb the light - this would help reduce energy usage on air conditioning. In winter time - areas exposed to sun would have darker finishes to store the heat.



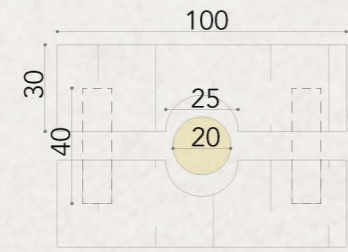
SE Sun  
SW Sun  
Main areas exposed to the sunlight throughout the year



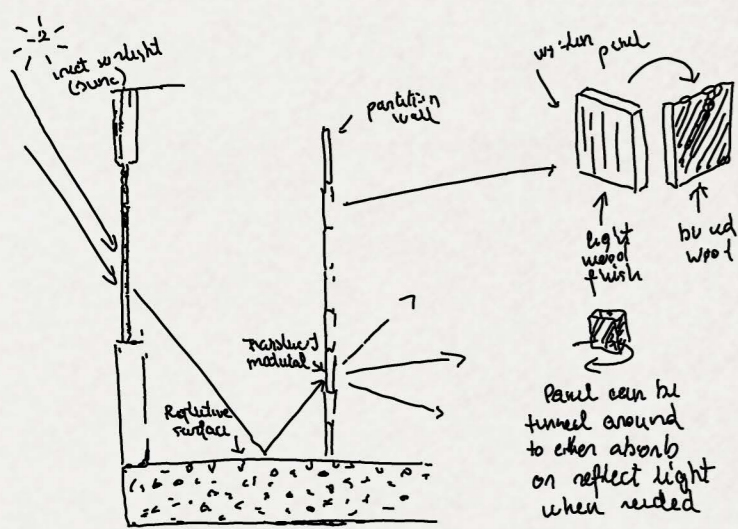


## Modular wall system

The strategy that exterior olive tree leaves use to store and reflect sun inspired me to design a modular wall system that would function in a similar way. The areas that get most exposure to sun would be treated as the tree canopies where modular wall systems would be built to help improve the energy-efficiency of the building.



Top View - Individual Panel (not to scale)



## Sustainable materials

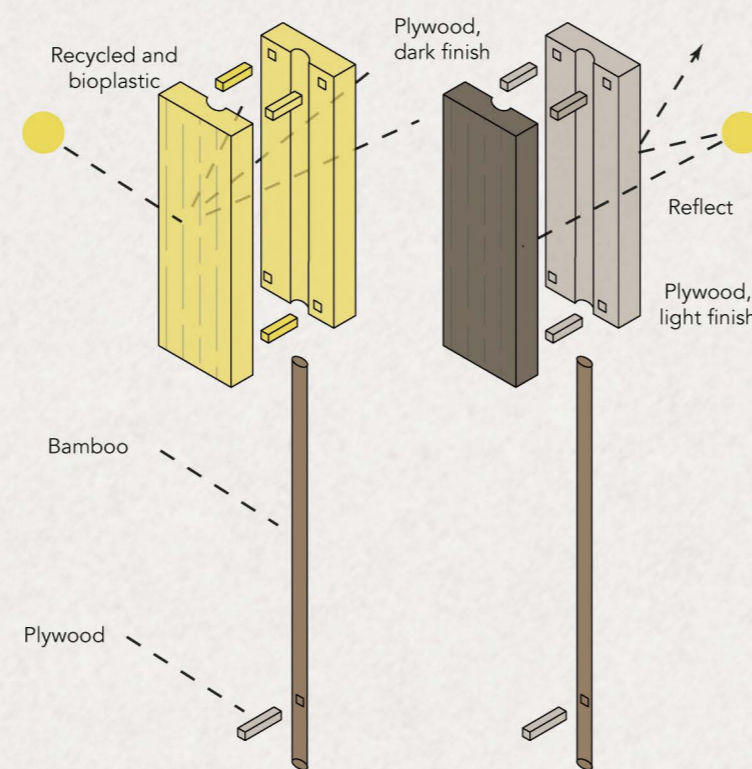
The wall will be built of plywood sheets creating a frame to hold the inner structure which will consist of multiple plywood panels cut in different sized and stained in light and dark finishes to either reflect or absorb the sun light. Transparent recycled and bio plastic will be used to diffuse incoming light to the space and provide darker spaces of the building with more light. These panels will be attached onto bamboo pillars to be able to spin and adapt to the sun.



Rendered Front Elevation (not to scale)

## Designing for disassembly

Sustainability being one of the key drivers of my project made me consider not only material choice but also waste and assembly processes. Plywood panels and frames will be cut using CNC machine and joint by using wooden joinery to meet DFD requirements.



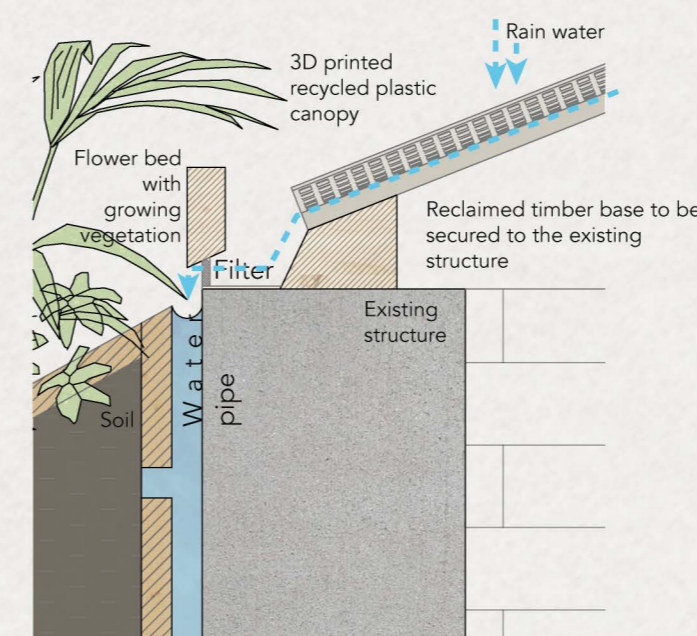
Joinery and Detail Drawing (not to scale)



## Water recycling system

Roundhouse is located in a medium risk zone of surface water flooding - this threat is turned into an opportunity in which rain water will be collected and used for growing vegetation.

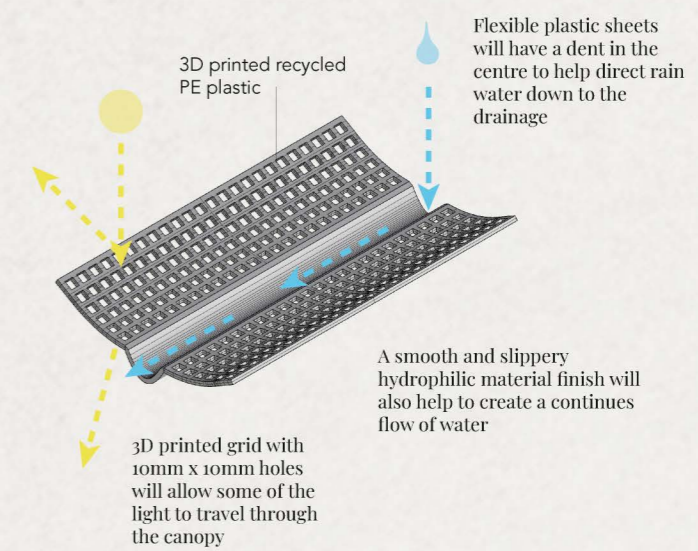
The structure and shape of bamboo leaf has informed the development of water collection system that would be built using similar principles to bamboo leaf where the shape and surface would control the water flow. Young leaves of bamboo consist of two different surfaces that help the leaves to control water flow - the hydrophobic waxy surface covers the margins and the central channel is hydrophilic that create a continuous flow of the water rather than making water droplets to stick to the surface. The concave shape of the leaf guides droplets from the margin to the central channel, where they collect and form a continuous flow down the leaf to its tip, where water drips harmlessly away.



Drawing above shows key components creating water collection system

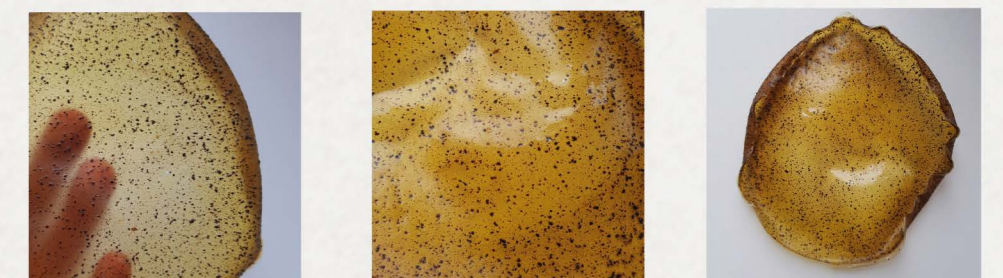
## Canopy structure

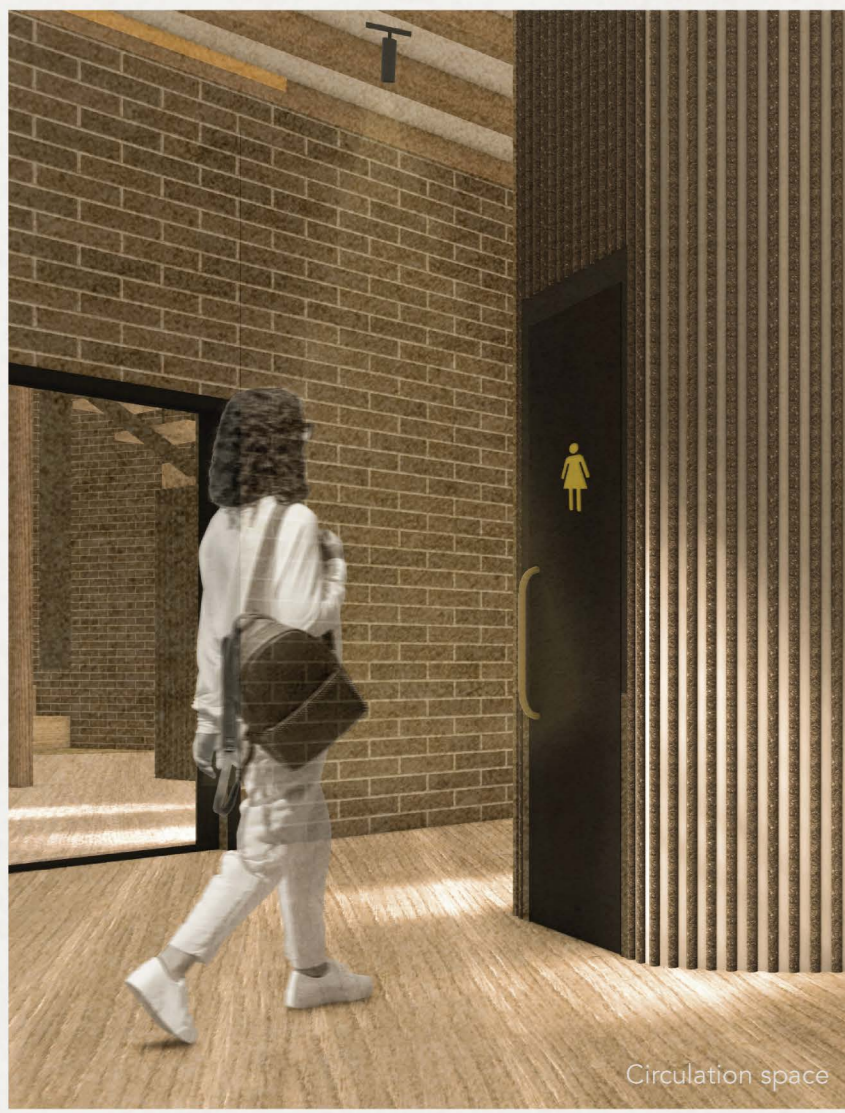
The entire structure will be created by 3D printing recycled PE plastics to create 350mm wide and 6000mm long flexible sheets that will have a dent in the middle helping to direct water down to the water collection units. A multiple sheet structure will be secured to the drainage system and will create a canopy covering the passage. The drainage system will be linked to the flower beds to provide vegetation with water.



## 3D-printed plastic

To support the development of the structure I decided to 3D print bioplastic. I tried to replicate a small section of water collection system's structure. Even though the final sample shrunk and slightly changed its shape, I still managed to produce a sample that let me understand the scale and experiment with the material's transparency and flexibility.





Circulation space



Studios



Digital Fabrication room



### Designing for disassembly

This furniture collection was designed for an easy assembly and disassembly using wooden joinery. To reduce material waste, all the pieces will be cut using CNC machines.



## MINIMAL

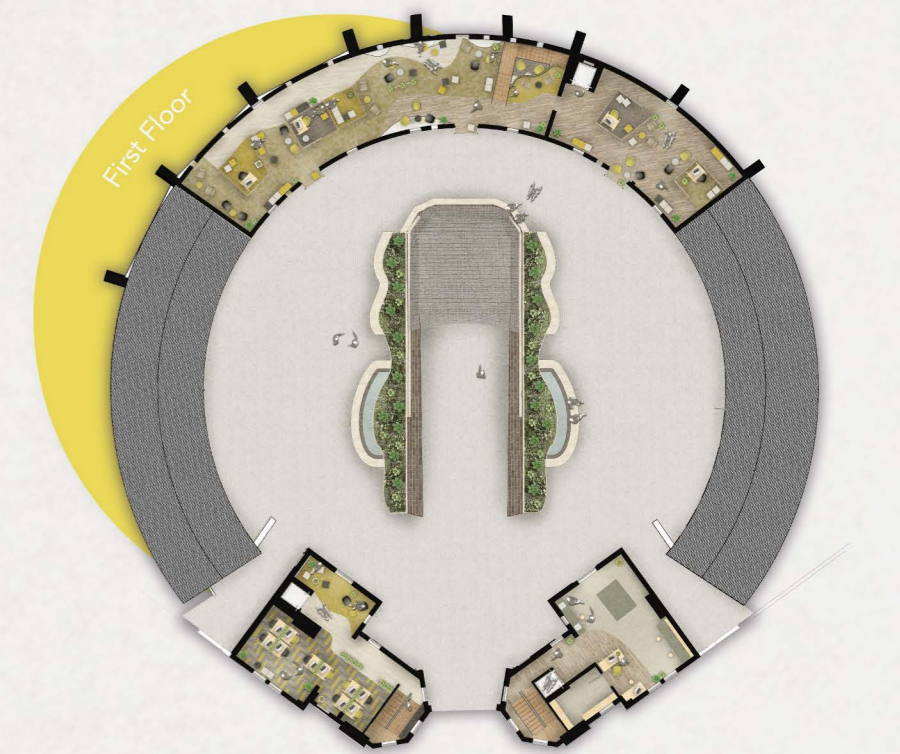
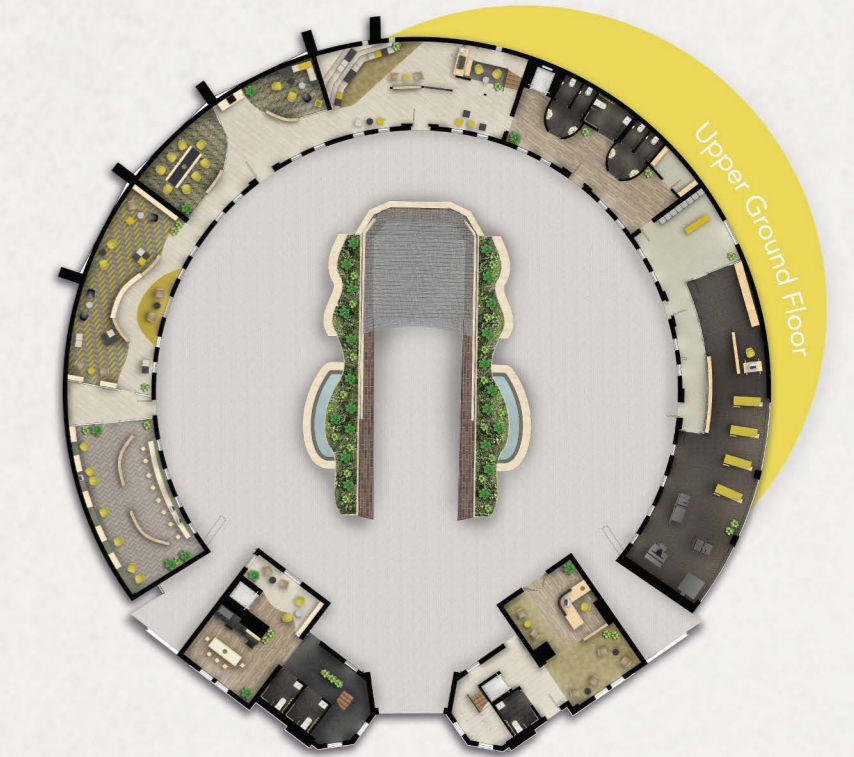
MINIMAL WASTE / MINIMAL DESIGN

### Carbon neutral materials

Locally sourced floor and wall finishes come from reliable suppliers such as Interface, Amtico, and Nakamoto Forestry helping to reduce carbon emissions. To meet sustainability standards, only durable and carbon neutral materials were selected.



### Rendered floor plans



### Minimal material waste

Furniture collection MINIMAL was created following my design ethos that strongly focus on sustainability and connection to nature. Each piece of furniture has been designed using two key materials - either birch plywood or beech timber to create strong and rigid structures that last.

To minimize carbon emissions, only sustainably sourced wood products and upholstery made of recycled materials were used.



### Material connection to nature

Earthy tones and woven fabric textures were used to evoke and mimic natural features with an aim to enhance the connection with nature. Panaz Highland Stretch collection products were used to create indirect connection to nature that will help the user to relax and de-stress.



Staff kitchen



Wood-workshops



This innovative mobile app was designed to educate users about sustainable wood sourcing and production as well as assure a seamless journey and experience.



A platform bringing designers and local residents together to share their skills and knowledge and build a more resilient community. It allows the users to book their visits in advance and explore activities and events available at Forest Hub.

