GROWING OVER GROUND®

BY PATRICIA CEBAN

FOCUSING ON CURRENT ECOLOGICAL AND HUMANITARIAN ISSUES, AND UN SUSTAINABLE DEVELOPMENT GOAL 2, ZERO HUNGER AND GOAL 12, RESPONSIBLE CONSUMPTION AND PRODUCTION,
THE GOAL OF THIS PROJECT IS TO CREATE A SPACE, **THROUGH THE 'EYES' OF ESTABLISHED VERTICAL FARM 'GROWING UNDERGROUND'**, WHICH WOULD EDUCATE THE COMMUNITY ON PRESSING MATTERS SUCH AS **FOOD INSECURITY, SUSTAINABLE CONSUMPTION, CLIMATE CHANGE** AND, GIVE THEM GUIDANCE ON HOW THEY CAN ALTER THEIR BEHAVIOURS IN ORDER TO HELP, THROUGH AN INTERACTIVE AND AESTHETICALLY PLEASING EXHIBITION. VERTICAL GARDENING WOULD BE INTRODUCED TO THE COMMUNITY THROUGH A VARIETY OF WAYS, SUCH AS SCHEDULED GARDENING WORKSHOPS, 'HOW TO:' SESSIONS AND A DISPLAY OF THE THREE MAIN GROWING METHODS: HYDROPONIC, AQUAPONIC AND AEROPONIC. **THE PRODUCE GROWN ON SITE WOULD BE SOLD IN A SUSTAINABLE WAY AND ENSURING NOTHING IS WASTED** BY USING THE LEFTOVER PRODUCE AT THE ON-SITE CAFE, THUS SHOWING RESPONSIBLE CONSUMPTION METHODS FIRST HAND.

THE HISTORY

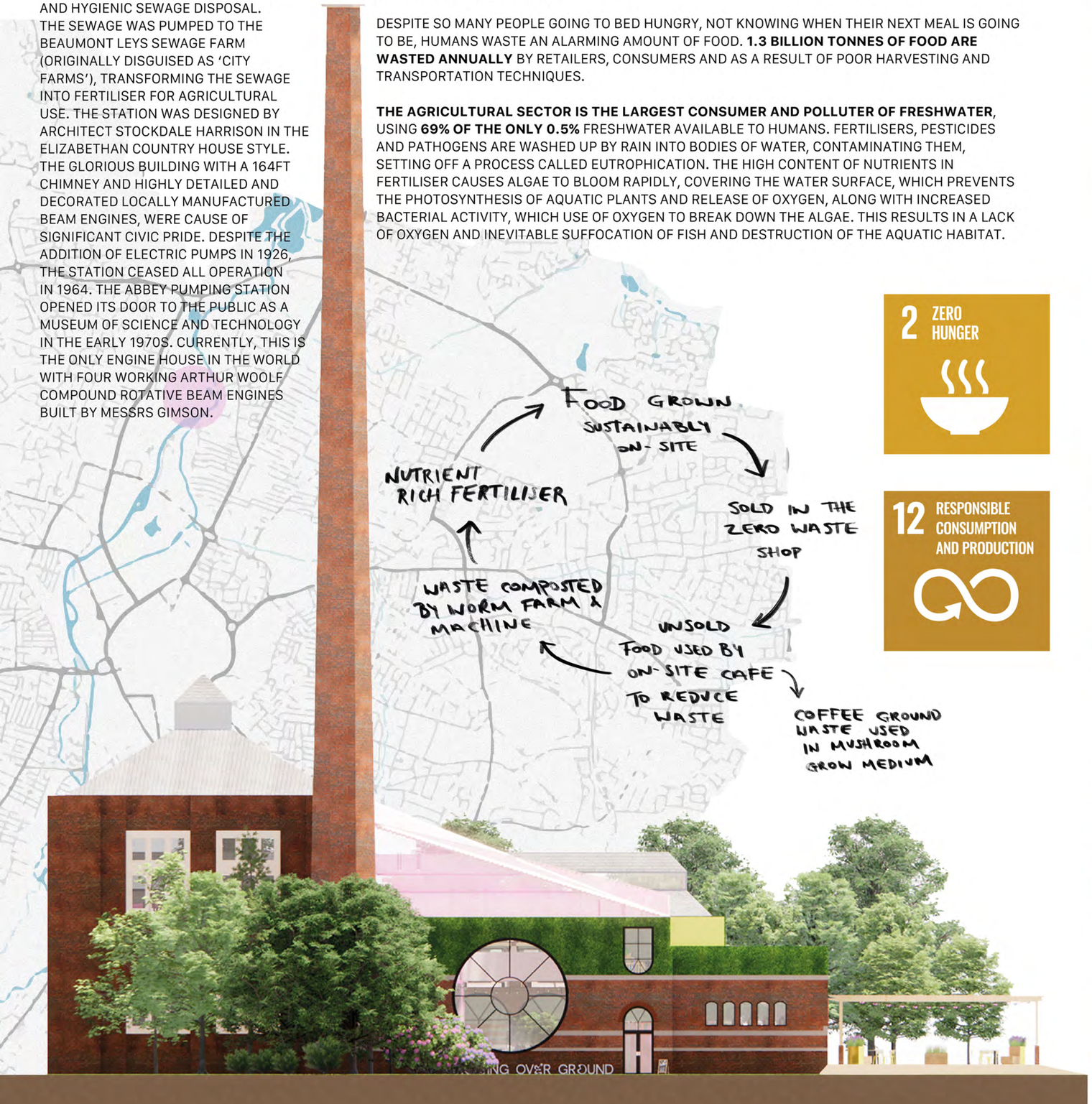
ABBEY PUMPING STATION IS A GRADE II LISTED BUILDING, SITUATED AT **CORPORATION ROAD, LEICESTER, LE4 5PX, OPENED IN 1891** AS A RESULT OF THE RISING POLLUTION LEVELS OF THE RIVER SOAR, AS A MEANS OF SAFE AND HYGIENIC SEWAGE DISPOSAL. THE SEWAGE WAS PUMPED TO THE BEAUMONT LEYS SEWAGE FARM (ORIGINALLY DISGUISED AS 'CITY FARMS'), TRANSFORMING THE SEWAGE INTO FERTILISER FOR AGRICULTURAL USE. THE STATION WAS DESIGNED BY ARCHITECT STOCKDALE HARRISON IN THE ELIZABETHAN COUNTRY HOUSE STYLE. THE GLORIOUS BUILDING WITH A 164FT CHIMNEY AND HIGHLY DETAILED AND DECORATED LOCALLY MANUFACTURED BEAM ENGINES, WERE CAUSE OF SIGNIFICANT CIVIC PRIDE. DESPITE THE ADDITION OF ELECTRIC PUMPS IN 1926, THE STATION CEASED ALL OPERATION IN 1964. THE ABBEY PUMPING STATION OPENED ITS DOOR TO THE PUBLIC AS A MUSEUM OF SCIENCE AND TECHNOLOGY IN THE EARLY 1970S. CURRENTLY, THIS IS THE ONLY ENGINE HOUSE IN THE WORLD WITH FOUR WORKING ARTHUR WOOLF COMPOUND ROTATIVE BEAM ENGINES BUILT BY MESSRS GIMSON.

THE ISSUES

BY 2050, THE HUMAN POPULATION IS EXPECTED TO REACH **9.7 BILLION**. IN ORDER TO SUSTAIN ALL THOSE PEOPLE, A LAND MASS EQUIVALENT TO **3 EARTH'S WOULD BE REQUIRED TO PRODUCE SUFFICIENT FOOD** THROUGH THE CURRENT AGRICULTURAL PRACTICES.
IN 2019, ALMOST **750 MILLION, OR 1 IN 10 PEOPLE** ACROSS THE GLOBE, WERE EXPOSED TO **EXTREME LEVELS OF FOOD INSECURITY**, CONSISTENTLY LACKING RELIABLE ACCESS TO ENOUGH NUTRITIOUS AND AFFORDABLE FOOD.

DESPITE SO MANY PEOPLE GOING TO BED HUNGRY, NOT KNOWING WHEN THEIR NEXT MEAL IS GOING TO BE, HUMANS WASTE AN ALARMING AMOUNT OF FOOD. **1.3 BILLION TONNES OF FOOD ARE WASTED ANNUALLY** BY RETAILERS, CONSUMERS AND AS A RESULT OF POOR HARVESTING AND TRANSPORTATION TECHNIQUES.

THE AGRICULTURAL SECTOR IS THE LARGEST CONSUMER AND POLLUTER OF FRESHWATER, USING **69% OF THE ONLY 0.5%** FRESHWATER AVAILABLE TO HUMANS. FERTILISERS, PESTICIDES AND PATHOGENS ARE WASHED UP BY RAIN INTO BODIES OF WATER, CONTAMINATING THEM, SETTING OFF A PROCESS CALLED EUTROPHICATION. THE HIGH CONTENT OF NUTRIENTS IN FERTILISER CAUSES ALGAE TO BLOOM RAPIDLY, COVERING THE WATER SURFACE, WHICH PREVENTS THE PHOTOSYNTHESIS OF AQUATIC PLANTS AND RELEASE OF OXYGEN, ALONG WITH INCREASED BACTERIAL ACTIVITY, WHICH USE OF OXYGEN TO BREAK DOWN THE ALGAE. THIS RESULTS IN A LACK OF OXYGEN AND INEVITABLE SUFFOCATION OF FISH AND DESTRUCTION OF THE AQUATIC HABITAT.



2 ZERO HUNGER

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

ZERO WASTE SHOP SELLING FOOD GROWN ON-SITE AND OTHER LOCAL PRODUCERS, AS WELL AS SUSTAINABLE KITCHEN STAPLES, ALLOWING YOU TO BUY ONLY WHAT YOU NEED, REDUCING WASTE

ZERO WASTE SHOP WITH A "HARVEST YOUR OWN" GREENS SECTION, BUYING ONLY WHAT YOU NEED TO REDUCE FOOD WASTE


ZERO WASTE CAFE SALVAGING UNSOLD FOOD AND UTILISING IT TO ITS FULLEST POTENTIAL, ELIMINATING WASTE AND SHOWING RESPONSIBLE CONSUMPTION

THE SOLUTION

HUMANITY NEEDS TO CHANGE ITS CONSUMPTION BEHAVIOURS AND REDUCE WASTEFULNESS IMMEDIATELY, BEFORE REACHING THE POINT OF NO RETURN. A WAY TO PRODUCE FOOD MORE EFFICIENTLY AND WITH LESS RESOURCES WOULD BE INDOOR VERTICAL FARMING. **VERTICAL FARMING CONSISTS OF GROWING FOOD IN VERTICAL MODULAR SYSTEMS** IN AN ENCLOSED, CONTROLLED ENVIRONMENT THAT RESULT IN HIGHER PRODUCTION YIELDS PER ACRE COMPARED TO TRADITIONAL FARMING PRACTICES. THE MAIN ADVANTAGES OF VERTICAL FARMING ARE:

- THE LACK OF SOIL, WHICH HELPS PREVENT THE FURTHER DEGRADATION OF FERTILE SOIL
- RECYCLING OF ALL RESOURCES, INCLUDING THE NUTRIENT RICH SOLUTIONS IN WHICH PLANT ROOTS GROW, SUCH FARMS CAN USE **UP TO 98% LESS WATER THAN TRADITIONAL FARMING**
- A HERMETIC ENVIRONMENT ELIMINATES THE NEED FOR PESTICIDES, HERBICIDES AND FUNGICIDES MEANING THAT **THE FOOD PRODUCED IS ORGANIC**
- EXTREME WEATHER CONDITIONS AND GEOGRAPHICAL LOCATION DO NOT AFFECT THE HARVEST
- PROXIMITY TO CONSUMERS REDUCES TRANSPORTATION DISTANCE AND REFRIGERATION PERIODS SO FOOD FRESHNESS IS PROLONGED, **REDUCING FOOD WASTE AND GREENHOUSE EMISSIONS**
- NUTRIENT SOLUTIONS AND LIGHT WAVES CAN BE OPTIMISED FOR MAXIMUM FLAVOUR

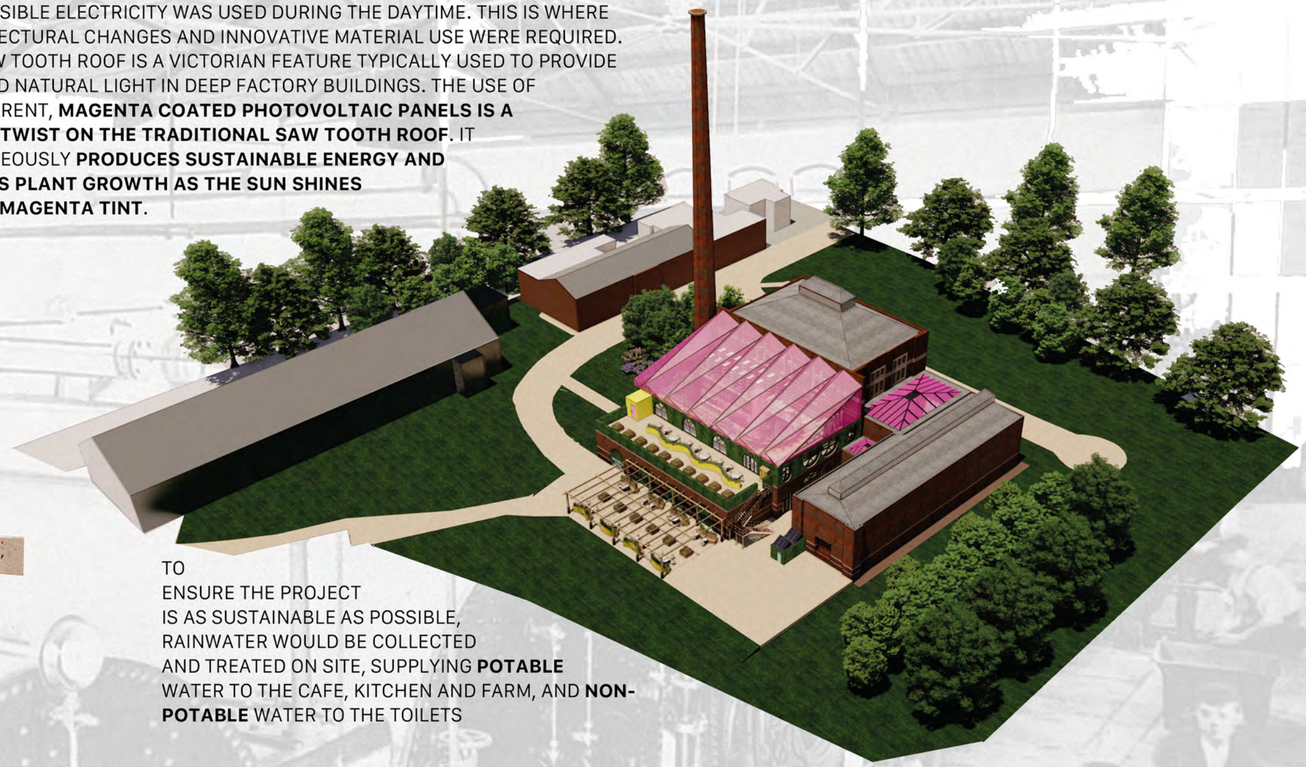
THE TARGET AUDIENCE

THE MILLENNIAL (22-37 YO) AND Z (10-22 YO) GENERATIONS ARE CAUSING SOCIETAL CHANGE THROUGH THEIR INCREASED SOCIAL AND ENVIRONMENTAL AWARENESS, AND CONSEQUENTLY SHAPING THE WAY BRANDS POSE THEMSELVES. IN THIS DIGITAL WORLD, BRANDS NOT ONLY HAVE TO BE AESTHETICALLY PLEASING IN ORDER TO CAPTURE ATTENTION, THEY ALSO NEED TO HAVE A STRONG PURPOSE AND VALUES THAT ALIGN WITH THE MILLENNIAL AND GEN Z MINDSET (PINAS, 2021).

A SURGE OF DEMAND IN ALLOTMENT PLOTS AND THE POPULATION'S DESIRE TO GROW THEIR OWN FOOD, AS A SURVEY REVEALED THAT OUT OF ALL AGES GROUPS, 24-35 YEAR OLDS, AKA THE MILLENNIALS, WERE THE MOST INTERESTED IN GROWING THEIR OWN FOOD. THIS IS DESPITE THE FACT THAT THE TYPICAL AND PROVEN AVID GARDENER IS 55+ YEARS OLD (LOCK, 2021). THESE FINDINGS COME DOWN TO ONE THING - LIFESTYLE. GEN X (41-56 YO) AND BOOMERS (57- 75 YO) ARE AT A TIME IN THEIR LIFE WHERE THEY DON'T HAVE CHILDREN TO LOOK AFTER, HAVE ACHIEVED THEIR CAREER GOALS AND HAVE MORE FREE TIME FOR HOBBIES, SUCH AS GARDENING. WHEREAS, MILLENNIALS AND THE OLDER GEN Z ARE EITHER YOUNG ADULTS IN EDUCATION, PURSUING A CAREER OR HAVE YOUNG CHILDREN, THEREFORE, INHERENTLY HAVE LESS TIME.

THIS LEADS TO THE CONCLUSION THAT THE YOUNGER GENERATIONS NEED A SOLUTION WHICH WOULD ALLOW THEM TO GROW FOOD WITH LITTLE TIME COMMITMENT - HYDROPONIC INDOOR FARMS.
THE WIDER LOCAL COMMUNITY IS ALSO PART OF THE TARGET AUDIENCE, PROVIDING THEM WITH SUSTAINABLY GROWN PRODUCE AND EDUCATING THEM ON THE IMPORTANCE OF RESPONSIBLE CONSUMPTION.

THE USE OF NATURAL LIGHT WAS VITAL FOR THIS PROJECT, ENSURING AS LITTLE AS POSSIBLE ELECTRICITY WAS USED DURING THE DAYTIME. THIS IS WHERE ARCHITECTURAL CHANGES AND INNOVATIVE MATERIAL USE WERE REQUIRED. THE SAW TOOTH ROOF IS A VICTORIAN FEATURE TYPICALLY USED TO PROVIDE DIFFUSED NATURAL LIGHT IN DEEP FACTORY BUILDINGS. THE USE OF TRANSPARENT, **MAGENTA COATED PHOTOVOLTAIC PANELS IS A MODERN TWIST ON THE TRADITIONAL SAW TOOTH ROOF.** IT SIMULTANEOUSLY **PRODUCES SUSTAINABLE ENERGY AND INCREASES PLANT GROWTH AS THE SUN SHINES THROUGH MAGENTA TINT.**

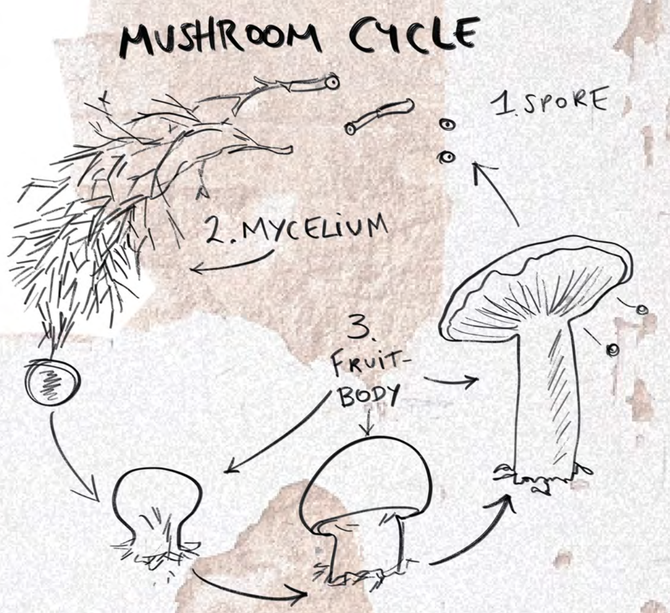


TO ENSURE THE PROJECT IS AS SUSTAINABLE AS POSSIBLE, RAINWATER WOULD BE COLLECTED AND TREATED ON SITE, SUPPLYING **POTABLE** WATER TO THE CAFE, KITCHEN AND FARM, AND **NON-POTABLE** WATER TO THE TOILETS

EXHIBITION AREA, INDOOR ALGAE FARM CONTAINERS DISPLAYED ON ILLUMINATED ARCHES

EXHIBITION AREA, ENCLOSED WORM FARM ROOM VISIBLE FAR RIGHT, COMMERCIAL COMPOST MACHINE IN THE MIDDLE WITH INFORMATION SCREEN ABOVE

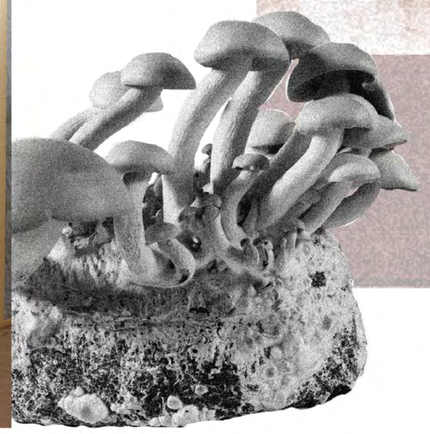
EXHIBITION AREA, ENCLOSED MUSHROOM GROW ROOM VISIBLE FURTHER INTO THE SPACE



THE EXHIBITION PANELS **HIGHLIGHTS THE ORIGINAL ARCHES** BY WEAVING THROUGH THEM, AND CONSIST OF LIVE **MYCELIUM BOARDS** WHICH ARE ABLE TO **PRODUCE EDIBLE MUSHROOMS**, AND INFORMATION PANELS ILLUMINATED BY AN OVERHEAD LIGHT FIXTURE. THE BLACKED OUT WALLS IN THE AREA ARE A SUBTLE HINT TO THE SUPPORTING BRAND GROWING UNDERGROUND, AND THE MAGENTA LIGHTS REPRESENT THE IDEAL LIGHT COLOUR THAT FACILITATES PLANT GROWTH.

COFFEE GROUNDS WASTE PRODUCED BY THE CAFÉS WOULD BE USED IN THE **NUTRITIOUS SOIL FOR MUSHROOM SPORES**, WHICH ARE DISPLAYED IN A CLIMATE CONTROLLED GROW ROOM IN THE EXHIBITION AREA. ANY OTHER ORGANIC WASTE WOULD BE COMPOSTED THROUGH THE TWO DISPLAYED METHODS - COMMERCIAL COMPOSTING USING A MACHINE, OR A **WORM FARM**, WHICH PRODUCE A HIGHLY NUTRITIOUS FERTILISER THAT CAN BE USED IN THE ROOFTOP GARDEN.

THE FIRST FLOOR IS SUPPORTED BY MYCELIUM BEARING COLUMNS DESIGNED BY BLAST STUDIO, ADDING TO THE **'EDIBLE ARCHITECTURE'** ELEMENT OF THE EXHIBITION PANELS.
CONSTRUCTED FROM A MIX OF MYCELIUM AND WASTE COFFEE CUP PULP AND PRINTED TO RESEMBLE A TREE TRUNK, T**HE COLUMNS PRODUCE MUSHROOMS THAT CAN BE PICKED OFF AND CONSUMED**.



AGRI / CULTURAL REVOLUTION

FIRST FLOOR PLAN

GROUND FLOOR PLAN

ZERO WASTE CAFE AREA

VERTICAL FARM AREA WITH STACKED, HYDROPONIC SHELVES AND BUILT IN GROW LIGHTS

WELLNESS GARDENING WORKSHOP AREA FOR INFORMATIONAL SESSIONS, TUTORIALS AND DEMONSTRATIONS