Bio-inspired Design

2022-2023 Fall Semester

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Invited Contributor: Ece Atacan

The students enrolled in ENT371E Bio-inspired Design developed design projects inspired by natural and biological systems.

This course is based on understanding the basics of bio-inspiration in design through the concepts of bio-inspiration, the use of bio-inspiration in different fields, analysis of the biological process and relating to design processes, transferring the biological principles to design solutions and details, inspiration from nature regarding pattern-form-structure and function/behavior, sustainability and ethics in bio-inspirational studies.

As a term project, the students are expected to develop a conceptual bio-inspired design project in a system approach.

The projects focused on climate change and eco-justice issues referring to UN Sustainable Development Goals (SDGs). The students worked in groups and suggested system design projects to mitigate environmental problems. The design process started with archive research for biological entities and natural processes. Then, the students worked on system maps to address the stakeholders and possible design areas based on the problem definition. The outcomes include conceptual design suggestions for products, services, events, mobile applications, educational materials, database and communication systems.

SDG(s)

| 6 CLEAN WATER AND SANITATION | 7 AFFORDABLE AND CLEAN ENERGY | 11 SUSTAINABLE CITIES AND COMMUNITIES |
| 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION | 17 PARTNERSHIPS FOR THE GOALS |

INSPIRED BY

Namib Desert Beetle was our inspiration source which the way of **collecting droplets** from the air then put them together by using **hidrofilic** and **hidrophobic** surfaces on their shell and with the gravity they direct the droplets thorough their mouth. Thanks to this mecahnism they provide their water from the droplets from the air. Inspired by this situation, we thought of bringing water droplets in humid and steamy environments into the existing **water cycle**.
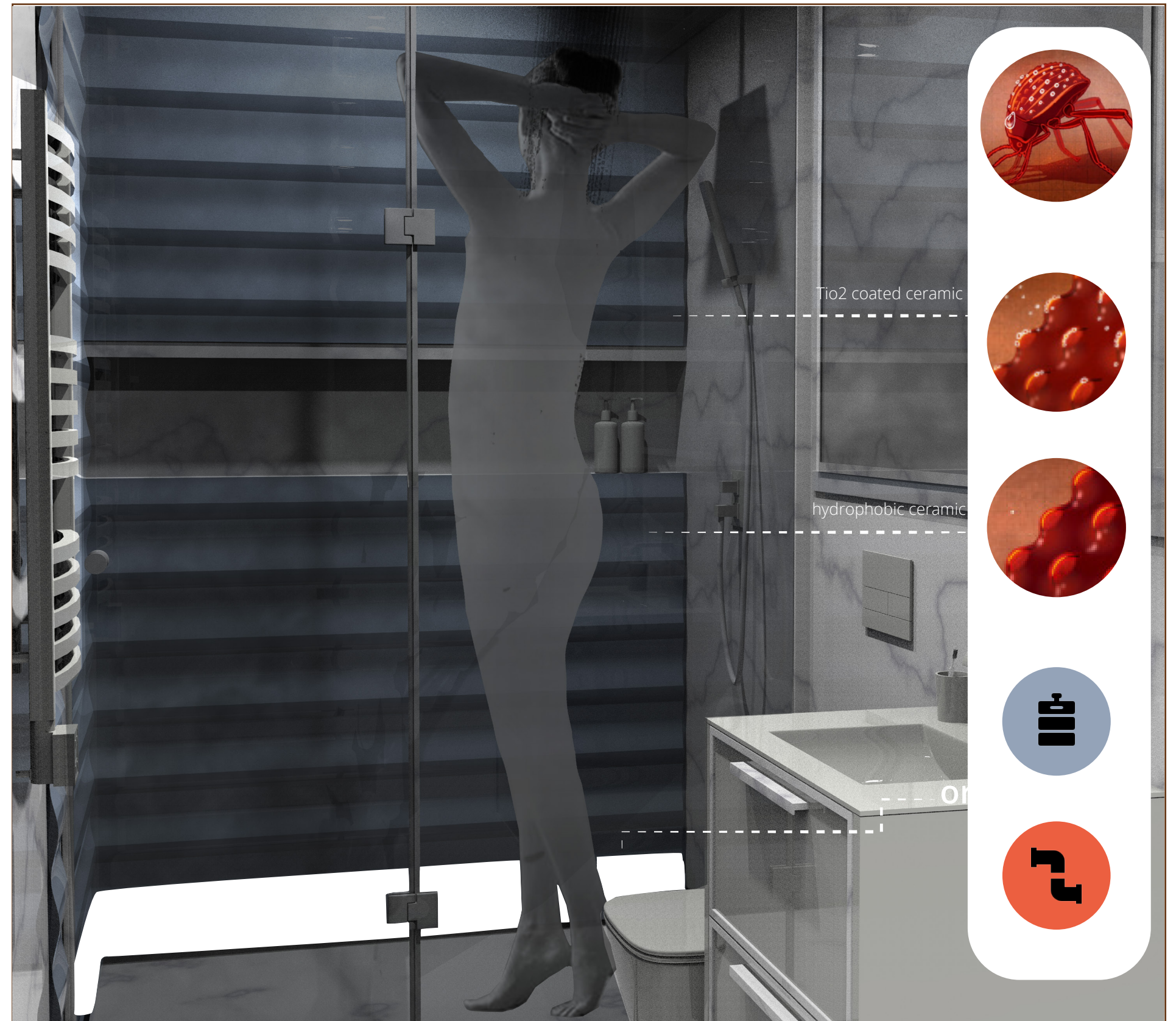
ENVIRONMENTAL CONTRIBUTION

The designed product - system, as mentioned above, helps to raise awareness for water scarcity, one of the most serious ecological problems of the future, and to re-enter the water cycle of condensed water in areas such as baths, showers, saunas and thermals.

GROUP MEMBERS
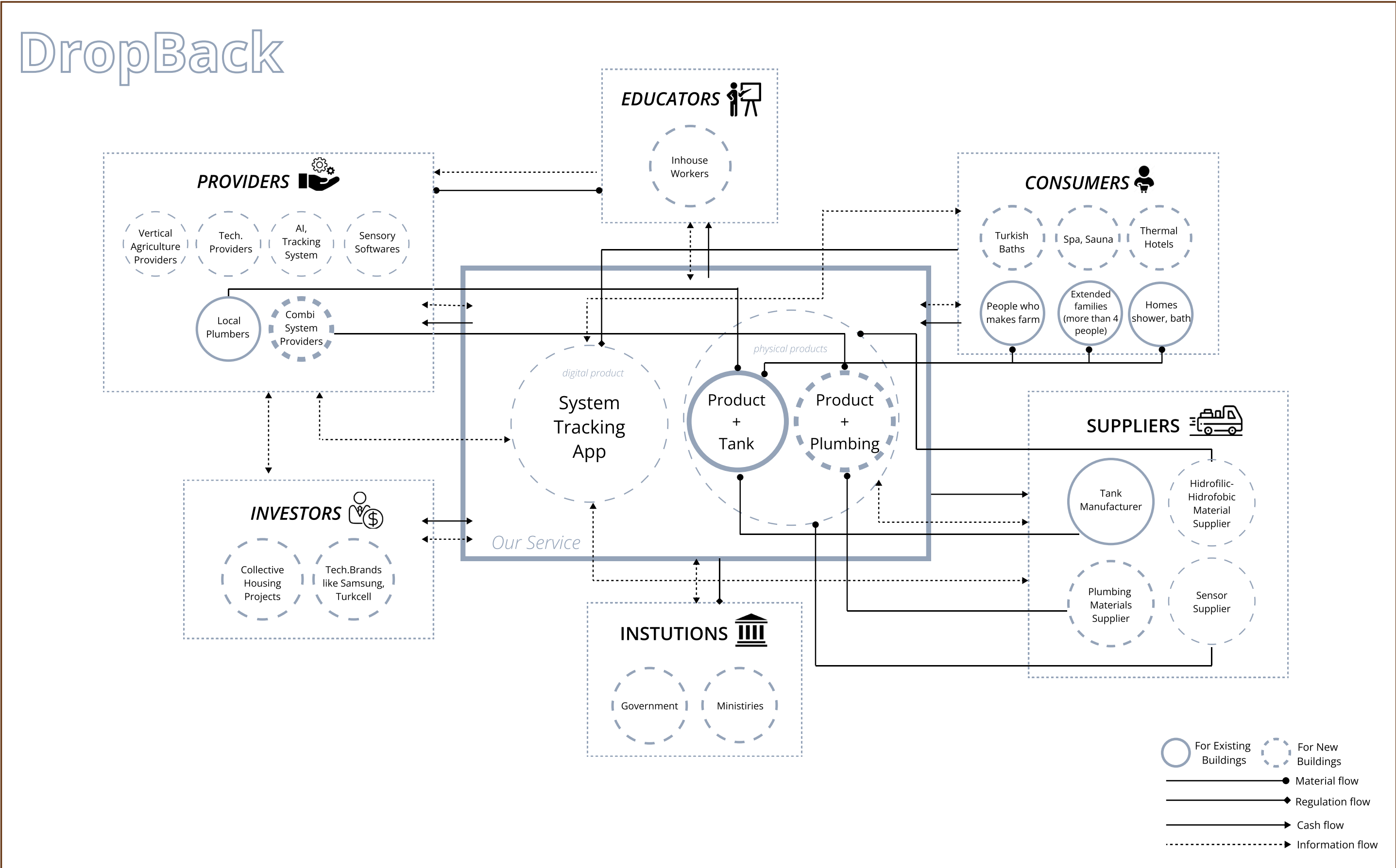
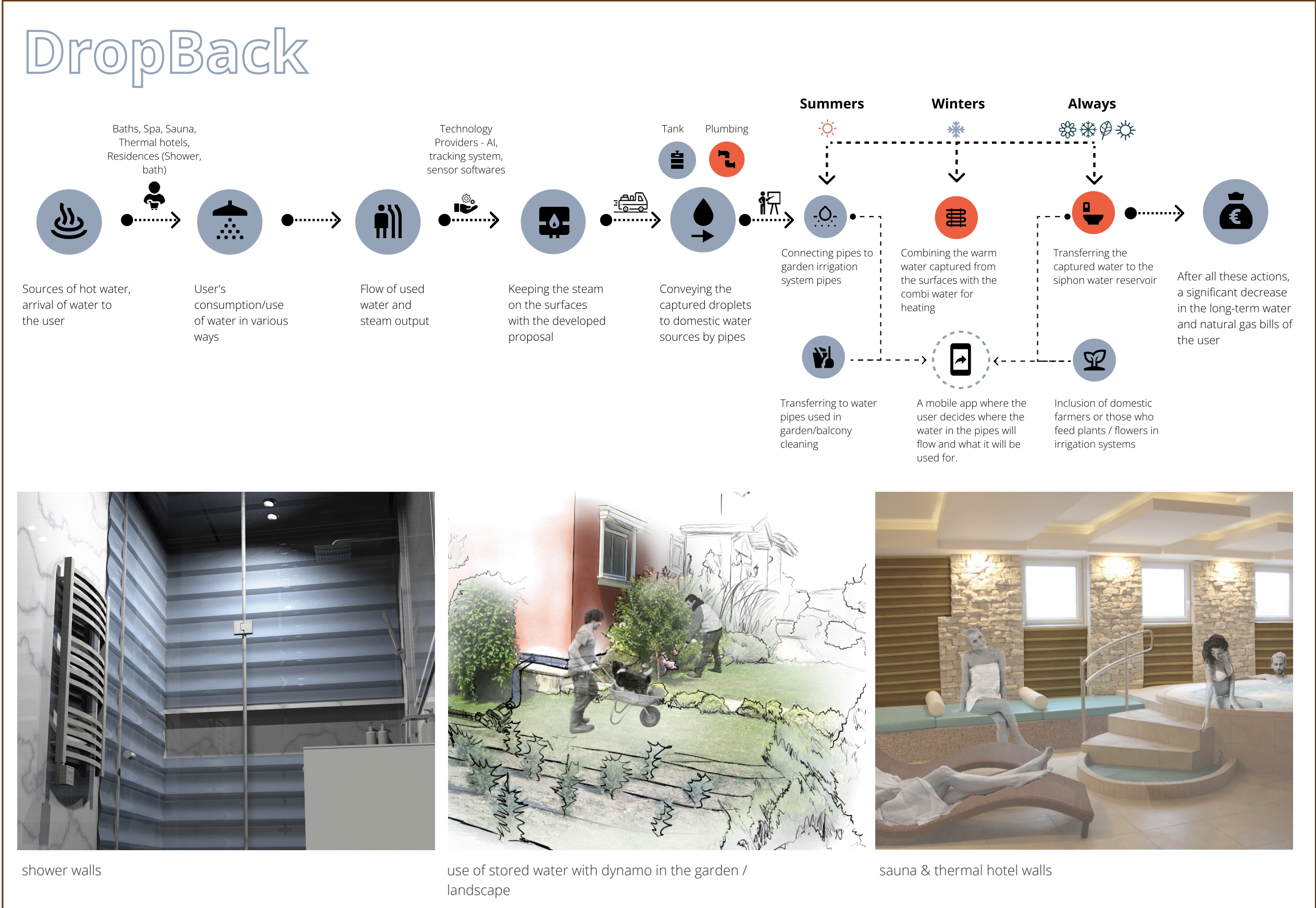|	
Büşra Akata	020180642
Ayşe Kumsar	020190735
Ahmet Furkan Kurt	020180651

PROBLEM DEFINITION

Water scarcity is expected as a problem for next generations, so this PSS is designed to bring the water droplets formed by condensation in case the vapor in the air encounters a cold surface, into the water cycle.

Tio2 coated ceramic

hydrophobic ceramic

SYSTEM MAP

DropBack

EDUCATORS

Inhouse Workers

PROVIDERS

Vertical Agriculture Providers

Tech. Providers

AI, Tracking System

Sensory Softwares

Local Plumbers

Combi System Providers

CONSUMERS

Turkish Baths

Spa, Sauna

Thermal Hotels

People who makes farm

Extended families (more than 4 people)

Homes shower, bath

digital product

System Tracking App

physical products

Product + Tank

Product + Plumbing

Our Service

SUPPLIERS

Tank Manufacturer

Hidrofilic-Hidrofobic Material Supplier

Plumbing Materials Supplier

Sensor Supplier

INVESTORS

Collective Housing Projects

Tech.Brands like Samsung, Turkcell

INSTUTIONS

Government

Ministiries

For Existing Buildings

For New Buildings

● Material flow

◆ Regulation flow

Cash flow

Information flow

SYSTEM SCENARIO & USAGE AREAS

DropBack

Summers　　**Winters**　　**Always**

Baths, Spa, Sauna, Thermal hotels, Residences (Shower, bath)

Technology Providers - AI, tracking system, sensor softwares

Tank　Plumbing

Sources of hot water, arrival of water to the user

User's consumption/use of water in various ways

Flow of used water and steam output

Keeping the steam on the surfaces with the developed proposal

Conveying the captured droplets to domestic water sources by pipes

Connecting pipes to garden irrigation system pipes

Combining the warm water captured from the surfaces with the combi water for heating

Transferring the captured water to the siphon water reservoir

After all these actions, a significant decrease in the long-term water and natural gas bills of the user

Transferring to water pipes used in garden/balcony cleaning

A mobile app where the user decides where the water in the pipes will flow and what it will be used for.

Inclusion of domestic farmers or those who feed plants / flowers in irrigation systems

shower walls

use of stored water with dynamo in the garden / landscape

sauna & thermal hotel walls

SDG(s)

INSPIRED BY

In the changes we made in the cargo system and packaging, We were inspired by ants and cones. To save fuel in the cargo system and to minimize the damage to nature, we created the basic nodes, inspired by the ants' route creation by combining the individual cargo transportation systems of the cargo companies. Thus, Cargoes will be transported to common warehouses by vehicles used jointly, and multiple vehicles will be prevented from traveling on the same route. In terms of packaging, we chose to use bioplastic products with air-inflatable areas, inspired by pine cones, both in wraps and in boxes, and for the outer packaging with logos and inscriptions, we preferred flat packaging from the same material.

ENVIRONMENTAL CONTRIBUTION

To support the cooperation of different cargo companies, using common vehicles on common routes, reducing carbon footprint. To build a sustainable cargo system by minimizing the waste generated by the existing cargo system. To offer sustainable solutions to plastic packaging and boxes by using bioplastic materials for existing packaging, to offer a second use and recycling opportunity.
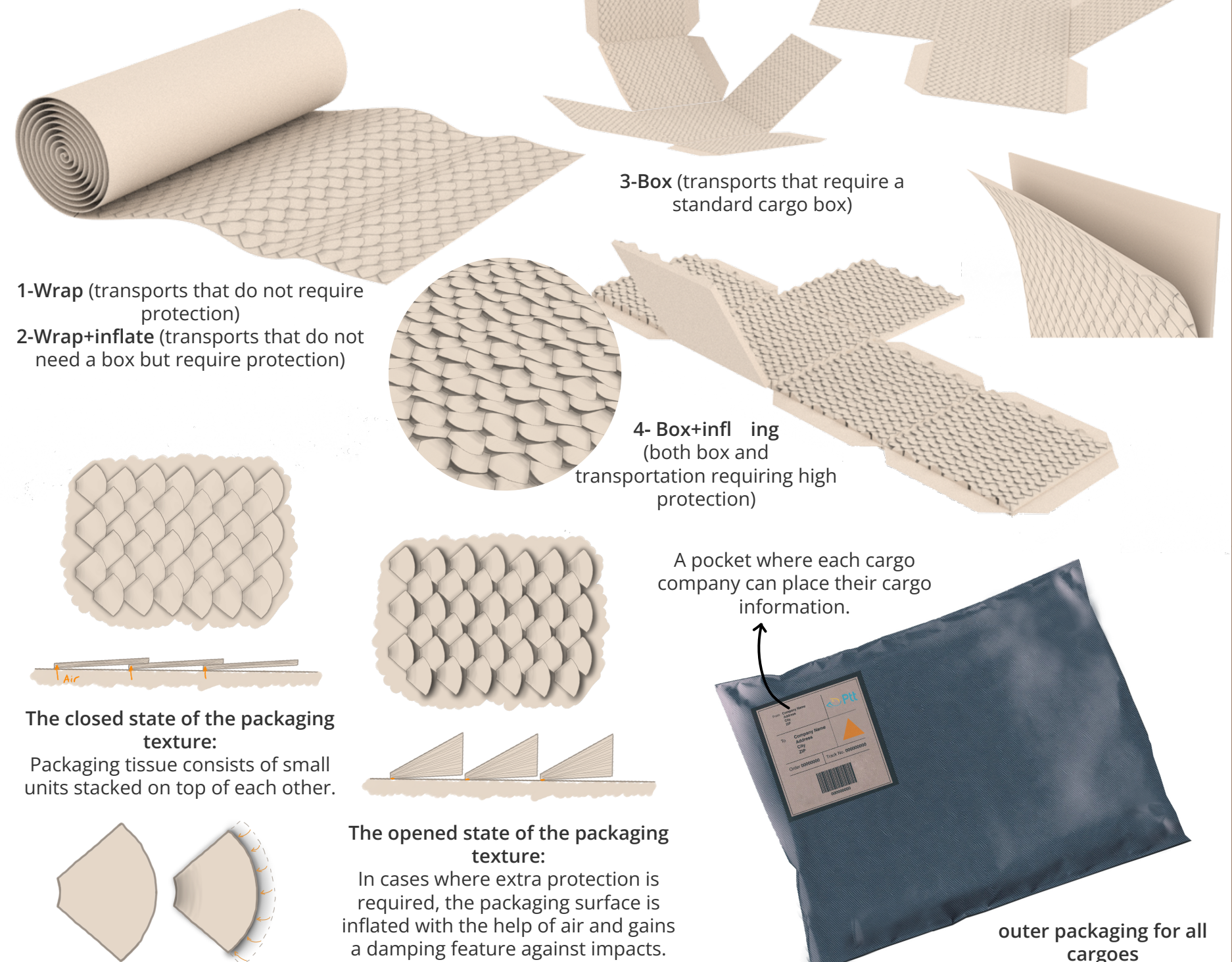
GROUP MEMBERS

Ebrar Coşar
Elif Esma Ecevit
Esra Betül Türk
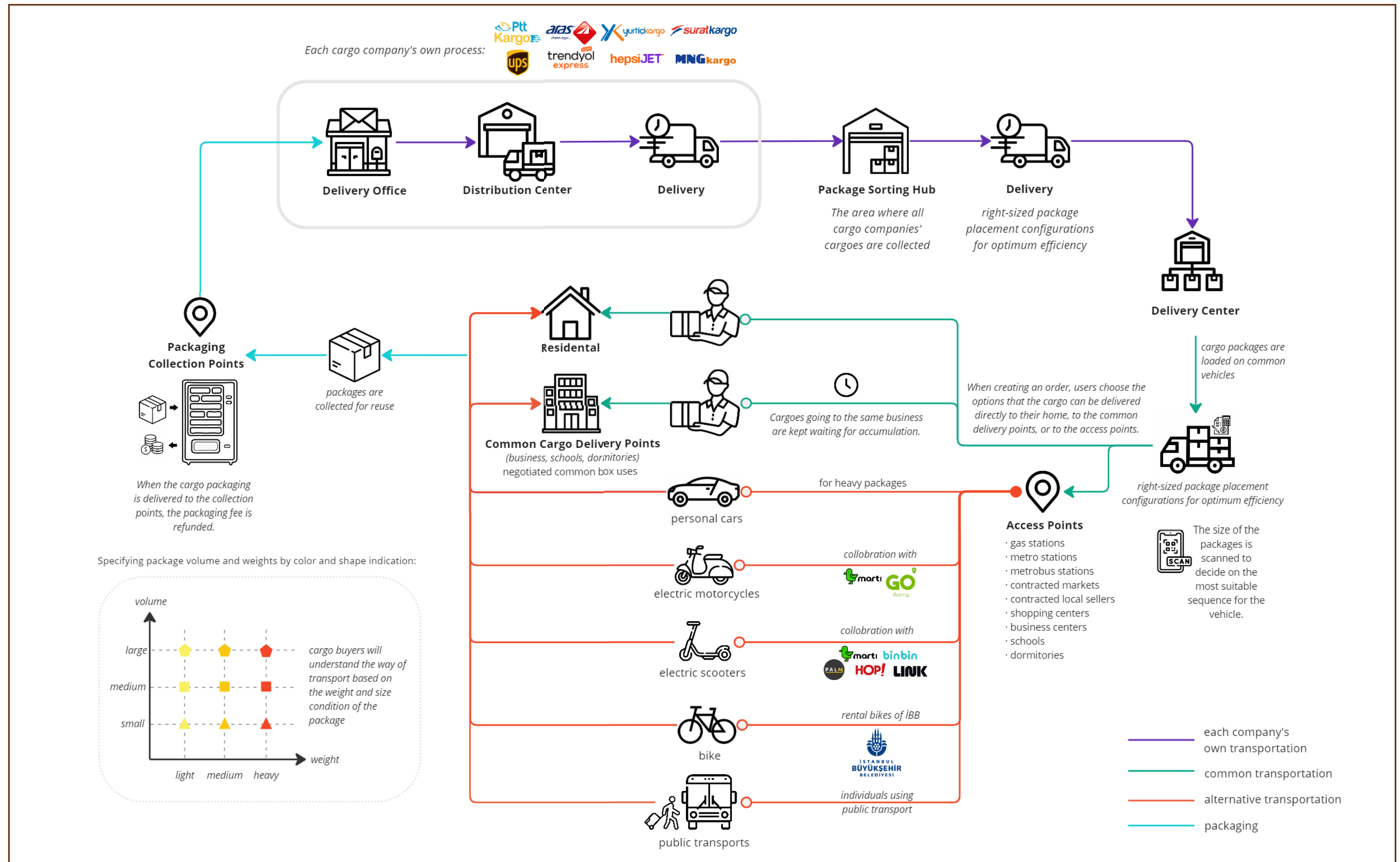Yaren Şevval Yılmaz

PROBLEM DEFINITION

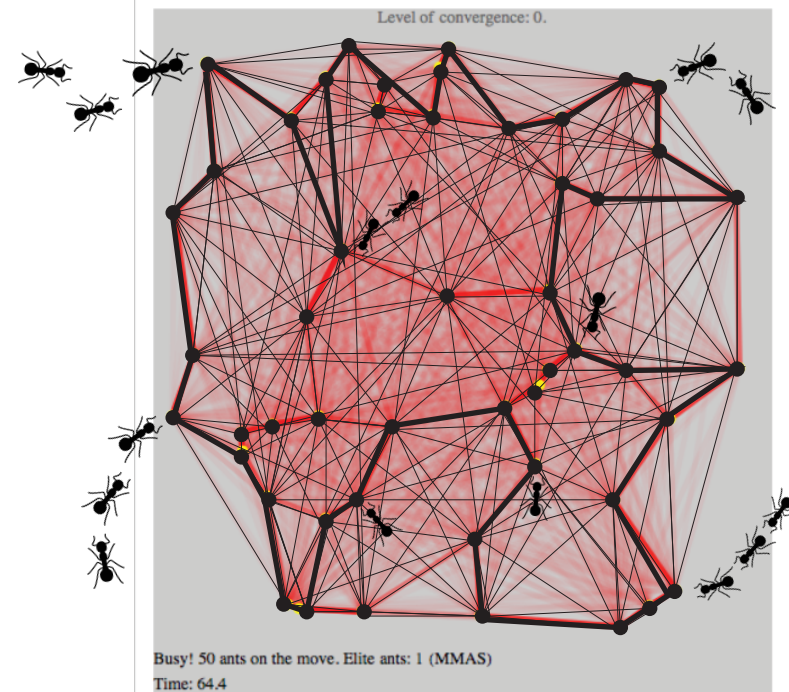Packaging waste and excess carbon footprint in the cargo industry

The structure of the material allows it to be wrapped, folded, and inflated with air. The packaging provides 4 different types of protection.

**3-Box** (transports that require a standard cargo box)

1-Wrap (transports that do not require protection)
2-Wrap+inflate (transports that do not need a box but require protection)

4- Box+infling (both box and transportation requiring high protection)

A pocket where each cargo company can place their cargo information.

The closed state of the packaging texture:
Packaging tissue consists of small units stacked on top of each other.

The opened state of the packaging texture:
In cases where extra protection is required, the packaging surface is inflated with the help of air and gains a damping feature against impacts.

outer packaging for all cargoes

SYSTEM MAP

Each cargo company's own process:

Delivery Office → **Distribution Center** → **Delivery**

Package Sorting Hub
The area where all cargo companies' cargoes are collected

Delivery
right-sized package placement configurations for optimum efficiency

Delivery Center

cargo packages are loaded on common vehicles

When creating an order, users choose the options that the cargo can be delivered directly to their home, to the common delivery points, or to the access points.

right-sized package placement configurations for optimum efficiency

The size of the packages is scanned to decide on the most suitable sequence for the vehicle.

Packaging Collection Points

packages are collected for reuse

When the cargo packaging is delivered to the collection points, the packaging fee is refunded.

Residental

Common Cargo Delivery Points
(business, schools, dormitories) negotiated common box uses

Cargoes going to the same business are kept waiting for accumulation.

Access Points
· gas stations
· metro stations
· metrobus stations
· contracted markets
· contracted local sellers
· shopping centers
· business centers
· schools
· dormitories

personal cars — for heavy packages

electric motorcycles — *collobration with* martı GO sharing

electric scooters — *collobration with* martı binbin PALM HOP! LINK

bike — *rental bikes of İBB* İSTANBUL BÜYÜKŞEHİR BELEDİYESİ

public transports — *individuals using public transport*

Specifying package volume and weights by color and shape indication:

cargo buyers will understand the way of transport based on the weight and size condition of the package

Legend:
— each company's own transportation
— common transportation
— alternative transportation
— packaging

DETICS

Level of convergence: 0.

Busy! 50 ants on the move. Elite ants: 1 (MMAS)
Time: 64.4

Creating route for the our system:

Şenaras et al. asserted that, the Traveling Salesman Problem (GSP) is a problem that aims to return to the starting city by visiting the cities with a certain distance between them, starting from any city, and finding the shortest and least costly route.

Ant colony algorithms are a technique inspired by the way ant colonies secrete pheromones to find the shortest path between their food sources and their nests. (2017)

Ant colony optimization is one of the most successful heuristics in finding the shortest path in traveling salesman problems. We used these nodes for route optimization.

Packaging inspiration details from pine cone:
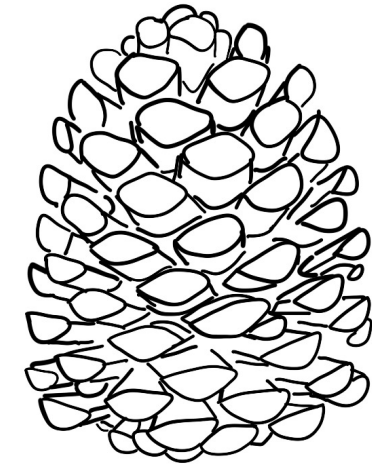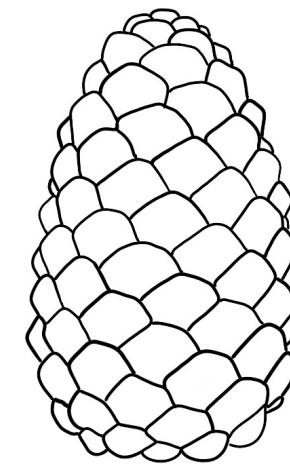
Behavior:
Cone's shells protect their seeds with the opening and closing movement

Pattern:
Stacking units

Form:
The structure of the units that supports the opening and closing behavior

Biodegradability

Raw material

Recycle

Design

Production
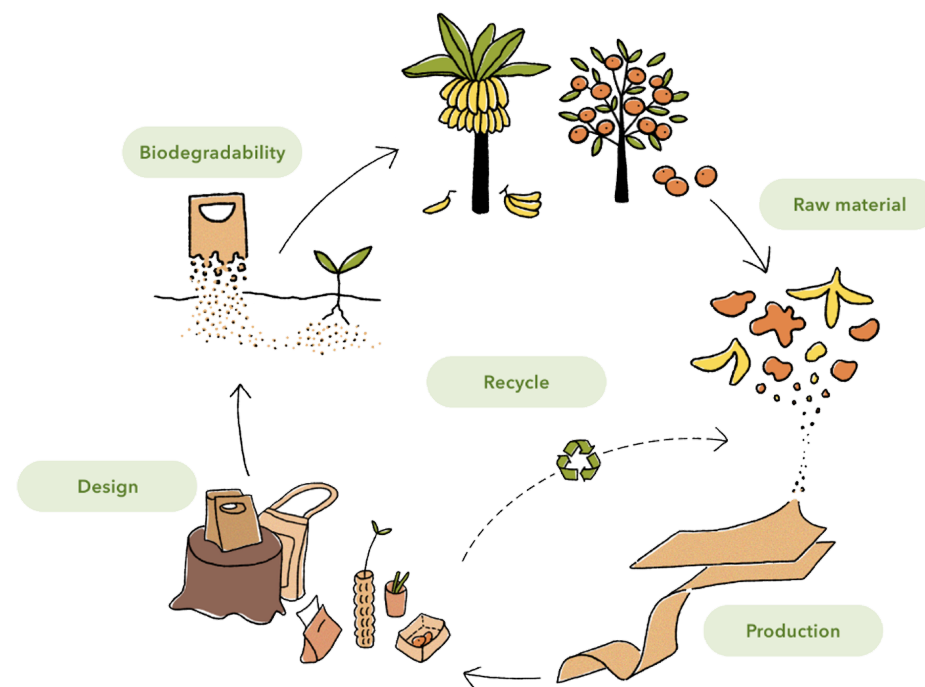
Material:

PEELSPHERE® is a totally circular material created through innovative material engineering from fruit waste and algae. It is made by reconsidering fruit waste, lowering the carbon impact, and planning for circularity. PEELSPHERE® is a durable, adaptable, and biodegradable alternative to leather and synthetic leather.

| Flexible | Strengh | Water resistant | Laser cut | Sewing & embroidery | Molding | Antibacterial | Zero waste & biodegradable |
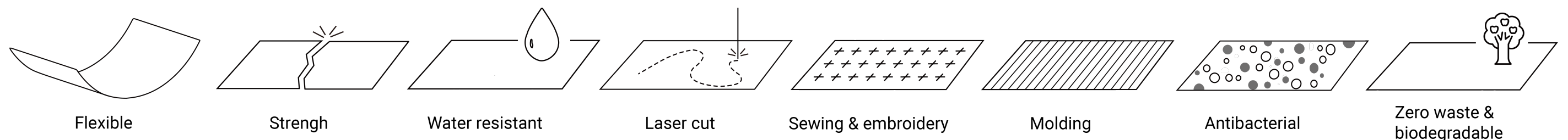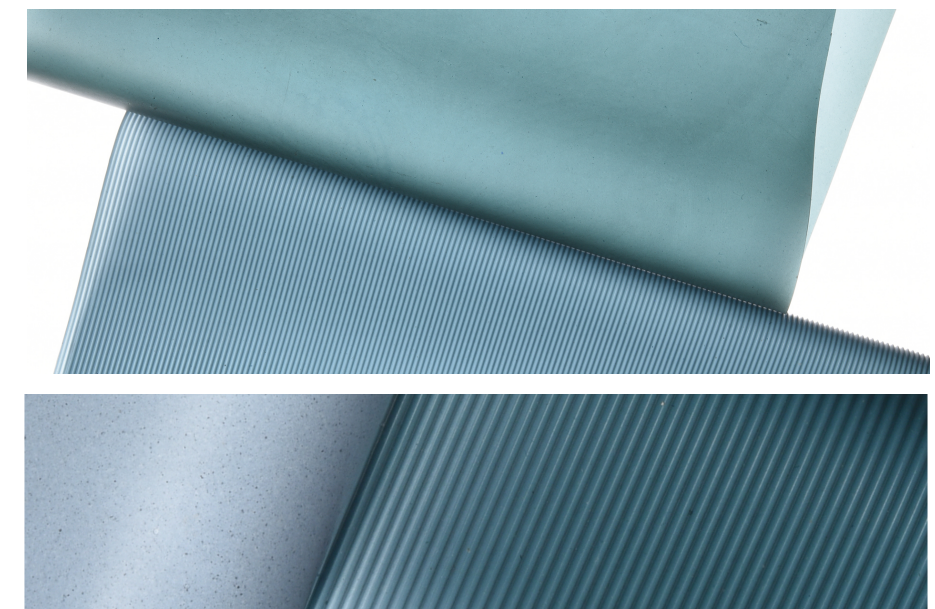
SDG(s)

INSPIRED BY

Monstera is a tropical flowering known for their large, glossy leaves, which often have unique fenestrations or holes in them. Some species of Monstera are also called "split-leaf philodendron," or "swiss cheese plant." The hollow structures are actually natural leaf modifications that allow the plant to grow and to absorb more sunlight. It increases the leaf surface to capture more sunlight without having to spend energy for growing extra leaf area.
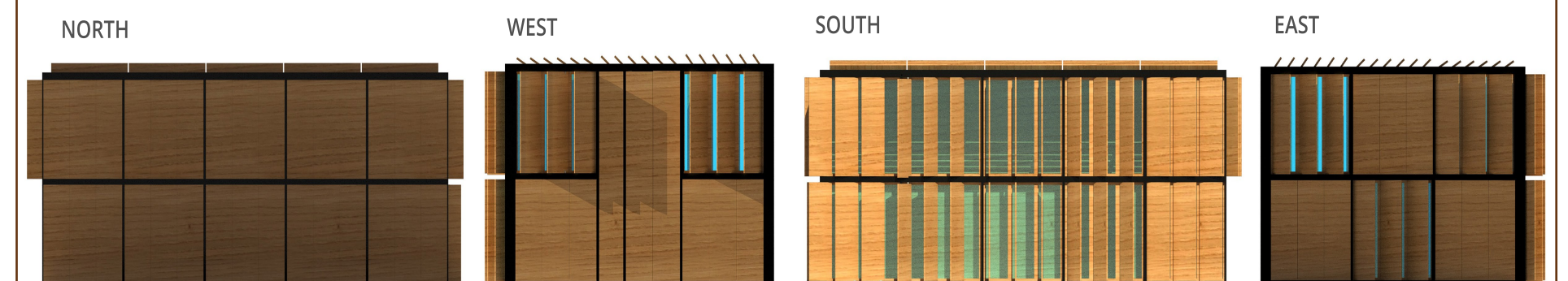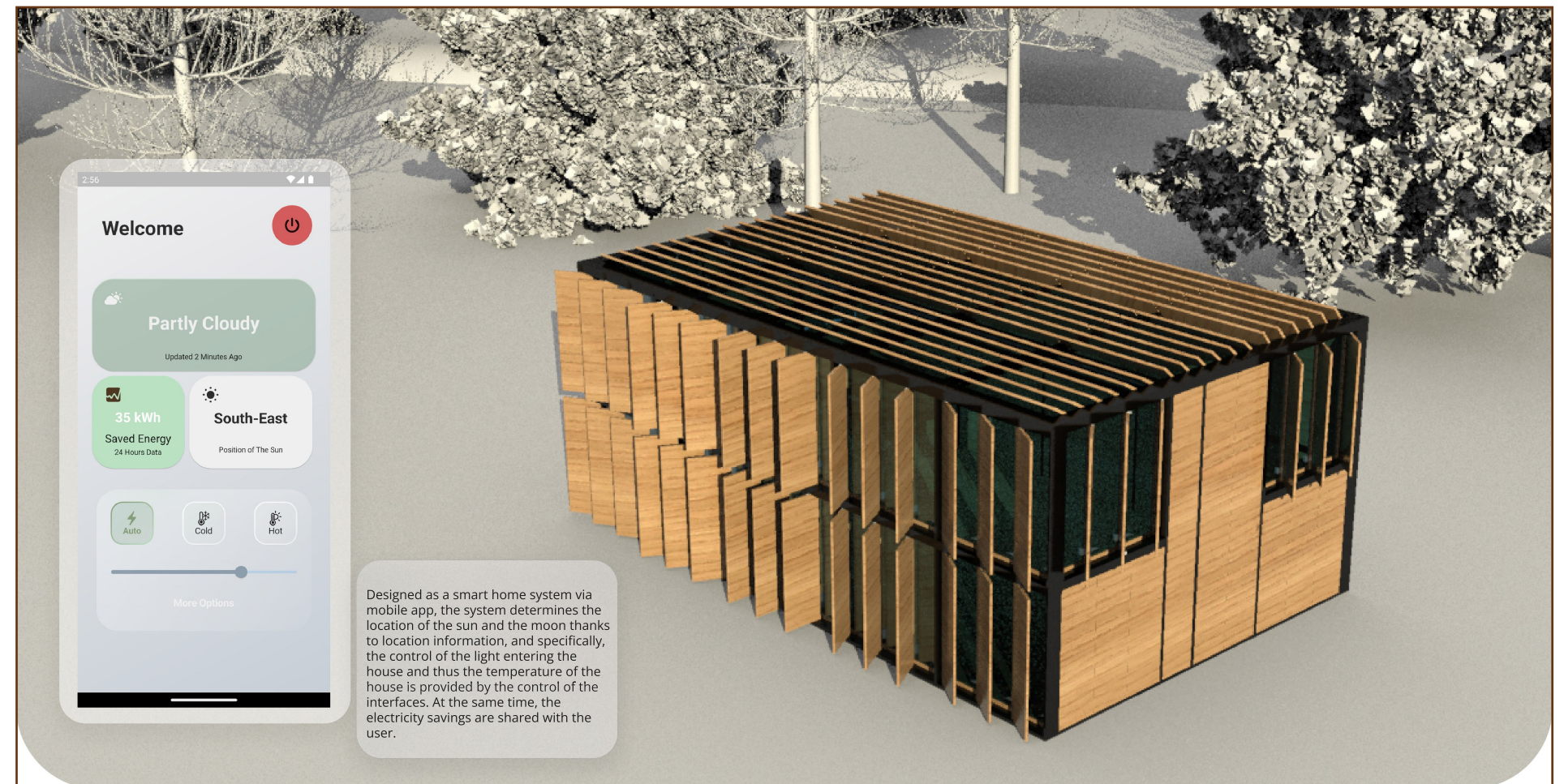
ENVIRONMENTAL CONTRIBUTION

In this project, energy conservation is the main goal by designing a system that minimizes energy consumption by utilizing natural sources and uses renewable energy. This Eco-village reduces the use of electricity by creating openings to take the sun rays inside the living zone. Users can control the enlightenment and accordingly the temperature of the place with a mobile app that operates the interfaces surrounding the house. Besides, the main electricity source of the eco-village will be solar panels and the energy that is provided by the collective work areas.

GROUP MEMBERS

Derin Naz Kızılsavaş
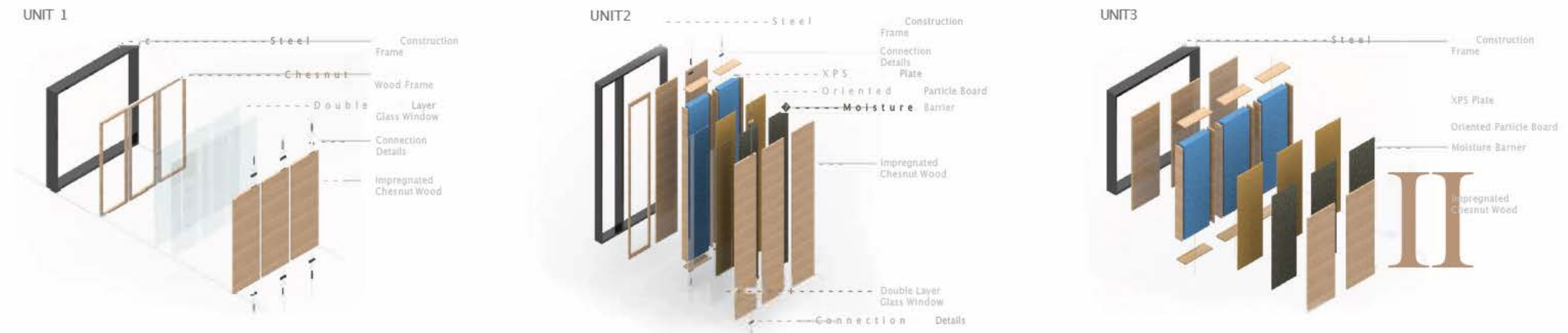Eyşan Öztürk
Şevval Aydın

PROBLEM DEFINITION

Since electricity is one of the major reasons for global warming, replacing it with renewable energy systems and finding natural solutions to decrease the domestic electric use is the aim.


Designed as a smart home system via mobile app, the system determines the location of the sun and the moon thanks to location information, and specifically, the control of the light entering the house and thus the temperature of the house is provided by the control of the interfaces. At the same time, the electricity savings are shared with the user.

NORTH   WEST   SOUTH   EAST

SYSTEM MAP

Government

Private Enterprise

Construction Workers

Material Flow
Information Flow
Laber Performance Flow

Component Manufacturer

Components (glass&frame)

Transportation

Construction Site (Eco-village)

Units

Electricity

Electric Distrubution

Design Studio

Architects and Designers

Instructor

Local Volunteers and Craftsmen

Local material

Interfaces

Secondary Energy Source

Primary Energy Source

College Students

Local Cooperative

National Energy Supplier

Solar Panels

Electricity generation from Collective Work

ENERGY CONVERSION MAP

Sun → Solar Panel → Electric Current → Charge Controller

Electric Grid

Battery System → Inverter → Power Meter

Bicycle → Motor

Appliences

DETILS

UNIT 1

Steel — Construction Frame
Chesnut — Wood Frame
Double — Layer Glass Window
Connection Details
Impregnated Chesnut Wood

UNIT2

Steel — Construction Frame
Connection Details Plate
X P S — Plate
Oriented — Particle Board
Moisture — Barrier
Impregnated Chesnut Wood
Double Layer Glass Window
Connection Details

UNIT3

Steel — Construction Frame
XPS Plate
Oriented Particle Board
Moisture Barrier
Impregnated Chesnut Wood

MORNING

Sunlight comes from below. To prevent the intense light fower interfaces are slightly closed while the upper interfaces are open to let the environment be lighted enough.

upper side from top view

lower side from top view
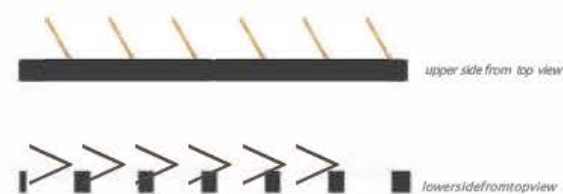
NOON

Sunlight comes directly from above. To prevent the intense light upper interfaces are fully closed while the lower interfaces are open to let the environment be lighted enough.

upper side from top view

lower side from top view

AFTERNOON

Sunlight comes from below with a low intensity. To make the environment lighted and heated at the night upper interfaces are fully open and lower interfaces are a little more closed to prevent excessive reflection.

upper side from top view

lower side from top view

NIGHT

Infertaces are placed in the east-west direction. Therefore, the moonlight can get in the house while the interfaces on the roof stand still.

roof from west elevation
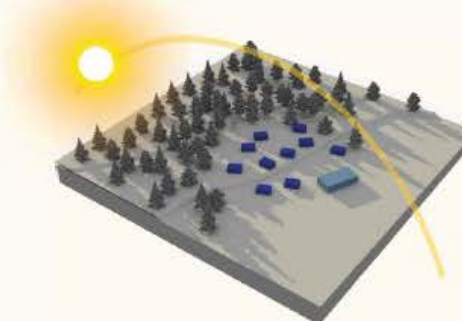
| Time: | 7am | 1pm | 7pm | 1am |

Location: Termal, Yalova, Turkey

SDG(s)

INSPIRED BY

The point of our inspiration is that living things in nature do not need artificial indicators,
they can satisfy their needs dynamically based on physical-environmental conditions.

The hour-oriented and measurable objective time perception-centered cleaning practices brought by city life are inefficient and disconnected from the dynamics of the utilized space.

ENVIRONMENTAL CONTRIBUTION

Promoting a sustainability-focused cleaning procedure that generates less waste by making use of materials sparingly and only as needed.

GROUP MEMBERS

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Sude Kartalbaş 020190701
Özlem Şahin 020180611
Uğur Zülkadiroğlu 020180646

PROBLEM DEFINITION

Inefficienct cleaning applications in public places causes discomfort for both cleaners and guests, loss of time, money and labour.

Data Collection Points

SYSTEM MAP

Subcontractor

cleaning staff

Job Application

organization company → BioClock training team → Training → BioClock cleaning professionals

Job Assignment

through BioClock mobile App

School

User → Toilet

School Administration

Zero-waste management system

Registered to (obligatory)

Integrated environmental information system

Collected by sensors

Data
- Floor Pollution Rate
- Number of flushes
- Opening and closing of doors
- Trash & waste amount
- Cleaning Intervals

via internet

Stimulative feedback

Service center

BioClock cleaning solutions

- Weather
- Humidity
- Smell

Evaluated according to external parameters

Assessed Values

Legend:
—— Interaction
- - - Information

SDG(s)

INSPIRED BY

Inspired by mammals' childcare and passing on knowledge and behavior patterns across generations, Unearth is an interactive mobile application designed for children of 6-9 years of age with the goal of helping transfer important natural knowledge and motivating kids to grow into environmentally aware individuals by developing environmentally-friendly habits.

ENVIRONMENTAL CONTRIBUTION

Unearth aims to help children, who are eager to learn in a technological era, gain environmental awareness and be raised with the feeling of responsibility against nature by presenting interactive visuals of different endangered animals around the world and their natural habitats, giving simple tasks to complete in a home environment and showing children how small, everyday actions can prove vital for the protection of nature.

GROUP MEMBERS

Ece Manav
H. Nur Şahinci
Filiz Yer

PROBLEM DEFINITION

Lack of awareness and presence of irresponsibility regarding endangered animals, habitat destruction and environmental pollution caused by the human kind.

SYSTEM MAP
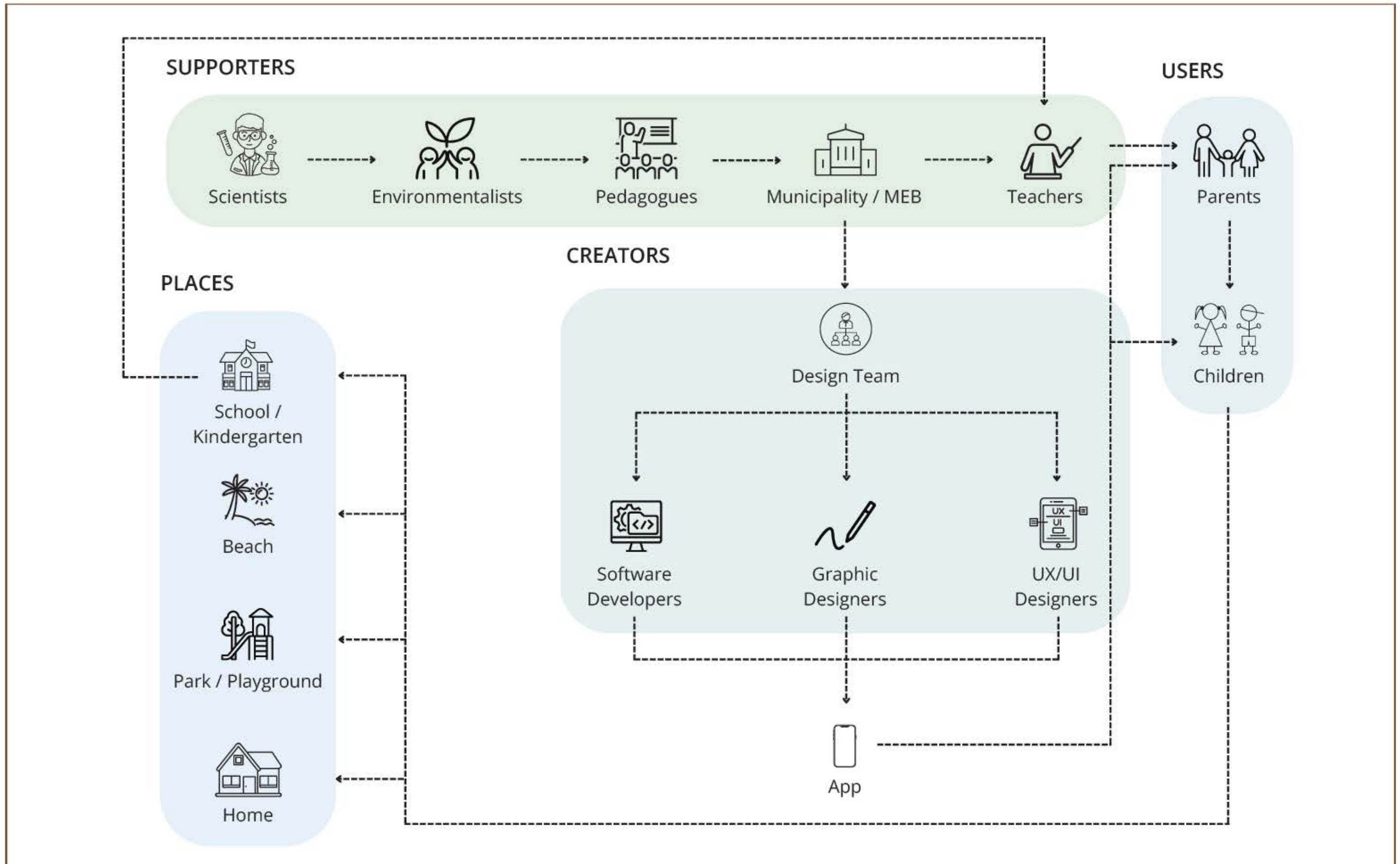
APPLICATION FLOW

The 1st group of frames show the first scenes of the app and the guide character within the app (Max the Dinosaur) is introduced.

The 2nd group of frames, once pressed "START", take the user to an interactive visual of the Earth, which can be spinned around. When pressed "SHOW ANIMALS", the user is guided to the next three frames.

The 3rd group of frames show what happens when the said button is pressed, and endangered animals all around the world appear over their homelands. The Earth can still be spinned around.

The 4th group of frames show what happens when a specific animal is pressed on. The rest of the scene fades and the name of the animal appears. The button "GO TO HABITAT" takes the user to their natural habitats.

The 5th group of frames show the natural habitats with environmental difficulties. The scenes can be navigated through by swiping and more of the habitat can be observed.

The 6th & 7th group of frames show the first task of the user and they are directed to a specific part of one's house. The user is asked to find and fix what is wrong while a child is brushing her teeth and once completed, is taken to the improved habitat of an endangered animal to be shown the positive affects of that action.

The 8th, 9th, 10th & 11th group of frames are variations of tasks and habitats.

The user is given a different task and shown a different endangered animal and its habitat every day, and is notified when a new task comes up.

The app is intended for children of 6-9 years of age, under adult supervision.
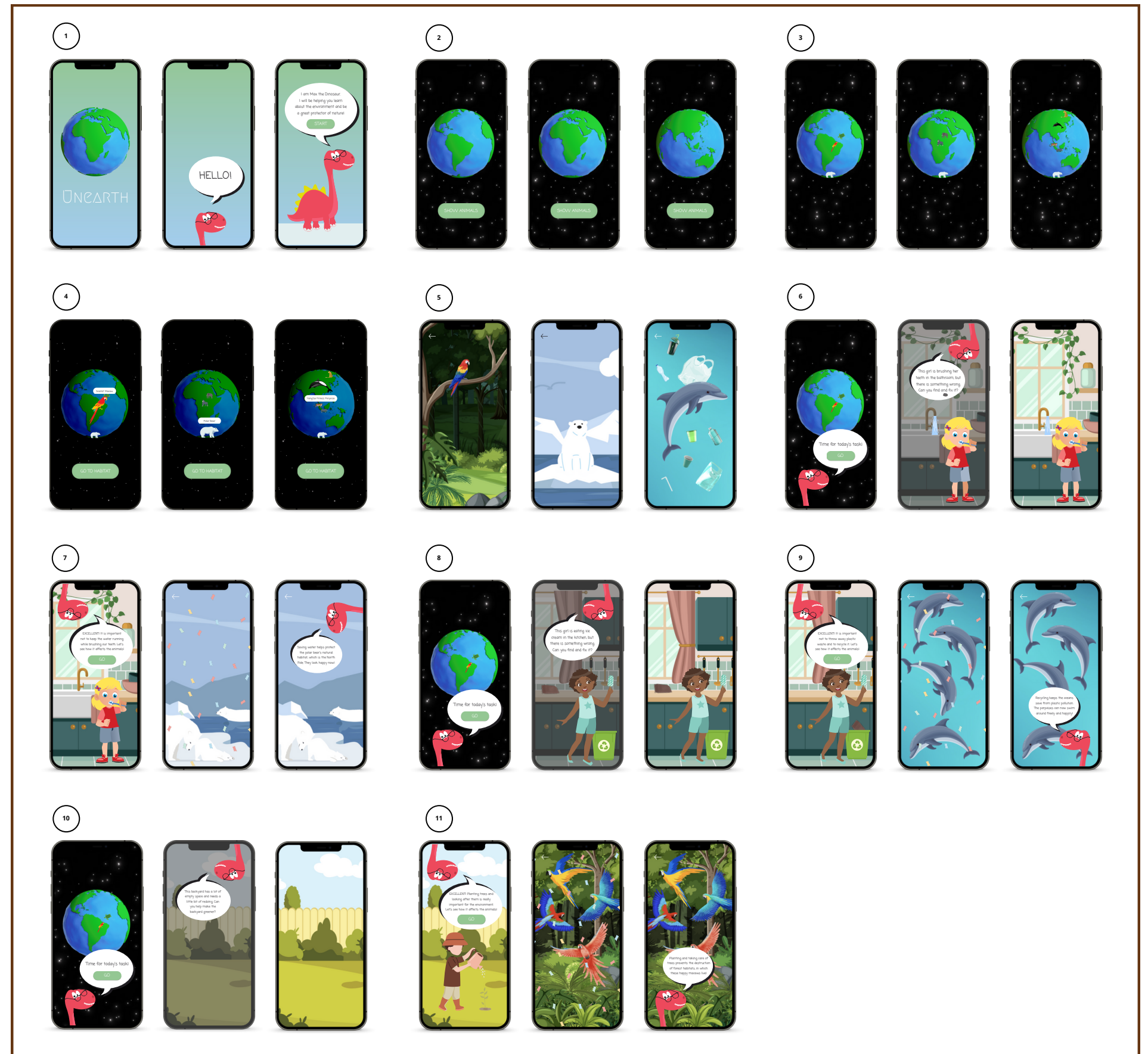
SDG(s)

INSPIRED BY HONEYBEES

Honeybees use dance to communicate information about new food sources to other bees. Scout bees perform a dance that conveys the distance and direction of the food source, and the intensity of the dance indicates the quality of the food source. Other scout bees assess the food source based on the intensity of the dance and may also perform a group sway dance if they consider the source to be promising. This allows bees to efficiently locate and gather nectar and pollen from various flowers.

ENVIRONMENTAL CONTRIBUTION

One important aspect of sustainability in park and garden management is the proper disposal, reuse, and distribution of products that can be recycled. By implementing planned transport routes that are optimized for efficiency, we can significantly reduce our carbon footprint and do our part to protect the environment.

GROUP MEMBERS

Ayşe Pelin Ekici　| 020200766
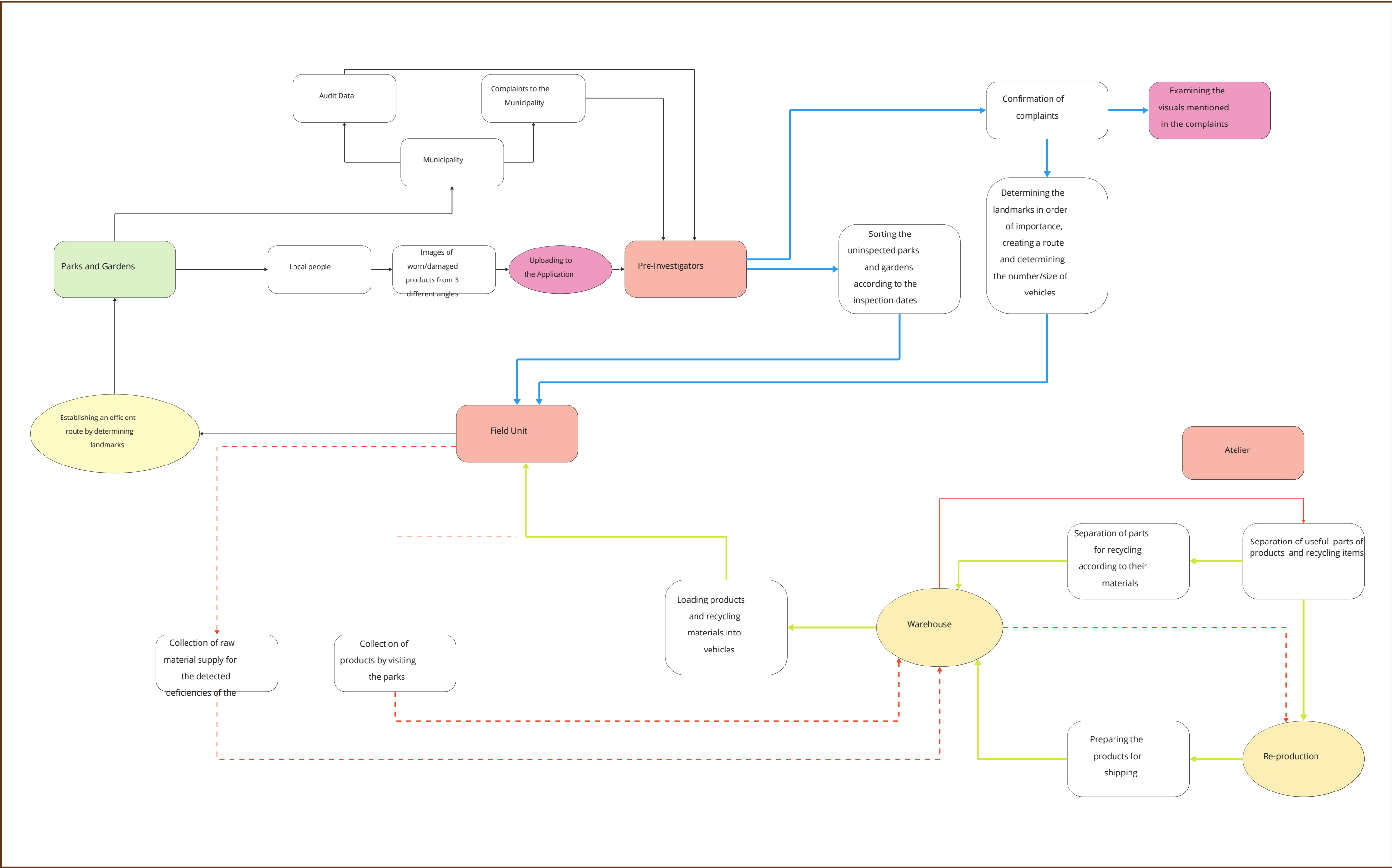
Ulaş Erdem Önal　| 020190638

Merve Elif Ürtiş　| 020180610

PROBLEM DEFINITION

Increase in greenhouse effect and carbon footprint due to exhaust gas emissions.
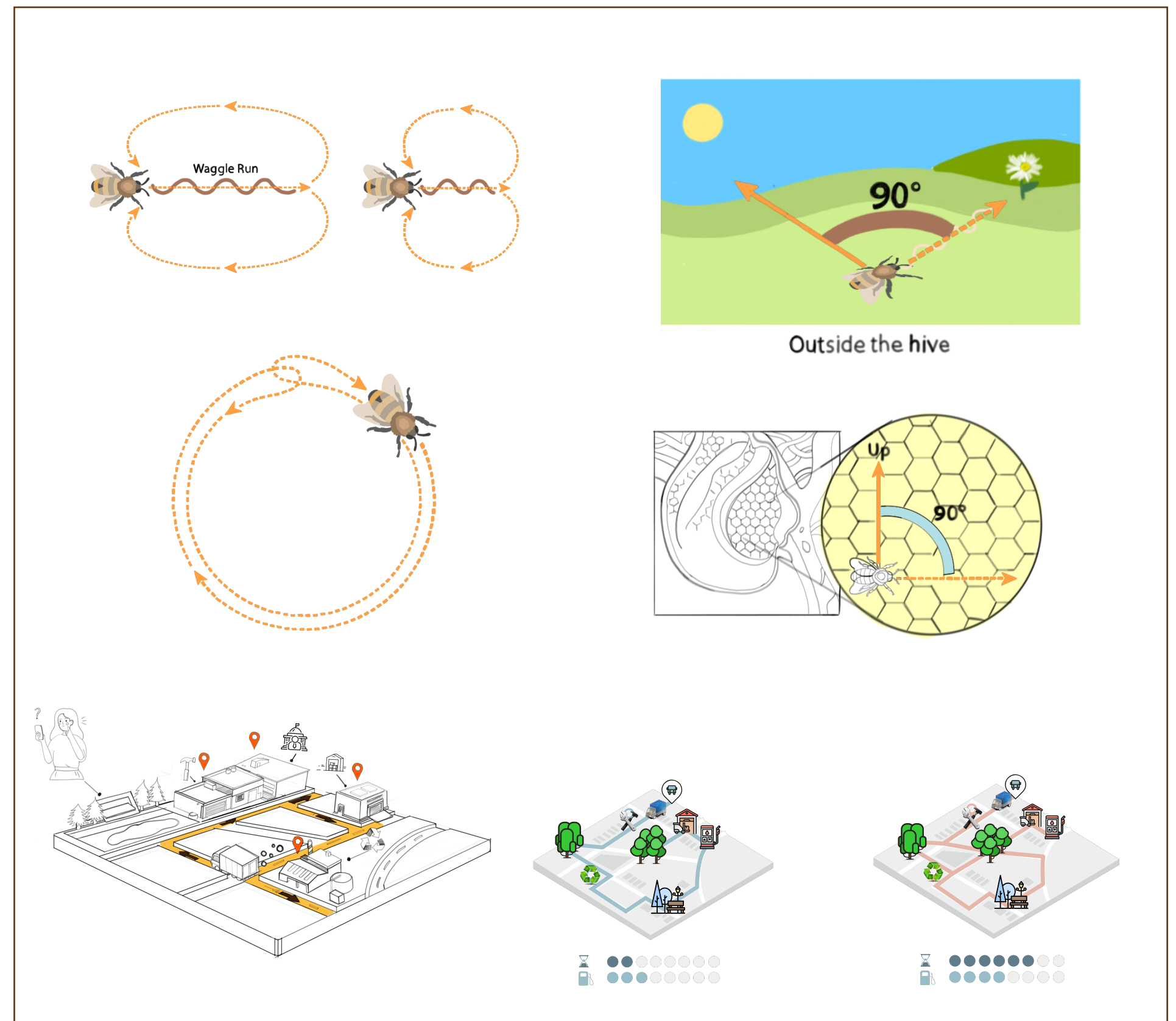
SYSTEM MAP

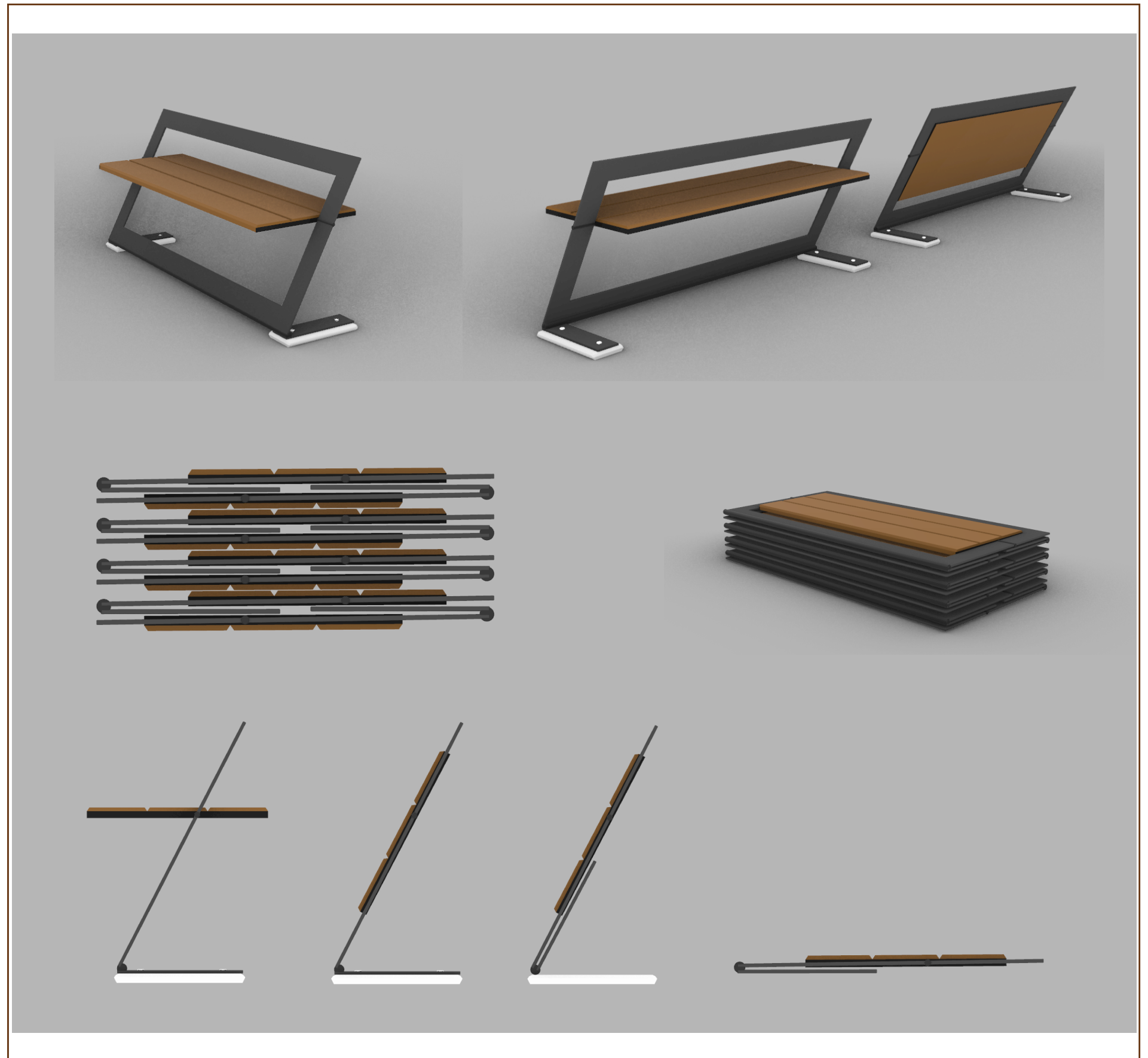## ADDITIONAL PAGE (TITLE THAT YOU PICK)

Pre-Inspectors

The role of these people is to investigate and verify complaints, identify parks that have not been audited for a long time and list them in order of their audit dates, establish landmarks, and determine the best route for shipping products, supplying raw materials, and collecting products.

Atelier

The atelier team is responsible for maintaining and repairing various products using the materials and information provided to them. They are also skilled in separating and storing intact parts of products that may be useful in the future. This allows the team to efficiently and effectively ensure that all products are functioning properly and ready for use. Through their attention to detail and dedication to their work, the atelier team plays a crucial role in the smooth op-eration of the system.

Field Unit

The field units are responsible for collecting damaged or re-evaluated products from the parks and gardens identified by the pre-inspectors and delivering them to the central workshop for repair or reworking. Once the products have been repaired or reworked, the field units return them to their designated parks or gardens. They also dispose of any decomposed products that cannot be reused by transporting them to recycling facilities for reprocessing. The field units play a vital role in ensuring that all products are properly maintained and functioning correctly within their respective parks and gardens. Through their tireless efforts, the field units contribute to the overall efficiency and effectiveness of the system.

SDG(s)

3 GOOD HEALTH AND WELL-BEING

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

15 LIFE ON LAND

INSPIRED BY

- Optimal oraging behavior of animals: Animals that adapt appropriately to this strategy, behave to reduce energy production and increase energy gain. Time, energy and accessibility are important.
- ixed-species foraging bird flocks: They create a balance between reducing competition and finding food. By sticking together, they minimize risks and find varied food. If the sources are limited, they share to co-exist.
- Honeybee ' interaction: Their behaviors of following simple instructions without exhibiting complexity and hierarchy.

ENVIRONMENTAL CONTRIBUTION

The purpose of this system is the gathering of goods depending on the seasons; the transformation, preservation and the usage of other methods to prevent the goods from going bad; adding these goods to healthy eating options with as little waste as possible while also steering away from overconsumption. While doing this, the aim is also to unite different communities and to make people aware of their responsibility towards nature via the channel of eating rather than it being forced upon. In addition, the reduction of effort to gain access to seasonal goods is aimed towards.

GROUP MEMBERS

Cemre Yaşar
Dilara Yeşilgül
Zeynep Saygısever

PROBLEM DEFINITION

The fact that organic food products are expensive and barely accessible and generally, if these organic foods are used or not, they are spoiled and wasted like any food.

BEE COLONIES

Honeybees interact with one another via body language and pheromone trails. A hive has no "top-down" administration. They make judgments based on rules that are pretty straightforward. This is how bees manage an adaptable colonial colony in the ABSENCE OF TOP-DOWN MANAGEMENT or "intelligence" in the human sense. Each individual bee contributes to the hive-level aim of survival by FOLLOWING BASIC RULES AND COMMUNICATING FREQUENTLY via pheromone trails.

The concept is known as "EMERGENCE" because a sophisticated communication and decision-making system evolves from a huge number of relatively smaller interactions.

The app provides the appropriate space to communicate digitally as well as face to face. Signing up to a workshop turns that communication into a face-to-face one, along with assigning the user to a role that is given at random. This plays into the idea of an equal community as well as simple and personal instructions leading into a bigger organisation.

Regularly held, cheap workshops with experts in a comfortable setting.

INSTRUCTOR

APP with the ability to sign up tp workshops, communicate with others, learn new facts, donate to help the system, and to earn free attendances to some workshops.

Kairos

FORAGING in mixed-species bird flocks

The formation of MIXED-SPECIES BIRD FLOCKS demonstrates a possible exception to the universal ecological assumption: Instead of competing with one another for limited resources, some bird species who share the same food source can co-exist in mixed-species flocks.

These flocks may find food clusters together, but then also eat different foods within the clusters. The balance is created between reducing competition and finding food by behaving in this way. By sticking together, they also find varied food without competing. And if the sources are limited, they share their food source in order to co-exist.

Rules to keep the balance and prevent competing:
1. Help keep the flock together.
2. Minimizing risk coming from predators and competition when trying to keep the flock stick together.
3. While minimizing risk coming from predators and competition, placing to areas with sufficient diversity for foraging but this rule depends on the flock sizes and proportions so it can be scaled to varying flock sizes.

STAND & WORKSHOP Frequently placed workshop areas and goods stands for accessibility

Pelicans and seagulls flocking together.

Optimal forging behaviour is seen in many beings, such as lions and squirrels.

OPTIMAL FORAGING BEHAVIOUR in animals

Animals that appropriately adopt the optimal foraging strategy do so in order to reduce energy production and increase energy gain. The TIME and ENERGY required to seek a food source, as well as the ACCESSIBILITY of the food supply, affects this behaviour.

LOAD

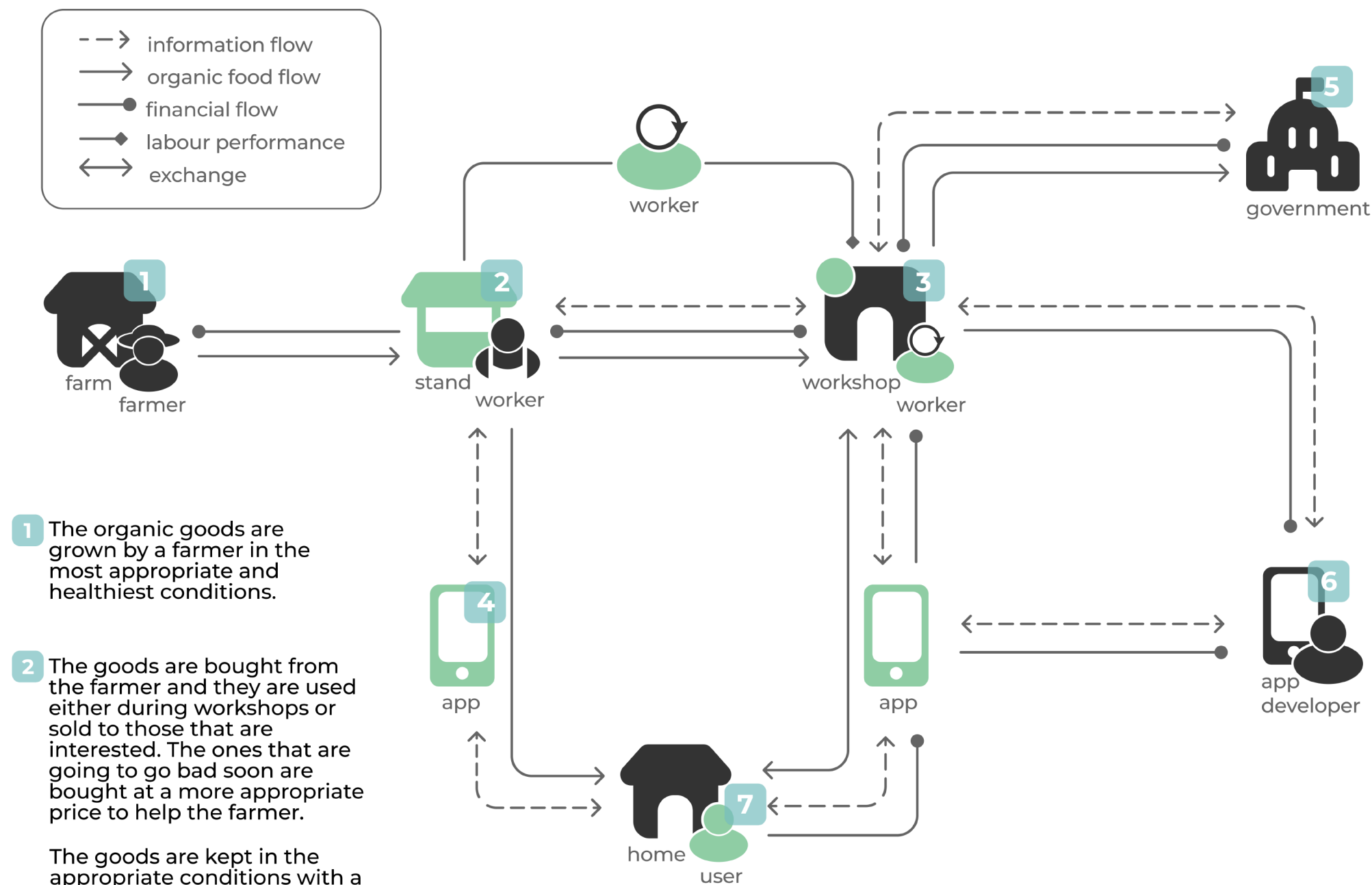optimal load (long)
optimal load (short)

long   short

TRAVEL TIME   SEARCHING TIME
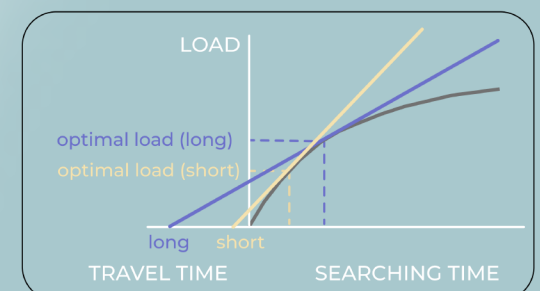
Optimal foraging in starlings: If starlings are maximizing net rate of energy gain, longer traveling time results in larger optimum load.

SYSTEM MAP

Legend:
- information flow
- organic food flow
- financial flow
- labour performance
- exchange

1 The organic goods are grown by a farmer in the most appropriate and healthiest conditions.

2 The goods are bought from the farmer and they are used either during workshops or sold to those that are interested. The ones that are going to go bad soon are bought at a more appropriate price to help the farmer.

The goods are kept in the appropriate conditions with a stand that is designed to preserve them for as long as possible. The ones that are going to go bad soon are sold on discount, used in workshops or gifted to the people who attend the workshops.

The stand and the workshop are located next to each other, which are located in populated areas to attract more people.

3 The worker of the current workshop easily gathers the required goods from the stand and uses it to demonstrate that week's theme. The themes may be regarding how to preserve and utilise food that is going to go bad soon, a variety of recipes with the current season's fruit and vegetables, easy and healthy recipes that are easily applicable to daily life.

Some workshops have the purpose of eating the food that has been cooked there, whereas some have the purpose of giving said food to various government organisations as a donation.

Workshops are held every two weeks, for three consecutive days, to be available to as many people as possible.

4 The app is used for the main purpose of participating in workshops and gaining knowledge about organic goods in general.

The app gives the location and date of a workshops that is held every two weeks for three consecutive days, to cater to a large group of people.

The information flow between the user and the stand is regarding navigation, as well as the workshops' location.

The workshops require an entry fee, since there is an instructor and organic goods that are provided for free, and the transaction is done from the app.

The user has a profile in which they can save entries regarding the workshops they attended, share the results, and interact with other users. The app also provides knowledge that is relevant depending on the seasonal goods.

5 The government funds this system and helps to run it, alongside the help of volunteers, the policies against waste being the most prominent reason why. The system pays back with the lessened amount of waste, and the occasional donation of cooked food and organic goods to their organisations.

6 Aside from the government funding, the app developers that design and run the app are paid with a fraction of the in-app purchases, and the payment increases with the amount of downloads.

7 The user gains awareness and perhaps healthier habits, along with a community that has similar interests and passions as theirs.

THE "KAIROS" APP

SDG(s)

INSPIRED BY

Cuban Painted Snail: According to what it eats, its shell changes into several colors, thus, protects itself from the hunter.

Bengal Tiger - Deer - Langur Monkeys: Unavailable orange color noticer Deers are warned for Bengal Tiger danger by Langur Monkeys' shouting signal, which can recept orange color.

Christmas Red Crabs Migration: With first rainfall of wet season and lunar phase they know beginning of their migration time.

ENVIRONMENTAL CONTRIBUTION

This system basically aims creating sustainable volumes. By connecting smart home devices together collects datas from them and creates optimized solutions for energy use in cases of illumination or heating using both electricity and natural sources like sunlight or wind. Also bringing together all kind smart home devices can be a preventation for extra buying and digital pollution.

GROUP MEMBERS

Beyza Nur Kaşka / 020180803
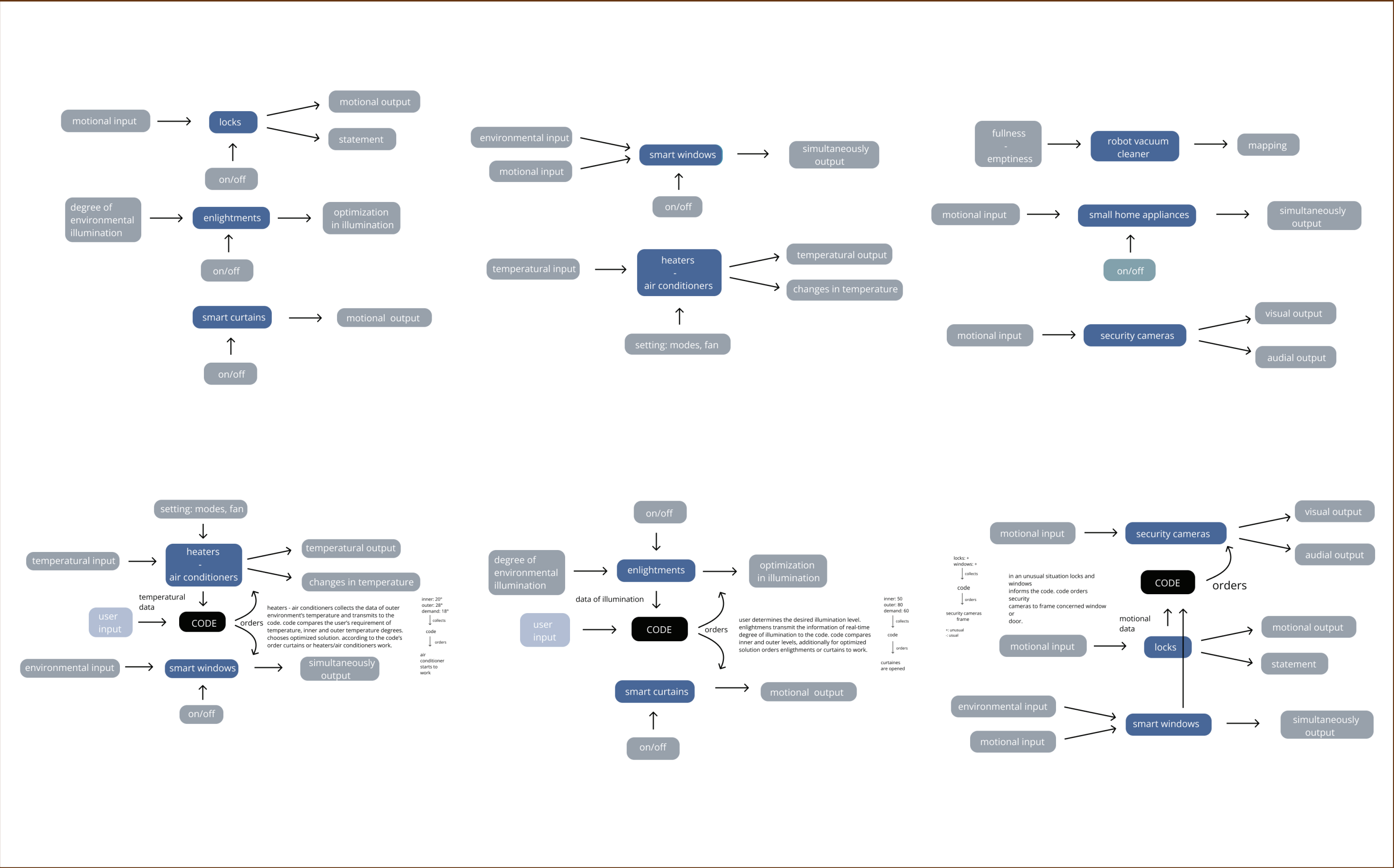Zeynep Karadeniz / 020190127
Süha Cengiz / 020190641

PROBLEM DEFINITION

Incompability of smart home products since being from different brands or families

SUSTAIN IT

"To Create Sustainable Places"

SYSTEM MAP

motional input → locks → motional output / statement

on/off → locks

degree of environmental illumination → enlightments → optimization in illumination

on/off → enlightments

smart curtains → motional output

on/off → smart curtains

environmental input / motional input → smart windows → simultaneously output

on/off → smart windows

temperatural input → heaters - air conditioners → temperatural output / changes in temperature

setting: modes, fan → heaters - air conditioners

fullness - emptiness → robot vacuum cleaner → mapping

motional input → small home appliances → simultaneously output

on/off → small home appliances

motional input → security cameras → visual output / audial output

---

setting: modes, fan → heaters - air conditioners → temperatural output / changes in temperature

temperatural input → heaters - air conditioners

user input → CODE → orders

temperatural data

environmental input → smart windows → simultaneously output

on/off → smart windows

heaters - air conditioners collects the data of outer environment's temperature and transmits to the code. code compares the user's requirement of temperature, inner and outer temperature degrees. chooses optimized solution. according to the code's order curtains or heaters/air conditioners work.

inner: 20°
outer: 28°
demand: 18°
↓ collects
code
↓ orders
air conditioner starts to work

---

on/off → enlightments → optimization in illumination

degree of environmental illumination → enlightments

user input → CODE → orders

data of illumination

smart curtains → motional output

on/off → smart curtains

user determines the desired illumination level. enlightmens transmit the information of real-time degree of illumination to the code. code compares inner and outer levels, additionally for optimized solution orders enlightments or curtains to work.

inner: 50
outer: 80
demand: 60
↓ collects
code
↓ orders
curtaines are opened

---

motional input → security cameras → visual output / audial output

locks: +
windows: +
↓ collects
code
↓ orders
security cameras frame
+: unusual
-: usual

in an unusual situation locks and windows informs the code. code orders security cameras to frame concerned window or door.

CODE → orders

motional data

motional input → locks → motional output / statement

environmental input / motional input → smart windows → simultaneously output

An application that creates relationships between your smart devices and offers sustainable solutions...

Creating Sustainable Places

When the user opens the application, this page appears.
As new places are added, they are listed on this screen.
For example: My Home, My Office, etc

Connecting Smart Products and Product Relationships

The user adds their smart products to the interface of their sustainable space.
If the code detects a sustainable relationship between two or more products, it alerts the user.
When the relationship is created, new control interfaces are appeared in the application.

Security Arising from Product Relationship

When the user connects products such as security camera, smart window, smart lock to the application together, the code creates a new security system. "Unexpected movement" data coming from the lock or window activates the security cameras and starts showing, recording at an angle to see the product which the data came from.

Sustainable Illumination Interfaces

The user selects the desired level of illumination in the environment through this interface. Then, the code evaluates the illumination data it receives from the lighting and decides whether the most sustainable option is to open-close the curtain or change the level of the light and apply it.

Sustainable Temperature Interfaces

The user selects the desired temperature in the environment through this interface.
Then, the code evaluates the indoor-outdoor temperature data it receives from the air conditioner and decides whether the most sustainable option is to open-close the window or open-close the air conditioner, and apply it.

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES

INSPIRED BY

Elephantnose Fish. These fish live in dark, dirty water and detect prey/ threats through the electric barrier they create.

They use a method called electrolocation. This method allows them to determine the distance, size, material, direction of travel and speed of the surrounding volumes when they do not have good visibility.

ENVIRONMENTAL CONTRIBUTION

For social development and sustainable cultural/everyday life in society, the welfare of individuals is one of the key factors. The fact that visually impaired individuals live as independently as possible in society is one of the most important factors for individuals' mental and physical health.
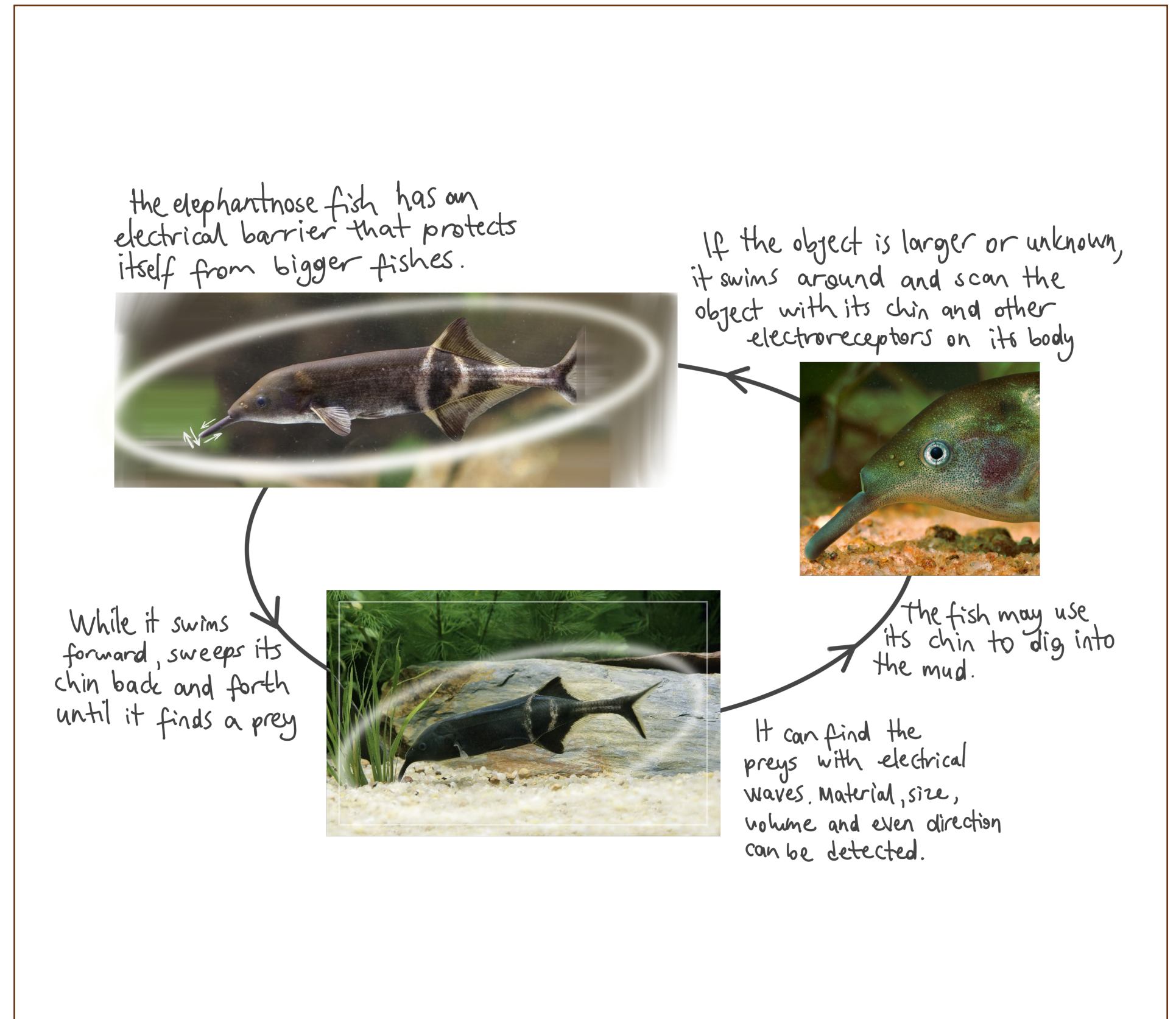
If adequate support is provided for visually impaired individuals in terms of materials, rules and order, a more sustainable society will be achieved with these individuals.
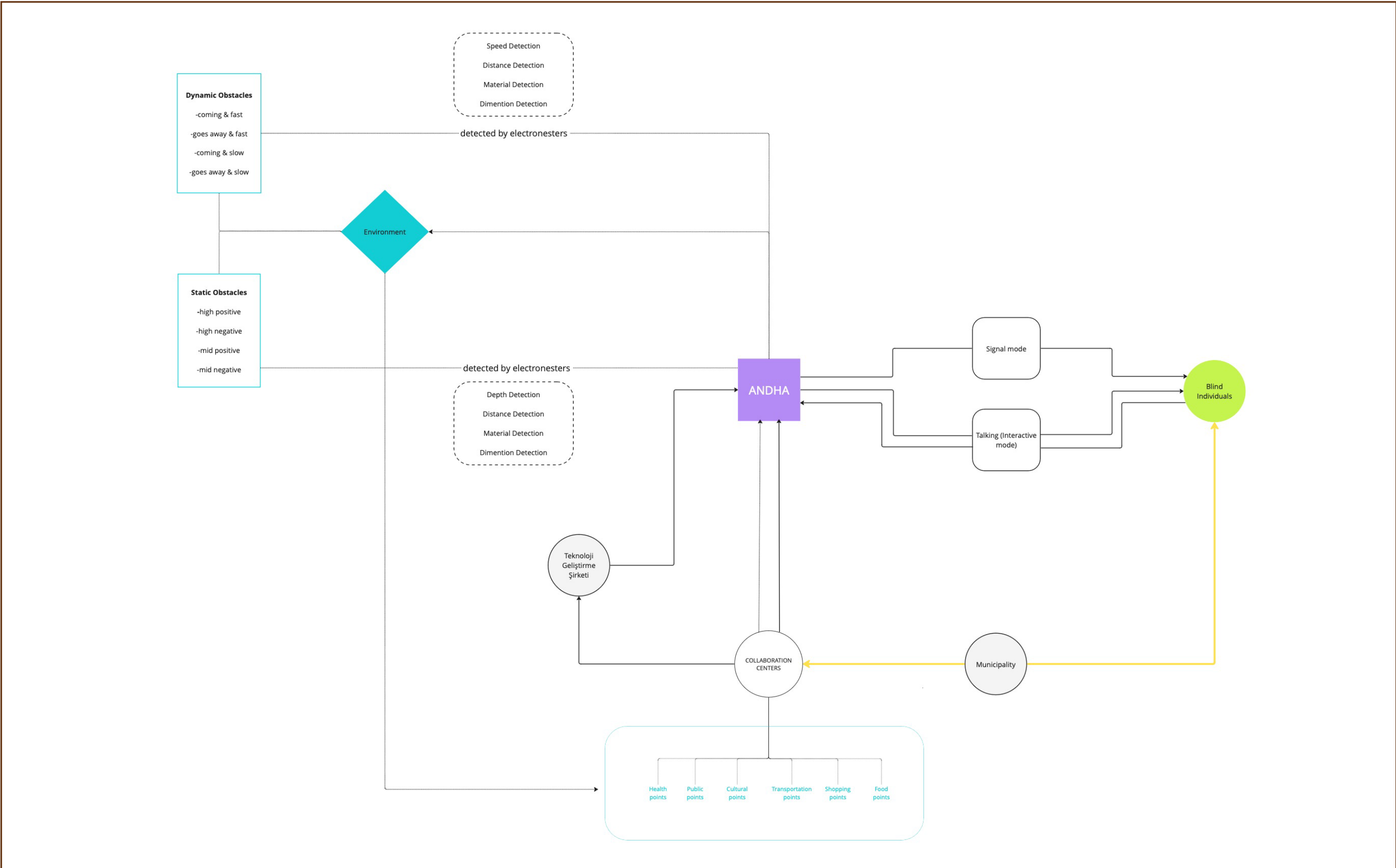
GROUP MEMBERS

Mervenur Hidayetoğlu
Sevcan Sert
İzay Göksu Ünlübaş

PROBLEM DEFINITION

Visually impaired individuals need a support to conduct their daily life activities. It makes it difficult for them to act alone. They need individuality.

the elephantnose fish has an electrical barrier that protects itself from bigger fishes.

If the object is larger or unknown, it swims around and scan the object with its chin and other electroreceptors on its body

While it swims forward, sweeps its chin back and forth until it finds a prey

the fish may use its chin to dig into the mud.

It can find the preys with electrical waves. Material, size, volume and even direction can be detected.

SYSTEM MAP

USAGE MODES, SYSTEM COMPONENTS

MODES

Transportation mode: when the user wants to know abot transformation, can turn on this mode. After turning on the transportation mode, bus information, bus station information around is heard by the user. It can be disactive when transformation information is not needed.

Social mode: With activated social mode user can hear about what is around. For example the cafes, shopping points, important buildings like hospital, police stations etc.

Instant mapping mode: when the user activates this mode, close tangible boddies are detected and user is informed by Andha.

TALKING (INTERACTIVE) ANDHA

Andha communicates with the user by talking. For example says the bus is coming or there is a coffee shop on the right etc.
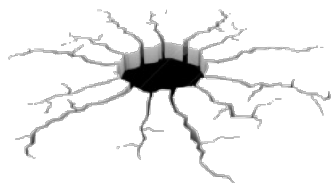
SIGNALING ANDHA

when the signal mode is activated, Andha informs the user by coded signals. For example it beeps three times when there is a person around, or beeps loudly and constantly when thereis a stair around.
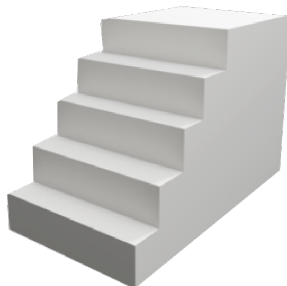
HIGH
NEGATIVE
OBSTACLE

MID
NEGATIVE
OBSTACLE

MID
POSITIVE
OBSTACLE

HIGH
POSITIVE
OBSTACLE

SDG(s)

INSPIRED BY

Sheep herds make collective behaviors based on their leaders. This is called herd psychology. Accord-ing to this, the sheep in the flock do what their lead-ers do, go wherever they go, and take action without questioning.

A similar situation is the activities or situations that are trending among children. It is seen that children also tend to behave in this way. Here, a simulation

ENVIRONMENTAL CONTRIBUTION

Instead of teaching children the sensitivity that hu-manity should show to the environment, as a rule; It is aimed to raise environmentally sensitive people by imposing this on them in a fun way, that is, by making them a healthy habit. In this context, this is a game designed to radically solve the problem of climate change, and thus the mucilage problem.
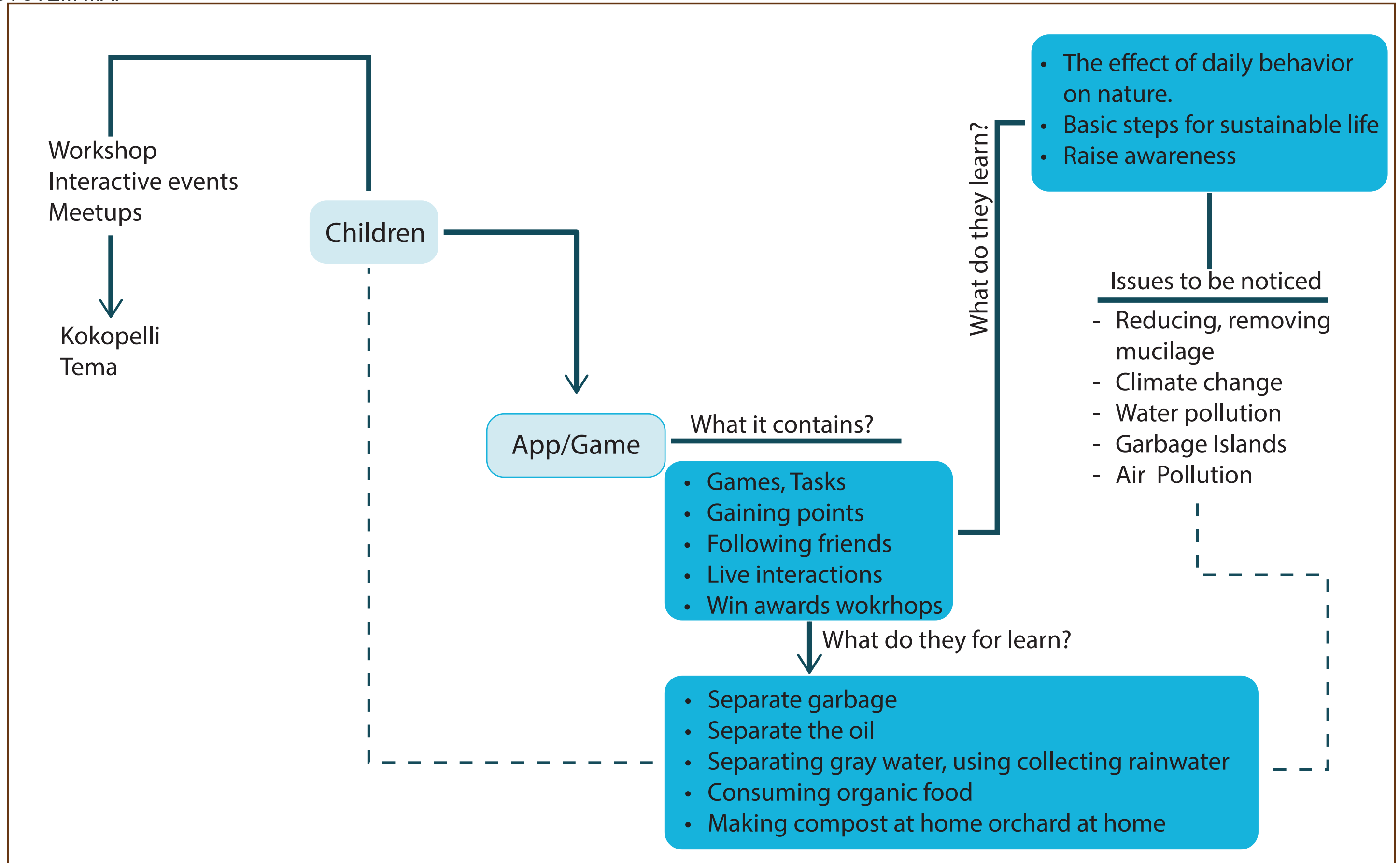
GROUP MEMBERS

BASOGLU Saliha Nur
DEMIRBAS Melda Seray
OZ Bengü Nur

PROBLEM DEFINITION

Peoples' actions that have been done unconsciously causes climate change and mucilage indirectly.

?   Informing about musilage   **2**   Tasks to do in garden

1   Tasks to do at home   **3**   Tasks to do at shopping

SYSTEM MAP

Workshop
Interactive events
Meetups

Kokopelli
Tema

Children

App/Game

What it contains?

- Games, Tasks
- Gaining points
- Following friends
- Live interactions
- Win awards wokrhops

What do they learn?

- The effect of daily behavior on nature.
- Basic steps for sustainable life
- Raise awareness

Issues to be noticed

- Reducing, removing mucilage
- Climate change
- Water pollution
- Garbage Islands
- Air Pollution

What do they for learn?

- Separate garbage
- Separate the oil
- Separating gray water, using collecting rainwater
- Consuming organic food
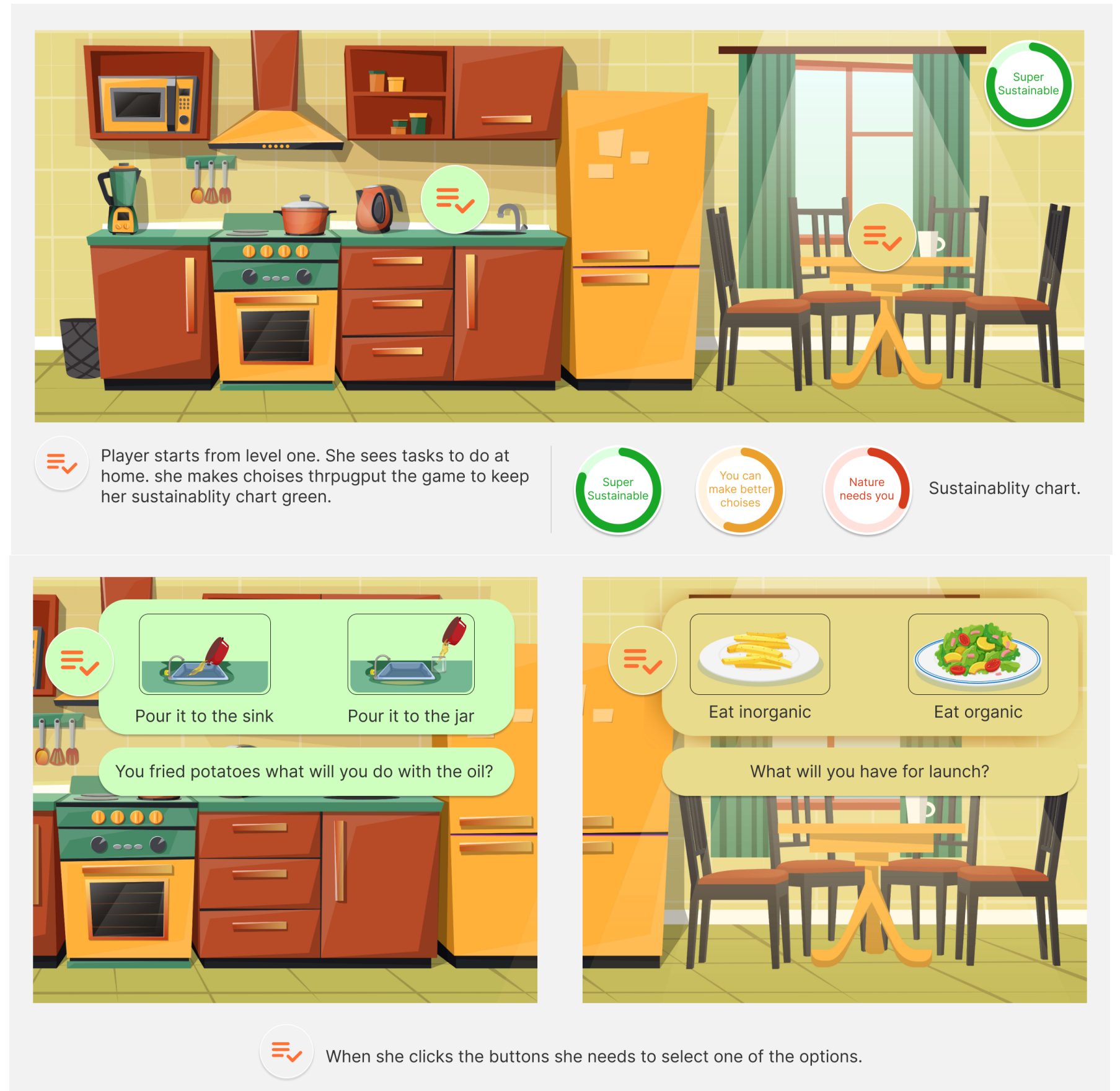- Making compost at home orchard at home

HOW THE GAME WORKS

When the game interface is opened, we see a map, 4 bubbles on it and a friend activity section on the right. Then the game is divided into 3 parts as Kitch-en, Garden, Shopping, and the additional part which explains what mucilage is to children in an appropri-ate way and teaches them how their actions in this game would effect the world in real-life.

When the player clicks on any section other than the additional section, the interface there appears on the screen. There is a round score bar in the upper right corner. For instance in the kitchen part, chil-dren are given a number of tasks to choose from. He or she starts to prepare by choosing between french fries or salad for example. If the player chooses french fries, they lose some points. Then, when he finishes the meal, whether to pour the remaining oil into the sink or not if the player choses to pour it; he loses points again and receives a notification from the score bar about what his actions have caused.

In the opposite case, if the player gains points in line with his choices, he receives a notification about what he caused in the same way. However, as the user earns points in each of the 3 sections one by one, they will get badges.

For example, when the user collects a certain amount of points by choosing organic foods in the kitchen section, he will win the "HEALTHY" badge. With these badges, the player will be able to partici-pate in the activities in the "kokopelli" which is our stakeholder. Also players will be able to see how many points the people they have added, which badges did their friends have earned from the friend activity section on the right, and maybe share their points they have earned so that they can participate in the reward events together.

Player starts from level one. She sees tasks to do at home. she makes choises thrpugput the game to keep her sustainablity chart green.

Sustainablity chart.

Pour it to the sink

Pour it to the jar

You fried potatoes what will you do with the oil?

Eat inorganic

Eat organic

What will you have for launch?

When she clicks the buttons she needs to select one of the options.

DESIGNED TASKS

Task 1 : Player has to shop for kitchen needs.

Organic food and supplies' cost in the game is similar to daily life to show the player that in longitudinal time it is much more beneficial.

By buying organic products over fabrication goods, player will gain points in order to achieve shopping batches.

Player will lose points if the plastic based fabrication products or plastic bags are chosen.
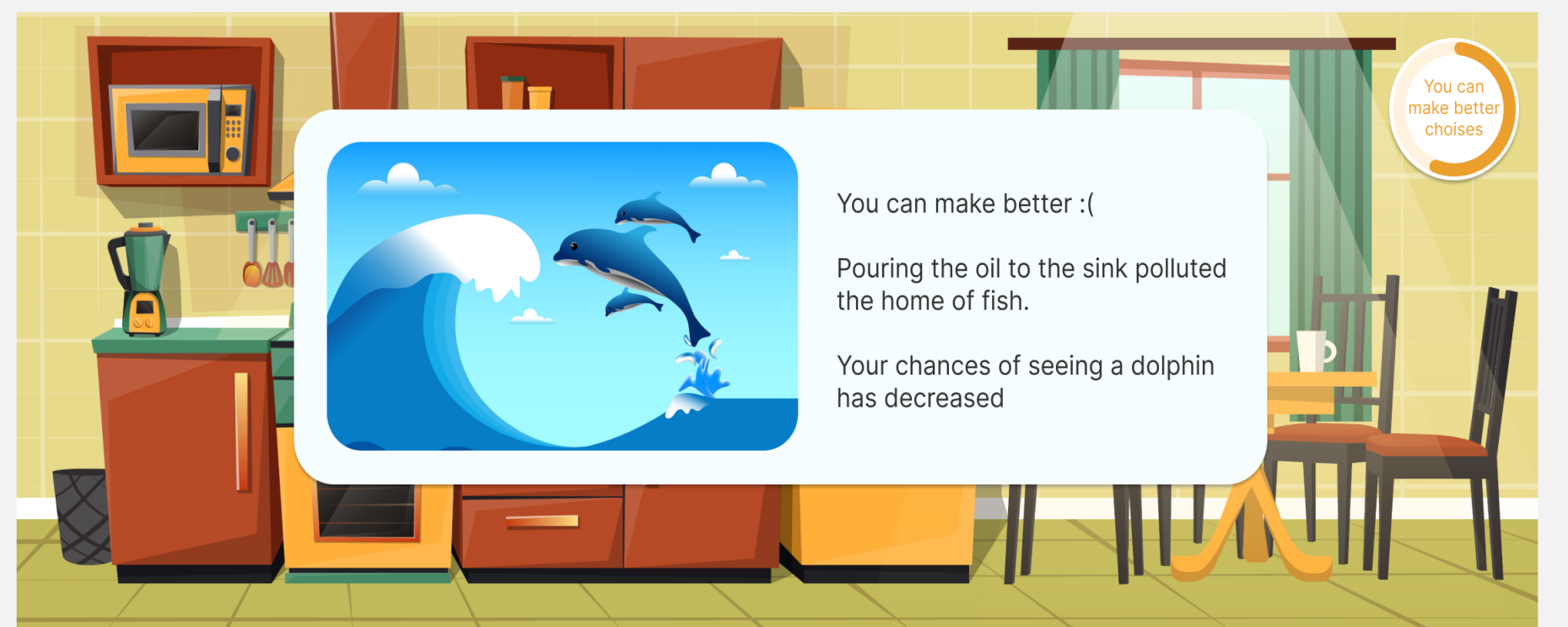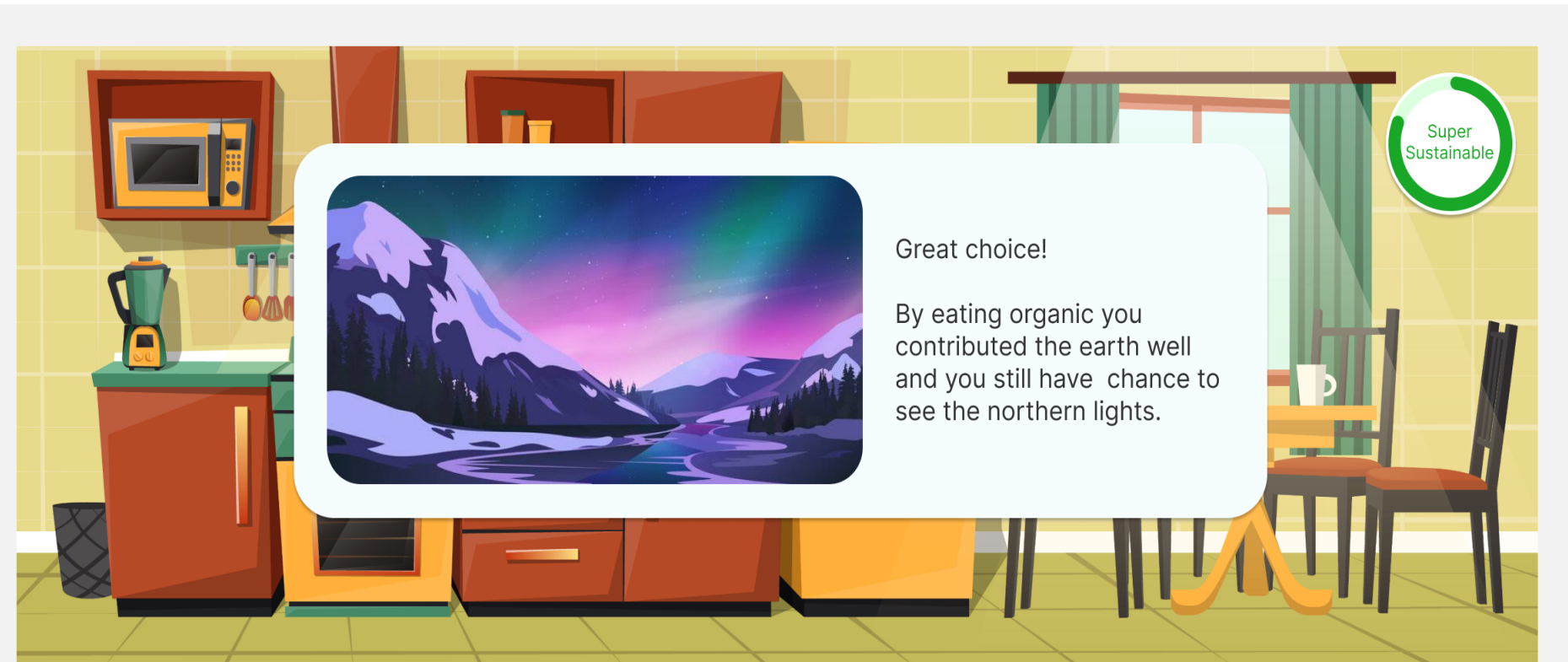
When the point is lost, there will be a notification on top showing the points have been lost and :
"Your possibility to see a dolphin decreased by %2."

Task 2 : Player has to plant things

The player will choose what to plant. When the player chooses organic fertilizers over chemical ones, player will gain points to achieve gardening batches.

Player will gain points if he or she stocks the raining water to supply water to the garden.

When points are gained, there will be a notification on top showing the points have been gained and says :
"Your possibility to see the northern lights increased by %1".

Great choice!

By eating organic you contributed the earth well and you still have chance to see the northern lights.

Super Sustainable

You can make better :(

Pouring the oil to the sink polluted the home of fish.

Your chances of seeing a dolphin has decreased

You can make better choises

When see make choices she will have feedbacks of what is her actions causing on earth.

SDG(s)

INSPIRED BY

Co-flow is inspired by the co-metabolism behavior of bacteria. Co-metabolism is a reaction in which bacteria transform a contaminant even though the contaminant cannot serve as an energy source for the bacteria but can be used as an energy source by another organism. The system takes food waste from the restaurants and delivers it to stakeholders which can use food waste as a source for the products they produce. The products these stakeholders produce comes back to restaurants for the event that promotes the reuse of food waste.

ENVIRONMENTAL CONTRIBUTION

Food waste is a major economic and social problem and leads to the release of greenhouse gases. There are services and systems that treat this waste but still, it is not accessible enough for restaurants to use it. The system we designed separates food waste and works with stakeholders to convert it into something more valuable than it was before as biofuel, cutlery, fabric, and animal food. With the system promoting the stakeholders that repurpose food waste and rewards restaurants that use the system food waste repurposing will become more common.
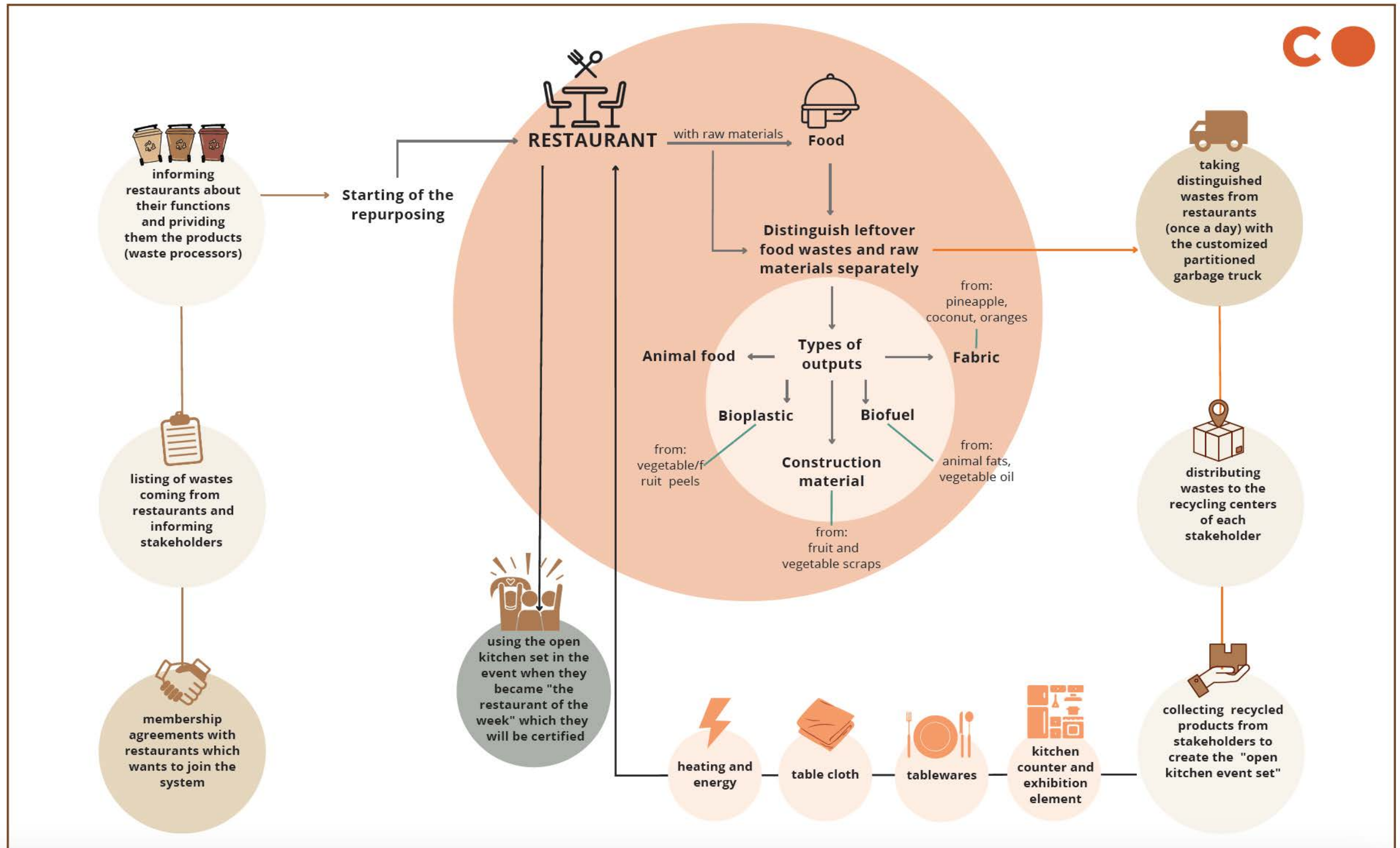
GROUP MEMBERS

Nilay Çatlı
Cansu Karaca
Gamze Uğurlukişi

PROBLEM DEFINITION

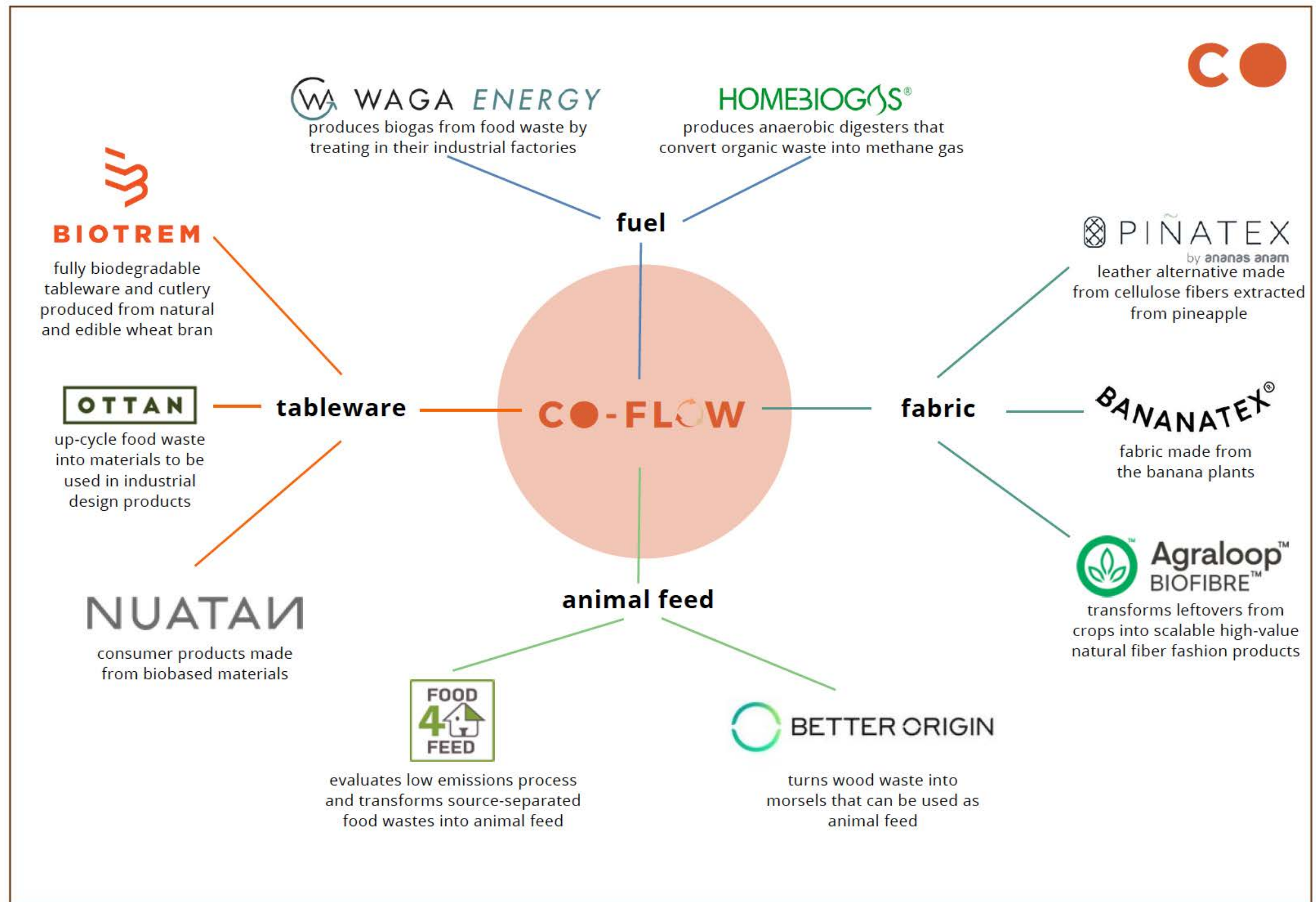The difficulty of the process of food waste evaluation and the lack of systems that use repurposed products.

tablecloth from banana fiber

bio-plastic from tomato peel waste

bioplastic cutlery from food waste

material from recycled potato peels

CO-FLOW

SYSTEM MAP

RESTAURANT — with raw materials — **Food**

informing restaurants about their functions and prividing them the products (waste processors)

Starting of the repurposing

Distinguish leftover food wastes and raw materials separately

from: pineapple, coconut, oranges

Types of outputs

Animal food ← → **Fabric**

Bioplastic   **Biofuel**

from: vegetable/fruit peels

Construction material

from: animal fats, vegetable oil

from: fruit and vegetable scraps

listing of wastes coming from restaurants and informing stakeholders

membership agreements with restaurants which wants to join the system

using the open kitchen set in the event when they became "the restaurant of the week" which they will be certified

heating and energy — table cloth — tablewares — kitchen counter and exhibition element

taking distinguished wastes from restaurants (once a day) with the customized partitioned garbage truck

distributing wastes to the recycling centers of each stakeholder

collecting recycled products from stakeholders to create the "open kitchen event set"

STAKEHOLDER MAP

WAGA ENERGY
produces biogas from food waste by treating in their industrial factories

HOMEBIOGAS®
produces anaerobic digesters that convert organic waste into methane gas

fuel

BIOTREM
fully biodegradable tableware and cutlery produced from natural and edible wheat bran

OTTAN
up-cycle food waste into materials to be used in industrial design products

tableware

CO-FLOW

PIÑATEX
by ananas anam
leather alternative made from cellulose fibers extracted from pineapple

BANANATEX®
fabric made from the banana plants

fabric

Agraloop™ BIOFIBRE™
transforms leftovers from crops into scalable high-value natural fiber fashion products

NUATAN
consumer products made from biobased materials

animal feed

FOOD 4 FEED
evaluates low emissions process and transforms source-separated food wastes into animal feed

BETTER ORIGIN
turns wood waste into morsels that can be used as animal feed

CO

SDG(s)

INSPIRED BY

Ant Colonies and their path tracking behaviors are remodelled as an information network of a research database. The most optimized shorter chemical paths, by comparison, gets marched over more frequently, and thus the pheromone density becomes higher on shorter paths than longer ones in ant colonies similarly in human acquiring of new information
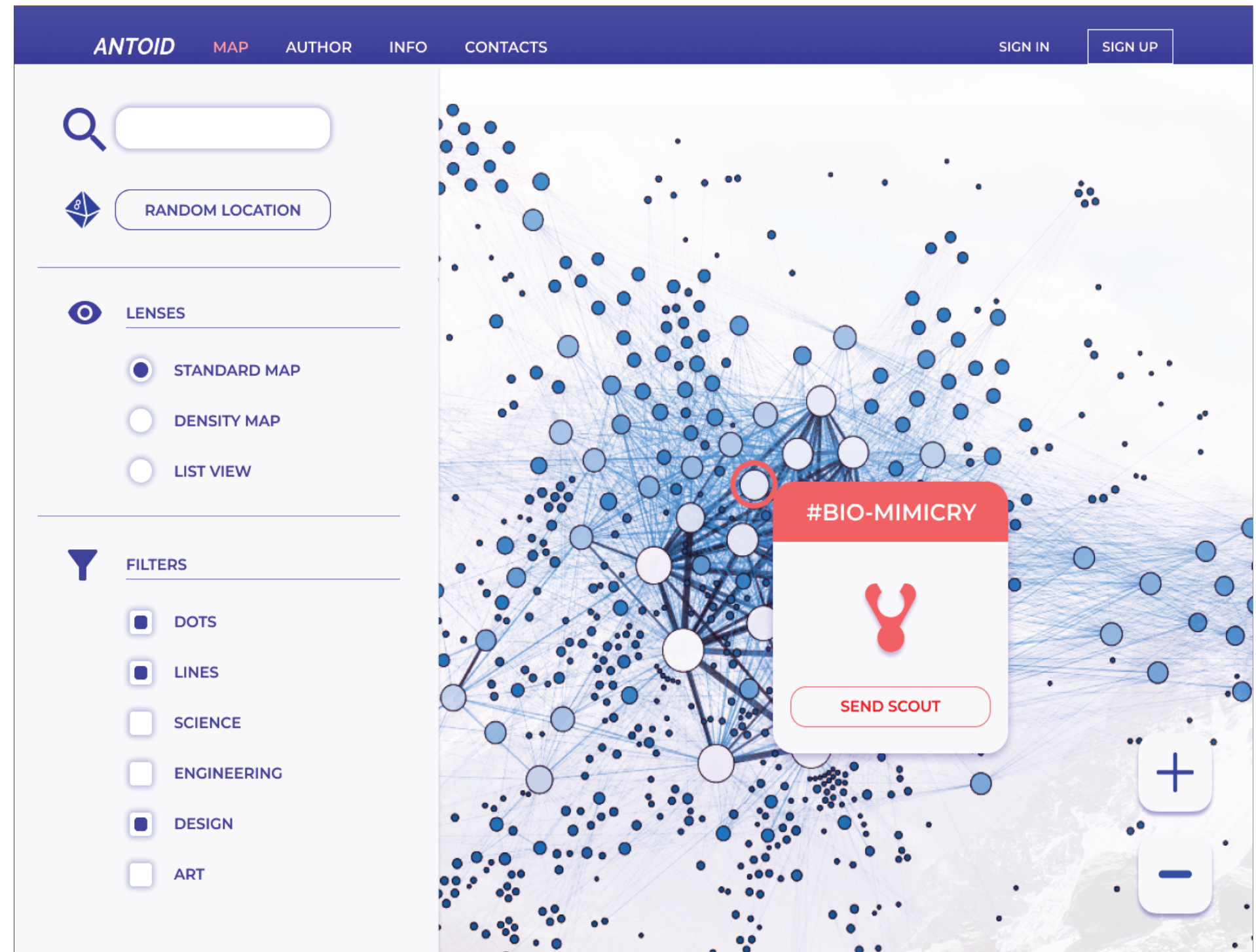
ENVIRONMENTAL CONTRIBUTION

With an understandable and interactive interface Antoid can be an enpowering solution for scholars to research and author more efficiently and in a more enjoyable way. Moreover it highlights what topics are underlooked and this can fasten the overall research speed while eliminating over-saturated works in similar topics.
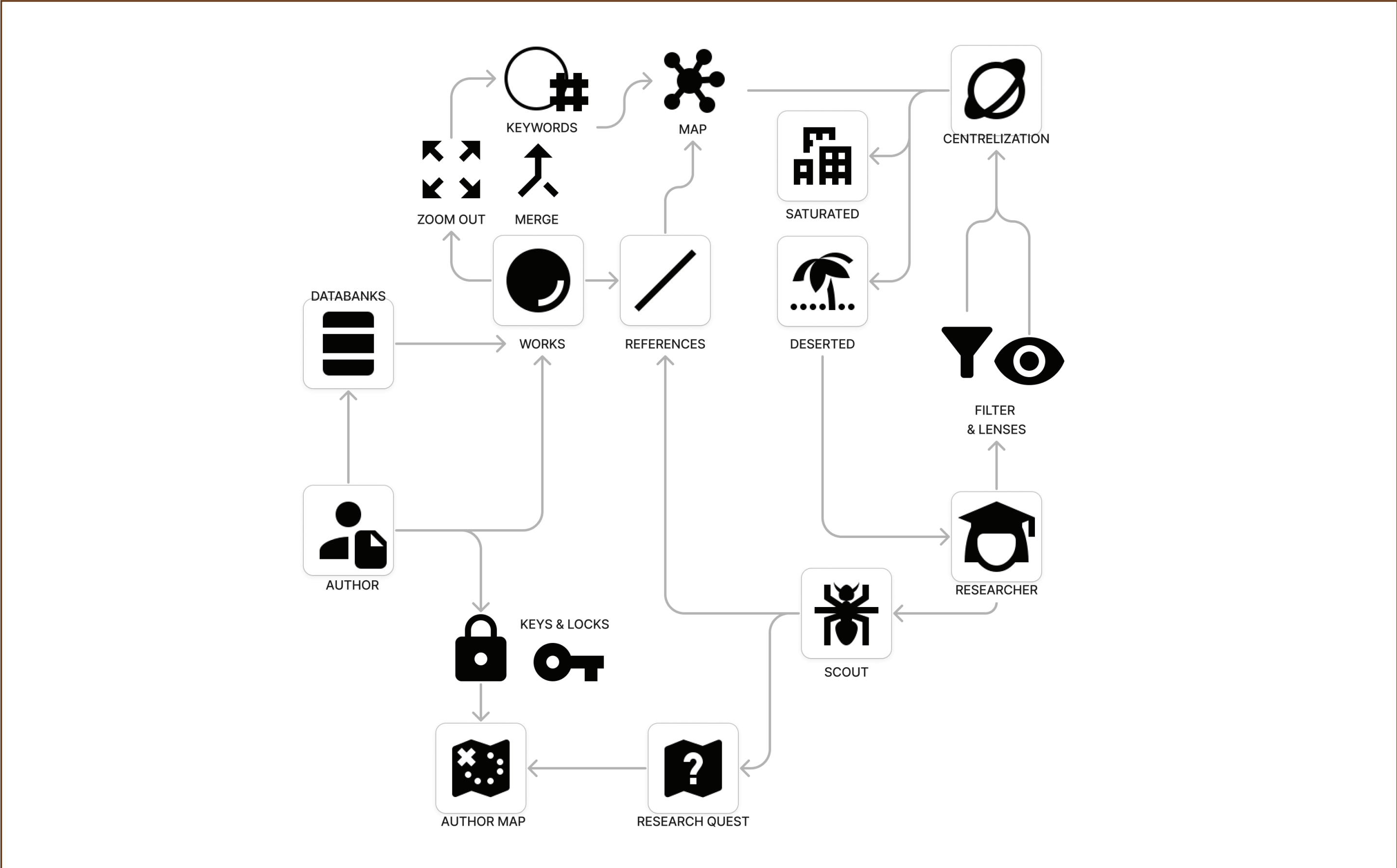
GROUP MEMBERS

Acar Batın Can - 020170701
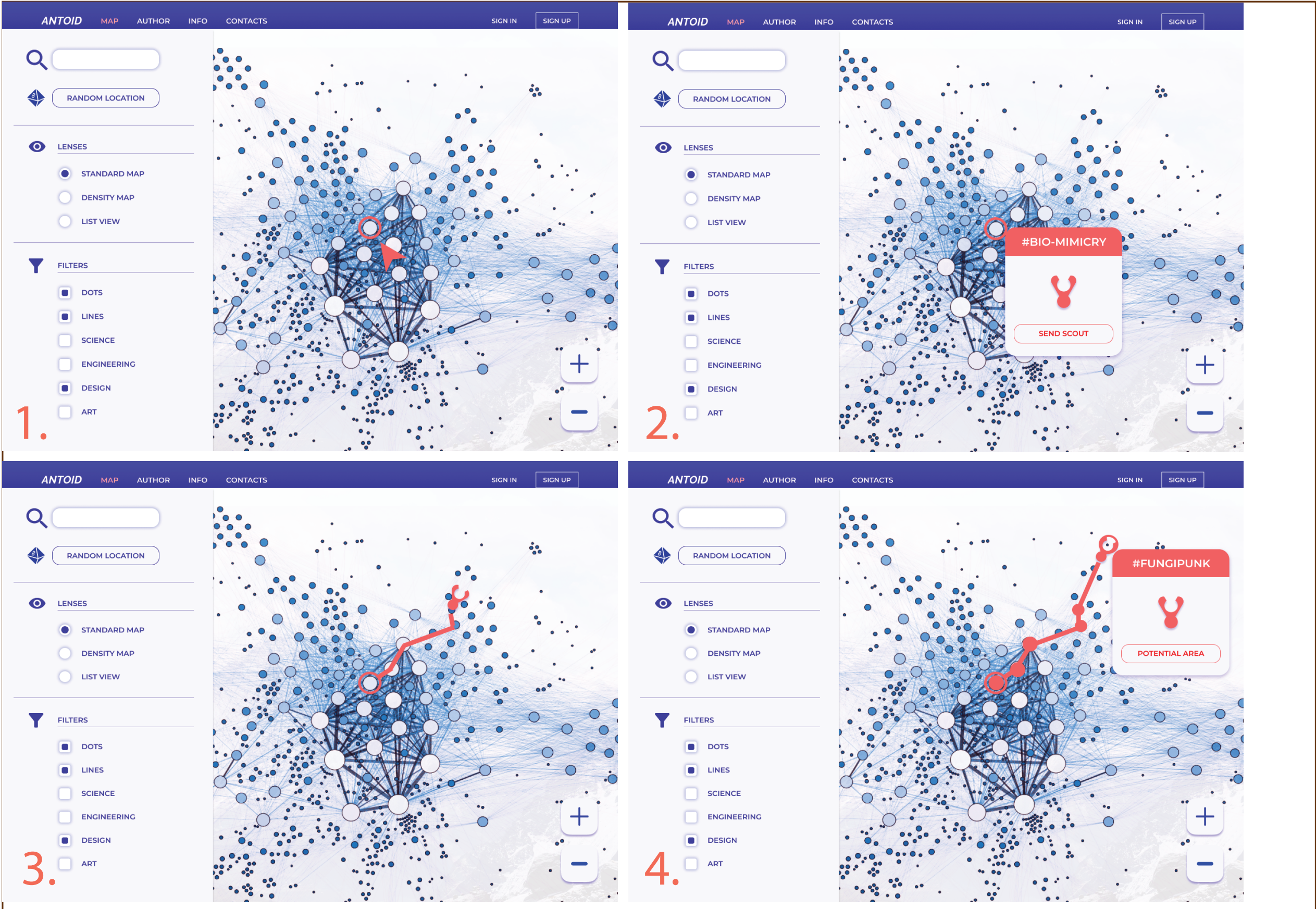Güneri Yağmur - 020190729

PROBLEM DEFINITION

Well-being of the society is dependent on the efficiency of research and education yet people very often work on oversaturated areas of Cultural and Natural researches.

SYSTEM MAP

KEYWORDS

MAP

CENTRELIZATION

SATURATED

ZOOM OUT

MERGE

DATABANKS

WORKS

REFERENCES

DESERTED

FILTER
& LENSES

AUTHOR

KEYS & LOCKS

RESEARCHER

SCOUT

AUTHOR MAP

RESEARCH QUEST

SCOUT SENDING SCENARIO

SDG(s)

INSPIRED BY

In a documentary, Hermit crabs adapting to occupy cleaned empty mollusc shells to protect their fragile exoskeletons as they grow, and exchange shells with other crabs as they grow, inspired us to exchange fabrics, which is the main loop in our project.In addition, while creating the fabric design that changes by peeling off in the cycle, the fact that chameleons change their shells by peeling off piece by piece at certain times and that the properties of the leather are preserved in this process inspired us in pattern production and fabric design.

ENVIRONMENTAL CONTRIBUTION

People felt the need to express themselves. By choosing the way of fashion, people spend more on textile consumption and therefore world resources such as water.
With this system, it contributes to the cycle with waste products designed by designers, which allow people to use products and express themselves in different ways with changing clothes.
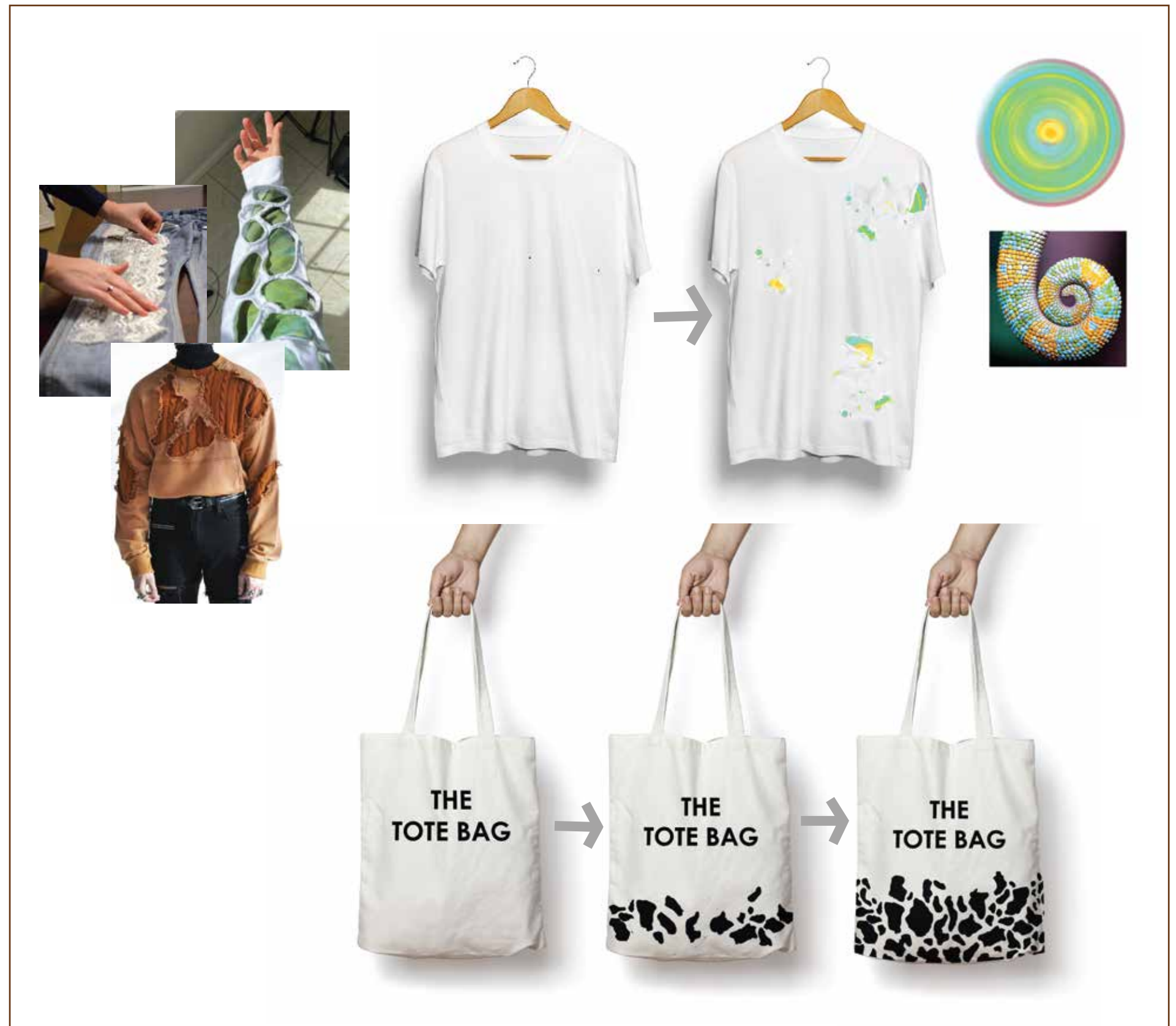Over consumption has been prevented, fashion design students have developed their creativity and working women have gained financial income.
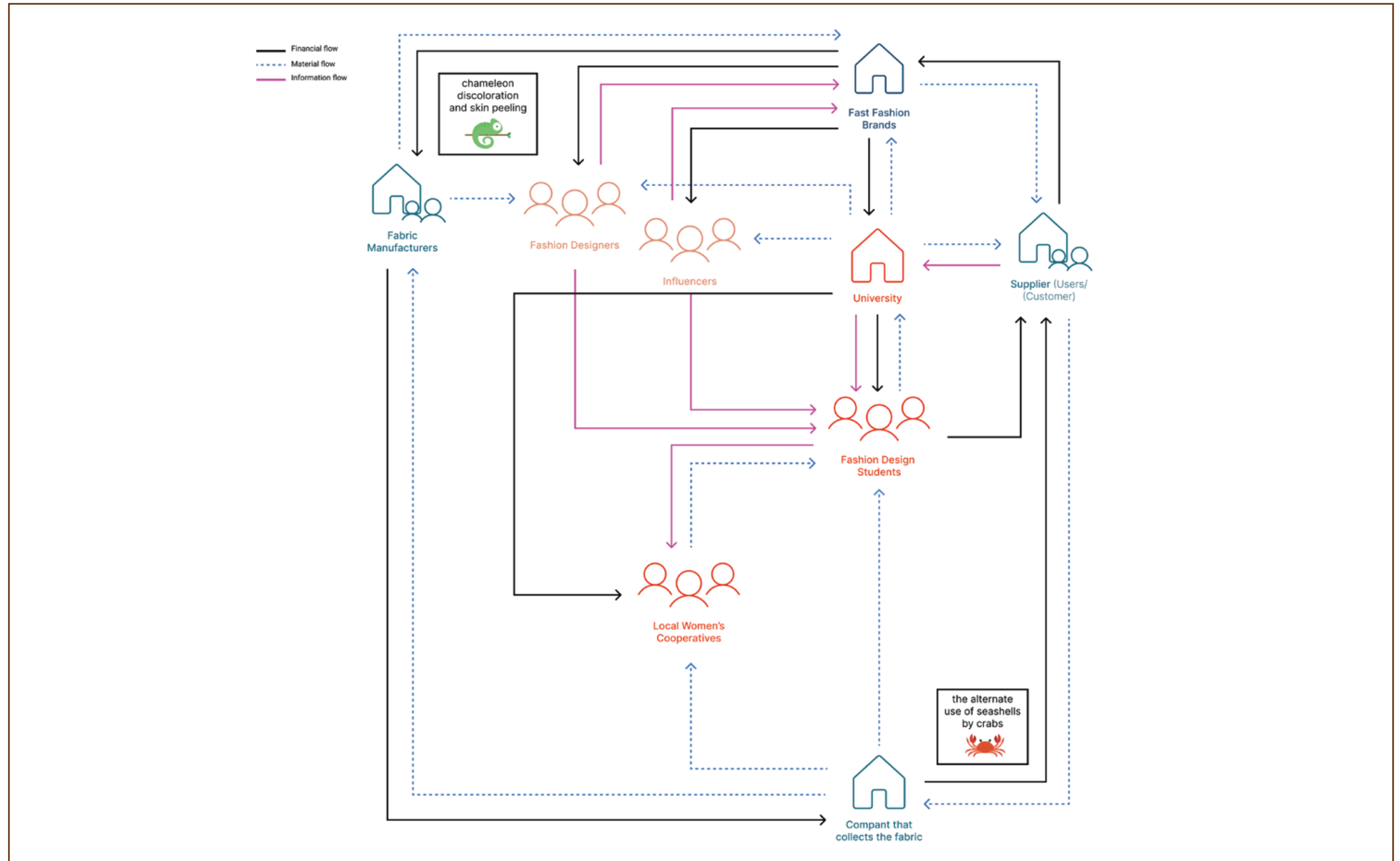
GROUP MEMBER

Asena ÇAKMAK
Cansu İmran ÇELEN
Zeynep Nihal ŞAMAT

PROBLEM DEFINITION

Overhauling and avoiding the damage caused by the recent rise of fast fashion.

SYSTEM MAP

SDG(s)

INSPIRED BY

ZEBRA FINCH AND BOTTLENOSE DOLPINS

Zebra Finch birds acquire the ability to imitate by encoding the new sounds they hear into their brains as rhythms. They can also correct the mistaken sounds with feedback systems.

The new generation of bottlenose dolphins do peer learning as well as learning from the mother or the oldest of the herd, which we see many examples of in nature.
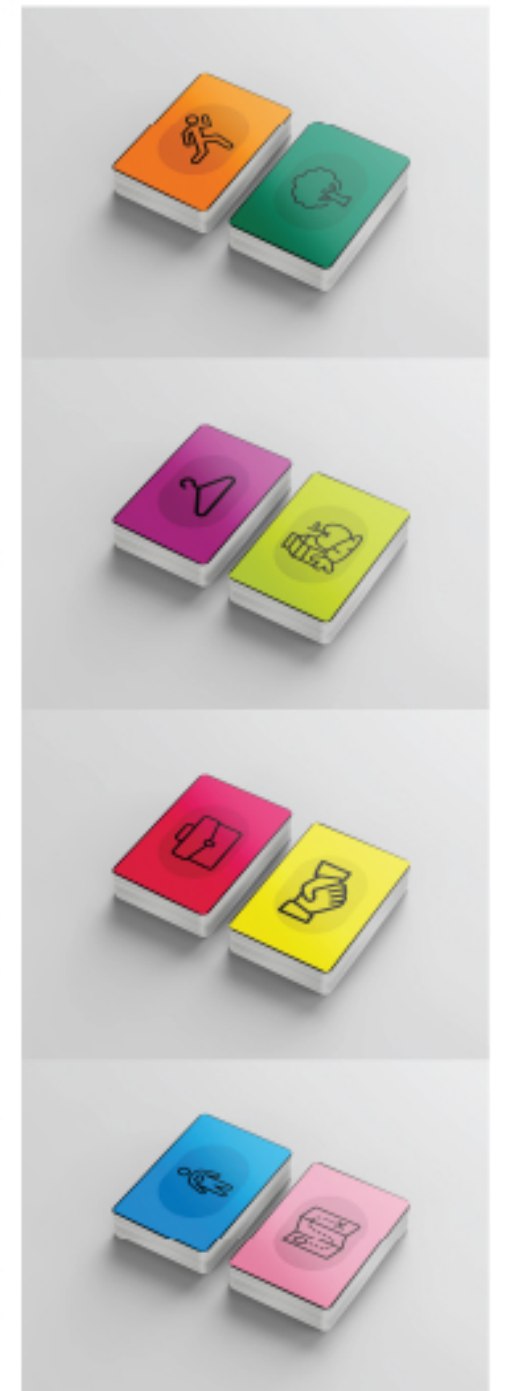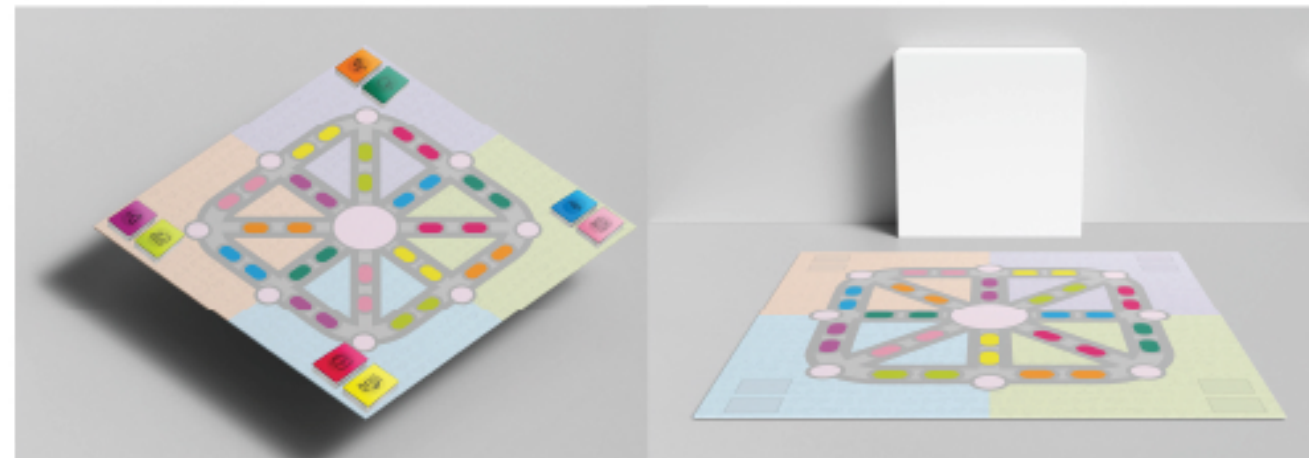
ENVIRONMENTAL CONTRIBUTION

The main purpose of this project is to overcome the language barrier in countries where refugee children have to migrate; is to help them overcome quickly with methods such as coding, feedback and peer learning. The game aims to teach simple words and sentences that can use in daily life by playing games with their friends. Thus, local and refugee children in the classroom try to overcome the language barrier by communicating with each other through the game. The project, which is carried out with the ministries of public education and non-governmental organizations, is distributed to primary school teachers to play with the children in the classroom.

GROUP MEMBERS

Sıla Arıca
Eylül Çakır
Hatice Kadriye Öztürk

PROBLEM DEFINITION

Refugee children (age 6 to 9) can't overcome the language barrier and excluded from society due to limited opportunities. They do not receive adequate education in schools.

SYSTEM MAP

Refugee Children's Education

Challenges
Equality, peace, justice

- Making Money
- Poverty
- Health
- Friends
- Orientation
- Education

Fast Learning

- Feedback
- Coding

Trainings

- Science Maths
- Reading Writing
- Language
- Daily Needs
- Communicate

Actors

- Part time educating
- Teachers
- Peer Learning
- Volunteer Educators

Methods

- Practical Training
- Games
- Workshops
- Seminars

Connections

- The Ministry of Interior
- Immigration Office
- Ministry of Public Education
- Civil Society Organizations
- Social Services

The game is suitable to be played on surfaces such as walls or on the ground.

It is played with 2-8 teams and progresses clockwise. The team to start the game first is determined by the rhyme.

After the order of play is decided, the tokens are placed in the circle in the middle of the map, this is the starting and ending point.

The team that starts the game moves 1 unit towards the category it has chosen.

Selects a card of the color of the unit the token is on. Explains the image on the card to their teammates with shape, color and body language.

If teammates get it right, they advance one unit and the turn goes to the next team.

If teammates do not know the word, there is no progress, the turn goes to the next team.

All teams play in turns and try to progress on the map.

When they reach the pink circles, they are expected to form sentences using the last 2 words before the circle.

Teams that can make sentences, move on and the turn progresses as in other units.

The condition of finishing the game is to reach the middle circle by going around the edges of the map and re-entering the path from the starting point.
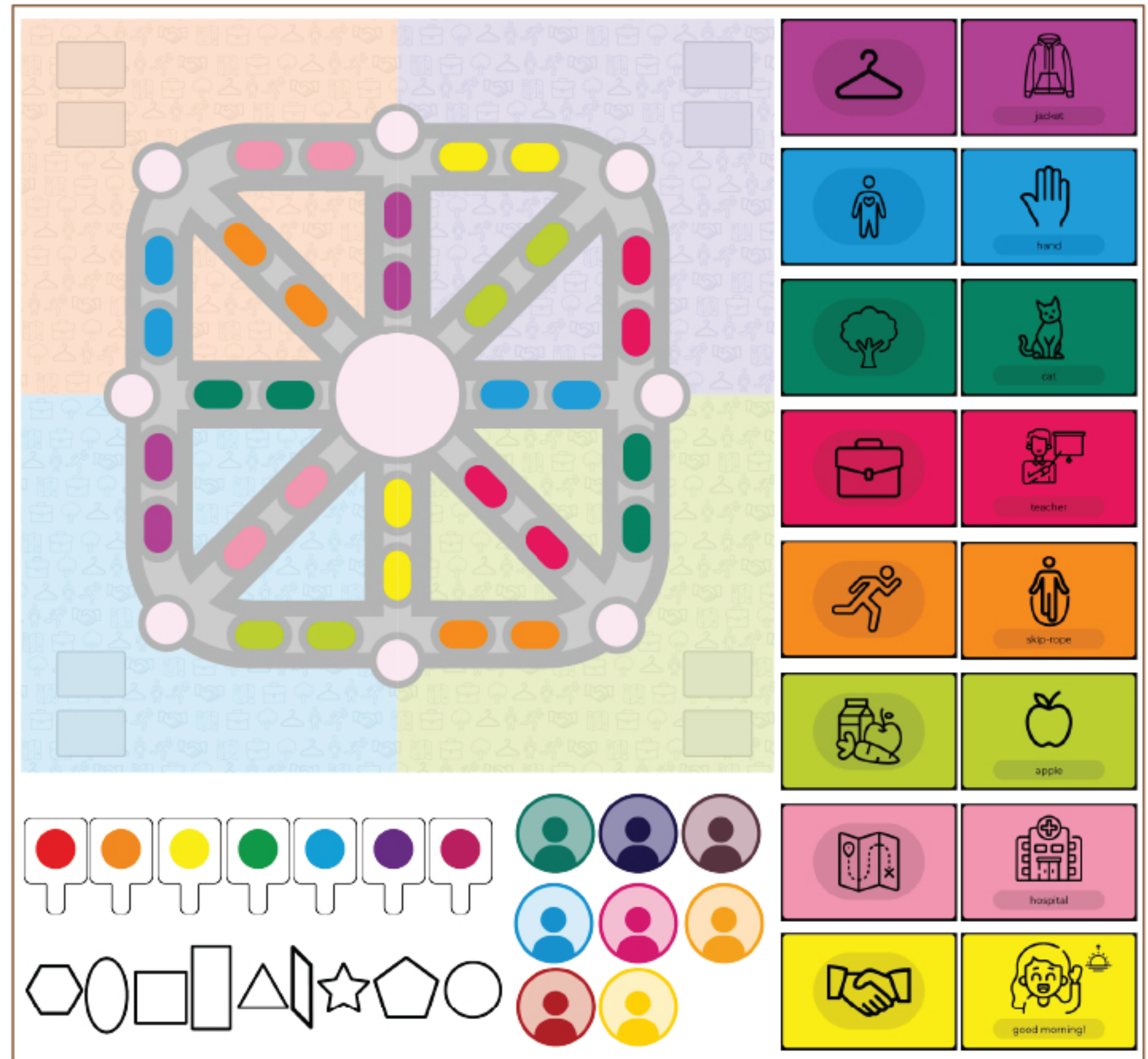
SDG(s)

INSPIRED BY

This project is inspired by the behavior of spiders of different kinds. Orb-weaver spiders build webs in order to prevent birds harming the webs. This behavior is interpreted as to drawing attention to something or a situation. On the other hand, Diving Bell Spiders, which are species that live underwater, build and carry bubbles that do not harm the ecosystem around, from the surface to underwater. This allows a system that is based on ensuring safe transportation in the way of carrying those bubbles.

ENVIRONMENTAL CONTRIBUTION

This project contributes to climate change by creating awareness using behavior change as the method. As the knowledge increases in the society, taking actions on climate change will get easier and preferable. When the starting point becomes the daily lives of people, the integration of tracking recycling into their lives is an issue. Our proposal is to create an application that will make users gain a perspective on their recycling habits and their waste's journey after disposal. It is an app to remind people their waste has a life after disposal and also to educate the users on ways to recycle.
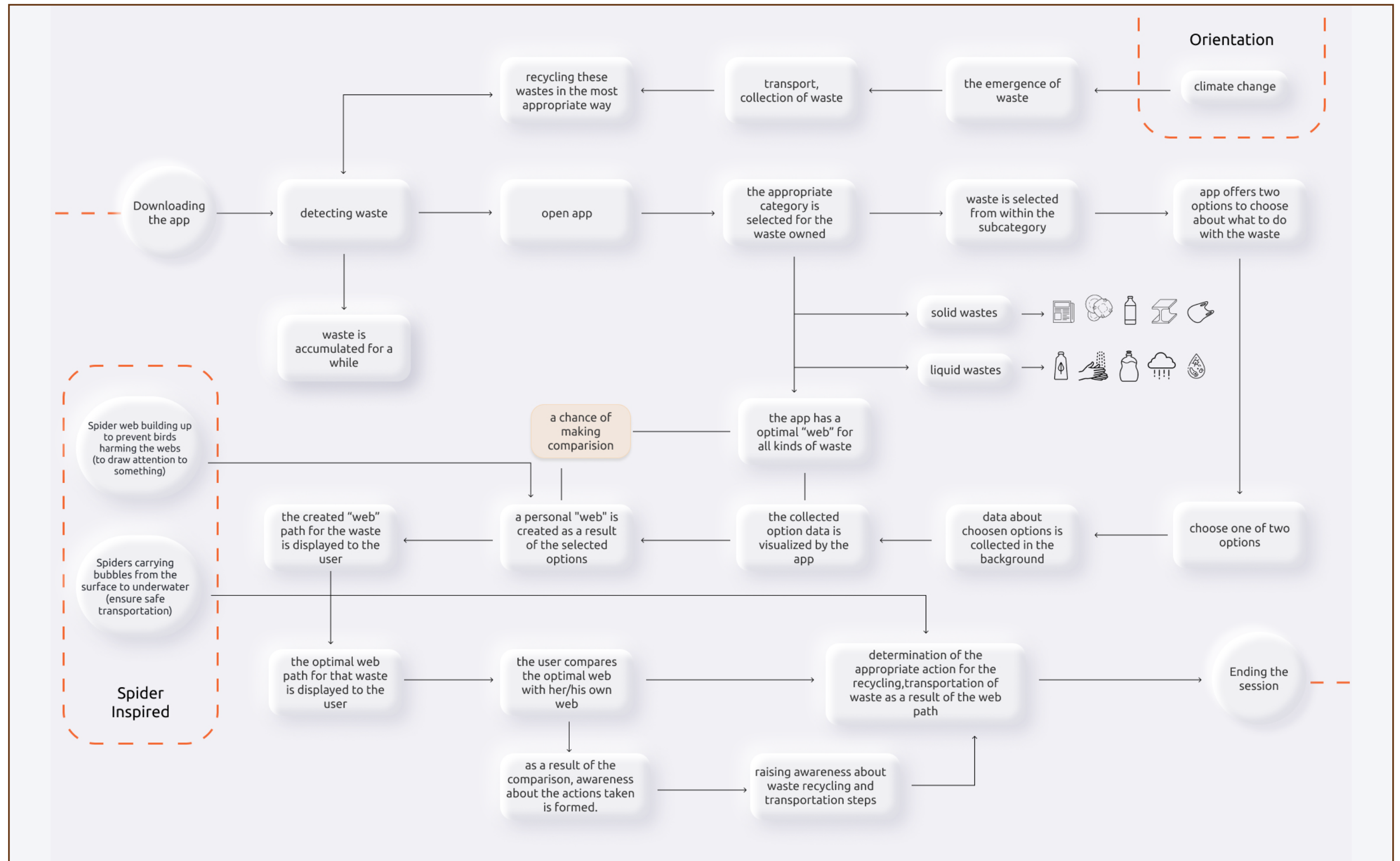
GROUP MEMBERS

İrem Aslan - 020180645
Günseli Gürünlü - 020180622
Ecem Peçin - 020180654
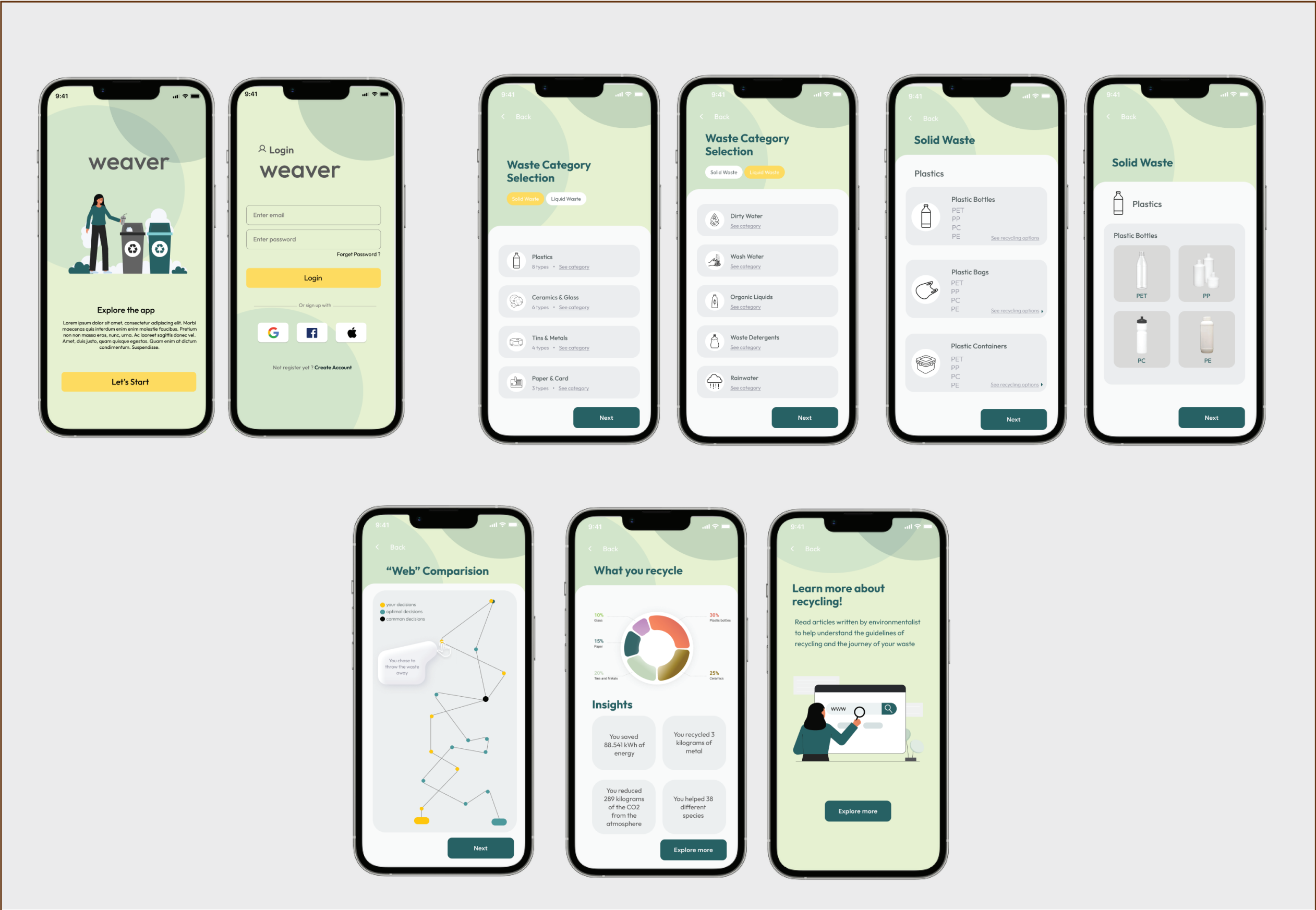
PROBLEM DEFINITION

There is a need for an informative and educative tool for people that do not track their recycle process. Awareness on climate change could be emphasized.

SYSTEM MAP

SYSTEM DETAILS

SDG(s)

INSPIRED BY

Ants and acacia: The acacia trees produce specialized structures to shelter and feed the ant colony, and the ants, in turn, defend the tree against herbivores.

Lichen: They are symbiotic associations consisting of fungi and photosynthetic (chlorophyll containing) algae (either green algae or cyanobacteria, or both).

Pistol Shrimp and Gobies: The shrimp builds and maintains a burrow that both animals live in, and the fish offers the shrimp protection from predators.

Senita Cacti and Senita Moths: The benefit of moth pollination to fruit set was found to outweigh the costs their offspring inflicted by consuming fruit.

ENVIRONMENTAL CONTRIBUTION

There is a big oil waste that needs to be stopped in restaurants, cafes, bars and similar public places that serve food almost everywhere in the world. Over-purchasing, surplus production, product loss due to lack of organization, and inadequate storage are the main causes of oil waste. This issue worries the consumer more than the producer, but the model and scale of oil waste along the supply chain are not fully understood. In addition, these waste oils cause great harm to the environment. With our service design, we aim to prevent this and create a design that will benefit society by creating biodiesel fuel.

GROUP MEMBERS
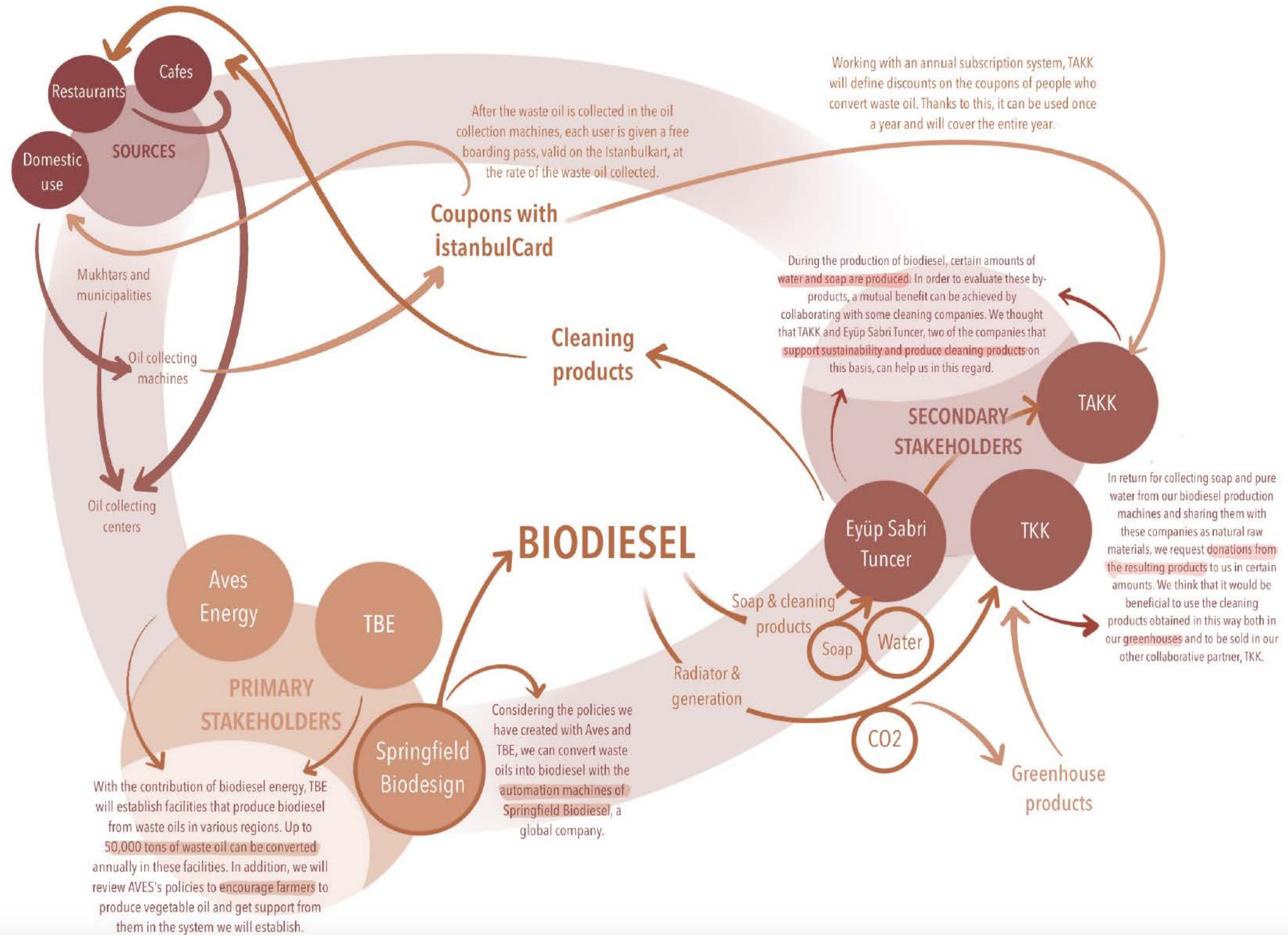Dilara Atik - 020200657
Tuba Ezgi Keser - 020180603
Muhammet Onur Taşdönderen - 020200706

PROBLEM DEFINITION
Waste of oil in restaurants, cafes and similar public areas.

No Oil Waste!

Aa.
arciform

Aa.
avenir next

SYSTEM MAP

Restaurants

Cafes

Domestic use

SOURCES

After the waste oil is collected in the oil collection machines, each user is given a free boarding pass, valid on the Istanbulkart, at the rate of the waste oil collected.

Working with an annual subscription system, TAKK will define discounts on the coupons of people who convert waste oil. Thanks to this, it can be used once a year and will cover the entire year.

Coupons with İstanbulCard

Mukhtars and municipalities

Oil collecting machines

Oil collecting centers

Cleaning products

During the production of biodiesel, certain amounts of water and soap are produced. In order to evaluate these by-products, a mutual benefit can be achieved by collaborating with some cleaning companies. We thought that TAKK and Eyüp Sabri Tuncer, two of the companies that support sustainability and produce cleaning products on this basis, can help us in this regard.

TAKK

SECONDARY STAKEHOLDERS

In return for collecting soap and pure water from our biodiesel production machines and sharing them with these companies as natural raw materials, we request donations from the resulting products to us in certain amounts. We think that it would be beneficial to use the cleaning products obtained in this way both in our greenhouses and to be sold in our other collaborative partner, TKK.

Aves Energy

TBE

BIODIESEL

PRIMARY STAKEHOLDERS

Springfield Biodesign

Eyüp Sabri Tuncer

TKK

Soap & cleaning products

Soap

Water

Radiator & generation

CO_2

Considering the policies we have created with Aves and TBE, we can convert waste oils into biodiesel with the automation machines of Springfield Biodiesel, a global company.

Greenhouse products

With the contribution of biodiesel energy, TBE will establish facilities that produce biodiesel from waste oils in various regions. Up to 50,000 tons of waste oil can be converted annually in these facilities. In addition, we will review AVES's policies to encourage farmers to produce vegetable oil and get support from them in the system we will establish.

STORYBOARD