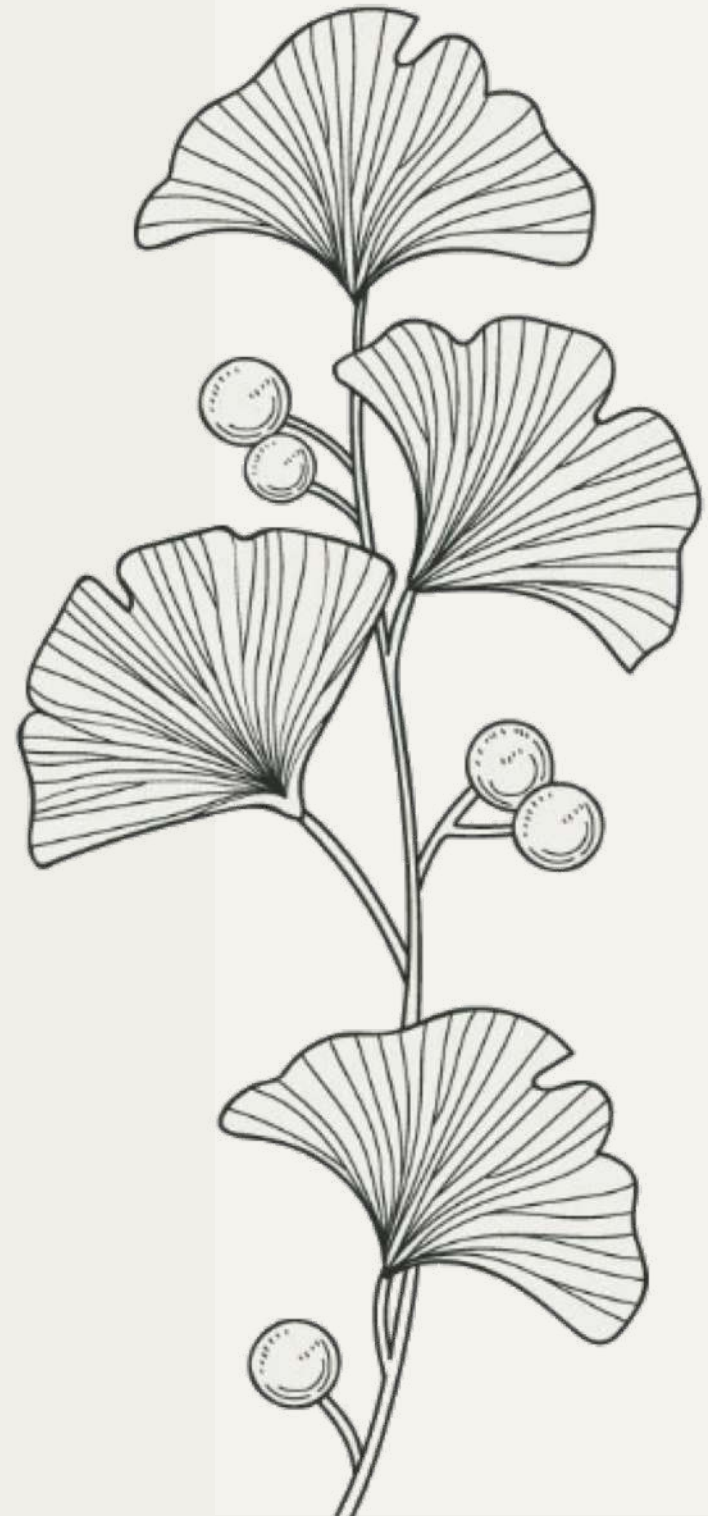


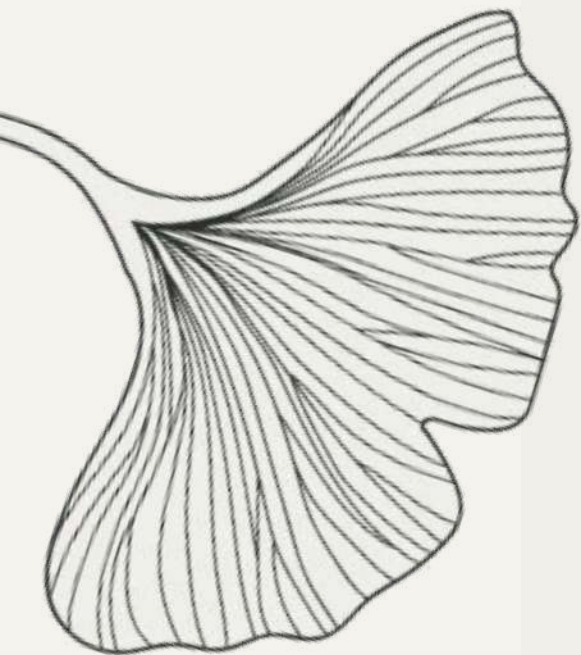
# A Japanese urban house

日本の都会の家

*Sendai, Miyagi, JAPAN | 日本国宮城県仙台市*

*Designer: Mayi Lekuona*





# Introduction

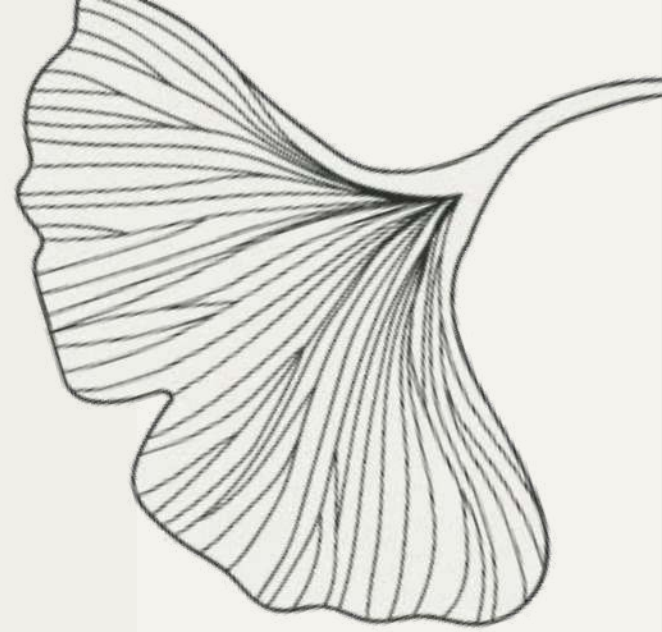


# Introduction

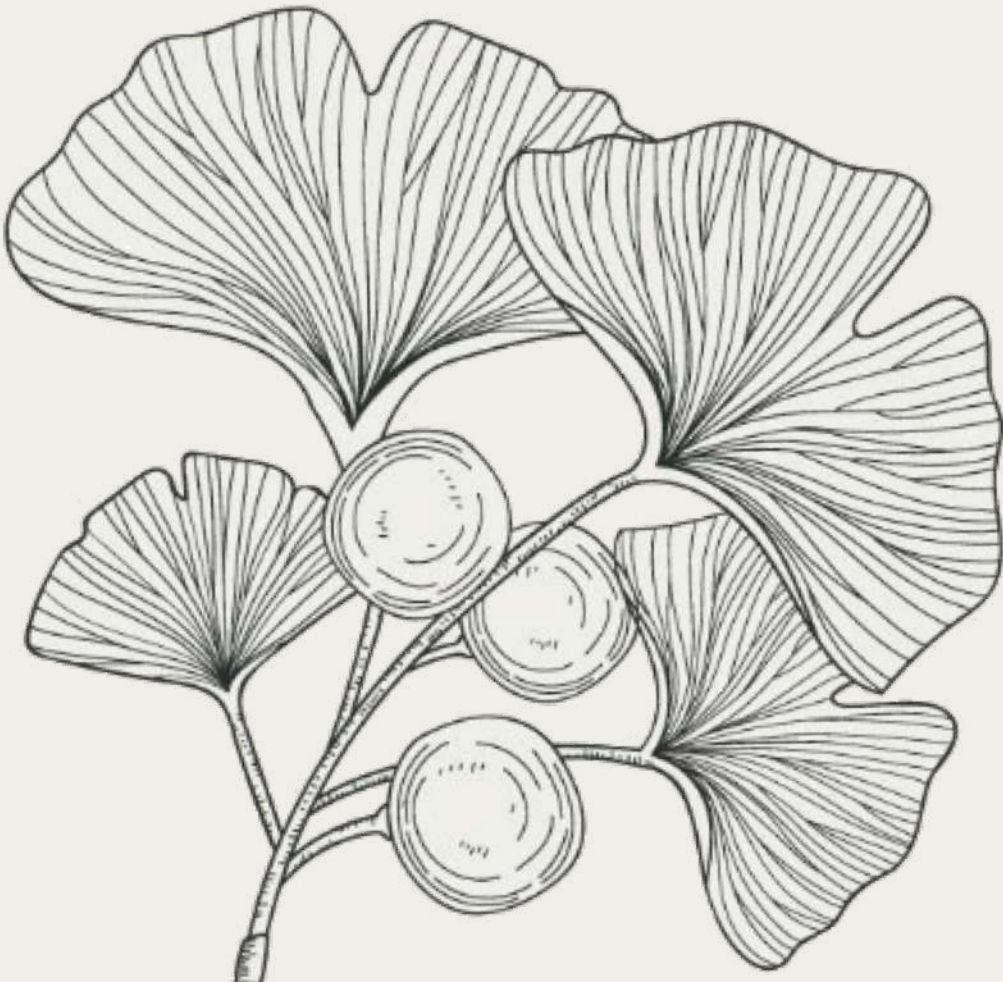
Permaculture was first introduced as “permanent agriculture” by Bill Mollison & David Holmgren and focused mainly on sustainable food production. Since then, permaculture principles are being applied to design in many areas, such as, water and energy use, waste treatment and, personal, community and, economic design.

In 2016, 1.7 billion people - 23% of the world's population - lived in a city with at least 1 million inhabitants. And, by 2030, a projected 27% of people worldwide will be concentrated in cities with at least 1 million inhabitants. In this time of crisis, urban permaculture can help us improve our cities, by making them more sustainable and resilient and, by building community. As permaculturist Toby Hemenway says, “Urban permaculture takes what we have learned in the garden and applies it to a much broader range of human experience. We're not just gardening plants but people, neighbourhoods, and even cultures.”

This design is an example of an urban rented house design using our permaculture lenses. The design process has been structured around the GOBRADIME process, which I learned during my PDC with the Permaculture Women's Guid, and which is very useful not to forget any step during the design process.



# Goals












# Design Thesis & Vision Statement

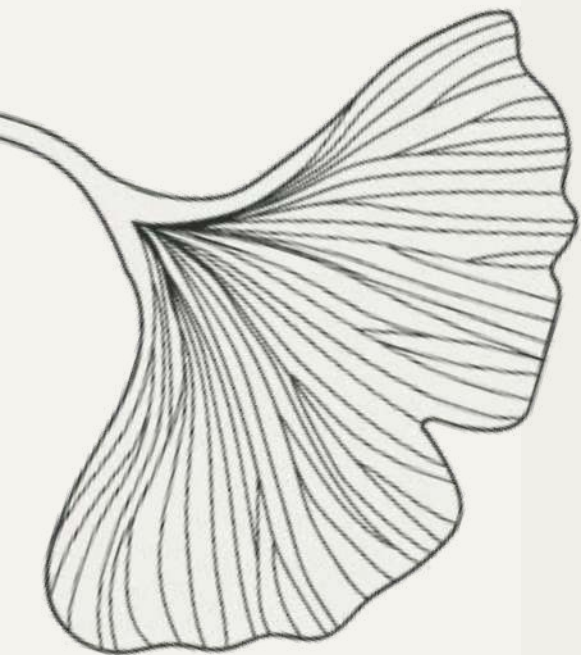
**Mission:** To create a sustainable environment that is functional for a family of five and builds resilience in the lives of those involved.

**Vision:** The property will become a colourful demonstration of sustainable living where waste is reduced to the minimum. The landscape will contain a mixture of delicious food plants and stunning ornamentals that also support wildlife. It will also provide a dynamic environment in which kids will be able to observe, discover, experiment and, learn. Creative projects will brighten up this urban house.

## Goals:

-  Reduce overall water consumption
-  Start composting and reduce waste as much as possible
-  Grow as many food as possible
-  Create an outdoor feel-good space for family and friends
-  Increase the biodiversity
-  Enhance interactions with the community
-  Make our own cleaning and cosmetic products
-  Share good practices with our children
-  Learn new skills (worm composting, bokashi, soap making...)





# Observation



# Observation & Site Assessment Notes



## Climate:

Sendai has a humid subtropical climate that means warm and wet summers, and cool and dry winters  
Sendai is situated in the cool temperate wet forest biome.

Hardiness Zone: 9a

Record High Temp.: +37.2C

Record Low Temp.: -11.7C

First frost: November 21-30

Last frost: April 11-20

Average Annual Precipitation: 1254.1mm

Max Precipitations: from May to September; Rainy season late June-early July

Predominant winds:

- September to January: NNW, 3,33m/s
- February and March: WNW, 3.85m/s
- April to August: SE, 3m/s

Potential Disasters: - Earthquakes (several/month; last big one: 2011 Big Japan Earthquake (magnitude 9.0))  
- Typhoons from August to October (but often get to Sendai as tropical storms)

## Humans in the property:

Five people live in the house: my husband (38 years old), our three children (8, 7 & 3 years old) and myself (38 years old). Used to big spaces, and being close to nature, we seek for a greener space in this urban site. The children need space to observe and experiment outside, and Andre and I need a space to chill, and do some gardening. We also need some privacy from the kids park situated in front of the house.

## Waste:

Japan is the second largest producer of plastic waste per capita (60% of municipal waste consists of plastic packaging of food products). Almost all the waste is incinerated (toxic emissions) in energy-from-waste plants, or common incineration plants. Part of the collected waste is not treated in the country and is sent abroad and, unfortunately, many of the receiving countries do not have the infrastructure to treat this waste.

# Observation & Site Assessment Notes



## **Water:**

House connected to the municipal system. Gas heater for first floor system, and solar heater for second floor system.

Outside, 4 downpipes connected to an underground fluvial drain, and 2 accessible taps near the cherry tree, and in the parking space.

There is a flooding possibility, since the property is situated at the limit of the historical flood outline from Nanakita river.

## **Invisible structures:**

The property is rented. Not allowed to do any building transformation, not even a nail. No pets are allowed.

## **Limiting factors:**

Space. Outside, there is concrete everywhere, except for a tiny raised bed in one corner.

## **Access and circulation:**

The house is situated at the end of a quiet street and adjoins a main road in the Eastern side.

## **Vegetation and Wildlife:**

The space does not attract many wildlife (some ants, and woodlouses but overall, it is a concrete desert).

A couple of barn swallows nest in the main entrance of the house during late spring - beginning of summer (good predators).

The neighbouring park's grass is mown three times a year. Therefore it has time to get very long and hosts a large variety of insects.



# The House

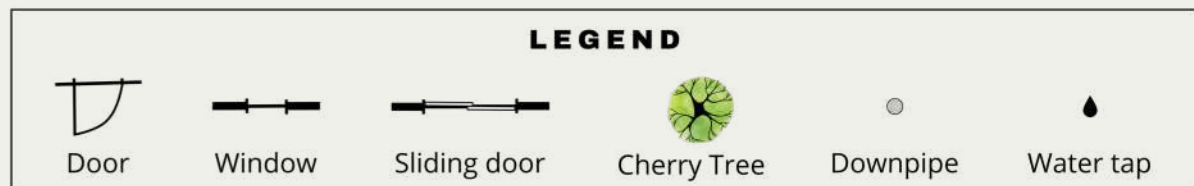
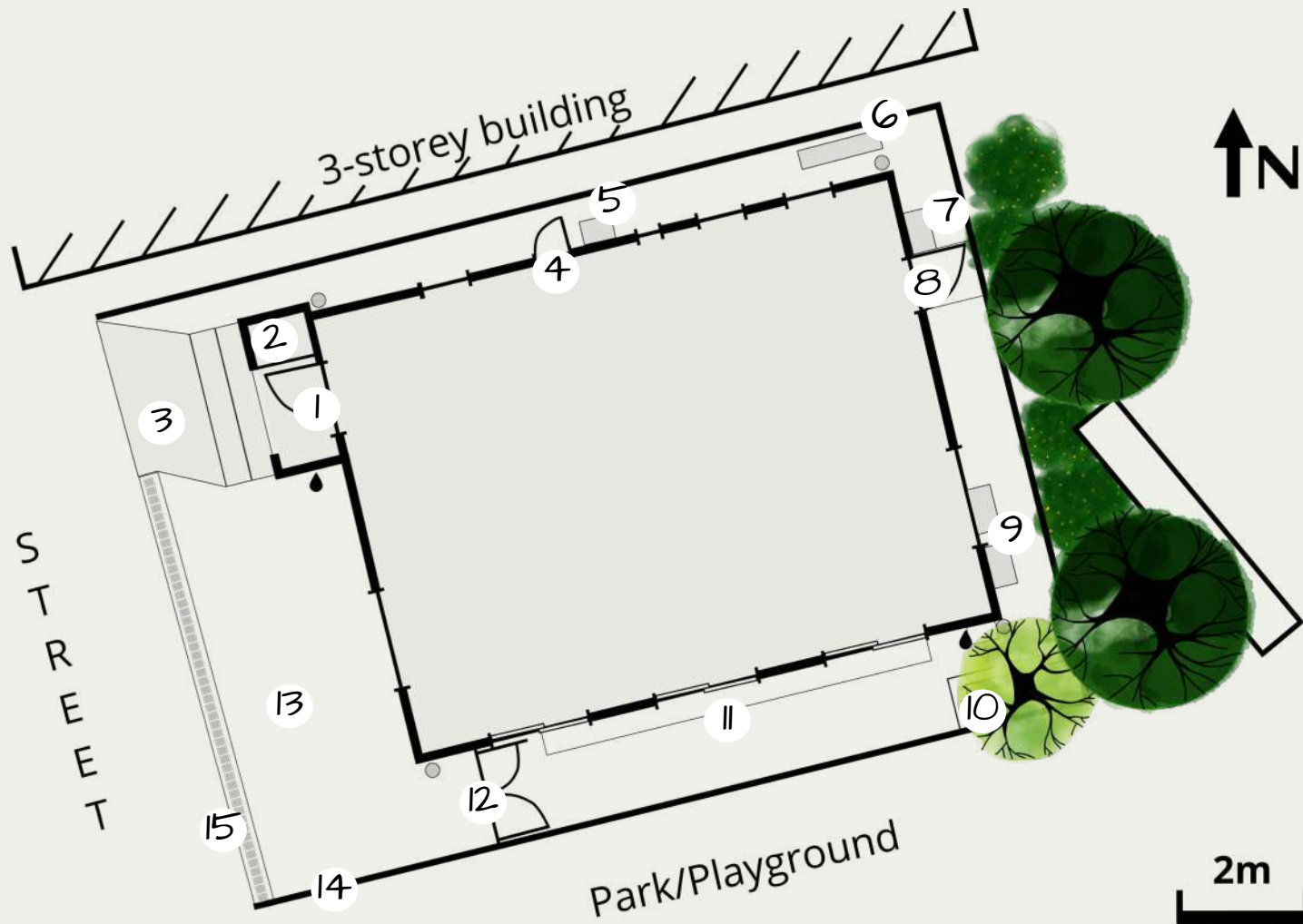


The house is a 20 years old two and a half storeys house with a passive solar design. Even if the property is situated in an urban district and adjoins a main road, it still has a quiet vibe, since the main entrance is at the end of a short street, and neighbours a little kids park. There is no lawn in the property, the house is surrounded by cement except of the little raised bed with a cherry tree and some ivy. The house is near all amenities (school, parks, supermarket, post office, convenience stores, pharmacies and few restaurants).

# Base Map



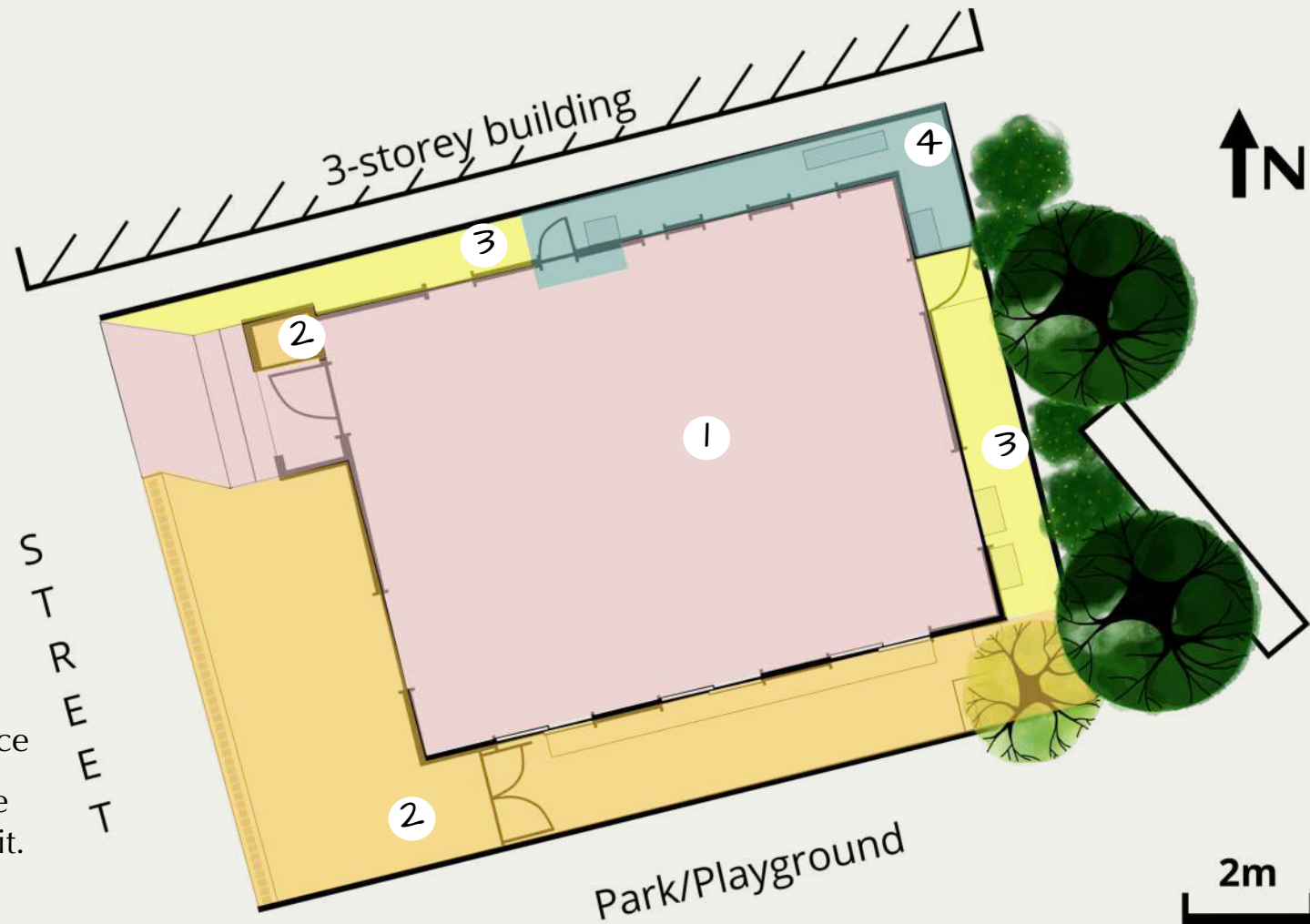
- 1 Front door
- 2 Storage unit
- 3 Ceramic tiles
- 4 Small storage unit
- 5 Electric box
- 6 Old gas tank
- 7 Water heating system
- 8 Kitchen door
- 9 AC units
- 10 Raised bed with cherry tree
- 11 20cm high cement step
- 12 Outdoor gate
- 13 Parking
- 14 Fence
- 15 Drain



# Zones in the Property



- 1 **Zone 1:** Daily attention  
The house, and entrance.
- 2 **Zone 2:** Every other day  
Southern terrace, storage unit, and parking.
- 3 **Zone 3:** Regular Maintenance  
Back of the house, and first meters of the Northern side.
- 4 **Zone 4:** Infrequent Maintenance  
Other half of the Northern side including the small storage unit.

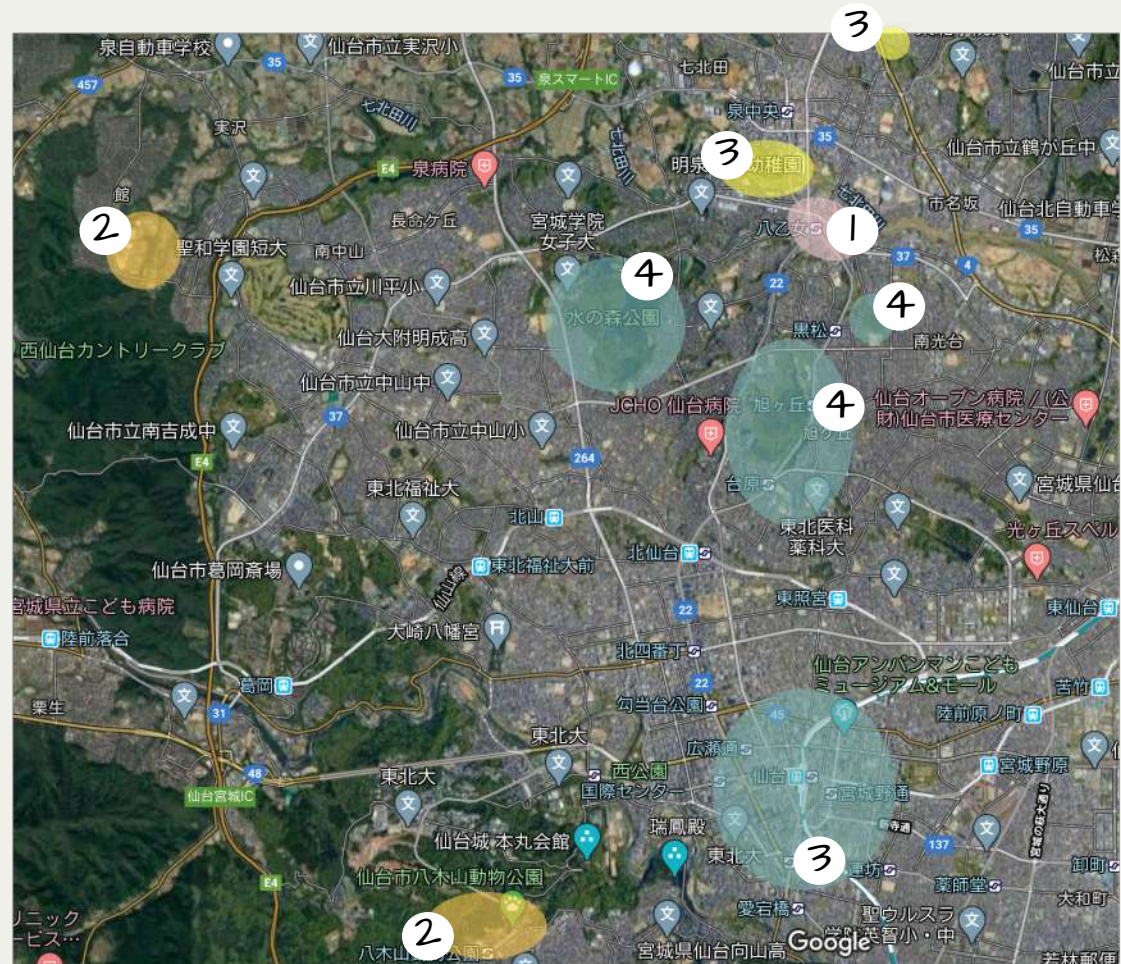




# Zones in the City



- 1 **Zone 1:** Everyday  
Immediate neighbourhood
- 2 **Zone 2:** Several days a week  
Children's school, Japanese classes
- 3 **Zone 3:** Once a week  
Expanded neighbourhood, Nanakita Park, Farmer's Market.
- 4 **Zone 4:** Less frequent visits  
Natural parks, Downtown Sendai, Antiques market.



A small urban property is embedded within a larger community and landscape and it is useful to look at zones beyond the proper site. Urban zones can be based on the use of fossil fuels in transportation (0: Home, 1: Walking distance, 2: Bicycling distance, 3: Reachable by public transportation or by a short drive, 4: Driving distance, 5: Reachable only by plane or other long-distance transport). Following this guideline, the children's school would be in zone 3, but we go there 5 days/week, and sometimes 6. In my opinion, the amount of time spent at the school does not reflect the normal use of zone 3. So I prefer defining urban zones by frequency and intensity of use.




# Sectors Overview

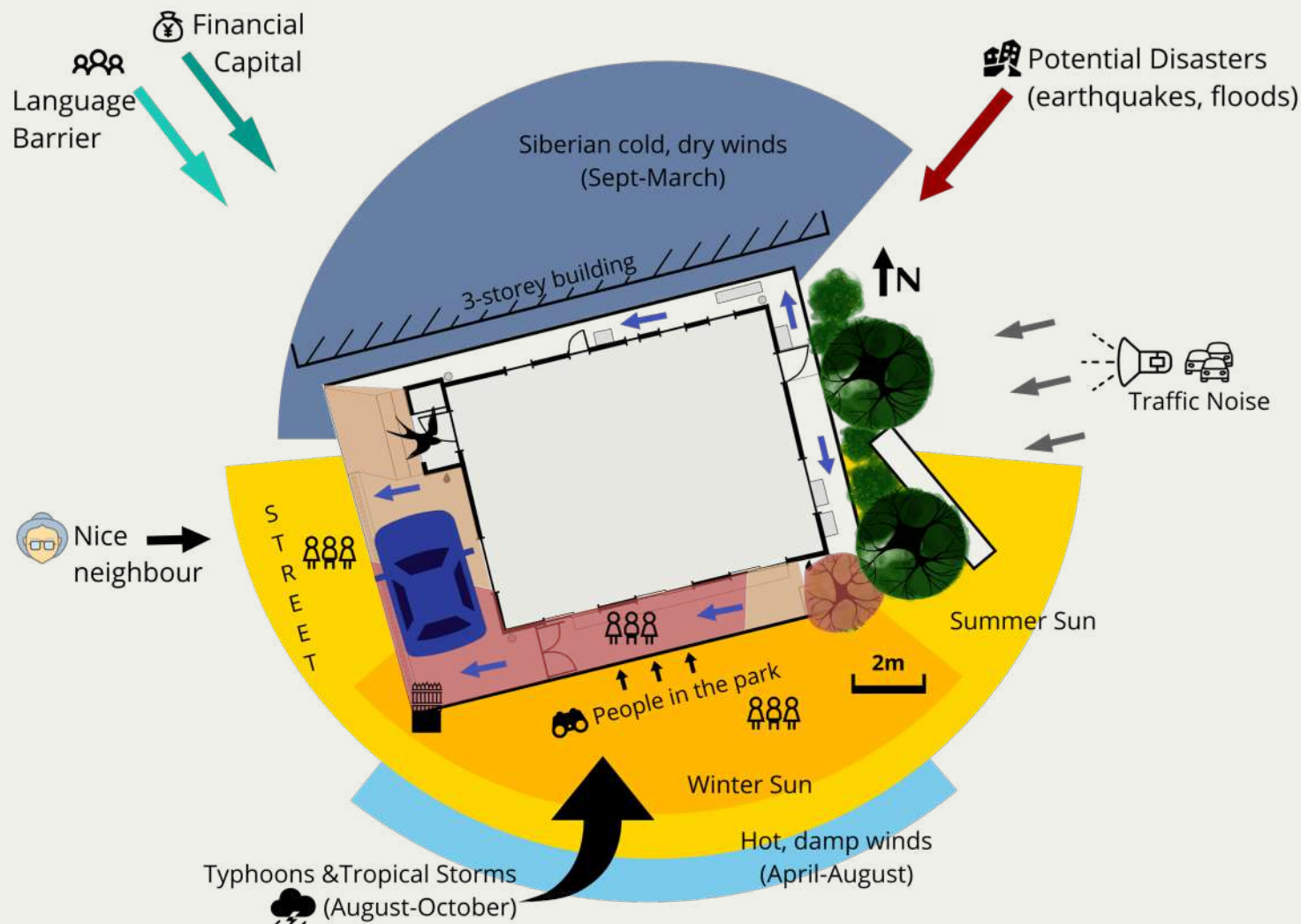


## LEGEND

-  Climate: Humid Subtropical  
Hardiness Zone: 9a
-  Full sun (+6 hours/day)
-  Partial sun (3-6 hours/day)
-  Water runoff
-  Fence (60cm high concrete fence + 80cm high metallic fence)
-  Children playing
-  Barn swallow nesting place (May-August)

## INVISIBLE SECTORS

-  No pets
-  No modifications to the structure allowed
-  Available access to water and gas counters for the municipal workers

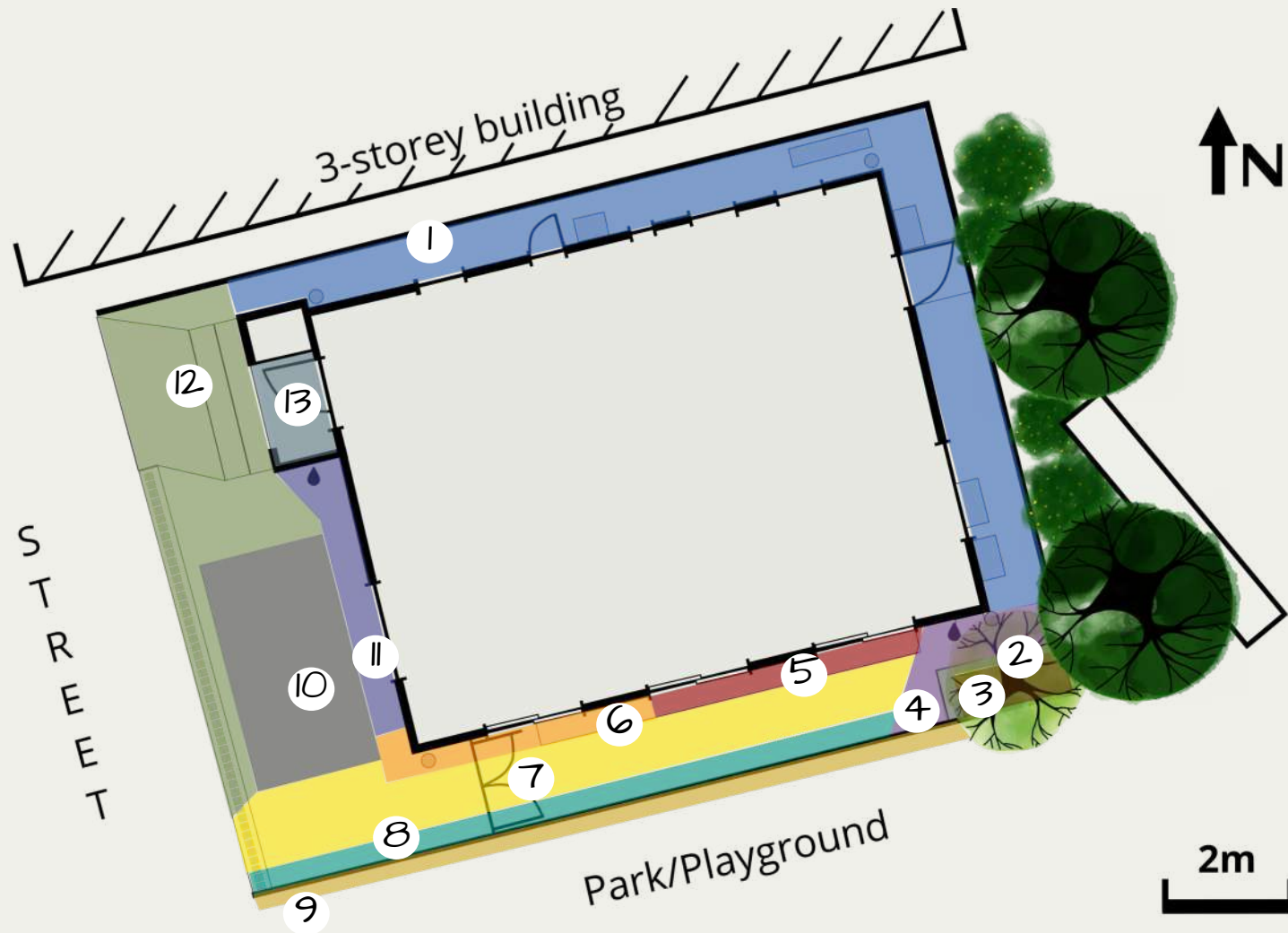




# Edges & Microclimates



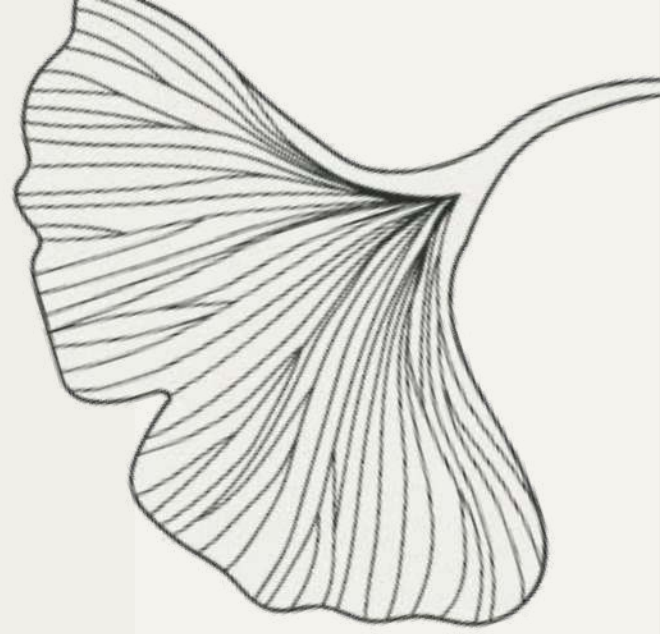
- 1 Total shade
- 2 Cement bricks raised bed
- 3 Only soil in the property (shady under cherry tree)
- 4 Shady, humid space
- 5 Cemented step (increased heat, sunny in winter, shady in summer)
- 6 Cemented step + house wall (sunnier than the above)
- 7 Cemented pathway (increased heat, full sun)
- 8 Foot of the wall (total shade)
- 9 Metallic fence (full sun)
- 10 Parking space
- 11 Shady space due to car
- 12 Front of the house (shady in winter, afternoon sun in summer)
- 13 Entrance (shady and protected)



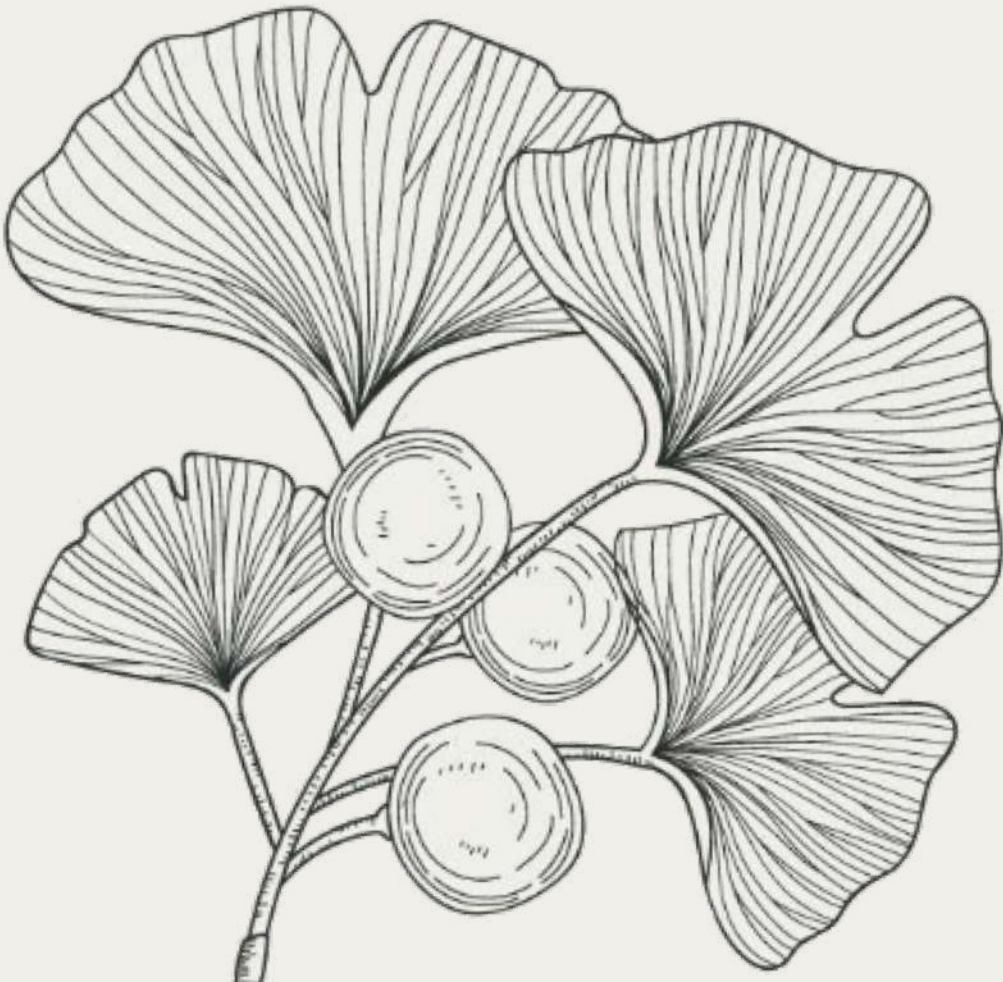
Urban house Yaotome - Microclimates Map (September 2020)

Designer: Mayi Lekuona

The house is surrounded by cement except of the little raised bed, so the whole property retains heat.



# Boundaries



# Boundaries & Limitations



## Personal Boundaries:

- ✿ The whole family will be involved in the project.
- ✿ We all work like a team and everybody's ideas and feedback are welcome.
- ✿ A component is not only a useful element in the design. It also has to be educative and creative.
- ✿ We are not going to stay very long in Japan (probably less than what we thought).
- ✿ We don't want to invest too much money on the property.
- ✿ We don't want to buy anything new if we are able to find it as a free resource or second hand.
- ✿ Since the house is neighbouring a small park, we would like to have some components to include the community who gathers in the park. But we also need some features that give some privacy since our living/dining room faces the park and privacy has already been an issue a couple of times.
- ✿ Our Japanese level is not very high, so we have some communication problems.

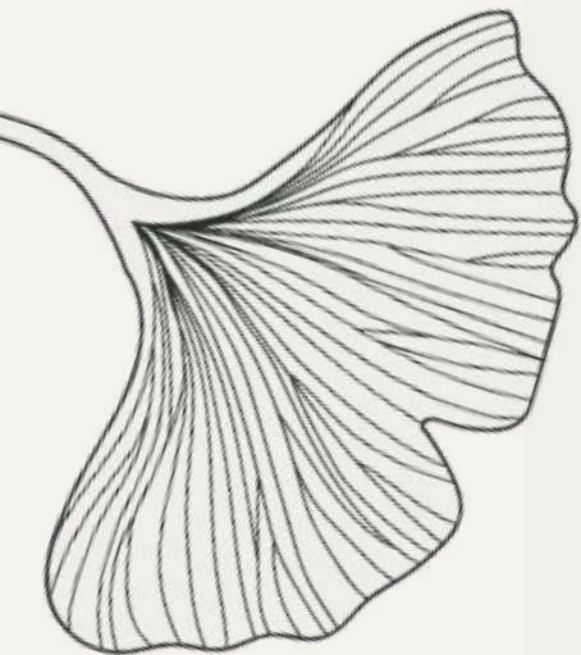
## Ecological Boundaries:

- ✿ Almost all the property is covered in cement, and we don't have access to proper soil except of the small raised bed with the cherry tree.
- ✿ Barn swallows nest in the entrance of the house from May to August. We don't want to disturb them, and we try to limit the use of the front door during their nesting time, and the nest will not be removed after their seasonal departure.

## Socio-Economic Boundaries:

- ✿ Not allowed to do any building transformation, not even a nail. Everything needs to be temporary, since the house needs to be like the first day when we give back the keys.
- ✿ The downpipes are connected to an underground fluvial drain and the owner doesn't want us to cut them for connecting them to rain barrels.
- ✿ No pets are allowed on the property.
- ✿ Easy evacuation is necessary (in case of big earthquakes).
- ✿ The water and gas counters must be accessible to municipal workers.

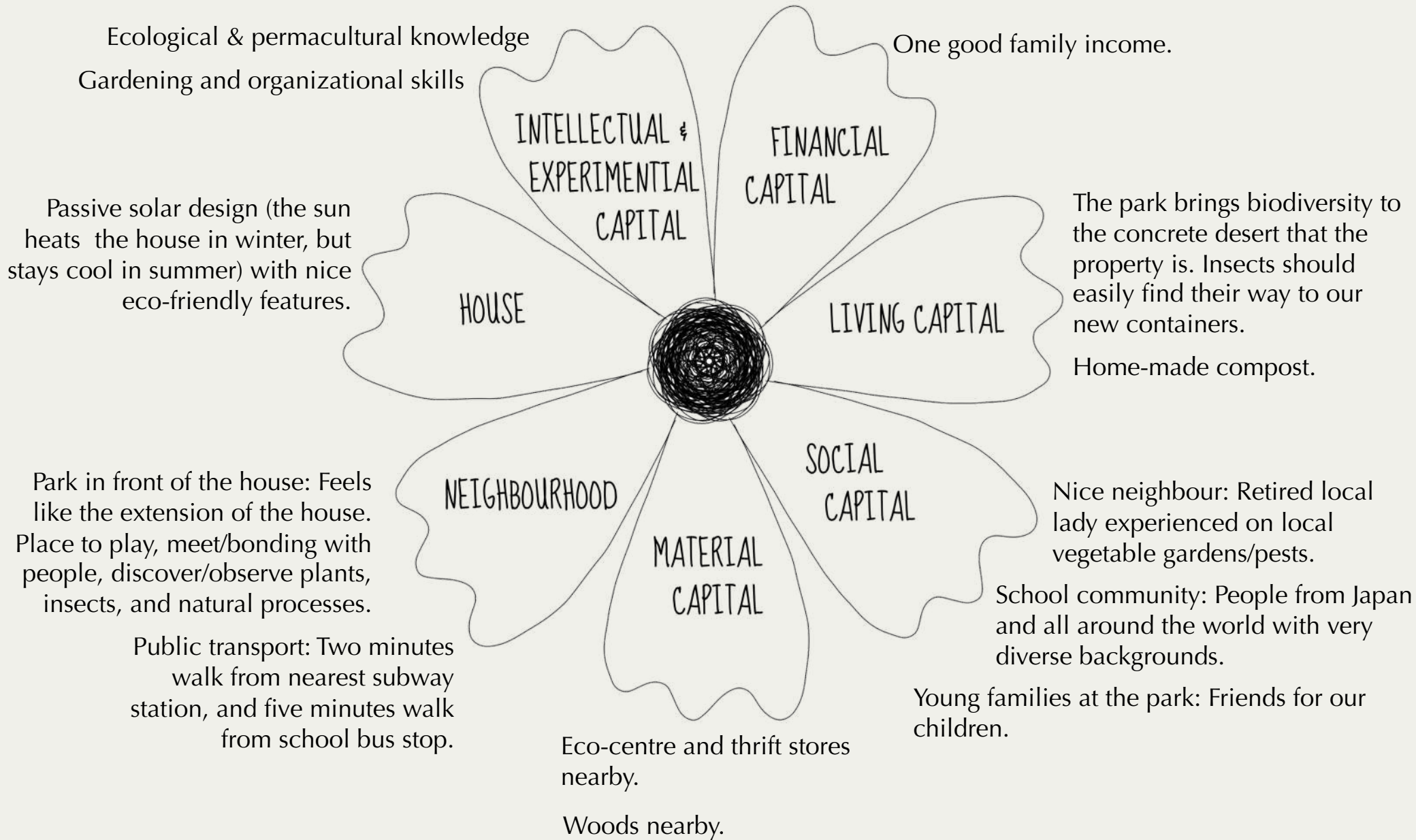




# Resources

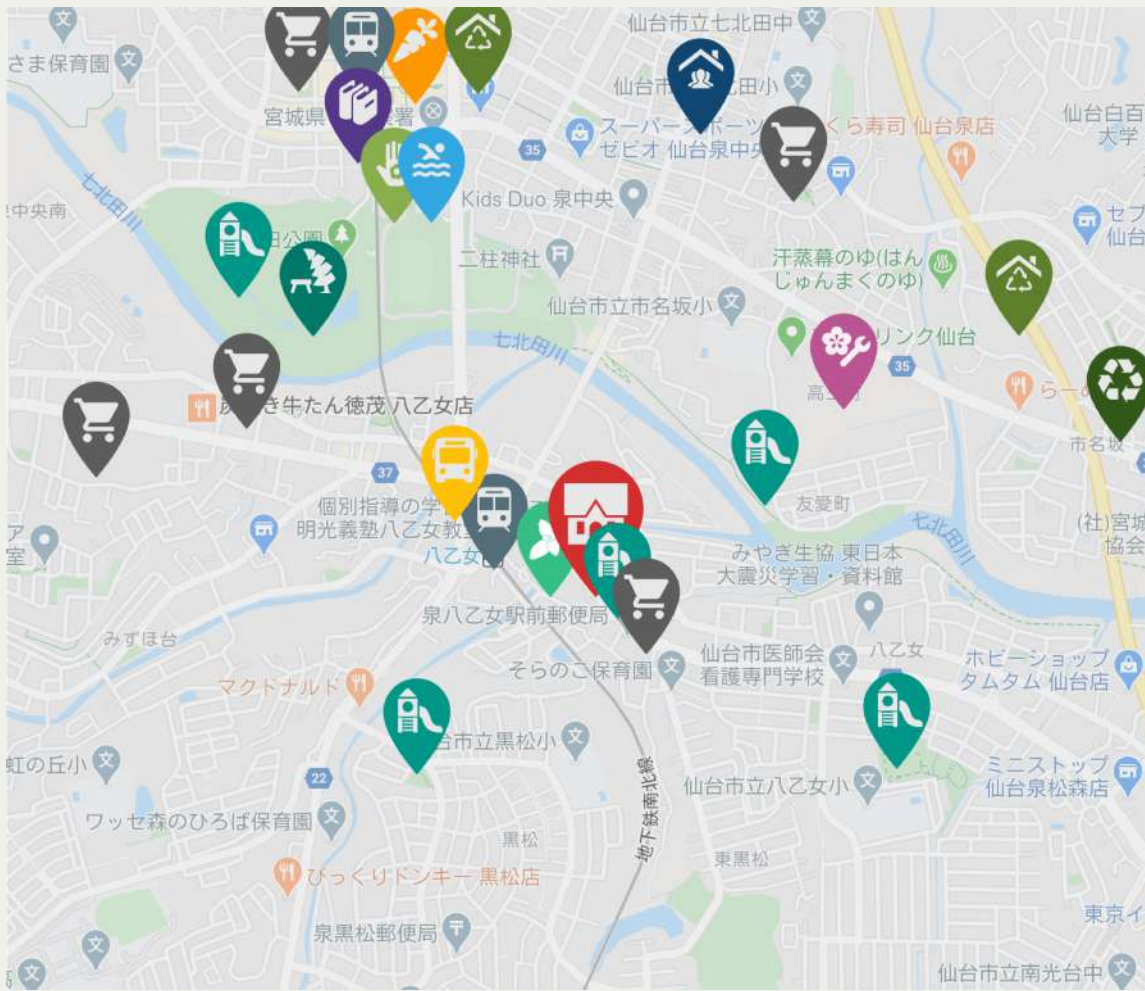


# Resources



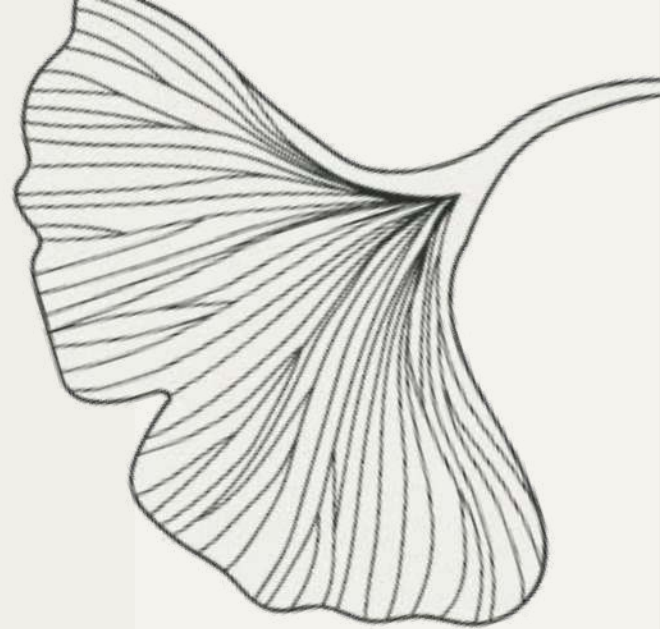


# The Connected Neighbourhood

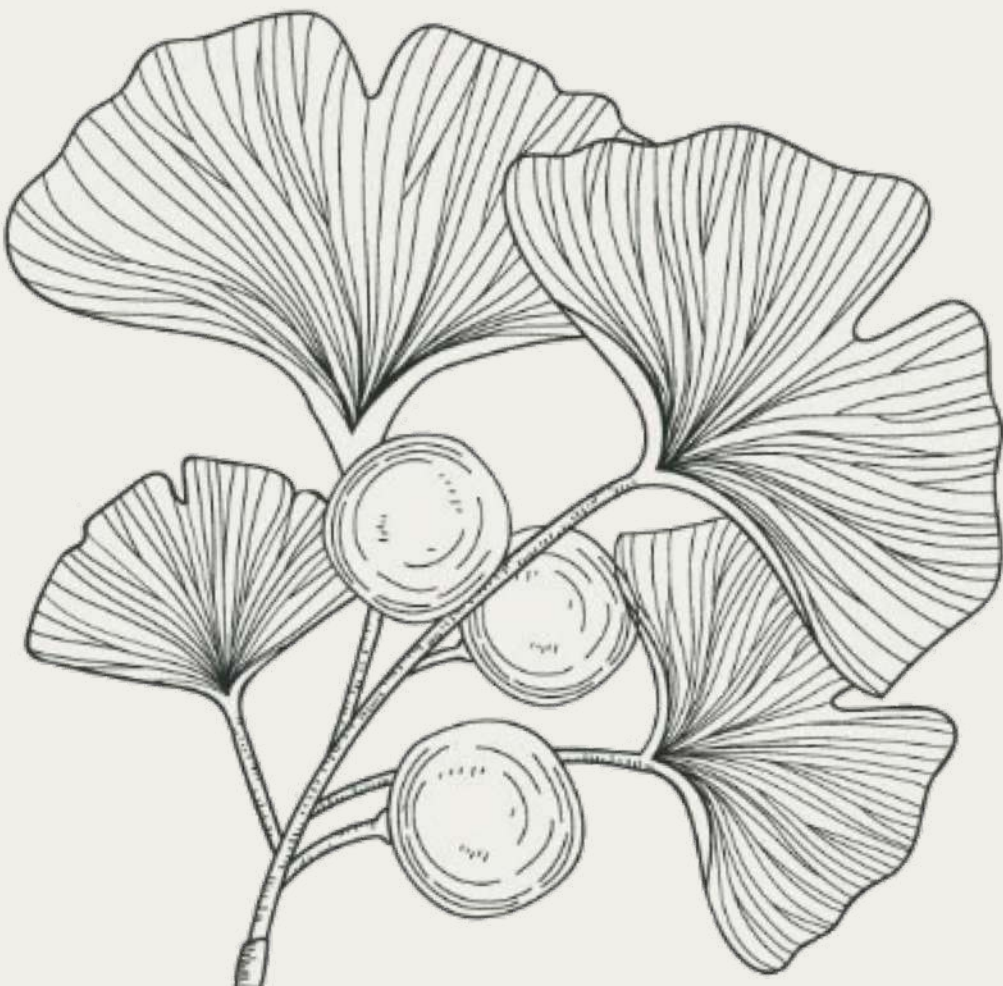


In an urban environment, it is often not possible to be completely self-sufficient on-site. But cities have a wide variety of resources, sometimes in the form of garbage, garage sales and thrift stores. Cities also offer the chance to connect with a large diversity of people who have both resources and skills to share. This strengthens relationships, and individual and community resiliency.

Here are listed some of the neighbourhood and community resources within walking distance.



# **Analysis**



# Analysis

We have been working on a more sustainable way of life for many years now. While we were living in Canada, we made many renovations on our house to achieve good isolation, energy and water use efficiency. We had our edible & medicinal garden, we made compost and we were quite far in our zero waste journey.

We moved to Japan because my husband got a four-year contract in Sendai, and we were longing for adventure. We knew that we would feel like aliens at the beginning but, what we didn't expect was the step backwards in our sustainable way of life. No access to land, very few organic/zero waste stores, inexistent ecological thinking,... and plastic EVERYWHERE!!!

As my husband is struggling at his job, we will probably leave sooner than we thought. So this design takes into account that our stay in this house and this country is ephemeral and we won't seek the design of the perfect sustainable urban house. But, since for us, raising our children being consistent with our ecological concerns is extremely important, we will try to get as close as possible of the ideal urban house while considering the limited time we will stay here.

# PNI Composting Methods

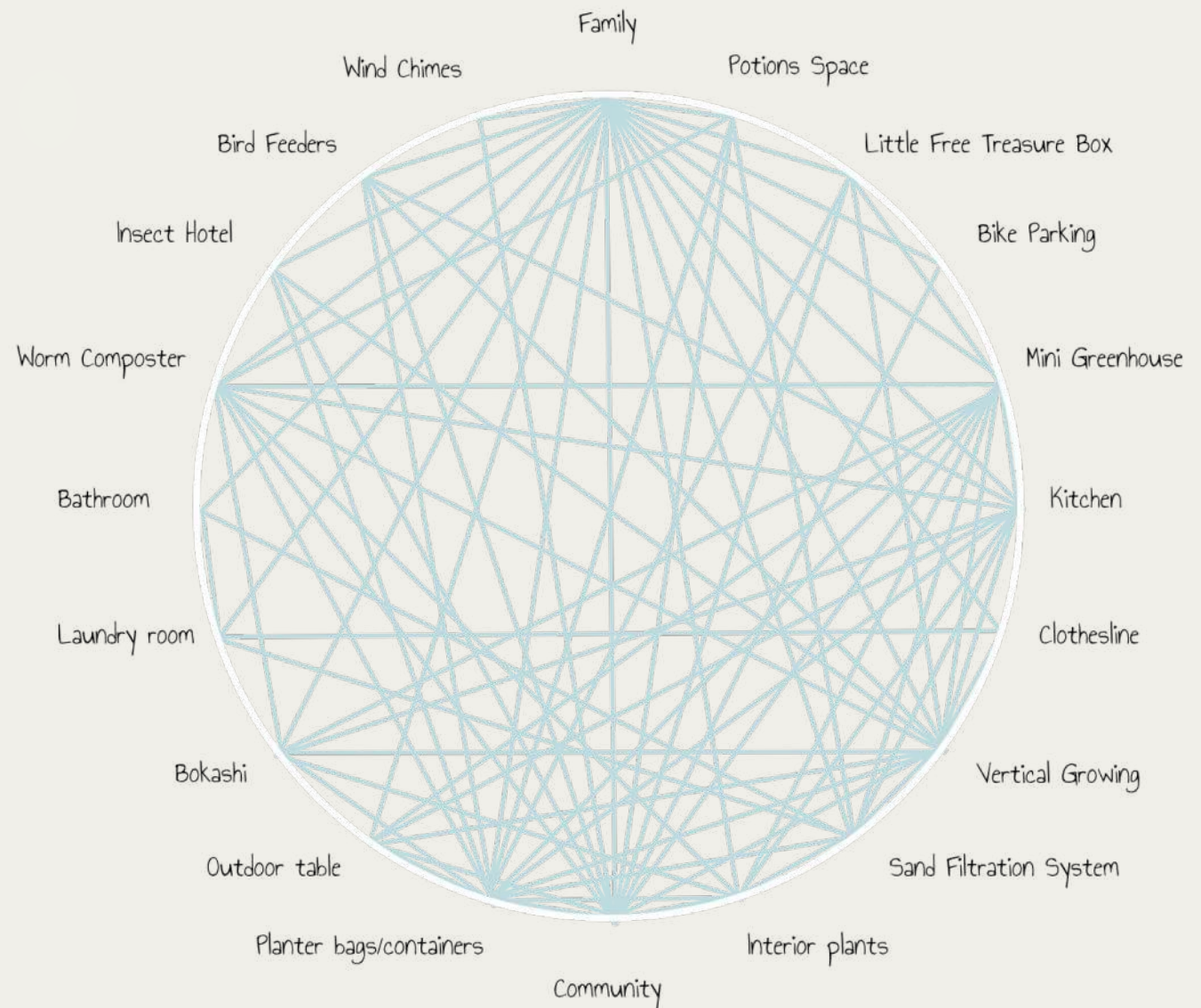
Matter is never lost in nature, everything is recycled. Composting allows us to imitate the processes that occur in nature to transform organic waste into compost and nutrients that plants can use for food production and, to maintain fertility over time. The PNI will allow me to evaluate the advantages and disadvantages of composting methods in order to choose the most appropriate method in our case.

	Compost Pile	Tumbler	Bokashi	Takakura	Worm Compost
POSITIVE	<ul style="list-style-type: none"> <li>• Easy</li> <li>• Good compost quality</li> <li>• Cheap</li> </ul>	<ul style="list-style-type: none"> <li>• Fast process</li> <li>• Heat preservation</li> <li>• Easy</li> <li>• Free from bad smells</li> <li>• Practical</li> <li>• Compatible with interior spaces</li> </ul>	<ul style="list-style-type: none"> <li>• Efficient microorganisms</li> <li>• Bad smells contained</li> <li>• High temperatures</li> <li>• May be exposed to rain</li> <li>• Cheap</li> <li>• Fast process</li> <li>• Compatible with interior spaces</li> <li>• Bokashi tea = liquid fertilizer</li> <li>• Possibility to add citrus, raw meats, dairy, and processed foods</li> </ul>	<ul style="list-style-type: none"> <li>• Efficient microorganisms</li> <li>• Fast process</li> <li>• Cheap</li> <li>• Easy</li> <li>• Rare bad smells</li> <li>• Compatible with interior spaces</li> </ul>	<ul style="list-style-type: none"> <li>• High compost quality</li> <li>• Free from bad smells</li> <li>• Worm tea = liquid fertilizer</li> <li>• Compatible with interior spaces</li> <li>• Fun for kids</li> </ul>
NEGATIVE	<ul style="list-style-type: none"> <li>• Needs space</li> <li>• Slow process</li> <li>• Need to manually stir the content</li> <li>• No citrus, raw meats or dairy</li> <li>• Not compatible with interior spaces</li> </ul>	<ul style="list-style-type: none"> <li>• Needs space</li> <li>• No citrus, raw meats or dairy</li> <li>• Most expensive method</li> <li>• Must be protected from the rain</li> <li>• Lower compost quality (as the process is faster)</li> </ul>	<ul style="list-style-type: none"> <li>• Needs inoculum</li> <li>• The final product is pre-compost, so another compost system is needed</li> <li>• Bad smells when opening the can</li> </ul>	<ul style="list-style-type: none"> <li>• Needs space</li> <li>• Need to manually stir the content</li> <li>• No citrus, raw meats or dairy</li> <li>• Needs an initial inoculum</li> <li>• Must be protected from the rain</li> <li>• More prone to contain pathogens since the temperature does not rise much</li> </ul>	<ul style="list-style-type: none"> <li>• There may be many fruit flies</li> <li>• Slow process</li> <li>• Needs space</li> <li>• No citrus, raw meats dairy or processed foods</li> <li>• More work to monitor temperature and humidity, cut food into small pieces and shred paper / cardboard</li> </ul>
INTERESTING	<ul style="list-style-type: none"> <li>• Aerobic process</li> </ul>	<ul style="list-style-type: none"> <li>• Aerobic process</li> </ul>	<ul style="list-style-type: none"> <li>• Japanese traditional method</li> <li>• Anaerobic fermentation</li> </ul>	<ul style="list-style-type: none"> <li>• Japanese traditional method</li> <li>• Anaerobic fermentation</li> </ul>	<ul style="list-style-type: none"> <li>• Aerobic process</li> <li>• Optimal temperature 15-25°C</li> </ul>



# Connection Web

In permaculture, our goal is to establish beneficial relationships whenever we can, as therein lies the ecological and energy efficiency of the design. The connection web is a diagram that connects the components of the design based on the relationships between them to visualize the level of complexity of the system and see what elements we must place in proximity.





# Each element performs many functions...



## WORM COMPOSTER

- ✦ Reduce household waste
- ✦ Recycle resources (garden waste, scrap food, scrap paper)
- ✦ Help composting the bokashi
- ✦ Help build soil
- ✦ Add micronutrients to the plants
- ✦ Boost the community of microorganisms
- ✦ Recycle and repurpose material
- ✦ Educational

## BOKASHI

- ✦ Reduce household waste
- ✦ Recycle resources (garden waste, scrap food, scrap paper)
- ✦ Help build soil
- ✦ Provide feed for worms
- ✦ Add micronutrients to the plants
- ✦ Boost the community of microorganisms
- ✦ Educational

## SAND FILTRATION SYSTEM

- ✦ Greywater use
- ✦ Municipal water use reduction
- ✦ Plant watering
- ✦ Educational

## VERTICAL GROWING

- ✦ Create microclimate
- ✦ Cooling effect for the upstairs bedrooms in summer
- ✦ Increase yield
- ✦ Create habitat & biodiversity
- ✦ Attract pollinators
- ✦ Beauty
- ✦ Waste for the compost
- ✦ Privacy
- ✦ Playing space
- ✦ Build community

## PLANTER BAGS & CONTAINERS

- ✦ Create microclimate
- ✦ Increase growing space
- ✦ Increase yield
- ✦ Create habitat & biodiversity
- ✦ Attract pollinators
- ✦ Beauty
- ✦ Waste for the compost
- ✦ Build community
- ✦ Educational

## BIKE PARKING

- ✦ Mobility
- ✦ Exercising
- ✦ Maintaining healthy habits
- ✦ Boost energy
- ✦ Improve mood
- ✦ Nurture family & couple life
- ✦ Educational
- ✦ Reduce family's ecological footprint & carbon emissions

## OUTDOOR TABLE & CHAIRS

- ✦ Gathering space
- ✦ Communication space
- ✦ Working space
- ✦ Playing space
- ✦ Relaxing space

## CLOTHESLINE

- ✦ Dry clothes
- ✦ Save energy
- ✦ Enhance clothes freshness
- ✦ Enhance clothes' lifespan
- ✦ Save time
- ✦ Reduce family's ecological footprint

## BIRD FEEDERS

- ✦ Attract wildlife
- ✦ Pest management
- ✦ Beauty
- ✦ Nurture curiosity & imagination
- ✦ Educational

## INSECT HOTEL

- ✦ Create habitat
- ✦ Attract wildlife
- ✦ Pest management
- ✦ Recycle & Repurpose material
- ✦ Beauty
- ✦ Nurture curiosity & imagination
- ✦ Educational

## MINI GREENHOUSE

- ✦ Create microclimate
- ✦ Increase yield
- ✦ Season extension
- ✦ Start seeds

## INDOOR PLANTS

- ✦ Increase yield (microgreens, sprouts)
- ✦ Beauty
- ✦ Detoxify air
- ✦ Waste for the compost
- ✦ Educational

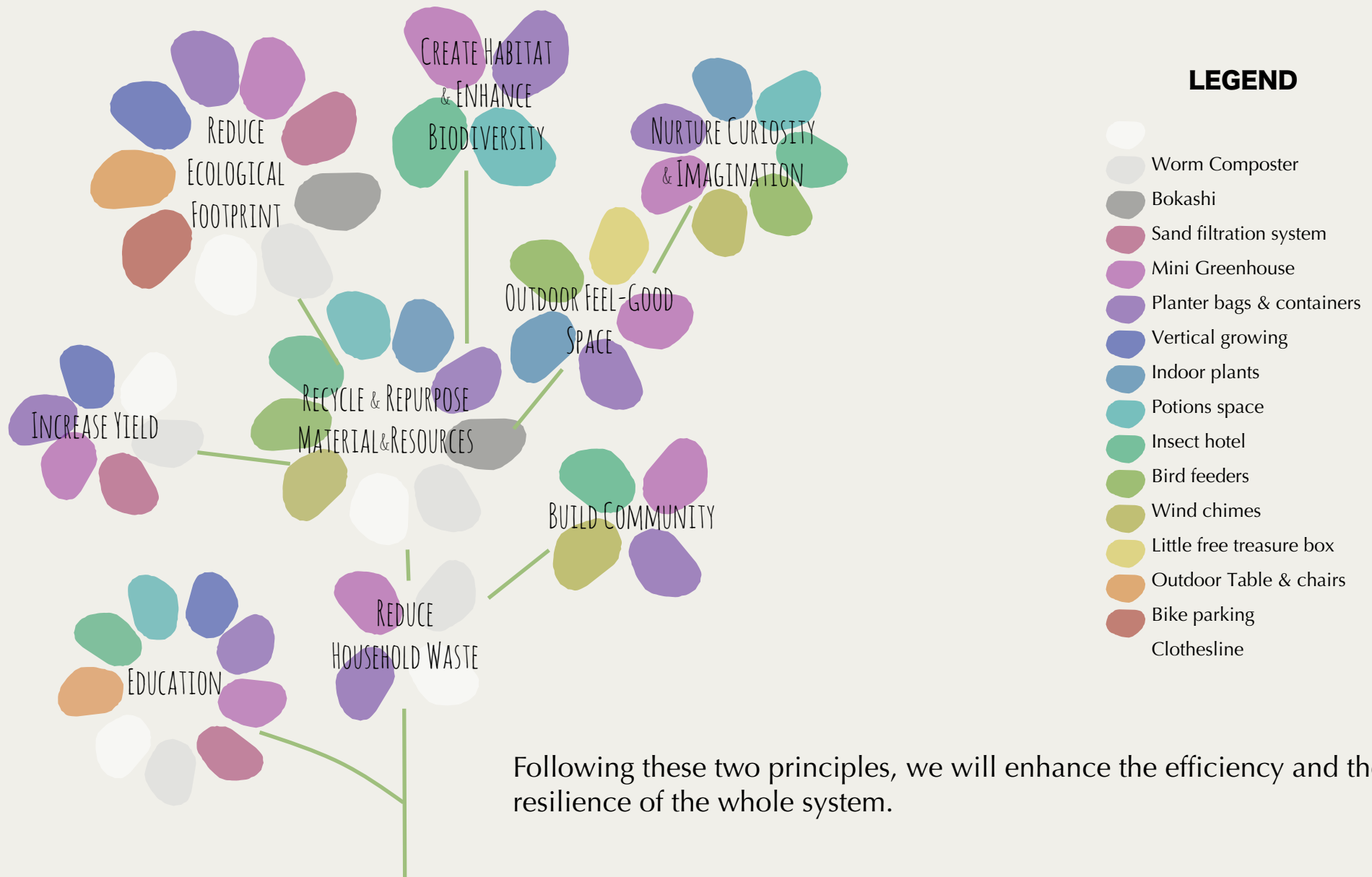
## POTIONS SPACE

- ✦ Playing space
- ✦ Nurture curiosity & imagination
- ✦ Recycle & repurpose material

## LITTLE FREE TREASURE BOX

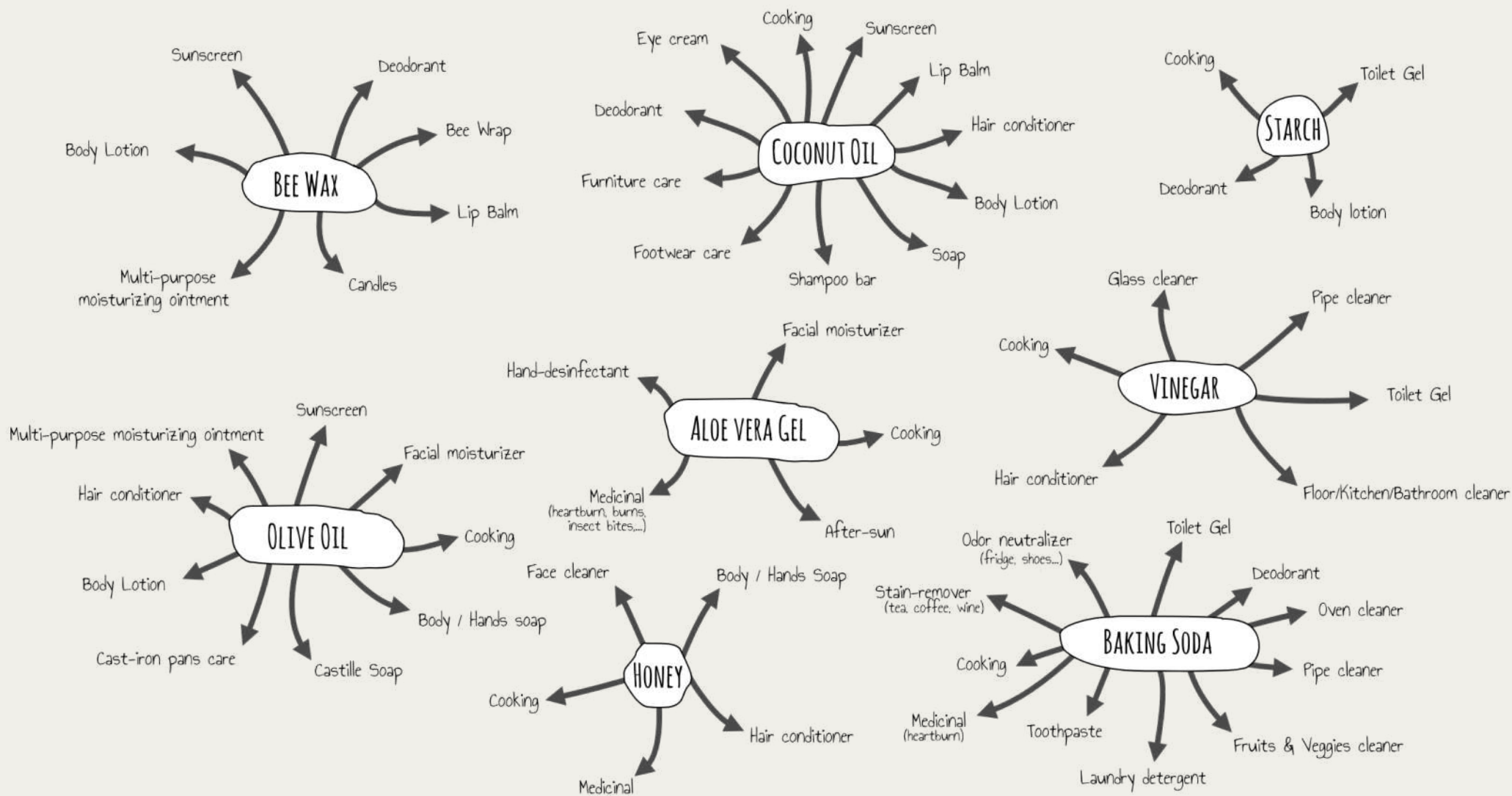
- ✦ Place to share any special thing/treasure/seedling (Fair share)
- ✦ Cultivate spirit of generosity (Care for the people)
- ✦ Build community
- ✦ Recycle & repurpose material
- ✦ Allows you to talk with people you usually don't speak with
- ✦ Nurture curiosity & imagination

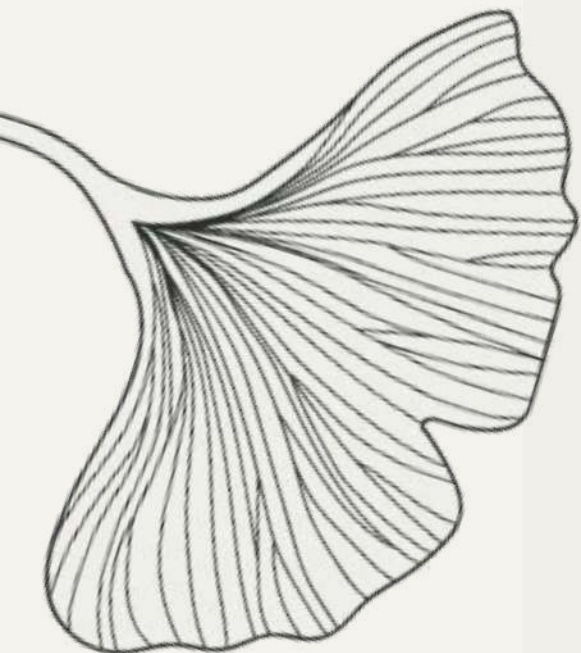
# ... And each important function is supported by many elements



# Ingredients found in kitchen cupboards

There are many ways of making cosmetic and cleaning products. Most of the time this involves rare and non-sustainable ingredients. But, if we want to make natural, non-toxic and low-waste products, we can just look in our kitchen cupboards. Ingredients found in there can have many functions. Here we will look at how to maximize the use of the ingredients we find in our kitchen. As for the elements in a land-base design, these ingredients can perform many functions.





# Design





# Built Environment



Since we are renting this house, we are not allowed to do any modification on the built environment. Luckily, this house has a passive solar design. Principal windows (and rooms) are oriented southwards to maximize solar gain in winter, but the balcony and roof are large enough to block the sun in summer. All the windows are double-paned with gas filled inter-pane voids. The only “problem” is that the house is not well insulated. But traditional Japanese houses are not well insulated because of the very hot and wet summers (everything molds), so the house needs to breathe in summer. Winter insulation will be improved by adding foam strips in every window (easily removable in summer and when we leave the house). Thick curtains will also help with the insulation.



# Water System



The vast majority of Japanese houses have many features for grey water use. Toilets have an incorporated sink, and the washing machine is always beside the bathtub since it has an intake pipe that you immerse in the bathtub to reuse the water. The drain for the washing-machine is just a hole on the floor of the bathroom, so it is really easy to collect the water afterwards. (This drain system is very useful in case of strong earthquakes. Water will always find its way to the drain, and there won't be any water damage due to the earthquake.)

Bathrooms are built as wet-rooms and traditionally, there is a specific pattern for bath-time: you never go in the bathtub after filling it. First, you wash your body outside of the bathtub, sitting on a stool and using a small bucket for taking water from the bath. Once your body is clean, you can enter the bathtub. That way, the water in the bathtub stays clean, and everybody in the house can use the same water. You can even cover the bathtub to maintain water temperature and also reheat it. When it is time to empty the bath, you can reuse the water in the washing machine.

Features we have in the house:



Grey water system in the toilet



Washing machine beside the wet-room

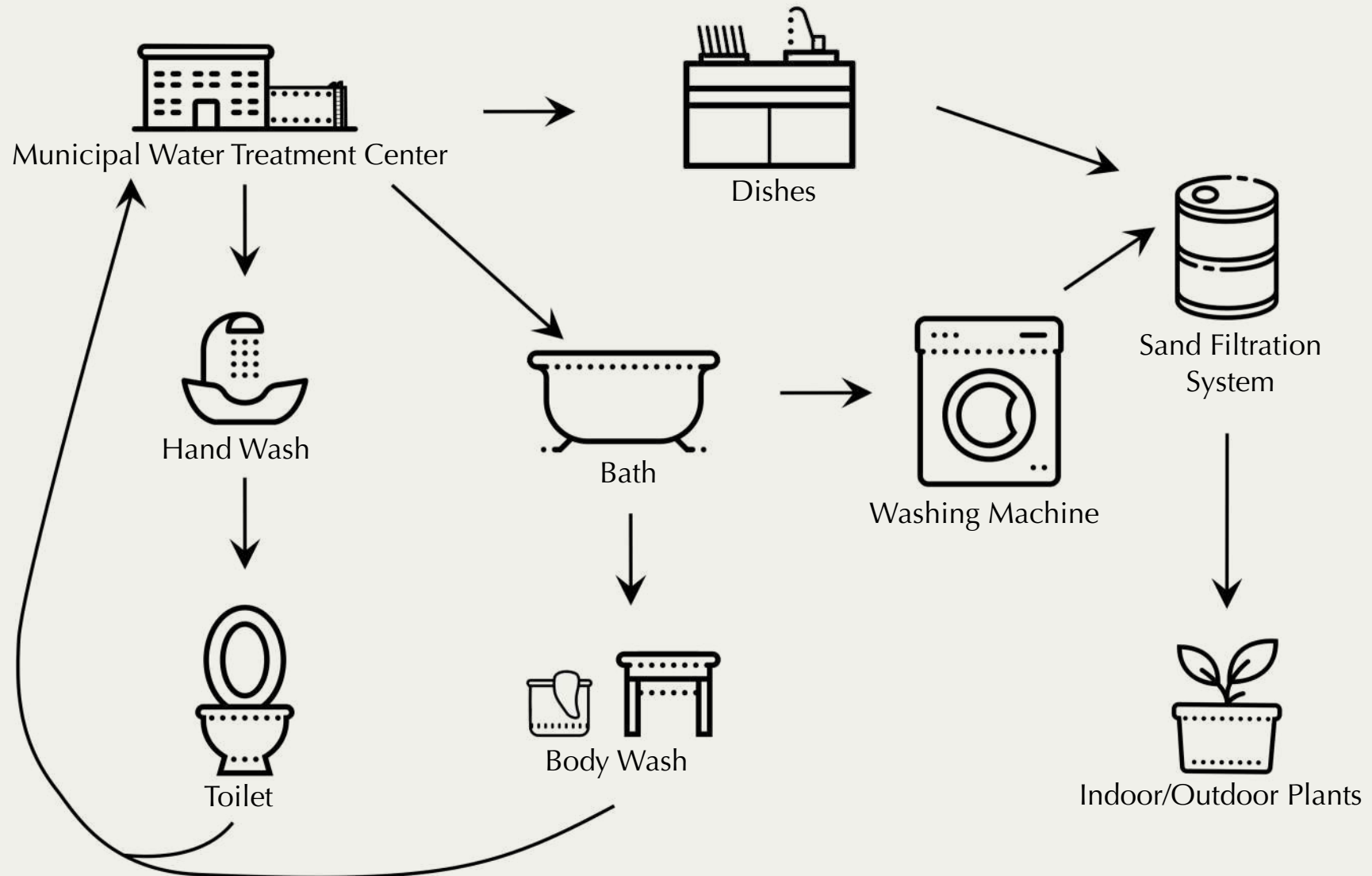


Bathtub cover & water reheating system

# Water System



Here, we will maximize the use of the grey water systems of the house, and we will add a couple of buckets to collect the water from the kitchen sink and washing machine and use it to water the indoor and outdoor plants after filtration. The land owner doesn't want us to install rainwater barrels.

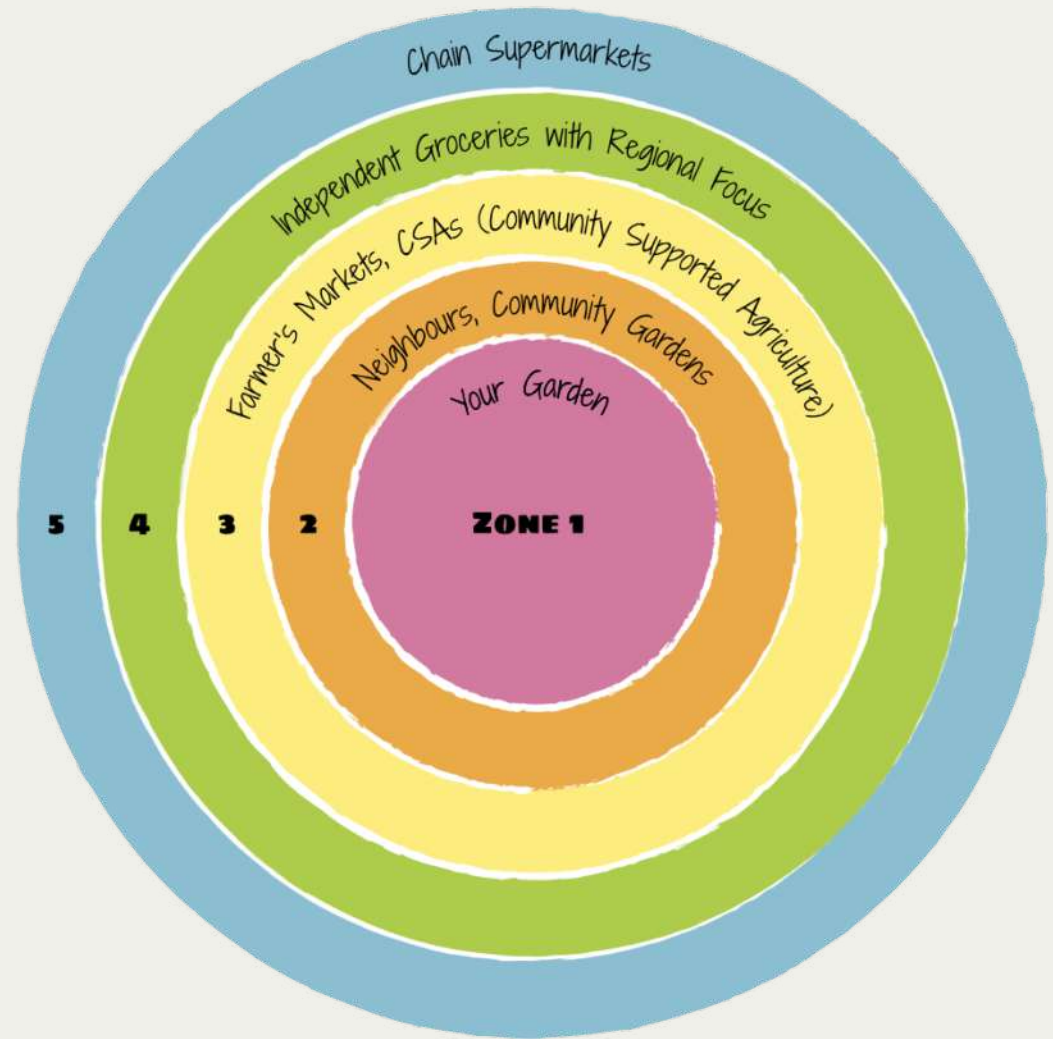


# Food System



Using the foodshed zoning system will help us reduce our ecological footprint, connect with our local community and, will point our resources, money, and energy toward building, supporting, and enhancing exactly the food system that we want to see in the world.

We will favor the food we can get in the inner zones and will try to avoid zone 5's corporate chain groceries and big-box stores.



Foodshed zones (Adapted from The Permaculture City – Toby Hemenway)

# Food System



**Zone 1:** We will plant **vegetables** in containers outdoor, plant **microgreens** and **sprout** seeds indoor. We don't buy process food, and **make everything from scratch**.

**Zone 2:** We are on the waiting list for a 30m<sup>2</sup> plot in a **community garden** (at only a five minutes bike ride from home) that should be available on March 2021. In the meantime, we will work in implementing the T.I.S. **School garden** so we can get some of our vegetables and fruits from there. We don't get any food from the **community garden** at our sport center but it helps us grow food for people in need. Finally, we have a good relationship with our **neighbour** who gives us delicious veggies.

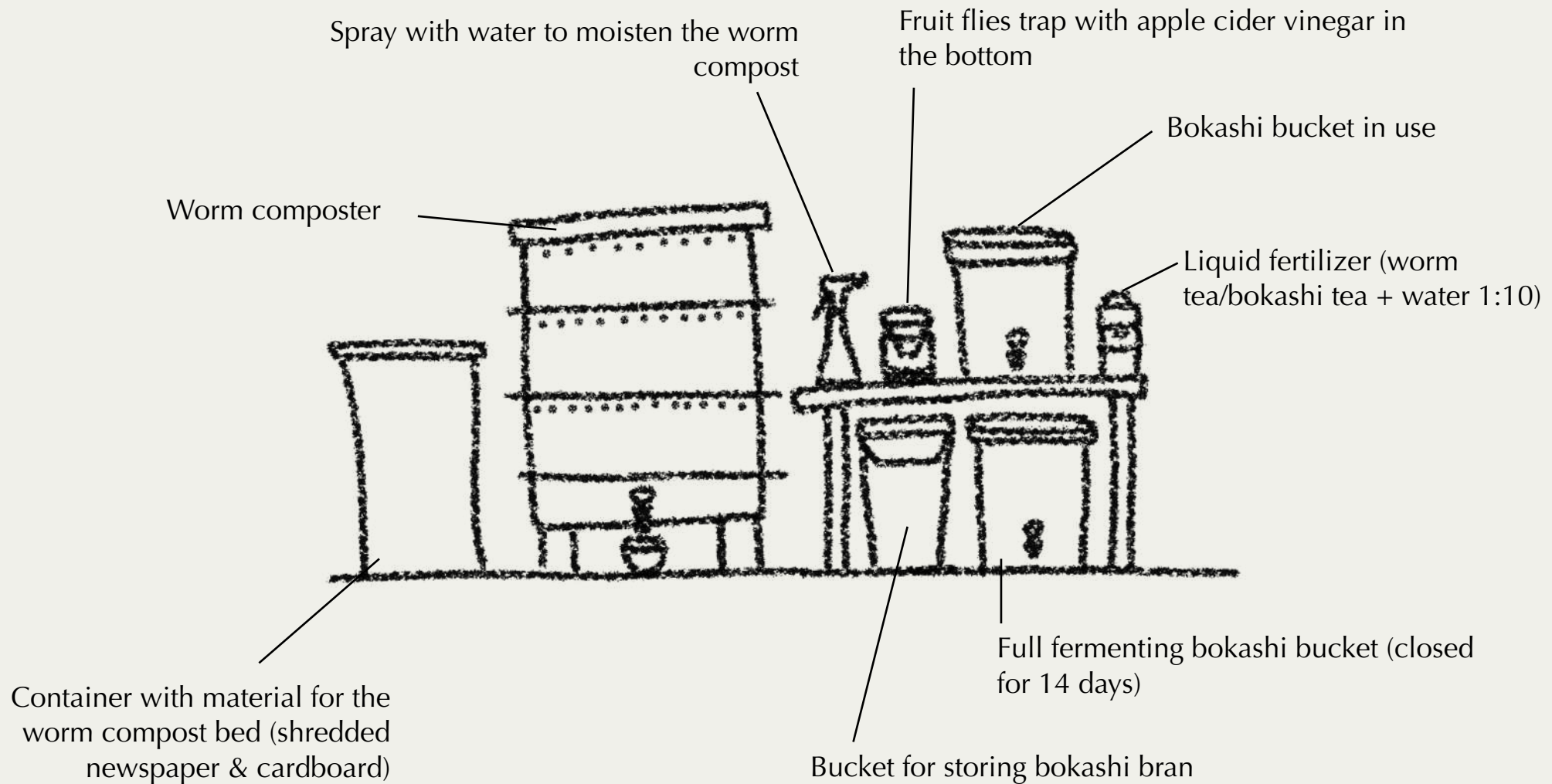
**Zone 3:** The local **farmer's market** is situated in our zone 3 in our Zones in the City Map and is not very close to the house, but I can stop by once or twice a week when I go to my Japanese lessons. There we can buy locally grown fruits and veggies, as well as other products like eggs, meat, fish, rice, noodles, dry beans, honey... While not having a plot in a community garden, the vast majority of our food will be bought here, since our garden and the school garden won't be able to feed a family of five. Once we get out plot, we expect to depend less on the farmer's market. During harvest season, we can visit our **local orchards**, where we can pick our own fruit (strawberries, cherries, prunes, peaches, pears, and apples).

**Zone 4:** In this zone we will have our **independent natural-food store** near the farmer's market were we can find some other products. This zone should be rarely visited compared to the inner zones. Focusing our diet on locally grown food we can find in zones 1-3 and processing them at home via canning, drying, pickling, and baking will reduce our visits to zone 4.

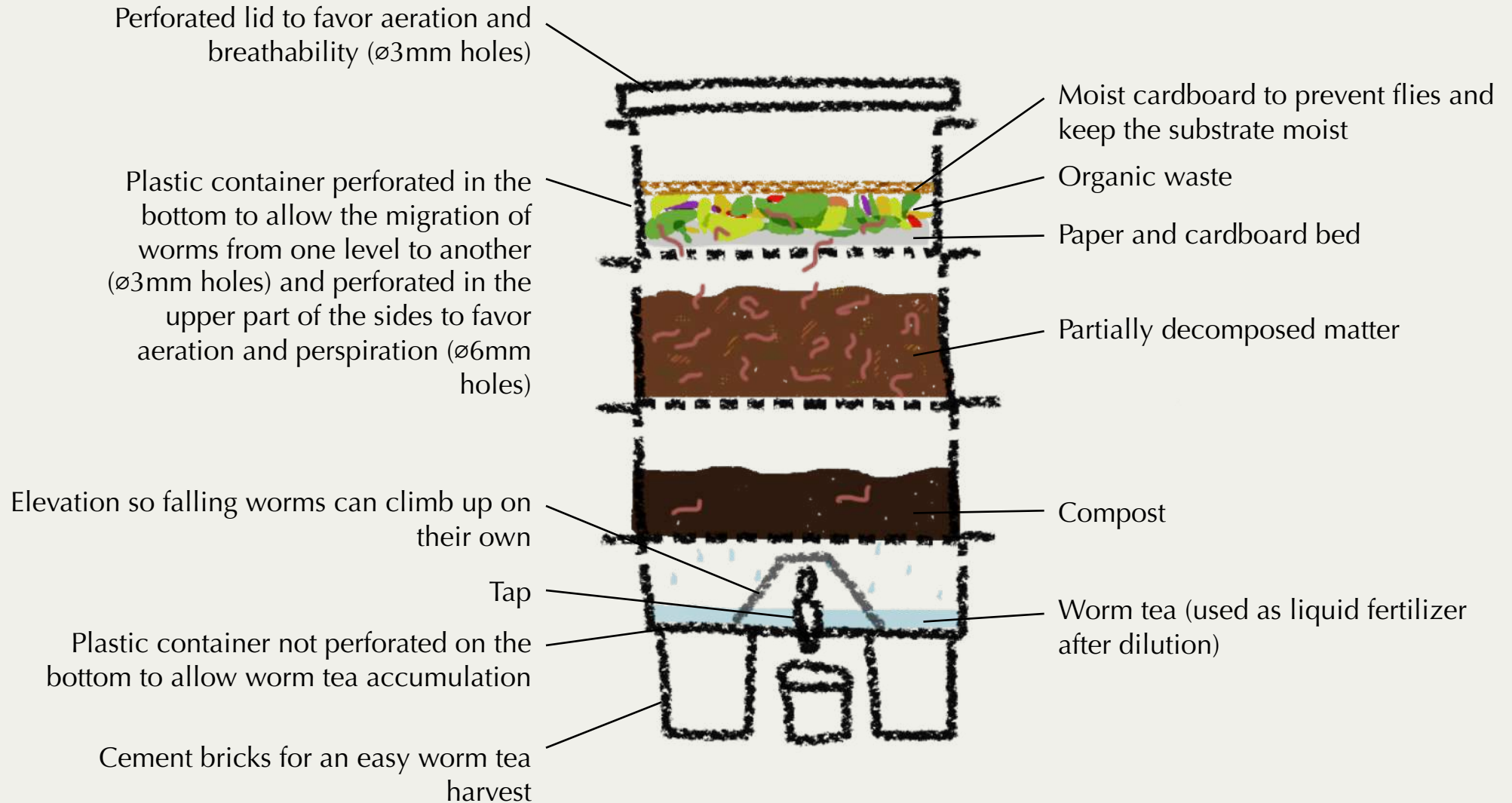
**Zone 5:** We will try to **avoid** the chain grocery stores as much as possible, and if we can't, we will not buy any produce we are able to find in one of the closer zones.



# Waste System: Composting System



# Waste System: Worm Composter



# Waste System: What goes where



# Waste System : Sustainable Household Consumption



In our household we follow the **5 R's** of zero waste living:



Pyramid of Needs



The Zero Waste is in accordance with several principles of permaculture, such as:

PRODUCE NO WASTE The basis of the Zero Waste movement

USE AND VALUE RENEWABLE RESOURCES AND SERVICES Reuse things creatively

USE SMALL AND SLOW SOLUTIONS Small individual changes made globally can create a big global change

THE PROBLEM IS THE SOLUTION Often what is waste for some can be resources for others. There is not such thing as waste!



# Waste System



We reduced our belongings to the minimum when we moved to Japan. Before buying anything, we always ask ourselves: Do we really need it? If so, can I ask a friend/rent it? Can I find it second hand? If we have to buy from the first hand market, can we find it locally/ethically/naturally made? For example, the only pieces of furniture we bought brand new were the mattresses, everything else we found second hand. As for clothes, we usually find everything we need in thrift stores or clothes swaps. We also love making everything from scratch: food, beer, clothes, house cleaners, cosmetics, up-cycling, any DIY project....

The principal sources of waste in this design are **food waste**, **packaging** and **scrap paper** (André's work papers, always printed on one-side....). In Japan, everything is ultra-packaged with several layers of plastic and zero waste stores where you can buy anything in bulk do not exist out of Tokyo.

## Methods to reduce our household's waste

### FOOD WASTE



- 🌱 Worm Composting
- 🌱 Bokashi

### PACKAGING



- 🌱 Refuse extra packaging
- 🌱 Reduce purchases
- 🌱 Buy second hand
- 🌱 Buy in bulk
- 🌱 Always carry tote bags in handbag, backpack and car

### SCRAP PAPER



- 🌱 Reuse paper for notes, children's drawings and crafts
- 🌱 Worm composting
- 🌱 Planters in spring

# Natural body and house care



Closets usually overflow with cosmetic and cleaning product. Besides producing a huge amount of plastic waste, they also contain ingredients that are not so good for our health and that will end up polluting the environment. Making our own body care and cleaning products will allow us to reduce the number of products we use, reduce our waste and choose healthy and biodegradable products. This way, we will take care of the people (in the household, and Friends) as well as take care of the earth (by not using petroleum-based products and using biodegradable products).

## Toothpaste:

- 🍯 1 tbsp of baking soda
- 🍯 3 tbsp of white clay
- 🍯 5 drops of peppermint essential oil
- 🍯 ½ tsp stevia

Mix all the ingredients until you get a homogeneous mixture.

## Deodorant:

- 🍯 80g coconut oil
- 🍯 68g of baking soda
- 🍯 40g corn/potato/arrow-root starch
- 🍯 10g beeswax
- 🍯 20 drops of lavender essential oil
- 🍯 20 drops of tea tree essential oil
- 🍯 20 drops of patchouli essential oil



Melt the coconut oil and beeswax in a water bath. Add the baking soda, starch, and essential oils. Mix and chill in the fridge so the ingredients don't have time to separate.



# Natural body and house care








## Facial moisturizer:

-  1 part *Aloe vera* gel
-  ¼ part jojoba oil







Put the ingredients in the palm of your hand. Rub your hands and spread on your face.

## Multi-purpose moisturizing ointment:

-  5 tbsp olive oil
-  2 tsp beeswax
-  2 tsp rose water
-  1 tsp glycerin
-  4 drops of rosemary essential oil

Melt the olive oil and beeswax in a water bath. Let it cool and add the rose water first, followed by the other ingredients. Pour in container while the mixture is warm.

## Body lotion:





-  22.5g coconut oil
-  15.5g olive oil
-  7g beeswax
-  7g shea/cocoa butter
-  4ml corn/potato/ arrow-root starch
-  12 drops of lavender essential oil

Melt the vegetable oils, butter and beeswax in a water bath. Let it warm and add the starch and drops of essential oil. Chill the mixture in the freezer for 10-20 min. Mix until the same consistency as the whipped cream is reached.

# Natural body and house care





## Lip Balm:

-  12g cocoa butter
-  20g coconut oil
-  16g beeswax
-  32g sunflower oil



Melt the oils and beeswax in a water bath. Remove from heat, mix properly and pour into 15ml bottles.

## Sunscreen: (250ml)

-  90g coconut oil
-  65g olive oil
-  28.5g beeswax
-  27.5g shea butter
-  40g zinc oxide
-  ½ tsp vitamin E

Melt the oils, butter and beeswax in a water bath. Remove from the heat, and add the zinc oxide. Mix with the blender until no lumps remain. Pour into a glass jar and chill in the fridge so that the ingredients do not separate.

## Eye cream:

-  60ml coconut oil
-  1.2ml of vitamin E

Mix the two ingredients for 5-6 minutes until obtaining an opaque and creamy consistency.

## Hands disinfectant:

-  100ml *Aloe vera* gel
-  50ml rubbing alcohol



# Natural body and house care



## Oatmeal & Honey Soap: (Body, hands)

- 🍯 500ml olive oil
- 🍯 75g lye
- 🍯 170ml distilled water
- 🍯 50g colloidal oatmeal
- 🍯 20g powdered milk
- 🍯 2 tbsp honey

Add the lye to the water (never the other way around) and mix carefully. Let cool until the temperature drops below 57°C and add the mixture to the oil. Mix until the mixture reaches trace. Add the oatmeal, milk powder and honey and stir again (5-10 min). Pour the mixture into the mold and spray rubbing alcohol on the surface of the mixture. Unmold after one week, cut and let cure in a well-ventilated place for 3-5 weeks.

## Shampoo Bar:

- 🍯 935.5g coconut oil
- 🍯 355.5g distilled water
- 🍯 154g lye
- 🍯 14-28g essential oils (optional)

Add the lye to the water (never the other way around) and mix carefully. Let cool until the temperature drops below 57°C and add the mixture to the melted oil. Mix until the mixture trace. Cover and heat over low heat for 45 minutes - 1 hour. Pour the mixture into the mold. This soap is very hard, so it must be cut as soon as the mixture solidifies. Let cure in a well-ventilated place for 2-3 weeks.

# Natural body and house care



Castille Soap: (Stain-remover, dishes, laundry)

- 🍯 935g olive oil
- 🍯 120g lye
- 🍯 309g distilled water
- 🍯 1 tbsps sea salt
- 🍯 28g orange essential oil x10
- 🍯 14g black pepper essential oil

Dilute the salt in the water. Add the lye to the water (never the other way around) and mix carefully. Let cool until the temperature drops below 57°C and add the mixture to the oil. Mix until the mixture reaches trace. Incorporate the essential oils. Pour the mixture into the mold and spray rubbing alcohol on the surface of the mixture. Unmold after 48-72 hours, cut and leave to cure in a well-ventilated place for 3-5 weeks.

Laundry detergent:

- 🍯 140g castille soap
- 🍯 250ml baking soda
- 🍯 3l water

Grate the soap. In a large pot, heat the water and the grated soap and allow the soap to melt, stirring occasionally. When it is almost melted, add the baking soda.

Pipe cleaner:

- 🍯 Baking soda
- 🍯 Vinegar

Pour half a cup of baking soda down the drain and pour half a cup of vinegar. Wait about 20 minutes for the mixture to act. Then pour about 3l of boiling water down the drain.

# Natural body and house care



## Multi-purpose cleaner:

🍯 1l water

🍯 ½ l vinegar

🍯 20-30 drops lemon essential oil

Mix all the ingredients in a sprayer.

## Toilet Gel:

🍯 200ml vinegar

🍯 200ml boiling water

🍯 3 tbsp corn/potato/arrow-root starch

🍯 3 tbsp baking soda

🍯 30 drops essential oil (tea tree, eucalyptus, mint, lemon, grapefruit)

Mix the baking soda and starch. Add 50ml of cold water and beat. Add 200ml of boiling water and beat again.

Finally, gradually add the vinegar and essential oils.

## Glass-cleaner:

🍯 ¾ l water

🍯 ¼ l vinegar

Mix all the ingredients in a sprayer.

## Oven-cleaner:

🍯 2 parts baking soda

🍯 1 part water

Mix until you get a soft but not runny paste. Apply to the surface and let it rest for at least 20 minutes. Clean with a sponge and water.

# Outdoor Components Map



- 1 Bike parking
- 2 Worm composter & Sand filtration system
- 3 Mini greenhouse
- 4 Potions space
- 5 Insect hotel
- 6 Bird feeders on cherry tree
- 7 288L planter bags
- 8 Garden containers
- 9 Clothesline
- 10 Table & chairs
- 11 Wind chimes
- 12 Vertical growing on fence
- 13 Little free treasure box (attached to the fence but facing the park)





# Plants, Trees & Gardens



There are several strategies to access land in urban spaces including using public land (community gardens), using somebody else's property, gardening in containers, guerrilla gardening...

In this case, we will focus on using 288L fabric planters, hanging baskets and other smaller **containers** to plant a variety of edible, aromatic and insectary plants, and on **vegetalizing the fence** that separates the property from the park to add some privacy and increase yield. A small **greenhouse** will help starting seedlings in spring.

The whole family will take part in the plant selection, and the plants will be planted following **guild and companion planting thinking**. By using diversity and by stacking plants in time (planting several crops a year) we will be able to obtain a yield during the whole year, and not only during summer.

Since the second floor is very hot in summer, we will grow **climber vines** on the South-facing balcony to create some shade and, thus obtain a nice cooling effect.

Indoors, we will have a variety of detoxifying plants. In the kitchen, we will grow cooking herbs and make **sprouts** and **microgreens** which are a great source of nutrients and antioxidants as well as a great project for the children.

We will also expand our possibilities by taking part in the little **community garden** of our sports centre and in the school's future **school garden** which I am designing. This is an awesome way to create community.

Finally, we are a family of **garden guerrilleros**, and we really enjoy planting seeds anywhere we are.

# Outdoor Plant Species List



LAYER OF FUNCTION	ROOTS	GROUND COVERS	HERBS & VEGGIES	SHRUBS	TREES	CLIMBERS
EDIBLES	Allium Radish	Strawberry Watermelon	Chard Spinach Tomatoes Eggplant Lettuce Kale Zucchini	Wild raspberry	Cherry tree Dwarf lemon tree	Cucumber Kiwi Luffa
MEDICINALS & AROMATICS	Turmeric Ginger Dandelion	Mints Plantain	<i>Calendula officinalis</i> Marigold Basil Coriander Parsley Yarrow Oregano	Lavender Rosemary Sage		
N <sub>2</sub> FIXATION & MINERAL ACCUMULATORS		Clovers Squash	Lemon Balm Sweet peas			Beans
INSECTARIES		Nasturtium Thyme Ground Ivy	Petunias Geraniums Dahlias Jasmine Gerberas Daisies			Morning Glory

# Animal System



The main idea here is to encourage wildlife for the benefits they bring to the ecosystem. We will attract pollinators, predators of insect pests, decomposers by planting wildlife-attracting plants, and increasing the biodiversity overall. The addition of a worm composter will help us to reduce waste, as well as feeding the plants.

For example, caterpillars can be very invasive and voracious in vegetable gardens in Japan (no yield for us during the first season... they ate EVERYTHING!). Since ladybugs and birds are good caterpillar predators, we will try to attract them. Ladybugs are attracted by yellow and white flowers, so we will plant more calendula, cilantro, marigold and yarrow. We also need to let the pests in place for them to eat, and we may attract more prey for them by planting nasturtium, marigold and radish, since they are very good attracting aphids. Ladybugs also need shelter. So, we will make sure that we keep a nice layer of mulch on the planters and we will build an insect hotel in the little raised bed to provide a warm place for them to stay during the winter. Finally, we will attract birds by leaving the cherries in the tree, and by installing a bird feeder.

During the nesting season, in order not to disturb the barn swallows, we will avoid using the entrance, and we will use the kitchen door. Barn Swallows return to the same nest season to season and will make repairs to the nest if needed, so the nest will not be removed in winter.



Barn swallow nesting in the entryway

# Technology, Transportation & Energy



Solar water heating system on the roof & clothes drying on the clothesline

The house is connected to municipal gas (for water heating and cooking), and electricity networks. The house's passive solar design reduces the overall energy consumption, but we will try to minimize our consumption by:

- ☞ Adding insulation
- ☞ Adding thick curtains
- ☞ Using clotheslines
- ☞ Not using air conditioning
- ☞ Using the solar water heating system as much as possible
- ☞ Using solar energy in the outdoor lights

As for transportation, walking and biking will be our first choice. When not possible, we will favour the use of public transportation, since the bus, train, and subway's network work perfectly here in Japan, and the subway station is only at a two minutes walk from the house. Finally, even if its consumption is low, we will use our second hand hybrid car as a last resort.



# Chaos & Catastrophe



Japan is the land of natural catastrophes: earthquakes, tsunamis, volcanoes, typhoons, landslides, floods, heat waves... you name it. Everything is designed to face these hazards in an ultra-efficient way.

The house is built to resist earthquakes (did not have a scratch after a 9.0 in Richter scale earthquake), the windows have metallic roller blinds in case of typhoons and the house is slightly elevated from the outdoor ground level to prevent floods. The nearest evacuation shelter is situated at a 10 minutes uphill walk from our house.

In case of evacuation, we will have an emergency kit at home. This will include: dry food, water, flashlights, whistles, solar-radio, batteries, candles, matches, thick gloves, spare underwear for everybody, masks, survival blankets, some cash, and a photocopy of all important papers (passports, IDs, certificates...).

## Emergency Survival Kit



NON-PERISHABLE  
FOOD



WATER



FIRST-AID KIT



MEDICINES



MASKS



SURVIVAL BLANKETS



THICK GLOVES



UNDERWEAR



THICK SOCKS



WHISTLE



BATTERIES



PORTABLE RADIO



FLASHLIGHT



LIGHTER/MATCHES



CANDLES



EMERGENCY CONTACT  
INFORMATION



PASSPORTS/IDS



CASH

# Social & Invisible Structures



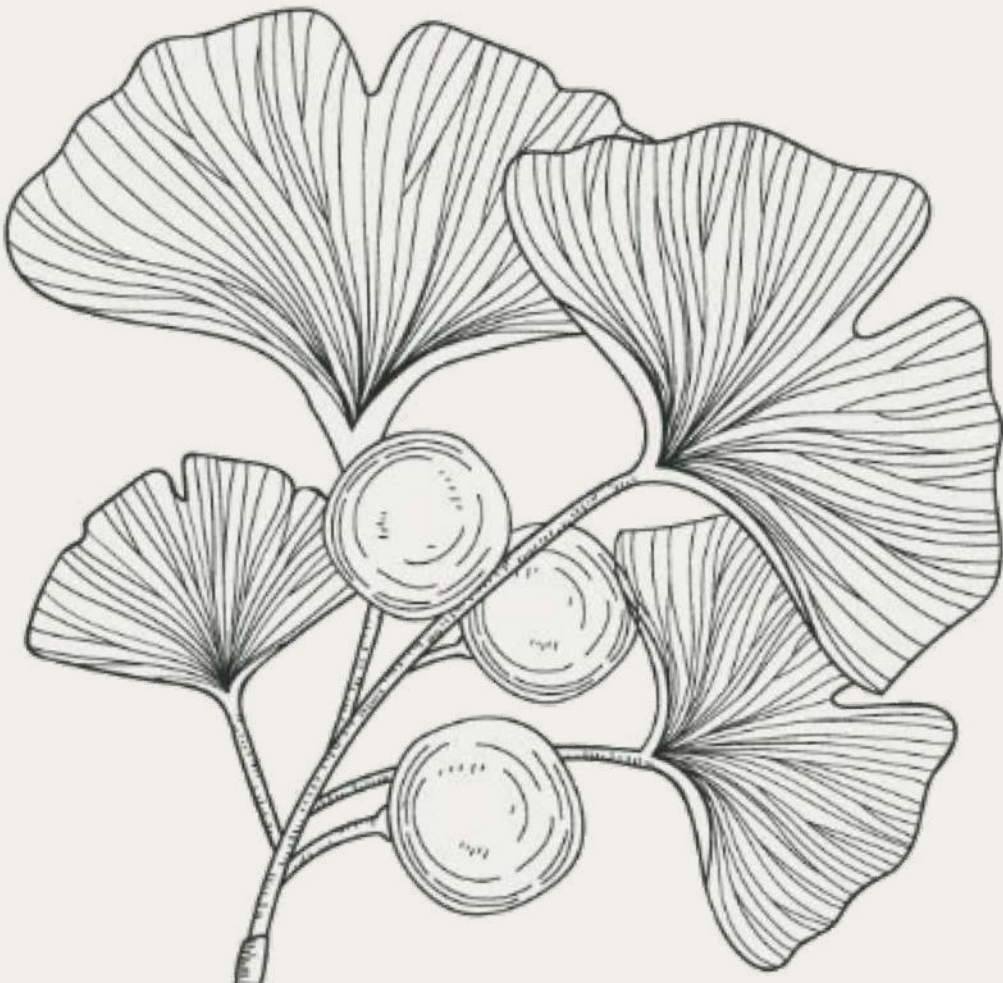
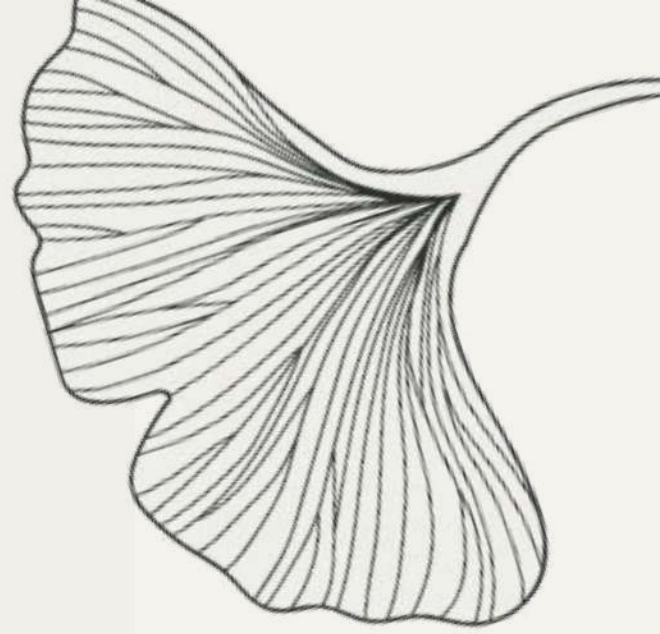
The first invisible structure is us. Many problems in a project are caused by the people in or around the project.

I will do a separate design of my inner landscape using Looby Macnamara's "People & Permaculture" book, as well as Heather Jo Flores's mini-courses on Emotional Permaculture and Daily Practice.

André's mood has a huge impact on this design. He has the whole financial charge of the household but he is struggling to adapt to the work system in Japan (toxic environment). We will try to give him all the emotional support he needs.

Finally, all the design is thought around the fact that there are more children than adults in the house. Components need to have educational, creative & playful functions. For example, growing sprouts indoors and vegetables outdoors can be a good science, responsibility and resilience lesson as it can be fun for children. Making wind chimes with different things found in the forest or the beach is a nice creative way to learn to make things with our hands using only the resources that are available. We will also add a potion corner on the raised bed for their experiments and little free treasure box in the park which will be great to meet people and build community.





# Implementation

# Implementation

TASKS	2019	2020	2021-2022
<b>Zone 1</b>			
Buy & install clothesline poles			
Insulate windows with foam strips			
Prepare emergency survival kit			
Start growing sprouts			
Start seed growing project (starting seeds from any fruit we eat), and or growing back veggies (i.e. lettuce)			
Start using water from the bath in the washing machine			
Create indoors grey water collecting system in the kitchen & near washing machine			
<b>Zone 2</b>			
Set outdoor seed start & growing area			
Buy & install 288L fabric planters			
Add more containers			
Plant all the outdoor plants			
Mulch containers			
Create privacy fence by planting climbers			
Create potions corner			
Set the outdoor sitting area & solar lighting			
Build insect hotel			
Build & Install bird feeder on cherry tree			
Make things to decorate the outdoor space (wind chimes, garlands,...)			



# Implementation (continued)

TASKS	2019	2020	2021-2022
<b>Zone 3</b>			
Adapt corner for bicycle parking			
Build worm composting system & start composting			
Build grey water sand filtration system			
<b>Neighbourhood</b>			
Build & install Little free treasure box			
Share seeds, seedlings, plants & materials with neighbours			
Stewardship of neighbourhood green spaces			
<b>Community</b>			
Share seeds, seedlings, plants & materials with neighbours with school & sports centre community			
Work on school garden project			

# Implementation

In spring 2020, we started the gardening project. We started seeds indoors and in the little greenhouse. We also added geotextile planters and many other containers we found second hand. The summer's harvest included strawberries, pole beans, sweet peas, cucumbers, tomatoes, zucchinis and many fresh herbs. The fall-winter harvest included kale, spinach and cabbages.



Seed starting



Greening the outdoor space



Season extension & potion-making corner



Containers





# Implementation

In autumn 2020, we started the composting project. We added two bokashi buckets in the kitchen, build our worm composter and greeted the new members of our family: our worms! Worms need a couple of months to adapt to their new conditions before the winter arrives.



Bokashi



Building the worm  
composter



Welcoming our worms (yes, our  
worms are multilingual!)

# Implementation



Winter 2020-2021 was the coldest Winter we had since we arrived to Japan. Unfortunately, earth worms die when temperature reaches the freezing point. So our way to apply self-regulation and respond to change was to move the worm composter to a full sun spot, so the black plastic of the bin would help to absorb sun radiance and warm the worm bin. We also covered it with a cardboard box and felt fabric to enhance the insulation and avoid losing internal heat.

We also observed that our house was in the daily route of a stray cat. Once the cold arrive and in order to help him survive Winter, we started putting some cat food outside and the cat started coming every day. We also added a cardboard box with some blankets under the worm composter so the cat could use it as a shelter as well as warm the worms (Stacking functions).



Worm bin, ready for Winter & cat shelter



# Implementation



In order to include our children in this design, we wanted to include fun, educational and, creative components. The kids love starting and eating sprouts and microgreens. They also love growing plants from random fruits & veggies they find in our fridge. As for today, we grew avocados, sweet potatoes, lemon trees, kiwis, peppers, oignons, lettuces, pineapples and many more.



Propagation and germination corner in the kitchen

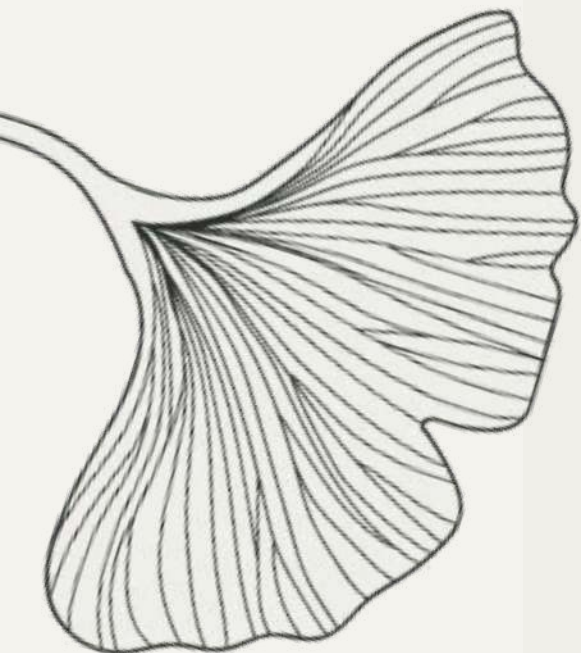
Homemade macrame hangers



We also teach them many ways to use their hands to learn different ways of using their creativity, ways to relax and ways to be more responsible in their consumption habits. They have learned how to use manual tools safely, knit, crochet, macramé, sew, etc. All the material is accessible for them to use and, they are always eager to learn new skills.



Transforming our dining table in a ping-pong table using clamps and crocheted net. Rackets and balls were found second-hand.



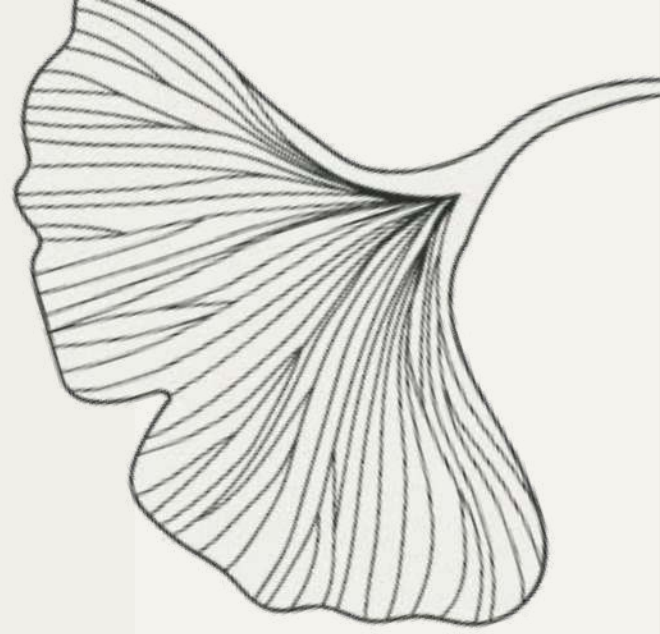
# Maintenance



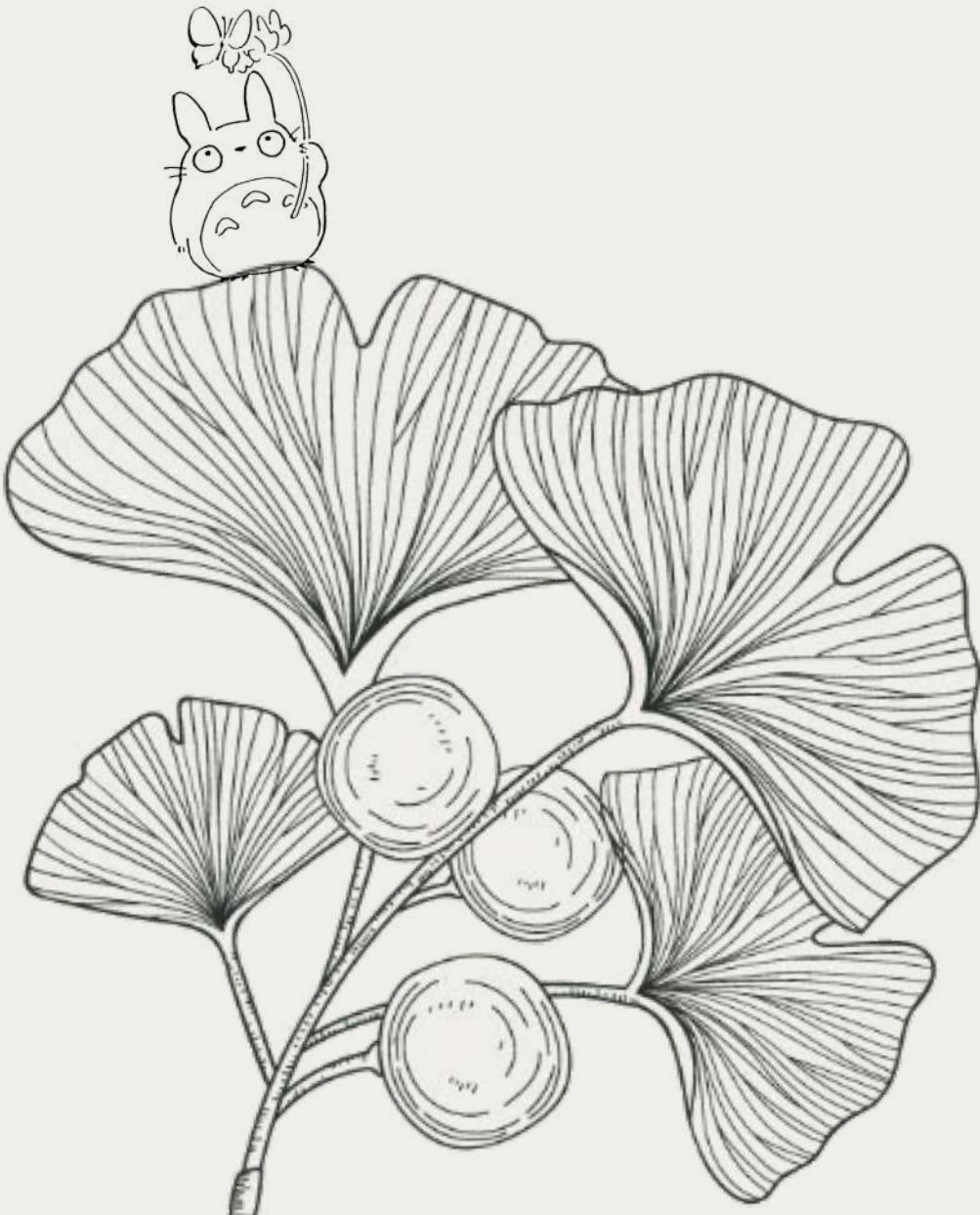
# Maintenance Plan

JANUARY	Water, weed & mulch planters Harvest & share harvest Order any new seeds required	AUGUST	Water, weed & mulch planters & containers Harvest & share harvest
FEBRUARY	Water, weed & mulch planters Harvest & share harvest Start & exchange seeds Seedling care	SEPTEMBER	Water, weed & mulch planters & containers Harvest & share harvest Check & update Emergency Survival Kit
MARCH	Water, weed & mulch planters Harvest & share harvest Start & exchange seeds Seedling care	OCTOBER	Direct sow winter veggies Water, weed & mulch planters & containers Harvest & share harvest
APRIL	Water, weed & mulch planters Harvest & share harvest Start & exchange seeds Seedling care Direct sow in containers	NOVEMBER	Direct sow winter veggies Water, weed & mulch planters Harvest & share harvest Add insulation foam on windows
MAY	Remove insulation foam on windows Direct sow in containers & plant seedlings Water, weed & mulch planters & containers	DECEMBER	Direct sow winter veggies Water, weed & mulch planters Harvest & share harvest
JUNE	Direct sow in containers & plant seedlings Water, weed & mulch planters & containers	DAILY	Empty grey water buckets in sand filtration system Feed the worms Garden observation Evaluate & troubleshoot
JULY	Water, weed & mulch planters & containers Harvest & share harvest	WEEKLY	Water indoor plants Check excess liquid in bokashi bucket and worm composter





# Evaluation





# Evaluation



Leaving our life in the suburbs of Montreal, where we lived in a zero waste way, and owned a little plot where we could grow our food, and arriving to Japan, kingdom of single-use plastic, where we started a more urban life was quite a shock for the whole family.

Using slow and small solutions and creatively adapting ourselves to change, we managed to recover from the shock and realign with our values. Therefore, this design has been very helpful and made us realize that we could also live in accordance to permaculture ethics and principles in a heavily urbanized area.

This project also provided an opportunity to talk about permaculture and, eco-friendly, ethical and, healthy living with our Friends. Most of them come from different backgrounds and were eager to learn options that didn't follow the main stream.

Overall, this design help us understand that if we creatively adapt to change, we can live following permaculture ethics and principles, in any place, city or countryside, apartment or farmhouse.

