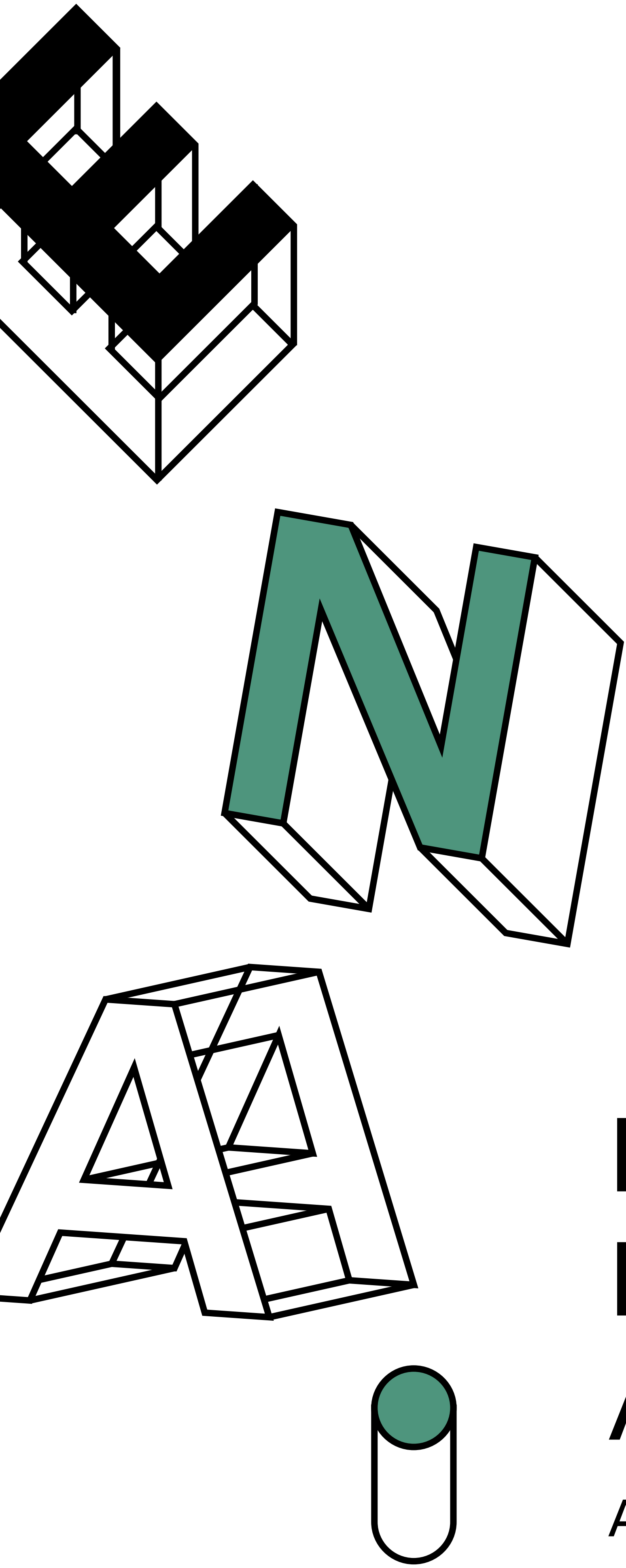

Experimental Network Autonomy

A lifeboat for the disembedded

open source document
Version 1.0

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Contents

INTRODUCTION


KASKANTINE

The KasKantine aims to contribute to a "future-proof city". We empower ourselves with tools to fight against climate change and biodiversity loss, and at the same time mobilize our community against its consequences.

We recycle materials together, manage food waste and cook with the neighbourhood. We create gardens and strengthen local knowledge and social networks.

In addition to our off-grid day-to-day functioning, we are also actively petitioning the municipality of Amsterdam to form a new relation with its citizens, allowing citizens to take over management of land and water in places where it is currently underused, and/or where the current management does not contribute to the well-being or sustainability of the neighbourhood. These can be temporary places, or places to which natural functions (i.e. gardens or biodiverse spaces) can be added. We work on formalizing these win-win situations into new land- and water-use contracts.

Whilst building on its new location, the KasKantine opened the Voedselkringloop ("the food chain"), a shop where food surplus from different shops and businesses are gathered and redistributed. We also started a communal garden, and are preparing a Greening the Neighbourhood plan and a bike repair workshop where people can learn how to fix their bikes. The restaurant is still waiting for official permits.

Fig 1.1 The Kaskantine in its third location in Nieuw-West, Amsterdam 2017.
Photo by Julie Ann Riemersma

For over six years, we[1] have been experimenting with the transformation of our urban lifestyle into one that is more locally integrated, and that produces more social value and meaning.

1. By "we" we mean people connected to the "the Kaskantine, a small urban farm cafe run in a cooperative way, as described later in this book.

Our objective in this manual is to deliver proof that a community can start to do so immediately without waiting on financial investments and governmental support.

We use local resources, and manage the environment in such a way that we contribute to a neighbourhood which is more pleasant, sustainable, resilient and future proof, and better able to face current and upcoming economic and ecological shocks.

The main "trick" that we developed, which we will demonstrate here, is that by living and working off-grid, we are able to use temporarily-available space in the city which is considered worthless by project developers and landowners for commercial use. With this off-grid technology, you can build a community from scratch in places where others are unwilling or unable to go! This place can then function as a learning and meeting hub, a basecamp A or GreenLab, for further strategies and initiatives in your neighbourhood.

In this experiment, we focus on common local problems and issues, listed next page, which many people living in urban areas are confronted with. With our technology, and as an active community, we can actually work towards answering these questions!

1 Waste management

how can we limit litter on the streets, as well as limit household waste? How can we better separate and reuse waste? How can we better limit consumption? How can we make and repair more of our things?

2 Energy use

how can we limit energy consumption and economise energy use? How can we produce our own green energy? How can more household and electronic appliances fit within a lifestyle where less energy is consumed?

3 Growing food

how can we green the house, the street, and the neighbourhood? How can we more efficiently and effectively grow our own food? How can we fix CO_2 using trees? How can we promote more flowers for bees and butterflies? Can we create a more natural habitat in our direct urban environment? How can we maintain a natural habitat while still producing food?

4 Water management

how can we collect and save more water in summer, or during drought? How can we more effectively use rainwater? How can we promote cleaner water in the canals? How can we test whether the water we collect is fit for our garden or consumption?

5 Citizen and neighbourhood engagement

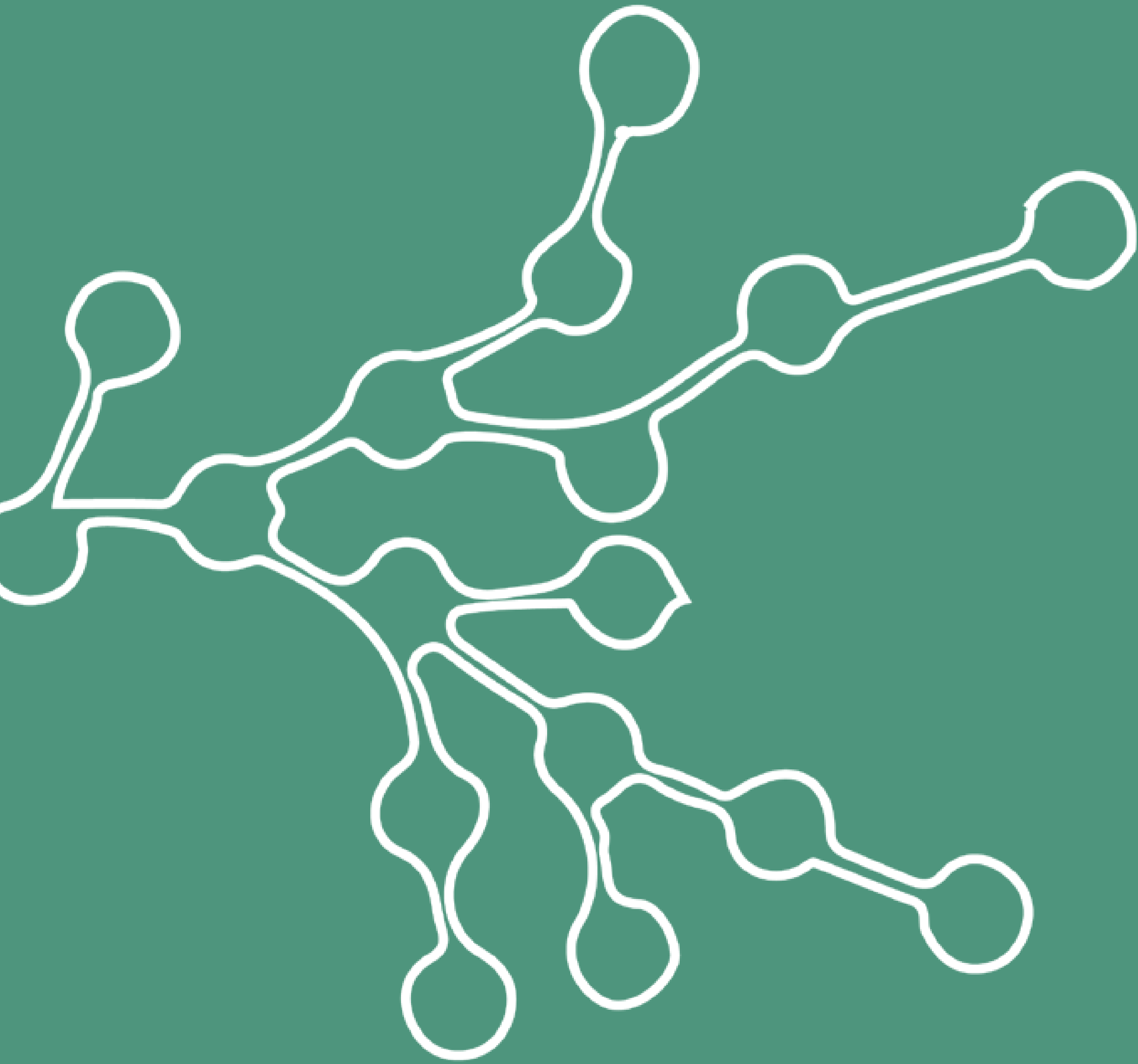
how can we mobilise our co-citizens? How can we involve children in these challenges, and how can we encourage children to transform the unsustainable lifestyles of many adults?

6 Systems and bureaucracy

how can we cooperate more effectively with systemic partners (e.g. government, market and educational sectors)? How can I co-plan, co-create and co-manage?

Fig 1.2 Volunteer working at The Kaskantine, Amsterdam 2015. Photo by Edwin Dominguez

This book is an open invitation to everybody who is willing to do some practical work, to be part of this experiment in taking back control over your life and your local environment. We offer some practical suggestions for working in a community to address some of the above questions.



WHAT IS EXPERIMENTAL NETWORK AUTONOMY (ENA)?

Our 21st century consumer lifestyles have negative impacts beyond the obvious social and environmental harm; we risk losing our ability to correct the course of the super tanker that is globalized society. We see more and more people less integrated and engaged in society and community, and many feel themselves as permanent migrants in an insecure world. It is time for a lifeboat! One that can sustain ourselves for some time and that fosters the values that we need: respect for eachother, space for nature, freedom of expression and equal opportunities. So, we started a life experiment by designing an "urban survival unit". Since the start of this project 6 years ago, we have rebuilt our community to its 4th version. We foster these above-mentioned values on a local level for our community, by gardening, cooking and fixing things together. Our unit consists of community-run, locally based, food, energy and water production systems, which are described in detail in this manual.

The overall question is to identify to what extent we can take (back) control of our basic life conditions in an urban environment in order to be more autonomous in producing the values that we need. To what extent are we able to empower ourselves on a local community level? Can we change society by not depending on the traditional institutes, such as state democracy, or market-driven technological solutions? How can we be in fact a good citizen, a good friend or a good neighbour in a society that seems to reduce options for attractive future perspectives, and trustworthy guidance?

Fig 2.1 Volunteer working in the vegetable garden at The Kaskantine in New West, Amsterdam 2017.
Photo by Julie Ann Riemersma

The political-economic system, as it develops right now, is producing too many negative social and ecological side effects, such as economic insecurity, inequality, environmental degradation, loss of habitat and biodiversity, to name a few. We could say with sufficient certainty that the paradigm of progress, namely that we need economic welfare to repair for the damage done by it, has lost its appeal. The degrees of freedom to act against the negative side effects are reducing so much that we see people start to revolt everywhere on the planet.

Our idea is to build a local production system and ecosystem that is able to thrive, parallel to the existing capitalist modes of production.

On a local level, with a small group of dedicated people, we can make a real difference for ourselves, and for our surroundings. This new local praxis is indeed challenging but, as we will show, does not necessarily imply destroying or avoiding the current system.

How does it work? How can the preference for the economies of scale and concentration of property and power of the current system be reversed to more power and influence for the local praxis? What are the keys to success in our ENA paradigm, described in detail below, which can best neutralise the damaging tendencies of the current system?

network autonomy

functional integration

modular growth

ecosystem approach

neighbourhood commoning

Principles of ENA

From 6 years of experimenting with our "survival units" and observing other community experiments, we have identified five principles that, when addressed, might together form the key to growing and promoting this new mode of production, parallel to the traditional capitalist mode of production. These principles should guarantee a sufficient level of self-production vis-a-vis capitalist production, but also enable a considerable transfer of capital from the capitalist mode to the local community mode of production[2].

The first two principles are very much derived from our own practice, and are described here as innovative concepts: our own motivation and technological and managerial solutions. The last three are elements that we adopted from the solutions already worked out to some extent by the new anti-capitalist and anti-consumerist social movements that are growing up around the globe.

Together these 5 principles are, we presume, essential for self-sustaining growth of the movement. They are also essential for actually building a (for the moment) parallel, alternative economy, as described by a growing number of scholars, as e.g. *regenerative economy*[3] or *doughnut economics*[4].

Each principle (or working hypothesis) is a solution suggested for the following questions and challenges that we are confronted with in our practices:

2. Kleiner & Baruch Gottliebhttp://wiki.p2pfoundation.net/Transvestment
3. Kelly, M. (2012). Owning our future: The emerging ownership revolution. Berrett-Koehler Publishers.
4. Raworth, Kate (2017). Doughnut economics : seven ways to think like a 21st century economist. Vermont: White River Juncti The transfer of value from one system of production to another is known as Transvestement.

On next page Fig 2.2, Principles of ENA, by Linda Tonin

1 **motivational principle**

What is our drive?
Why are we doing what we are doing?

2 **technological principle**

What technology do we need?

3 **organisational principle**

How to express costs and values of matters that are currently not sufficiently addressed by the capitalist dominated market economy?

4 **legitimizing principle**

How can we as a local community justify claims to natural and cultural resources?

5 **growth principle**

How can we establish new communities?

Network Autonomy (motivational principle)

We found out that our production system should act relatively **autonomously** from the larger system in order to be resilient and withstand the shocks and big policy changes that are currently occurring or upcoming. Our assumption is that communities are more resilient if they can guarantee production with minimal fixed financial costs, including the absence of debts or paid labour force. According to this principle, the production system does have a degree of integration within networks of other community based companies, as well as within the capitalist economy, but not so much for daily survival. Networking is done for reasons of extra comfort, pleasure, social and knowledge exchange, political organisation, long term security and insurance. In case of a shock, it should be able to retreat to the basic functions and survive. This is a motivation for a community to be autonomous within a support network of other communities, and that's why we call this principle "network autonomy".

Micromanagement of functional integration (technological principle)

Recently, the mainstream economy has discovered that the next step towards making production processes more efficient is to make the production chain circular. Companies are under high political pressure to realise this soon, as humanity faces the peak production and availability of most natural resources. Companies can do this in two ways: they can integrate more production chain steps into their process (what used to be "input" and "output") or they can try to cooperate with other companies (that are specialised in the other steps) within a commonly managed production chain. Either way, the circular economy logic goes against the capitalist logic.

The first option is going against the principles of specialisation and the division of labour, the second goes against the principle of "free market". In the capitalist mode of production, one always wants to be able to choose the best quality/price relation for your inputs, and not get stuck with a fixed supplier. Thus, the circular economy concept is not evolving naturally within the constraints of this mode of production, and governments are putting considerable effort and resources to force the capitalist mode of production to function more within the environmental "donut". Our argument is that sectoral (functional) integration is much easier to realise on a micro level. The ecosystem approach integrates all sectors in one production system. System needs can be easily fine-tuned with the local circumstances. We want to fully exploit the potentially huge comparative advantage of this characteristic of the generative economy vis-a-vis the capitalist economy. We will call this principle the *micromanagement advantage of functional integration*.

Ecosystem approach (organisational principle)

As humans we have evolved within, and have actively shaped, the ecosystem that supports our survival. As we increasingly created and inhabited an artificial world, we have had to actively protect and even recreate these "ecosystem services" such as genetic diversity, climate control, soil fertility, protection against diseases and pests and many others.

> **We should make sure that nature keeps on being the support system it is, and in doing so, guarantee the survival of all our fellow beings on the planet earth.**

We, as a local community, are in the right position to make decisions on the creation and management of ecosystem services.

Recently, much practical knowledge has been gained through the design of food production systems as complete ecosystems. In these systems, a lot of agricultural labour such as fertilisation, ploughing, reproduction, water conservation and pest control is performed by natural processes, and can thus be considered **ecosystem services**. This is being studied and practiced in Agroforestry, Regenerative agriculture, Agro-ecology and Permaculture.

5. https://thelandmagazine.org.uk/articles/short-history-enclosure-britain
6. Van der Ploeg, J. D. (2013). Peasant-driven agricultural growth and food sovereignty

Neighbourhood commoning (legitimizing principle)

Communities throughout human history have claimed the use of local resources, like access to land or fishing grounds. These can be called "commons" after the English "open fields", that local communities were allowed to use until private land property was introduced in the 16th century and commons were gradually "enclosed" with fences[5]. Reclaiming this right for commoning of resources might very well be an answer to the problems created by extreme privatisation and the concentration of private property and production. If backed up by democratic states, this principle could guarantee a long-term access to considerable means of production for urban neighbourhoods, like buildings, land, water, waste streams, wind and solar power.

Modular growth (growth principle)

Production can be easily up- or downscaled by the modularity of the production units which make up the community. Modules can be transported to and used in other or new settings. Communities can join or split (reproduce) technically easily. Modularity also gives the potential for exponential growth of this mode of production.

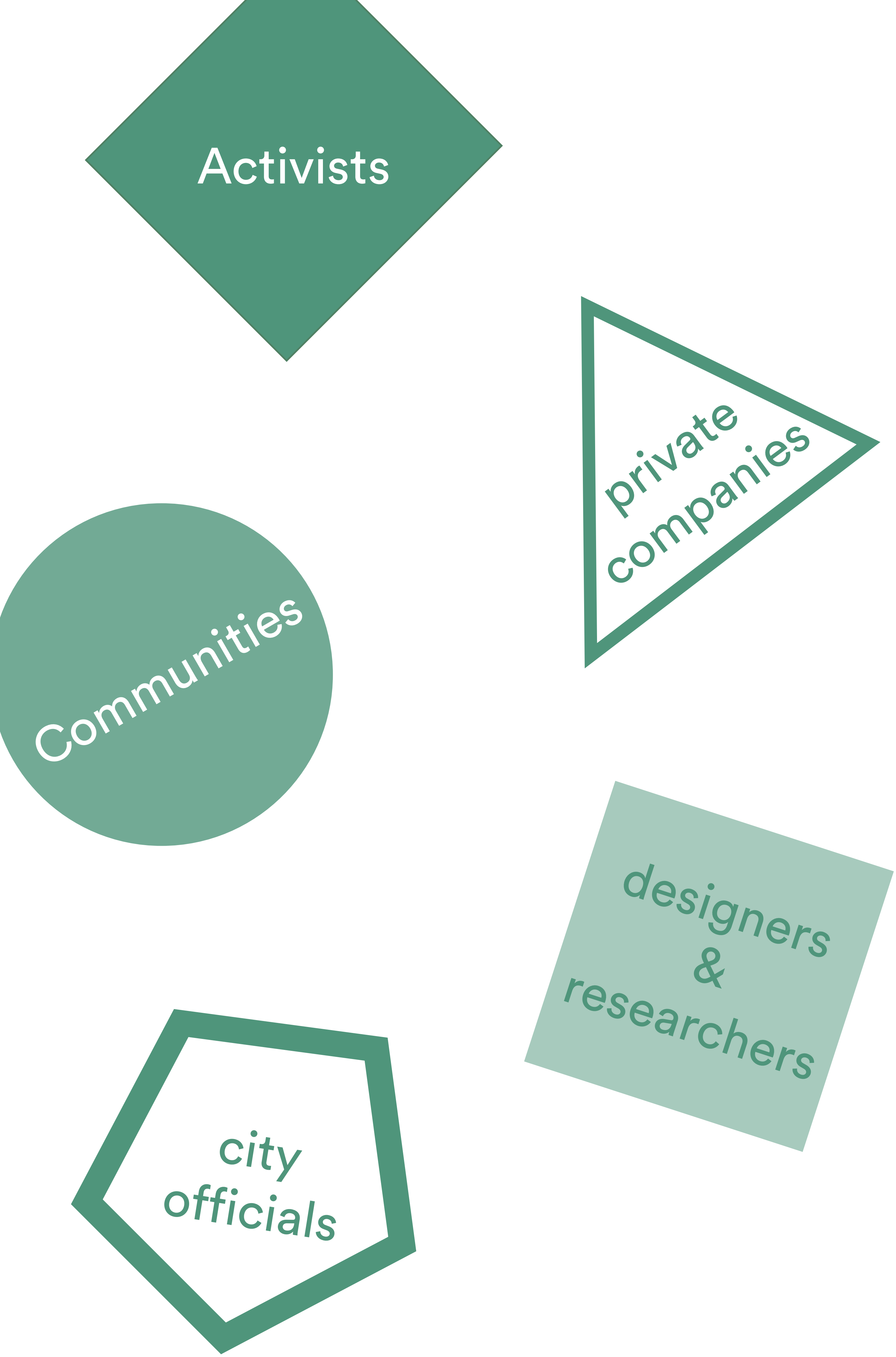
The principles are summarised in the table below, and are presented in opposition to the capitalist mode of production. The "ENA mode of production" has a striking resemblance to the "peasant mode of production"[6], with the difference being that the agency of the latter comes mainly from rural households that are constantly faced with reducing rights in the commons, as opposed to "urban commons" that increasingly seem to manage to claim resources.

Key principles of the ENA as compared to the capitalist mode of production

System

Principle
1 Motivational principle
2 Technological principle
3 Organisational principle
4 Legitimizing principle
5 Growth principle

Capitalist System	Network Autonomy
• Thriving business • Profit seeking • Capital accumulation	• Thriving autonomous community supported by network. • Risk management • Sustainability
• Economies of scale in one sector	• Integration of sectors
• Controlling and organising scarcity	• Controlling and organising abundance
• Shareholder owned • Based on private property rights • State protecting property rights	• User owned • Based on user rights of resources • State enables participatory democracy and right on commoning
• Acquire maximum market share	• Split and link modular means of production


Activists
private companies
Communities
designers & researchers
city officials

For whom?

1	activists	for those who want to start an initiative
2	communities	for those who want to apply designs in their projects
3	designers & researchers	they can help communities to produce open source urban designs they can support initiatives with evaluation and scientific evidence
4	city officials	they can enable and facilitate such projects
5	private companies	they can collaborate with initiatives

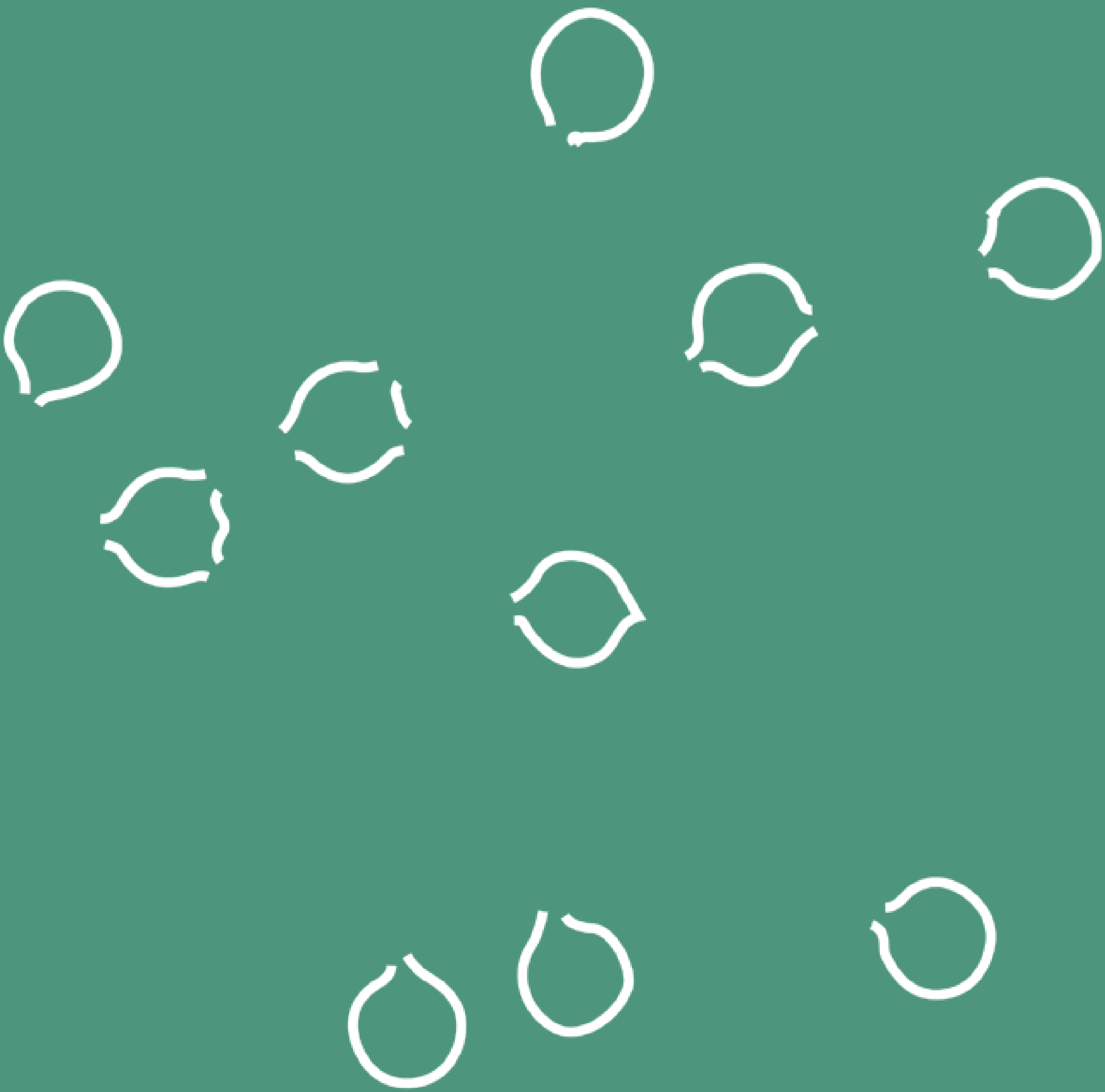
Disclaimer

Our designs were approved with building permits by the city of Amsterdam every time we re-built on a new experimental site. Also, our space proved to be sufficient to allow for a restaurant permit.

However, the building, operating and maintaining of an off-grid urban farm restaurant entails extreme awareness of risks alongside good self-organisation and preparedness for the building and construction elements, especially when working with non-professional volunteers.

It's all an experiment, completely off the beaten track, and experiments can sometimes be dangerous. Our designs are not 100% finished and not fool-proof! You are responsible for the outcome, and responsible for reducing the risks of others.

Please contact your local authorities prior to taking any action



THE MODULES

Container greenhouse

- Description
- Materials and construction

Off grid solar

- Description
- Materials and construction

Rain water system

- Description
- Materials and construction

Gray water system

- Description
- Materials and construction

Rocket stove

- Description
- Materials and construction

Raised bed garden

- Description
- Materials and construction

Fresh water aquaponics

- Description
- Materials and construction

Worm compost

- Description
- Materials and construction

Food recycling station

- Description
- Materials and construction

How does the experimental set-up look like that was tested? And who are the people engaged in it? The production modules described in this manual went through different versions: from stand alone survival modules, like a stove, a container, a solar energy installation, etc. to modules that are interconnected and form together one production system.

Page 34-35 is a flowchart with the different modules presented in this manual. Basically, it demonstrates how local waste streams (food waste, scrap metal, demolition waste, building waste, household waste, pallets, etc.) and local natural materials (maintenance timber, wood chips, straw, wild foraging products, clay, sand, water, sunlight, etc.) are transformed into community values, like food security and sovereignty, social and cultural space, sustainable mobility, etc.).

The heart of the off-grid experiment is the rocket stove pizza oven (chapter 3.5). The fresh ingredients for the pizzas come from the vegetable garden, the raised bed garden (chapter 3.6), the aquaponic system (chapter 3.7), and the food recycling and anti food-waste programs (chapter 3.9). Food scraps are composted in worm hotels (chapter 3.8). Water for washing comes from the rainwater filter (chapter 3.3). Wastewater is treated in the helophyte filter (chapter 3.4)
The restaurant, the aquaponics and filters are all placed in container greenhouses (chapter 3.1). Finally, all the electricity needed is supplied by different interconnected solar energy systems (chapter 3.2).

All modules are designed, built, and operated by volunteers. The system does not give, and is not meant to provide, full economic autonomy. The community values produced do however considerably replace products that otherwise would have been looked for on the market, and in this respect it represents an important economic value and thus creates a certain relative autonomy. The volunteers can, to a greater or lesser extent, "afford" to be less active in the mainstream system and spend more time in the community. The ones able or willing to be more involved are mainly coordinators or "core members". The ones that can do to a lesser extent are "volunteers" or workshop participants.

The means of coordinating operations and maintenance can also be considered as a technology (communication and management tools), and is in fact part of the design, as described in this manual.

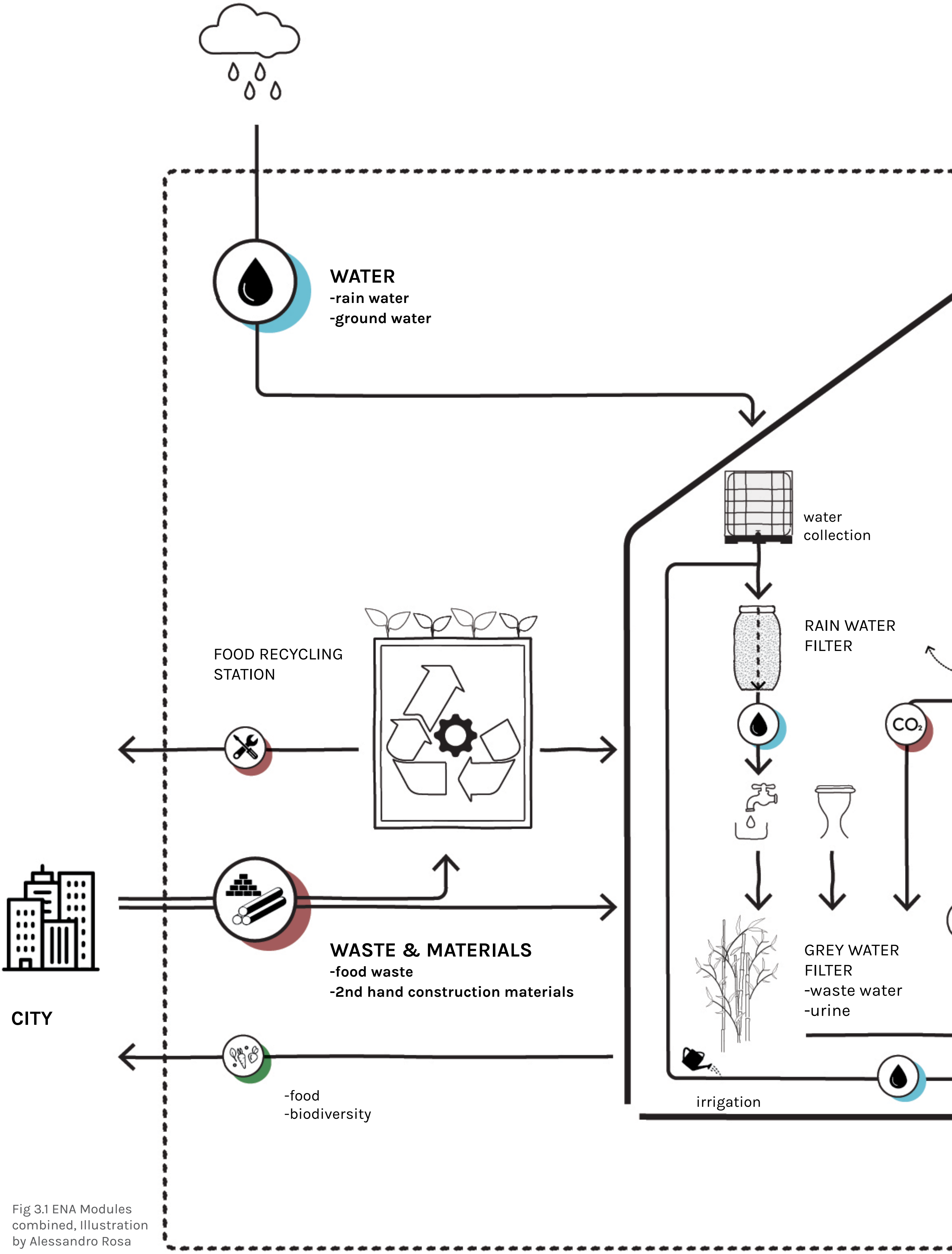
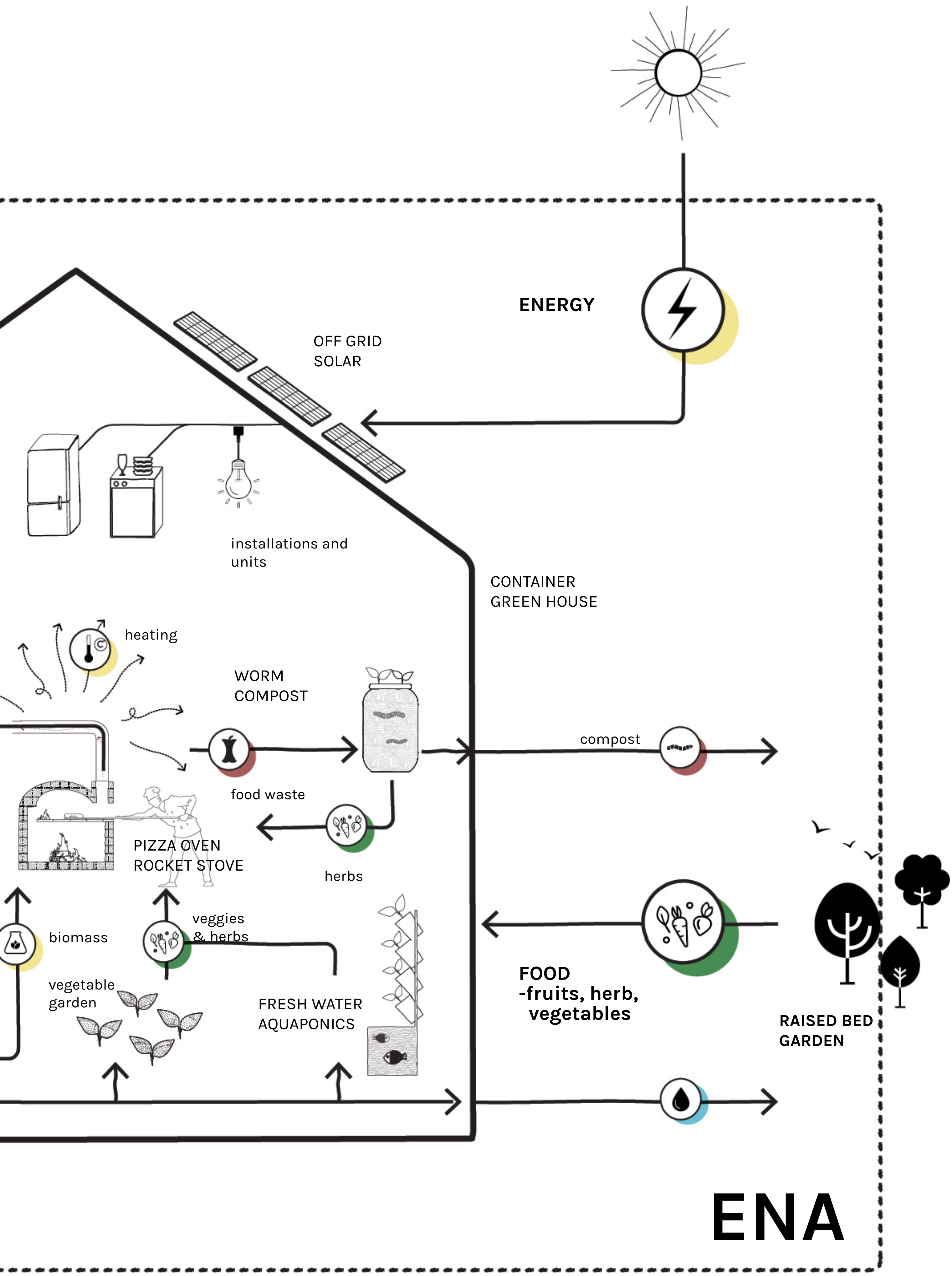


Fig 3.1 ENA Modules combined, Illustration by Alessandro Rosa



ENERGY
OFF GRID
SOLAR
installations and
units
CONTAINER
GREEN HOUSE
heating
WORM
COMPOST
compost
food waste
herbs
PIZZA OVEN
ROCKET STOVE
biomass
veggies
& herbs
vegetable
garden
FRESH WATER
AQUAPONICS
FOOD
-fruits, herb,
vegetables
RAISED BED
GARDEN
ENA

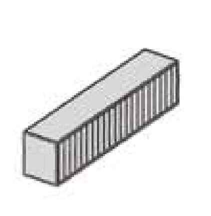
Container green house

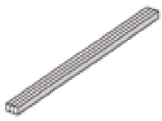
Description

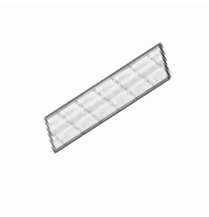
The container greenhouse is one of the quickest and cheapest ways per square meter to create wind and rain protection while producing food. Depending on the climate conditions and heating and insulation requirements and availability, it can be used for a growing space, a restaurant, or even a year-round living space.

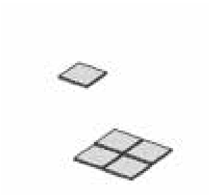
This design is optimal in terms of time and financial investment for temporary land-use, for anywhere from 2 up to 15 years. The building materials can be shipped inside the container, and once at the destination, the container can immediately act as a basecamp (water and energy utilities are inside), and as the most important structural element for the new building.

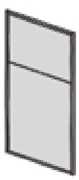
Fig 3.2 Green house contruction Kaskantine in its last location in the Delflandpleinbuurt, 2019, Photo by KasKantine

	Container	**Height:** High cube (2.90m) Normal (2.60m) **Length:** 20 ft 40 ft. **Quality:** A (everything fine), B (could have a bump, or bad paint, but are water tight and closeable) C (could have holes, but structurally sound).

	Trusses	You might find your **metal** trusses on the second hand market. But transport is difficult Not recommended to use a mix of types of trusses. Structural calculation is difficult and expensive. Make your own laminated trusses. The cheapest **wood** on the market is 4x6 inch beams, which go up to a length of 4.20 m.

	Roof cover	**glass.** For a transparent roof, the cheapest option per m2 material investment. However, logistically and operationally for DIY it is a nightmare. **plastic.** fast to build and easy to find No sustainable and durability limited to not more than 2 years **polycarbonate and plexiglass.** long lasting, UV resistant, and have a relatively small environmental impact.

	Floor	Projects < 2 years, the easiest solution is to put **pallets** on the ground Projects from 2 to 10 years, **concrete slabs** could be considered. **Steenschotten** (thick flat pallets for stones). very durable, can be recycled after the project, and can be transported by hand. But making a straight platform with poles requires time and dedication

	Walls	Anything goes really: **plastic** **wood waste** **glass** ...

Materials and construction

Choice of container

Containers are big rectangular steel boxes. The floor panels are the strongest element, and the corner beams have the thickest profiles. The typical ondular shape of the side panels contributes to the overall structural strength. Cutting out windows from the side needs to be compensated by extra beams to make up for loss of structural strength.

There are different types of shipping containers: different heights and lengths and three quality classes. We describe here some of the pros and cons of each type.

Height:
High cube (2.90m) or normal (2.60m).
There is definitely a great advantage to using the High cube if you want a nice user space inside. This extra 30 cm makes all the difference in terms of practicality and feeling! However, the price is also much higher. If you stumble on a good deal, jump on it!

Length:
20 ft or 40 ft.
Per m2, the 40 ft container is much cheaper. However, moving it around is really much more difficult! 40 ft containers require special transport trucks, while a 20 ft container is still possible to move by hand (well, lots of hands, but still).

Quality:
A, B or C
There are three quality classes to containers: A (everything fine), B (could have a bump, or bad paint, but are water tight and closeable) and C (could have holes, but structurally sound).

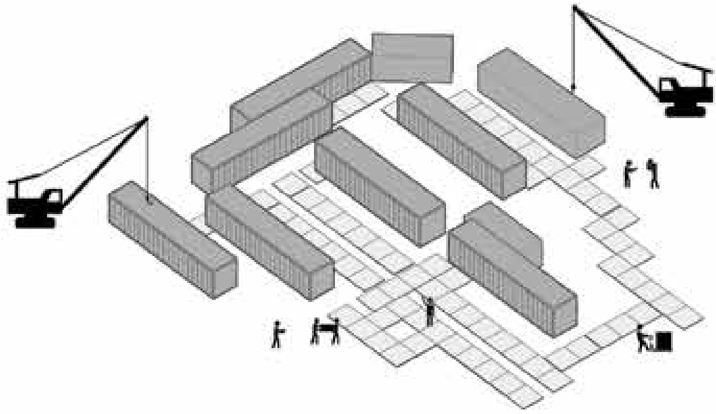
There is quite a big price difference between the quality classes. At the same time, in reality, a second hand class A container is often really a B, and a B is in fact often more a C, so be careful.

Transport and placement of the container

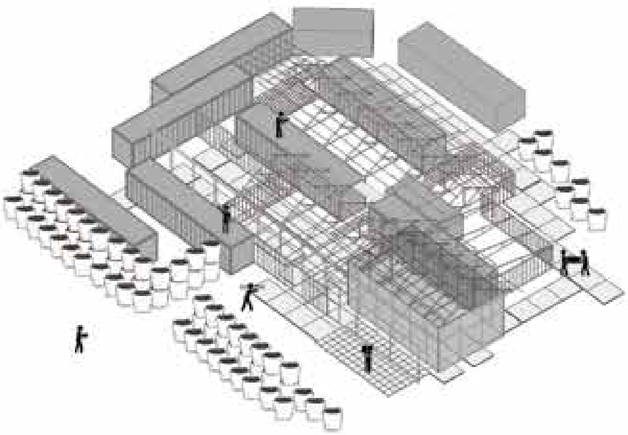
Transport of containers can be done by crane trucks. For 40-footers, the cheapest option is the "sideloader", a crane that can only load from a small distance, parallel to the truck.

A container has only 4 feet, thus considerable support is needed when the ground is not hard. Recommended are concrete slabs ("Stelcon") under each of the feet. Smaller slabs are possible, but 2 or 3 layers are necessary, in the shape of a pyramid; with the dimensions consisting of a first layer of 9 stones, a second layer of 4 stones, and a third layer of one stone (9-4-1).

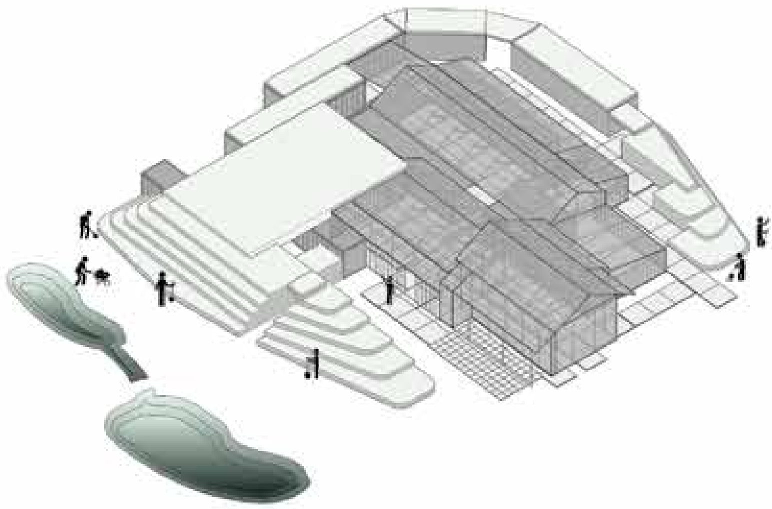
Next page Fig 3.3, land preparation.
Photo by Julie Ann Riemersma
Fig 3.4 and Fig 3.5 Transport and placement of the container 2019, Photos by KasKantine



Phase 1
The first step is to prepare the land. Make it flat, position the concrete slabs Stelcon under each container feet. Transport then the containers on site. It can be done by a crane truck.



Phase 2
Once the foundations and the container are in place, It is possible to go on with the construction of the greenhouse structure, walls, and roof.
Prepare as well the base structure for the dikes and start to work on installations such electricity and grey water piping



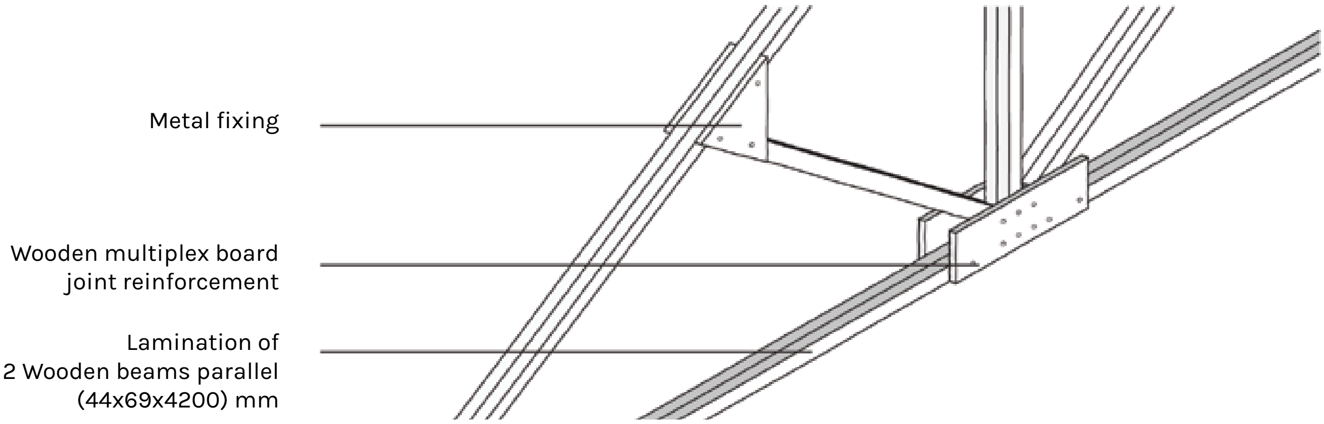
Phase 3
Roofing and covering,
Once you have a roof above you, you can start to work on the rainwater collection system and finalize the filters.
Then go on with interiors and details. Therefore with green roofs and landscape.

Next page Fig 3.6 construction phasing,
Below Fig 3.7 Trusses joints and Fig 3.8 Roof angle.
Illustrations by Alessandro Rosa

Choice of trusses

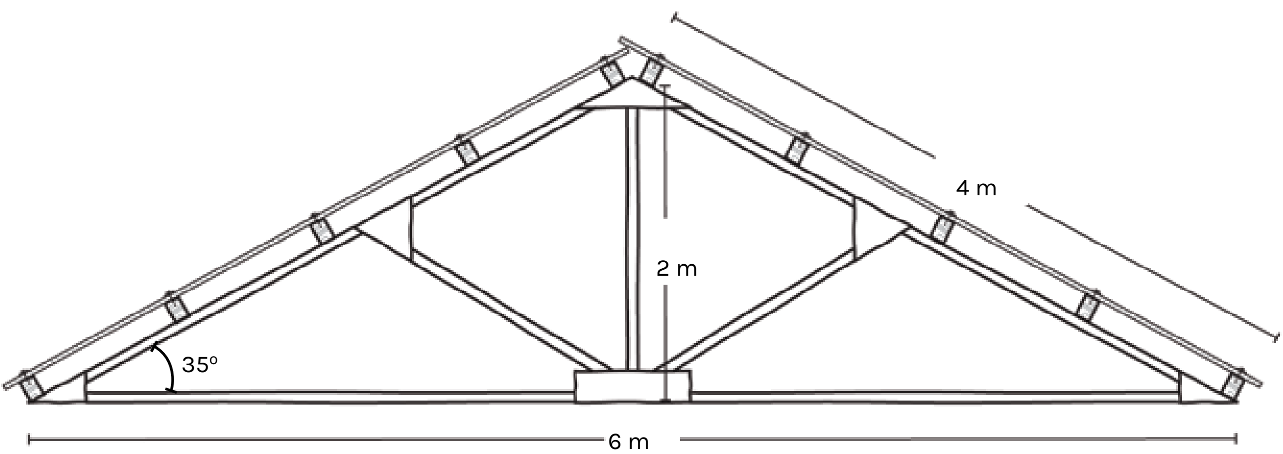
In order to receive a building permit, trusses need to be calculated by a professional for the required structural strength on the basis of material, thickness and strength of the connections.
You might be lucky to find your trusses on the second hand market. However, transport is difficult, and if you need many, it is not recommended to use a mix of types of trusses. This makes the structural calculation difficult and expensive.

There is a cheap way to make your own laminated trusses. The cheapest wood on the market is 4x6 inch beams, which go up to a length of 4.20 m. Make three lengths of beams to make a triangle, the central post and the reinforcements. Make one as a master, and copy the rest of the beams according to this example. The "lamination" will in fact extend the beams to the desired length. Lamination can be done with wood glue, reinforced by nails or screws. Important is to reinforce each angle using a sandwich plating with a piece of 1 to 2 cm multiplex board.



Choice of roof angle

In order to minimise the use of materials and also to limit the wind load, we tried to find the minimum angle where snow accumulation risks are acceptable, and the angle for solar panels are also acceptable. We found that this is around 35 degrees.



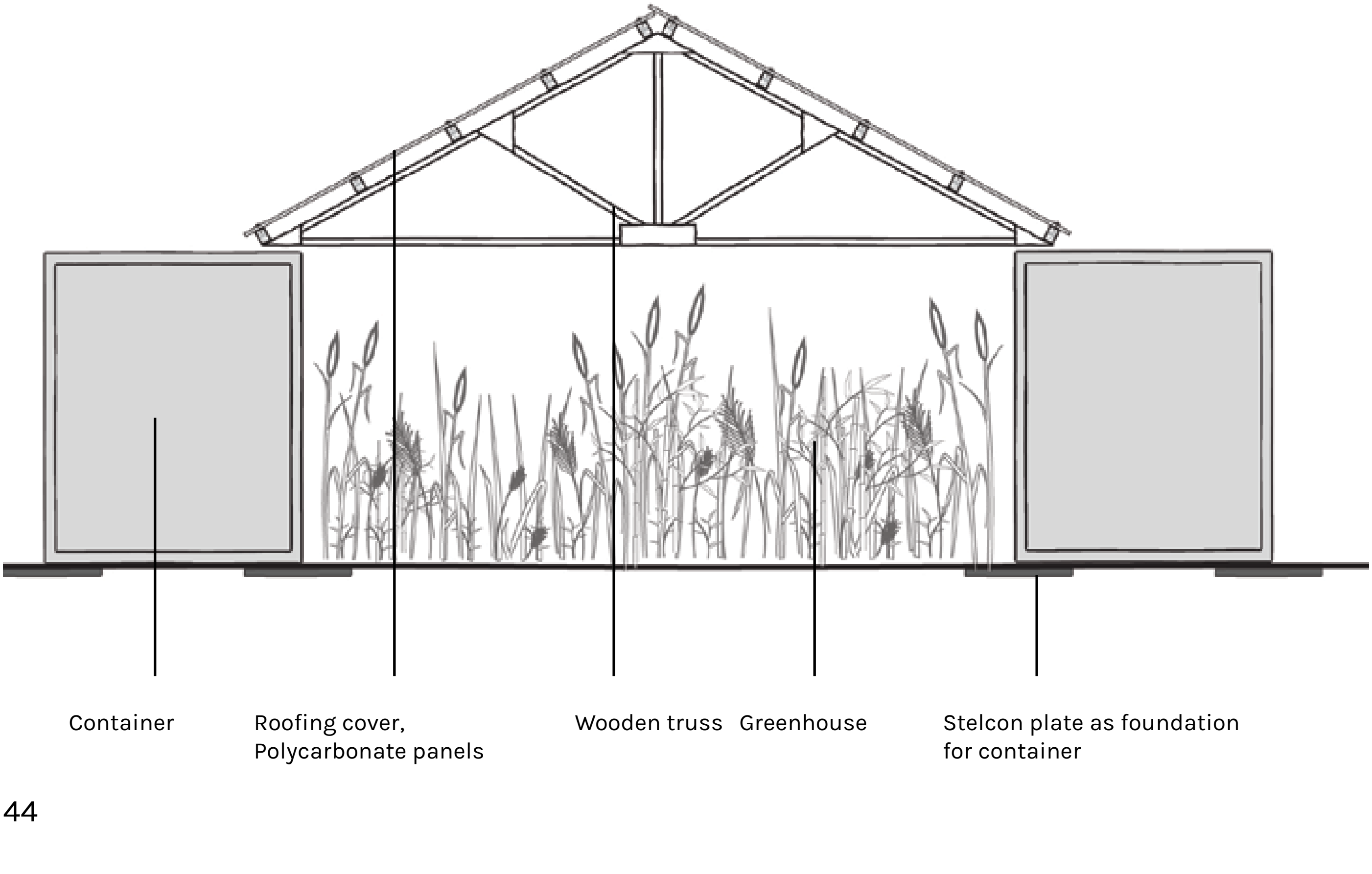
Because the cover material is plastic, the trusses can be fairly light. Within the triangle only three extra support beams are necessary in order to give the structure its rigidity.

Choice of roof cover

For a transparent roof, glass is the cheapest option per m2 material investment. However, logistically and operationally for DIY it is a nightmare. In order to use this material you need to be a specialist professional. What a difference with plastic sheeting! You can buy a plastic tarp at your local hardware store, put it on a wooden frame, and in no time you have a roof.

However, if you wish to prioritize sustainability and protection of the environment, you have to be careful with what plastic you engage in. A plastic tarp might give you emergency protection, but it will not hold for more than two years, because constant movement by wind and exposure to UV will make all kinds of plastic foil brittle, and it will eventually tear.

The most sustainable materials, but also most expensive, are polycarbonate and plexiglass. They are long lasting, UV resistant, and have a relatively small environmental impact. Therefore, it is possible to get these materials quite easily on the second hand market, making them affordable for projects that require little financial investment.



Next page Fig 3.9 construction greenhouse and roof covering, Illustration by Alessandro Rosa
On the right Fig 3.10 and below Fig 3.11 photos of the construction site, particulars of roof and cover, Photos by Naiara Alava Aguirre

Choice of floor

We need hard flooring in areas that need to be cleaned from food debris or for food preparation, and for transport with pallet jacks and food trolleys. For projects projected to last less than 2 years, the easiest solution is to put pallets on the ground, cover them with underlayment boards, and put a sheet of linoleum overtop. For insulation, rockwool can be put underneath. Unfortunately, this creates a heaven for rodents. Much better, but rather expensive, is to put a layer of shells first, also under the containers. This regulates humidity, and rodents cannot live in it because it has a dehydrating effect.

For mobile projects projected to last from 2 to 10 years, concrete slabs could be considered. They are value proof, so if investment money is available, you can reuse or resell them easily with little loss. What makes it expensive is the transport and placement, mounting up to 20 to 40 euro per slab (4m2). They also require drainage and solid underground, so an extra layer of 10 cm of sand ontop of the ground is often needed, also in order to place them neatly and levelled.

Finally, a platform can be built of wooden poles, with beams and underlayment or other wooden slabs, like "steenschotten" (thick flat pallets for stones). Steenschotten are very durable and can be recycled/reused after the project, and can be transported by hand. However, making a straight platform with poles requires time and dedication!

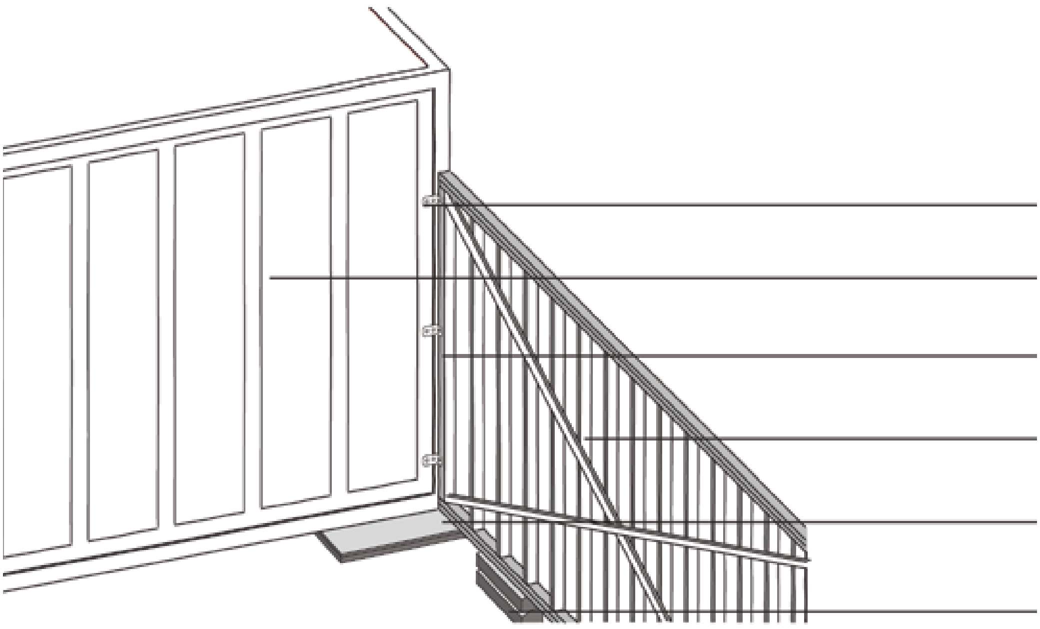


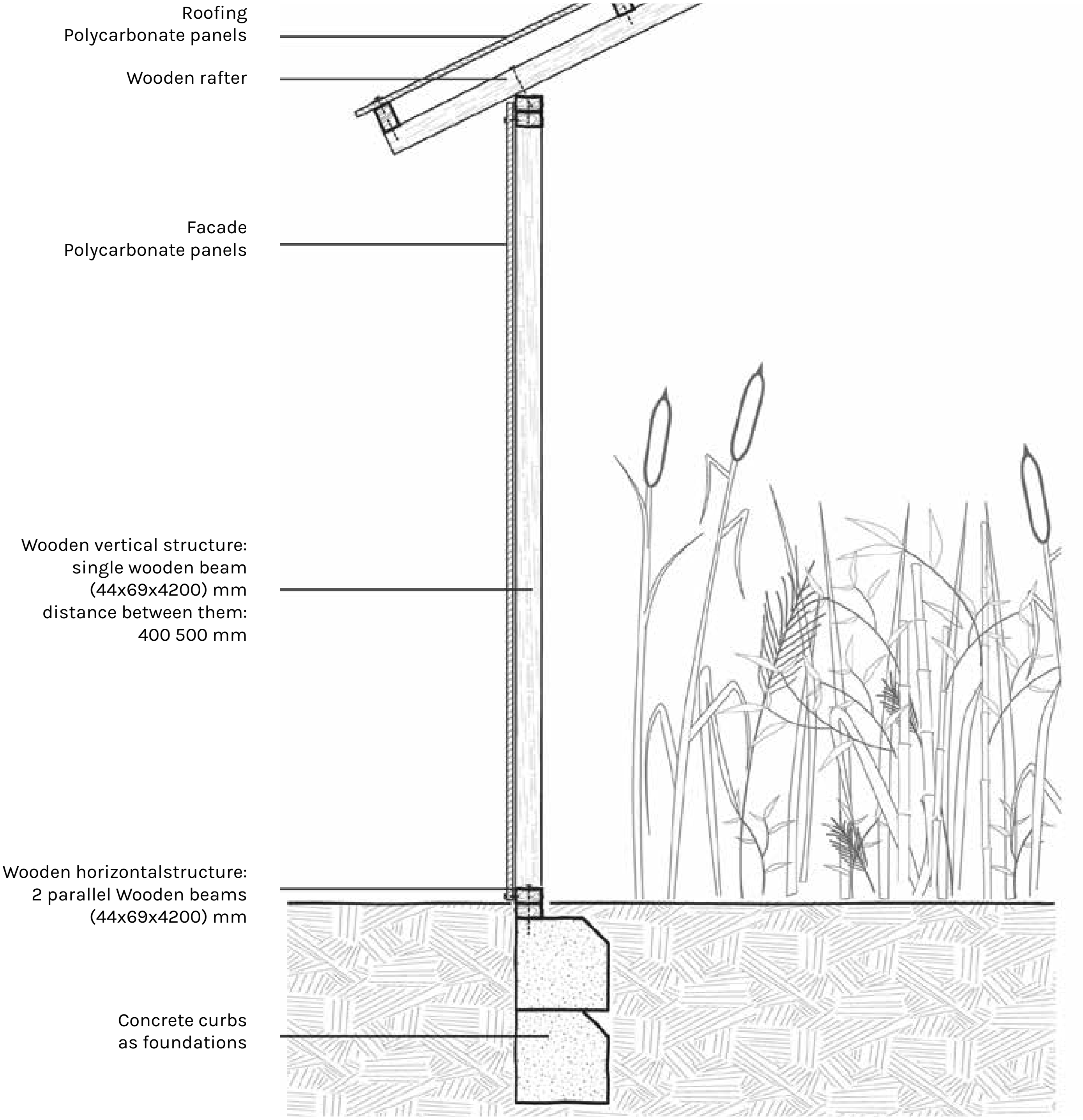
Fig 3.12 construction greenhouse joint wooden walls and container,
Illustration by Alessandro Rosa

Fig 3.13 construction greenhouse detail walls,
Illustration by Alessandro Rosa

Choice of walls

Walls are mainly barriers against temperature changes and unwanted guests. Valuable materials can be stored in containers that can be locked like a money safe!
Everything in the greenhouse should be of such low value, or too big to carry, that it isn't worth it for the thief to run the risk of getting a bite from the watchdog in their behind.

Insulation of a greenhouse also doesn't make a lot of sense, as the roof is not insulated at all. This makes the choice of walling not very difficult. Anything goes really: from plastic to wood waste. Keep an eye on second hand doors, and gliding garage doors. If you place locks in doors, keep in mind that there are identical lock sets available in hardware stores, so you can lock all doors of the complex with the same key.



Off grid Solar

Description

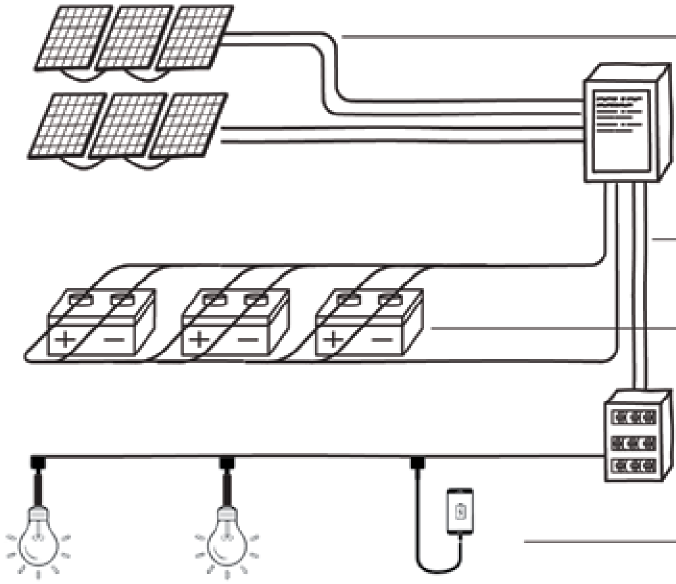
Off-grid versus grid production: the debate is long, and the answers are not obvious. What is certain is that it largely depends on how much storage you need for your solar production. If the storage need is high and grid connection close, then the decision is quickly made. Storage is (and will remain for some time) expensive, not environmentally friendly and high maintenance. However, the price for a grid connection and related monthly costs are relatively high, and the waiting time for a new connection can be long. The exciting thing is that we have discovered two tricks to limit storage need, and if you manage to apply them in a disciplined way, you might not want to consider a grid connection, even if the grid is around the corner!

It must be noted that it is NOT easy to depend on DIY solar energy production. Failures and malfunctions are difficult to detect, analyse and repair. And mistakes, misjudgements and mismanagement can turn out to be very expensive.

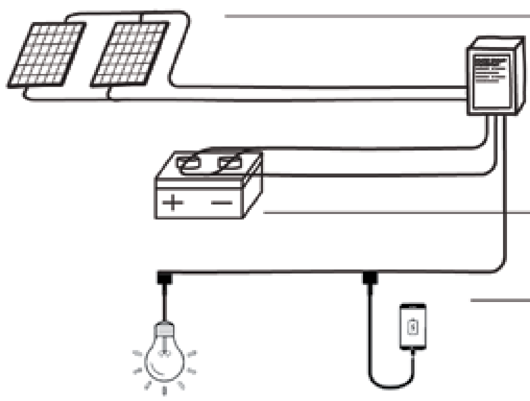
However, these limitations are also true for the professional sector. Thus, as we increasingly depend on solar energy, we will continue to pay the costs of counteracting this complexity one way or the other. Therefore, we have opted for another strategy: making the base system (a set of solar panels connected to a controller and battery) as simple as possible, and linking several base systems together, instead of one

Fig 3.14 Solar panels,
Photo by Fotograf Nürnberg
https://shotstash.com/photo/solar-panels/

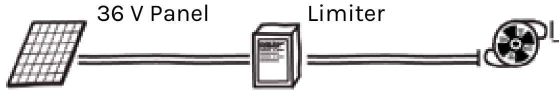
3 container units system



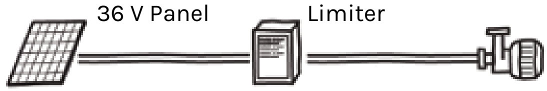
1 container unit system



Greenhouse, Grey water filter



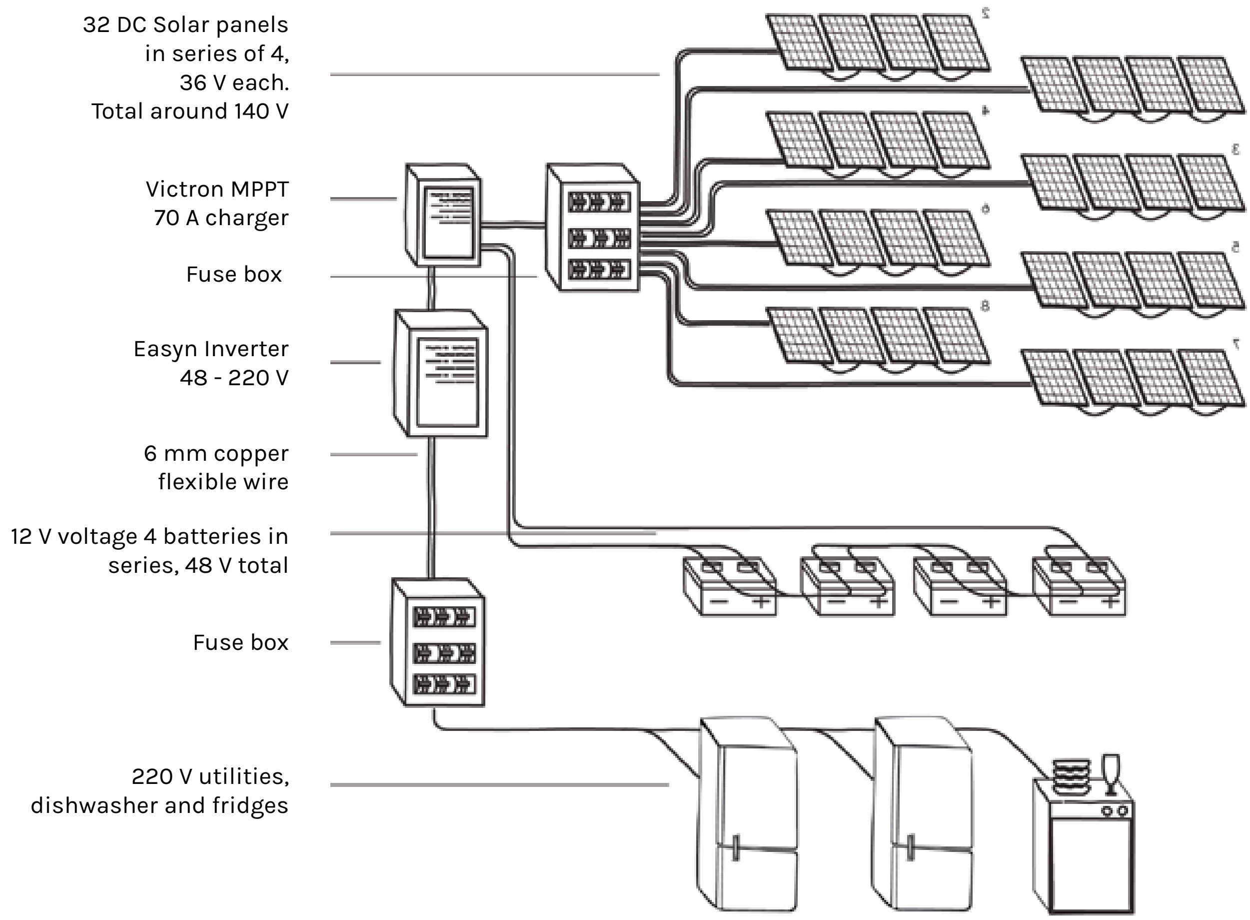
Greenhouse, Grey water filter



Next page Fig 3.15 Solar panels survivor units, 12 V units
Below Fig 3.16 Solar panels kitchen units, 220 V units
Illustration by Alessandro Rosa

central system. It is also critical to cut down on storage needs wherever possible. The different systems are interconnected with *network switches*, and most base systems are operating without batteries and solar controllers - the so called *direct applications*. With this modular system we are much more happy and relaxed in our day-to-day life!

Most manuals for DIY energy production start by asking the user to identify their exact energy needs, and to identify when and for what they need power. If you have unlimited resources, this is a straight-forwards approach. However, in practice, it is necessary to find a middle ground between what we want to use and what we can reasonably obtain and generate. Being used to grid connections, we are conditioned to expect a seemingly endless supply of energy.



Materials and construction

Choice of panels

Obviously we go for second hand or dumped solar panels. The development of solar technology is still progressing rapidly, and people are changing their solar panels before the end of their life cycle in order to profit from the higher efficiency of the newest panels, which are also becoming cheaper. Sometimes a whole set of panels are replaced because they are underperforming, and the insurance contract forbids selling on the second hand market, but can be given to "good causes". For the offgrid, small scale applications that we have in our experiment, they will perform perfectly! The choice is clear: get what you can get and don't pay too much (much less than 50% of the initial value for second hand)!

There is one drawback: if you want to build a bigger system, you need your panels to have more or less the same performance, so that one lesser panel is not functioning as an obstruction for the rest. So, you need to test the panels. We recommend testing them with an adjustable resistor, and seeing how much capacity they have with 2 or 3 different levels of resistance. For one system, you then choose the panels with more or less the same curves.

Choice of solar controllers and inverters

If you can get hold of a good second hand European brand (like Victron): take it! Stuff from AliExpress is dirt cheap, but most of it doesn't last long, and it might lead to problems that are not easy to identify. Guarantees are also complicated, sending back material takes a long time and it is difficult to communicate with the factory.

Choice of cables and cable connectors

With low voltage there is considerable loss of energy during transport through the wires. But thick cables are very expensive. We choose for 4 or 6 mm2 wires. Make sure to have DC adapted wires, which are stranded, not solid.

Choice of batteries

If you can get hold of cheap second hand lithium batteries: take them! They last longer and are easier to maintain. Otherwise, semi-traction LED batteries are clearly still the cheapest option. If you decide for a system that heavily depends on batteries, it might be good to invest in a battery tester. If you buy a second hand battery you can ask to test them first.

Fig 3.17 Victron MPPT 70A charger
Fig 3.18 batteries 12 V in series
Fig 3.19 fuse box
Fig 3.20 Victron MPPT 10 A charger
Fig 3.21 fuse box
Fig 3.22 Easyn Inverter 48- 220 V
Fig 3.23 Greenhouse roof with 12 DC Solar panels in series of 4,
Photos by Alessandro Rosa

Fig 3.17

Fig 3.18

Fig 3.19

Fig 3.20

Fig 3.21

Fig 3.22

Fig 3.23

Most important warnings for direct current (DC) systems

Making mistakes with electricity is expensive and risky, for yourself and for others.

1. Make a clear operating board, with disentangled cables, firmly attached controllers and batteries in an open box, with a lid to protect against falling (iron) objects
2. Use coloured cables as prescribed
3. Use cable pipes in walls, and ground cables in the ground
4. In case of disconnecting the system, always disconnect the solar panels first

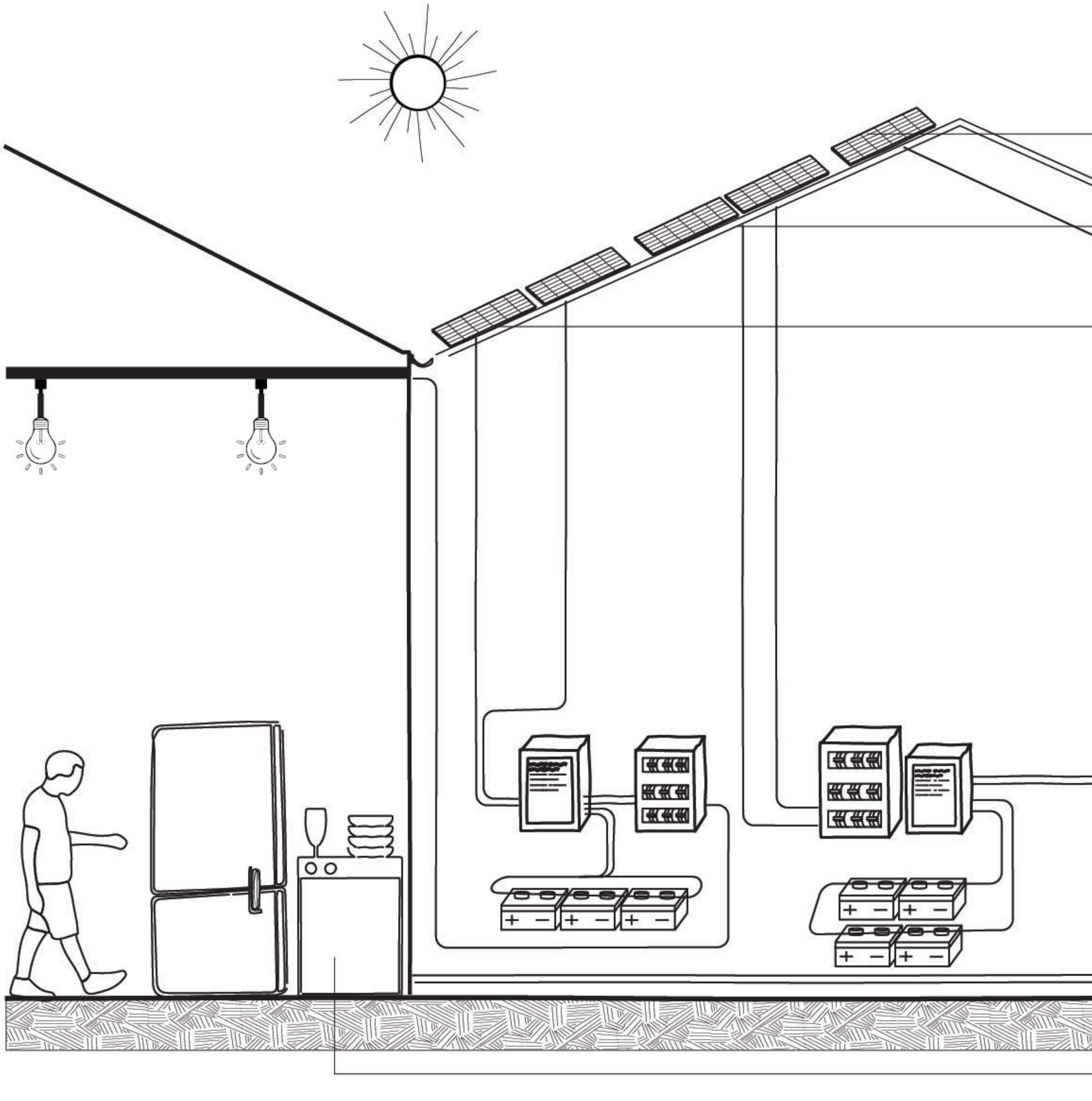


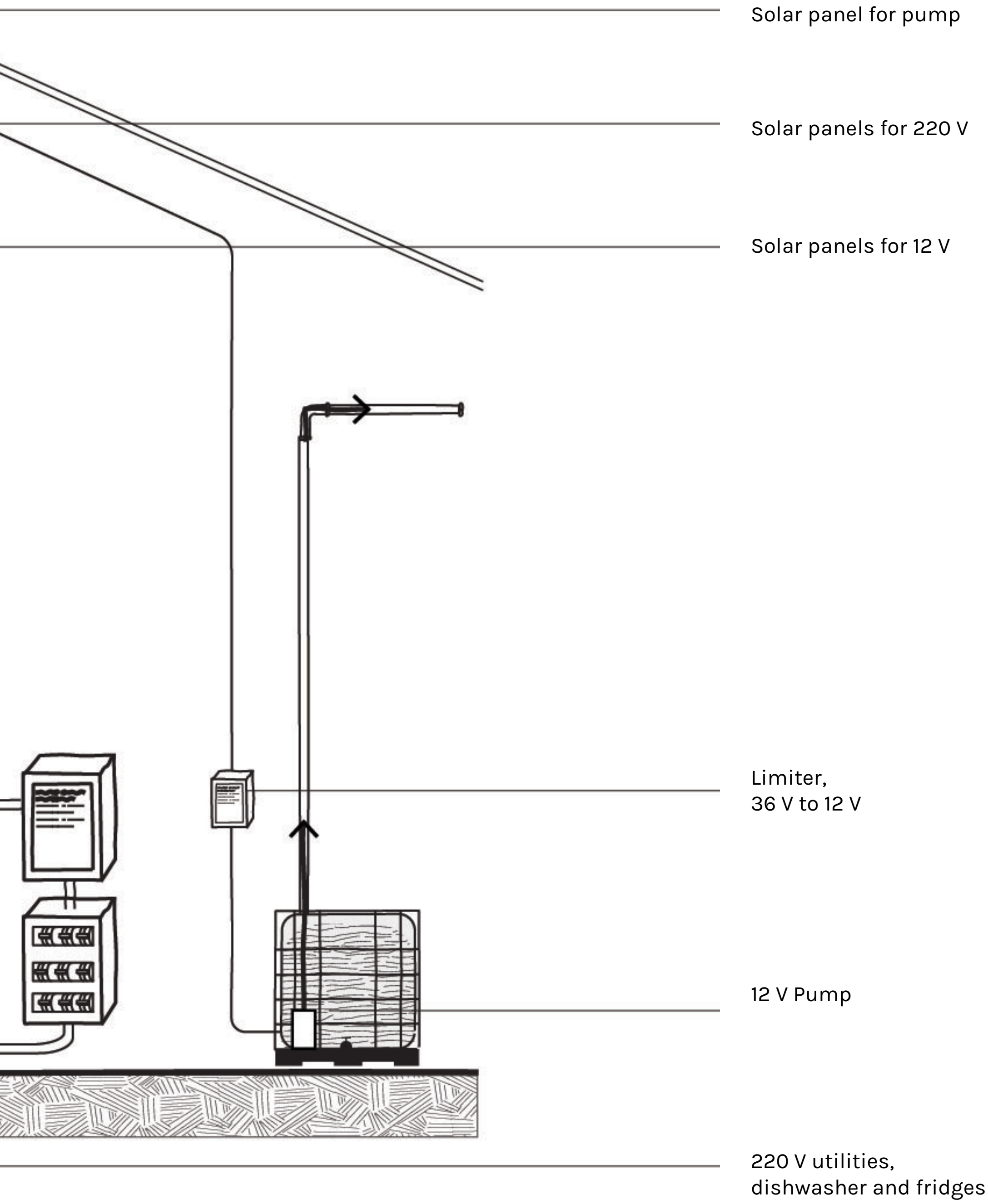
Fig 3.24 Solar Panels and electric system integrated,
Illustration by Alessandro Rosa

We recommend having different simple systems instead of one complex system.

Lighting requires so little energy compared to cooling or power tools, that we recommend to run one or a few 12 volt LED light systems on a few solar panels with a few old batteries and cheap solar controllers. These systems are very trustworthy and easy to repair. If the central system fails, there is still light!

For the central system, use the best batteries and the best controller. In this set-up, only the cooling runs on it, and occasionally the power tools.

For ventilation, and pumping, 12 volt applications are recommended. They can be connected directly to a solar panel, with only a 12 volt regulator in-between. If there is sun, it runs!



Rain water system

Description

The rainwater system consists of the water catchment, prefilter and rainpipes, storage, divider, slow sand filter, clean water tank, pressure pump and the water tower.
The water catchment for our 5x1000 liter storage is about 150m2 of roof surface. A 10 mm rain event with this surface thus yields 1500 liters. Four rainy days will therefore fill up the storage completely. In our community, the restaurant uses 200 to 400 liters of water per operating day.

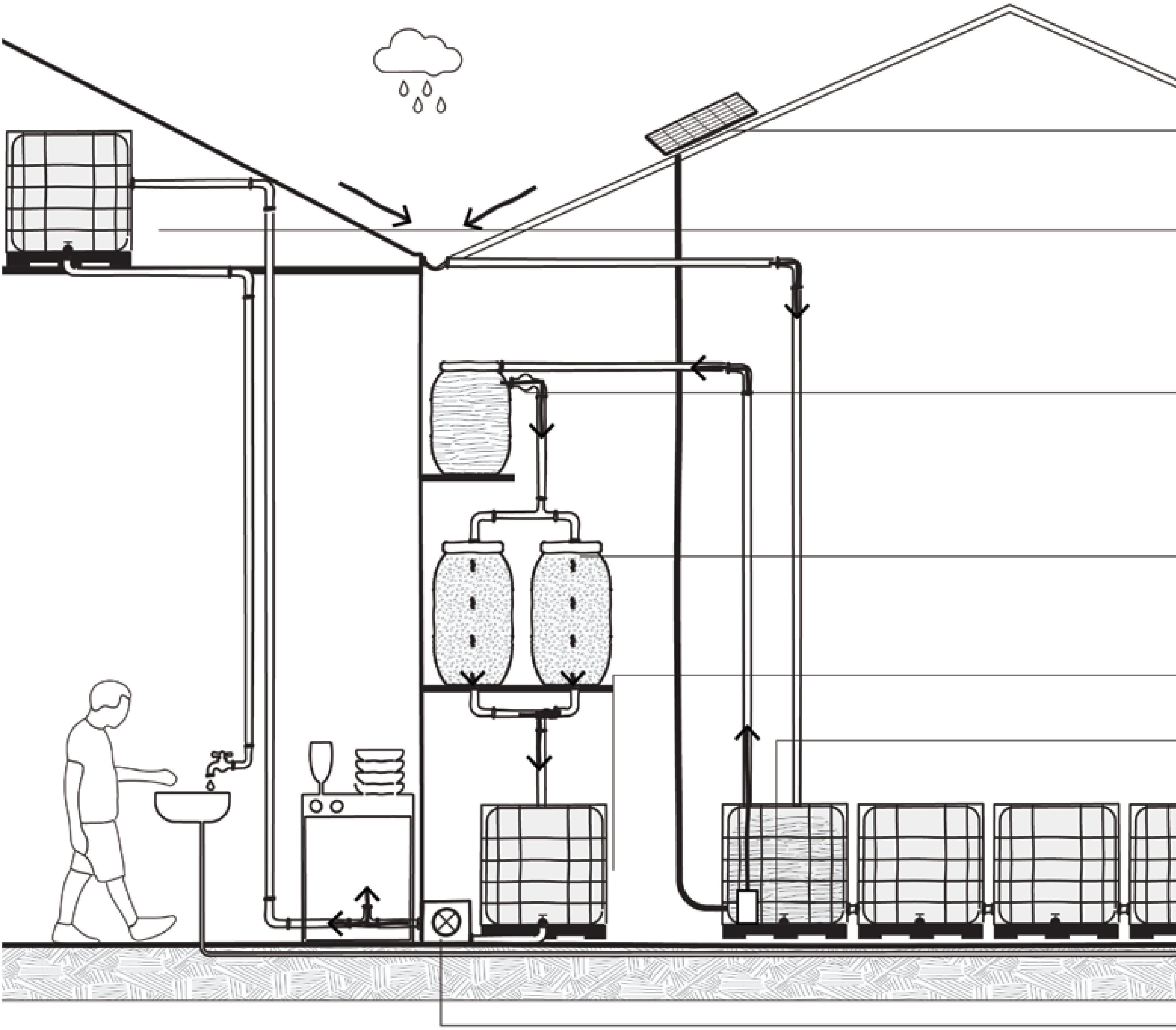
A small solar pump is continuously pumping water from the storage to the divider, a little tank which is placed at a height of 2 meters, from which water is transported down to the sand filter. A tap regulates the input to the filter. The rest of the water from the divider is sent back to the storage tank (and a small quantity goes to the greywater filter). The water that is sent back is thus circulating, and will prevent "dead zones" in the storage tanks.

The slow sand filter purifies the water, takes out dust and microbes, and slightly re-mineralises the water. The quality produced is sufficient for washing and personal hygiene, but not officially for drinking. The height of the sand column needs to be greater than 50 cm in order to function properly. The intake quantity should be slightly more than "dripping". We have made two barrels that together produce about 200 liters a day of clean water.

Fig 3.25 Rain Puddles
Photo by Thomas B
https://shotstash.com/photo/rain-puddles/

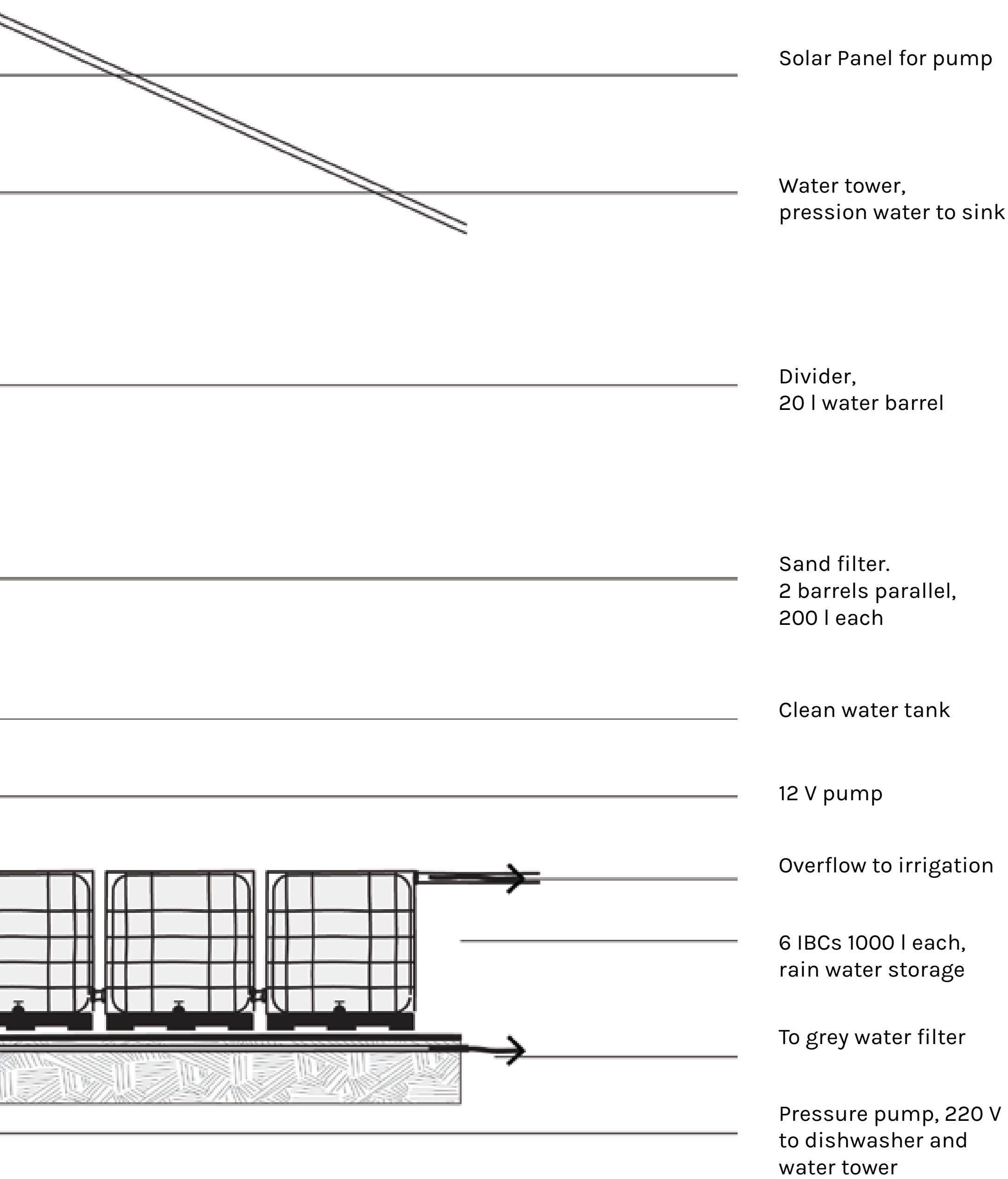
The clean water is then fed into the clean water tank, after which it is pressurised to the water network of the restaurant. The same pump can fill up the water tower (1000 liter tank sitting at a level of 3 meters high) with a "system switch" (either pressurize the network or pumping to the water tower). Normally, the network uses this gravity pressure, and pump pressure is used only when the restaurant kitchen is working.

Fig 3.26 Rain water collection system and filter integrated, Illustration by Alessandro Rosa



Materials and construction

- Around 24 m. Rain gutters
- Around 12 m. Rain pipes
- Debris filter
- 5 storage Intermediate Bulk Containers (IBCs), interconnected with tank connectors (25 mm)
- 20 watt/12 volt solar pump, 12 mm tube
- 12 volt limiter
- Min. 100 watt solar panel
- 25 liter barrel (divider)
- Clean water tank (IBC) + Water tower tank (Black IBC)
- Pressure pump (400 watt, 220V)
- 50 m. PE 25 mm tubes
- Plastic water taps for system switch



Construction

The level of difficulty of the construction is fair. There are however some important considerations for the safety of use.

1. Prevent algae:
algae can block pipes, and also feeds other unwanted biological activity. It can grow because of light exposure in the tanks and tubes. All IBCs need to be completely covered and insulated.

2. Prevent dead zones:
dead zones are areas of still water with low oxygen levels. Here, unwanted bacteria can develop.

3. Prevent high temperatures:
water in (black) tubes in particular can quickly raise in temperature. This can be dangerous considering the development of Legionella bacteria (>25C)

4. Prevent airlocks:
For a good flow of water, air locks should be prevented by installing the tubes without any vertical loops or u-shapes.

Fig 3.27 Divider, 20 l water barrel on top of a container
Fig 3.28 Sand filter. 2 barrels parallel, 200 l each
Fig 3.29 Pressure pump, 220 V
Fig 3.30 IBCs 1000 l each, rain water storage
Photos by Alessandro Rosa
Fig 3.31 Water collection on the pitch roof
Photo by Naiara Alava Aguirre

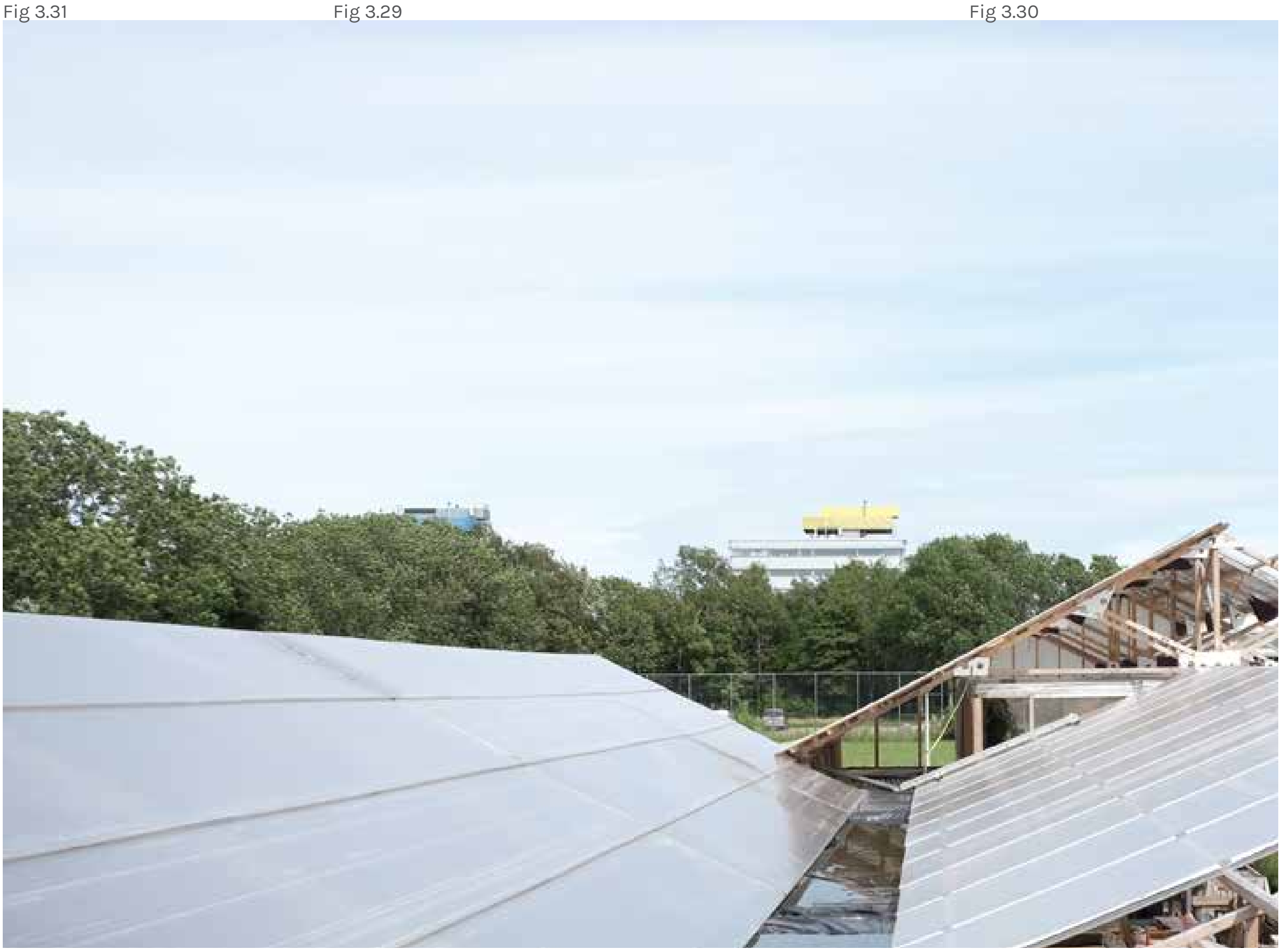
Fig 3.27

Fig 3.28

Fig 3.29

Fig 3.30

Fig 3.31



Grey water system

Urine diverting dry toilets (UDDT)

Description

The dimensions of a sewage system without faeces using urine diverting dry toilets are about 10 times smaller than a "wet toilet" system. This has considerable economic and ecological advantages. When a local treatment system needs to be considered, this type of toilet is an obvious choice. The most important advantage, however, is that because of the small dimensions, it becomes fairly easy to internally recycle the output of the water treatment system, and you are therefore (in principle) exonerated from any legal requirements concerning sewage. However, in order to prove that you have no leakage in the ground, it is necessary to construct a system that operates in a closed environment. This can be done by putting a pond liner under the whole system, and use the surplus water within this closed environment.

Functioning

This system is designed for 200 liters of urine and hand washing water per day. This capacity is enough for about 50 guests per day. One load of 200 liters waste water diluted with rainwater, is flushed in about 2 to 3 hours through a 12 meter long gravity fed helophyte filter. At the end it is pumped back to the beginning. This loop is repeated throughout the day. At the end of the day, the filtered water is

Fig 3.32, Detail of bamboo plant of the filter in the Kaskantine greenhouse, 2020
Photo by Naiara Alava Aguirre

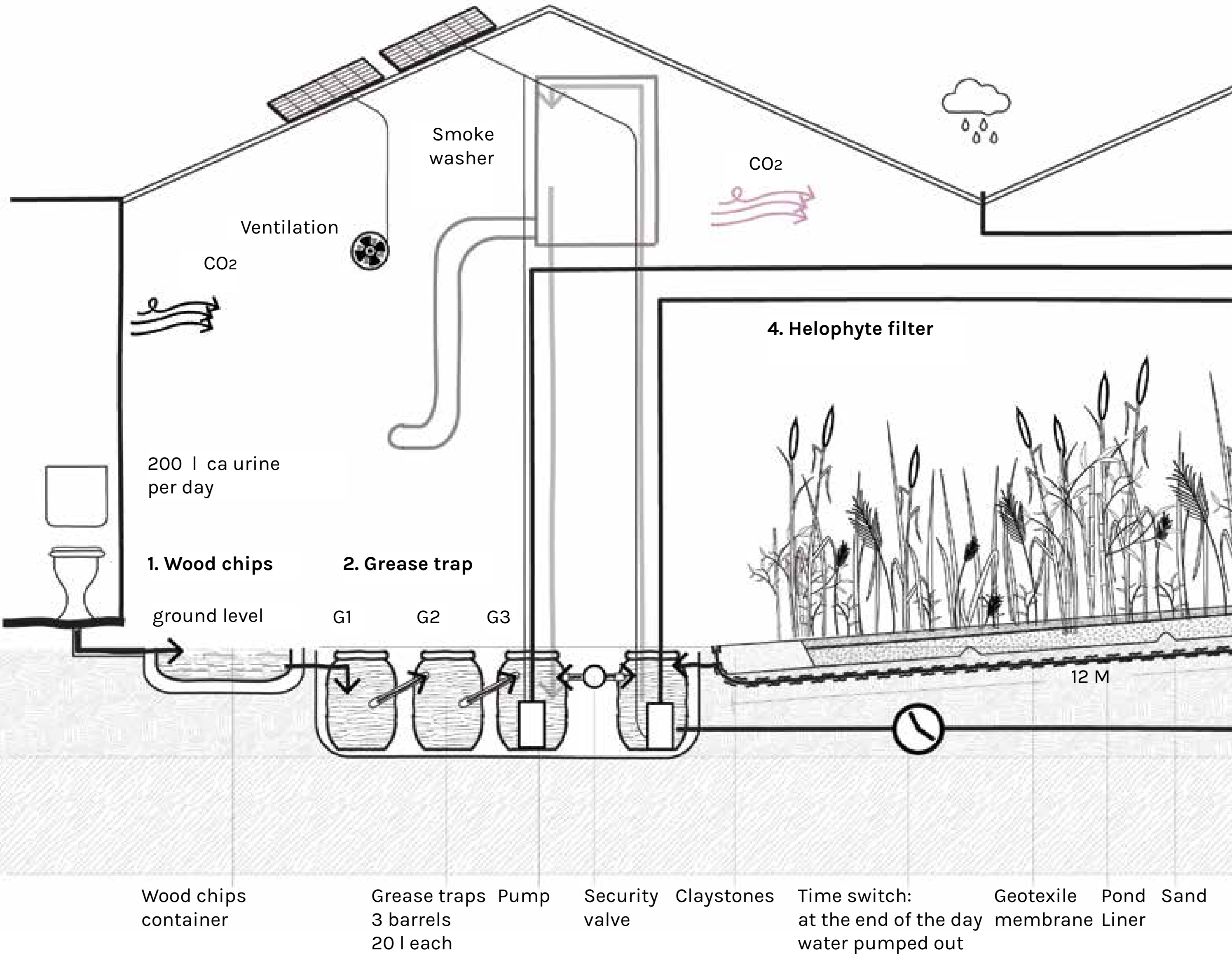
stored for irrigating the greenhouse where bamboo and young trees are grown. The compost from the toilets, is also produced in this space and applied after at least one year of maturation to the non-consumable vegetation system, and use the surplus water within this closed environment.

Fig 3.33, Urine diverting dry toilets (UDDT) integrated system Illustration by Alessandro Rosa

The treatment has 5 stages:

1. Pre-treatment.
This is a 1m2/ 50cm high container filled with wood chips in which the waste water arrives. This takes out the biggest particles.

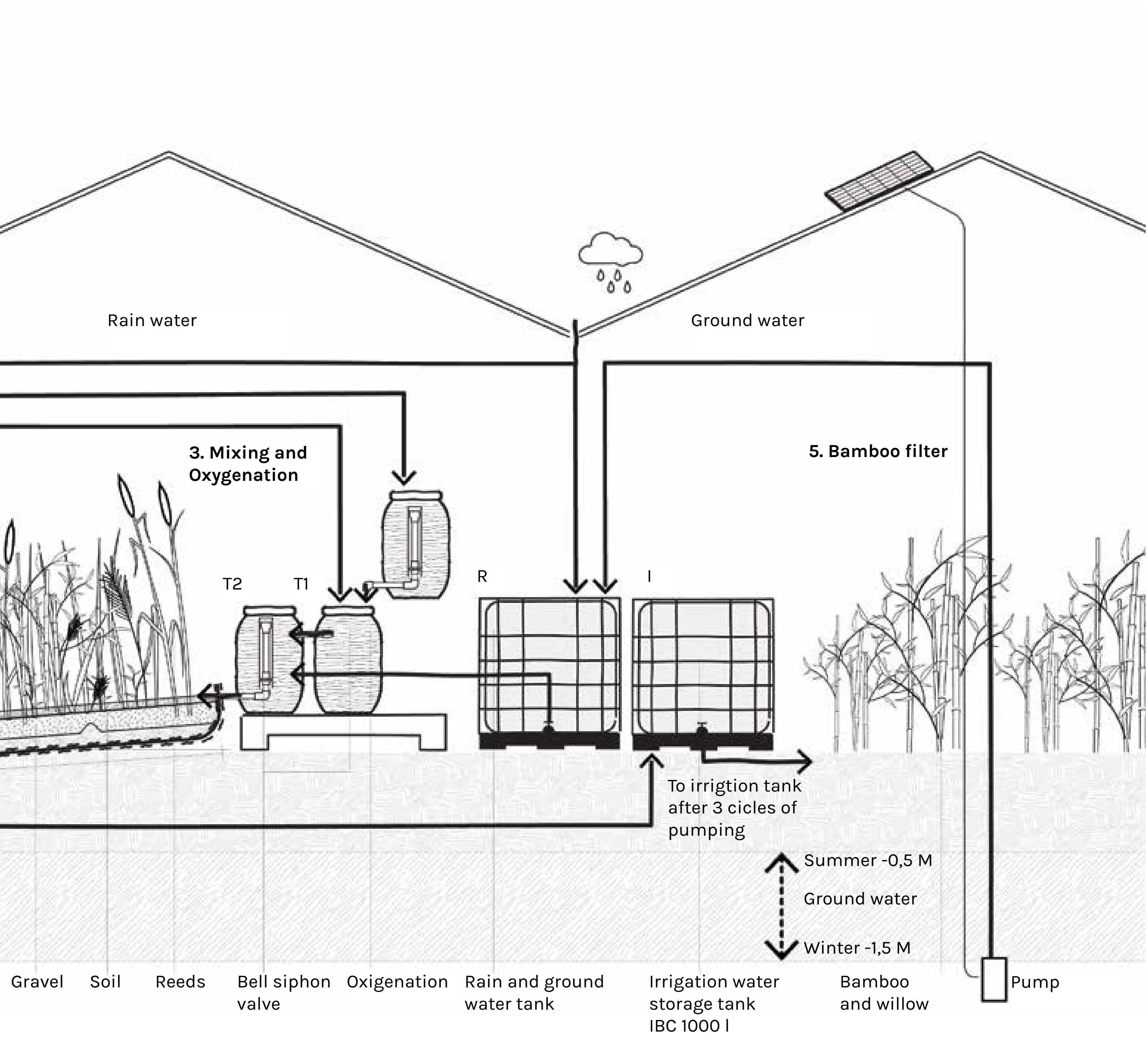
2.Grease trap.
This trap has three compartments (3 barrels) through which the waste water runs up and down in order to stimulate settlement.



3.Mixing and oxygenation.
These are three barrels. The first one receiving the waste water from the grease trap, the second from the filter, in which the new waste water is mixed, and the last barrel in which extra rainwater is mixed. All three barrels are oxygenated by a solar air pump.

4. Helophyte filter.
This 12 meter long filter contains gravel and sand, and is vegetated with reeds. Main purpose is to transform ammonia into nitrates and to reduce the nutrient level to a level acceptable for irrigation. A bell siphon empties the barrel in one flush, and gives a volume of 200 liters to the filter, resulting in a "flood and drain" type growing system.

5. Bamboo filter.
At the end of the day, the water is pumped to an irrigation tank and is used to irrigate fast growing plants, mainly bamboo and willow producing biomass, but also a nursery for young trees.



Detail grease trap.

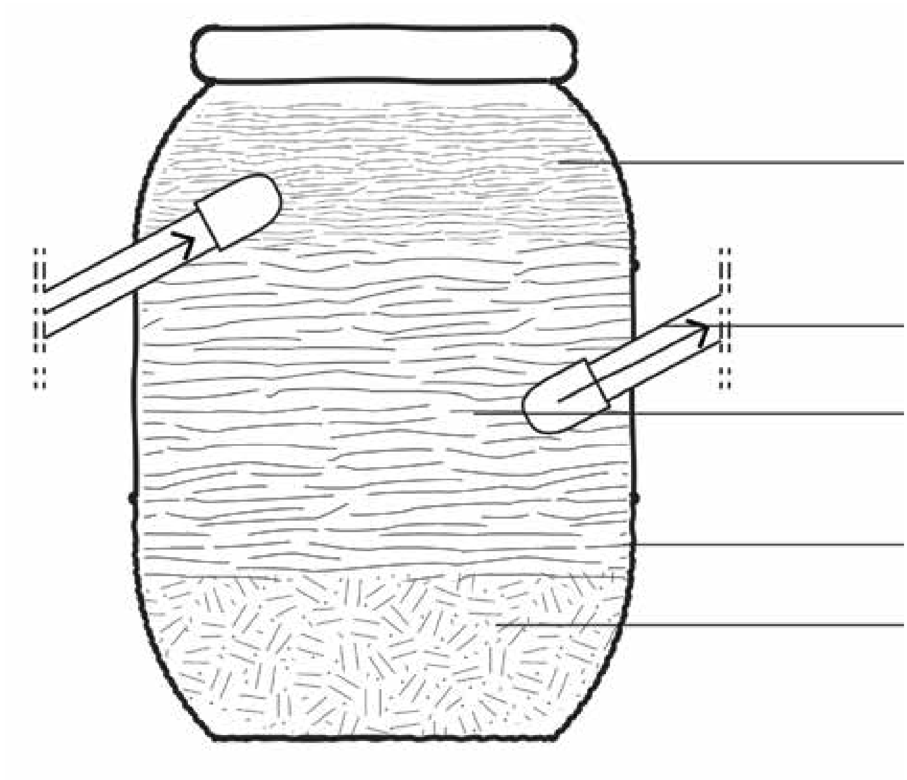


Fig 3.34, Detail grease trap with stratification of water Illustration by Alessandro Rosa

Detail Mixing and Oxigenation

Fig 3.35, Detail mixing and oxygenation barrel with bell siphon Illustration by Alessandro Rosa

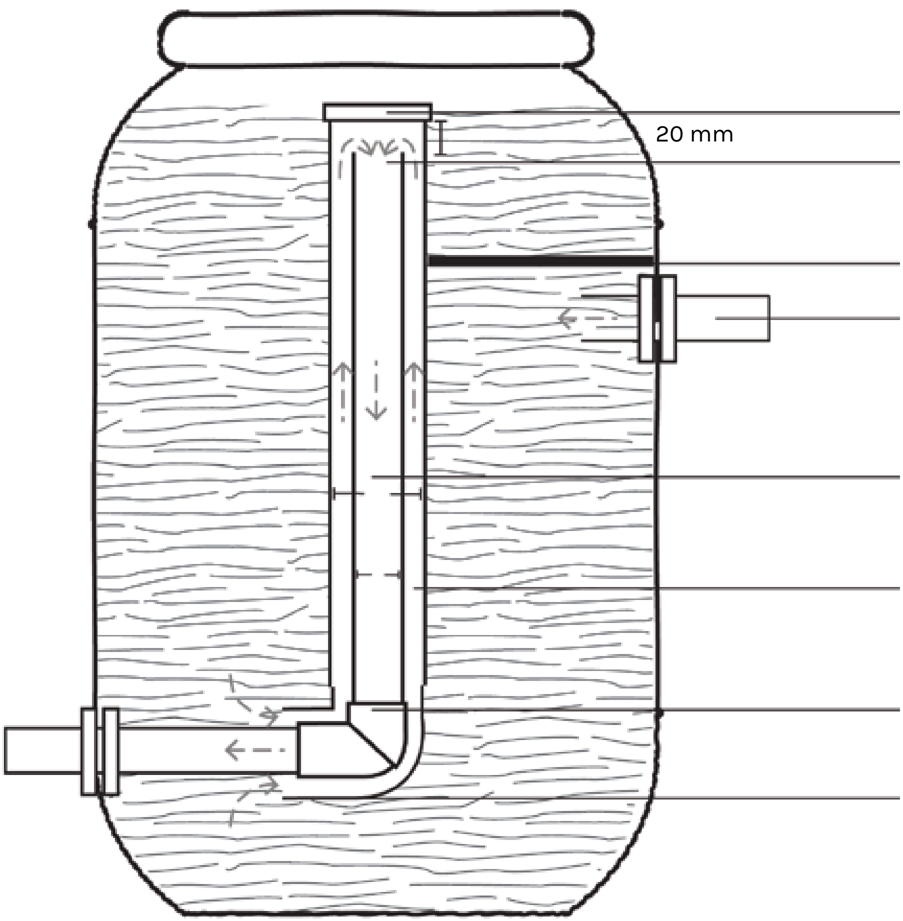
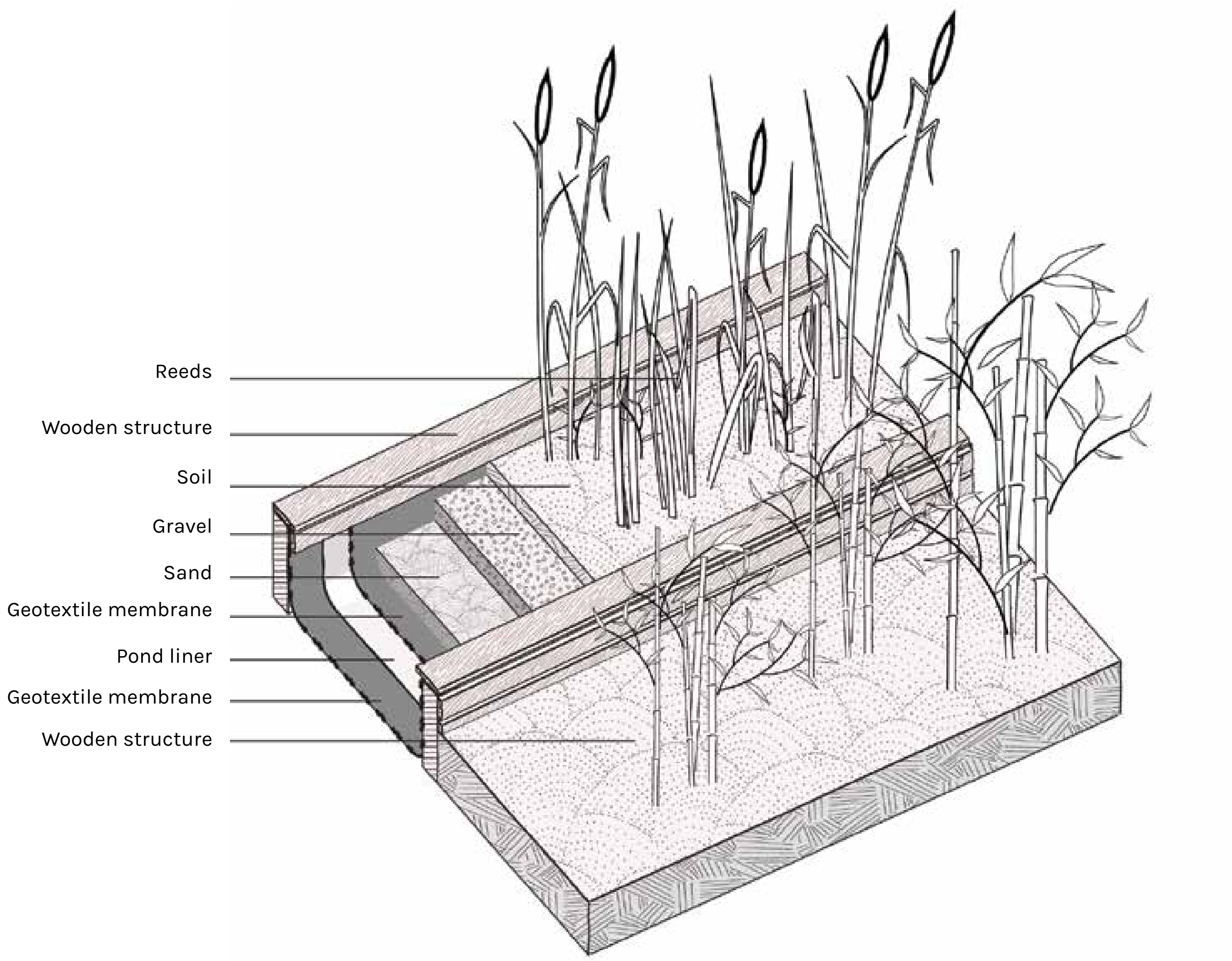


Fig 3.36, Detail Helophyte filter with stratification of layers and bamboo plantation
Illustration by Alessandro Rosa

Detail Helophyte and bamboo filters.



Materials and construction

From left to right
Fig 3.37 Overall Urine diverting dry toilets (UDDT) filter
Fig 3.38 Construction of the filter. The hole for the pond liner and the three terraces, with the buried box In the middle at its deepest point.
Fig 3.39, The buried box containing the grease trap and collection point of the helophyte filter.
Photos by Naiara Alava Aguirre

Most of the material for this unit can be made of scrap or be bought second hand. In order to prove it is a closed environment though, it is advisable to buy a new pond liner and tank connectors.

- a large box in the ground, at least 2 m3
- the barrels are from a pickle factory
- the IBC's are bought second hand
- two bilge pumps

Construction

1. In a 5x12 meter greenhouse[7], a pond liner buried in the ground, 1,5 meter deep at its deepest point.

2. In the middle there is a buried box containing the grease trap and collection point of the helophyte filter.

3. The hole for the pond liner is dug out 1,5 meter , creating three terraces, in order for the soil to hold irrigation water. The pond liner is protected by a sandwich of fabric. In order to prevent dead zones, the first layer in filling up the hole, consists of a coarse, draining, material like rough sand with gravel.

7. Greenhouse unit is described on page 37
8. Composting unit is described on page 91

4. In the middle, in the deepest point, the box for the grease trap is constructed.

5. The filter is laid out, ending in the middle, at the deepest point. In this case, the filter has an inclination of 1 meter, over 12 meters length, following the three terraces down. Then the original dug out soil can be put back in.

6. A pump for pumping up the urine to the helophyte filter.

7. A pump for redirecting the water from the end of the filter to the beginning of the filter for its second or third loop. Because the last two barrels are interconnected, the two pumps also function as each others back-up pump in case of malfunction.

Maintenance

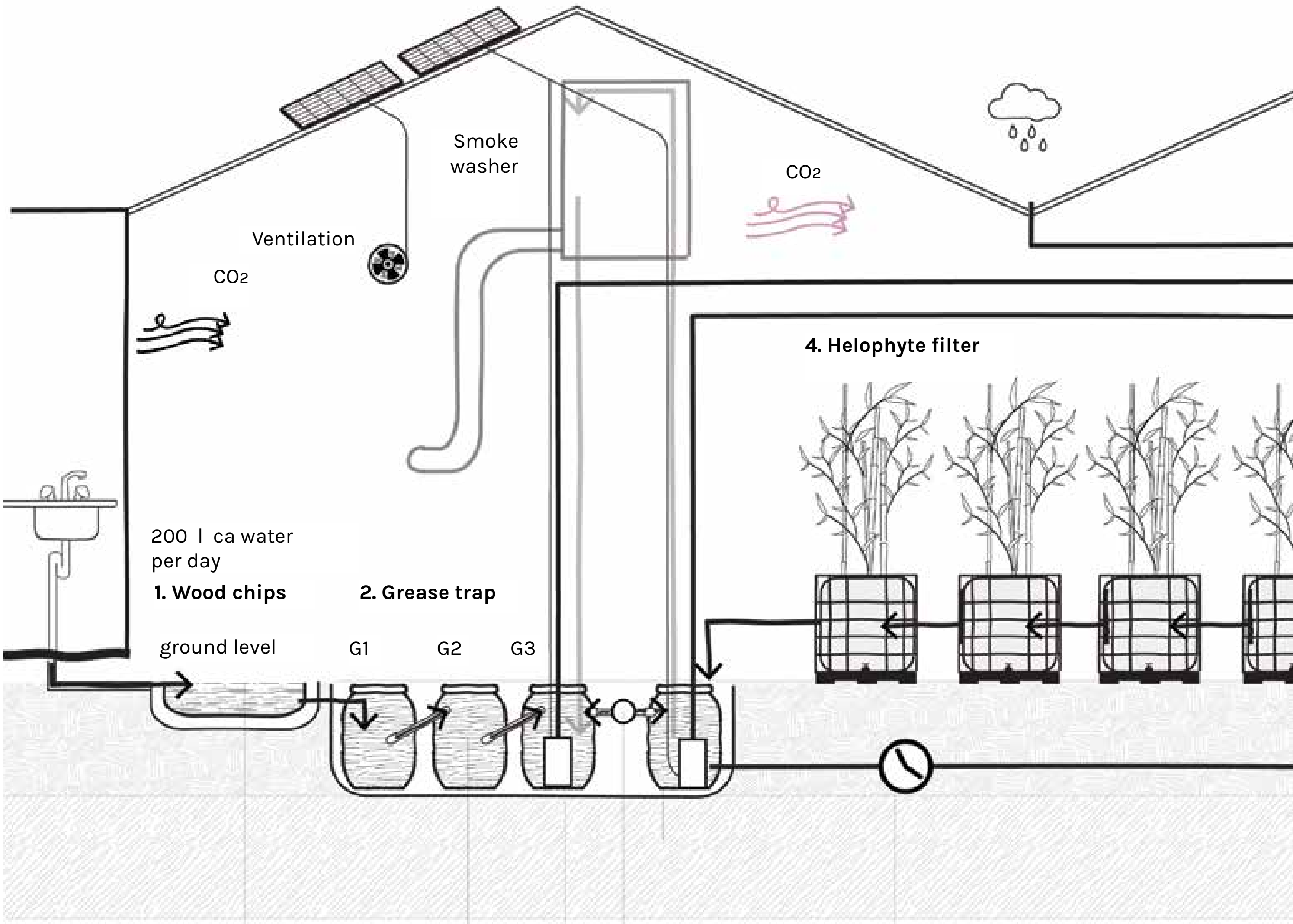
Wood chips and grease trap barrels should be emptied out every 6 months in the composting unit[8].

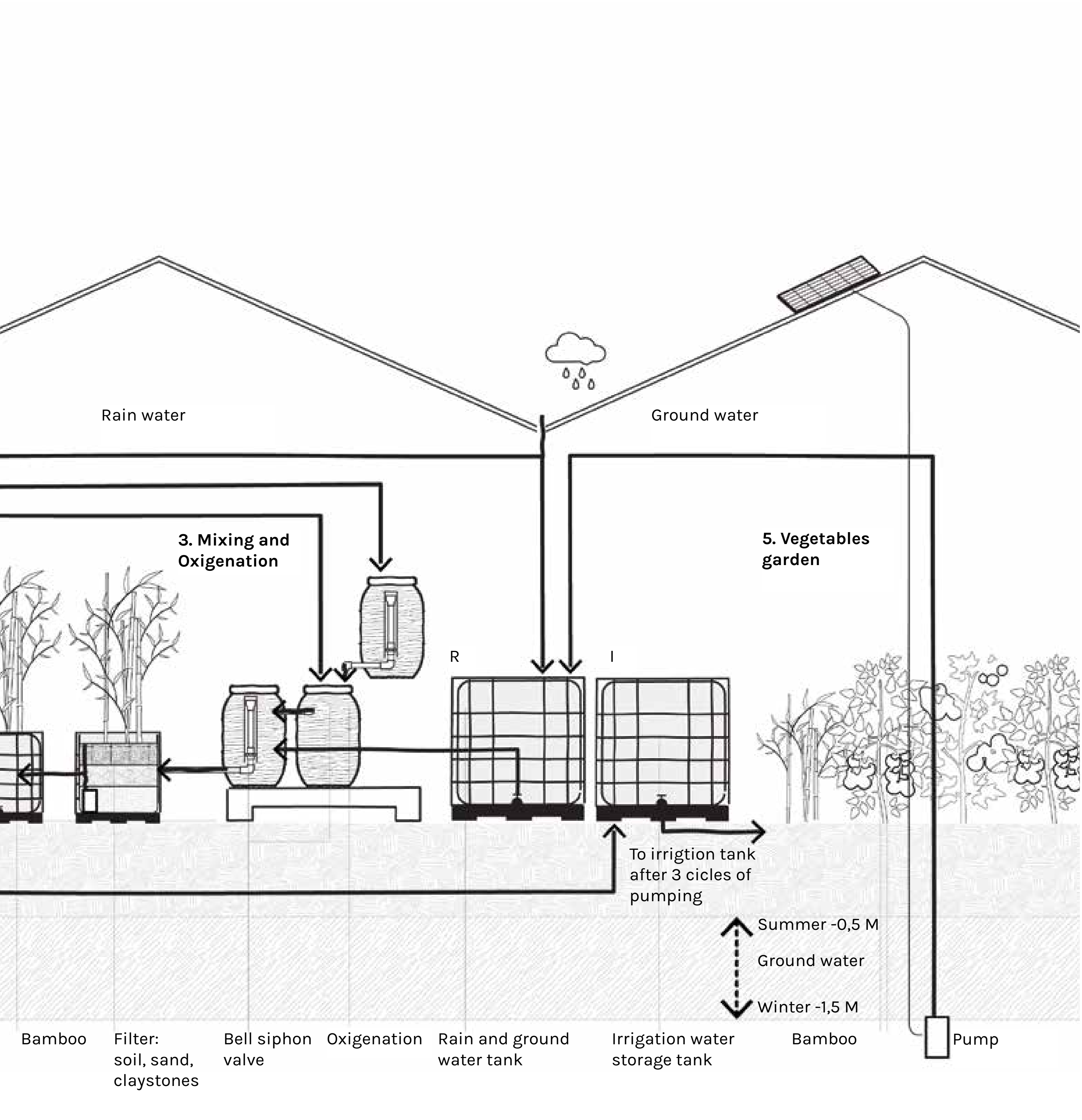
Kitchen filter

Fig 3.40, Kitchen filter
Illustration by Alessandro Rosa

The main difference between the kitchen filter and the Urine filter is the last part of the process; At the end of the day, the water is pumped to an irrigation tank and is used to irrigate instead of bamboo and willow, tomatoes and other edibles plants in the vegetable garden.

The use of IBCs for the Helophite filter is another possibility, best for projects with a duration lower than 6 years.




Rain water
Ground water
3. Mixing and Oxigenation
5. Vegetables garden
R
I
To irrigtion tank after 3 cicles of pumping
Summer -0,5 M
Ground water
Winter -1,5 M
Bamboo
Filter: soil, sand, claystones
Bell siphon valve
Oxigenation
Rain and ground water tank
Irrigation water storage tank
Bamboo
Pump

Rocket stove

Description

For burning biomass on household level, the rocket stove design currently gives you the highest efficiency and burns the cleanest.

The basic design is fairly simple. There are, however, some essential issues to take into consideration. These specifics, as listed below, will make sure that within seconds to a few minutes following ignition, depending on the size of the oven and material of the riser, a continuous hot flame will be created that sounds like a mini-rocket. The temperature in the riser reaches well over 1000 C, which is why it burns so clean. Heat is extracted mainly from the exhaust, for example, on top of the riser. This is the most common application, hence the name "rocket *stove*". The second popular application is the "mass heater". Because of the enormous draft of the rocket stove, the exhaust pipe can be laid out horizontally along a length of several meters, so it can exchange heat inside a bench (for example), made from a box with pebbles, or made of clay.

There are basically two types of rocket stoves: J-models with vertical wood input, and L-models, with horizontal input. J-models are usually small because they require thin pieces of wood that are either time consuming to make or expensive to get. Because they glide down as they are burning up, they give a rather continuous fire in between feedings with wood. The L-model can be equipped with a larger burning room in

Fig 3.41, fire of the pizza oven
Photo by Julie Ann Riemersma

order to batch feed it. The advantage of the L-model is that it can be fed practically anything of any size, whatever fits. However, the fire is less constant, and therefore when not carefully monitored, it can be effi- cient in the end less and thus more polluting.

Fig 3.42, rocket stove integrated system, Illustration by Alessandro Rosa

Specifics needed for the rocket to take off:

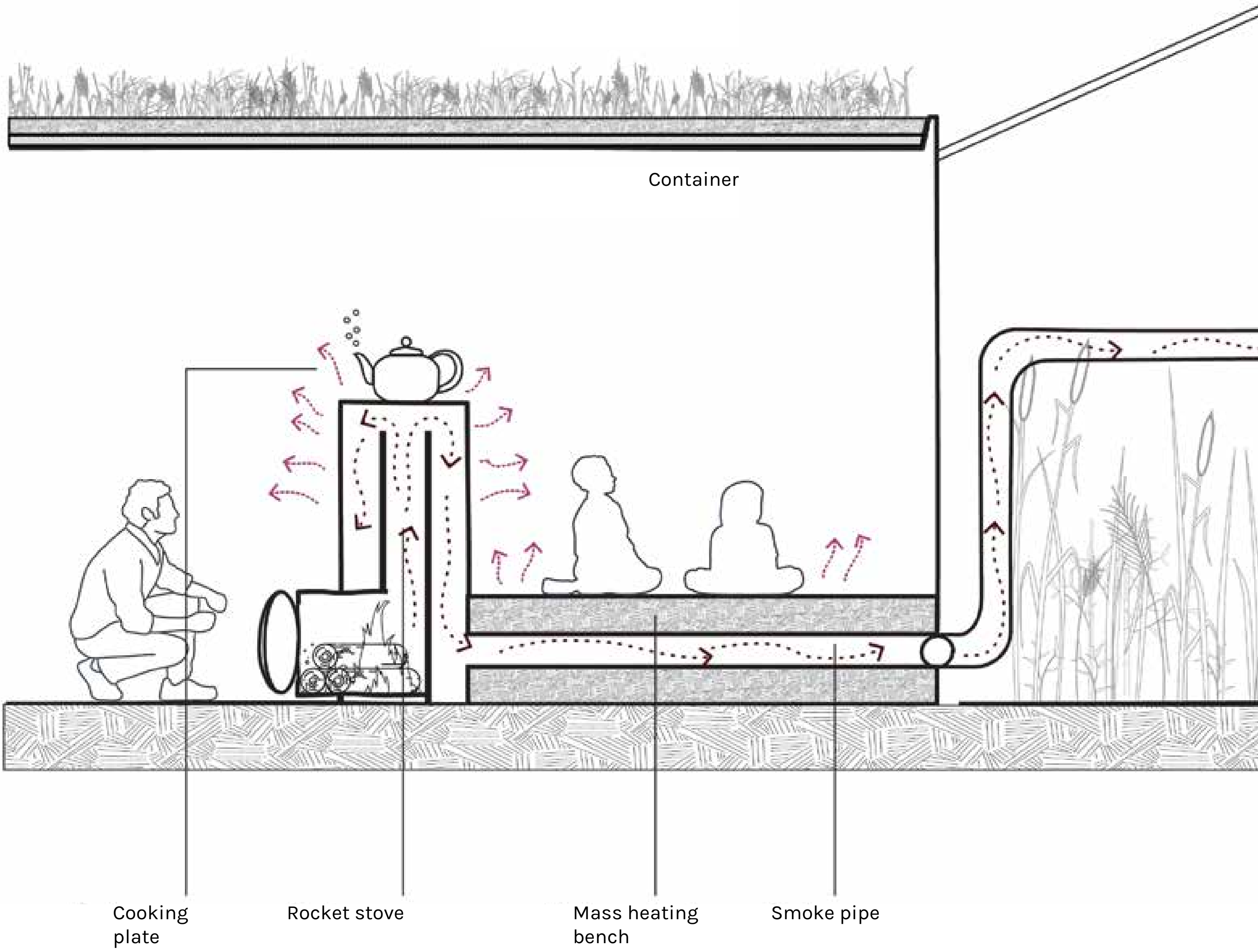
- Heavy insulation of the riser in the stove
- The riser should be made of light fireproof materials for a good re- fraction, quicker heating and therefore better overall performance.

Specific for the J - model:

- Length of burning tunnel max 1/2 of the riser
- Height of wood intake max 1/3 of riser

Specific for Batch burners, L - models:

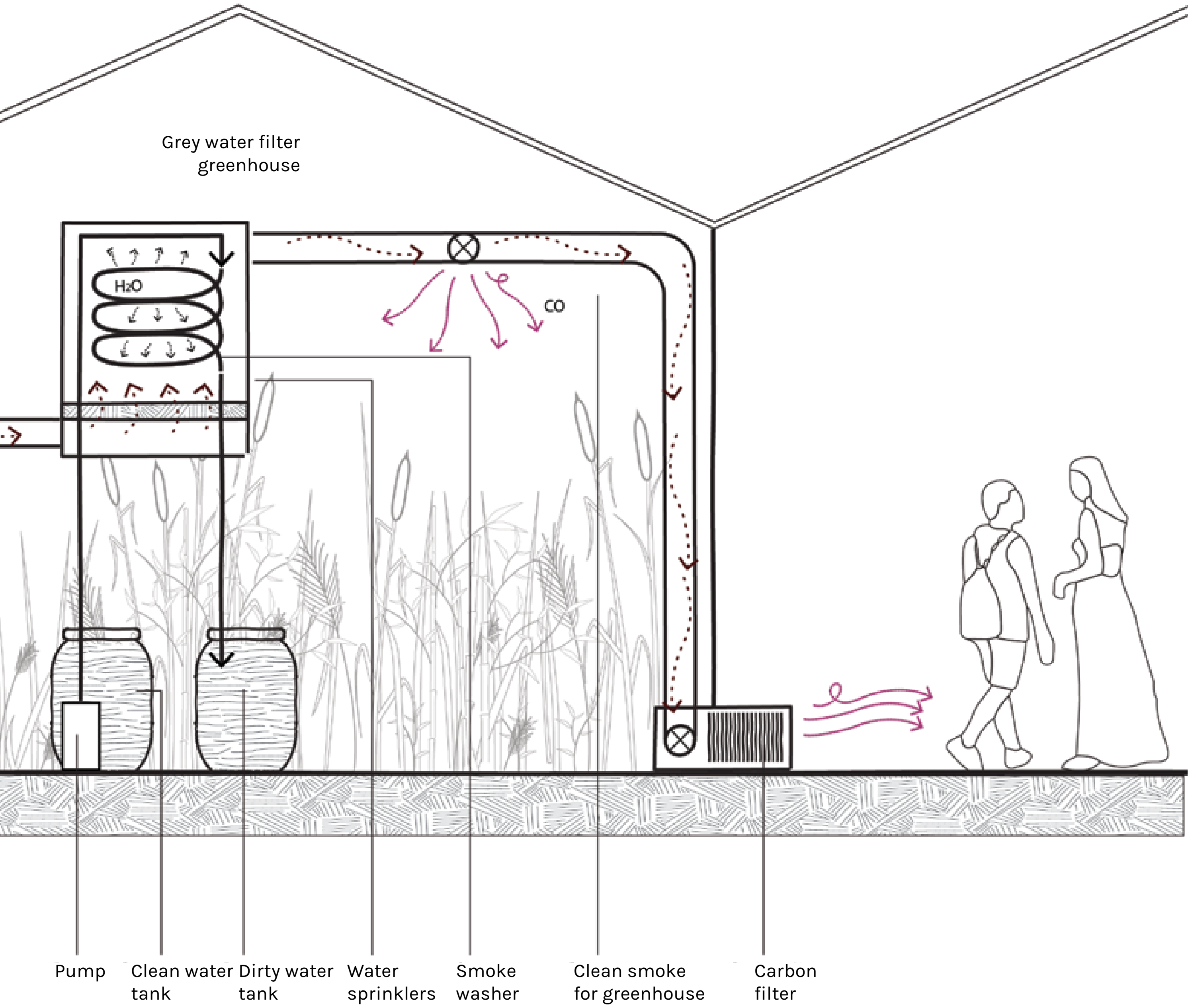
- A secondary air inlet towards the beginning of the riser. This should be 5% of the cross sectional area of the riser.
- Adjustable main air intake



9. https://en.wikipedia.org/wiki/Ianto_Evans
10. http://aprovecho.org

Forum:
https://donkey32.proboards.com/
https://www.rocketstoves.com/
http://batchrocket.eu/en/
https://walkerstoves.com/index.html
https://lifeboat.com/InfoPreserver/images/e/e2/39346203-How-to-Build-A-Rocket-Stove-DIY-AT-HOME_%281%29.pdf

The rocket stove was first invented by Ianto Evans[9]. He worked with Larry Winiarski, who tried to take most of the credit for it. They agreed to separate, and so the J-model was henceforth attributed to Ianto, and the L-model stayed with Winiarski with the non-pofit organisation Aprovecho[10]. Since then, there have been many people working to improve the designs of both types. The batch-burner design came as a third type as a solution to reduce the rather time consuming activity of wood filling associated with L and J tubes.



Materials and construction

The design that we present here are two batch-burners that are used to heat a pizza-oven. They both have a riser diameter, equivalent to a 15 cm diameter pipe, and an exhaust pipe from the oven with a diameter of 20 cm. The rocket stoves and pizza-oven are made of new and recycled fire bricks, with an insulation of rockwool and a cover of 20 to 30 cm of a local clay-sand mixture.

Materials

- 272 new fire bricks for the original burn chambers and the vault of the pizza oven, about 10 large fire bricks for the pizza oven recycled from an old chalk burning factory, and around 54 of thin fire bricks for the riser.

- Recycled rockwool to insulate the burning chamber, riser and pizza oven.

- One M3 of dirt with some good clay content

- The first meters of the exhaust pipe must be made of thick steel, however, in case of a heat bench (exchanger) is built in, the heat of the exhaust fumes are so reduced that cheaper materials are possible. Also the smoke channel in the heat bench can be made of (smooth) brick walls

- 1 meters of 20cm diameter steel exhaustpipe

- 5 meters of 20 cm diameter recycled ventilation pipe

- 1 meter of 25 cm diameter recycled ventilation pipe for go through side wall or roof

- Steel plate for welding the doors together of the two batch burners

Construction

The construction is quite simple, basically laying down bricks like lego, and covering it with rockwool and cob. There are several tricky things that require more careful attention.

1. The secondary air inlet is welded from iron tubes, in the shape of a "bird mouth". This requires obviously some welding skill. It would be possible to have the air inlet cut into the back of the bricks, also some skill would be needed here also.
2. The back of the burning chamber should be made quite solid to prevent that aggressive wood loading will kick out fire bricks from their positions. To prevent that, the riser can be constructed at the side of the burning chamber
3. The size of the slot between the burning chamber and the riser should

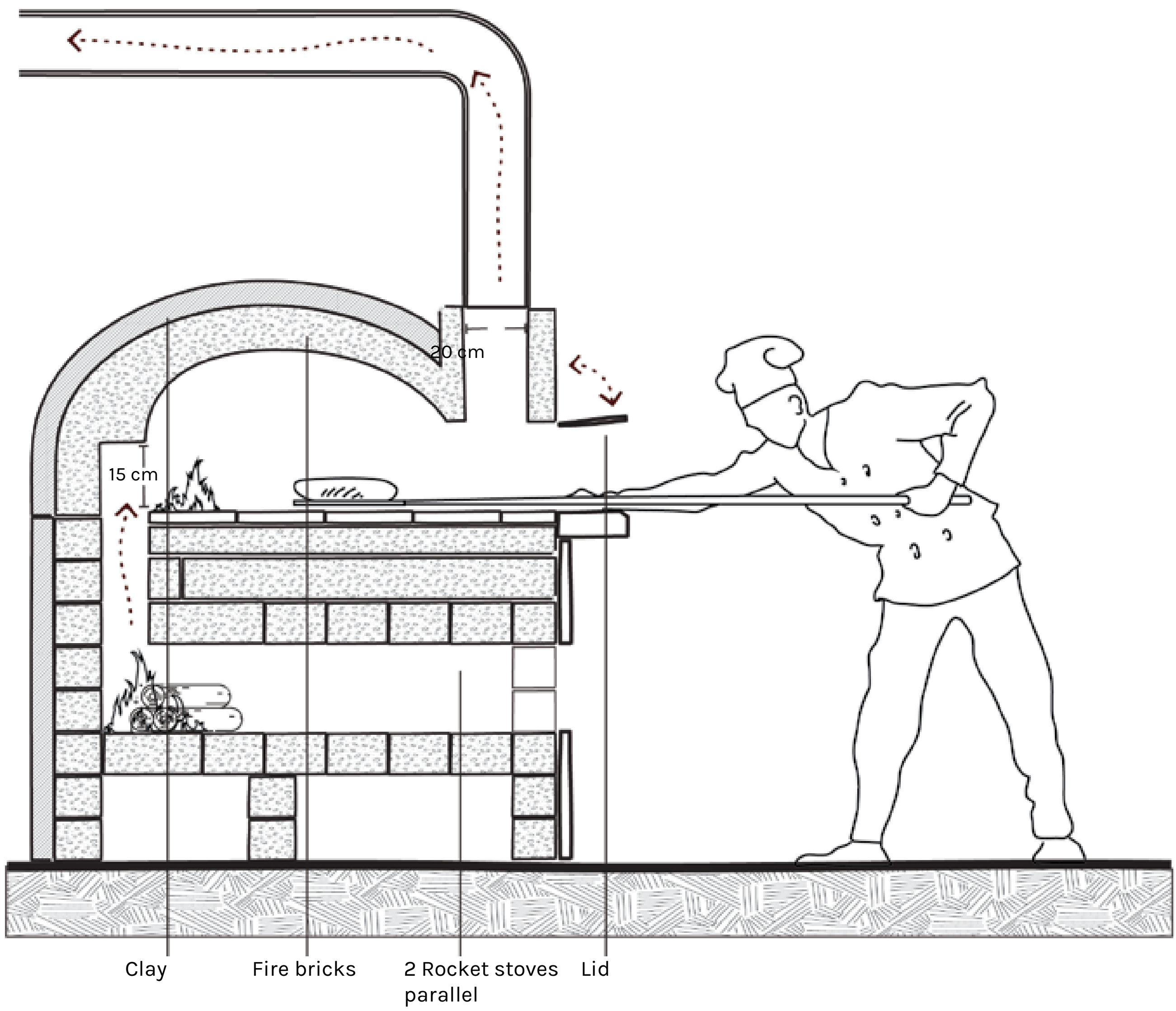
Fig 3.43, Front view of the Pizza oven with a system of two batch-burners below,
Fig 3.44, Pizza oven in action
Photos by KasKantine

be 65-72% of the chimney/riser diameter also known as the cross sectional area.
4. Cob making is a separate profession, but shortly: if local clay is used, or simply dirt, first the relation needs to be found in which extra sand needs to be mixed in order to prevent cracking. This can range between 3:1 sand/dirt and 6:1 sand/dirt, the latter representing almost pure clay. Recommended is to make 5 to 10 samples, and apply a layer of one cm or so on some wet brick (soaked for one night) to identify the optimum between stickiness and absence of cracking. A quick and dirty method is to make a ball of your test mix and if it holds its shape but will crack when squished you know it is about correct.
5. The oven needs clean-out access points on places that you cannot reach once the oven has been built. For example at the back of the burning chamber and within the exhaust pipes.
6. Horizontal pipes must be laid out with a small inclination towards a lowest point with a small exit for condensation water.

Fig 3.45, pizza oven section, Illustration by Alessandro Rosa
Fig 3.46, Pizzas cooking in the oven
Photos by KasKantine

Maintenance

- After several uses, the ash needs to be removed from the burning chamber.
- Small crackings of the cob can be washed away with a wet towel.




REGENWATER OPVANG
ZONNESTROOM INSTALLATIE
AQUAPONICS
STADS LANDBOUW
FIETSEN REPARATIE
KLUSSEN
~OFF-GRID EXPERIMENT~
DE KASKANTINE

Raised bed garden

Description

Raised bed gardens have been common practice for quite some time. Their advantages in urban areas are many. Here, we will just stress a few extra points such as the communal management aspect and use of materials.

Functioning

If you only need a small growing area, it can be very rewarding to make a raised bed.

1. On average, the fertile root zone of natural soil is only about 20 cm. Under this, the organic matter content, also known "humus", reduces quite dramatically. With raising the bed and adding more organic matter, fertility is improved enormously. Also, drainage issues are solved, although sometimes the bed may drain too much, resulting in extra watering needs.

2. The beds can be made so high that for most (superficially rooting) vegetables, the quality of the underground becomes irrelevant, making it even possible to make a garden on an asphalt surface or on polluted ground.

Fig 3.47, vegetable garden at the Kaskantine,
Photo by Alessandro Rosa

3.Raised beds are conveniently high for gardeners, as they save stress to your back!

They are also convenient for keeping out certain unwanted weeds and insects. The disadvantage however is that they are rather costly and time-consuming to construct. Most raised beds are made of nice timber, which doesn't last long, a pity! We therefore choose to use old pavement slabs.

Materials and construction

In our case, we transformed an old football field with sandy soil into our wheel garden. We made a pattern of the garden (half a wheel) and cut out the paths to a depth of 10 cm, turning the soil cakes upside down onto the future beds. We inserted the slabs 10 cm deep into the ground at the edges of the paths. The paths were covered up with cardboard to prevent weeds, followed by lots of wood chips. Each bed was then covered with a few wheelbarrows of (oak) leaves, manure and plastic sheets with little aeration holes, so the old vegetation could start to decompose.

In the late spring we removed the plastic and the leftover organic matter, and the beds were entirely clean and warm for seeding!

Maintenance

The only maintenance required is to keep on adding wood chips to the paths, so weeds are suppressed and counterpressure is given to the stone slabs so they don't slowly move outwards.

From top to bottom
Fig 3.48 Harvesting the spinach
Fig 3.49 Construction of the raised bed garden
Photos by KasKantine

Fresh water acquaponic

Description

Fig 3.50 Fresh water aquaponics,
Photo by Julie Ann Riemersma

Aquaponics is a revolutionary type of horticulture. Basically, it adds fish breeding to hydroponics (aquaculture + hydroponics), inspired by traditional forms of agriculture such as the Sawas of Southeast Asia and the Chinampas of the Meso-Americas. It is a type of closed-loop food system. The fish excrements supply the fertility for plant growth, and the fish are fed with food scraps and insects grown in compost (soldier flies). If the fish are bred for consumption, it theoretically doubles the production of total food (calories) per m2 compared to the two growing systems operated apart.

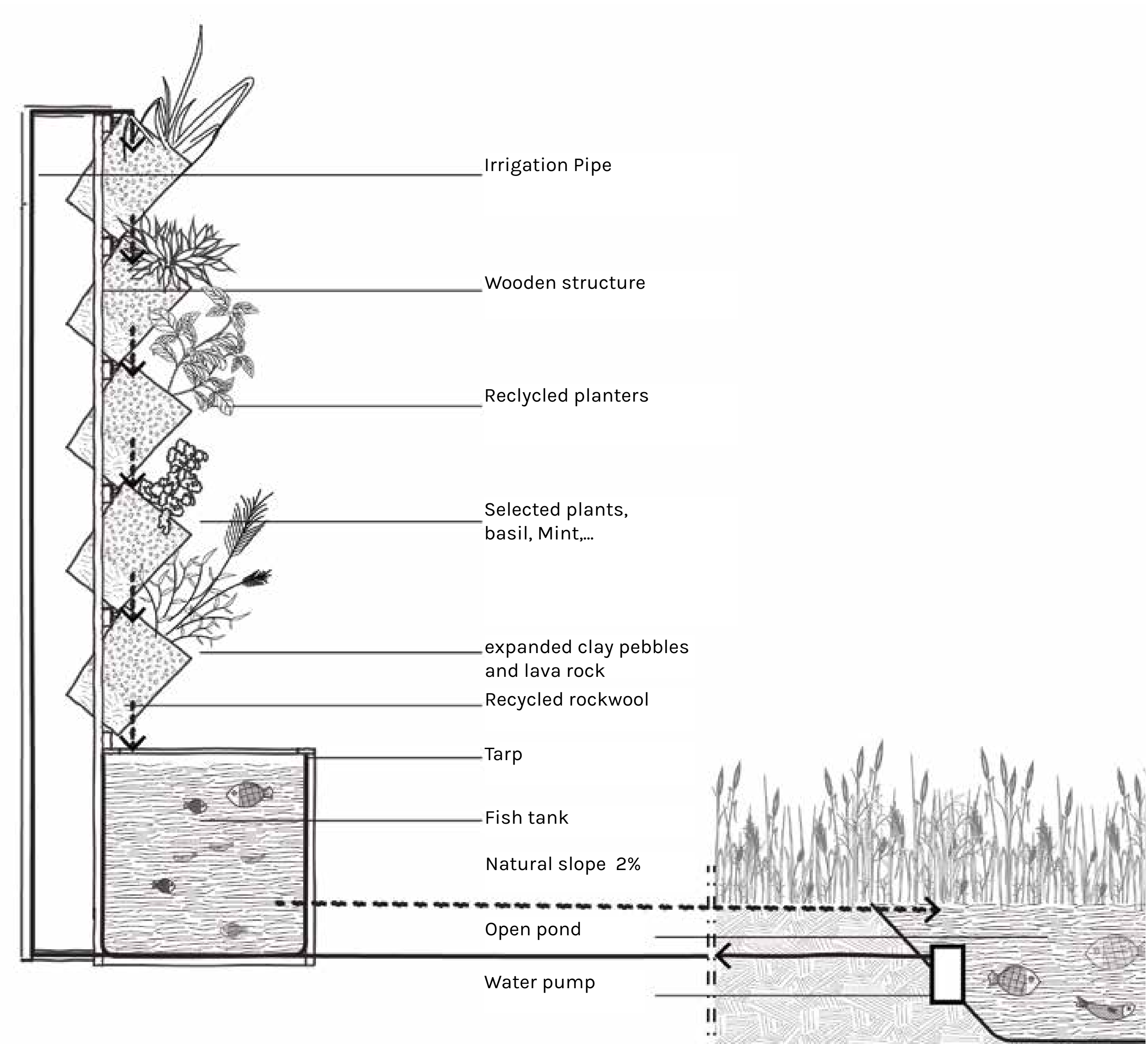
Functioning

There are many types of aquaponics, such as floating raft production, or on a substrate with flood and drainage irrigation. We choose for vertical gardening with buckets, in which the fish water runs through the pebbles in the buckets from the top downwards, and back into the fish basin.

The solar pump works during the daytime for 15 minutes per hour, which is sufficient to keep the pebbles wet.

Because the greenhouse is not systemically heated during winter, we chose for native, easy to keep fish (carp and roach). So, when plant production comes to a stand-still, the fish also go into "winter sleep" (hibernation).

Fig 3.51 Fresh water aquaponics section scheme,
Illustration by Alessandro Rosa



Materials and construction

- Planters: recycled from shut-down marijuana plantations, left by the police

- Substrate: recycled rockwool, expanded clay pebbles and lava rock (8-16 mm). Lava rock is cheaper than clay pebbles, but it can create basic water (high pH). We found that a 50/50% mix resulted in pH stable water.

- Rack: untreated wooden beams, with 2 metal ls as top support for the planters

- Pump: 200 Watt bilge pump

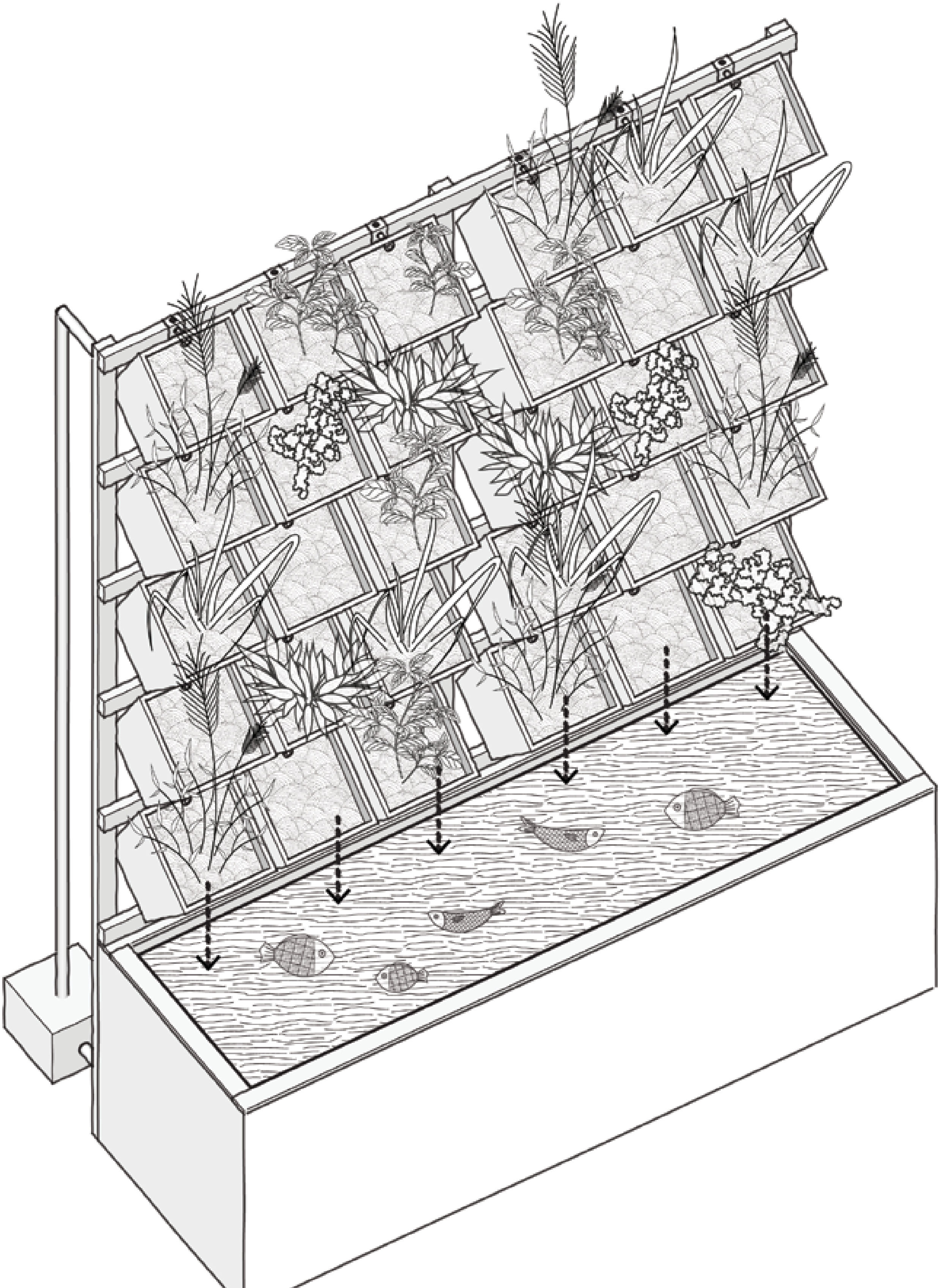
- Tubes: 20 mm PE tubing, with holes and little reeds sticking out for each of the top row planters.

- Aquarium and mix tank: Wooden boxes with pond liner

Maintenance

The motivation to choose this system was not so much the fish production - we keep the quantity of fish to the minimum and don't eat them - but rather an easy to maintain vertical garden. The system is fairly self regulating. If plant growth doesn't seem right (slow growth, yellowing of leaves), some check-ups can be done regarding nutrient availability, for example with an EC meter. The EC meter measures conductivity of salts in the water and is thus a measure for salty nutrients. If the reading is lower than 1, there can be a problem, and a chemical analysis can be done to look at the levels of Potassium - which is one of the most important salts. Chemical test sets are quite cheap if not used regularly.

pH is easy and cheap to measure with lakmoes/litmus papers. If the pH is higher than 7, the water is basic, and nutrients become less available for plants; therefore acidity needs to be added. One of our experiments in acidifying the water comes from our compost. We treat compost tea (drainage water from work compost, see next chapter) with EM1 (a mix of lacto fermenting bacteria) and sugar beet juice. The compost tea with EM1 can be added in the mix tank, making the water more acidic because of the lactic-acid. In case the acidity needs to be raised, only some more sugar beet juice needs to be added to the water to activate the EM1 again. EM1 can be made DIY. The reason for this experiment is that it seems more natural than alternatives (just pouring some salpeter acid in the mix tank). This also provides nutrition to the plants while keeping the fish population to a minimum, so you avoid not having enough fish-sourced "manure" for the plant production.



Next page Fig 3.52 Freshwater aquaponics axonometric view, Illustration by Alessandro Rosa
From top to bottom Fig 3.53 and Fig 3.54 Freshwater aquaponics, Photo by Edwin Dominguez
3.55 Freshwater aquaponics construction and frame structure, Photos by Alessandro Rosa

Worm compost

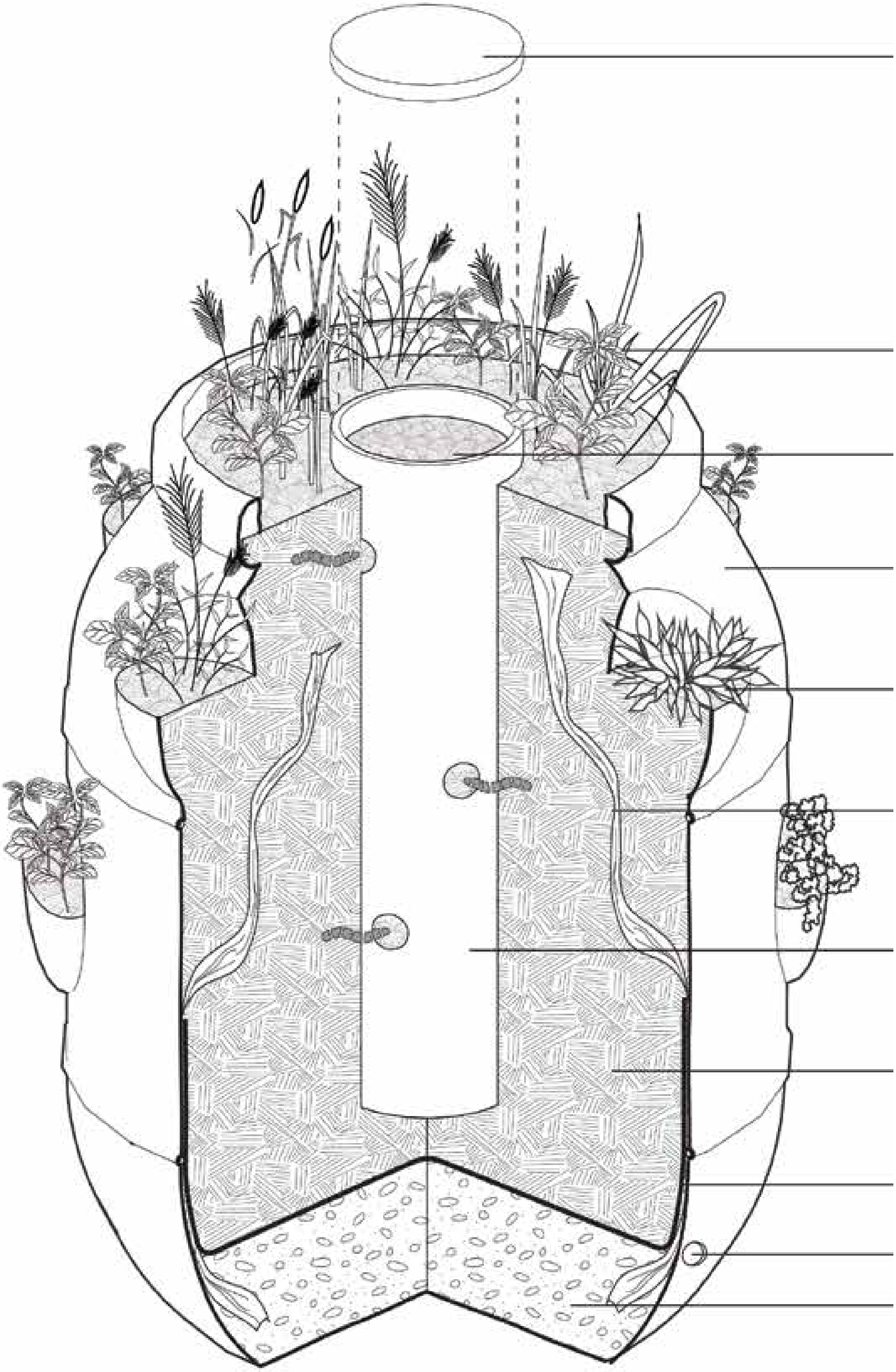
Description

Worm composting (vermicomposting) is a slow, "cold" composting method. This is opposed to fast, "hot composting", in which only thermophilic bacteria and fungi are active which can survive high temperatures (thermophilic = heat-loving).

Hot composting can kill most germs that are bad for your plants, so if some bacteria or viruses were present in the plant material you threw on the compost, they are likely to be neutralised. The same goes for seeds and the roots of weeds. So, the advantage of hot compost is that you can throw lots of different material on it, and destroy unwanted microbes and plants. The downside is that it produces more methane and nitrous gas (NOx), which are bad for the environment. Also, worm composting results in a superior compost product: the organic material passes through the digestive tubes of the worms, which makes the decomposing process very efficient and thorough. It results in very fine compost with high CEC qualities (Cation Exchange Capacity: the capacity of a substrate to hold and release nutritive salts, especially potassium).

Compost worms are a different species than earthworms. Earthworms migrate up and down in the soil, and are thus one of the most important contributors to natural soil structure and deep soil fertility. Compost

Fig 3.56 worm compost,
Photo by Julie Ann Riemersma



Cup for worm compost
Selected plants,
basil, mint...
Worm compost
Plastic barrel
200 l
Cuts for hosting extra
plants
Tissue for water
PVC pipe
Soil
Roots barrier
Drainage hole
Gravel

Fig 3.57 worm compost detail, Illustration by Alessandro Rosa

worms stay in the mulch layer, where they can continually work hard at digesting. Half of the species used as compost worms are actually tropical. The most commonly used species is the Red Wiggler, which is endemic to Europe.

Functioning

Vermicomposting can be done simply in a bin with little holes for aeration and drainage. More advanced is to collect the drainage and a possibility to tap it. This "compost tea" can be used, diluted 1:10, as a liquid fertilizer. It is also good to insulate the bin against temperature changes, and to actively aerate with a fan.

There are two types of vermicomposters.

Continuous feed.

One that releases compost at the bottom through rails placed at close distance from each other.

Stapled containers.

Different containers placed on top eachother with holes in the bottom, with adding empty containers on top of a full one, allowing the worms to migrate from the full container with fully decomposed to the new one, to be filled with new organic matter.

The container must be able to be closed off very well, or otherwise wrapped in chicken wire, to guard against mice and rats. Besides not wanting them around in general, they can eat all the worms in one all-night buffet!

Finally, ventilation is very important. Besides the fact that the composting process requires oxygen, the smell attracts flies. They can be a nuisance, as they will reproduce very successfully in the compost. With an aeration pipe, the flies are directed to the wrong place.

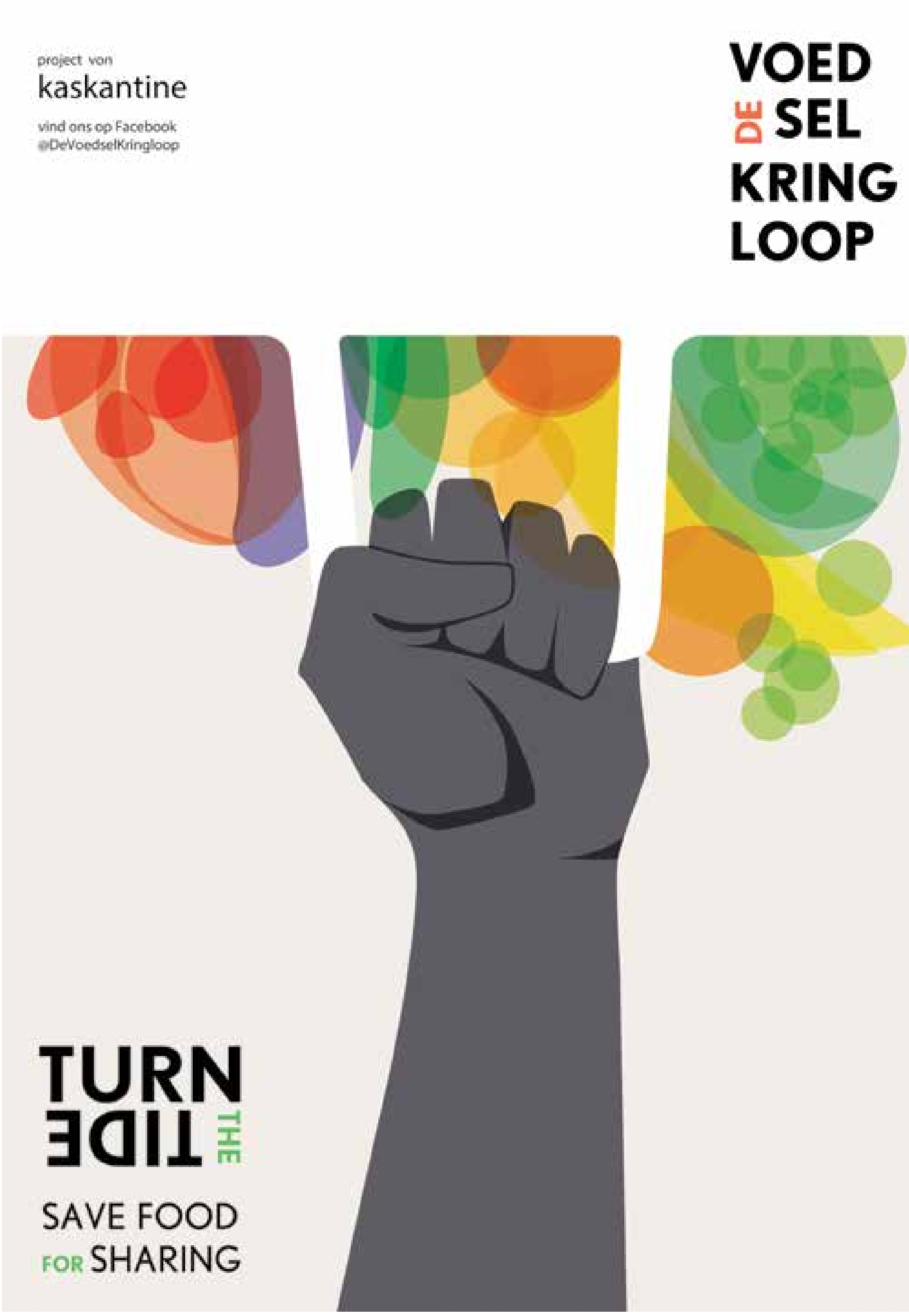
Materials and construction

Fig 3.58 and Fig 3.59 worm compost barrel,
Photos by Alessandro Rosa

The containers can be made from buckets, or from wood with a liner of geotextile.
The ventilation system can be made from pvc-pipe/drainage pipe and a 12 volt computer fan.

Maintenance

The installation is fairly maintenance poor, but the composting process should be carefully, almost daily, monitored. It requires careful mixing, adding dry organic matter in case to wet, or humidifying when it is too dry. Also attention should be paid to the speed of adding new material. If the conditions are right, and the worms grow well, and reproduce themselves, the composting speed will be a few times faster than if they don't reproduce.


project von
kaskantine
vind ons op Facebook
@DeVoedselKringloop
VOED DE SEL
KRING
LOOP
TURN THE TIDE
SAVE FOOD
FOR SHARING

Food recycling station

Description

The Food recycling station is a refurbished old shipping container that is used to sort-out and redistribute food from small scale "food-rescue" operations: the collection of wasted food from supermarkets and food distribution centers. If food is stored in the container, it should be very well insulated. A green roof, and an earthen wall against the south side, is highly recommended. Refurbishment can be done with recycled wood and insulation material.

Food rescue is an activity mainly done by volunteers. It enables them to learn about food, about the food system, food preservation, and to contribute to food security and take action against food waste. For one target group, one or two food collections per week is a good schedule. Most food that is picked up can be stored for the week. On one distribution day, and after sorting, the container acts as a food hub which can on average store and display enough food for 20 to 50 packages, depending on how much the "customers" take.

It is rather easy to mobilise volunteers for this activity, if it is only for a couple of hours per week. One advantage for the volunteers is that they can have first access to the food, and can obtain much of their weekly food needs for free. Based on a 4 hour schedule per week, per volunteer, this operation can be done with between 10 and 20 volunteers, and one or two coordinators who spend one or two entire days per week on

Fig 3.60 Poster De Voedselkringloop, 2019 design by Selvatico Collective the activity. This does not count extra activities like administration or promotion.

However, it is not an easy task to coordinate all those volunteers! New volunteers need to be trained, and they need to work in a responsible way. Communication is also very labour intensive.

Food safety regulations need to be obeyed. This means that food rescue has been limited to fruits, vegetables and dry products that do not require strict cooling protocols (during the whole chain). Furthermore, working surfaces must be cleanable, and working above the ground needs to be guaranteed.

Fig 3.61 and Fig 3.62 food waste sorting by the volunteers of the Voedselkringloop,
photos by Edwin Dominguez

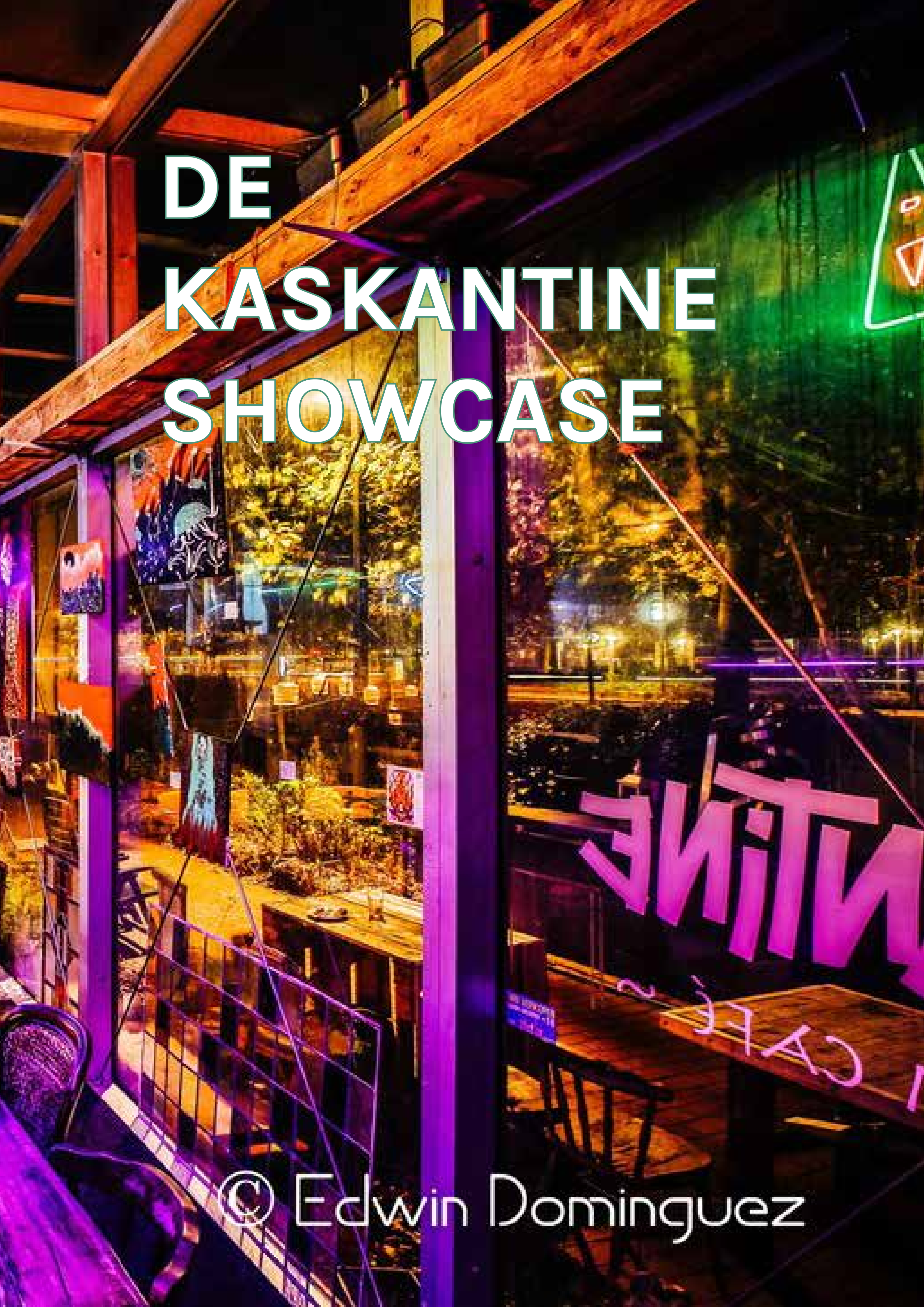
Materials and construction

Based on the scale described above, the following materials are indispensable:

- Transport bike, or a borrowed car
- Around 20 food crates
- Clean water source to wash the crates
- Stainless steel tables
- Storage (animal-proof)


Fresh Herbs
© Edwin Dominguez

DE KASKANTINE SHOWCASE



Previous page Fig 3.63, Kaskantine by night.
From top to bottom.
Fig 3.64 Kaskantine I in the ruins of an old Sugarfactory in Halfweg. Photo by Kaskantine
Fig 3.65 Kaskantine II in Harlemmerweg in Amsterdam.
Photos by Edwin Dominguez
Fig 3.66 Kastakine III in Delflandplein in Nieuw-West.
Photo by Julie Ann Riemersma
On the other page, Fig 3.67 Pizza-nights at Kaskantine.
Photo by Edwin Dominguez

The KasKantine started in 2013 in one of the ruins of the old sugar factory in Halfweg, when two chefs, who met each other while working in an organic restaurant in France, decided to realise their dream of making affordable meals with local and self-produced ingredients. We acquired a greenhouse and an old shipping container, and built a strawbale house in the old building. Our cooking style gathered a lot of attention, especially from folks in Amsterdam.

After three years, when our user agreement stopped, we got an offer to build a new KasKantine on the parking lot of an old bank on the Haarlemmerweg in Amsterdam. Several new initiatives joined, and a cooperative was established. Four shipping containers and a greenhouse were added to the building.

In 2017, the KasKantine was invited to build a new place on a construction site opposite the Delflandplein in Amsterdam Nieuw-West. The cooperative grew again with several members and new containers. A large garden was also added to the formation.

In 2019, the KasKantine moved to its present location, still in the Delflandpleinbuurt, where we are negotiating a longer rental contract with the municipality. It is an old football field, waiting to be transformed into a new neighbourhood in about 7 years time

Fig 3.68 Amsterdam map with the different Kaskantine locations, Illustration by Alessandro Rosa

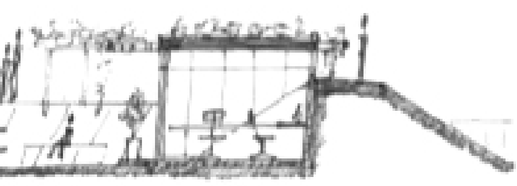
LEGENDA

- Kaskantine I
- Kaskantine II
- Kaskantine III
- Kaskantine IV

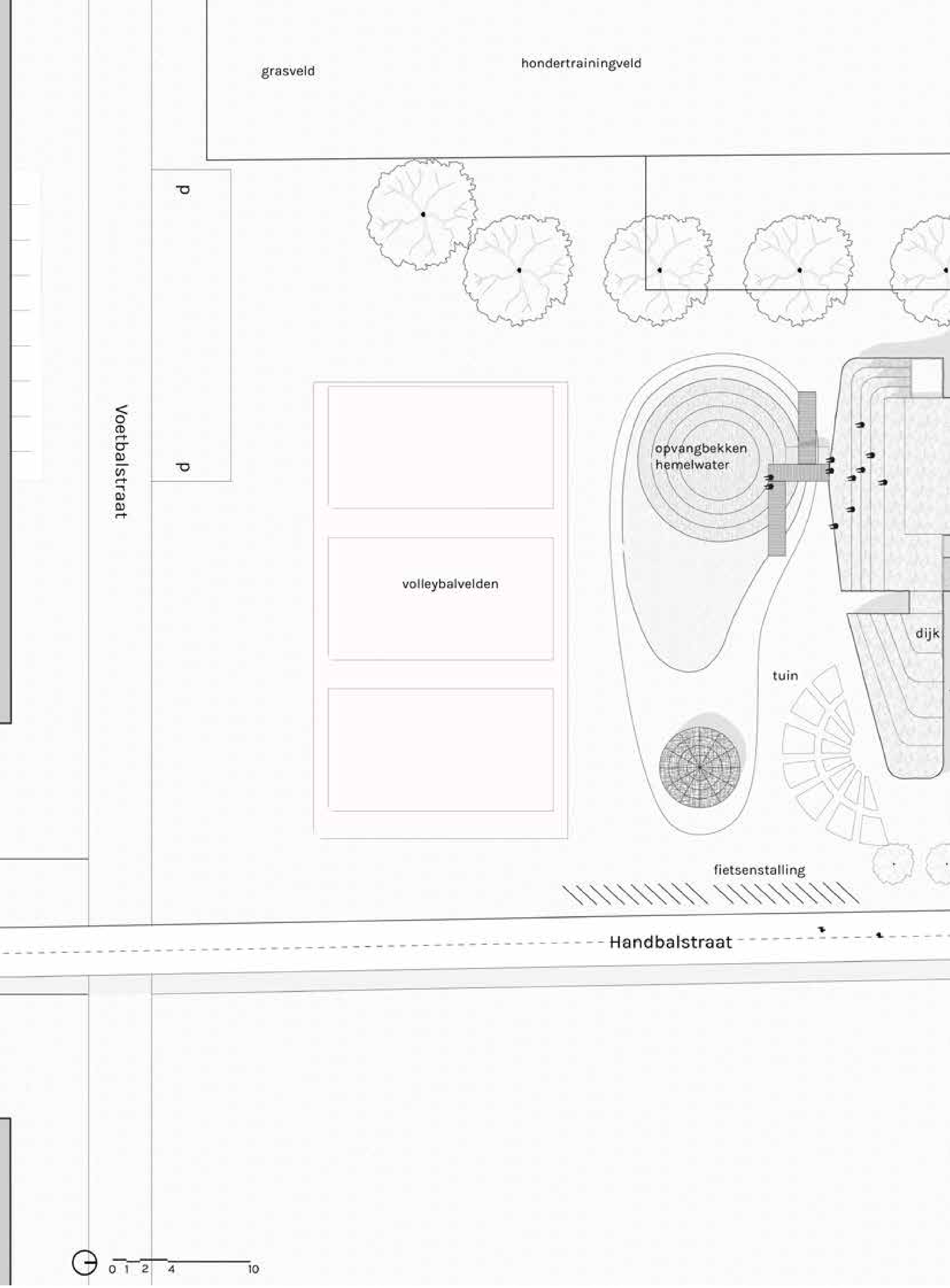
0 1 2 4 Km


KASKANTINE

Kaskantine IV



Drawings
Fig 3.69 Kaskantine schematic section,
Illustration by Richard Bosgraaf
On the next pages
Fig 3.70 context plan
Fig 3.71 interior plan
Fig 3.72 prospective section
Fig 3.73 axonometric view
Illustration by Alessandro Rosa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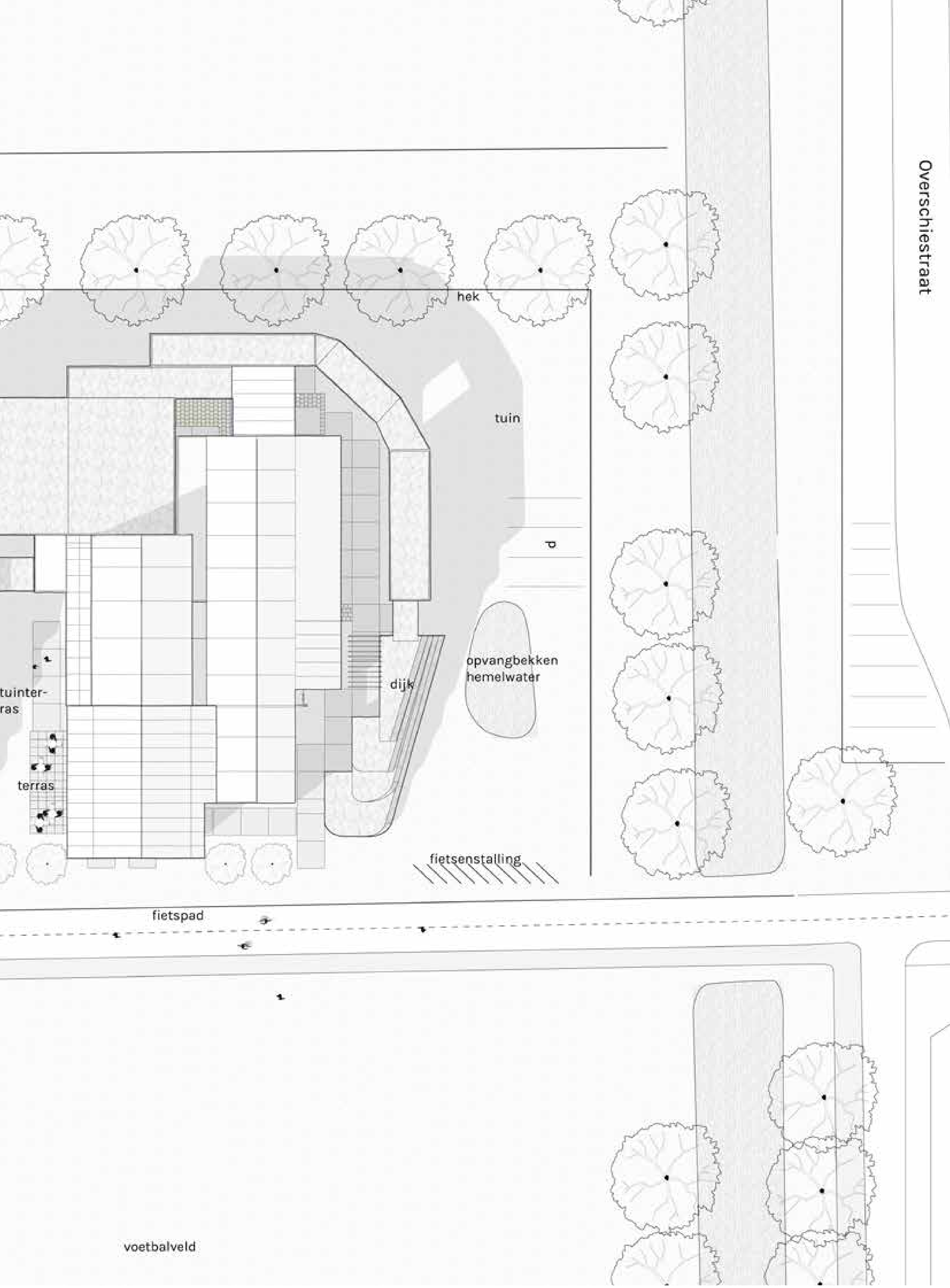
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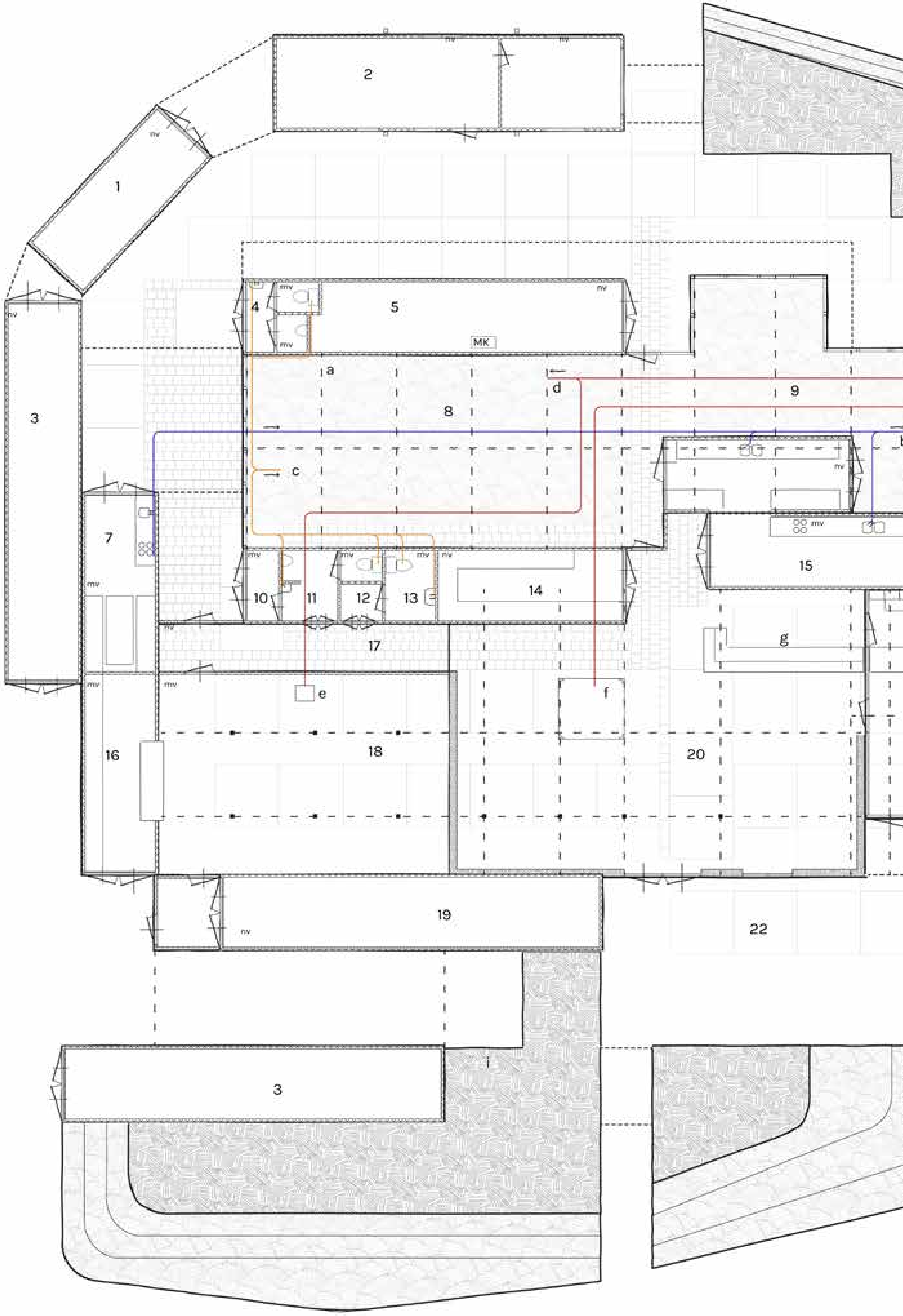
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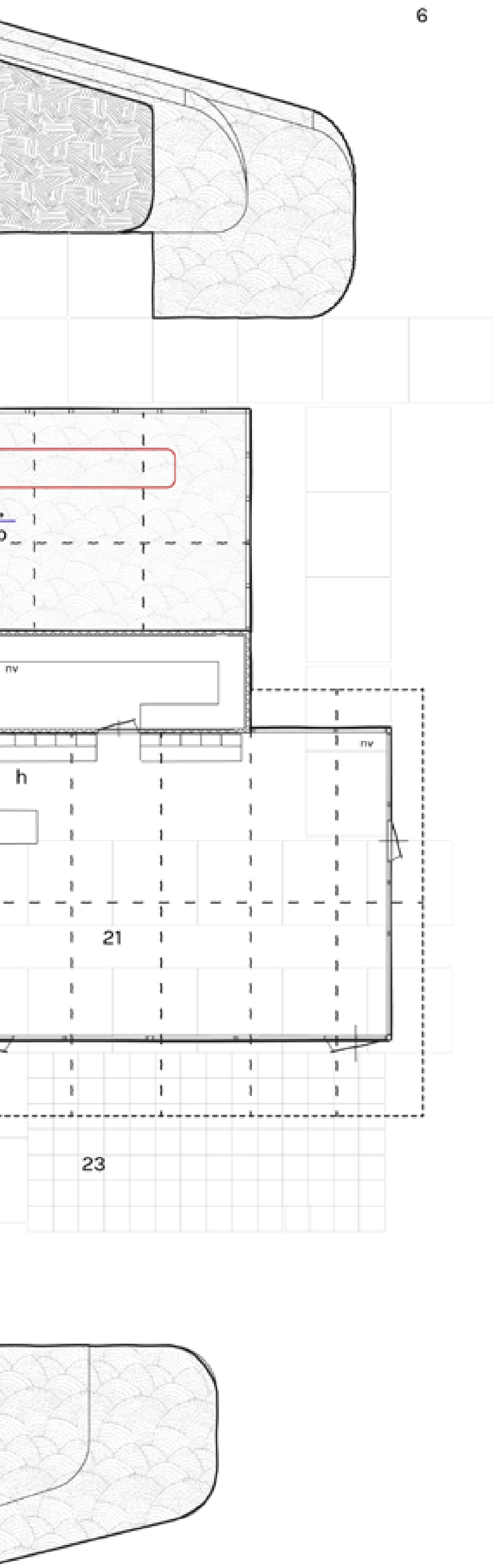
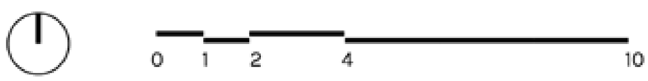
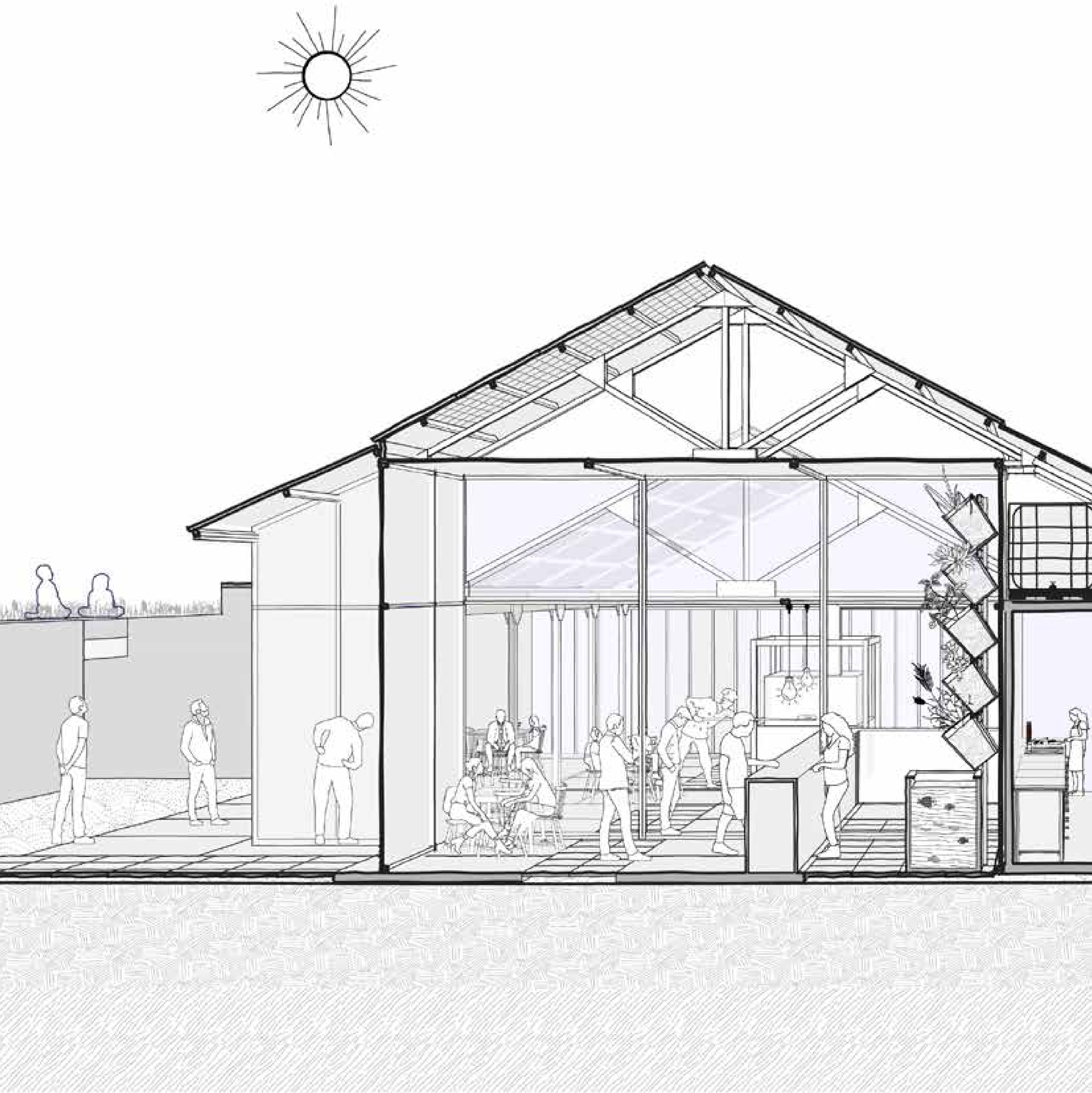


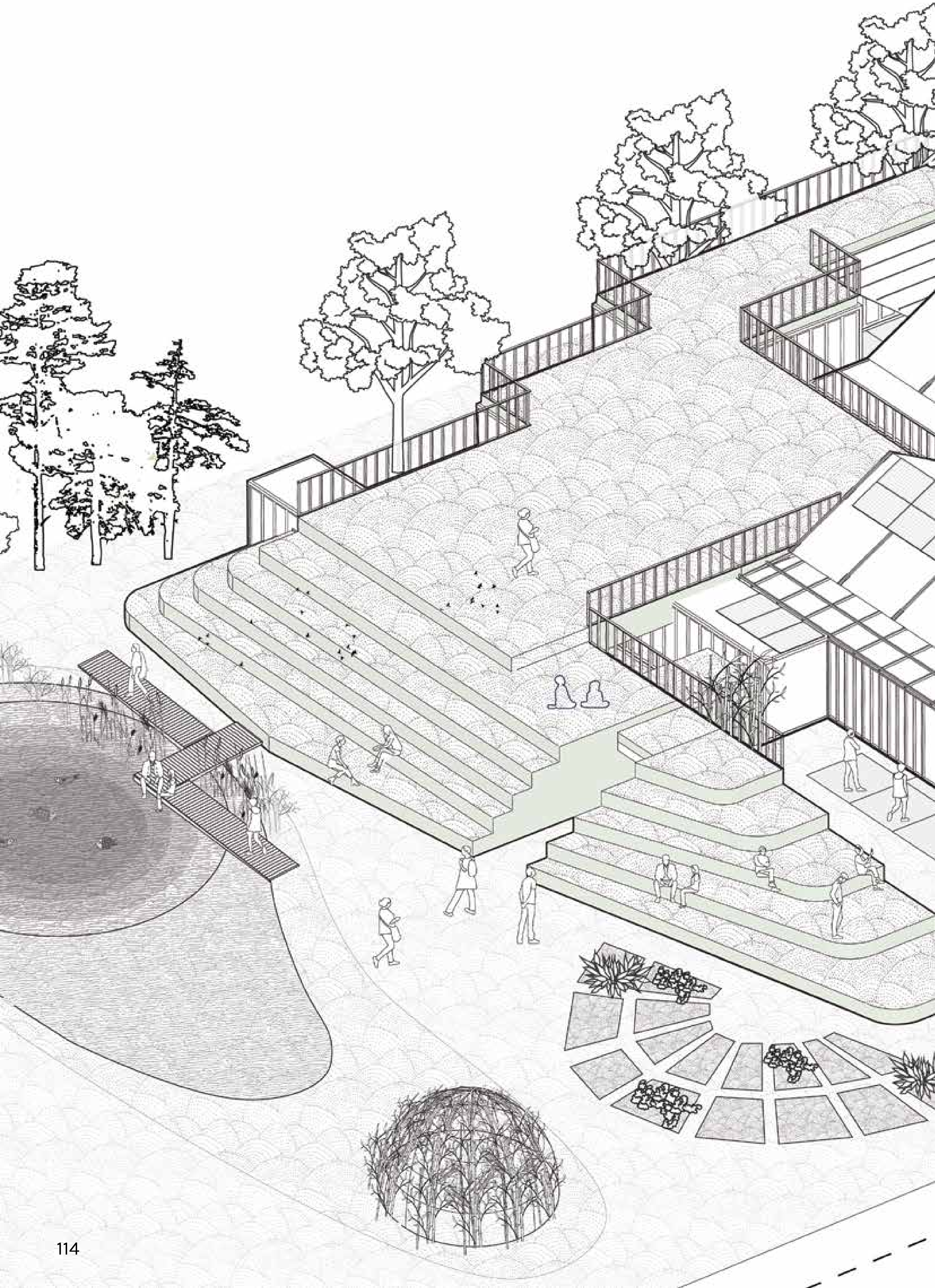
LEGENDA

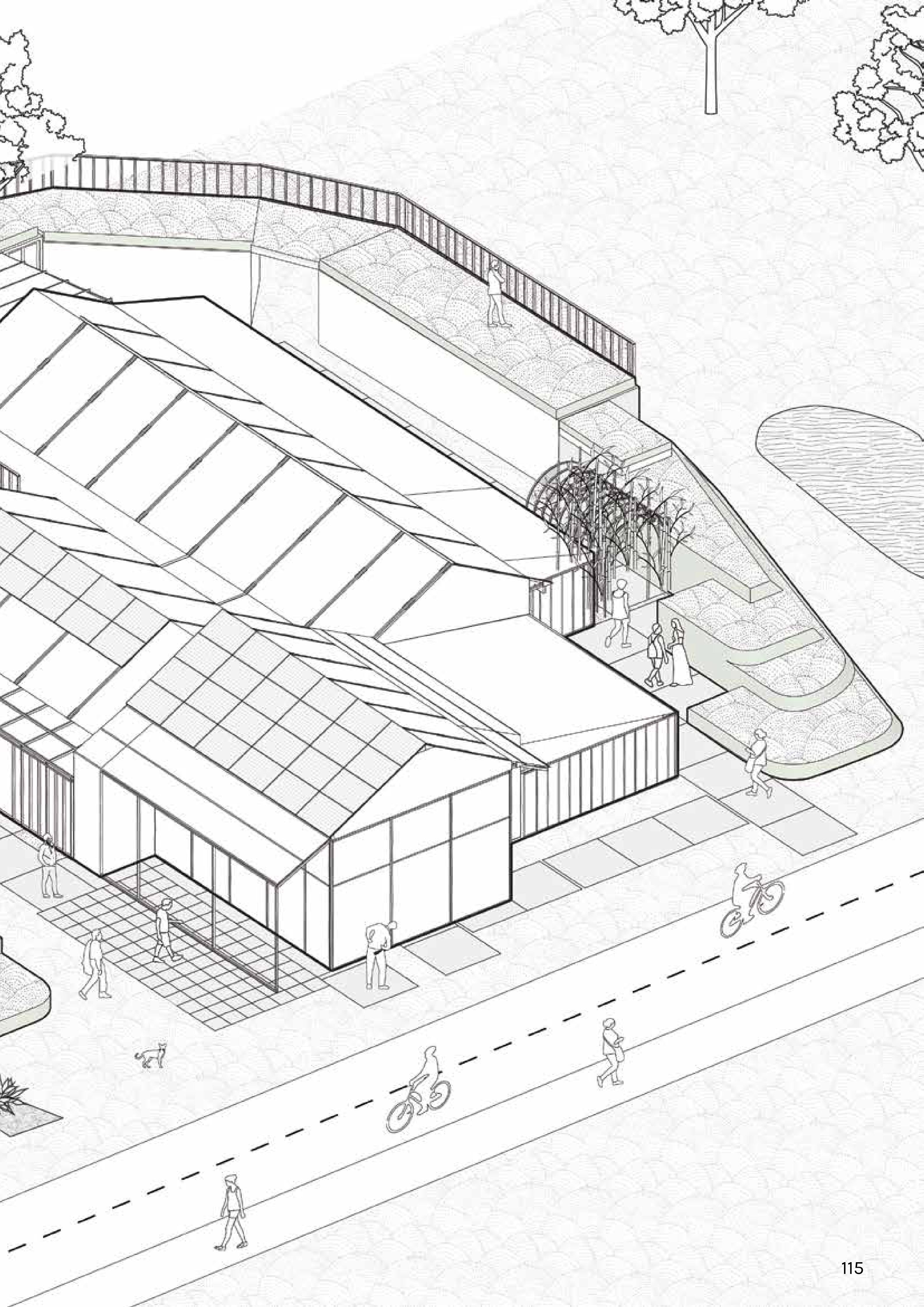
1	atelier vr 13,7 m^2
2	atelier vr 29,9 m^2
3	werkcontainer vr 27,9 m^2
4	wc personeel
5	faciliteitcontainer vr 22,6 m^2
6	fietsenstalling
7	personeelskantine vr 13,0 m^2
8	zuiveringskas vr 72,0 m^2
9	tuinkassen vr 73,5 m^2
10	opslag
11	wc heren
12	wc damen
13	wc mindervaliden
14	keukenberging vr 13,5 m^2
15	keuken vr 40,7 m^2
16	keuken vr 14,4 m^2
17	gang
18	dans/muziek/culturele ruimte vr 55,0 m^2
19	muziekcontainer vr 27,9 m^2
20	kantinekas vr 95,8 m^2
21	serre/plantenkas/entree vr 67,5 m^2
22	tuin
23	terras

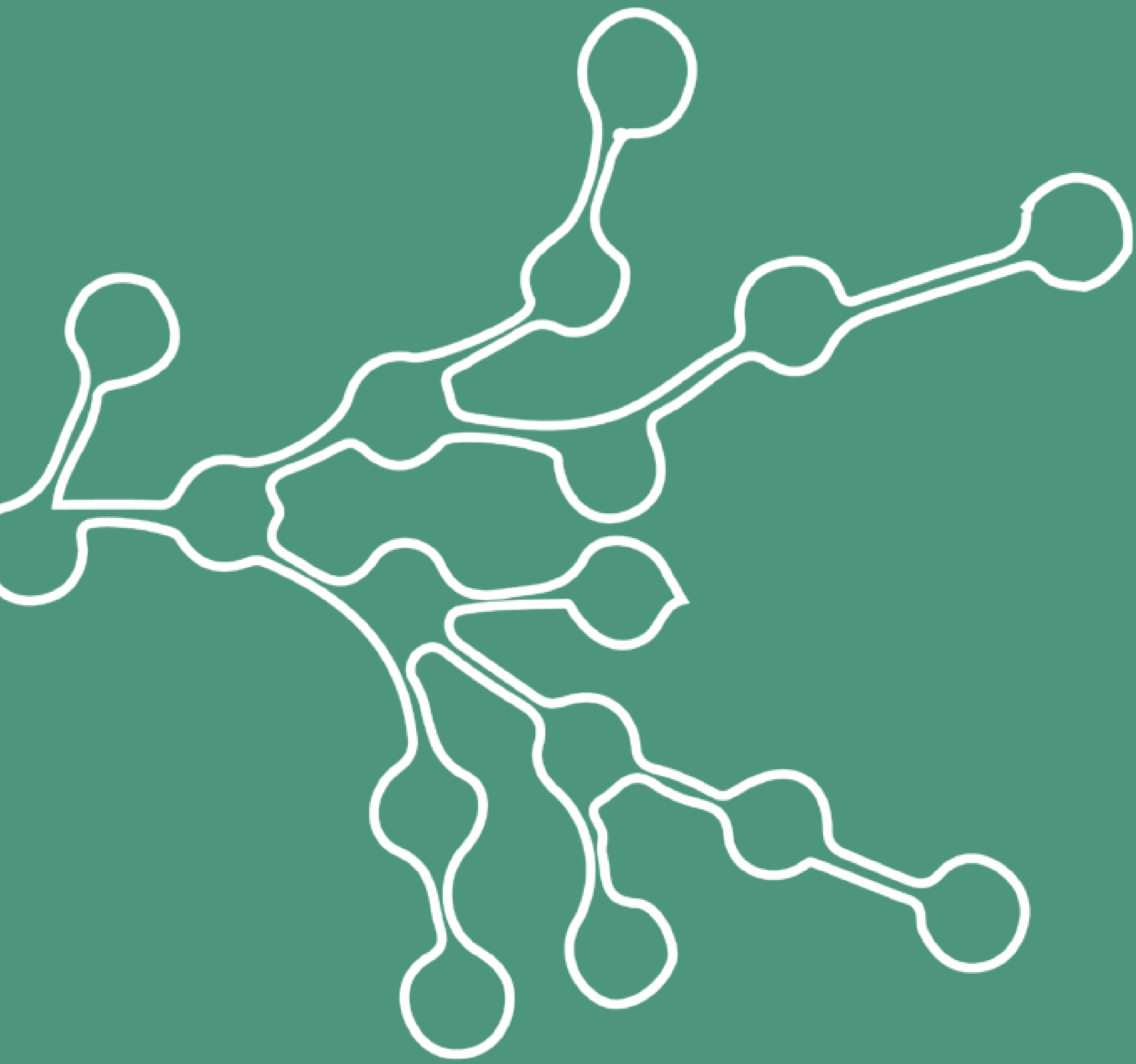
a	lekbak 0,8 m maaiveld d.m.v. waterdichte folie
b	zuiveringsinstallatie grijswater keuken
c	zuiveringsinstallatie urine en handenwaswater
d	rookwasser rookgassen
e	rocketstove
f	pizzaoven rocketstove
g	bar
h	aquaponicswand
i	opgevuld met lokaal aarde











CREDITS

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IMAGES

Cover by Linda Tonin
Pag 18 ENA principles, by Linda Tonin
Pag 102-103 Kaskantine schematic section, by Richard Bosgraaf
Fig 3.11 Solar panels, Photo by Fotograf Nürnberg https://shotstash.com/photo/solar-panels/
Fig 3.22 Rain Puddles Photo by Thomas B https://shotstash.com/photo/rain-puddles/
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A special thanks to all the volunteers that contributed and helped in the years to the project.
Without you nothing of this would have been possible!

DE KASKANTINE

~ URBAN FARM CAFÉ ~