A STUDY TO CHARACTERISTICS THAT CREATE THE RIGHT CONDITIONS IN AND AROUND DWELLINGS FOR PEOPLE TO ADOPT A SUSTAINABLE LIFESTYLE

LEARNING FROM BOTTOM-UP, SUSTAINABLE INITIATIVES: DUTCH TINY-HOUSES AND ECOVILLAGES

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HOMES FOR SUSTAINABLE LIVING

‘’The good intentions and creativity of citizens and their willingness to make a difference is one of the most underutilized resources we have today’’, says Global Ecovillage Network Europe (GEN). Bottom-up initiatives like ecovillages and the recently emerged Dutch ‘Tiny House Movement’ are sustainable projects organized and shaped by people who adopted a sustainable lifestyle and with that contribute to the reduction of climate change. It appears that similar people, who are also willing to reduce their carbon footprint, can’t find a suitable living environment in the current housing stock that fully meet their needs. While, in a world where nowadays climate change is a big problem, we should encourage this group of people to get most out of their willingness by giving them the right circumstances in the built environment. As architects, we can learn from the way residents of tiny houses and ecovillages organize and shape their environment, and use this knowledge in the design of future dwellings. By visiting and interviewing the residents of tiny houses, and by visiting and talking to the initiators of ecovillages, aspects that are being integrated in tiny-houses and eco-villages that support a sustainable lifestyle are found. Mainly, sustainable methods for energy- and water consumption, food consumption, the way they deal with transportation and product consumption are discovered.

Keywords: sustainable lifestyle, sustainable design, tiny-house, ecovillage.

1. INTRODUCTION

Climate change is noticeable more and more. Take recent disasters like floods in Asia and hurricanes like those in St Martin and the United States, which causes many deaths and a lot of damage. The Belgian Centre for Research on the Epidemiology of Disasters writes in his paper 'The Human Cost of Weather Related Disasters' that 90% of all disasters since 1995 are weather-related.[1] And this amount only increases. Due to natural disasters, 606.000 people have died and 4.1 billion people have been injured, have become homeless or are affected otherwise. These hard facts show how important it is that we should try even harder to reduce climate change.

Luckily, a select group of people is already aware of this. These people contribute to a healthier planet by adopting a sustainable lifestyle. This means that they attempt to reduce their carbon footprint by altering methods of transportation, energy- and water-consumption, product-consumption and diet.

In the built environment, however, little attention is paid to design homes that would fit sustainable lifestyles. Instead, when talking about sustainability, architects tend to focus on designing 'a building that can be build, used and demolished with the least amount of impact on the environment'. They try to design energy-neutral, or even energy-generating buildings. However, we then focus on how to meet the individual's needs with sustainable resources, rather than trying to reduce these needs in the first place. The built environment has great potential to make sustainable living more accessible by creating the right conditions, and with that reduce climate change.

To figure out what aspects should be implemented in the built environment to support sustainable living, the research will focus on bottom-up sustainable initiatives: Dutch tiny-houses and ecovillages. Tiny housing is about small living as a lifestyle, with the focus on financial freedom, a small ecological footprint and living with like-minded people.[2] An ecovillage is an intentional, traditional or urban community that is consciously designed through locally owned, participatory processes in all four dimensions of sustainability (social, culture, ecology and economy) to regenerate their social and natural environments.[3] Both types of projects focus on reducing their resident's ecological footprint and can be called 'models for lived sustainability'.

What can we as architects learn from the way these people organize and shape their environment and are therefore able to live a sustainable life? To figure this out, this research paper will give answer to the question: *''What social and physical characteristics of Dutch Tiny-houses and Dutch eco-villages support a sustainable lifestyle?"*. To answer the question, two sub-questions are formulated: *''Are all characteristics implemented really sustainable?"* and *''What influence do the sustainable characteristics have on the lifestyle of the residents?"*

This research will take the most extreme environments for sustainable living as examples, which are mostly situated in rural areas. It is my plan to, for my graduation project, translate these sustainable characteristics into an urban environment. With this, I will show how to create the right conditions for sustainable living in a densely populated area. Living sustainable will then become more accessible for a broader target group.

2. METHOD

To capture the social and physical characteristics of an environment which supports a sustainable lifestyle, two slightly different methods were required for the research to tiny-houses and ecovillages.

2.1 Method tiny houses

For the research on tiny-houses, residents of tiny-houses were interviewed in their homes. The in-depth interviews were semi-structured and of exploratory character. Open questions were asked based on all elements of a lifestyle. In this way, the participants get triggered to tell about their way of living in and around their homes without pushing the interviewee into certain directions. The elements of a lifestyle are: housing, mobility, food and products (see figure 1). These four categories come from the method of the lifestyle- or ecological footprint calculation, with which the individual's impact on the environment can be measured and understood.[4] During all interviews, however, characteristics were mentioned which did not fit directly within these four categories. Therefore, when processing the results, additional categories are added. Also, the category 'housing' is divided into sub-topics, since it contained a broad range of different aspects.

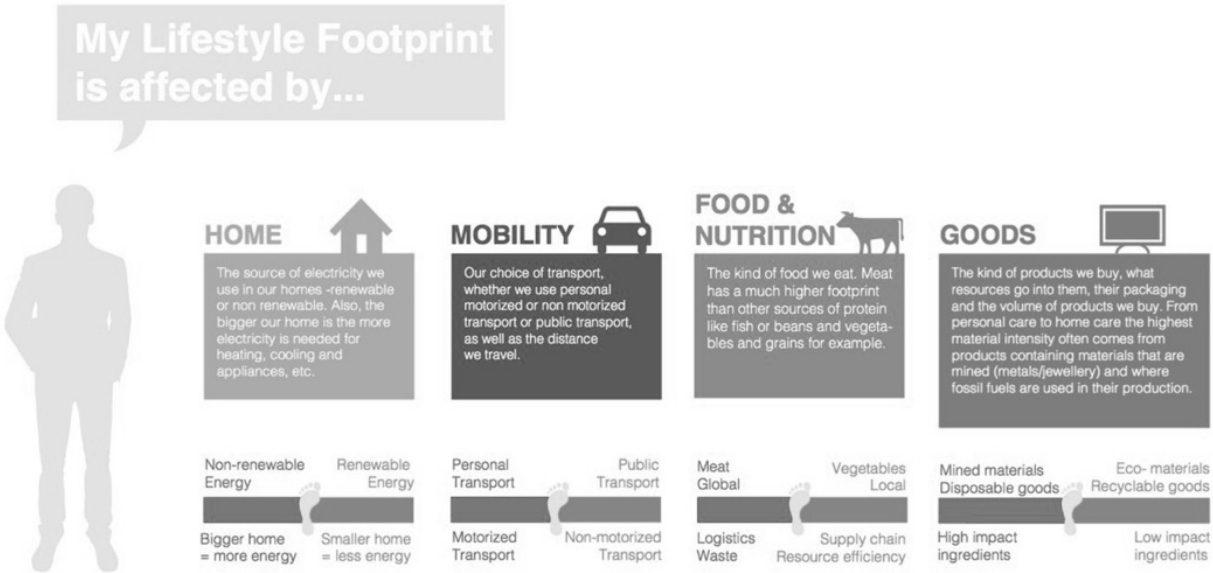

Figure 1: Sustainable lifestyle categories [4]

The starting point of the interviews was the physical environment. Questions like: ''what materials are used to build the house?'', ''where do you get your energy from?'', ''do you cultivate your own food?'' and ''do you share spaces or things with other people?'' were addressed. The interviews are added to the appendix. Even though mostly physical aspects were asked about, social aspects always became subject of discussion. During the description of a resident, additional questions were asked where necessary to get a complete picture of the physical and social environment. The non-directive methodology caused uncertainty about results in advance, but provided the broadest conversations.

The interviews took place in October 2017. Four conversations have been held. Information about the interviewees can be found in the appendix. During the interviews, the 'saturation principle' has been used. This means that the interview continued as long as new information was being told. They varied from one to two hours. The interviews were recorded and transcribed afterwards. Then, all relevant information from each interview has been visualized in separate graphic schemes and is added to the appendix. These findings have then been put together in one table (tables 1.1 and 1.2) to be able to compare the four interviews to find similarities and contradictions.

2.2 Method ecovillages

For the research on ecovillages, visits and guided-tours that the initiators and residents of the villages offer, were required. During these tours, they tell about their way of living and how their village is designed and organized. Before attending the guided-tours, information about the ecovillages were gathered already. [5,6,7,8] In this way, the projects were already a bit more known and it became clearer where to pay attention to during the tours. The visits to the ecovillages gave clarification and added information to the research which was already done before the visits took place. The information is structured according to the categories from the ecological footprint-method (see figure 1) and additional categories.

Since the tours were organized by the initiators and residents themselves, the research approach is very non-directive. This again lowered the chance on leading the information towards a certain direction. The information told was based on both physical and social characteristics of the ecovillage. If some characteristics still needed to be clarified after the tour was finished, the guide stood open to answering questions.

A total of three ecovillages have been researched, of which information is added to the appendix. The visits took place in November and December 2017 and took approximately two hours. During the tours, photos have been taken and information has been written down. Straight after the visits, when the information was still fresh in the memory, a broad document has been written with all relevant information. Some information about each ecovillage has then also been visualized in plans and can be seen in the appendix. All findings have been put together in one table (tables 2.1 and 2.2) to be able to see similarities and contradictions.

3. RESULTS

3.1 Results tiny houses

The characteristics which have been found in the interviews are shown in table 1.1 and 1.2. They are arranged to the categories: housing, food, mobility, products, the house itself and other. The residents had a lot of influence on the characteristics, since they all built their own homes. They addressed that their priority was to find sustainable methods for generating energy, for heating and for cooking. They also mentioned to be very conscious about the influence of mobility, food and the purchase of certain products on the environment.

	HOUSING				
	ENERGY	HEATING	COOKING	WATER	TOILET
Interview 1	- Four solar panels - Batteries and converter	- Gas heater (but: not recommended)	- Gas stove (but: not recommended)	- Roof as water collector - 1x 1000L tank - Filters - Heating by gas	- Compost toilet - Helophyte filter
Interview 2	- Three solar panels - Batteries and converter	- Wood stove with use of well dried wood	- Gas stove (but: not recommended)	- Roof as water collector - 2x 1000L tank - Filters - Heating by gas	- Compost toilet - Helophyte filter - Compost heap
Interview 3	- Five second-hand solar panels - Batteries and converter	- Wood stove with use of well dried wood	- Gas stove (but: not recommended)	- Water well in winter - Filters - Normal water connection in summer - Heating by gas	- Normal toilet connected to sewage system
Interview 4	- Three glass solar panels - Batteries and converter	- Hot air-heating trough solar collector - Future wood stove (extra)	- Gas stove (but: not recommended)	- Roof as water collector - Buffer vessel - Filters - Heating by solar collector	- Compost toilet - Helophyte filter - Compost heap

Table 1.1: Characteristics for living applied in and around Tiny Houses

	FOOD	MOBILITY	PRODUCTS	THE HOUSE ITSELF	OTHER
Interview 1	- Kitchen garden (private)	- House on wheels: able to move - Work/school is located close-by: use of bike as much as possible	- Manual above mechanical equipment - Energy-efficient fridge (A++) and LED-lightning - Like being able to share stuff with others	- Built from mainly sustainable and recycled materials - Compact design (20 m^2)	- Able to separate waste
Interview 2	- Food forest (shared) - Beekeeping (shared) - Ram- and sheep farming (shared)	- House on wheels: able to move - Work is located far away: use of car more often than public transport	- Manual above mechanical equipment - Energy-efficient fridge (A++) and TV-screen (A++) - Like being able to share stuff with others	- Built from mainly sustainable and recycled materials - Compact design (20 m^2)	- Able to separate waste
Interview 3	- Kitchen garden (private)	- Work is located close-by: use of bike as much as possible	- Manual above mechanical equipment - Energy-efficient fridge (A++) and small washing machine	- Built from mainly sustainable and recycled materials - Compact design (20 m^2)	- Able to separate waste
Interview 4	- Farmers' kitchen garden - Future own kitchen garden	- House on wheels: able to move - No need to travel large distances for work: always use (electrical) bike	- Manual above mechanical equipment - Energy-efficient fridge (A++)	- Built from mainly recycled materials (inside and out) - Compact design (20 m^2)	- Able to separate waste

Table 1.2: Characteristics for living applied in and around Tiny Houses

Looking at the table, however, we find some aspect which are not as sustainable as expected. In these cases, the sustainable methods were harder to apply, not suitable or it was more expensive compared to the less sustainable method.

Firstly, all tiny-houses have gas stoves with gas bottles for cooking. Also, in three out of four tiny-houses, gas is being used to heat up water for showering and cleaning. This is not a sustainable characteristic, since it makes the use of gas (a non-renewable energy source) unavoidable. The overall explanation was, that with their solar panels only, they couldn't generate enough energy to be able to use electricity for cooking or heating up water, especially in winter. More solar panels or a (small) wind mill would be too expensive and/or an extra panel did not fit on the roof. Using gas was then the easiest second option.

Secondly, in one tiny-house, a gas stove for heating is implemented. Here, the residents told that they do not like smell and the idea of making fire in their compact house, so they did not want to apply a wood stove. Also, they found the effort of providing dry wood too big: using wet wood in a wood stove makes ensures smoke development, which is not sustainable either. The other more sustainable option would be heating with solar energy. However, again they did not have enough energy from their solar panels only, and a solar collector was too expensive.

Another characteristic which cannot be called sustainable, is that one out of four tiny-houses is located far away from the resident's work. Even though most tiny-houses are built on wheels, it seems that residents do not always choose to place their moveable house as close to work as possible. The resident told that she still travels around 2,5 hours by car each day. She is not able to use public transport, since the connection is too bad to get to work in time. The resident said that they like the area where they live now too much to exchange it for (an area close to) the city where she works. In this case, the wish to live in that specific area was more important for them than traveling a smaller distance every day.

On the contrary, the other characteristics shown in tables 1.1 and 1.2 do give good examples of how to be able to live a sustainable lifestyle.

The residents have access to only self-generated solar power, so that only renewable energy is used.

The self-sufficient method for collecting and filtering rain- or groundwater saves a lot of (clean) tap water. Because of these methods, the residents also become more conscious about the use of energy and water since they only have a limited amount available. Also, the limited amount of energy forced the residents to only purchase the urgent mechanical devices, and then only the most energy-efficient variant.

The implementation of compost toilets also helps saving tap water. Solid waste is thrown out or put on a compost heap by the residents once in a while. The liquid waste gets brought back into nature after it is purified by their helophyte filters. This takes away effort and thus energy from the sewage treatment plants we have in the country.

The compactness of the houses also has sustainable advantages. A lot of energy for heating is saved: less volume means less air to heat up. Even though, with the implementation of wood stoves, only renewable energy is used for heating. Thereby, a small house requires less (sustainable) materials to build the house. The compactness also makes mechanical devices such as vacuum cleaners unnecessary. A broom is, according to the residents, easy enough to be able to clean the house. Also, less space means a limited amount of storage space. Therefore, they say not to be able to buy lots of clothes and other stuff. This is also why they like to share certain products with others. Products you use only sporadically, like a ladder. It saves space but also materials. The compact house forces the residents to adopt a more minimalistic lifestyle, in which they have to choose 'experiences' over stuff.

The kitchen gardens and in one case even a food forest, makes the residents partly self-sufficient in their food supply. When cultivating your own food, people become more conscious about eating fruits and vegetables from the season. It also saves energy for transportation and packing material compared to buying fruits and vegetables in supermarkets.

Also, cradle-to-cradle design is incorporated when residents have a compost toilet and a kitchen garden. Solid waste from the compost toilets, mixed with sawdust, grass clippings, kitchen waste, newspaper and other compostable material, is turned into compost which is then used in the kitchen gardens. Food becomes waste, which again becomes food.

The option to move the house, when it is built on wheels, does not only makes it easier to move closer to work when switching jobs. It also gives the option to move frequently without having to buy/hire a new house and adjust it to your taste.

3.2 Results ecovillages

The results of the research to ecovillages are shown in table 2.1 and 2.2. The characteristics are arranged to the different categories: housing, food, mobility, products, the village itself and other. Here, the founders of the village had influence on the characteristics. They determined how their village would be designed and organized.

	HOUSING				
	ENERGY	WATER	HEATING	COOKING	TOILET
Ecovillage 1	- 'Bergen Energie' helps with application of producing renewable energy (solar panels)	- Ground water collection and filtering: water from the dunes	- Heat pumps or electricity	- Cooking with biogas or electricity	- Compost toilets - Helophyte filters - Compost heap for the kitchen garden
Ecovillage 2	- Producing energy with solar panels and possibly windmills: 'Smart micro grid'	- Greywater-system - Circular shower - Water heated by solar collectors on roof, heat exchanger in the stove or by electrical heating in the water tank itself	- Rocket Mass Heater with wood from pollard trees - Floor heating only in bathrooms	- 'Rocket stove' with wood from pollard trees - Possibly cooking on biogas	- Flush toilet but no connection to the sewage system (own filtering system) - Blackwater system with algae ('hemel(s)water') - Helophyte filters
Ecovillage 3	- Passive design principles - Wind energy, solar energy and biogas from own black water and kitchen and garden waste - micro-co-generator	- Green roofs, rainwater ponds, minimalizing of hardened surface - Rainwater: used for a.o. washing machine - Tap water for mainly only drinking water - Greywater-system for each cluster (50 homes) with biological water treatment - Process water (closed system)	- Heat pumps - Heat from micro-co-generator fed with biogas	- Cooking with biogas or electricity	- Water-saving toilets connected to the sewage system - Compost toilets if residents wish - Compost heap

Table 2.1: Characteristics for living applied in and around ecovillages

	FOOD	MOBILITY	PRODUCTS	THE VILLAGE ITSELF	OTHER
Ecovillage 1	- Own kitchen garden which serves as own small supermarket	- Need for traveling is smaller since the village functions as a whole neighbourhood	- Communal storage building for certain tools/stuff	- Buildings low and spread out in nature - Community building for cooking, dining, showering and with children-area - Learn to build their own houses with straw and loam - Camping and education space to invite and educate others	- Sociocratic organized - Organization of artistic- and cultural activities to bring the community closer together - Enhancing biodiversity by using principles from permaculture
Ecovillage 2	- Own kitchen garden which serves as own small supermarket - Food forest (nuts, fruit trees etc.) - Aquaponics system	- Need for traveling is smaller since the village functions as a whole neighbourhood	- As efficient as possible devices or alternatives like communal laundry space - Led-lightning - Innovative streetlights with motion sensors	- Climate adaptive living: rain, hail, drought, heat - Climate positive building: CO_2-negative, bio-based materials, 100% circular - Circular economy (materials): easy to reuse, high quality, no waste, finding alternatives (glue?), timber frame construction with little as possible screws - Small, compact houses - Community building for communal dining and relaxing	- Enhancing biodiversity by using principles from permaculture - Preferring energy-free solutions (low-tech over high-tech) - Behaviour: shutting off devices when not being present, etc.
Ecovillage 3	- Sustainable agriculture and horticulture with educational and social functions - Mini plantations and kitchen garden clusters - Green-houses and winter-gardens	- Need for traveling is smaller since the village functions as a whole neighbourhood - Combination of working and living reduces travelling large distances - Good accessibility to public transport - Car sharing project	- Energy efficient devices and installations and conscious use of them	- Bio-ecological building - Buildings as compact as possible with an as small as possible outer shell (stacking and connecting) - Different residents: diversity of housing-requirements and -types - 'Centre for Integral Ecology' will form the centre of the village, situated at a communal square - Use of only sustainable materials which are healthy for the residents - Extend the life span of buildings through flexibility and adaptability	- Residents work in the field of ecology and sustainable developments - Integration of permaculture to enhance biodiversity - Making streams visible (of energy, water and materials) in the built environment ensures awareness of a sustainable society

Table 2.2: Characteristics for living applied in and around ecovillages

Compared to the tiny-house residents, it seems that the founders of the ecovillages did not face the same problems for implementation the most sustainable solutions for living. There is not a single characteristic in tables 2.1 and 2.2 that is not sustainable. Sustainable solutions for all categories of a sustainable lifestyle is thought about.

With the application of solar panels, windmills and/or a technique to produce biogas, the residents of the villages only have access to renewable energy. In some villages, multiple homes are connected to one central energy source, so that a 'micro grid' arises: the generated energy is shared by multiple households. It is an advantage that there is more energy available for one family when another family is not home. On the other hand, all residents have to take responsibility for the finiteness of the energy.

Compact design and passive design principles applied to the houses, ensures a reduction of the need for heating and cooling. The remaining necessary heating is done by renewable energy like solar energy, biogas or with wood or heat pumps, to make sure also here, no non-renewable energy is being used. The same principle goes for cooking. The compactness also saves (sustainable) building materials.

Next to generating renewable energy, the residents try to reduce the demand for energy by incorporating energy-efficient devices into the homes, and only the most necessary ones.

To provide the homes with water, techniques to collect and filter rain- and groundwater are applied. In this way, they save a lot of (clean) tap water. In some villages, there is still access to tap water, but is only meant for consumption.

The application of compost toilets also helps saving water. In some villages, however, residents have the option to have a flush toilet instead. Some residents do not like the idea of cleaning the bag with feces regularly. But, there are also water-saving toilets, and most of the time the toilets get flushed with rainwater. One village is even experimenting with such a flush toilet which is completely disconnected from the sewage system. With a filtering system with algae's, they filter their own black water. In this case, multiple households are connected to that system. This takes away, just like compost toilets, effort and thus energy from the sewage treatment plants we have in the country.

With kitchen gardens, greenhouses, winter gardens and/or a food forest integrated in the villages, they are (partly) self-sufficient in their food supply. As a community, they cultivate their own food, which enhances the solidarity in the village. The cultivation itself, just like in tiny-houses, also makes people conscious about the different seasons and saves energy for transportation and packing material. Thereby, the food-producing areas are designed with the principles of permaculture. This means that the planting has benefits for humans (food supply), but also nature: it enhances biodiversity. Also here, cradle-to-cradle design is incorporated by using compost from possibly the compost toilets and kitchen waste, for the kitchen gardens.

Next to the communal food cultivation, the 'community building' also has sustainability advantages. It contains a.o. a kitchen, living room, laundry room and storage space which makes it easier and more accessible to share. The residents can share stuff and meals. Sharing stuff prevents them from buying unnecessary products. For example, according to an interviewed resident: ''it is ridiculous for each household to have a ladder, when you maybe use it only a couple of times a year''. Sharing meals counteracts food waste and again enhances the solidarity within the community. In the first researched ecovillage, the community building is even most part of the residents' homes: their private space only consists of a bedroom, toilet and maybe a small kitchen. In the different ecovillages, the amount of functions that are being shared differs. Sharing more functions can be more sustainable, but it has to be desired by the residents.

The community also tries to share knowledge. They desire to have residents living in the village with different expertise. Someone who knows how to build with sustainable materials, someone else who knows how to cultivate, et cetera. They try to live as self-sufficient as possible, even when it comes to knowledge. In this way, they can teach each other how to be sustainable on all different aspects of sustainable living. Ecovillages then become 'models for lived sustainability'. To share this knowledge with the outside world, they have a special education space or they try to invite people by letting them stay overnight at their campsite. The self-sufficiency means, besides, that the need to travel is a lot smaller compared to general neighbourhoods. For basic needs, the residents do not really have to leave the village.

4. CONCLUSION AND DISCUSSION

In case of tiny-houses, not all implemented characteristics serve as examples for sustainable living. Ecovillages, on the other hand, completely show how to be able to live a sustainable lifestyle.

The physical characteristics of tiny houses and ecovillages which support a sustainable lifestyle are characteristics which together create a mainly passive, or 'self-sufficient' lifestyle and reduce particular needs. The social characteristics are about creating the opportunity to implement more sustainable lifestyle-aspects such as sharing spaces or products by creating this self-sufficient environment on a bigger scale (within a neighbourhood instead of one household only).

To be able to live self-sufficient, several off-grid techniques are implemented. The most sustainable projects generate renewable energy for electricity, heating and cooking on-site. Also, entire water-systems are off-grid. Before using sources, however, they already thought of reducing the needs in the first place (passive design). Thereby, ways for being (partly) self-sufficient in food is in all projects also a common characteristic. Besides being self-sufficient and using passive design principles, they also think about ways to reduce the need for (motorized) mobility. If it comes to products, they implement manual above (energy-efficient) mechanical devices to reduce the demand for energy. They also try to implement social circumstances which makes it possible to share certain devices or products with others. Even though, especially in Tiny-Houses, they already try to live with less stuff in the first place (minimalistic living). In ecovillages, the number of products and materials is reduced by sharing functions and spaces (community-living).

Next to the four main categories for sustainable living, the researched projects also contain sustainable characteristics which but did not directly fit within these categories. At first, they make sure they are able to reduce waste. If possible, closed-loop chains are incorporated (cradle to cradle). Also, enhancing bio-diversity is an important topic, mainly in ecovillages.

This research was done for graduation in a relatively short period of time. Therefore, the number of tiny-house interviewees and visits to ecovillages were limited. A follow-up research would be therefore desirable.

The characteristics found in this research together create the right circumstances in and around houses for people who are willing to live a sustainable lifestyle. The examples give, however, different ideas on how to apply these characteristics in their environment. The common thing in all projects, though, is that relatively more outside than inside space is required. Take for example the water collecting- and filtering systems, techniques for generating energy and land to cultivate food. The extra outside space is the biggest challenge when applying these characteristics in a design in an urban environment. This means that most characteristics will not be applied exactly as in the examples. Different variants for the characteristics has to be researched, to discover the possibilities and see which ones fit best on the chosen location.

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6. APPENDIX

Appendix A: Interview tiny house residents

GENERAL

1. With how many people do you live in your Tiny House?
2. In what kind of house did you live previously?
3. In which city do you currently live with your Tiny House?
4. Is your Tiny House moveable?
5. Was the starting point of your Tiny house sustainability (both sustainable construction and a sustainable lifestyle), or were there other reasons to live this way?

LIVING

6. What is the source of your energy?
    a. How do you obtain the direct flow?
        - Can this be done in a more sustainable way? If so, how?
        - Could you have applied this in your previous home?
    b. How do you heat up the house?
        - Can this be done in a more sustainable way? If so, how?
        - Could you have applied this in your previous home?
    c. How do you cool and ventilate the house?
        - Can this be done in a more sustainable way? If so, how?
        - Could you have applied this in your previous home?
    d. How do you cook?
        - Can this be done in a more sustainable way? If so, how?
        - Could you have applied this in your previous home?
7. How high is the energy demand?
    a. What is the size of the house?
    b. Have you consciously chosen not to buy certain appliances (such as a washing machine, vacuum cleaner, fridge/freezer, dishwasher) because they cost too much energy? If so, why and how do you solve this?
    c. Are you more conscious about the use of electricity compared to when you lived in a 'normal' house? If so, with what factors does that have to do?

LIVING

8. Do you produce renewable energy (with windmills, solar panels)? If so, is the house energy-neutral or energy-producing?

9. How do you provide yourself with clean (warm) water? Shower-, washing- and drinking water? Is this different than in your previous home? If so, why?

10. What kind of toilet do you have and do you use clean water for this? Is this different than in your previous home? If so, why?

MOBILITY

11. Do you travel more with public transport or more with personal transport?

12. When traveling with personal transport, is this more often motorized (car, motorcycle) or non-motorized (bicycle, by foot)?

13. Has there been any change in the way and frequency of travel since you live in a Tiny House?

14. If your house is moveable: would you move the house to reduce the average travel distance per day, for example if you were going to work somewhere else?

FOOD

15. How would you describe your diet (omnivore, vegetarian, vegan)? Has this changed since you live in the Tiny House?

16. Are you (partly) self-sufficient in your food?
    If so, what do you produce and can you estimate a percentage of the total amount of food that you consume? Did you already do this before you moved into the Tiny House?

17. Is the food you buy mainly locally or globally produced? Has the awareness of this increased since you live in the Tiny House? If so, how is that?

PRODUCTS

18. Has the number of products you buy changed since your live in the Tiny House? If so, how does this come?

19. Are there things that you do not have to buy yourself because you share it with others (car, washing machine, etc.)? Is this different from when you were not living in the Tiny House yet?

20. Are you paying attention to the durability of the material that products are made of when you buy something (from clothing, jewellery, appliances, etc.)? Did you always do this and why?

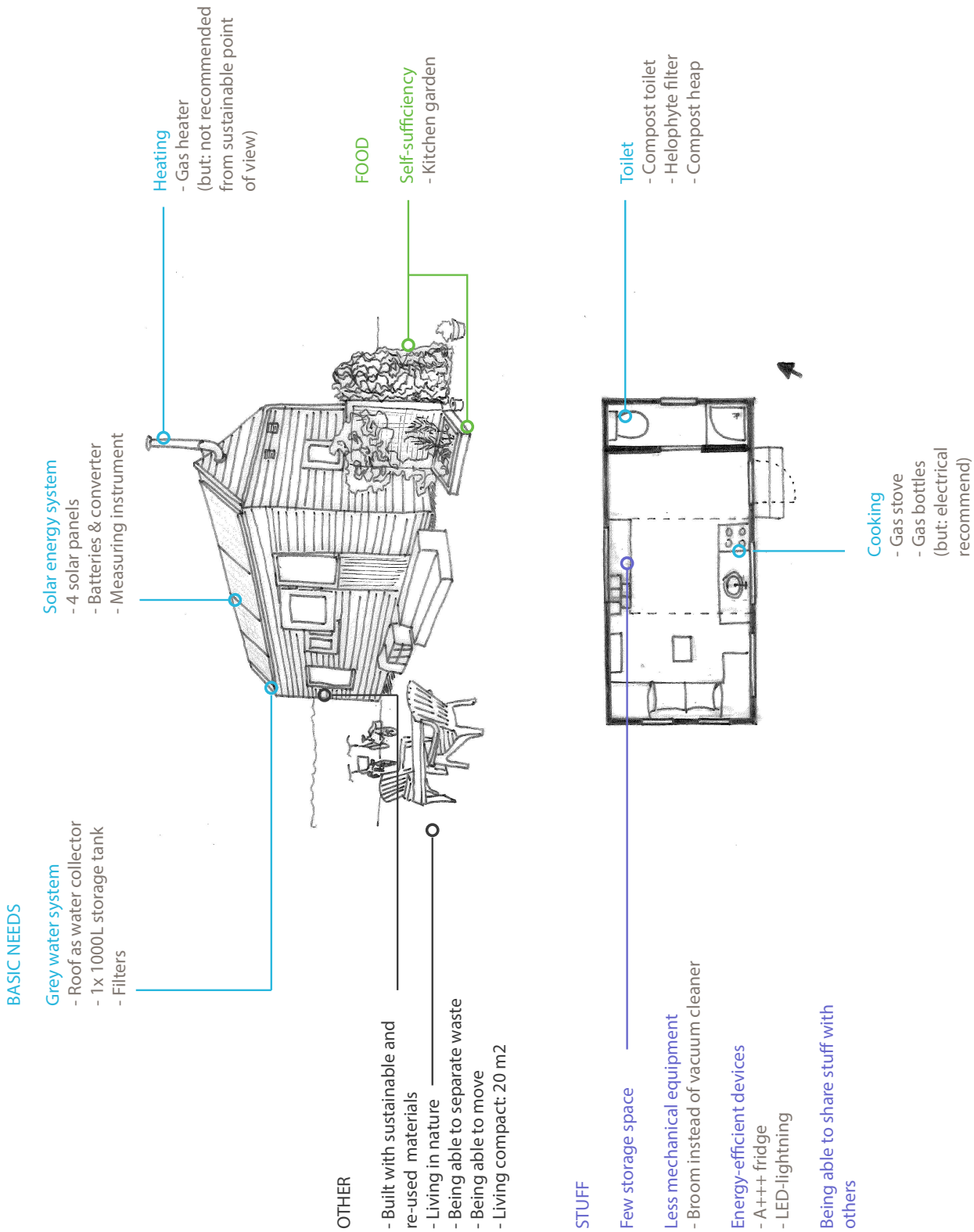
Appendix B: Interviewed tiny house residents

	Name	Date	Place of residence
Interview 1	Madelief & Yvette	7 October 2017	Beverwijk
Interview 2	Linde & Kjeld	9 October 2017	Dronten
Interview 3	Dennis & Marjan	13 October 2017	Rotterdam
Interview 4	Elke	17 October 2017	Westbroek

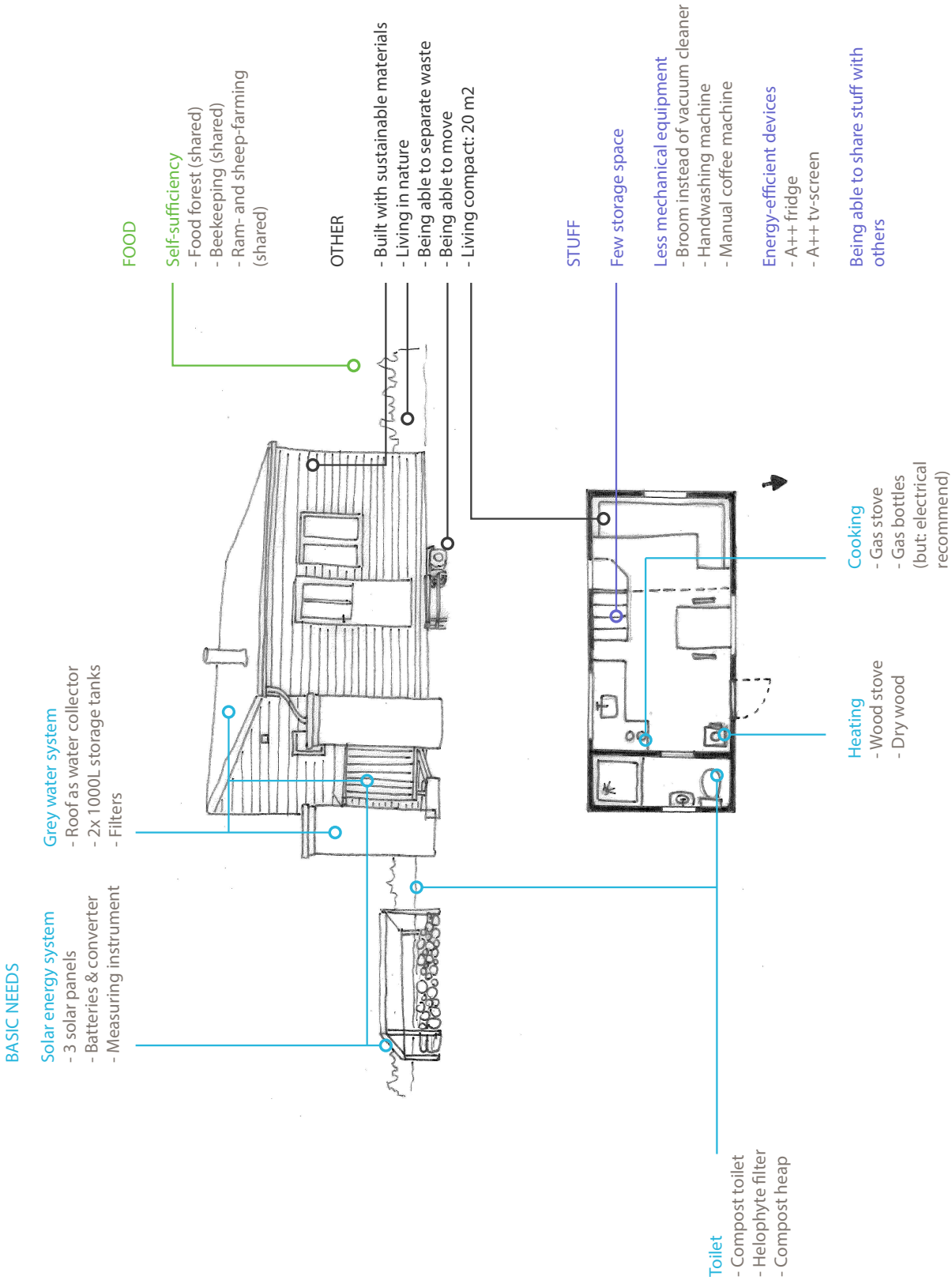
Appendix C: Interviewed ecovillage residents

	Name ecovillage	Name guide	Date visit	Location
Visit 1	Ecodorp Bergen	Fredjan Twigt	5 November2017	Bergen
Visit 2	Ecodorp Boekel	Ad Vlems	19 November 2017	Boekel
Visit 3	Eva-Lanxmeer	Marleen Kaptein	22 December 2017	Culemborg

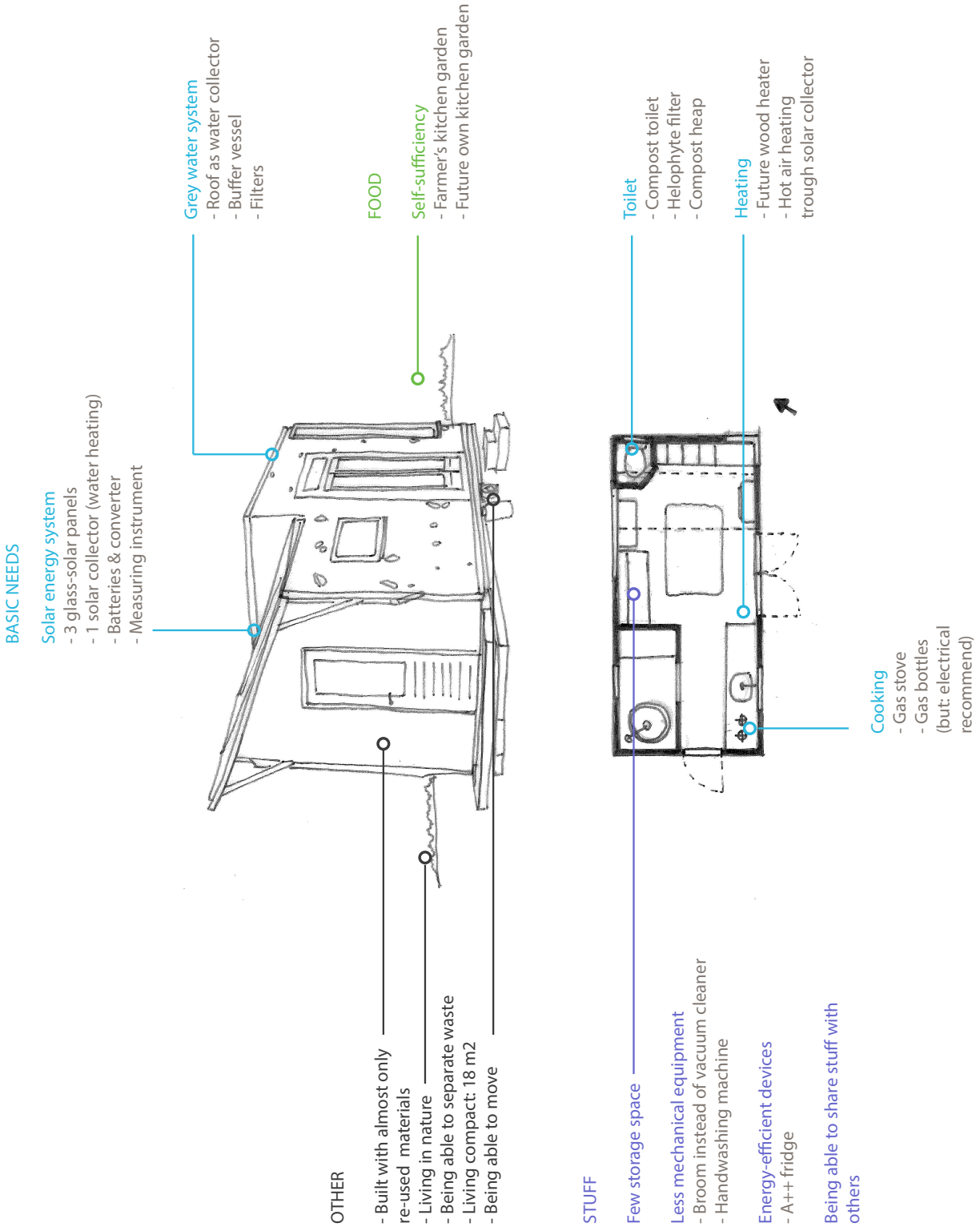
Appendix D: Tiny house interview 1



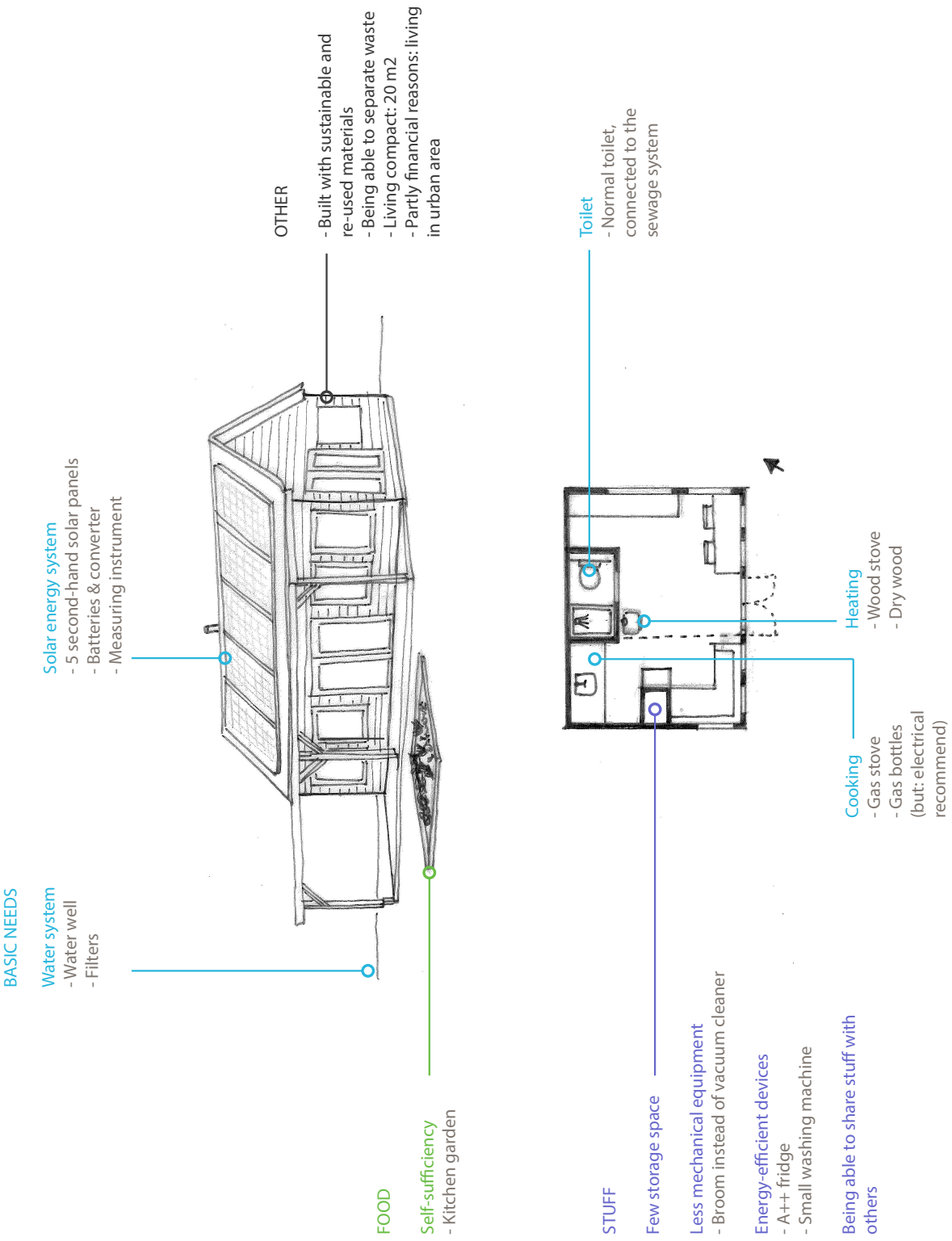
Appendix E: Tiny house interview 2



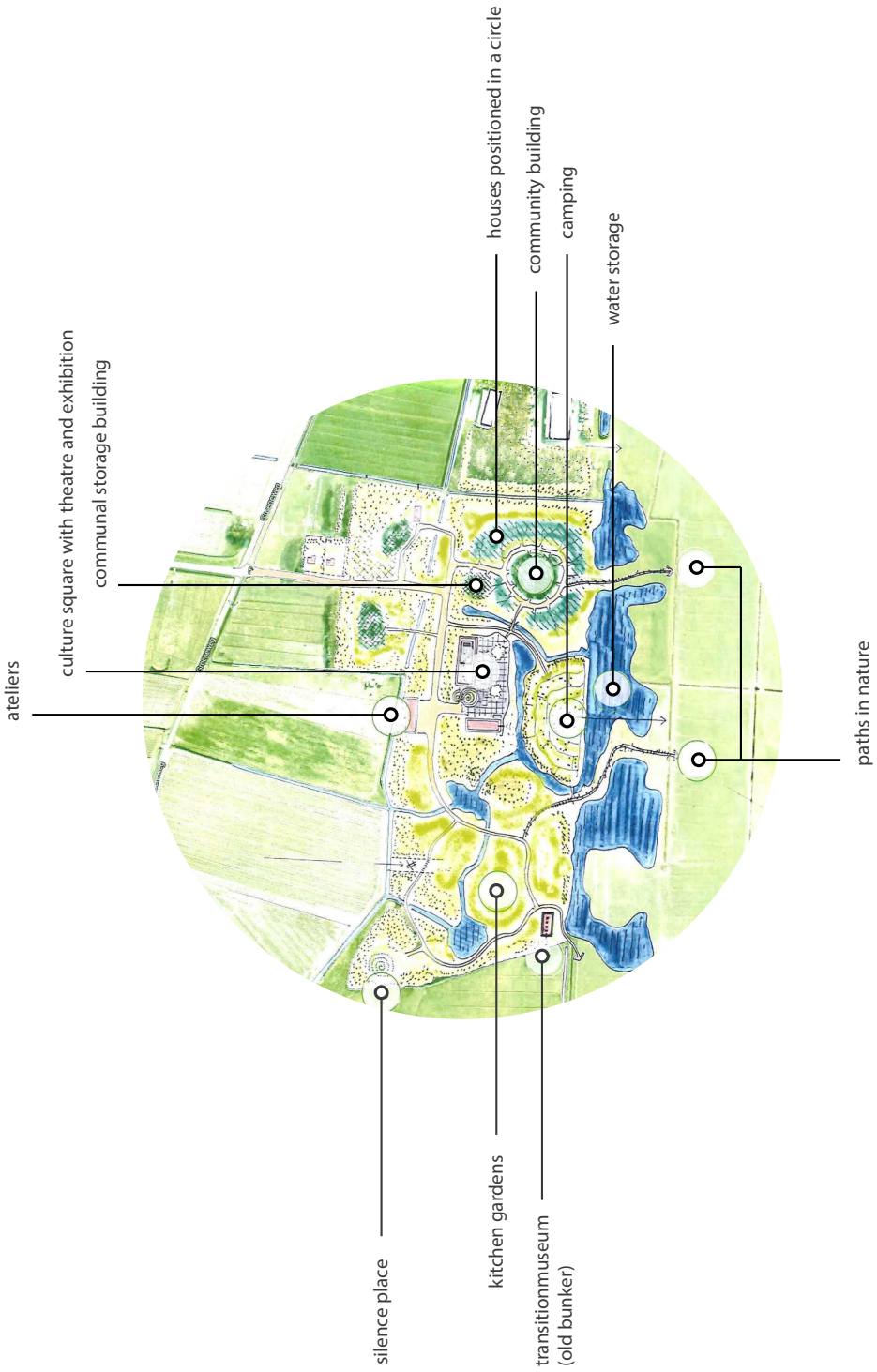
Appendix F: Tiny house interview 3



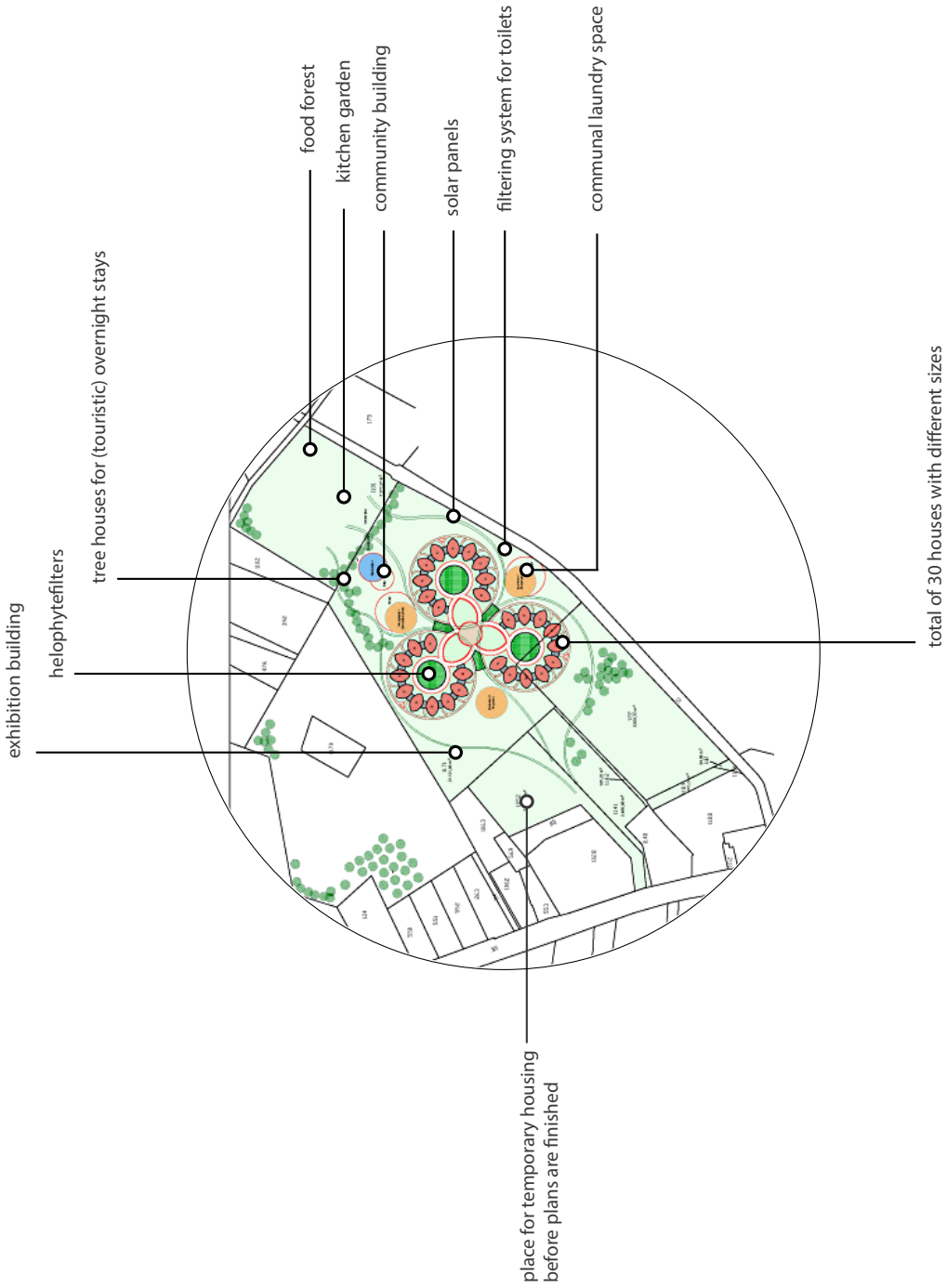
Appendix G: Tiny house interview 4



Appendix H: Ecovillage 1



Appendix I: Ecovillage 2



Appendix J: Ecovillage 3