

Rhodo Workhome: Rethinking the post-pandemic residence

A symbiosis of living and creating organic
materials

gemeenschap
bio-based producten
architectuur
milieubescherming
community
bio-based materials
residential architecture
ecological recovery

Roels, Marie¹

¹Department of Architecture / KU Leuven, Campus Sint-Lucas, Ghent, Belgium
marie.roels97@gmail.com

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Rhodo Werkhuis: Het heruitvinden van de post-pandemische residentie

Samenwonen met het maken van organische materialen

Tijdens de wereldwijde pandemie hebben we onze waarden heroverwogen. Door van thuis uit te leven, hebben we geleerd zowel de nabijheid van mensen als die van een natuurlijke omgeving te waarderen. Daarnaast hebben we gemerkt hoe benauwd een gezinswoning kan aanvoelen en hebben we ons gerealiseerd dat we architectuur nodig hebben die aanpasbaar is aan verschillende situaties om comfortabel samen te kunnen leven. Als reactie hierop bestudeert dit onderzoek een nieuwe manier van wonen, die een sterke gemeenschap, een pro-milieu houding en een innovatieve gediversifieerde manier van leven omarmt. Deze drie aspecten komen samen in het maken van bio-based materialen¹ binnen een co-housing project: 'The Rhodo Workhome'. Deze materialen worden gemaakt van de Rhododendron ponticum, een exotische en invasieve soort die, als onderdeel van dit onderzoek, uit bossen in België wordt verwijderd en in dit huis wordt verwerkt tot mycelium, papier, bio plastic en kleurstoffen. De productieprocessen en de daaruit voortvloeiende materialen hebben niet alleen een invloed op de dagelijkse gewoonten van de bewoners, maar ook op de materialiteit en het ontwerp van het huis.

During the global pandemic, we have reassessed our values. Through living from home, we have learned to appreciate both the proximity of people and a natural environment. In addition, we noticed how cramped a family home can feel and realised that we need architecture that is adaptable to varying situations to live comfortably together. In response, this research investigates a post-pandemic way of living, one that brings together a strong community of people, a pro-environmental attitude and an innovative diversified way of living. These three aspects collide through the process of making bio-based materials¹ inside a co-housing project: 'The Rhodo Workhome'. These materials are created from the Rhododendron ponticum, an exotic and invasive species that, as part of this research, is being removed from forests in Belgium and processed into mycelium, paper, bioplastic and natural dyes inside this home. The production processes and their resulting materials not only impact the habits of the residents, but also the materiality and design of the house. Firstly, the Rhododendron is integrated in the home through drying, storing and processing the plant material in preparation of the various products. Secondly, the community within the housing project comes together to process these materials. Finally, the bio-based materials themselves are used to reorganise the house from time to time. Because of their short lifespan and compostable properties, this can happen more frequently compared to traditional durable building materials. The architectural findings within this research expand from a new materiality in architecture to a post-pandemic way of living in symbiosis with growing and making bio-based materials.

INTRODUCTION

This research started from two fundamental principles. On the one hand, rethinking the traditional house in response to how we experience the global pandemic from home. And on the other hand, from an environmentally conscious position: keeping in mind that the making of architecture should be accompanied by a contribution to the environment. These two aspects are brought together in 'The Rhodo Workhome', a cluster of traditional houses in the city centre of Ghent, which is renovated into a co-housing project.

Rethinking the traditional house

During this global pandemic we are obliged to stay inside. Activities which we often execute away from home, such as working and exercising, are brought inside the house. Because of this intensive use, several architectural and social loopholes in traditional housing are being uncovered. The consequences of the lockdown were studied on 1,006 Italians and showed that "the longer the isolation and the less adequate the physical space where people were isolated, the worse the mental health (e.g., depression)."² Through experiencing this challenging way of living in lockdown, we learn to value specific architectural, social and environmental aspects of living. This research focusses on the following. Firstly, we think more about caring for the common wealth of nature. Secondly, while living- and

working from home we feel how important it is to have a strong community of people, around us. Thirdly, we realised that a more intensive and varied use of indoor spaces demands a new type of architecture and lifestyle. This research will address these three specific aspects of the global pandemic and, as a reaction, aim to create a home that can adapt itself to these environmental, spatial and social conditions.

Environmentally conscious position

These three conditions collide through the process of making bio-based materials inside a co-housing project: 'The Rhodo Workhome'. The materials are created from the *Rhododendron ponticum*, an exotic invasive species that, as part of this research, is being removed from forests in Belgium. The plants are collected at 'The Rhodo Workhome' and processed by the residents into different bio-based materials such as mycelium, paper, bioplastic and natural dyes. The residents live together with the grow- and make-processes of these materials. This symbiosis of living and making results in an environmentally conscious attitude, on the one hand, and a new type of organic materiality in residential architecture, on the other hand.

Design methodology

The design methodology of this home is carried out in such a way, that it implements the various processes of making from the start of the design exercise. As a result, a flexible architectural program is designed, which is based

on, not only the needs of the residents and their community, but also the requirements of the *Rhododendron*-based products. In this way, the project is built up by incorporating both human- and nature-based design. As a consequence, this multi-disciplinary research focusses both on architectural design as well as nurturing a community and supporting biodiversity.

RETHINKING THE TRADITIONAL HOUSE

Reassessing our values during the global pandemic

Architectural practice is highly complex and an entanglement of many different processes and concerns, involving complex relationships between community, ecology and society. Residential architecture raises fundamental questions about living together. This research focusses on dimensions that are specifically uncovered by the global pandemic, which are the following: malfunctioning of spaces in traditional housing, social isolation of both individuals and people working from home and living in a densely built city without nature nearby.

Malfunctioning of spaces in traditional housing

During the global pandemic many households are being challenged by the limitations of their living spaces, which no longer function as they did before. From one day to the next, we are obliged to work, exercise, learn and relax from home. In her social anthropologic article,

Constance Smith describes how “Experiences of lockdown are drastically altered by housing and space.”³ One of the most substantial adaptations we had to make as a consequence of covid-19 is working from home. During the global pandemic it is happening to all of us. Working from home in a house that is not designed for this function can be challenging. Today, in a post-pandemic society where home-based work continues to grow, there is a demand in merging the two functions: working and living. On top of that, there is a rise in non-traditional households such as young workers living together, grandparents who stay with their children, couples who co-house in order to share the costs. These new living and working combinations require a new way of building and renovating our houses. ‘The Rhodo Workhome’ researches how to design spatial configurations according to this post-pandemic way of living.

Social isolation of both singles and people working from home

In its essence, ‘The Rhodo Workhome’ is about creating a community on different scales. First and foremost, ‘The Rhodo Workhome’ is designed in response to social isolation amongst home-based workers and loneliness amongst singles in lockdown. This social isolation which is occurring in lockdown, is argued in ‘A Study on 1,006 Italians Under COVID-19 Lockdown’⁴ and goes hand in hand with working from home. Frances Holliss, architect and Doctor of philosophy in the field of ‘The architecture

of home-based work’, states in her doctoral research that there is a “blindness to home-based work and its social and spatial consequences⁵”. In reaction, this project aims to create an open co-housing and co-working environment which includes a strong community, to fight social isolation. This community is called ‘The Rhodo Community’ and invites people outside of ‘The Rhodo Workhome’ to participate in the processes of making Rhododendron-based materials. Amongst other perks, ‘The Rhodo Community’ will be able to use the co-working spaces and join workshops organised by ‘The Rhodo Workhome’. In return, an open-minded, responsible and trustworthy attitude is required from the people that are part of ‘The Rhodo Community’. In addition, this co-housing project creates a platform of opportunities and collaborations with organisations, artists and

universities. These will be discussed later in this article in the section: ‘Social and environmental impact through collaborations’. ‘The Rhodo Workhome’ provides an open workspace in the city centre of Ghent and above all, represents a shared, transparent, fair and comfortable environment, through its co-housing structure and its participative processes.

ENVIRONMENTALLY CONSCIOUS POSITION

Living in a densely built city without nature nearby Constance Smith states that “While the rich can escape to second homes, cramped housing and lack of outdoor space make extended time at home much harder to endure.” In response, ‘The Rhodo Workhome’ which includes five small traditional houses and is situated in the city centre of Ghent, aims to expose its residents to nature



Fig. 1 - Rhododendron ponticum bushes in Wetteren – Den Blakken.

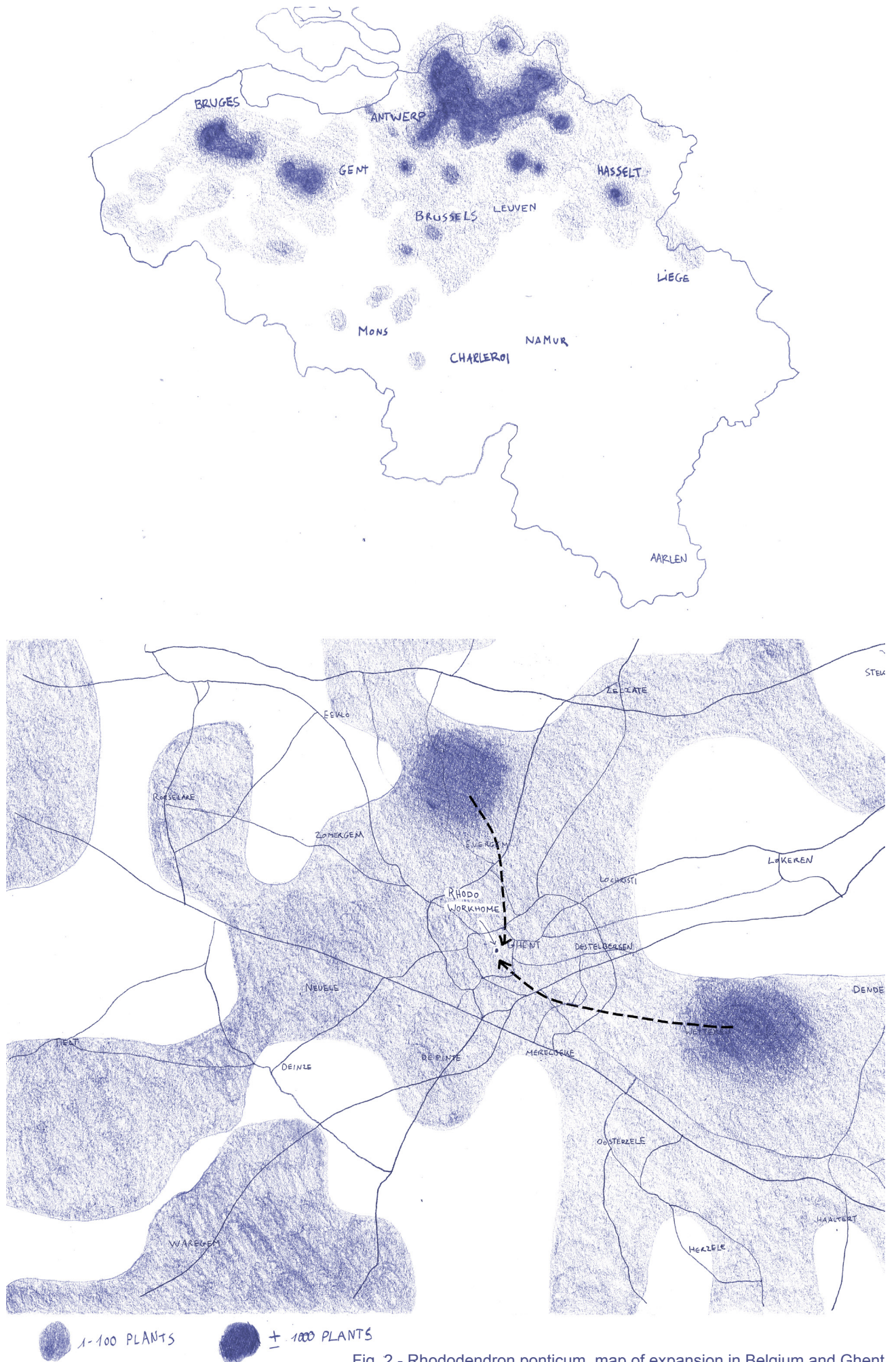


Fig. 2 - Rhododendron ponticum, map of expansion in Belgium and Ghent

on three different levels. Firstly, by creating a co-housing project that includes a common garden. Secondly, by introducing the *Rhododendron*-based production processes inside the house. And thirdly, by representing a community that raises awareness on a scale that generates impact in restoring biodiversity. More specifically, 'The Rhodo Workhome' is a circular-minded project that partners up with 'Natuurpunt'. This is a Belgian organisation which, among other tasks, removes the *Rhododendron ponticum* from Flemish forests.⁶ This is an exotic invasive species in west Europe and is native in south Europe, mainly in Turkey. (fig. 1) The species thrive in our climate, growing and spreading very fast while preventing native species from growing. As a consequence, they are taking over the shrub layer in our forests which has resulted in a critical reduction of biodiversity in Belgium. In reaction to this increasing problem, Natuurpunt is removing *Rhododendron ponticum* plants to restore our ecosystems. Nevertheless, after the removal, the plant material is treated like waste and brought to container parks. This is where this research steps in to recover the wasted plant into bio-based materials. After the removal, the plant material is collected at 'The Rhodo Workhome' and recovered into *Rhododendron*-based materials. The *Rhododendron* plants that are being processed inside contribute to the ideology that lies at the heart of 'The Rhodo Workhome'. Namely, contributing to the recovery of biodiversity by processing

a plant, that would otherwise be thrown away, and living inside a house which is enriched by these natural elements. The study by Rita Berto and Giuseppe Barbiero, on 'How the Psychological Benefits Associated with Exposure to Nature Can Affect Pro-Environmental Behavior' discusses how, "it is fundamental to foster a connection to Nature not only to enhance perceived restorativeness (a useful way to cope with daily hassles), but also to have people keener to behave pro-environmentally"⁷. In this way, by being in close connection to these natural material processes, 'The Rhodo Workhome' aims to increase the pro-environmental attitude of its residents.

Rhododendron ponticum

Since there are several exotic invasive species in Belgium, this section will clarify the reason of choosing the *Rhododendron ponticum* as the processed plant species. The first reason is its area of expansion. In Belgium, this species is invading mainly the northern part and more specifically the areas around Bruges, Ghent, Brussels, Hasselt and Antwerp. The dark zones on the map in indicate where high concentrations of *Rhododendron* shrubs are present. (fig. 2) In Ghent and its surrounding sub-urban areas specifically, more than 2000 plants have been observed, which is one-fifth of the total amount of 10000 individual plants observed up until today. (fig. 2) 'The Rhodo Workhome' will collect the *Rhododendron* bushes from both, two highly

densified areas near Evergem and Wetteren as well as densified areas within the city centre of Ghent, in which it is situated.

Secondly, this species was chosen because of its physical properties, which have as a consequence that there are no traditional timber applications possible. To be more specific, this plant is a shrubbery with thin irregular, tortuous branches. Therefore, commonly used applications like timber beams for construction or furniture are out of the question. Alternative wood-based materials like MDF or OSB are optional, but were rejected for the following reasons. Firstly, creating MDF from *Rhododendron* has already been investigated in the study 'Manufacture of medium density fibreboard (mdf) panels From *Rhododendron*'⁸ which proved that MDF made from *Rhododendron* should be mixed with other hardwoods, to create a qualitative and competitive product. Secondly, it was an important requirement from the start of this project that the residents of 'The Rhodo Workhome' could preserve their current occupations and freedom, while processing the materials from home. For this reason, the material should be created within a low-maintenance production process. MDF and OSB require a more industrialised manufacturing process, which is not applicable to this design-exercise in which the residents are living together with 'the process of making'. Thus, the challenge in this research was to find alternative

applications for the species which can be created in a non-industrialised and low-maintenance manufacturing process. In addition, the wasted plant should be recovered into bio-based materials within a sustainable and circular approach.

Considering the requirements mentioned above, several organic and compostable materials were tested. (fig. 3) After testing, it was decided that the program of this co-housing project would include a yearly sequence in the production of mycelium, bioplastic, natural dyes and paper. The choice to make different materials was made in order to design the most diverse annual

programme possible. The different products are each accompanied by their own type of process that varies in length, intensity, materiality, actions and architectural applications in the house itself.

DESIGN METHODOLOGY

Methodology

The timing of the production processes has had a substantial agency in the design choices of this architectural project. Therefore, a calendar was created which outlines when a certain product is made and how long the process takes. (fig. 4) In addition, five product-specific graphs were designed, which

indicate the workload within each production process.

These graphs integrate both the preliminary steps, which include collecting, drying and storing of the Rhododendron plant material, as well as the more detailed steps within the process. (fig. 4) These graphs are created to ensure that the personal schedule of the residents would not be disrupted too much, in order for them to keep pursuing their jobs and interests.

Site

The site includes five traditional homes in the city centre of Ghent. (fig. 5) The existing houses are being connected by one shared

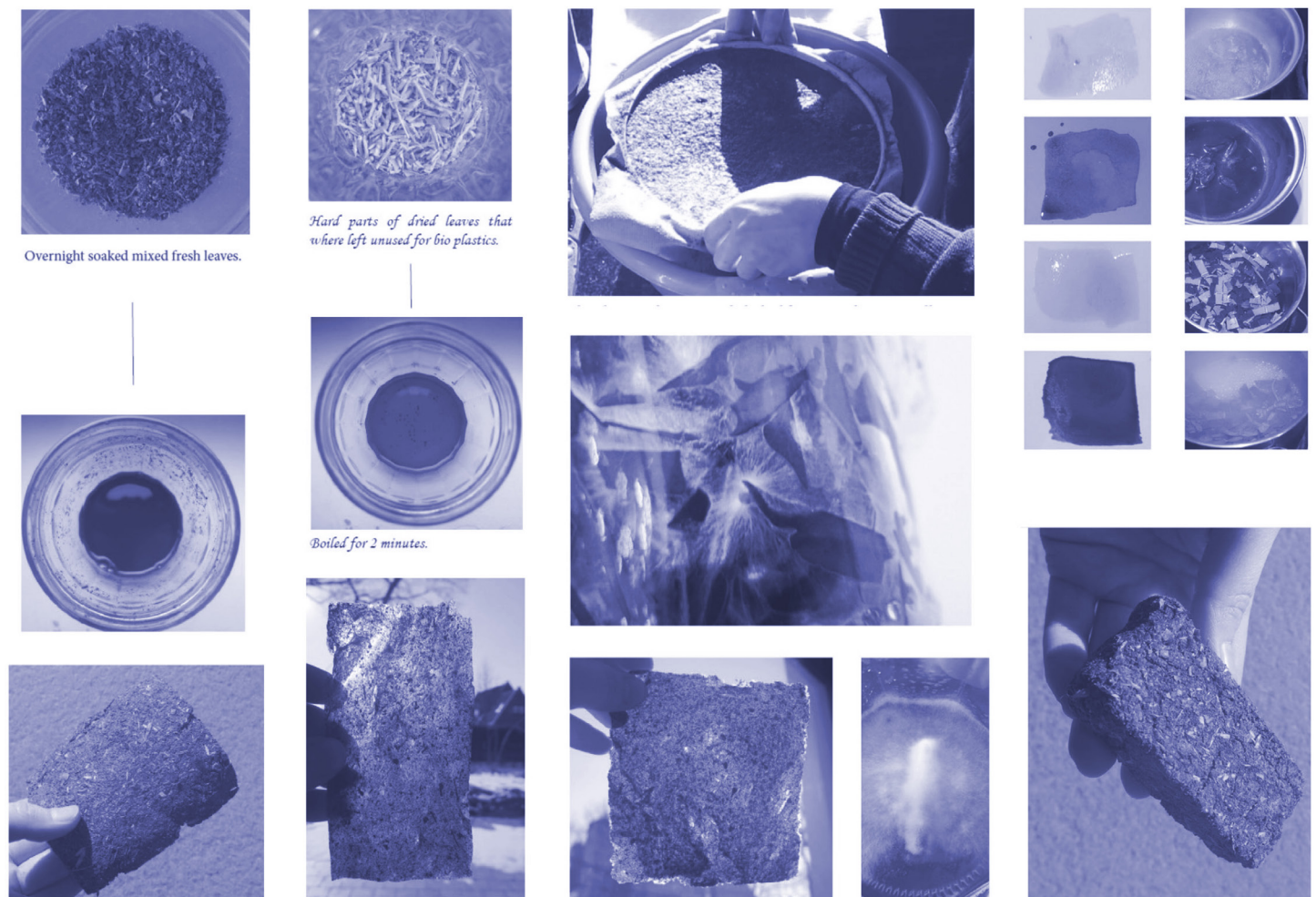
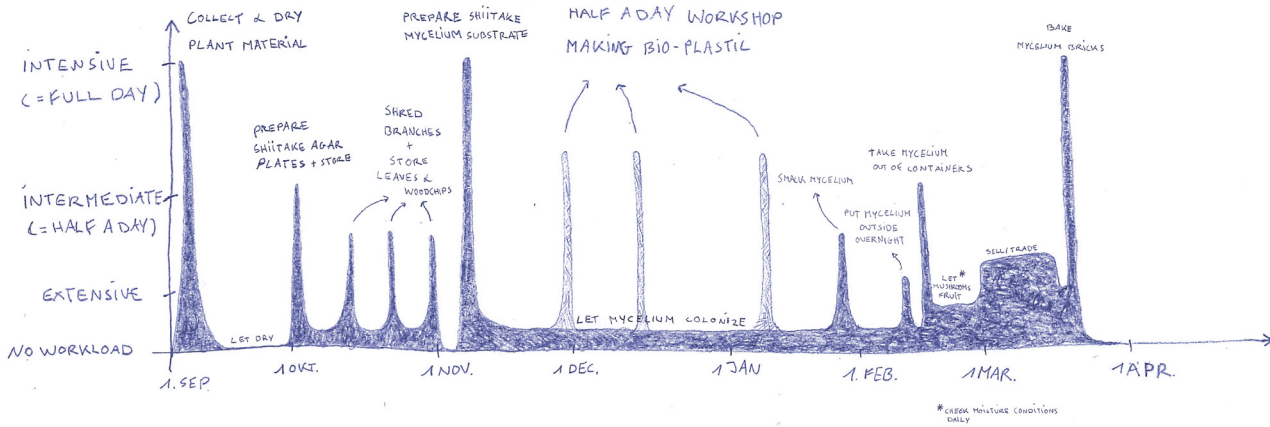
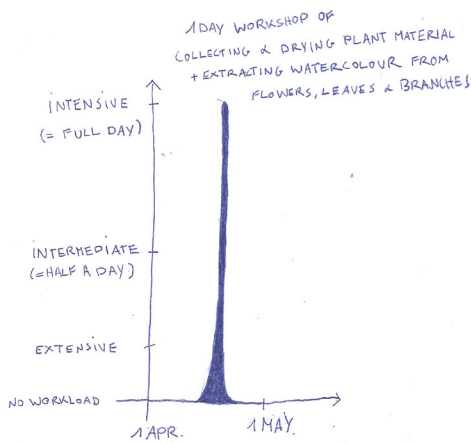


Fig. 3 - Empirical study of organic materials such as, watercolour, paper, bio-plastic and mycelium

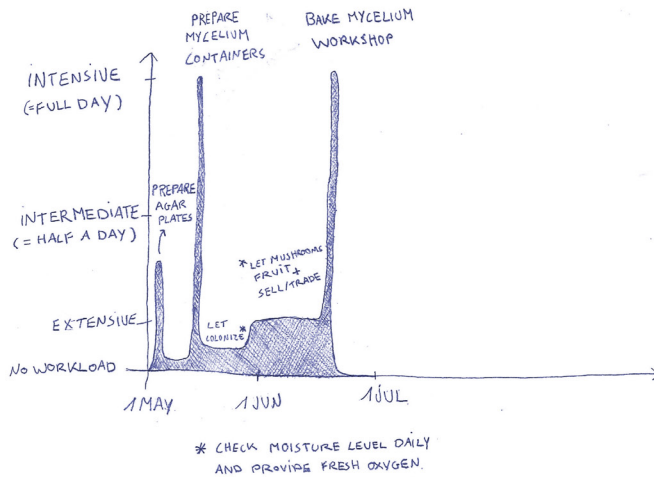
SHIITAKE MYCELIUM PROCESS OF MAKING - WORKLOAD DIAGRAM



WATER COLOUR



GREY OYSTER MYCELIUM



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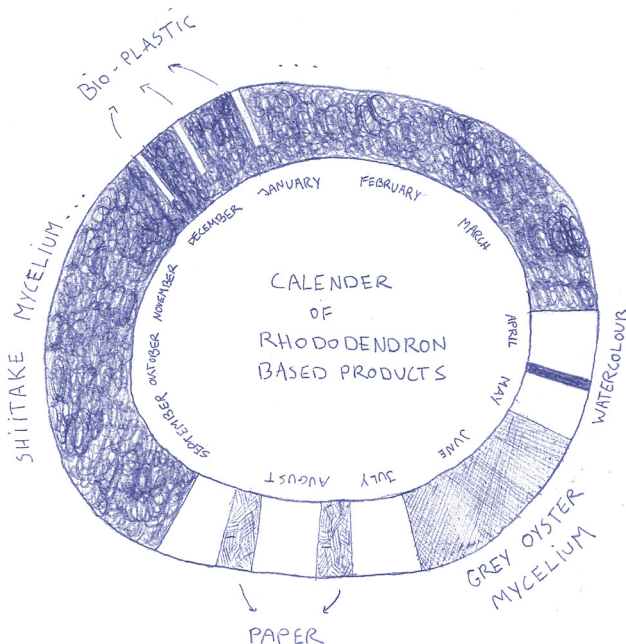
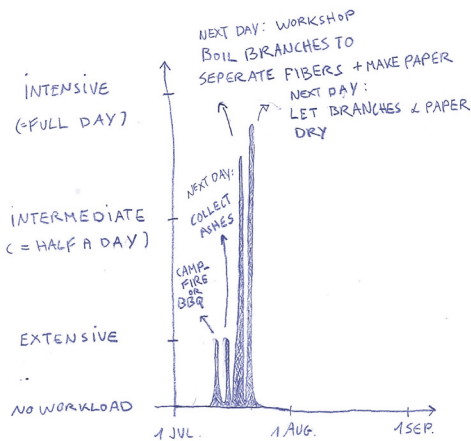


Fig. 4 - Calendar and graphs visualising the different production processes that are carried out in one year.

courtyard and renovated into an open co-housing project that houses nine people on the north side of the courtyard and eight on the south side. (fig. 5)

The design of the south side will be elaborated upon in this research. The radically open renovation of this co-housing project provides space for on the one hand, the residents

to live and work from home, and on the other hand, for the production processes and the Rhododendron-based materials to make architectural interventions.

Design

The open design of the house creates space for, on the one hand, the residents to change the function and size

of the rooms according to their needs. On the other hand, the spacious architecture changes throughout the days, months and seasons according to the different processes of making. How these processes have agency in changing the way the residents live and move inside the house, will be discussed chronologically moving from one production process to



Fig. 5 - Site of 'The Rhodo Workhome' based in the city centre of Ghent

another.

This is because the different Rhododendron-based products are logically scheduled according to: the temperatures in which they should grow, the seasons in which they should be processed, and the occasions in which they make an intervention inside the house.

This time-line discusses only a limited number of applications possible for the Rhododendron-based products. The design-program invites the residents to, while living at 'The Rhodo Workhome', improve the production processes to their own preference and experiment with the materials to discover new applications and architectural solutions.

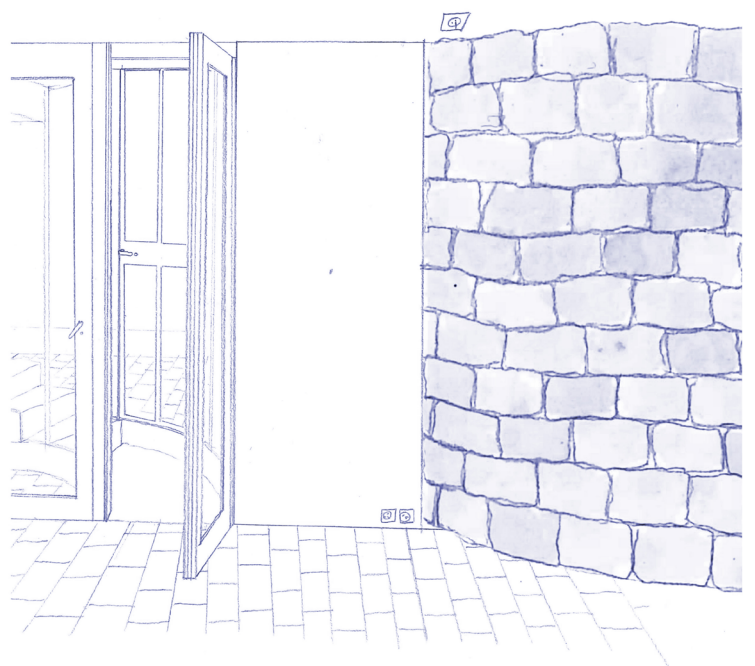
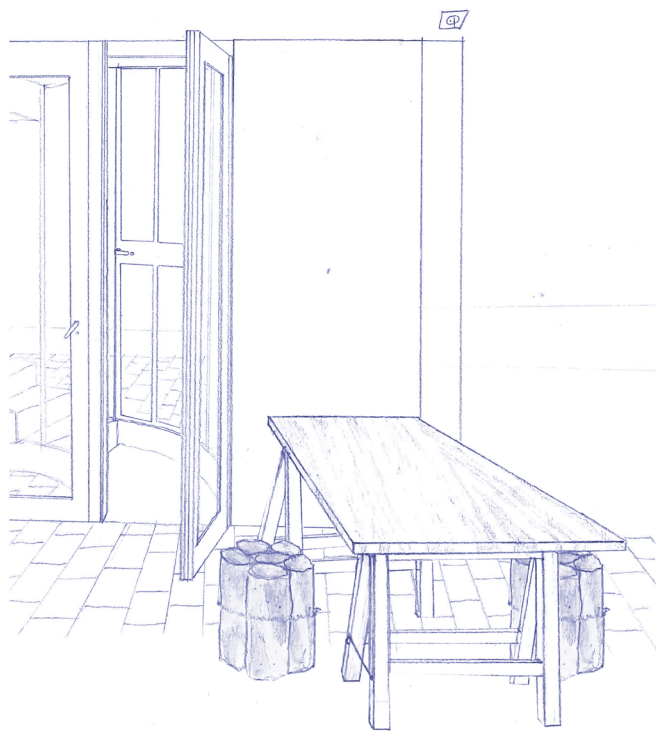
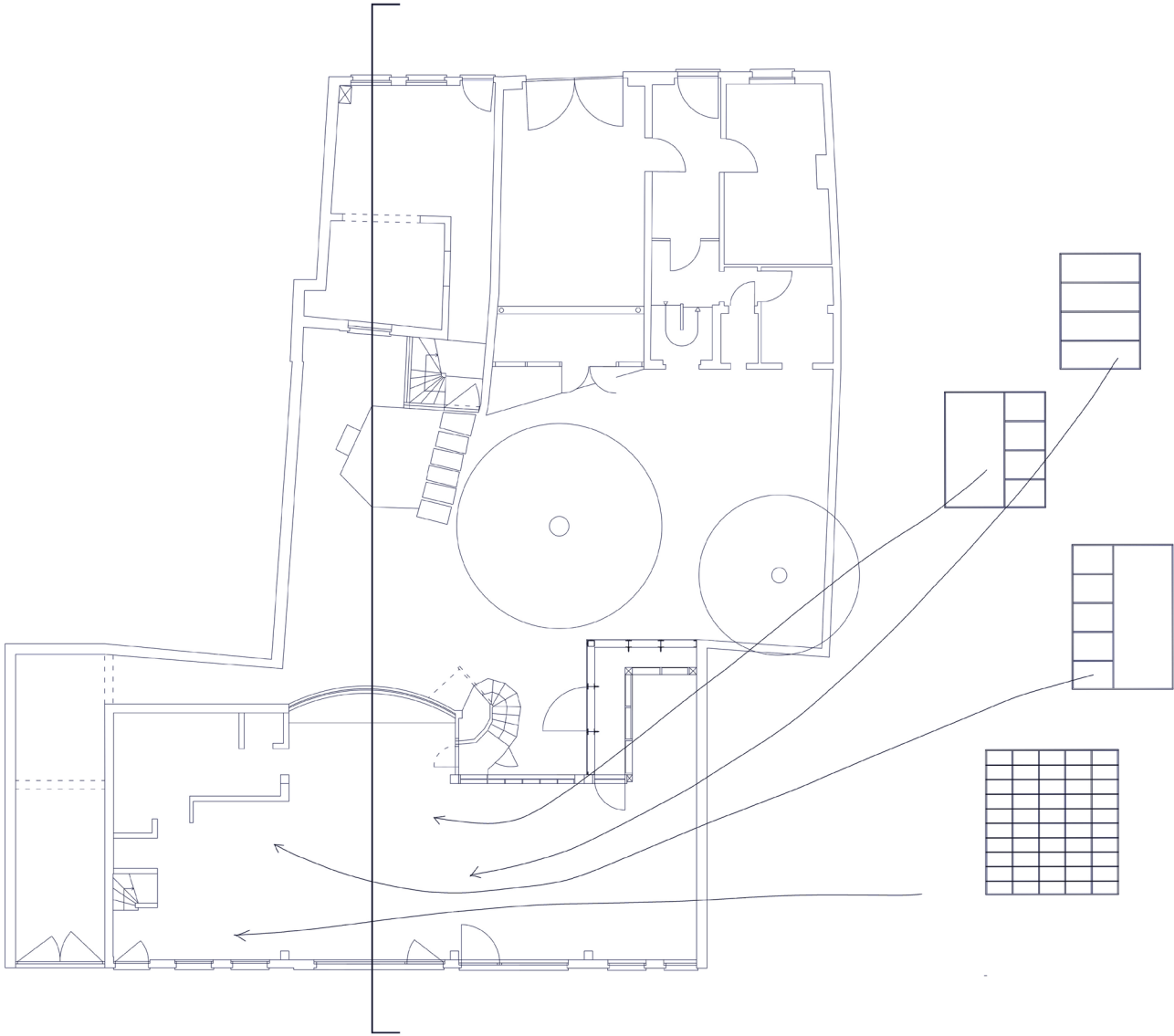
One year at 'The Rhodo Workhome'

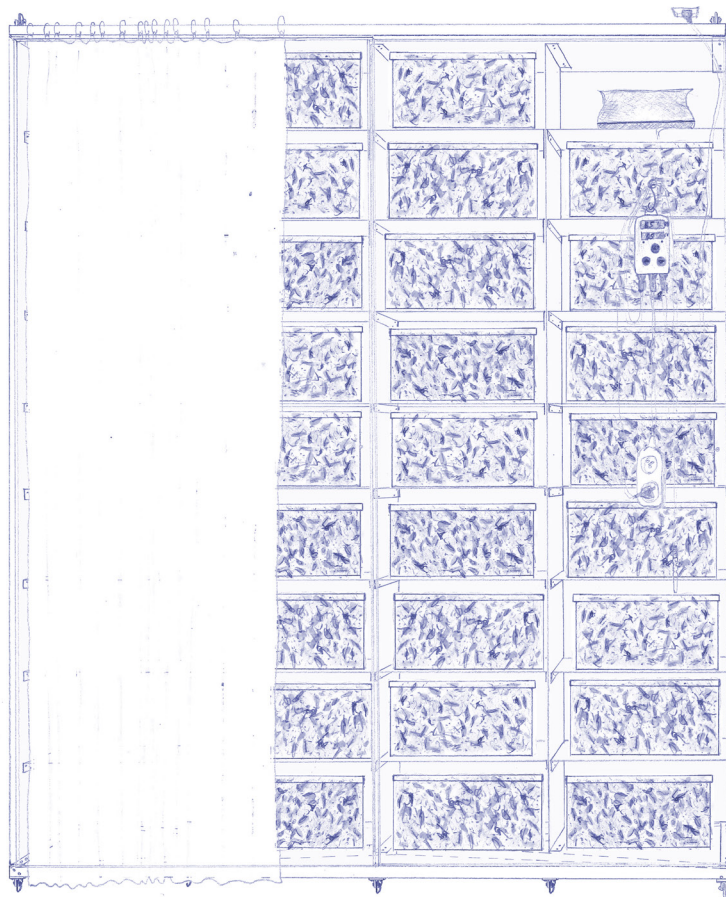
September – drying Rhododendron plant material (fig. 6)

The calendar-year at 'The Rhodo workhome' starts in September, when the first batch of Rhododendron ponticum has been removed from the forests in and around Ghent. First, it



Fig. 6 - Drying and storing Rhododendron plant material





is taken into account how and where the Rhododendron plants are being dried and stored. The leaves dry on ropes which are raised to the high ceilings, created during the renovation, while the branches are being cut in shorter pieces and dried in nets. The branches that are hung up in the ceiling create a playful mood and improve the acoustic performance of the room. A dense curtain of leaves brings a characteristic musk scent of the forest inside, while creating privacy and sunshade in a natural environment. After approximately four weeks the plant material has dried out. The leaves have been drying in different places with different exposures to sunlight. As a consequence, the leaves changed into different shades of colour. They also shrunk a little, letting in a dappled sunlight.

October – Storing Rhododendron plant material (fig.6)

At the beginning of November, the drying process is finished and 'The Rhodo Community' comes together to shred the branches into woodchips. The dried leaves will be stored in semi-translucent fabric bags, which let through a glimpse of the colours of the leaves inside. These are hung up in-between two floors and function as hammock-like structures in which the residents can read, chat and relax. The structures create a separation of floors and muffle the sound of the rooms above and below. The leaves will be used later in the year, in December and January to create bioplastic. The woodchips will be stored

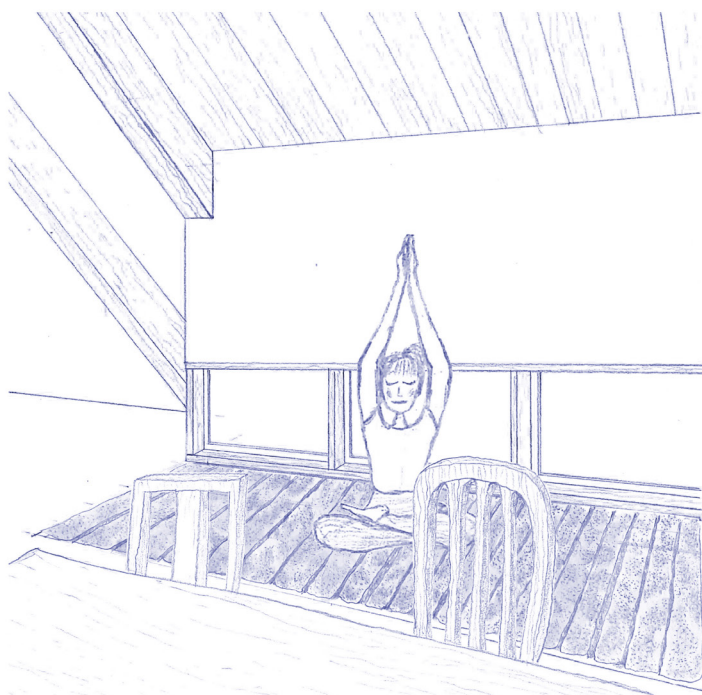
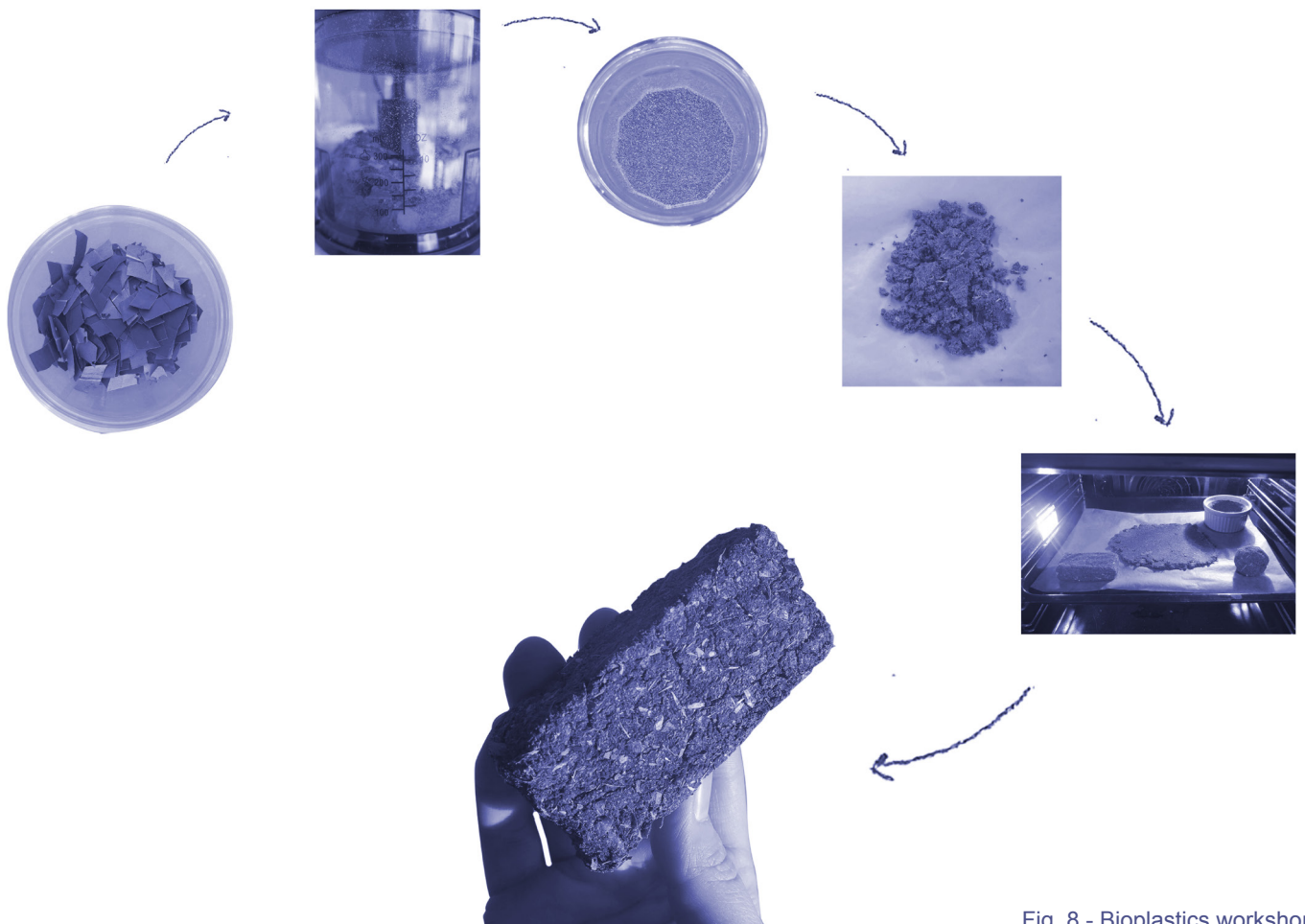
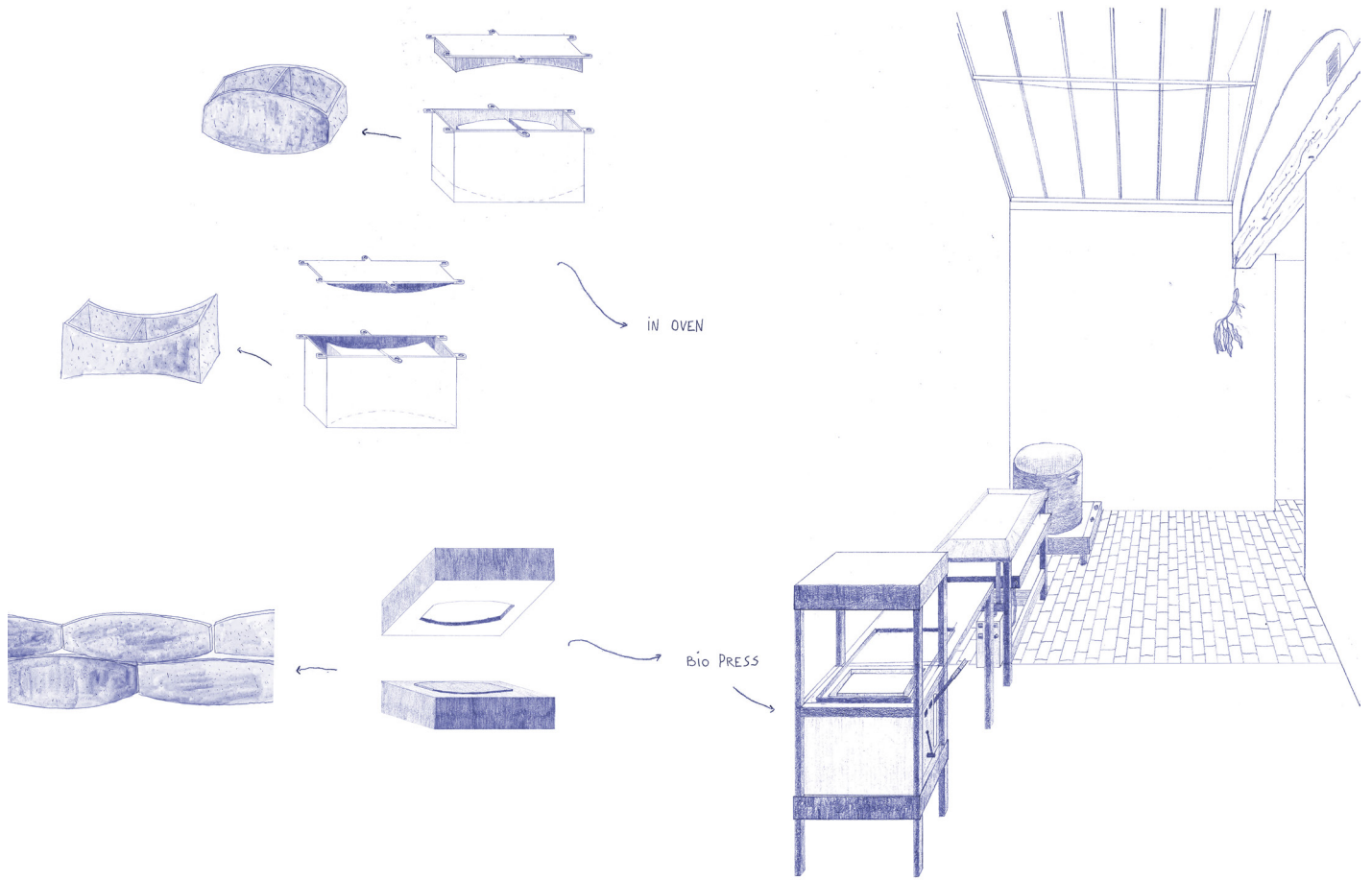


Fig. 7 - Shiitake mycelium



in the greenhouse at the back of 'The Rhodo Workhome'. The greenhouse is constructed to let in sunlight and to make it possible to have a light, duplicated timber structure on the inside which accommodates the storage of the woodchips. They function as a flexible type of insulation which creates open ventilated spaces in summer and closed insulated rooms in winter. In this way, the insulating storage of the chips is synchronised with the seasons.

November – growing Shiitake mycelium (fig. 7)

In November, the growing process of Shiitake mycelium begins. Shiitake mycelium was chosen because of their rich flavour, and low requirements in growth environment. This mushroom species can grow in warm and cold temperatures, but needs a controlled humidity level. The full process of the mycelium takes place in several ceiling-high moving closets. They function as micro-laboratories and can be closed with glass to keep them sterile and to monitor the relative humidity level inside.

This is important, in order to have a high success-rate in the creation of the mycelium blocks. The closets are constructed on wheels in order to move to different places, depending if the mycelium needs to be in a dark, light, cold or warm environment. The closets will also be pushed towards the windows facing the street in order to communicate to passers-by what is happening inside 'The Rhodo Workhome'. Because of this

modular flexibility, the closets not only serve the needs of the mycelium, but also create a moving interior layout in which the residents can change the function and size of spaces. In this way the residents can improve the co-housing spaces as well as the co-working spaces. For example, the residents can transform a more divided bedroom configuration at night into more open spaces, to work together during the day or to organise workshops during the weekend.

The closets have various divisions and are ceiling-high in order to, on the one hand, grow mycelium in a variety of shapes and, on the other hand, to function as separating walls or as wardrobes, shelf units and door-openings in-between growing processes. The different mycelium figures will have different architectural applications in 'The Rhodo Workhome'. There are three different shapes: short cylinders (40cmx15cm diameter), long beams (250cmx23.5cmx23.5cm), and bricks (40cmx24cmx24cm). The short cylinders are used in a variety of small impact applications such as furniture and insulation. The long beams can be used to assemble straight partitioning walls, insulation and flooring. The bricks are used to create straight and curved partitioning walls.

When the Shiitake growing period starts, the containers will be kept in the dark. This is needed for the mycelium to be able to inhabit the substrate. The closets will be moved away from the windows and

the curtains, attached to the closets, will create a dark environment. This growing process takes two to three months.

December – bioplastics workshops (fig. 8)

December and January are calm months within the production process of Shiitake mycelium. This is because, the mycelium grows by itself. The only support that needed from the residents is to monitor the moisture level in the closets to a relative humidity of approximately 75-85%. This gives the residents and volunteers within 'The Rhodo Community' time to organise three workshops. In these workshops, the leaves of the Rhododendron are processed into bioplastic bricks and tiles. These are made with machines designed by the 'Precious Plastic Community'⁹. This organisation is an online open source that shares manuals in which they explain how you can build your own tools at home to shape recycled and bio-plastic materials. In addition, the 'Precious Plastic Community' has a platform that indicates in which city certain machines are present and if they are available for rent or use. 'The Rhodo Workhome' participates in this community and shares its workshop and machines with people on this platform and inside 'The Rhodo Community'. The tiles which are made in this workshop are created from the leaves of the Rhododendron ponticum. These leaves are taken out of their hammock-like storage spaces and are ground into grains of different sizes. Subsequently, water is added

to a mix of these grains and compressed in the bio-press under high temperature. The design of the bricks and tiles is inspired by the characteristic lancet-shaped leaves of the *Rhododendron ponticum*. According to the amount of light, to which the leaves were exposed to when they were drying, the tiles will have different shades of green and yellow. The grain and texture of the bricks and tiles have a wheat-like, grassy appearance and introduce a natural scent and atmosphere inside.

January and February – growing Shiitake mycelium

After three months, the mycelium has fully inhabited the substrate and the block has turned into a white colour. At this stage, the mycelium will be left to grow for another four to eight weeks. When the substrate has turned from white to brown and bobbly for at least 70%, it is ready to be exposed to fruiting conditions.

March – fruiting Shiitake mycelium

In March, the mycelium is ready to fruit mushrooms. To activate fruiting, the blocks need to be placed in a cold environment for one night. The growing process of Shiitake mycelium is scheduled this way that, at this time, at the end of February and the beginning of March, it is still quite cold outside. Because of this, the mycelium blocks do not need to be placed in the refrigerator which would take a lot of space and energy, but can be left outside overnight. The closets are pushed out into the courtyard. The day after,

the mycelium blocks will be taken out of their containers and will be rinsed thoroughly. Subsequently, they are placed in the closets again, stripped from their reusable boxes, and the closets will be pushed back inside. In order to fruit, the mycelium blocks need to be in a half-shaded place with a controlled humidity level of approximately 80%. This is why the closets will be pushed to the façade facing the street. These movements cause the interior layout of 'The Rhodo Workhome' to shift. As a result, the functionality and experience of the spaces change along with the needs and appearance of the Shiitake mycelium. Replacing the closets can happen in a variety of efficient, spatial combinations and be compatible with a different number of residents. In addition, through the window display, passers-by can follow the growing process of the mushrooms and estimate when the mushrooms will be ready to be picked. Within one week, the mushrooms are full-grown. During this week of fruiting, the residents participate in the process by eating, selling and trading the fruits. The Shiitake mushrooms have a rich and earthy flavour and are a valuable alternative to meat. Together with the process of selling and trading, the residents can also share recipes on cooking, marinating and drying the mushrooms. The dried mushrooms can be kept for at least nine months and be used in a variety of dishes after soaking them in hot water.

After one harvest, the mycelium blocks will be

baked. This happens during a workshop, led by a couple of residents. This workshop invites people to learn about the production process of Shiitake mycelium and the way people live inside 'The Rhodo Workhome'. Within this workshop, the participants build partitioning walls inside the house by laying the bricks with compostable cement. These walls will change the interior configuration and make it possible for the residents to change the function and size of the existing rooms. Depending on when the mycelium bricks are baked, before or after fruiting, the colour and texture of the material can vary from almost white and smooth to brown and bobbly. In addition, these bricks can be compressed into tiles to create soft and isolating flooring for winter.

The mycelium and bio-plastic materials have a shorter lifespan compared to traditional durable building materials. The workhome takes advantage of this property by frequently reorganising the indoor spatial configurations through composting and reusing these materials. This makes it possible for the composition of families to change from time to time. (fig. 7)

April – extracting colour from flowers, leaves and branches

The *Rhododendron ponticum* blooms in April and May with large lilac flowers. In mid-April, a new batch of plant material arrives at 'The Rhodo Workhome'. The residents organise a one-day workshop

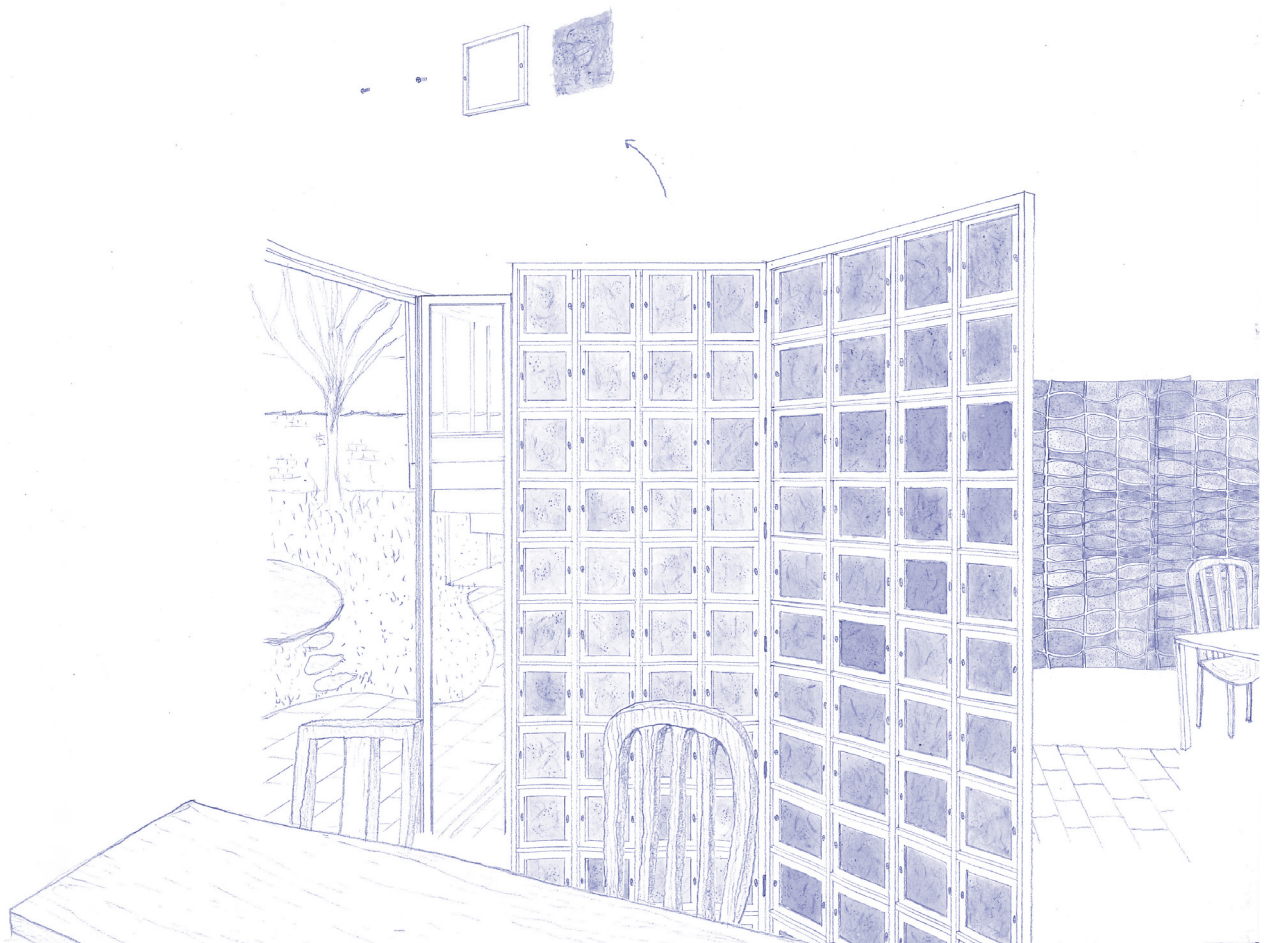
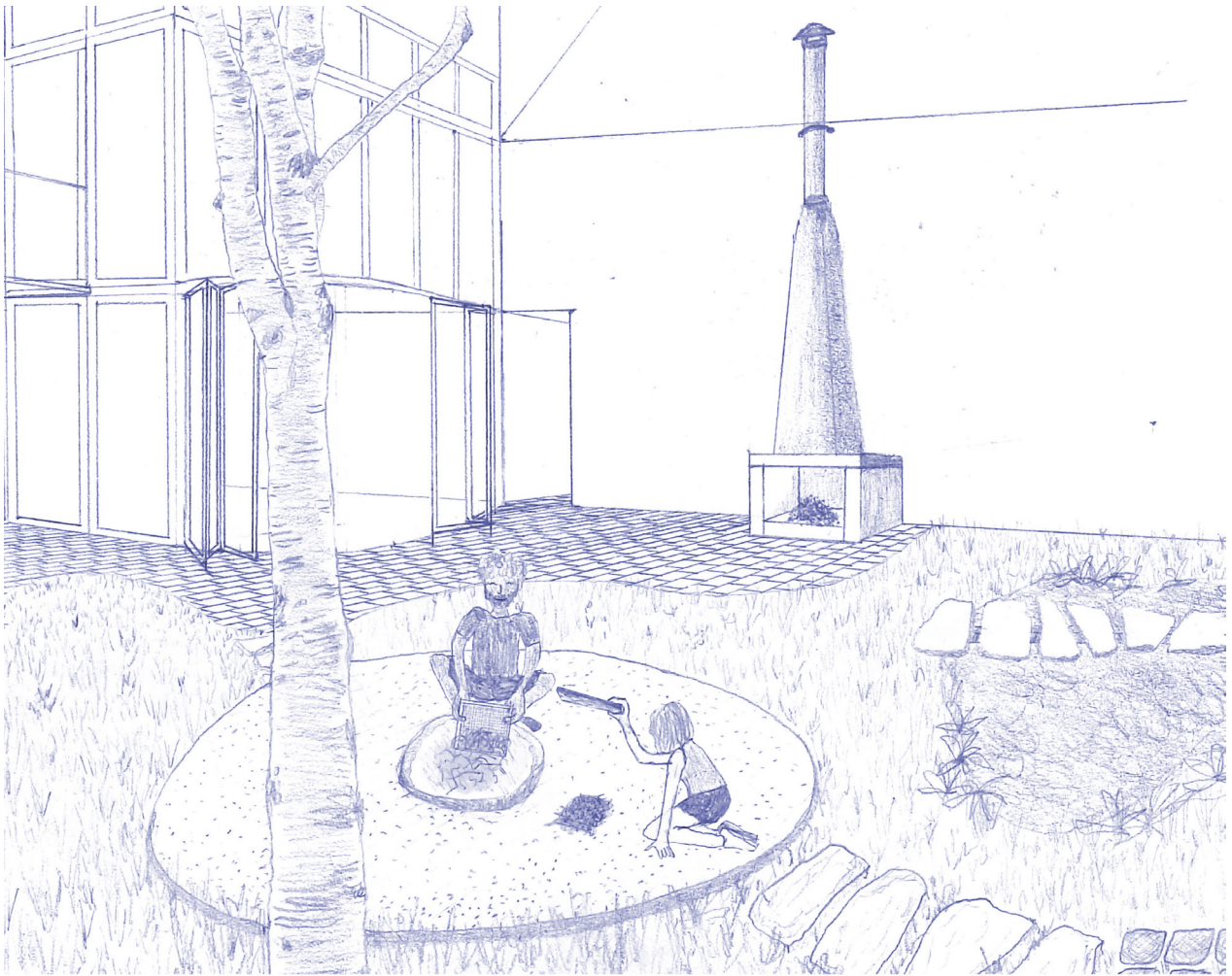


Fig. 9 - Rhodo paper

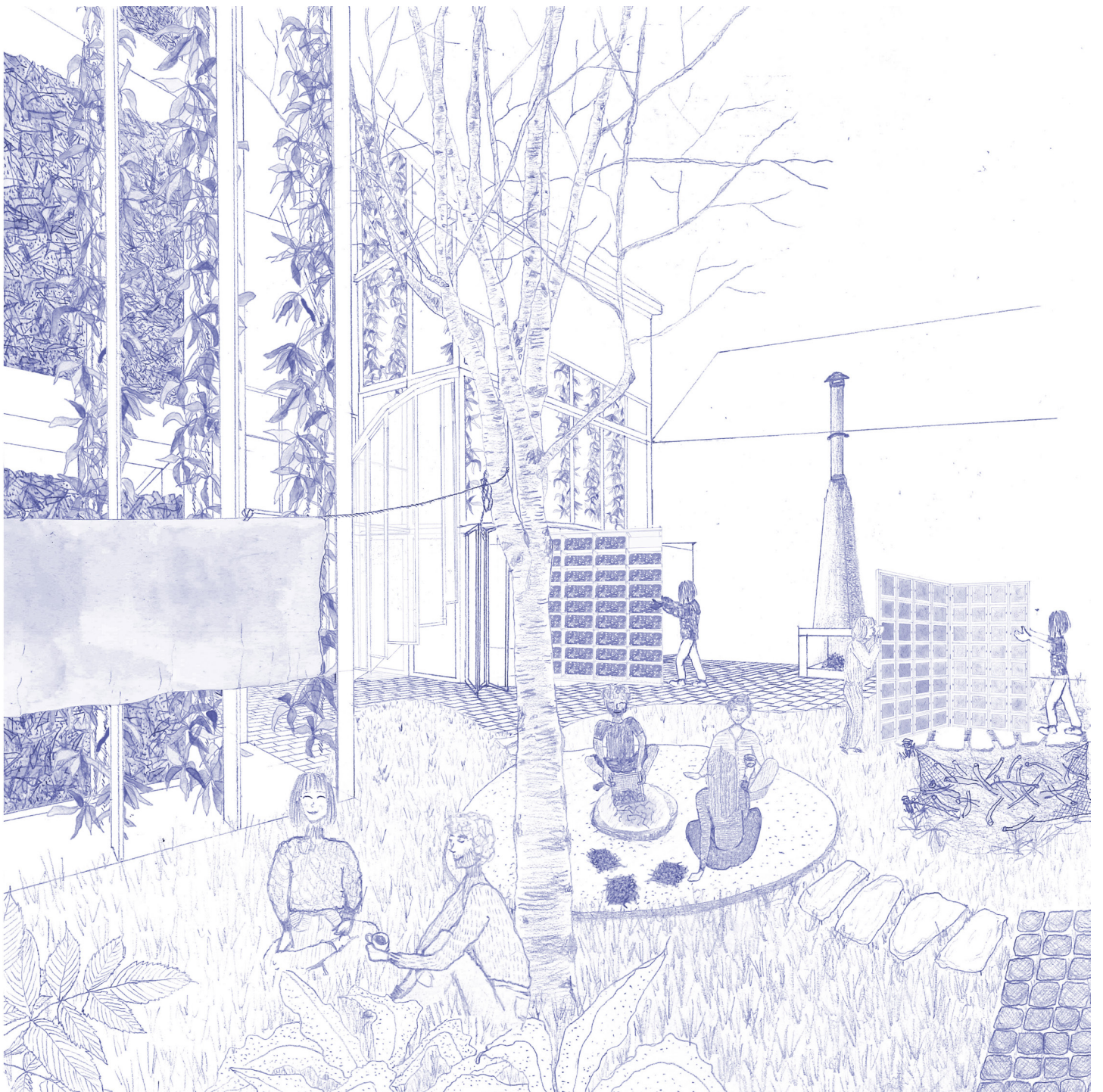


Fig. 10 - A post-pandemic lifestyle

which revolves around extracting colour from the flowers, branches and leaves, which are being used to dye textile and create natural watercolour paint. For the colour extraction, it is important that the temperature of the water does not rise above 95 degrees. This would turn the extracted yellow, green and pink pigments of the fresh leaves and flower petals to brown colours only. In addition, soaking the parts of the Rhododendron overnight, will intensify the colours of the extraction process. As a result, the extracted colours can be used to dye curtains, carpets and even clothes. The colours can also be distilled into a more concentrated substances to be used as watercolour paint.

In this same workshop the plant material is dried and stored in a different manner, compared to the previous drying process which takes place in September. Firstly, the number of flowers that are not used in this workshop will be dried in a dark place in order to keep their pigment. Secondly, the branches of the Rhododendron will not be dried this time. On the contrary, they will be soaked in the pond in the courtyard. Soaking the branches is part of the preliminary process of making 'Rhodo paper'.

May and June – Grey oyster mycelium

In late spring, the woodchips will be taken out of their storage in the greenhouse at the back of 'The Rhodo Workhome'. The chips will be used as substrate for the growth of Grey

oyster mycelium. As a result, the timber structure in the greenhouse will be empty when the temperature in Belgium rises and make it possible for the residents to maximize the ventilation of the indoor spaces within the greenhouse. (fig. 6) The Grey oyster mycelium has approximately the same process compared to Shiitake mycelium. The most significant difference here, is that the growth period of Grey oyster mycelium is only 10 to 14 days instead of two to three months, making its process from beginning to end last for only two months instead of six.

July and August - Rhodo paper (fig. 9)

July and August are more quiet months. In this period, two short processes of making paper of the Rhododendron fibres, are carried out. On a warm summer evening the residents of 'The Rhodo Workhome' come together in the courtyard around a campfire. This might as well be a BBQ in which they grill the tasty fresh Grey oyster mushrooms, which have fruited recently. In addition, they can soak and roast some of the dried Shiitake mushrooms or use them in side dishes. Most importantly, this is a time for the residents to join in the common garden and enjoy their time together. The day after, the ashes of the fire are collected. These are used as binding material to create the 'Rhodo paper'. In the morning the branches, that were left to soak in the pond in April, are boiled until the layer of fibres comes off. These fibres are then smashed together with

the ashes to create a flat mass. This method of making paper is inspired by the Japanese technique 'Sekishu-Banshi'¹⁰ and results in a sturdy and flexible paper-like sheet material. The paper will be used in wooden frames that function as light, modular partition walls and sunshades. The construction of the timber frames allows the paper to be replaced when damaged. Depending on how intensively the fibres are rinsed, the colour of the paper will vary from dark brown to almost white. The 'Rhodo paper' has a surprisingly fresh and herbal fragrance.

DESIGN IMPACT - A NEW MATERIALITY

As illustrated within this one-year timeframe, the processes of making these materials vary in intensity, actions, and architectural interventions. Overall, the processes are mainly extensive and involve a lot of waiting periods: drying and growing. This is very important. Because of this low-maintenance and non-industrialised process, the residents are able to still live their own lives, practice their jobs and hobbies, while in the meantime, they are surrounded by the colours, smells and textures of the products around them, which are drying, growing and being stored. The people living at the workhome will occasionally free their schedule to prepare a material or to support a certain phase of one of the five manufacturing processes. A new rhythm will turn the daily routines of the residents into a more varied and social post-pandemic way

of living. This lifestyle values alternative ways of working, together, in addition to the work that the residents deliver separately, during their paid jobs. (fig. 10)

The natural products have agency in creating an adaptable interior, suitable for all residents. They can work together from home, prepare dinner together or choose to live a more separate life for some weeks, months or years. 'The process of making' creates a varying housing structure which makes it possible for the residents to change habits and behaviour according to the seasons, according to the products or according to their mood. This creates an innovative and post-pandemic way of living which is adapted to a variety of social, spatial and natural conditions.

SOCIAL AND ENVIRONMENTAL IMPACT THROUGH COLLABORATIONS

'The Rhodo Community, designed within this co-housing project, has established various collaborations with researchers, universities, organisations and individuals to increase its environmental and social impact.

Environmental

More specifically, there is the collaboration with Natuurpunt. An organisation in Flanders which manages landscapes in Belgium. Their aim is to maintain and restore local biodiversity. 'The Rhodo Workhome' cooperates with Natuurpunt by, on the one

hand, collecting and recovering the removed Rhododendron plants into biobased materials, and on the other hand, setting up a 'Forest Recovery Model'. In this model 'the removal of the Rhododendron Ponticum' and 'the monitoring of ecological growth' are both incorporated. This program will intervene when the recovery of biodiversity in the forests which are stripped from Rhododendron shrubs, is growing too slowly, when a forest does not recover at all, or when ecosystems are developing into another damaging state. As stated in the article 'When does invasive species removal lead to ecological recovery? Implications for management success'¹¹, different tactics in monitoring an ecological recovery should be used, according to the situation in any particular forest. For example, when removing large volumes of Rhododendron shrubs, open spaces become an opportunity for other invasive species to settle. Another effect of removing the Rhododendron plants could be that a safe haven for a certain native plant or animal species is taken away. As a consequence, environmental conditions created by the shrubberies, that enable certain native species to exist could be altered when the shrubs are removed. This could result in a negative impact on the ecological quality of that site. These exemplary situations explain what is at risk when removing invasive species and not monitoring recovery. The examples prove that we cannot solely rely on the forest's capacity to restore

itself into its pre-invaded state. Thus, we can conclude that only taking care of the removal is not sufficient in restoring an ecosystem. A more holistic approach is needed in which seeding programs, frequent site visits, research and maintenance needs to be combined. This 'Forest Recovery Model' will include the investigation of an area, followed by observing which other invasive or dominant species could likely take over the site after the removal of Rhododendron shrubs. Another example of a tactic within this 'Forest Recovery Model' is establishing a list of native species that are present and used to be present at the site. This list will be prepared, in order to start up a seeding scheme, that indicates which seeds should be planted, how and in which season. In addition, this list should state how intensively or extensively the growth of these seeds should be tracked and supported. The previous examples help support the restoration of biodiversity, nevertheless it is not easy or even impossible to estimate or predict nature's reaction after an invasion. As a result, it is necessary to work in close collaboration with foresters and researchers to observe the progress and course of recovery, in order to apply a customized restoration strategy and to avoid undesirable changes in ecosystem processes.

Social

Through collaborations with individual artists, universities and other organisations

such as the 'Precious Plastic Community', a wide and diversified group of people is reached. In addition, within the program of 'The Rhodo Workhome', an online platform is designed to create and maintain a clear communication. This website, along with the window displays of the house itself, will announce what is happening inside 'The Rhodo Workhome' and which events and workshops are being organised.

The collaboration with the nearby 'LUCA School of Arts' invites art- and graphic design students to participate in the start of a new production phase by creating the design for its explanatory window display. These changing 'windowscapes' will attract people that walk by and engage them in the changing program of 'The Rhodo Workhome'. Moreover, the program of the house invites students and people from Ghent to use the workspaces, that are being created by the temporary partitioning walls, modular closets and paper-frames. The workspaces are also open for students to test materials in the 'Precious Plastic' machines. In addition, there is a collaboration with the University of KU Leuven. Their Architecture campus is situated around the corner of 'The Rhodo Workhome', right next to 'LUCA School of Arts'. The university incorporates the workshops organised by 'The Rhodo Workhome' into their curriculum and in this way, creates an opportunity for its students to be involved in learning about a 'new materiality' within the

architectural design-practice.

REFLECTIONS

Economic value of mycelium products

'The Rhodo Workhome' does not aim to become a company which produces bio-based materials, instead it still intends to be a home. It does not want to change the lives of its residents drastically, but rather bend and twist them in terms of pace, structure and flexibility. 'The Rhodo Workhome' is designed to create a community rather than a product. It is a place that houses both its residents, its production processes and the community around them. Accordingly, we can conclude that creating a product is far from being the sole purpose of this home.

When it comes to making a product within our current society, an economic value is subsequently associated with it. In contrast to this way of thinking, 'The Rhodo Workhome' is not mainly about creating a profitable product. Rather, it is the altered relation to materials and the lifestyle that it introduces in contrast to our current traditional way of living. Nevertheless, the materials that are produced, are and target to become even more valuable products. In addition, because of their basic shapes, they can be used in different architectural projects. Therefore, these bio-based products could optionally be sold or traded by the residents. In addition, creating connections with supermarkets and other local, small design stores could be interesting to expand the impact of 'The

Rhodo Workhome', allowing more people to get to know and use the products.

Impact on biodiversity and innovative design

There has not yet been much research into the possible uses of the *Rhododendron ponticum* within the scope of innovative organic materials. Additionally, this plant is invading areas in Europe of considerable size. These two elements make this study relevant within the research subjects concerning 'restoring biodiversity' and 'recovering wasted materials', especially within the discourse of products which are made in a fair, healthy and transparent environment. The techniques that 'The Rhodo Workhome' implements to design these products are low-tech. In addition, the products themselves need more experimenting to make them better. Therefore, a collaboration with research laboratories could be a step forward in order to make innovative design progress in an efficient way.

This article mainly focusses on recovering the *Rhododendron ponticum* plant material into organic materials. In addition, this research has decided to set Ghent as its case study. Nevertheless, this project can be adapted to various cities in Flanders such as Bruges, Antwerp, Brussels and Hasselt, where the *Rhododendron ponticum* is also invading many areas. As in Ghent, 'The Rhodo Workhome' could likewise be constructed in these cities. If we were to think even more into the future,

we could plot what will happen when all the Rhododendron bushes are removed. When this situation occurs, 'The Rhodo Workhomes' will be adapted to a new process of manufacturing, customized to a different invasive species.

For example, the American Oak or *Quercus rubra* are also invading our forests. In this way 'The Rhodo Workhomes', or in this case 'The *Quercus* Workhomes', will change name and format according to the invasive species of which they are helping our ecosystems to recover from.

Another, even more efficient method could be, to work our way through damaged ecosystems, not from species to species but, from forest to forest and immediately remove all invasive plants present in one forest, rather than focussing on one type of invasive plant. In this case, different Rhodo-, *Quercus*- and other- Workhomes should be developed at the same time to host different programs of bio-based materials.

Impact on today's architectural discourse

There are numerous design aspects of the Rhododendron-based materials, on which this research did not focus. One of these is the fact that mycelium, for example, can be created in many shapes, because it is grown inside a mould.

Therefore, a study on shaping mycelium in order to create more intriguing architectural forms would be an interesting consecutive investigation. Within this prospective study,

various building methods could be integrated, such as 'dry connection' building as an alternative method to using compostable cement. Moreover, more research should be established on the structural properties of mycelium and bioplastic depending on their shape and thickness.

In addition, when it comes to mycelium blocks, there was not any information to be found around the different qualities of mycelium blocks depending on if they are baked before or after fruiting. Additionally, this research raises questions about how we treat non-load-bearing-walls in today's architecture. Why are these permanent structures? How could we design partitioning walls differently in the future? Which other (organic) materials could be part of this study?

CONCLUSION

This research aims to define a new way of living in reaction to how we are experiencing the global pandemic from home. As a result, the project discussed within this research brings together a strong community, a close connection to nature and a flexible architectural system. These three aspects collide through the processes of growing and making Rhododendron-based materials inside a post-pandemic residence called: 'The Rhodo Workhome'.

Firstly, this project includes a strong community through participative architecture, which is designed in order to fight social isolation among home-based workers and individuals in lockdown.

Secondly, 'The Rhodo Workhome' raises awareness around the decrease of local biodiversity which is being caused by the Rhododendron *ponticum*. This exotic invasive species represents the ideology that lies at the heart of 'The Rhodo Workhome'. Namely, contributing to the restoration of ecosystems and recovering a plant material that would otherwise be thrown away into bio-based products.

Thirdly, the production processes of these materials create a flexible and varying way of living. While their resulting products introduce a new way of treating building materials as temporary and compostable in contrast to the current architectural situation, which builds with ever-lasting, durable materials.

The design of 'The Rhodo Workhome' houses a flexible spatial program which adapts itself to the rhythm and needs of both the residents, as well as the different natural processes which are carried out. This research invites residents to live a more self-sustaining and environmentally conscious life through living together with these naturally grown products.

To conclude, 'The Rhodo Workhome', creates a new materiality of shapes, smells and textures within a new kind of innovative participative residential architecture. In addition, this design exercise introduces a post-pandemic way of living, which is adapted to a variety of social, spatial and natural conditions.

NOTES

¹Bio-based materials are made from organic sources only and are compostable.

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FIGURES

Fig.1 - W., Koen, Rhododendron ponticum bushes in Wetteren – Den Blakken [online]. Photograph. Ghent: Waarnemingen.be, 1 January 2021. Available from: https://waarnemingen.be/species/7312/photos/?after_date=1993-01-01&before_date=2021-06-05&province=16&search=wetteren&likes=&user=&location=&sex=&type=&life_stage=&activity=&method=

Fig.2 - ROELS, Marie. 2021. Rhododendron ponticum, map of expansion in Belgium and Ghent.

Fig.3 - ROELS, Marie. 2021. Empirical study of organic materials: watercolour, paper, bio-plastic and mycelium.

Fig.4 - ROELS, Marie. 2021. Calendar and graphs visualising the different production processes that are carried out in one year.

Fig.5 - ROELS, Marie. 2021. Site of 'The Rhodo Workhome' based in the city centre of Ghent.

Fig.6 - ROELS, Marie. 2021. Drying and storing Rhododendron plant material.

Fig.7 - ROELS, Marie. 2021. Shiitake mycelium.

Fig.8 - ROELS, Marie. 2021. Bioplastics workshops.

Fig.9 - ROELS, Marie. 2021. Rhodo paper.

Fig.10 - ROELS, Marie. 2021. A post-pandemic lifestyle.