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ONE TILE, ONE DAY

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ONE TILE, ONE DAY

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ABSTRACT

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In this project I have created a practical, decorative and educational system of HDPE tiles and connections as a material for walls and floors in climate-smart housings. In doing so, I want to send a message about changing the perception of plastic as a disposable material and minimize the amount of plastic that ends up in the wrong places.

To make the message credible, I analysed politics, arts and different areas of a circular economy. One problem is that most plastics are made from fossil fuels and are used for disposable products. Another problem is that 8 million tons of plastic are released into the ocean every year. When plastics end up in nature or oceans, it contributes to climate change and affects the environment and ecosystems. By researching exciting problems, solutions, insights and production methods, I was able to make decisions about the project that consider a minimum waste of plastics.

The result is a system of modular and versatile HDPE tiles and connections for walls and floors. The production of the tiles considers different aspects of a circular economy, by using waste as a resource, as a production method and enable material recovery (once end of life) by avoiding binding fixtures. Each tile, by its weight, represents one day of plastic consumption by one person. The tiles can be combined in quantity to illustrate days, weeks or years (depending on space) to create a strong message. A tile with written message "ONE TILE, ONE DAY" can be added.

The system of plastic tiles and connections won't change the world, I strongly believe politicians should set up frameworks and regulations so that a circular economy is favoured. Yet, I still believe my project can tell about our contemporary and hopefully encourage to recycle and minimize the amount of plastics that ends up in the wrong places – to come a bit closer to a future with zero-waste.

INTRODUCTION

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The aim of the project was to visualize the contemporary problems related to a linear economy and the Western world's over consumption and plastic waste. This was motivated by my interest in circular economy and sustainability, politics and arts.

I started with researching the background of circular and linear economy. Then I did a primary analysis of circular economy and sustainability, focusing on recycling plastic. In doing so I analysed material extraction, sustainable manufacturing, packaging and transport, use and repair. I also analysed how new business models could be used for promoting circular economy. The concept of waste as a resource was discussed in terms of exploring the potential of materials and how to use waste as an alternative global recycling system. My secondary research and analysis was made concerning the field of politics, arts and information design and how this can be used to communicate a strong message.

My synthesis - brief presented the idea of making a system of modular and versatile HDPE tiles and connections for walls and floors in climate-smart housings. A functional analysis of recycling plastic was made and the "why, what, how and why care" of doing this was presented. During the design process, I described and evaluated my mock-up and different sorts of edge treatments, connections and methods.

The realisation and result of the project ONE TILE, ONE DAY was shown by renders and a blueprint of tiles and connections.

MOTIVATION

- A CIRCULAR ECONOMY, SUSTAINABILITY, POLITICS AND ART

A circular economy is something that has been part of my whole life in one way or another. Growing up, I inherited clothes and toys from my brother and my mom was always patching holes when I broke things. With grandparents coming from a post-war era, I was taught the value of products you keep throughout generations by repair and refurbishment.

When I moved to Berlin, Germany, I shared flats, worked in an open space office and washed my clothes in a self-service laundry shop. I became a member of a carpooling company and I rented bikes when going on vacation. I bought mostly secondhand or borrowed what I needed from friends and family.

As I got older I became more aware of sustainability and found an interest in politics, as I witnessed the consequences of capitalism and a linear economy. I believe sustainable consumption is about producing and consuming within the planet's resources. Right now, we are spending more natural resources than nature can recreate. This applies, for example, to forests, freshwater and soil. We also risk running out of non-renewable materials such as metals and plastics.

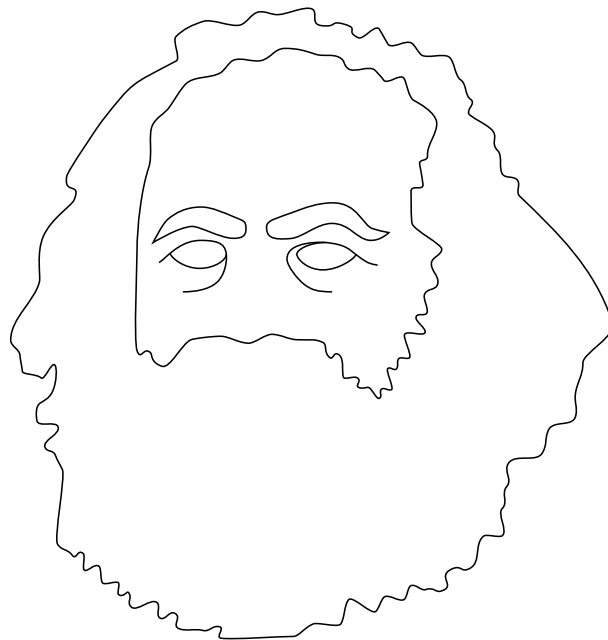
Another very serious effect of overconsumption is the global mass extinction of species, which is the loss of biodiversity. Three-quarters of all species on earth are likely to disappear in the next few centuries. By doing so, we threaten the very foundation of ecosystems and our survival on earth. Climate change is also affected by our consumption. With the current rate of consumption, we will push the climate change so far that it might get self-reinforcing and unstoppable.

With my interest in politics came a huge interest in art and design. I always found art and aesthetics to be an efficient way to communicate politics, whether it is a historical war-painting, propaganda poster, graffiti or a design with a strong message. A circular economy, sustainability, politics and art, are not only my motivations but also the foundation of my bachelor thesis.

PRIMARY RESEARCH

- CIRCULAR ECONOMY SINCE 1857

The circular economy was discussed by Karl Marx as early as 1857. Marx divides the economy into four areas: production, distribution, consumption and exchange (circulation). These four areas are all parts of a whole, where production plays the most important role.



PRIMARY RESEARCH

– LINEAR ECONOMY AND WASTE

Since the industrial revolution, rapid technological and economic development has continued. Groundbreaking innovations mean that many people now have access to products from all over the world at affordable prices and this has provided many material conveniences that were unthinkable for previous generations.

During the early industrialism, function and sustainability were important aspects. Mass production and saturated markets later created mass unemployment. To keep industries and production running, products with shorter lifetimes were produced.

In the documentary "The Lightbulb Conspiracy", industrial designer Brooke Stevens talks about planned obsolescence. The term planned obsolescence includes products with a limited lifetime and how new models (with small upgrades) trigger the consumer to buy new products even though the old one is not broken.

A historical event is the Khian Sea waste disposal incident. A ship named Khian Sea transported 1400 tons of waste from Philadelphia (US) to Haiti. During the 1980s, Philadelphia (US) went through an economic crisis. Waste workers strike and they tried to solve it by sending waste to other states and later to other countries. Green Peace helped to prevent the ship from entering different shores for 1,5 years before it finally came to Haiti. Reports and pictures from the event became symbolic of a system where wealthy countries get rid of the hazardous waste in poor countries. To prevent this, the Basel Convention was established in 1989. Higher requirements for recycling was established and made it more difficult and expensive. But this led to a waste trade, as it was cheaper than setting up a domestic recycling system.

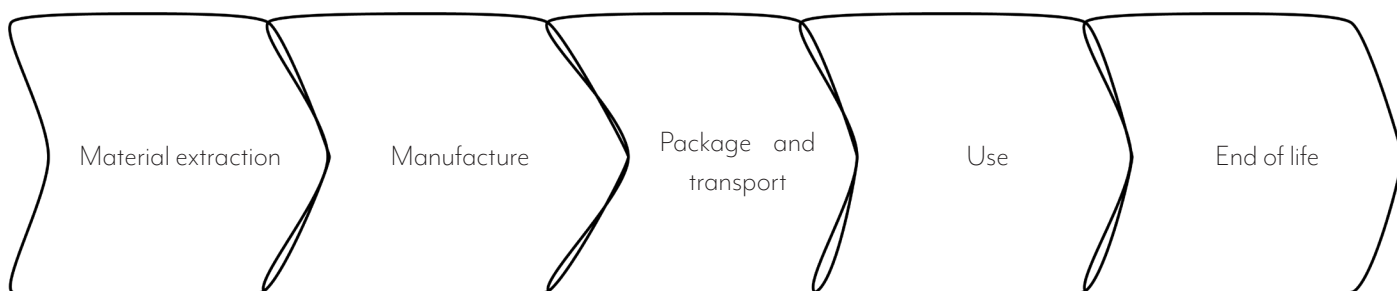
China became the world's largest importer of plastic recycling and half of the world's plastic was shipped there. China exported a lot of products and the idea was that they would take back, recycle and reuse the material. The new trading model worked well and contributed to China's rapidly growing industries and economy, in the beginning. The problem was that much of the material was not clean or sorted and therefore could not be recycled and reused. At the same time, domestic consumption increased and China could not handle all waste, which later ended up in landfills.

In January 2018, China decided not to trade or accept more waste. Partly because of the amount of their growing domestic waste, but also because they did not like the idea of them as the world's landfill. In the meantime, countries in the western world had not developed their systems for dealing with waste.

Today, countries in Africa have taken over recycling and in some cases, they stand for the only recycling system that some wealthy countries have. This generated more money and jobs in poor countries, but the human consequences are brutal. At landfills in Ghana, plastic removal (to access metal cables) has led to burns and poisonings, but also the spread of disease.

Landfills can cause natural disasters such as landslides, trash-quakes and floods, as they prevent the drainage of rainwater. Burning contributes to carbon dioxide emissions and climate change. Ashes from burns can blow over oceans and create eutrophication and algal blooms and fire smoke has been proven to destroy coral reefs in Indonesia.

A swedes average carbon dioxide emission is 11 tons of carbon dioxide per year if all our consumption is included. That is ten times more than what is sustainable. Already by 2030, emissions must drop to 2.5 tons of carbon dioxide per person a year - if we are to meet the Paris Agreement's goals. The total emissions from our consumption have not previously been calculated as it should. This is because two-thirds of Swedens emissions are counted in other countries where our products are manufactured. Since our emissions appear to be much lower, Sweden's climate policy is not strict enough.



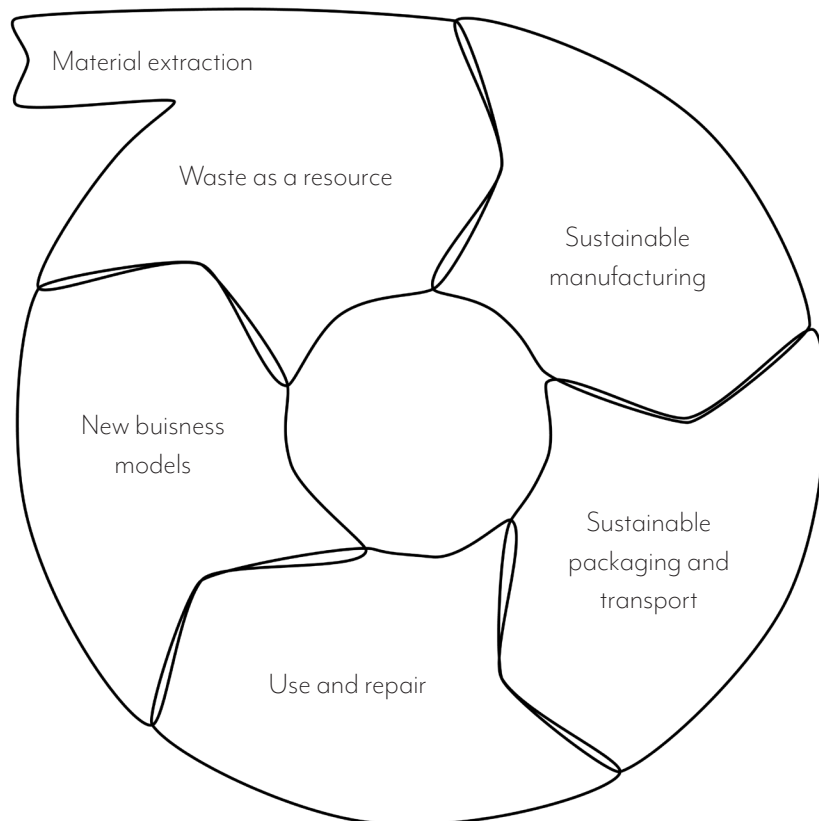
PRIMARY ANALYSIS

- A CIRCULAR ECONOMY AND SUSTAINABILITY

A circular economy is the creation of a functioning social, cultural and economic development, in balance with the earth's resources. It also means the creation of life quality for everyone, now and in the future. Circularity includes several aspects to help elongate the product lifetime before its useful life is over and it can feedback into the cycle.

I believe it will take both money and time to change the habits of company and customer behavior. If we are to meet the Paris Agreement's goals and become sustainable, I believe a structural change in society is a necessity. I think politicians should set up frameworks and regulations so that recycling is encouraged and a circular economy is favored. The obvious social, ethical and environmental crises associated with capitalism, can be defeated with sustainable growth and a circular economy.

To help me avoid waste and make a more sustainable design, I have analyzed extensive solutions and problems (greenwashing) of the different areas of circular economics.



MATERIAL EXTRACTION

- SELECTING LOW IMPACT OR RECYCLED MATERIALS

Material extraction has one of the biggest impacts on the environment, especially when it comes to extracting virgin material. Bio-based material can have a lower impact on the environment when it comes to extracting (growing) and recycling. Many bio-based materials are compostable or biodegradable, meaning the material does not require additional technology or energy to be recycled, as they will break down in nature within a reasonably short amount of time when exposed to air, moisture, and microbes. Before selecting a material there is a lot to be considered: transport, chemistry, energy, CO₂, water and end of useful life.

- Can recycled material be used?
- Can virgin material be avoided?
- Can scraps or left-over materials from other industries be used?
- Can natural materials (cotton, silk, wool or flax), bio-based (chitosan or potato plastic) or lab-grown materials (mushroom leather or spider silk) be incorporated?
- Can composite materials be avoided? It often requires additional technology, time and energy to recycle.
- Can the material choices be adjusted to make recycling easier?
- Can the material be extracted in near surroundings?

I think bio-based materials like chitosan or potato plastic or lab-grown materials like mushroom leather or spider silk, are interesting and innovating. But an easily biodegradable material is also more sensitive to moisture and air during its lifetime. These properties are good for the end of life and recycling but might shorten the lifetime of the product.

SUSTAINABLE MANUFACTURING

- PRODUCTS MADE STRONGER BY METHOD

The right material can increase durability and elongate the lifetime of a product. To prevent wear and tear, it is important to test the product to see what components are most fragile or risk being worn out first.

- Can a fragile component be reinforced (patches) in a way for it to last longer?
- Can a user-test (with feedback) show how well a product withstands wear and tear?

SUSTAINABLE MANUFACTURING

- MINIMIZING OR ELIMINATING WASTE IN THE PRODUCTION

Waste avoidance in the manufacturing process can be done by recovering scraps or left-over materials through a recycling program. It can also be done by efficient pattern making or innovations like 3D-printing.

- Can minimum material be used for prototypes and products without interfering with the durability?
- Can efficient patterns help to minimize or eliminate scraps or left-over materials?
- Can CAD or 3D-printing be used to reduce waste?
- Can molds be reused several times?

SUSTAINABLE MANUFACTURING

- REDUCE OR ELIMINATE HAZARDOUS SUBSTANCES

Green chemistry is the key to potential recycling and circular economy. It should always be a goal to achieve zero discharge of hazardous chemicals (zdhc) and this can be done by checking the restricted substances list (rsl) and researching innovations in finishes and materials. In the EU, consumers have the right to know if what they are buying contains substances that are included in the list of particularly dangerous substances.

- Can the usage of toxic or hazardous chemicals be eliminated or minimized? Perhaps by choosing another material or finish?
- Can partners guarantee usage of green chemistry?
- Can chemical pros against cons be justified, when it comes to the additional technology, time and energy required to recycle these materials?
- Can components be decomposed without additives or oxo-degradability? If not, are the additives needed causing unnecessary harm?

I believe green chemistry has a positive impact on humans and the environment. To create a product that is both safe and circular, materialwise.org is a good service. They offer information about hazardous chemicals and can help with a safer alternative. They help you avoid problematic ingredients from the beginning of the design process.

SUSTAINABLE MANUFACTURING

- PRODUCTS THAT EASILY ADAPT

Urbanization has led to increased real estate prices and smaller homes. People tend to have short-term life planning and move more often, which has led to lightweight, fast assembly/disassembly and compact solutions with efficient space usage or multifunctionality storage.

- Can the product incorporate timelessness and a color choice that remain relevant for multiple years?
- Can the product adapt to different environments (countries, cities and homes?)
- Can the product adapt to different cultures (ethnicities and traditions)?
- Can the product adapt to different people (genders, age, physical abilities: strength and size, etc)?
- Can the product adapt to different living standards?
- Can the product be personalized, upgraded or updated by changeable/modular component options?
- Can the product adapt to a flexible home and family (a modern family)?

SUSTAINABLE PACKAGING AND TRANSPORT

- PURPOSEFUL PACKAGING AND SUSTAINABLE TRANSPORT

Due to a wider global import, export and longer transports excessive packaging has increased. Today most plastic waste comes from one-time-use packaging, whether it is the grocery bag or the lid for the takeaway cup.

- Can packaging be avoided for the product?
- Can flat packaging be used for the package?
- Can recycled materials be used for the package? Can virgin materials be avoided?
- Can scraps or left-over materials from other industries be used for the package?
- Can the package incorporate natural materials (paper), bio-based (popcorn or sawdust) or lab-grown materials?
- Can the package be a part of the product?
- Can the package be easily recycled or reused for something else?
- Can the package serve another purpose (offer handle or easy-grip, instructions about how the product works, can be repaired or how to recycle it)?

Even though flat packaging minimizes the amount of material used, I think it can be problematic. In 1956 when IKEA introduced flat packaging, they were able to transport furniture safer. Their new concept made their furniture more affordable than the competitors since the company did not take part in the assembly process and the flat package also enable bigger stocks and bulk transports. But all of this eventually led to overconsumption.

A few years back IKEA also noticed another problem with its packaging. While the polystyrene foam used inside the packaging was great for protecting the product, it wasn't so great for the environment. It was made from fossil fuels and was difficult to recycle which didn't fit with the IKEA vision of using materials from sustainable sources. Today they look into using mushroom foam, honeycomb inserts and sugarcane-based film. I believe these materials can improve packaging for real.

USE AND REPAIR

- PROLONGING THE PRODUCT LIFETIME

A customer must know how to use a product right. That could mean good semantics, affordance, ergonomics or instructions on how to use a product. The possibility for a user to repair is also one important aspect of extending a product's lifetime. With customer insights and needs, it is possible to make desirable products where there is value in repairing and refurbishing them.

- Can a worn-out component be removed and replaced?
- Can the product be repaired by a non-professional?
- Can the product be repaired by a professional repair?
- Can the finish be refurbished (repainted, trimmed or oiled, etc.)?
- Can information about the product care boost longer use?
- Can all materials be described to ease maintenance?

When it comes to use and repair, I believe we have a lot to learn from older generations. With grandparents coming from a post-war era, I was taught the value of products you keep throughout generations by repair and refurbishment. As they lived on a farm they had both space and tools, but what fascinated me most was their knowledge and creativity when it came to elongate a product's lifetime. I believe there was nothing my grandmother could not patch with a sewing machine or my grandpa could not fix the workshop.

Today there is a wide range of cheap home electronics and the price often comes with decreased quality and shorter lifetime. When a device breaks, the cost of repairing can sometimes be more than to buy a new one. As a response to the throwaway, consumerist model of electronics that we've been sold and the growing mountain of e-waste - the Restart Project was born in London, 2013. They bring different skills together to help people make a real difference, as well as talk about the wider issue of what kind of products they want.

In Lund, there is a workshop called FixaTill, that helps you to extend the product lifetime by repairing and defeat planned obsolescence. They host courses about recycling and waste prevention and provide a space where you can bring your broken devices. At the workshop, you can access a wood workshop, sewing machines and a painting department that is free of charge.

NEW BUSINESS MODELS

- ESTABLISHING NEW SERVICES OR BUSINESS MODELS

With circularity - comes new business models. Whether it is a new ownership model, a recycling program or resale and service platform, customization, subscription or emotional connection.

- Can the product be taken back for repair or resell?
- Can a repair kit or repairs shop, help to elongate the lifetime?
- Can a new business model avoid waste (made to order)?
- Can a product, component or waste be a candidate for resale?

I believe H&M can be criticized for a lot of things associated with the linear economy, but they also provide their customers with plenty of new services to change towards a circular economy. Today, 57% of all materials sourced by the H&M group are either recycled or sourced more sustainably. This is an increase from 35% in just one year and takes them closer to their goal to only use recycled or other sustainably sourced materials by 2030.

In all H&M stores in Sweden, there are collection boxes where you can leave clothes and textiles that you no longer use. All textiles are welcome - from all brands, regardless of condition. To ensure that they are taken care of in the best way, H&M partner with a company called I: CO that sort and divide for best use.

Reuse: clothes that can be worn by new owners. Recycling: textiles that can no longer be worn are transformed into other products such as parts of new collections. Textiles that cannot be reused are given a second chance as textile fibers or used to manufacture products such as cushioning and insulation materials for the automotive industry.

H&M "take care" also provides inspiration and tips on how to fix clothes to give them a new life. "Take care" is divided into four categories: inspiration and DIY, fix and repair, wash and stains, and products: sewing kit, patches, broken zipper fixer, washing bags, stain-remover and combs. Some H&M stores also provide sewing studios. There you can repair or redesign clothes - old and new, regardless of where the garments are purchased.

NEW BUSINESS MODELS

-EMOTIONAL CONNECTION

Conscious consumption comes from proper research. Digitizing offers the customer a wide range of information, in the search of more environmentally friendly products with higher quality, that have been produced under responsible social conditions. This attracts a larger group that is willing to pay more for these products. A product that is consciously selected, is a product that customers will value, connect to and hopefully keep throughout life.

- Can the customer access the right information: materials, repair, retail information: country of manufacturing or factory, how to recycle?

- Can information about material attributes and method of making, give substantial importance in the product narrative?

In 2019, H&M reopened its flagship store at Sergels Torg in Stockholm. When reopening, H&M launched a bunch of new concepts and services including the self-scan. With this service, you can use your phone to scan the garments and access the retailer information and what country and in which factory the garment is produced. It is a service to help the customer to navigate and I think it is a great compliment to the wide range of information accessible online. I hope H&M can inspire more companies to do the same, but I'm still not convinced one should shop at H&M.

NEW BUSINESS MODELS

- A SECOND CHANCE FOR PROLONGED LIFE

As a protest against fast lifestyle and linear consumption, there is a trend of going back to the roots, meaning more awareness of resources, environment, second-hand and self-made products.

- Can the product be valuable on a secondary market?
- Can the product value enhance with time and usage?
- Can the value of a used product be communicated?

As the younger sister, I grew up inheriting clothes and toys from my brother. As I got older I found myself shopping secondhand, vintage or in thrift-shops. I think it is a fun way to consume sustainably and a cheap way to find peculiar products with a unique history. More and more companies offer a platform for used items online. Some examples are Tradera, Sellpy, Blocket and eBay.

NEW BUSINESS MODELS

- RENTING, LEASING AND SUBSCRIBING

When it comes to long-term emotional connection, it can mean a long-term relationship between the customer and the producer. When a product is rented it means it is always owned by the producer. This helps the customer adapt to the constant change in trends and it is a good way to try a product (before buying it). When it comes to products, costumers don't need to own every single item they use, but rather own their style.

- Can the product be valuable on a renting market?

- Can the value of a rented product be communicated?

Renting, leasing or subscribing are trending alternatives to buying and owning. It's a business model that works for B2C as well as B2B or C2C. Successful companies whose unique selling point is to rent, lease and subscribe are Spotify, Air-Bnb, Netflix or DriveNow. Renting clothes and clothes-library are yet uncommon, but I think we might see a change in the fashion industry since H&M relaunched their flagship store on at Sergels Torg in Stockholm. In this new store, which will be the first in the world with this service, H&M offers the possibility to rent selected items from H&M's Conscious Exclusive collections.

NEW BUSINESS MODELS

- SHARING AND IMPROVING SOCIAL COHESION

As for today, many people prefer to own things and ownership is still seen as a symbol of status. But people tend to move more often and have short-term life planning, which has led to downsizing in belongings and sharing/renting a daily routine. Examples of shared working and living are shared offices, meeting rooms, workshops, kitchens or laundry rooms. Sharing things with other people can improve social cohesion and contributes to environmental protection.

- Can the product be valuable in a shared market?

- Can the value of a shared product be communicated?

The sharing economy is described as a solution to buying and producing less, but there are examples of greenwashing. When I listen to a radio program called "Prylarnas Pris" on P3, they had a closer look at electric scooters that is a commonly shared transport nowadays. Sustainable mobility experts estimated that electric scooters have large emissions when you look at the entire lifecycle. The emission per distance is the same as a small and efficient car, as the lifetime of a scooter is fairly short (six months to two years) compared to cars. 50% of the emission comes from producing a shared electric scooter, which I don't think most people realize when they download the app.

When I moved to Berlin, Germany, I shared flats, worked in an open space office and washed my clothes in a self-service laundry shop. That was mostly due to a poor economy, rather than an active contribution to environmental protection. My own experience of shared working and living is good and I've made friends I would not have met otherwise. My experience is subjective and there are numerous examples when sharing things with others can cause frustration and stress. Sharing spaces or items with others, require a responsible individual or even strict rules, schedules or regulations of usage.

WASTE AS A RESOURCE

- RECOGNIZING THE VALUE OF EACH COMPONENT

Designing for disassembly (DFD) or take apart design, means designing the whole object in such a way that it can easily be disassembled and repaired, refurbished or recycled once the useful life is over. This is done by designing components or products avoiding glues, soldering threads, adhesives, joinery, closures and welding. To mix glass, metals, plastics, paint, shellacs and fillers makes the product almost impossible to separate and recycle.

- Can the product and different components be disassembled? What (tools, technology or chemistry) impacts the disassembly?
- Can the product use fixture (hooks or screws) that can be disassembled?
- Can each component be upcycled, recycled or downcycled at the end of the product life cycle? Does each component have value apart from the whole product?
- Can a consumer disassemble the product?
- Can the product integrate recycled materials and components to drive its market value?

WASTE AS A RESOURCE

- EXPLORING THE POTENTIAL OF MATERIALS

Malmö Upcycling Service (M.U.S.) is a design studio that focuses on exploring the potential of materials leftover from local manufacturers - materials that are often considered garbage. Their main purpose is to question the role as well as emphasize the responsibility of the designer in circular production and sustainable design processes. M.U.S. works mainly with manufacturers from the south region of Sweden, using their waste material to create new products and change the perception of waste to resources.

I was inspired by the cheap and sustainable design processes and how they want to change the perception of waste to resources. I think it is an efficient way to question the local manufacturer's production and responsibility. One problem for M.U.S. can be limited resources of material and that they can't scale up their production. To me, limitations and prohibitions create creativity.



WASTE AS A RESOURCE

- AN ALTERNATIVE GLOBAL RECYCLING SYSTEM

Precious Plastic is a combination of people, machines, platforms and knowledge to create an alternative global recycling system. At a Precious Plastic workshop, plastic gets transformed from waste into valuable raw materials or products. There are five different machines: shredder, extrusion, sheet press, injection and mix.

What inspired me is how they created a business model that considered so many aspects of circular economics. They created a collection points system, where communities can gather points by collecting plastics. The system does not only creates an alternative global recycling system but also helps in strengthening the community.



SECONDARY RESEARCH

- POLITICS AND ART

There is a strong relationship between politics and art throughout history. Arts tells something about their contemporary epoch or event, whether it is a historical war-painting, propaganda poster, graffiti or a design with a strong message. What they have in common is the desire to make controversy and force social and political change.

Superdome - Christoph Büchel

Karl XII:s Likfärd - Gustaf Cederström

Wooden Stools - Ai Weiwei

Cartoon Heads (Berlin wall) - Thierry Noir

War Is Over - John Lennon and Yoko Ono





SECONDARY ANALYSIS

- POLITICS AND ART

With my interest in politics came a huge interest in art and design. I always found arts and aesthetics to be an efficient tool to communicate, as well as provide knowledge and evoke emotions. By creating a strong message or controversy, it possible to create social and political change.

I want to create information design and I want to visualize the problems related to linear economy, overconsumption and plastic waste. I want to create something that easily and understandably acknowledges the contemporary problems related to plastic usage, production and recycling. I want to encourage recycling by spreading the word and making something beautiful yet educational.

When sharing this idea with Anna Persson and Jasjit Singh, Anna Persson said *"it should not become furniture, a candle holder or a vase. Maybe not even a product"*. Anna Persson advised me to look at alumna Jenny Nordberg's one-euro bracelet. It is produced locally (in Malmö), from 80% recycled bronze worth one euro, equivalent to the hourly salary in a Chinese factory.

INFORMATION DESIGN

- €1 BRACELET

I think this bracelet has a strong message and is a great example of information design. Not only is Jenny Nordberg questioning the conditions of Chinese factory workers and linear consumption. She easily and understandably visualizes the problem by simply using a material which value corresponds to the salary of one hour in a Chinese factory. Her bracelet is both beautiful and educational and it gives hope for a change.



CONCEPTS

- DIFFERENT ASPECTS OF RECYCLING PLASTIC

After I had done my research and my analysis, I was considering different aspects of using waste as a resource. To implement this and mediate the vision of zero-waste, I thought about recycling within an existing company or recycling a specific product. But I decided to recycle a problematic material - plastic.

Since I am interested in architecture and housing, I tried out some different concepts concerning that. Climate-smart architecture is constantly looking for controversy and climate-smart solutions and materials, including low impact or recycled materials.

- Concept 1: tools - compost bin, gardening tools, etc.
- Concept 2: exterior design - tables, benches or luminaries, etc.
- Concept 3: exterior architecture - cladding, insulation, outdoor ground plates, etc.
- Concept 4: interior architecture - tiles for walls and floors.

From recycled plastic, I wanted to illustrate how much plastic is wasted in the western world. The first three concepts had the advantages of being more public and visible, which is important from an educational point of view. But exterior architecture and design require more durable materials to be sustainable and not to break. A tile is capable of being both practical, decorative and educational.

SYNTHESIS

- BRIEF AND FUNCTIONAL ANALYSIS

Create a practical, decorative and educational system of modular and versatile HDPE tiles and connections for walls and floors in climate-smart housings.

| | |
|---------------------------------------|----|
| Visualize plastic consumption | MF |
| Create future with zero waste | N |
| Use waste plastic | N |
| Collect plastic in near surroundings | N |
| Consider sustainable manufacturing | N |
| Reuse molds | N |
| Avoid waste | N |
| Avoid binding fixtures | N |
| Ease assembly and disassembly | N |
| Be modular | N |
| Be versatile | N |
| Use left-over material for prototypes | N |
| Provide a list of materials | N |
| Avoid packaging | D |
| Create a narrative | D |
| Change preception of waste | D |
| Be educational | D |
| Provide knowledge | D |

WHY

- ONE TILE, ONE DAY

I strongly believe that recycling materials already in the cycle must be encouraged, to create a sustainable and circular future with zero waste. To mediate this, I want to create a practical, decorative and educational system of modular and versatile HDPE tiles and connections for walls and floors in climate-smart housings.

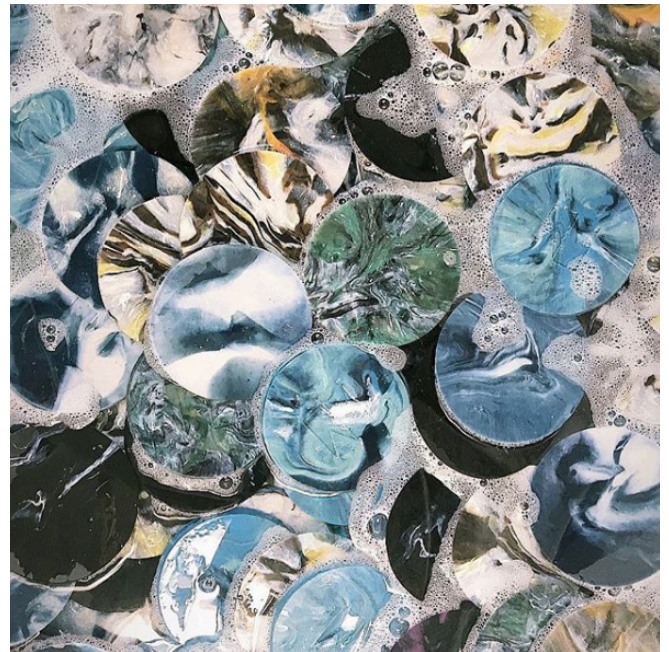
By doing this, I want to visualize our contemporary problems related to plastic usage, production and recycling and change the perception of plastic as a disposable material and minimize the amount of plastic that ends up in the wrong places - to reach the vision of a future with zero-waste.

To avoid packaging I want to engrave all information needed on the tiles. This helps to express my message and create a narrative about material attributes and method of making. Recycled plastic also has a unique history and peculiar aesthetic, which also helps to create a narrative.

Climate-smart architecture and urban design is the relationship between buildings and climate issues. That includes self-sufficiency to minimize energy use for transport, such as ecological food production, including farm-to-table or vertical farming, renewable energy including solar heating, solar electricity and wind power or water and waste recycling.

Today it is difficult to recover materials when renovating or rebuilding. Climate-smart architecture is constantly looking for controversy and climate-smart solutions and materials, including low impact or recycled materials. To implement this and mediate the vision of zero-waste, I want to use waste as a resource, avoiding waste in the production, as well as enable material recovery (once end of life) by avoiding binding fixtures. The modular and versatile system of tiles and connection can be easily assembled on both floors and walls, to adapt to different environments and spaces, as well as easily disassembled to be rearranged in different patterns.

Climate smart-housing and neighborhoods are often forefront for new innovations and solutions, so I hope by using their shared spaces like stairwells or terraces as my intended environment, can bring attention and publication to my project. I hope to evoke emotions and provide knowledge and eventually spread the message and encourage more people to recycle - so that the recycling network can become strong and self-reinforcing.



The pictures are of coasters made from recycled LDPE by the company Weez and Merl. This is what recycle plastic can look like:

WHAT

- ONE TILE, ONE DAY

In a climate-smart housing, there would probably be less plastic to recycle. But plastic is a common commodity, the average person living in the western world consumes 100 kg of plastic each year, mostly in the form of packaging. I chose to recycle HDPE because it is a cheap and durable material and a common plastic for disposable products like shampoo or household cleaner bottles. Disposable products have no secondary purpose and there is no easy way to recycle HDPE today. Here is a list of different plastics used for packaging and products:



PET: soft drink and water bottles, oil bottles and mouthwash bottles.



HDPE: shampoo bottles, household bottles and grocery bags.



PVC: wire/cable insulation, pipes or fittings, window frames and toys.



LDPE: frozen food bags and squeezable bottles.



PP: bottle caps, straws, dishware, medicine bottles and packing tape.



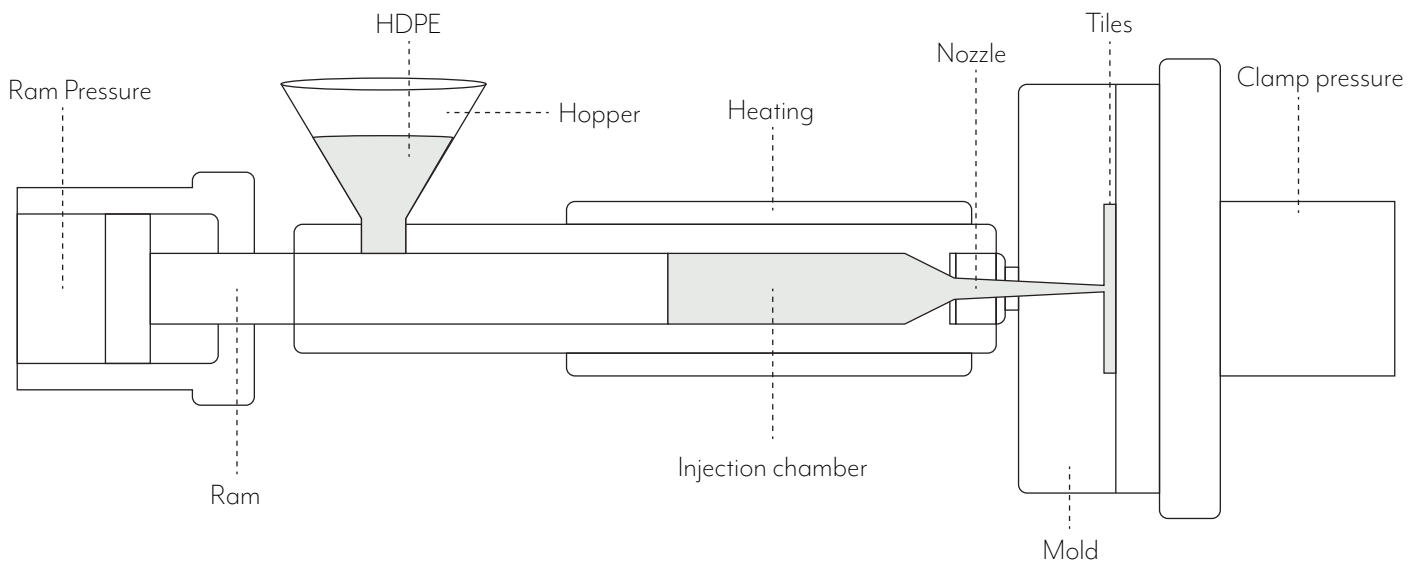
PS: disposable plates and cutlery, CD or video cases and trays.

HOW

- ONE TILE, ONE DAY

I want to send a message about how huge the consumption of plastic is and about the importance of recycling this material. To make the message credible, the tiles must be produced by collecting and recycling plastic sustainably and circularly. I want the system of tiles and connections to mediate the vision of zero-waste, by using waste as a resource and by a waste-avoiding production method, as well as enable material recovery (once end of life) by avoiding binding fixtures.

Therefore, I wanted to make a tool (mold) and injection mold my tiles. HDPE is a thermoplastic polymer that softens when heated and hardens when cooled, so a perfect plastic for injection molding. Injection molding creates very little waste and is an efficient way to mass-produce plastic products. To press sheets would require post-production (cutting, milling and drilling) which creates waste.



WHY CARE

- ONE TILE, ONE DAY

Today, most plastics are made from fossil fuels and that becomes a problem when used for disposable products. It is possible to recycle plastics, but it is cheaper to extract new materials than to recycle and remanufacture. Another problem with not recycling plastics, is that 8 million tons of plastic are released into the ocean every year. When I think of plastic in the oceans, I picture a floating plastic island. In fact, it is much more like a plastic broth with micro-plastics from laundry (fleece or nylon). When plastics end up in nature or oceans, it contributes to climate change and affects the environment and ecosystems.



EVALUATION

- COVID 19

Due to the ongoing pandemic Covid-19, it has been hard to conduct my bachelor's thesis in the way I intended. With a plastic recycling-oriented project, I planned to spend time in the M-house and use the knowledge I received in the production course - MMTF01. During a voluntary lab, we used these machines to practice shred, press, extrude and injection mold plastic. When the facilities open, I would like to manufacture these tiles, to test the material and connections and make improvements.

With social distancing and closed facilities, it has also been difficult to collect HDPE. As an experiment, I collected toiletries and household cleaning bottles at home. I removed stickers and leftover content and shredded the HDPE with a scissor before I melted it in the oven at 180c (recommended temperature) for 30 minutes.

This was a good experiment to understand the properties of HDPE, but it was very time consuming to do manually and the plastic solidified before I could do any further experiments.

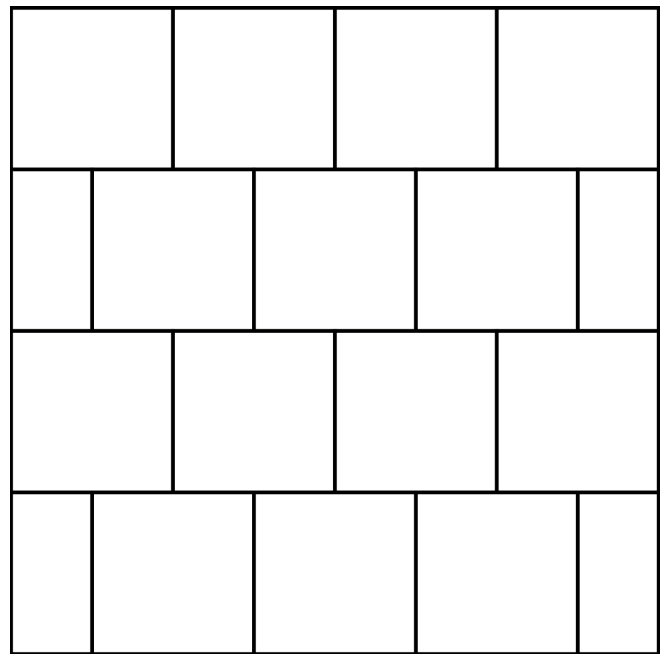
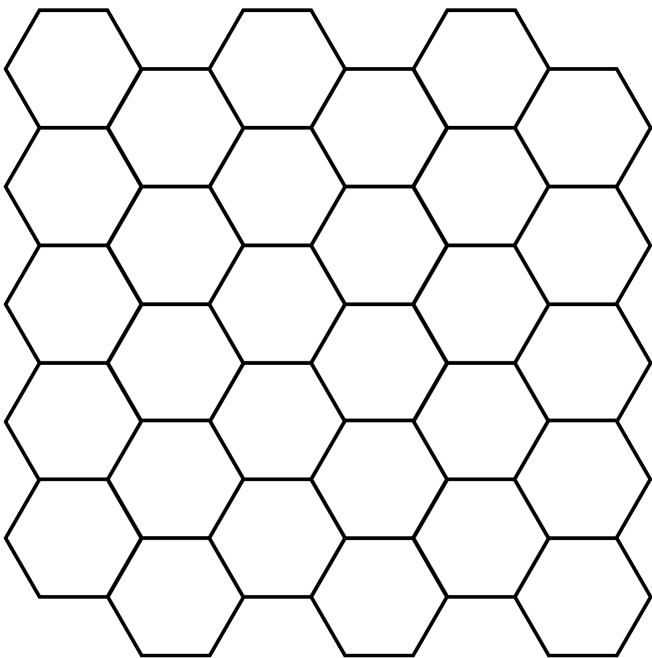


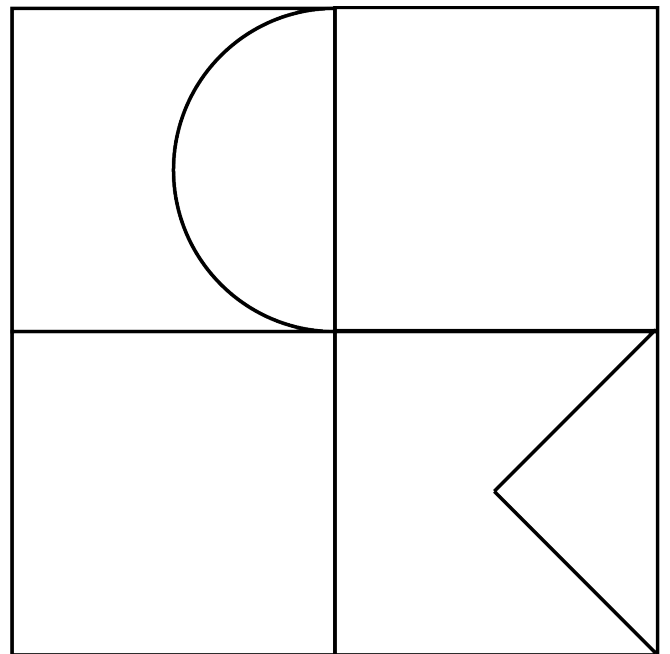
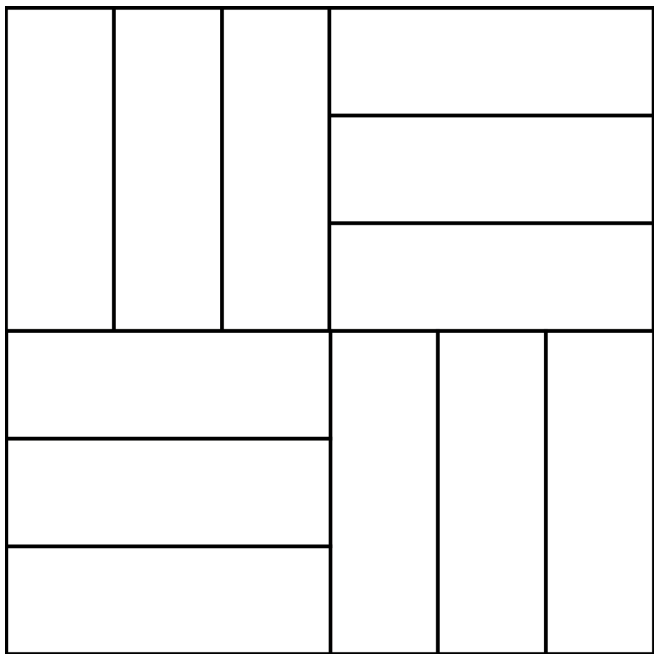
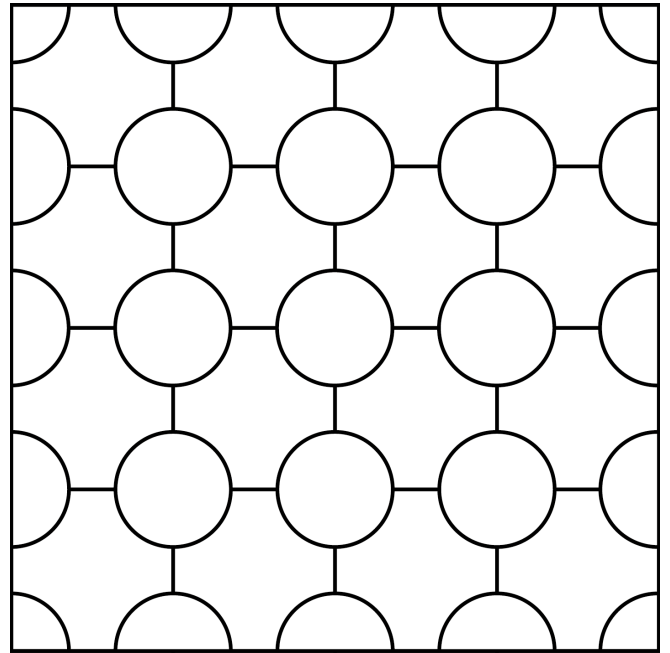
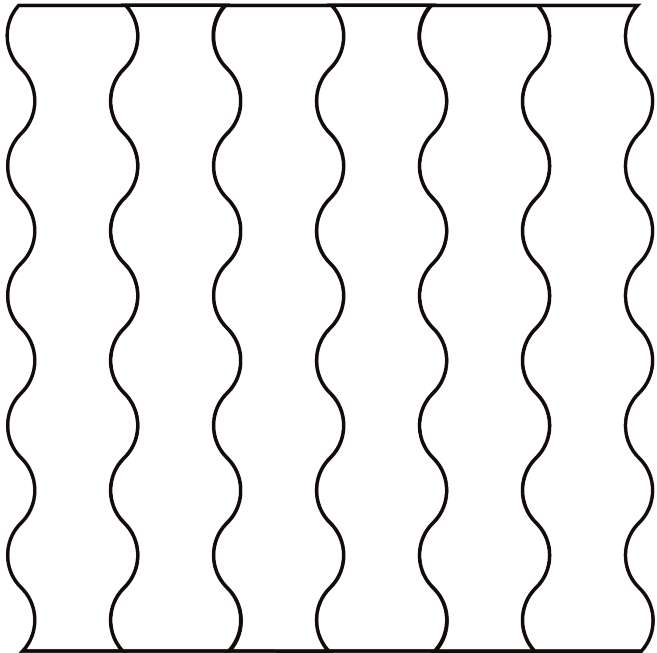


EVALUATION

- DIFFRENT TILES

Diffrent types of tiles and sizes.

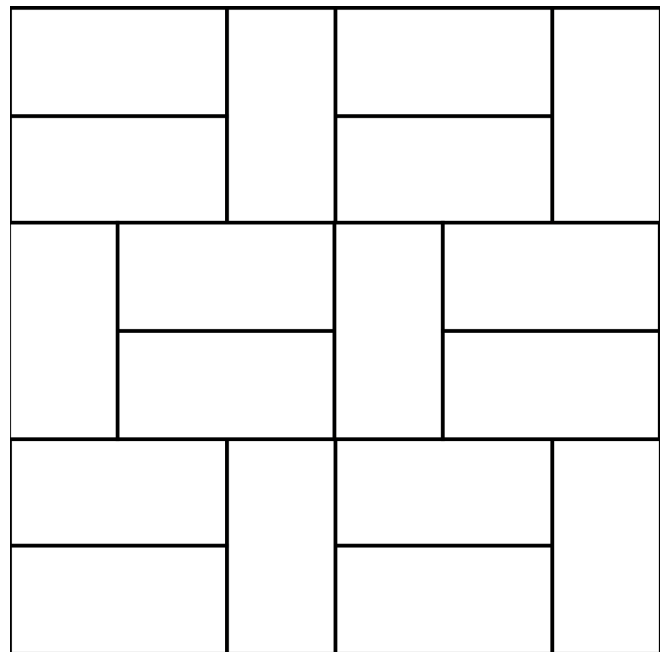
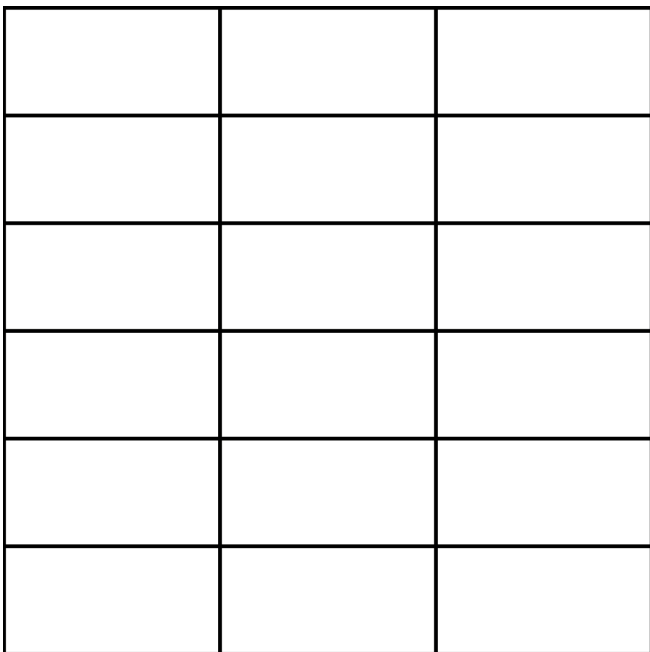


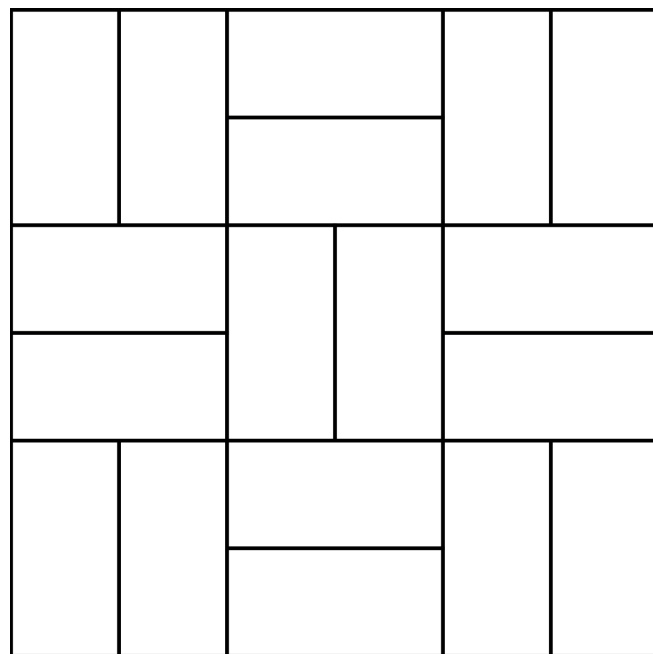
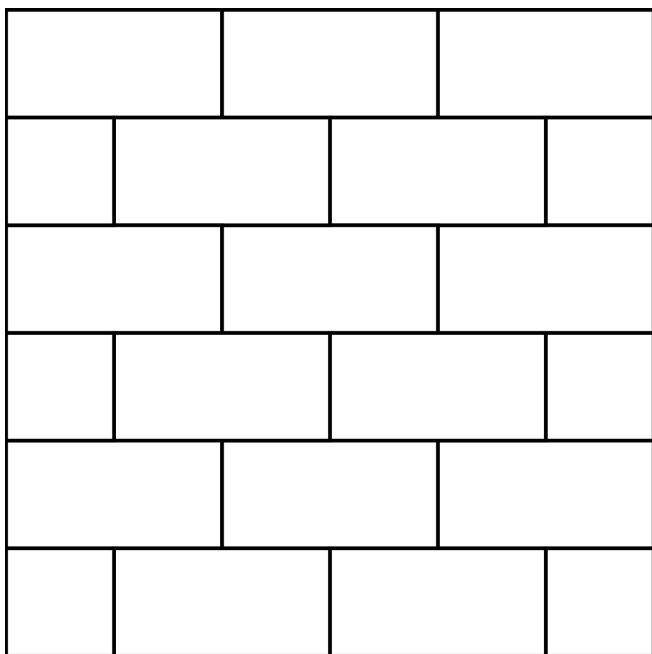
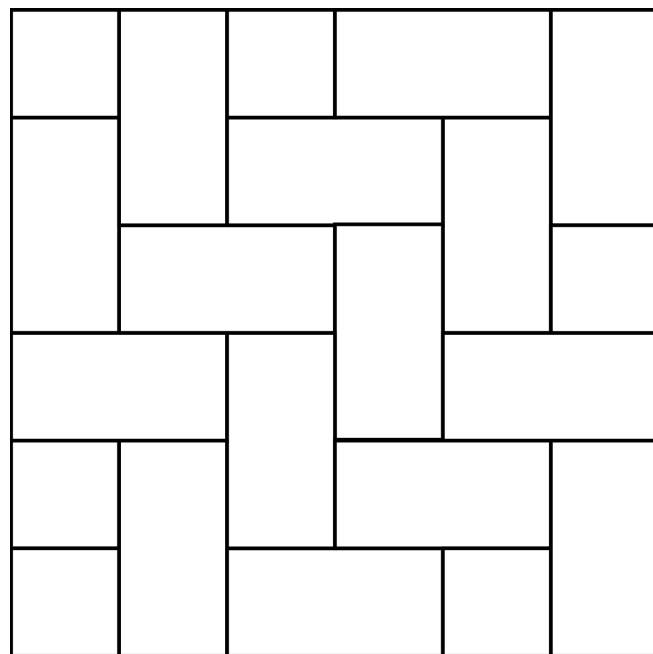
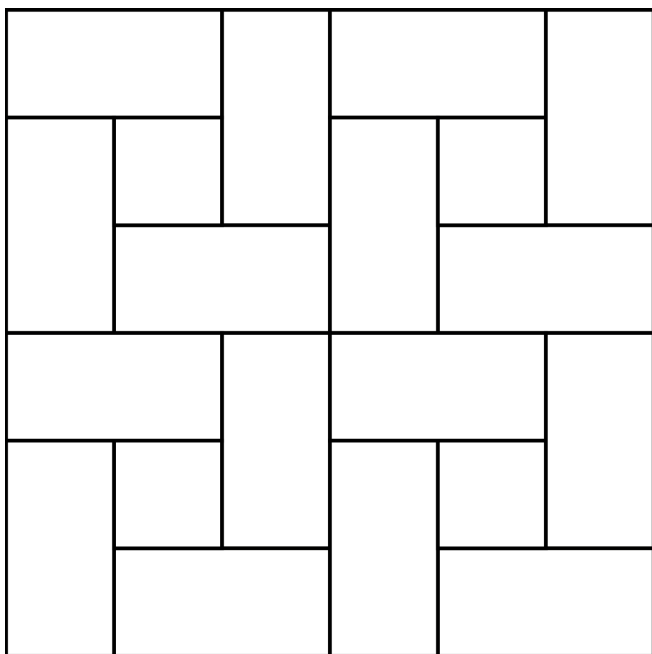


EVALUATION

- MODULAR AND VERSATILE

I wanted a tile that could create many different patterns and be both modular and versatile, therefore the tiles are 1×2 and 1×1 .





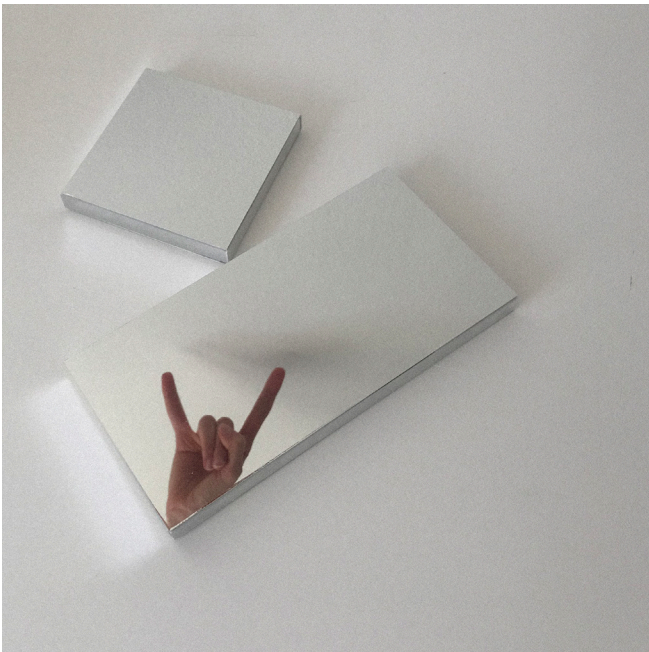
EVALUATION

- MOCKUP

The tile should easily and understandably illustrate the western world's consumption of plastic, where each tile, by its weight, represents one day of plastic consumption by one person. The tiles can be combined in quantity to illustrate days, weeks or years depending on space.

100kg a year is roughly 270g a day and HDPE has a density of 0.97g/cm^3 . Therefore the volume of each tile is 278 cm^3 - $200 \times 100 \times 14\text{ mm}$ and (half a day) $100 \times 100 \times 14\text{ mm}$.

A bigger tile would create left over material if not fitted to the space and a small tile would be demanding to connect.

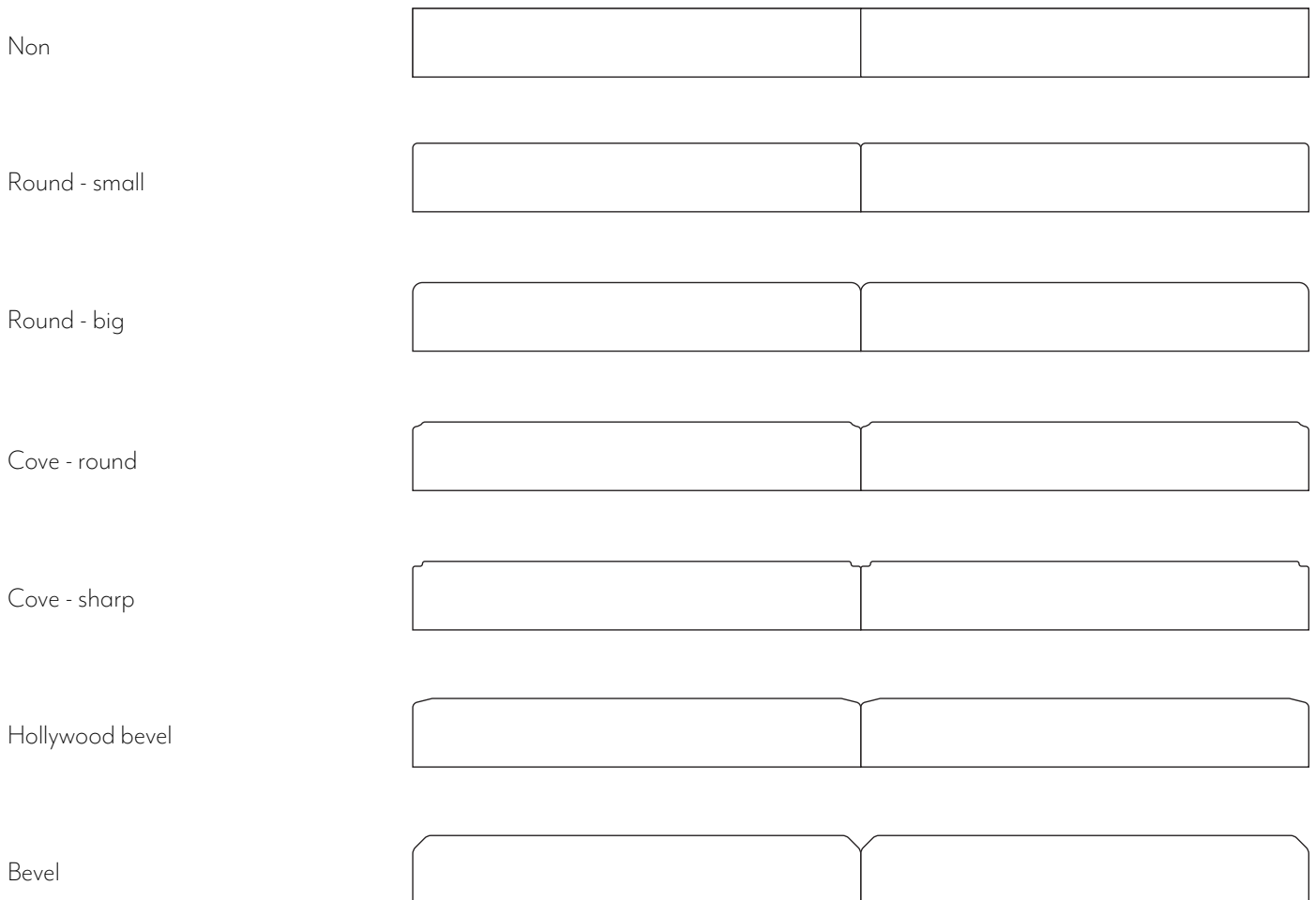


The mockups are made from left-over material I had at home.

EVALUATION

- THE HOLLYWOOD BEVEL

When designing the tile's details and edges, I had to consider draft angles and other restrictions of injection molding once again. I knew I wanted something simple and discrete. I investigated different tiles, edge profiles and how they would look together. By doing this I realized I like Hollywood bevel the most.



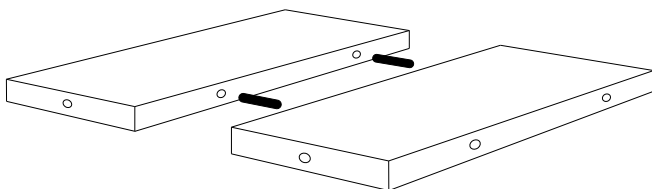
EVALUATION

- CONNECTIONS THAT ENABLE MODULARITY

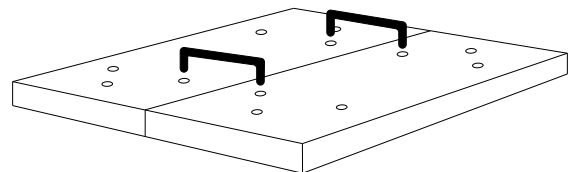
Due to sustainable manufacturing and waste avoidance, I chose injection molding as my method of use. When designing the tile's details and connections I had to consider these requirements too. It was important to ease assembly and disassembly and to avoid binding fixtures to help elongate the lifetime of the tiles.

The first connections are difficult to injection mold, they require a mold with several pieces or postproduction (milling or drilling) which creates waste. It would also be difficult to connect the tiles, as the connection can't make all patterns if all fixtures are used.

The second connections are easier to injection mold, they require a two-part mold that can be reused several times. The connections would avoid waste and post-production, as well as enable more patterns that are easier to assemble and disassemble.



1



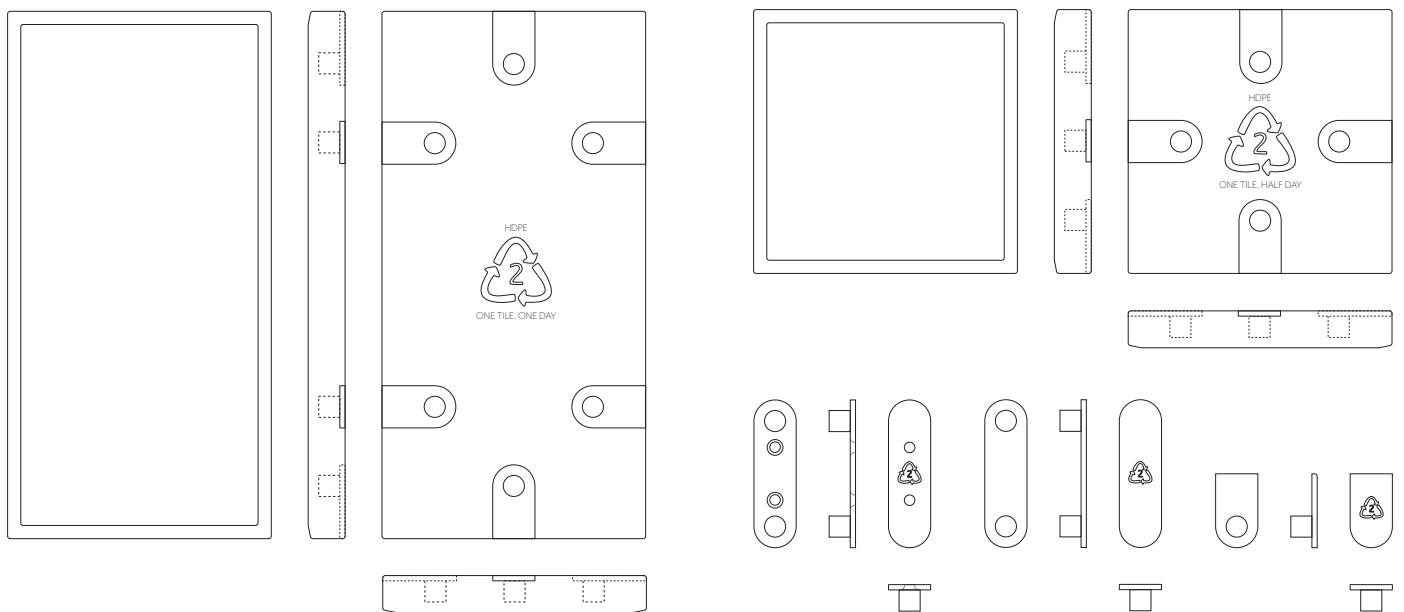
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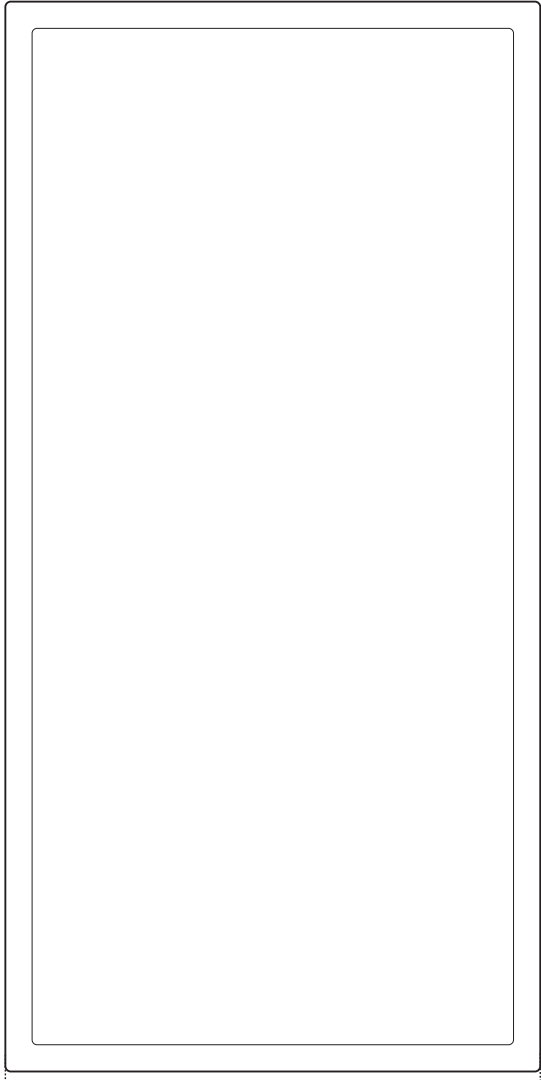
EVALUATION

- CONNECTIONS THAT ENABLE VERSATILITY

Refinements of the second connections were made so that tiles could be more versatile and placed vertically. By putting holes for two screws onto the connection, it is possible to place the tiles on to the wall.

By matching the connections and holes, I want to create a visual mapping and restrictions. Good affordance will hopefully allow assembly and disassembly without any description.

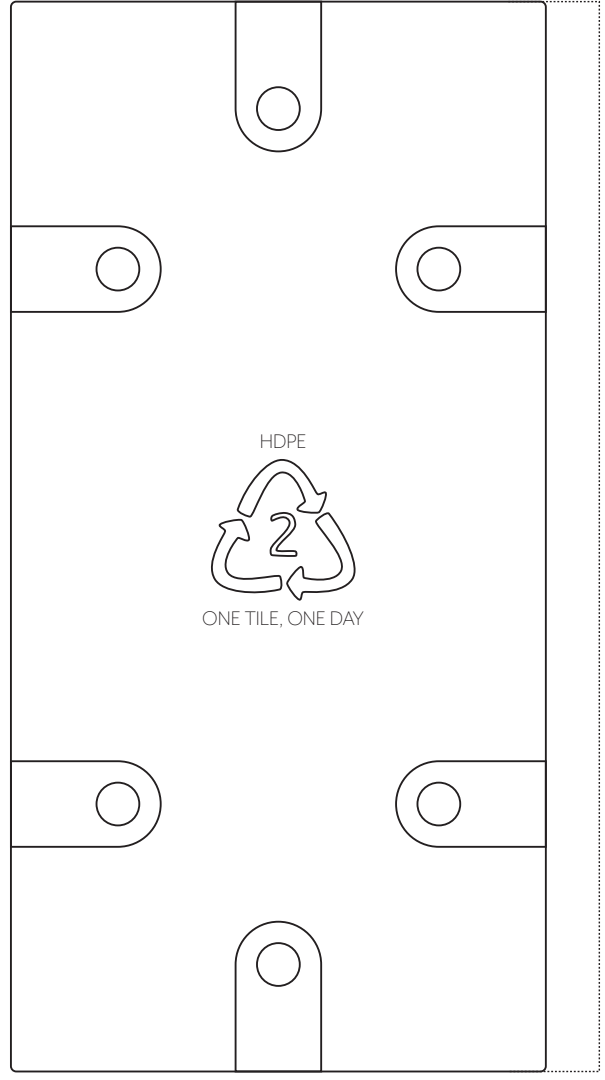




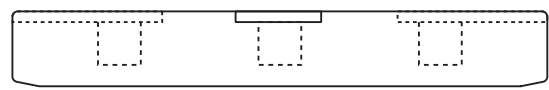
100mm

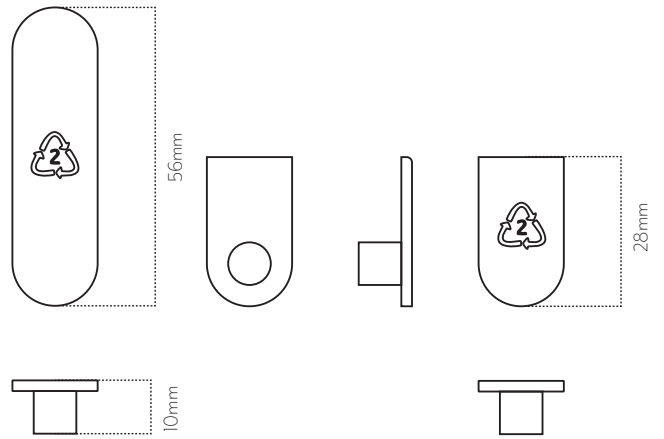
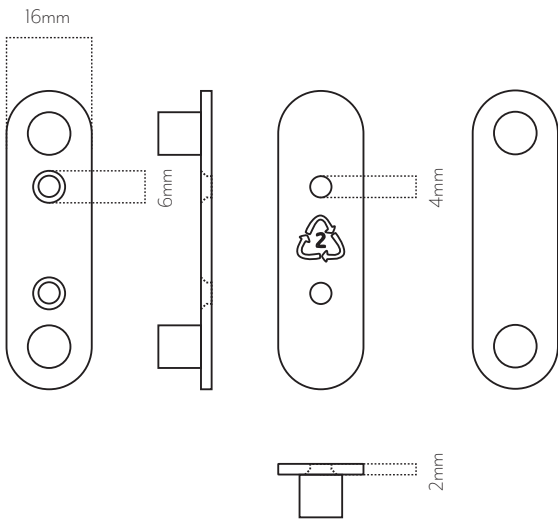
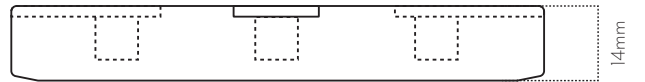
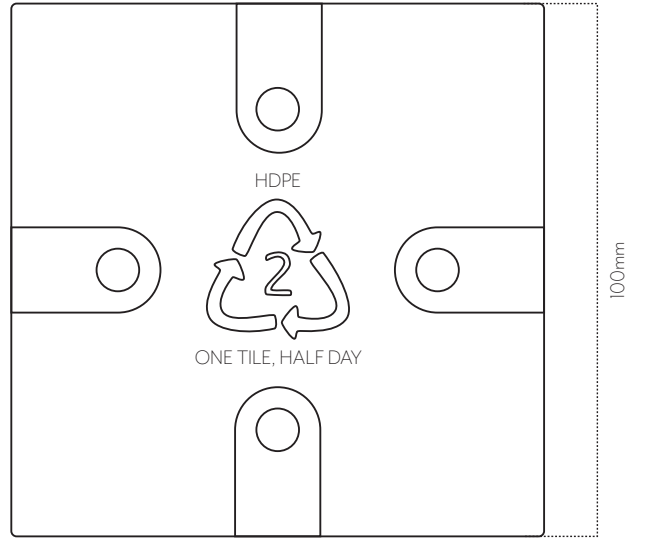
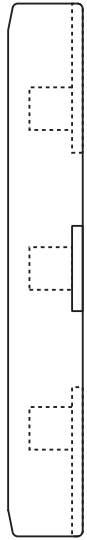
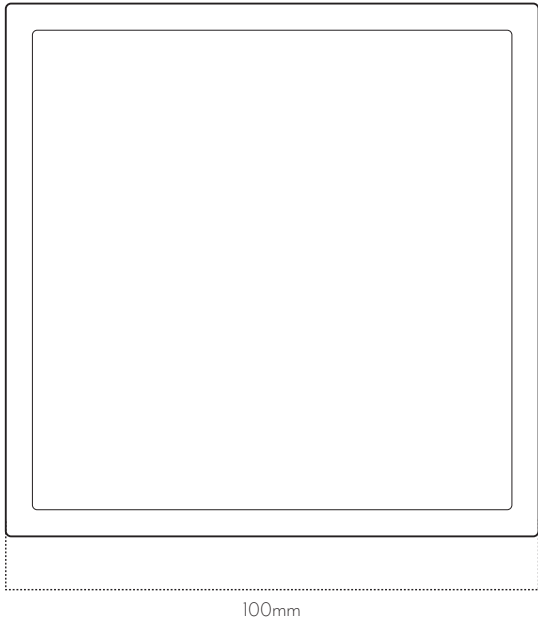


14mm



200mm





REALISATION AND RESULT

- ONE TILE, ONE DAY

Environment:

Climate smart-housing.

Basic function:

Visualize plastic consumption.

Product description:

You create 270 grams of plastic waste every day, the same weight as one of these tiles made of recycled HDPE.

Product value:

It is a practical, decorative and educational product system, that will hopefully change the perception of plastic as a disposable material, encourage to recycle and minimize the amount of plastics that end up in the wrong places – to come a bit closer to a future with zero-waste.

Product system:

- 1 day tile: 200 x 100 x 14 mm, hollywood bevel: 1/5 mm
- 1/2 day tile: 100 x 100 x 14 mm, hollywood bevel: 1/5 mm
- Additional tile with text "ONE DAY, ONE TILE": 200 x 100 x 14 mm, hollywood bevel: 1/5 mm
- Connecting plug with holes, for vertical use: 56 x 16 x 10 mm, holes: 4 mm
- Connecting plug: 56 x 16 x 10 mm
- Stabilizing plug: 28 x 16 x 10 mm

Design, material and method:

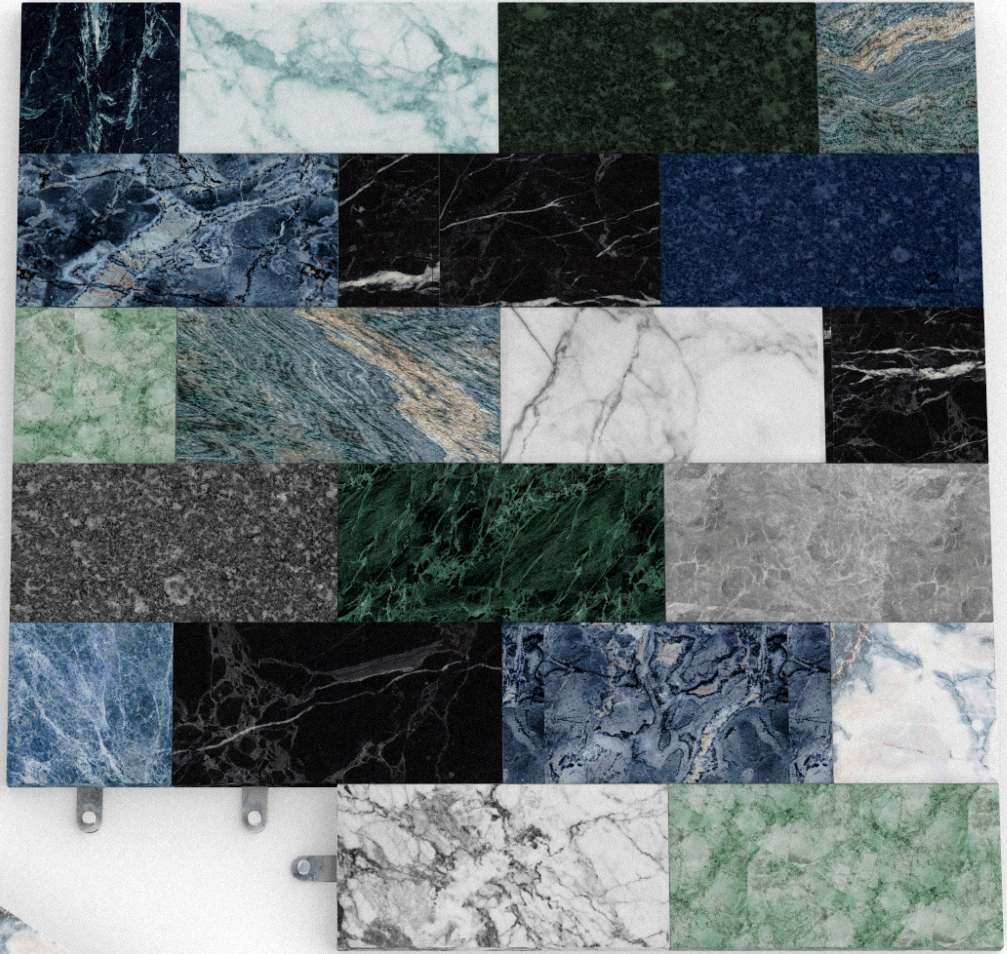
The modular and versatile system of tiles and connections offer various pattern combinations for vertical and horizontal use. It is made from recycled HDPE plastic and mediates the vision of zero-waste, by using waste as a resource and by a waste avoiding production method, as well as enable material recovery (once end of life) by avoiding binding fixtures.

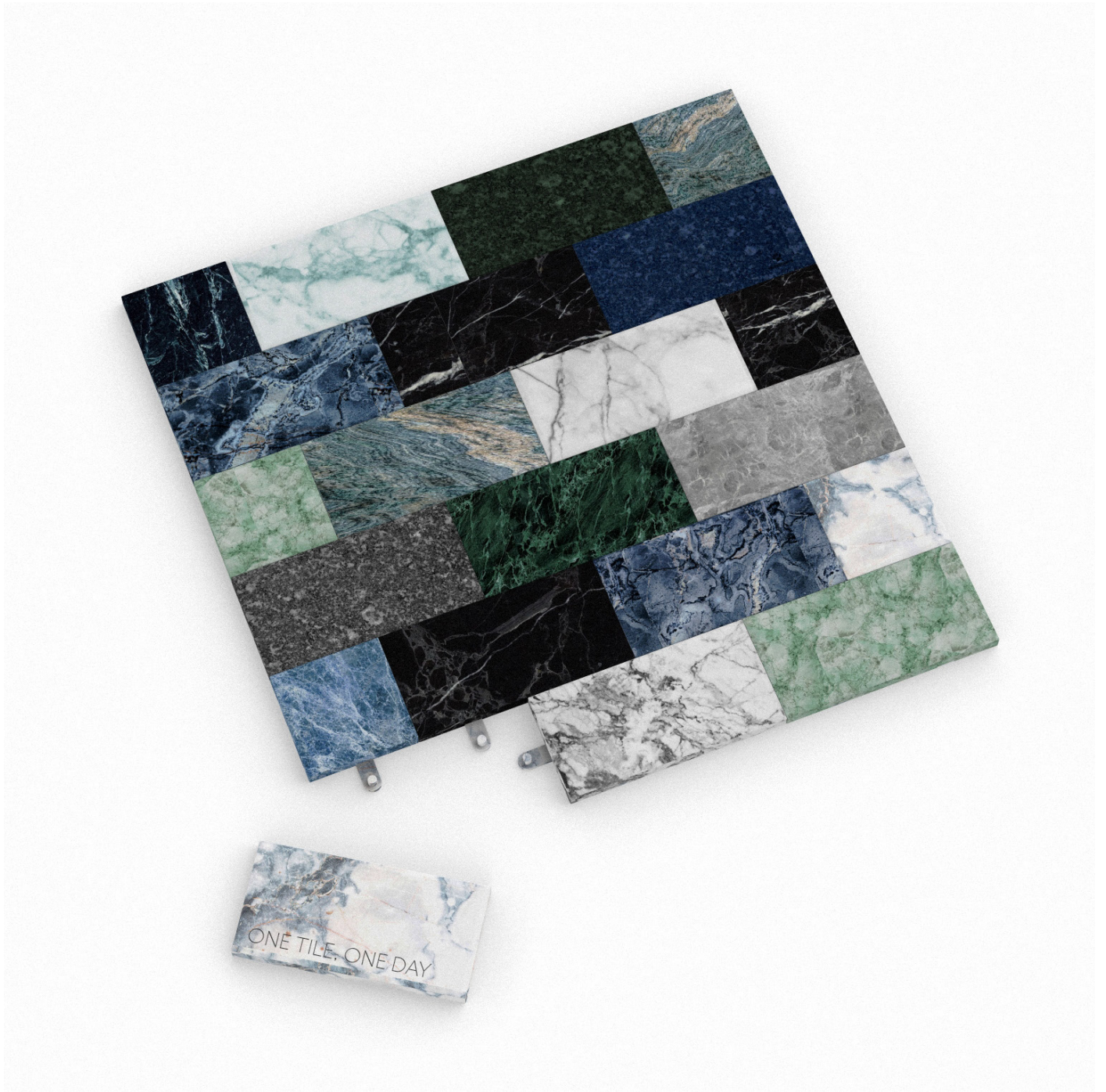


REALISATION AND RESULT

- RENDER









CONCLUSIONS

-

I have not been able to make real tiles and connections, due to covid-19. Otherwise, it would have been good to test how many connections need to be screwed onto the wall to carry the load. It would also have been good to test what parts need to be reinforced and test the affordance with a user test.

The system of plastic tiles and connections won't change the world, I strongly believe politicians should set up frameworks and regulations so that a circular economy is favored. Yet, I still believe my project can change the perception of plastic as a disposable material, encourage to recycle and minimize the amount of plastics that ends up in the wrong places – to come a bit closer to a future with zero-waste.

THANKS

—

I would like to thank my supervisors Claus-Christian Eckhardt, Anna Persson, Jasjit Singh and Charlotte Sjødell, who provided guidance and support throughout the course and the pandemic.

SOURCE

Webb

<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
<https://www.marxists.org/archive/marx/works/1859/critique-pol-economy/appxl.htm>
<https://www.neatorama.com/2007/08/15/worlds-most-unwanted-garbage-cargo-of-the-khian-sea/>
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<https://preciousplastic.com>

Pictures

<http://jennynordberg.se/el-bracelet-2013/>
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<https://www.pinterest.at/pin/660410732843624113/>
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<https://www.malmoupcyclingservice.com/Mental-Furniture>
<https://preciousplastic.com/solutions/machines/overview.html>
<https://www.instagram.com/liveberg/>
<https://www.instagram.com/weezandmerl/>

Radio

<https://sverigesradio.se/avsnitt/1391095>
<https://sverigesradio.se/avsnitt/1371105>
<https://sverigesradio.se/avsnitt/1391095>

Movie

<https://www.imdb.com/title/tt1825163/>

