The future of production is *hyperlocal* and *open source*

Kristoffer Steen Langvik
Diploma Project

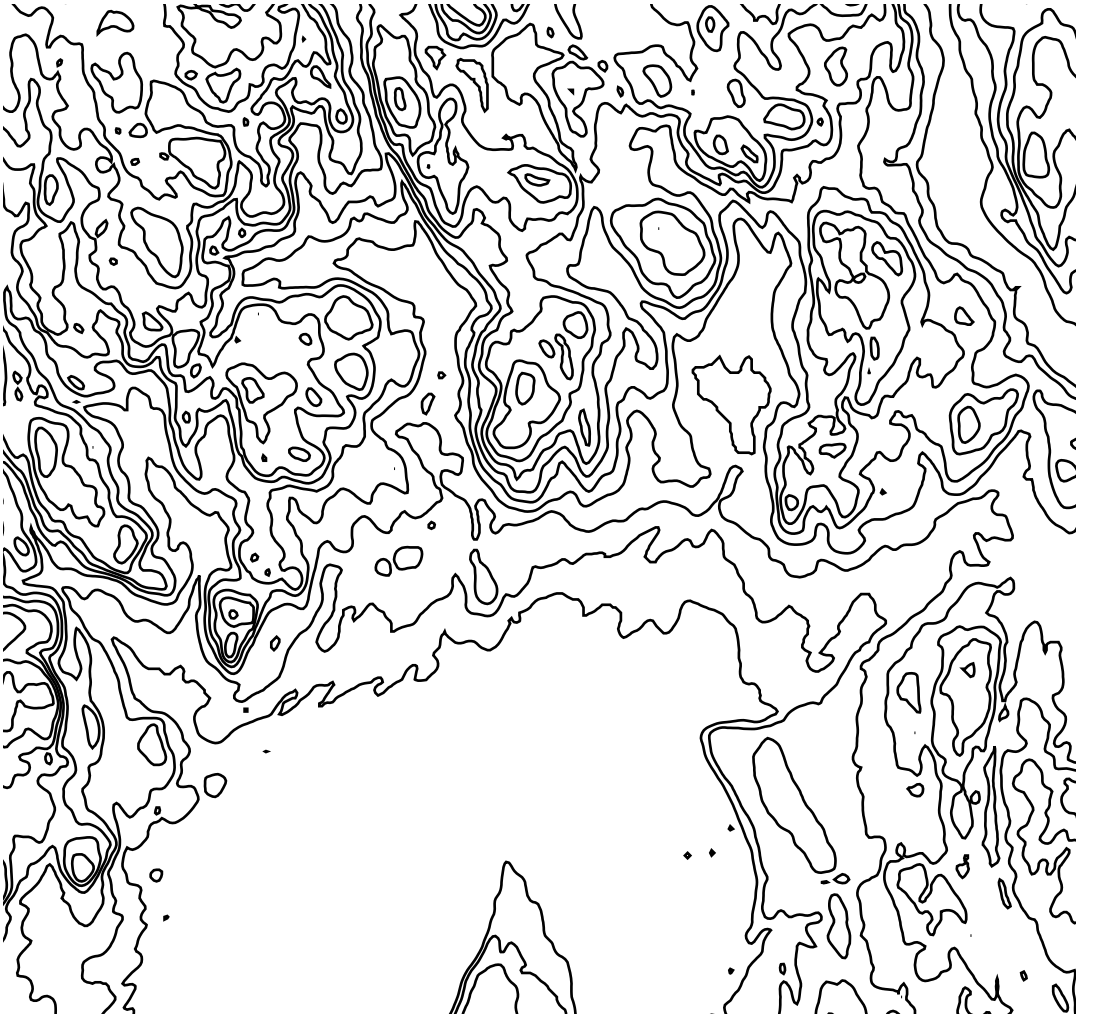

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Photo by Matt Palmer on Unsplash

Abstract

Every year, we see an increased number of disasters caused by human-induced climate change. The consequences of climate change, such as rising global surface temperatures, rising ocean temperatures, melting glacial masses, and rising sea levels, will continue to cause high-impact events. These cataclysmic events, such as heatwaves, coldwaves, fires, droughts, flooding, marine heatwaves, tropical cyclones, and coastal erosion, ultimately harm the people and communities least prepared to overcome these challenges.

Profit is at the core of production today. We see that businesses and leading industries are driven by expanding profits while minimizing labor costs. They export pollution and maximize production, while advertising for products we don't really need. Moreover, they manufacture products with materials, and resources extracted in exploitative ways, with both social and environmental consequences.

We can mitigate some of these issues by facilitating better local production, dispersing industries into smaller, local businesses, sourcing materials locally, and selling products locally. By producing products locally, made from sustainably sourced local materials, we can maintain a better dialogue between consumer and producer. We can produce products on a smaller scale, allowing us to create better and more durable products, while simultaneously decreasing the total amount of products being produced. This reduces unnecessary transport and resource use.

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Motivation

The news and social media is overflowing with images of protesters, increasingly more infuriated, protesting in radical ways. Driven by their frustration with how the world and those leading it continue to neglect the dangers and consequences of our environmental impact on the planet. Loss of hope and despair for how the lives of our children and their kids may look like.

Climate change is not a future problem. It is a now-problem, and we're no longer talking about eliminating these problems, but mitigating them.

At the core of these issues lies the way in which we consume, produce and dispose of. We need to turn our focus away from individual responsibility, to the root of the manufacturing process and the systems these processes operate within.

As an industrial designer, I believe it is my duty to create change in an industry that is driven by consumption and overconsumption. This is important for my own generation and future ones. I strive to educate myself and inspire others to do the same, with the goal of driving progress towards a more resilient future where we do not exploit others or the planet.

Photo by Jay Wennington

My goal

The goal of this project is to demonstrate the potential of using locally sourced materials in the production of new products. I hope to inspire and motivate entrepreneurs to seek out novel materials or consider existing materials in radically different ways.

Additionally, I aim to encourage these actors to share their knowledge and information about these methods of production, material sourcing and product development openly, so that others may replicate, learn from, and build upon them.

Overview of Project

The project revolves around three main pillars: ***production***, ***materials*** and ***knowledge.***

Throughout this diploma, I have been studying materials and ways to source them locally, considering factors that make certain materials suitable for sustainable local production. I have also been exploring the concept of hyperlocal production, a term I will be explaining further. Additionally, I have been examining the knowledge surrounding these pillars and how we can share it openly and freely on the basis of what I describe as an open-source mentality.

Production

Factory collapse in Bangladesh, The New York Times 2013 [1]

Production Today

The current state of product manufacturing is heavily influenced by the profits it generates. As a result, we tend to use materials that are cheap, easy to acquire, and require little maintenance.

Most products are designed, produced, and sold with the goal of generating profit for the manufacturer. Once the product leaves the manufacturer's hands, responsibility for it shifts to the consumer. This is true for most product categories, although there are exceptions. However, when considering climate change, this approach is fundamentally flawed. We currently assume that we can continue to extract new materials indefinitely and increase the amount of products we manufacture and consume without consequences. However, research shows this is not the case. If we continue to extract materials and mass produce at the current rate, we will reach climate tipping points much sooner than we realize.

There are numerous examples of businesses operating in ways that have had devastating effects on nature, workers, and their communities. These practices often lack transparency and oversight, and prioritize profit over the well-being of workers. A notable example is the deadly factory collapse in Bangladesh in 2013, which resulted in the deaths of 1127 people. This tragedy highlights the need for businesses to prioritize the welfare of workers and the environment, rather than solely focusing on profit.[1]

Production Tomorrow

Local production

Local production is a strategy of production which focuses on benefiting and sustaining local communities, while providing new jobs for those living in that community and preserving the quality of the environment.[2]

Why is local production better?

Local production of goods has the potential to mitigate some of the environmental challenges we face. It is a more sustainable approach, both environmentally and socially.

By producing goods locally, using sustainably sourced materials, we can foster closer relationships between consumers and producers. This allows us to make products on a smaller scale, resulting in higher-quality, more durable goods, while reducing resource use and unnecessary transportation. Local production also promotes transparency, making it easier to monitor working conditions and manufacturing practices.

Additionally, local production enables us to tell a more intimate story about the products and the manufacturing process, fostering stronger attachment to the goods among consumers. This encourages people to take care of and repair their products, prolonging their use. Local production can also create more resilient communities by building networks of solidarity and collaboration between material sourcing, production, and consumption. This allows communities to produce better goods while supporting themselves economically and environmentally.

To summarize, my findings are:

When consumers buy locally made products, it is much easier to create a dialogue between the consumer and the producer.

When these products are created locally, and the dialogue between them is stronger, the producer will be more inclined to manufacture durable, long-lasting products, and facilitate a greater service which includes repair and recycling of those products. To maintain sustainable customer relations.

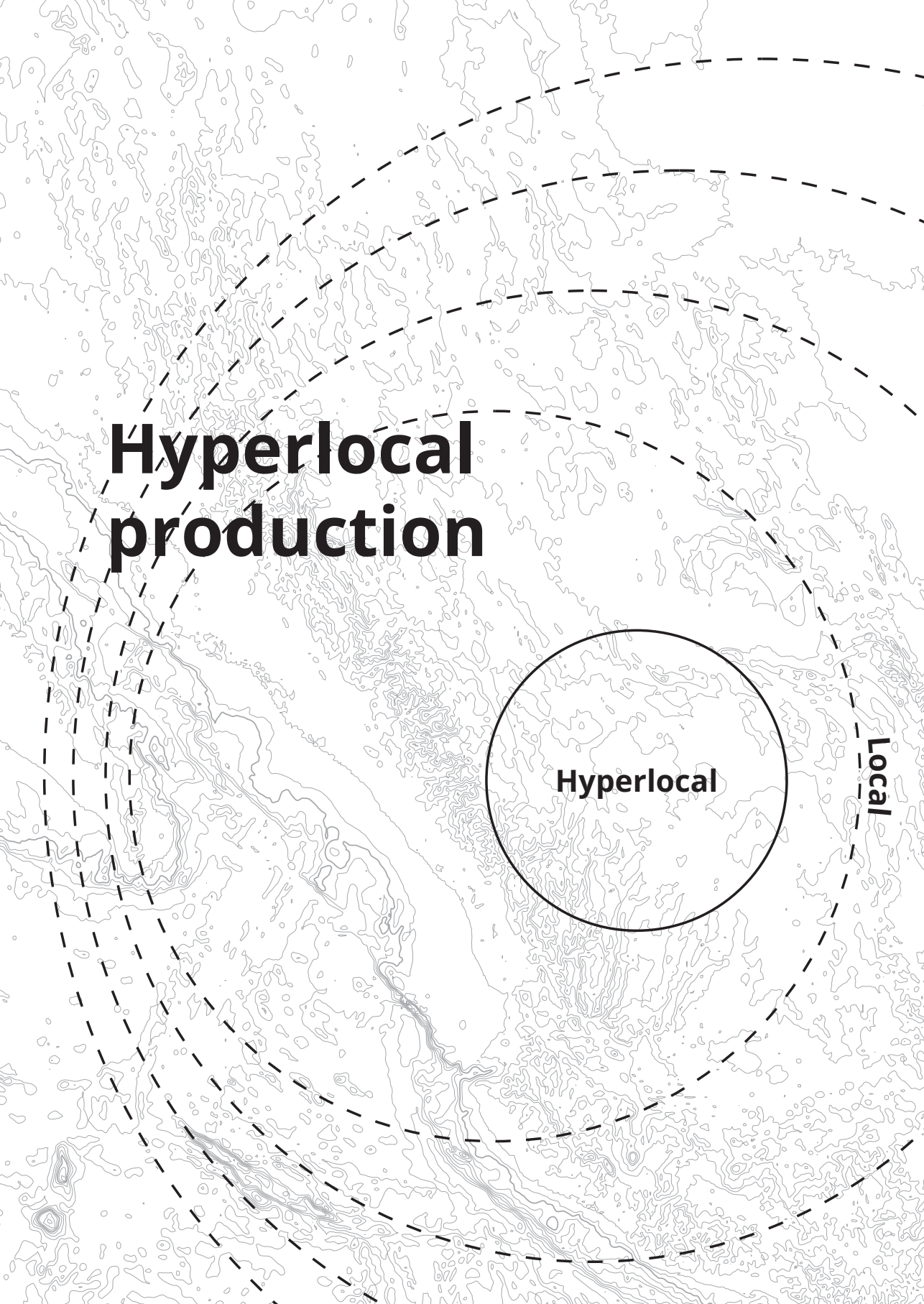
Local production creates better circumstances for transparent business practices, including oversight of working conditions etc.

Locally manufactured products and local consumers means less transport, which in turn means less polluting resource use.

Shorter distances, less transport and local materials, means more resilient supply chains.

Quality control is easier to maintain at a high level when the responsibility of creating good and durable products are required and appreciated by the consumers.

Hyperlocal production




Global
National
Regional

Where is hyperlocal?

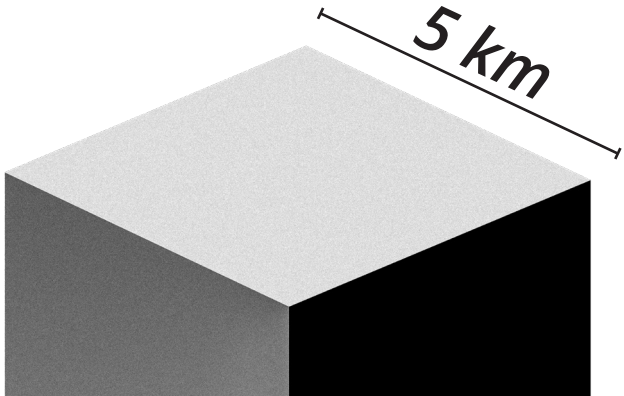
I have now described the concept of local production, but going further on in this project, I will talk more about the potential of hyperlocal production. This is a term I've decided to use, as a way of focusing on a very specific area. Initially I thought of this as a small community, a neighborhood, a household or even an individual. However, I soon came to realize that this needed to be defined in detail in order to reflect on the potential within an area.

Therefore, what does it mean to design, source and produce something hyperlocally?

Hyperlocal is, according to Merriam-Webster, defined as; *limited to a very small geographical area.*

I will allow myself to add that to design, source, and produce products hyperlocally means to limit the geographical area of focus to a very small region. This approach involves considering materials that can be easily accessed by walking from one point in the manufacturing process to the next. It means to look at materials found in close proximity and use them in the sourcing, processing, and final manufacturing stage of a product.

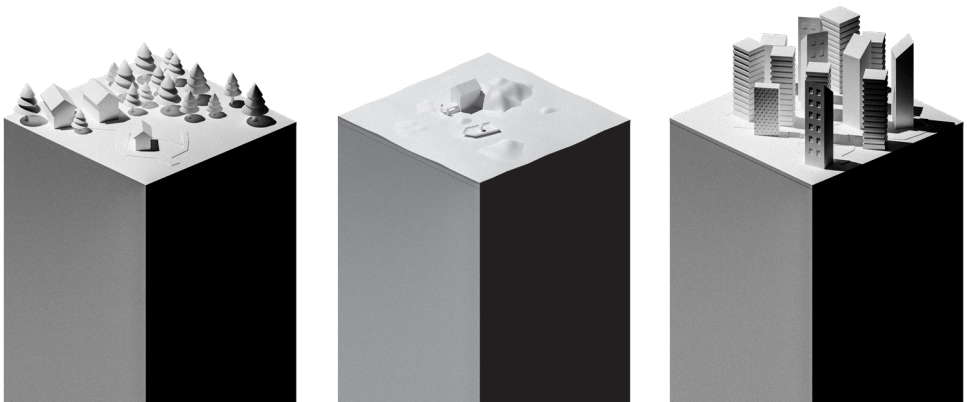
The concept of hyperlocal production is a radical approach to looking at location, a view that narrows the area of focus to an almost extreme extent. To do so even further, I've decided to limit myself to an area of 5 km in radius.



Three potential hyperlocal areas

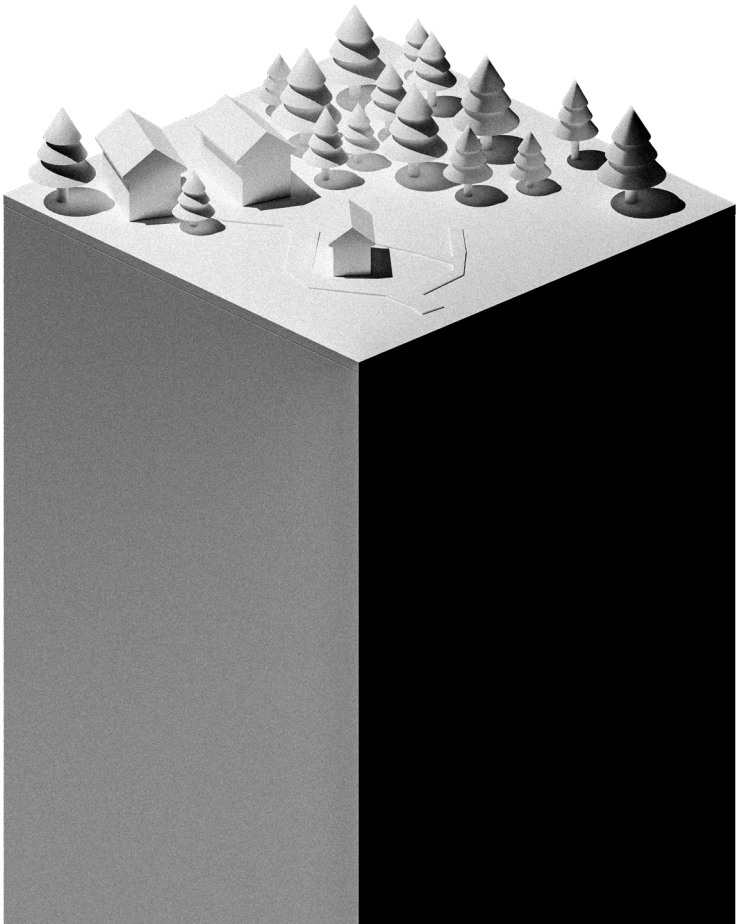
In this case, I have decided to look at three different potential locations that can be considered hyperlocal, and use these locations as cases for what and where materials could be sourced.

A *forest and farm area*, a *sea and coastal area*, and an *urban area*.



Forest and farm area

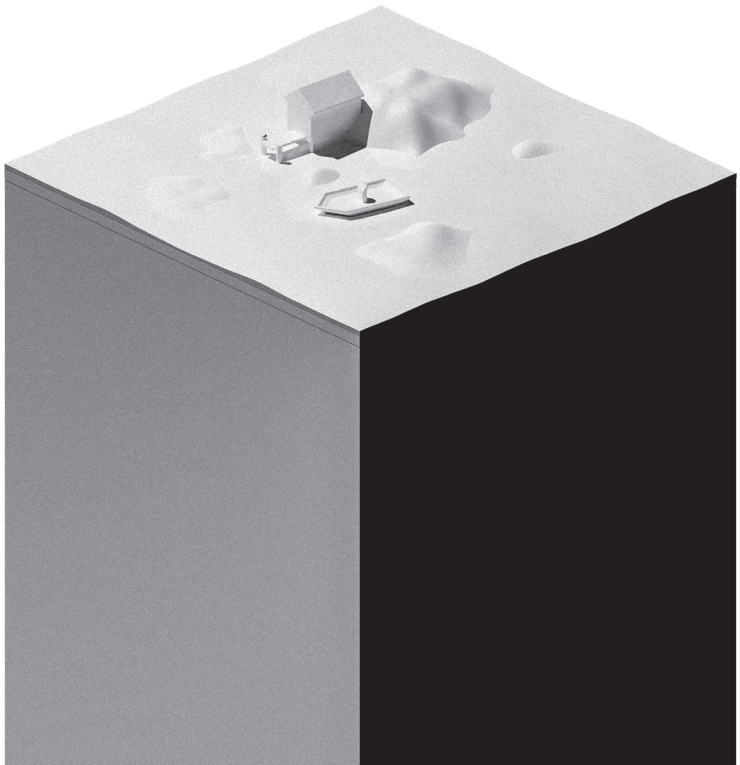
The materials found in forest and farm areas are generally that of more natural, and organic origin. We can look back in time to see what has historically been used to create products in these areas. In Norway, we have historically been benefiting from fibers found in these forests, such as grass, linen, birchbark and other materials suitable for the methods of production available throughout times before and after the industrial revolution.



Sea and coastal area

In sea and coastal areas, it is possible to find natural materials sourced from the ocean itself, as well as human-made waste such as lost fishing gear, land-based plastic waste, or sea-based plastic waste.

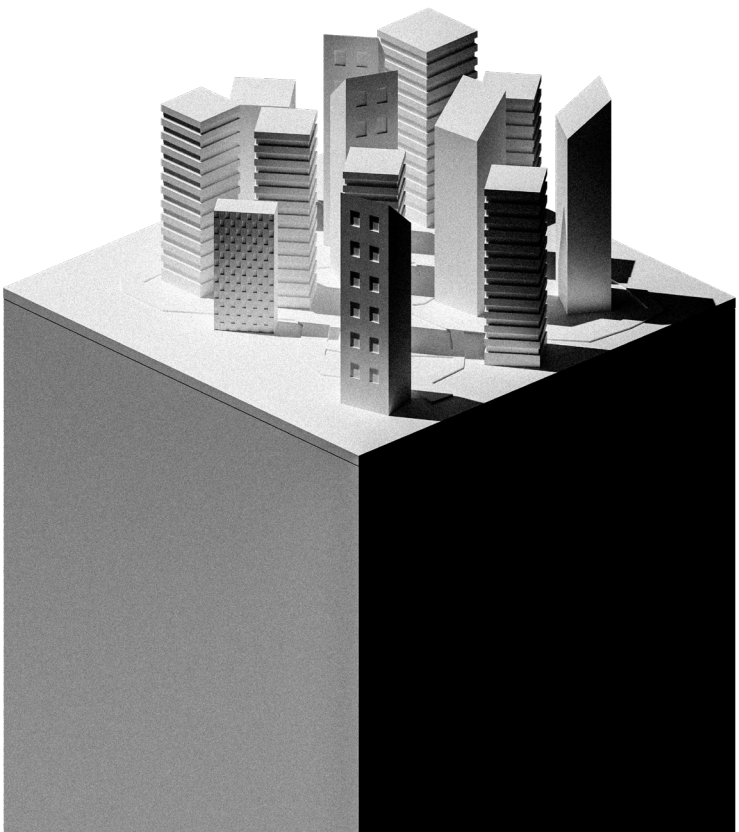
Norwegian Trash is a new business in Oslo that uses ocean plastics to create new products. The company uses 100% recycled plastics, which helps to demonstrate the potential of these materials. In addition, Norwegian Trash educates people about plastic use and manufacturing processes, and the steps required to utilize ocean plastics in manufacturing.[3]



Urban area

In urban areas, such as in Oslo, or other cities, it is more difficult to find naturally growing materials, but much easier, however, to find materials in the form of human-made waste. Organic waste in the form of food waste or weeds.

One such example of this is *Gruten, a* non-profit organization based in Oslo, with the goal of upcycling leftover coffee-waste (Oslo's black gold). They manufacture products such as soaps, with the additional purpose of educating others about the potential of the coffee-waste.[4]



After briefly looking at these three potential areas for hyperlocal material sourcing, I have gathered some insights to summarize my findings.

Most materials require a level of processing, that means that some materials need to be processed with tools, machines or chemical processes in order to be utilized in further production of products.

The tools and expertise required to operate these processes can be varied, and some are expensive, and some are highly complex. However, we can look back in history and be inspired or learn from the manufacturing processes utilized before the industrial revolution, and some of these methods may even be better for a community, in terms of sustainability for the environment as well as social sustainability.

Materials

Materials today

As the production methods that exist today are hugely driven by its potential of generating profits, so are the materials which are part of that production. They are more often than not chosen for their ability to keep profit margins as high as possible, which in turn means to be as cheap as possible, in terms of both material and labor cost. These materials may therefore be cheap, but it often comes at a great cost.

These materials are often extracted in highly exploitative ways, which leads to loss of human and animal life.

A huge number of products today are also made from materials that do damage long after its life as a usable product is over. They might get lost at sea, or thrown out in nature. Even in the case of proper disposal, some products may still end up in places where they do damage to communities, or nature.[5]

Local materials

Hyperlocal materials

An alternative to the aforementioned materials, are sustainably and hyperlocally sourced materials.

Hyperlocal materials are materials that are sourced sustainably within an area as mentioned previously. This means that they are obtained from a nearby area, rather than being imported from far away. Using hyperlocal materials can reduce the environmental impact of transportation and support the local economy. It can also provide uniquely different and novel materials that reflect the characteristics of the area they are sourced from.

What are the benefits of hyperlocal materials?

When materials are sourced locally, a better understanding of local resources, its history and functionality is vitally important.

Meaning that an understanding of local nature and its survival is required.

Utilizing local materials also let us take care of the knowledge of history and the processes connected to them to be maintained.

Local communities, the manufacturers and the consumers within them, will have a greater attachment to the materials and the places they are sourced.

A symbiosis between the industries, consumers and nature can be better facilitated when sourcing materials locally.

It is easier for the consumers to see the direct implications of the power they have as consumers.

Local sourcing of materials allows for a shortened and more resilient supply chain.

What materials should we look for?

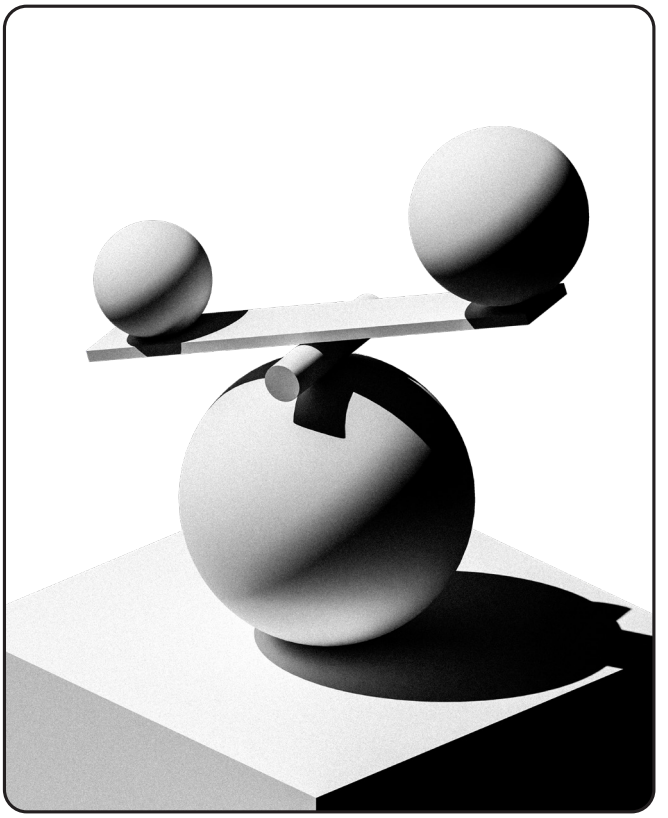
What materials are worth looking for?

As mentioned, we could look for materials, found historically, or look to new origins of materials, in the form of waste or even radically new materials that have never been considered.

To look at these potential materials, and figure out if they are viable or not, is a highly complex task. In order to try to systemize and map out the viability of these materials, it would be helpful to look at some factors by which they can be categorized.

Based on the findings from the three potential areas, as well as the desktop research portion of this diploma work, I have identified a set of factors. These are factors I suggest we should consider when sourcing and using materials going forward.

By which factors should we decide if a material is suitable or not?

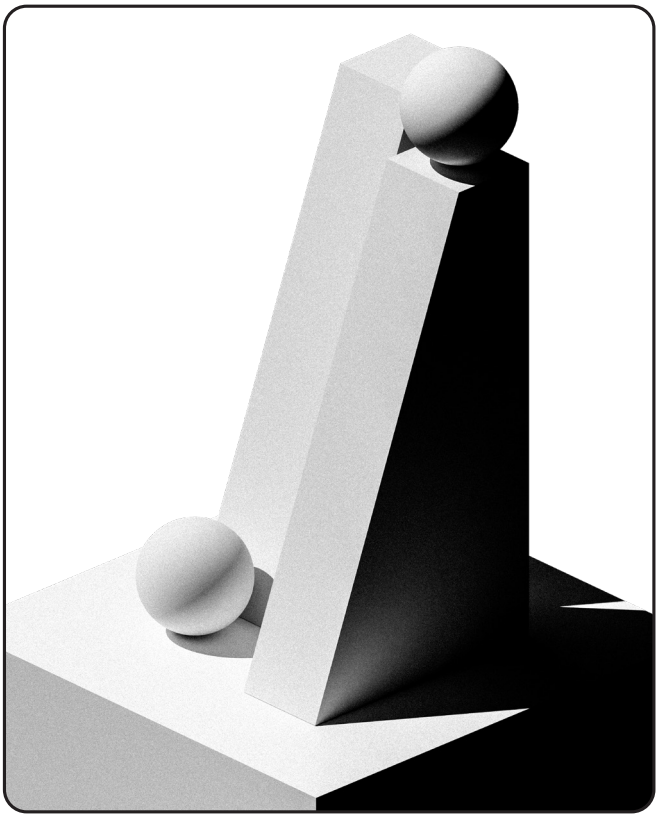


Environmental Sustainability

We should look for materials that are not creating unnecessary strain on the environment. That means materials that are not ruining nature by the means of its extraction or way of secondary processing methods. A part of that could be to utilize new and better suited technology, designed from the perspective of care and compassion for nature, and not from the perspective of effectiveness in terms of the profit it could generate.

We should look towards regenerative practices. Practices which allow nature to foster, and regenerate when resources are extracted. Our manufacturing methods, and sourcing practices need to co-exist with our planet, not be separate from it.

It also means that it is necessary to think of these materials with its life cycle in mind. To make sure that these resources can again be looped into the system, and be part of a circular economy. We have tools already available to us, for assessing the environmental sustainability of materials and products. Such as LCA (Life-cycle assessment). Analysis systems which seek to provide a complete overview of a product's life-cycle, by considering the potential environmental impact of all its components.[6]

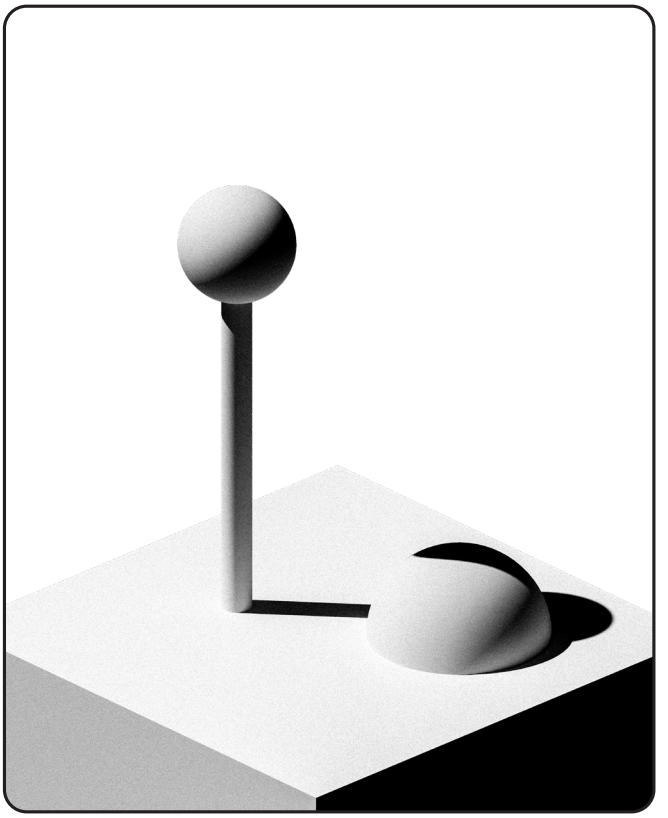


Social Sustainability

We should utilize materials that do not manifest social inequality, by the way it is extracted, processed or utilized.

This means that businesses should increase transparency and oversight of working conditions and extracting practices.

In addition, it would be beneficial for both consumers and producers to source and use materials that benefit the entire community. This could involve collaborating and co-creating with other industries, as well as involving consumers in the decision-making process for manufacturing products.



Longevity & Degradability

These materials should also be considered by its potential longevity and degradability. Making sure that these materials have the capability to be shaped into products that are appropriate for their intended use. If a product is meant to live for a long time, a durable and long-lasting material should be used. Likewise, if a product is not intended to be used for a long time, and the product will be outdated in a short amount of time, the materials used should reflect that.

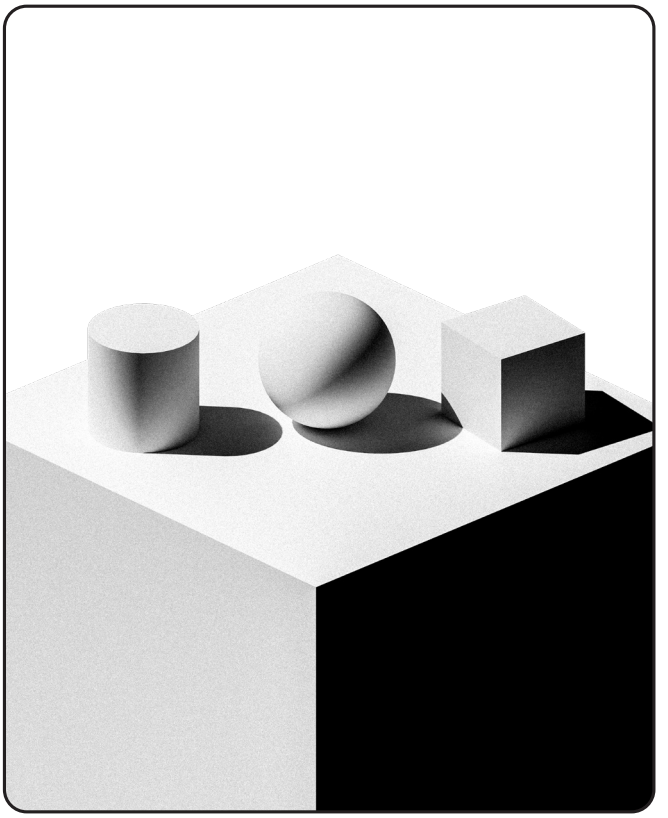
That does not simply mean to utilize materials that will never degrade, or easily degrades, but the way in which it degrades should be considered.

Is it possible to care for, and repair?

Does it allow for a beautiful patina to form?

A material's longevity and degradability should also be considered on the basis of its intended life expectancy. As an example, Israel based designer and teacher, Adital Ela designed Terra Stools. These are stools made from earth and natural fibers, made with a process that allows for full compostability.[7]

Another example that fits into this factor, are the objects designed by James Hennessy and Victor Papanek in their book nomadic furniture. A book full of wonderful furniture designed to be taken apart, and live a nomadic life along with their owners.[8]



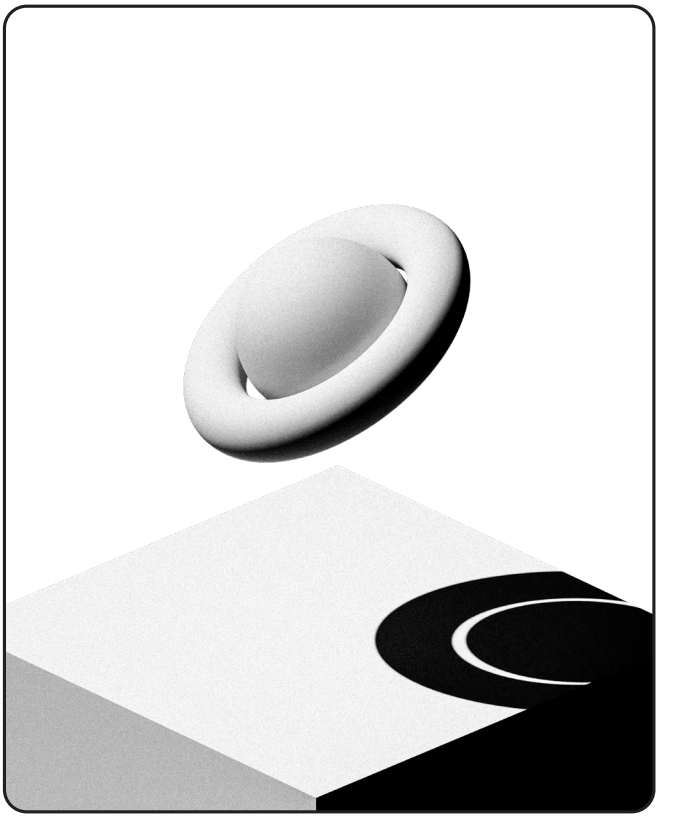
Aesthetic Properties

We should also look at the aesthetic properties of materials. These properties can be in the form of textures, visual and tactile, color and transparency. The main point of looking at these properties is to let the materials inspire and guide. Let the inherent visual and tactile properties of the materials guide its function and use, or inspire new potential functions and uses.

If we look at materials in novel ways, see how they look when applied in a variety of production methods, we can let these visual characteristics drive visual properties of the final products.

We can then ask ourselves what processes and methods of production we may utilize in order to capture these characteristics. And showcase these properties in visually interesting ways.

What are the tactile properties, smell and look of these materials?

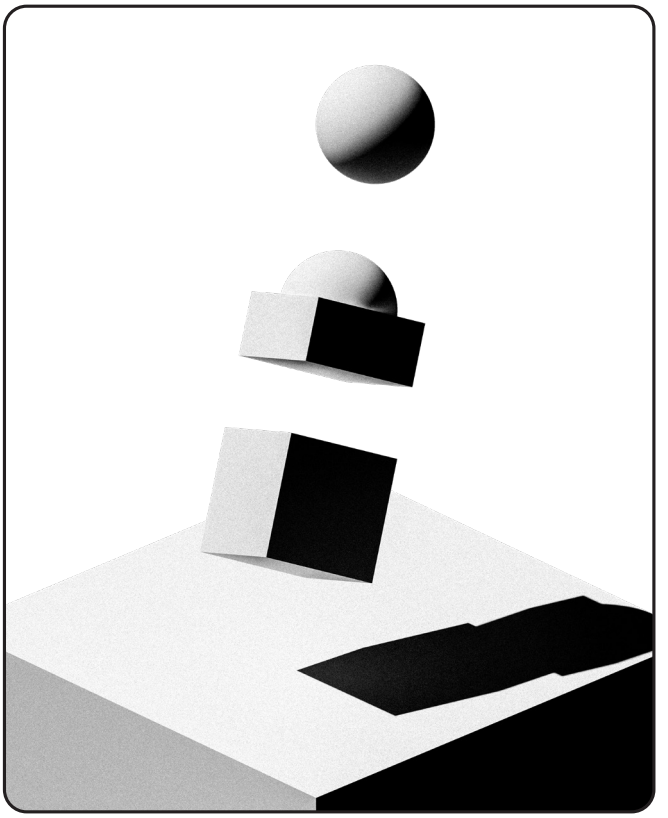


Functional Properties

Similarly to the aesthetic properties, it is also important to consider the functionality of the material in question. We should look at what functionalities the material inhabits naturally, and how we might capture that functionality best. For example, if this is a rubberlike material like fungi, or flexible natural fibers, we should see if that flexibility is something that can benefit the final product.

If a material found in the streets of Oslo, is a material with excellent sound dampening properties, such as insulation or cardboard structures. Perhaps that material can be utilized in a way that benefits from those properties.

Another example, could be the natural antibacterial abilities of sheep wool, which has been beneficial in garments.
In some cases, the functional properties of a material may change based on its processed state. This leads us into the last factor.

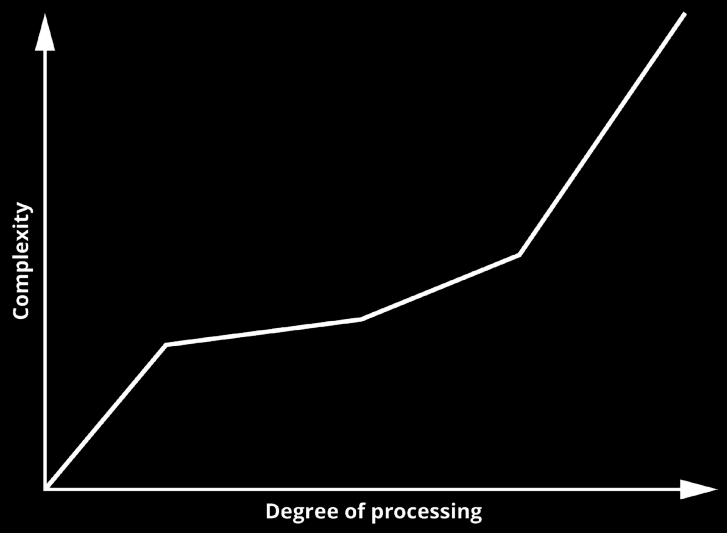


Degree of Processing

What are the processing steps necessary to benefit from the materials, and will all the factors above be affected when different processing strategies are applied.

Does the functionality change between each step of processing?

In most cases, yes, and the resulting material within each step has different potential use. Therefore, it can be beneficial to map out how these materials are processed, and utilize a material as soon as possible, with the least amount of steps required to utilize it.



Example: *Hemp*

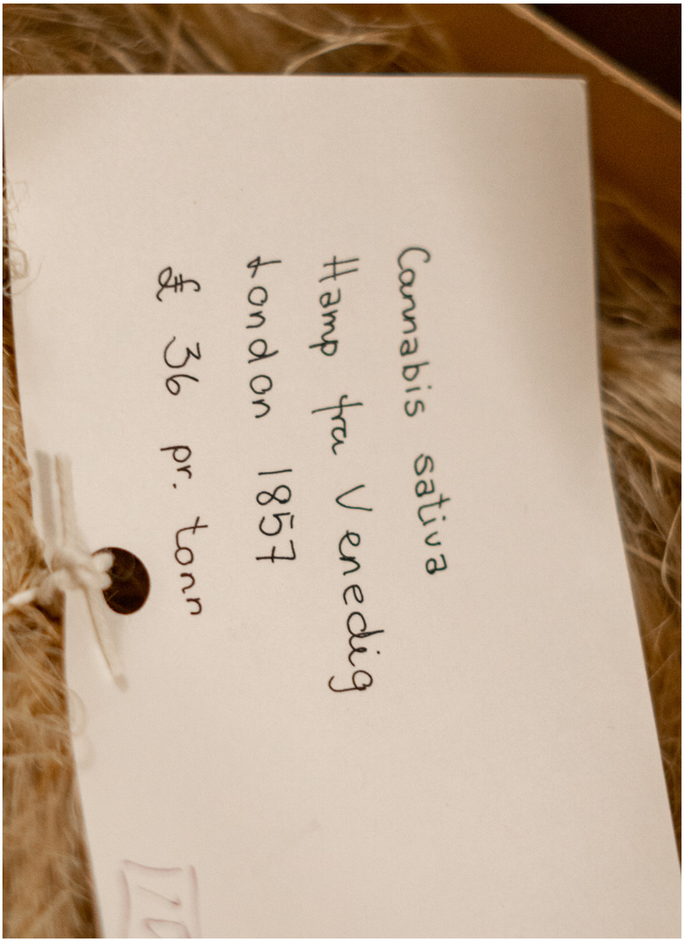
Hemp has been used for producing fibers for thousands of years, with traces found as far back as 8000 BCE in China and Taiwan. It has been used to make rope and paper, and even in 1942 Henry Ford built an experimental car body with hemp fiber. However, in recent years, the production of hemp has suffered greatly due to the illegality surrounding cannabis production, which also includes hemp as it is part of the same family of plants.

This shift in attitude towards hemp began in the early 1900s when the US government passed a tax act that heavily taxed all sales of hemp. Some argue that this was part of a scheme to benefit the emerging industries of plastic and nylon production.[9]

Now, hemp is making a comeback in some parts of the world and a shift in attitude towards it has begun. The production and use of hemp has shown great potential in terms of carbon sequestration, water usage, and growing efficiency. It is a fast-growing plant and has been used in the creation of a variety of products. For example, hempcrete, an alternative to common construction materials with excellent thermal insulating properties that have the potential to store carbon while being sustainable.[10]

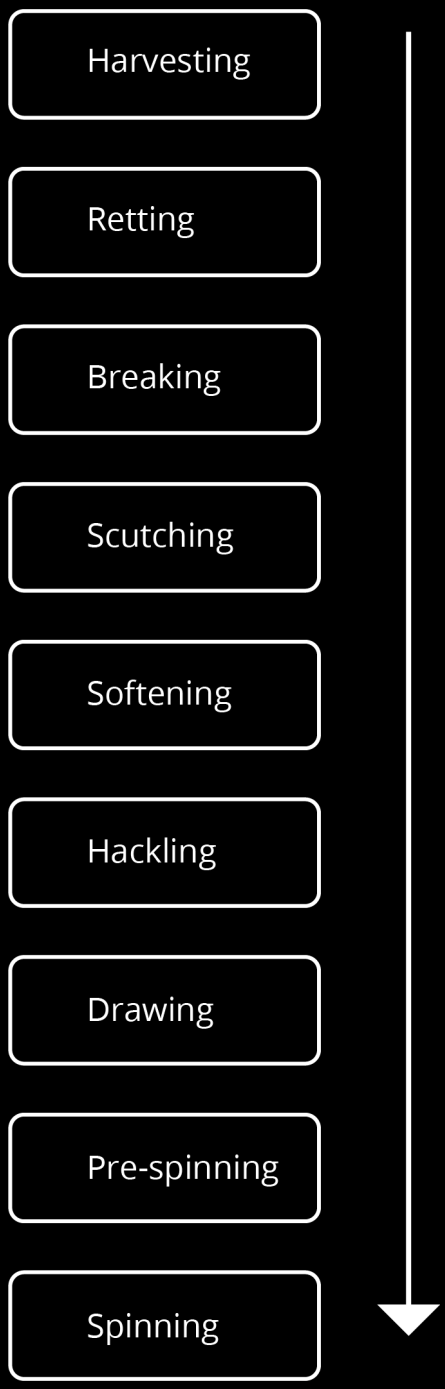
Hemp has also been used to showcase the potential beauty that lies within the aesthetic properties of the fiber. Phillip Hainke, with his project Organico, where he combined traditional and renewable resources to look at the potential of using hemp in product design.[11]

Organico, Phillip Hainke



Cannabis Sativa from a collection of fibers at The Natural History Museum in Oslo

Processing stages in hemp fiber processing



Rope made from pine needles from a collection of fibers at The Natural History Museum in Oslo

Where are these materials located?

Depending on the location, a multitude of potential materials could be found. It is then important to consider the above-mentioned factors, and keep them in mind when looking at potential materials.

This is also where I see the potential of a service or a database to be helpful. A library of materials where these factors are considered.

How do we source these materials?

There are multiple ways of sourcing materials in a hyperlocal manner. In order to do so in the most resource efficient way, it's helpful to obtain some knowledge about the history and the locality of a material. Learn about fibers, plants, the flora and fauna, and get a general knowledge about the processes and production methods required to utilize these resources.

It also requires some ingenuity and creativity in order to look at a material of any sort, and see new ways of utilization.

I will also suggest that there are multiple ways in which you may obtain a wide variety of materials, and I'm proposing two main categories.

The first category; *Harvesting methods*

Urban material sourcing
This method of material sourcing is about finding materials and resources in an urban context. This can be “garbage” found at the side of a road, in dumpsters, or natural fibers growing in a ditch, or deep in an alley.

Local business networking
This is a method that entails how you might gather materials of need by “networking” with local businesses.

Foraging
The foraging based methods include activities such as gathering plant fibers, fungi, pine needles, weeds and moss from the forest.

Furthermore, foraging for local materials in the forest can also be a valuable educational experience, providing opportunities to learn about the natural world and traditional knowledge and skills. By engaging with the forest ecosystem, individuals can gain a greater appreciation for the diversity and interconnectedness of nature

The second category; *Growing methods*

These are methods which aim towards the goal of utilizing something self produced. This may be growing your own fiber at home, collecting your waste and recycling or reuse them for new hardware or fiber.

Self-grown fibers
This method is quite self-explanatory, but is essentially the act of growing your own sustainable fibers meant for production of any product. Such fibers may be in the form of plants such as hemp, linen, cotton or any other plant with a suitable fiber for your intended use. In this case, it's important to keep in mind how they are sustainable. That includes looking at factors such as energy use, water consumption, pesticidal use and so forth.

Collected plastics
The collection of plastics is also a method I will categorize as growing, as this is, at least in today's society, something a typical household will have a flow of. And even though most households in Norway do sort these plastics for recycling, actually recycling these plastics is another practical problem in and of itself. Where it's increasingly hard to categorize different types of plastics, and then to recycle them into new products is even harder.

Knowledge

Who holds the knowledge?

When conducting research on local materials and production methods, it is crucial to identify the individuals who possess relevant knowledge in these areas. These experts, such as researchers and industry professionals, have extensive specialized knowledge. However, DIYers, hobbyists, and individuals with a particular interest in these topics also hold valuable knowledge that can be a valuable resource for a local community.

Charlotte Sletten Bjorå, a researcher at the Natural History Museum of Oslo, is an example of an individual who holds a significant amount of knowledge about plant fibers in Norway. I had the opportunity to visit her at the Museum of Nature History in Oslo and was inspired by the meeting. She showed me a variety of different fibers that have been used throughout history, both globally and locally in Norway. She also demonstrated the tools used to create these fibers, such as ropes made from pine needles, hemp, and jute.

While knowledge about local materials and production methods is important, it is also necessary to recognize that knowledge can be shared globally. For instance, knowledge about a specific type of fiber in Norway can be applicable to a locally-grown fiber in Siberia. Therefore, it is essential not to restrict this knowledge to a hyperlocal, local, or national level, even if the sourcing of materials and production methods are specific to a particular area.

What knowledge do they hold?

Materials

A part of the knowledge these people hold that are relevant to this project would be that of the materials which are in question. They know about the history, the technical properties of these materials, as well as the science and theoretical knowledge necessary to process and benefit from any material at the highest level.

Production Methods

There are people who also specialize in the production methods required to utilize a material as well. When it comes to linen for example, a multitude of these so called “ildsjeler” holds a great deal of knowledge about these methods, they know what works and what does not, how plausible things are to be used for a specific use case.

The Natural History Museum in Oslo also held an event in September of 2022, where people could come to learn about the processing of linen.[12]

Machinery and Technology

In addition to knowledge about local materials and production methods, it is also important to consider the technology and machinery necessary for manufacturing a final product using those materials. This means evaluating the level of processing required to utilize a particular material, which I previously discussed in this report.

Furthermore, the availability and accessibility of the necessary technology and machinery should also be considered when determining the feasibility of using a specific material in production. This can impact the overall usability and sustainability of the final product.

Overall, understanding the technology and machinery required for production is a crucial aspect of the knowledge needed to make informed decisions about the materials used in manufacturing.

How do we share the knowledge?

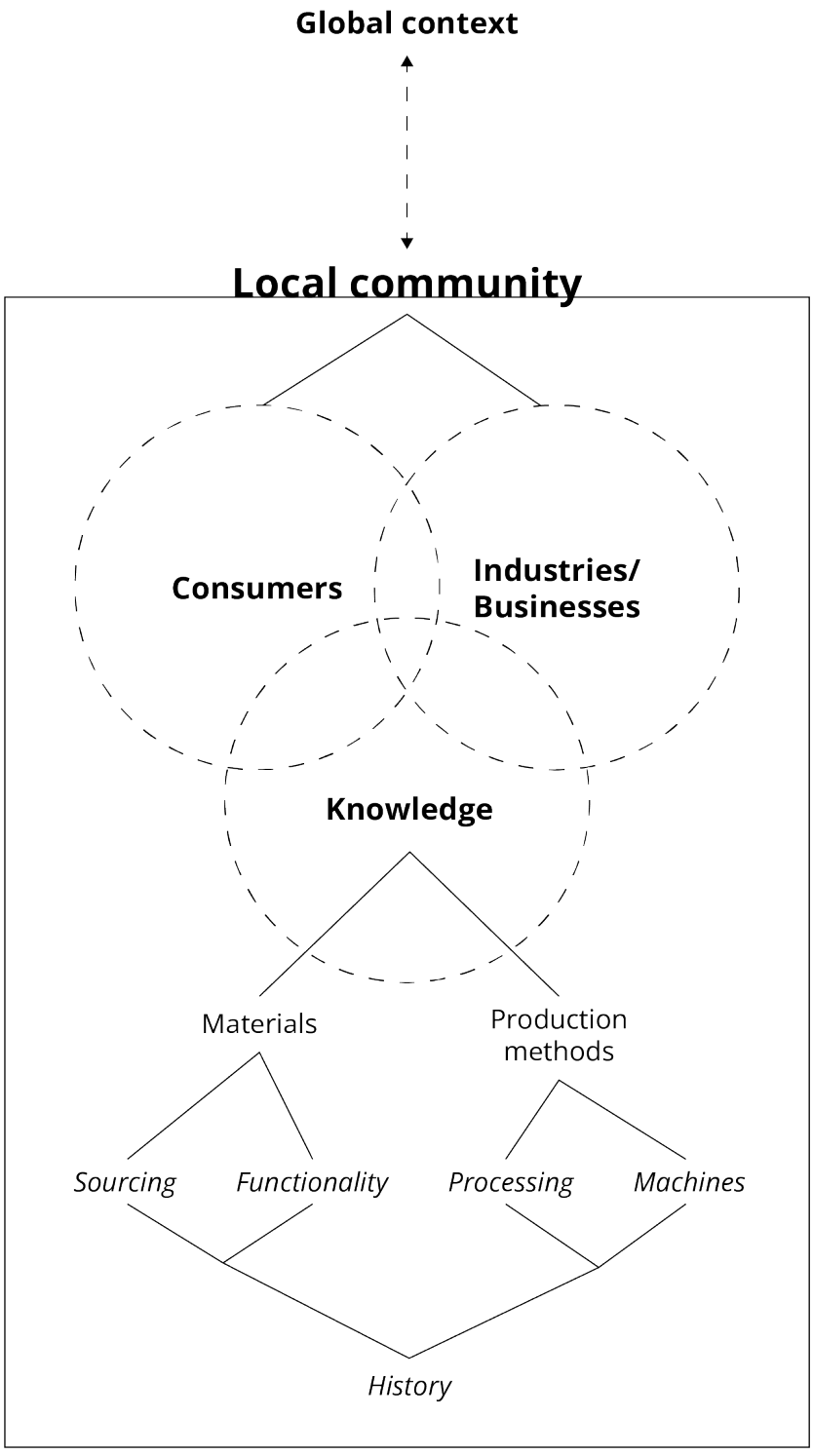
Open source knowledge sharing

To facilitate openly and freely shared knowledge about materials, processing, sourcing and manufacturing of locally manufactured products, would provide us with the possibility to innovate and increase the speed at which we change our patterns in production processes and consumer patterns.

Open source knowledge sharing gives the power of knowledge to new and emerging businesses and entrepreneurs. It could give the local communities transparent access to information regarding the products and materials they are purchasing.

Open source knowledge sharing allows for local communities to share and distribute their knowledge regarding their specific local materials and production methods, but that knowledge should not be contained within a specific local community or country.

The open and free database should allow and encourage local communities to build upon their production methods, while also creating global solidarity with other communities, industries and consumers. Because no innovation will happen without collaboration.

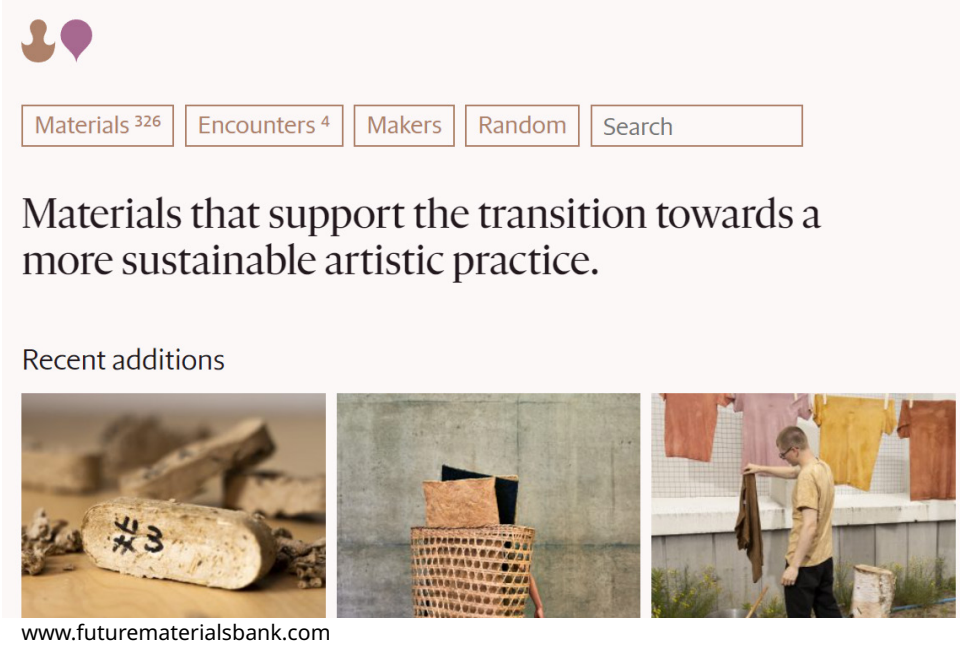

Global context
Local community
Consumers
Industries/
Businesses
Knowledge
Materials
Production
methods
Sourcing
Functionality
Processing
Machines
History

What does the sharing of knowledge look like?

A suggestion for sharing the knowledge about materials, processes and sourcing methods in an open source manner, could be wikis, digital platforms and databases for compiling and categorizing knowledge. It could be a publicly funded digital encyclopedia, specifically about materials, sourcing, machines, production methods and products. With the possibility to categorize this information based on a specific location, with local environment and materials in mind.

There are multiple platforms we could take inspiration from, or even implement, when developing something for that purpose. Some examples of that idea are websites such as Materiom.org or Futurematerialsbank.com. These websites contain a multitude of future potential materials, and shows the vastness of what materials could be utilized for production.

Examples of this could also be such websites as instructables, thingiverse and similar platforms that are based on user-input in the form of instructions and user-generated content meant to be replicated and built upon by others.



www.futurematerialsbank.com

A wiki

A wiki is a platform where information about materials, production methods, and sustainability can be shared openly and collaboratively. This allows for the creation of a comprehensive and constantly evolving knowledge base on these topics.

One of the advantages of using a wiki is that it allows for the participation of a wide range of individuals and organizations with expertise in these areas. This allows for the inclusion of diverse perspectives and experiences, leading to a more comprehensive and nuanced understanding of the topics at hand.

Additionally, the open and collaborative nature of a wiki allows for the quick dissemination and updating of information, ensuring that the knowledge base remains current and relevant. This can be particularly useful for addressing rapidly changing developments in the field of materials, production methods, and sustainability.

Overall, a wiki can serve as an invaluable resource for individuals and organizations seeking information and expertise in these areas.

A symbiosis between producers, consumers and nature

When products are made locally, by local manufacturers, with locally sourced materials, for local consumers, you have a huge potential in benefiting the local communities in which they're made. The consumers of these products will more often than not have a greater attachment to the products and the manufacturers, and this can create better product stories, better relationships, and a sense of personal and even emotional attachment. These factors are vitally important for a product's life-cycle, and the longevity of it.

Furthermore, the sense of belonging to the local environment this could create is massive, and I believe this could help to drive a better understanding and care for the nature we are part of.

Proof of Potential

Designing a Product

In this report, I have focused on the potential of local production, particularly in a hyperlocal context. To further explore these ideas, I have created a product to serve as a proof of concept for the principles I have discussed. This product is made of materials sourced from within walking distance of each stage of the manufacturing process, from sourcing materials to processing and final assembly.

I believe it is necessary to put these ideas into practice, which is why I have chosen to create a product with these principles in mind. The product I have selected is a backpack, chosen for its level of complexity and the variety of components it contains with different characteristics and functions. By creating this product using the principles of local and hyperlocal production, I hope to demonstrate the potential of these frameworks and inspire others to consider similar approaches.

In this proof of potential, I have decided to create **a backpack.**

Understanding the composition of a backpack

When designing any product, it's helpful to start by understanding the composition of existing products within a similar category. As designers, and specifically product designers, we have a multitude of tools available to us in order to understand and map out needs, functions of products, and factors by which we make decisions.

This is one of the main reasons for why I chose to look at a backpack as the proof of potential in this diploma project, as this is a product that is usually composed of a variety of components. Hard components, soft components, flexible components, technical solutions, components for comfort and daily use etc.

User and use-case

It is also important to understand the context in which the product should exist. For my purpose, to work as proof of potential, the backpack itself will not be specialized for a specific use other than to represent that proof of potential.

Nevertheless, it is important for any product to be designed by how it is intended to be used. So to keep a user in mind is necessary. This backpack is therefore designed with simple use in mind. And with a very specific requirement, being the capability to carry a 15-inch laptop. While being water-resistant and easy to commute with.

A material first approach

A big part of this project has been to look at production in a radically different way, and part of that I believe is to have a material first approach.

By following the factors for which material is suitable, I looked at materials that are close in proximity to my location. Looking at what aesthetic properties they may provide, while also leaning into those properties.

Where did the materials for this backpack come from?

This backpack is made by materials sourced from within five kilometers of its final assembly, excluding the thread and webbing. Otherwise, the entirety of the backpack is composed of bicycle inner tubes, heat-welded plastic packaging for the inner panels, weaved rice packaging and heat-welded plastic package protection for the edge tape. All waste “grown” over the duration of a few weeks from my own consumption of groceries.

For the bicycle inner tubing I went out to different bicycle repair shops in Oslo, all within five kilometers, and asked them if they had any punctured bicycle inner tubing that they were about to throw away. They did, in fact, and gave them to me, as this was something they were about to throw away anyway.

Understanding the material and its properties

Another big part of what I’m proposing in this project is of course that the knowledge about these materials, and the processes to utilize them, is of great value to not only the producers, but to the consumers and other actors within the local area as well.

A part of that knowledge is the look, feel, texture and characteristics in general about the materials themselves.

What do these materials look like?

What do they feel like, and which characteristics should we preserve when designing products with these materials?

In this case, the most recognizable and main characteristic of the bicycle inner tubes, are the rubberized and utilitarian look of them. And leaning into those properties could further showcase the fact that this is a water-resistant product.

Sketching with material in mind

As designers, we use sketching as a tool to brainstorm ideas, of forms and functions. We use sketching to think and discuss with ourselves or others, and to figure out what works and what does not, by getting abstract ideas onto paper or in 3D, physically or digitally. We often do so for the purpose of getting to a final form or to something that inspires us for further ideation.

In this case, as the materials are such an important basis for the rest of the design, I believe it's necessary to have the material in mind when sketching. To build upon the characteristics that the materials themselves inhabit. Both in terms of visual characteristics and functional characteristics.

Another way of sketching, a method which is supposed to reiterate my main finding within this project, is to sketch with the materials.

Let the materials available be the inspiration for form, functionality and further exploration. Let us have fun with the materials we explore and discover. I've become a big proponent of letting ourselves find potential in material use, through a child-like imagination and exploration of its potential use and functionality.

Moodboards

Moodboarding is a useful tool for ideation and staying inspired. It helps us to explore the potential of different materials, including their textures, visual properties, and functionality.

Here is one of the moodboards I created when looking at textures and possibilities within weaving, the use of bicycle tubing, and recycled plastic.

Alternate ideation methods

Through the sketching and ideation phase of the design of the backpack itself, I've set out to utilize different methods of ideation.

I've tried multiple AI frameworks, so-called text to image based AI-generators. I've used these tools as a way to challenge my usual way of ideation.

Furthermore, I believe that tools like these can function as a tool for creatives, not replace, but assist for creative generation. Any user of these tools becomes a creative director, and are now responsible to guide these tools towards a usable outcome. Based on the creative director's initial ideas. In my case, it's not replacing the sketching I will do manually, but it acts as a wall at which I may bounce ideas back and forth.

I got started by trying out different AI image-generating Models.

DALL-E 2, developed by Open-AI, and *Midjourney*, based on a stable diffusion model. The stable diffusion model is in fact also open source.

In these examples I explored the possibilities with the following prompts:

"a woven backpack made from recycled bicycle inner tubes"

"a backpack with a unique design, made entirely of bicycle inner tubes"



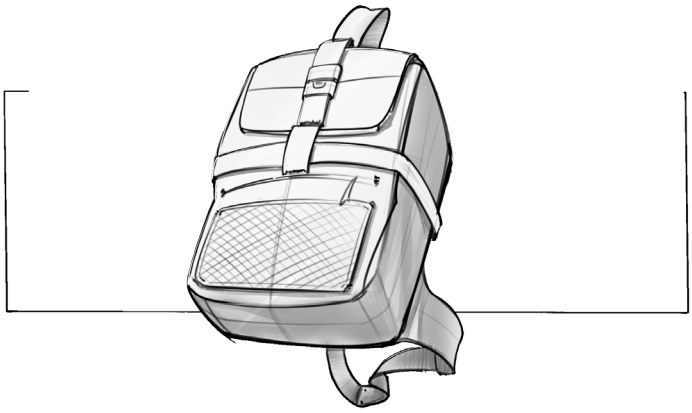


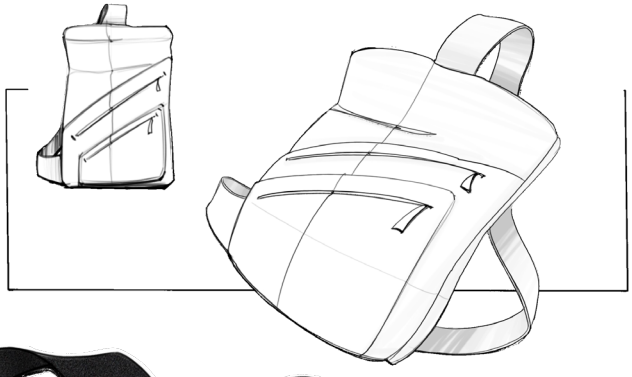







Regular sketching





Final result

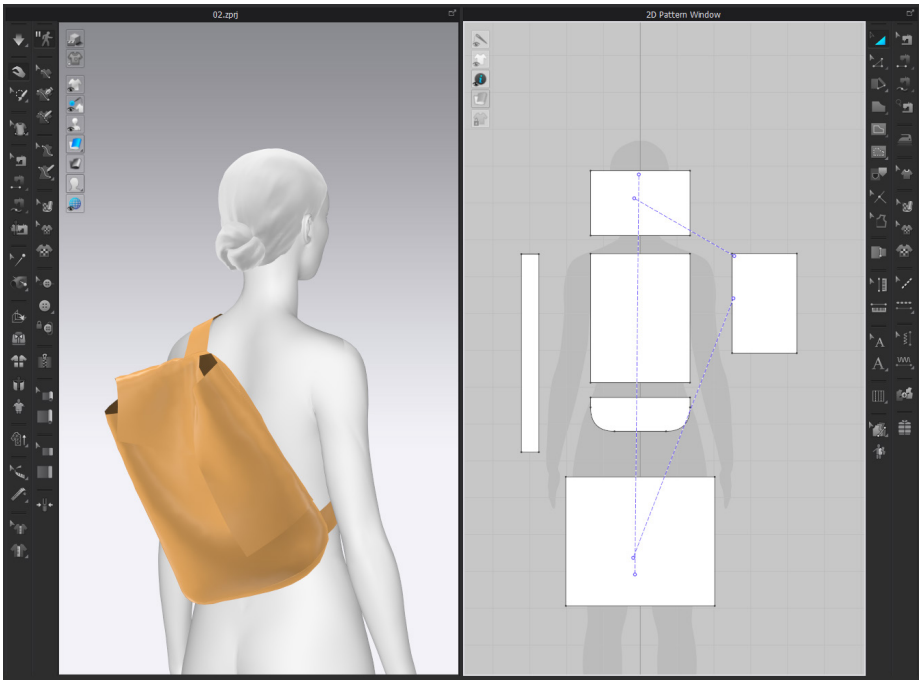
This short design process has then resulted in a backpack created with commuting in mind, with materials sourced from within five kilometers, and made to be repaired, mended and built upon by others.

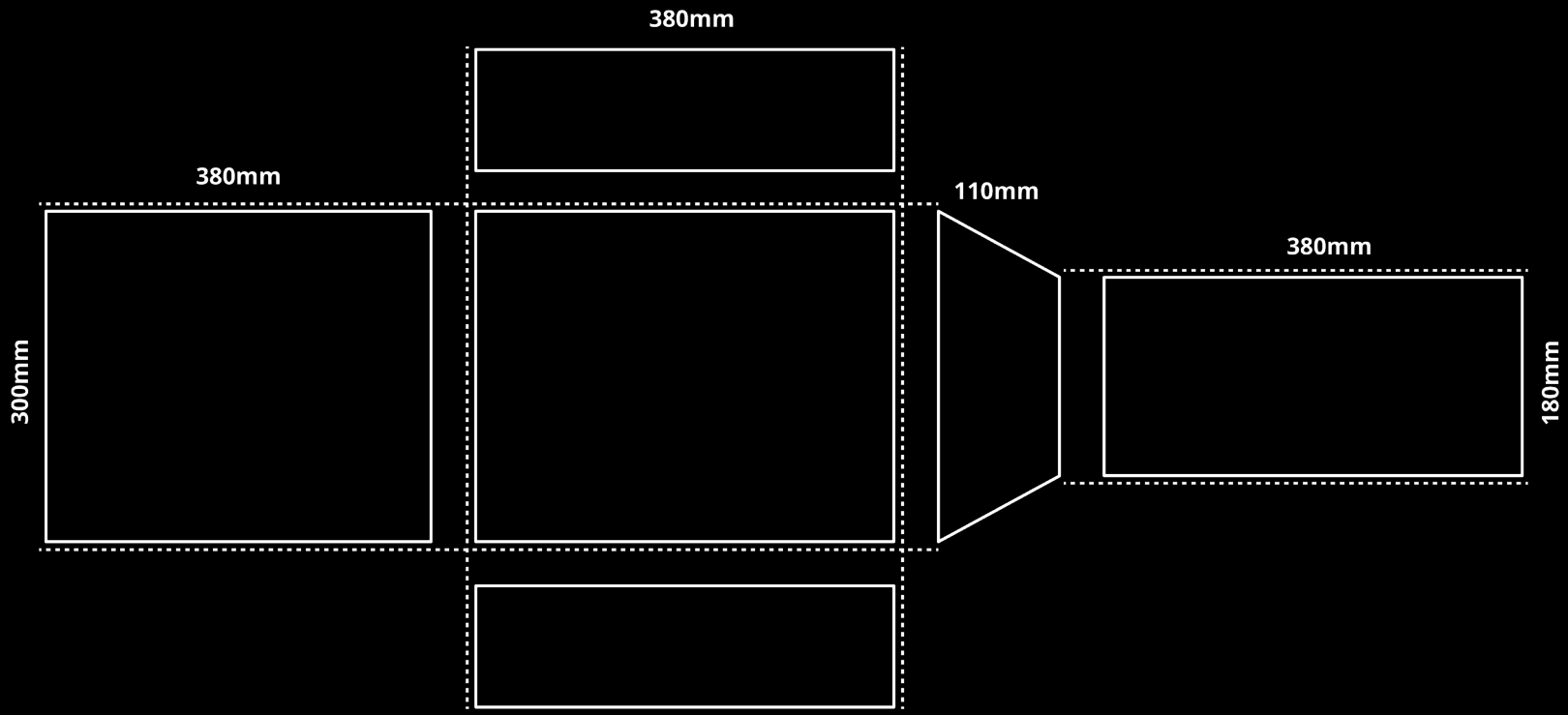
The main panels of the backpack are made of bicycle inner tubes, sourced from local bike repair shops. The inner panels are made from “grown” plastic packaging, and the clasp is made from recycled milk carton bottle caps in HDPE.

Pattern

The backpack has a single compartment, large enough to hold a 15-inch laptop. I used Clo3D, a fashion industry software, to quickly design the pattern and get a sense of the size and panel layout of the backpack.

The backpack is designed as a sling-style backpack, which makes it convenient to use while commuting on public transportation. The sling allows the user to easily bring the backpack to the front while sitting on a bus, train, or subway, without having to remove the backpack completely.

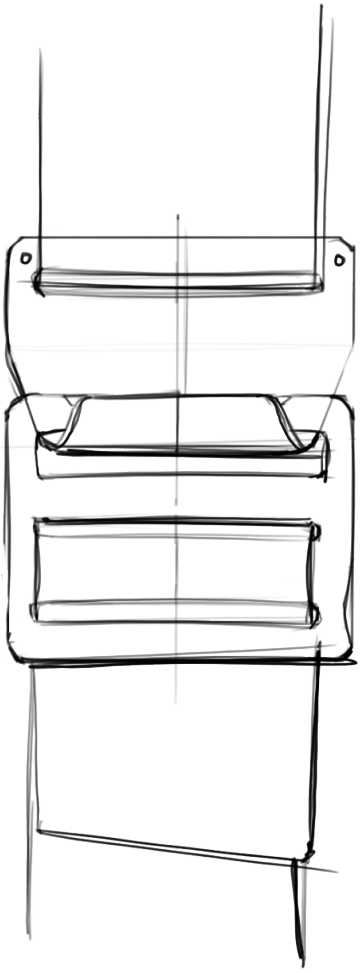



380mm
380mm
110mm
380mm
300mm
180mm

The clasp

The clasp of this backpack is made entirely from remelted HDPE, which is sourced from milk carton caps. It is melted in a regular oven and shaped into the clasp. This process is mainly meant to demonstrate the potential of the material and the design, and it could be further developed and manufactured at a larger scale using simple injection molding machines. This would allow the clasp to be more precisely made and stronger, while still being resource-efficient.

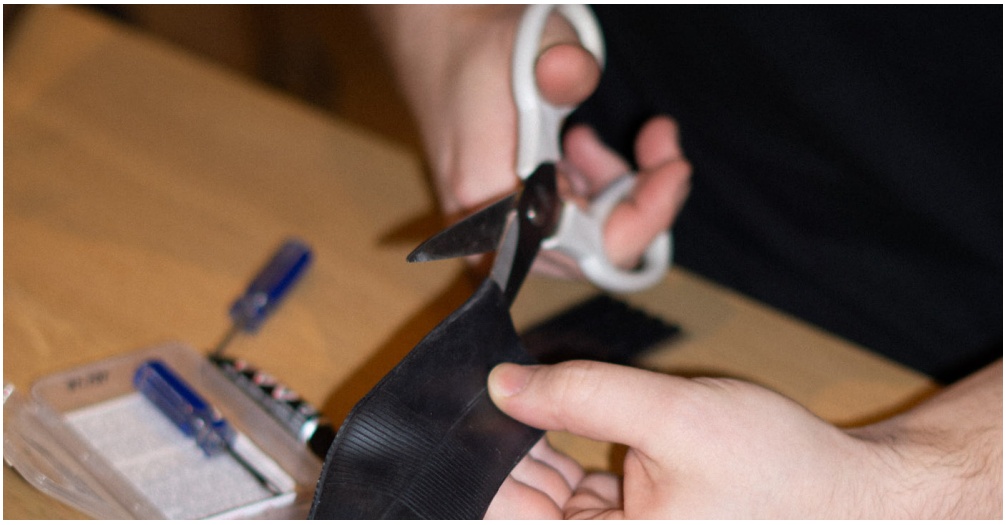
I was inspired by the work of Precious Plastics, who have designed machines and made them available in an open-source framework. Which in turn, allows others to build upon their work and use the machines for their own projects.[13]



Repairability

One potential benefit of using bicycle inner tubes as a material for a product is that people are already familiar with their common use and properties. For example, people know that inner tubes can be repaired if they get a puncture, so using them in a product may encourage the owner to repair it if it gets damaged or torn.

This example illustrates how the choice of material can communicate the intended use or reuse of a product to the user, based on their existing knowledge and expectations. By using a material that people are familiar with, the designer can convey the intended function and behavior of the product without explicitly stating it. I believe this is the responsibility of the designer of a product, and it should easily be communicated to the user.



A user test

As a simple user test, I asked a friend to use the backpack for work one day.

Again, this is not intended to be a final product, but rather a proof of potential. Therefore, I was interested in knowing what comments they got on the backpack, and what associations people got when seeing it.

Here are some excerpts of those comments:

"Looks like something an influencer would buy for 200 thousand."

"Definitely looks durable and waterproof"

"It would be cool to create an instagram account where you go some place and make something out of local garbage"

"Fun to see actual products inside, tortilla packaging and so forth."

These comments, although they are not very in-depth, show me that the choice of materials was a success. They have made it clear to me that these materials and the utilization of them showcase the potential these materials inhabit.

Furthermore, it would definitely be interesting to explore the potential of using social media or other platforms to showcase the possibilities of these locally sourced materials in the future.


ELDORADO
TORTILLA

Other examples of similar material use

There are other examples of similar material use in the case of bags or backpacks.

A very successful company which upcycles old truck tarps, and implement them into their products is Freitag. Creating unique products, where none are exactly the same.[14]

Another example which also utilize bicycle inner tubing, as well as other upcycled materials, for their products is Nukak, a Barcelona based company.[15]

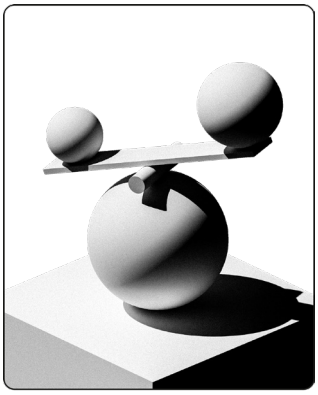
Freitag backpack

Nukak backpack

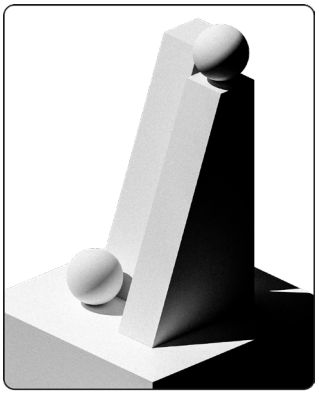
Contributions and Reflections

A set of factors to consider when sourcing sustainable materials hyperlocally

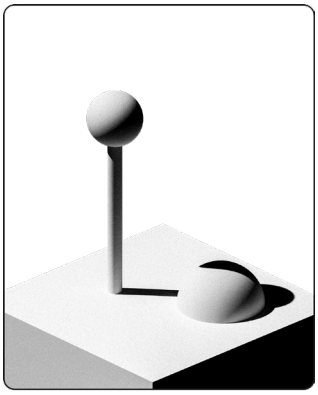
These factors are my main contributions, and I believe they answer well to the initial goal of this project. As I believe these factors can inspire as well as act as guidelines for those seeking to discover new potential materials, or wants to utilize long forgotten materials.



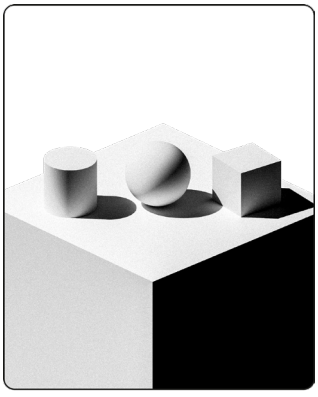
Environmental Sustainability



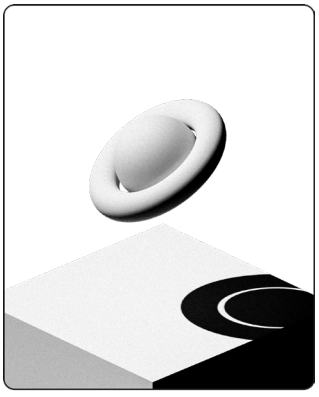
Social Sustainability



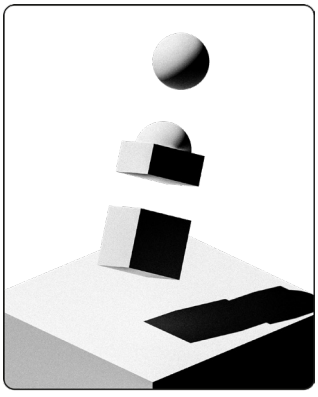
Longevity & Degradability



Aesthetic Properties



Functional Properties



Degree of Processing

A proof of potential

The other contribution is the backpack, created to act as a proof of potential. A task I believe it is sucessful at, as it showcase the potential that a novel or radically different material use can provide.

I also believe it is an object that, together with the factors for material sourcing, can provide an interesting story on how it is made, and the materials it is made of.

On project complexity

When I first started this project, I didn't fully realize how complex it would be. I had planned to create multiple machines and believed that I could do so using only open source information and recycled materials. However, I quickly learned that the project would require a combination of service design, systems oriented design, and industrial design. This shift towards a more systems oriented approach has allowed me to learn more about this type of design and has confirmed to me that all of these disciplines are interconnected.

As an industrial designer, I have approached this diploma project with the goal of changing minds. I have tried to use my skills and knowledge to explore the potential of the project from the perspective of an industrial designer. Although the project has taken a different direction than I initially expected, it has given me the opportunity to learn more about other design disciplines and how they can be used to achieve a common goal. Overall, this experience has taught me the value of staying open-minded and flexible when working on complex projects.

What is value?

In The Norwegian government's plan for climate and climate status, it is written about value creation under the green shift. However, this value is mostly considered on the basis on it's economic value.[16]

I would also like to suggest, perhaps not so profoundly, that value can be considered by other factors than its monetary value. For instance, social value refers to the positive impact a product or the business that manufactures this product has on the well-being of individuals and communities within a local area. This can include factors such as improved health, increased social inclusion, and a more resilient community.

It can be that of environmental value, which refers to the positive impact a product may have on the natural world, locally or globally. For example, as considered throughout this project, how a product is made of materials which benefit the surrounding climate.
Through the use of repurposed materials, upcycled materials, highly sustainably extracted materials or simply materials which allows for decomposing without harming nature or human life. Conserving natural resources and protecting biodiversity.

In addition, products can bring cultural value, which refers to the contribution that a product makes to the preservation and promotion of cultural heritage and traditions. This can include supporting local traditional production methods, such as weaving or other forms of traditional manufacturing practices. It can help promote cultural diversity.

Overall, there are many forms of value that go beyond economic value and can have significant positive impacts on individuals, communities, and the natural world as a whole.

On politics

The politics of climate change and sustainable resource use involve a complex interplay of factors, including economic interests, scientific knowledge, and public attitudes. In order to understand and address these issues, it is important to consider the following aspects:

The role of governments and international organizations in addressing climate change and promoting sustainable resource use. This can include the development of policies and regulations, the allocation of funding for research and projects, and the negotiation of international agreements.

The influence of economic interests, including the fossil fuel industry, on the politics of climate change and sustainable resource use. This can include lobbying efforts, campaign contributions, and media campaigns aimed at shaping public opinion and policy decisions.

The role of scientific knowledge in informing the politics of climate change and sustainable resource use. This can include the collection and analysis of data on the impacts of climate change and the potential benefits and drawbacks of different resource management approaches.

The influence of public attitudes and activism on the politics of climate change and sustainable resource use. This can include grassroots movements, campaigns by advocacy groups, and the role of the media in shaping public opinion and policy decisions.

Overall, the politics of climate change and sustainable resource use involve a complex interplay of factors that must be carefully considered in order to effectively address these pressing global challenges.

How does this project contribute?

A project that considers the use of local production and locally sourced materials, as well as open source knowledge sharing, can contribute to the design world in several ways. By prioritizing local resources and expertise, such a project can inspire designers to create more sustainable and community-oriented products.

One of the key ways in which a project like this can contribute to the design world is by highlighting the potential of local materials and production methods.

By showcasing the diversity and versatility of these resources, designers can be inspired to incorporate them into their work, resulting in unique and locally-oriented designs.

Furthermore, open source knowledge sharing is an essential aspect of design. By sharing information and expertise about local materials, production methods, and sustainability, designers can learn from and build upon each other's experiences. This can lead to the development of new and innovative design approaches that take into account a wide range of factors, including sustainability, social impact, and cultural heritage.

Overall, a project that considers the use of local production and locally sourced materials, as well as open source knowledge sharing, can contribute to the design world by promoting sustainable and community-oriented design practices.

Personal reflections

I see it as a necessity for our entire humanity, especially the global north, to radically change systemic factors that have been put in place since the industrial revolution. To change the ways in which we think about manufacturing of products. The products we utilize, and the materials they're made of, can not be made for the sole purpose of making profits. These products need to be made in new ways, from differently sourced materials, for other reasons than to generate economic growth.

We need to make products that are interesting, purposeful, mindful and valuable for other reasons than the money it is worth. The real value of products should be that of the people they help, the joy they bring, the stories they contain, or the change they drive, without exploiting or damaging our climate or communities.

Thank you

To my friends and family for contributing with helpful discussions, and input on such a wide and multifaceted topic.

Thank you to my supervisor, Steinar Killi. For seeing the potential of the project, even when I had a hard time seeing it myself.

I would also like to show gratitude to Mosse Sjaastad, and Hilde Angelfoss for inspiring and very important conversations and feedback.

And finally, thank you to Joselyn. For supporting me and motivating me throughout the final years of my time as a student at AHO.

References

1. Yardley, J. (2013) *Report on deadly factory collapse in Bangladesh finds widespread blame, The New York Times.* The New York Times. Available at: https://www.nytimes.com/2013/05/23/world/asia/report-on-bangladesh-building-collapse-finds-widespread-blame.html (Accessed: December 12, 2022).

2. Chitra, V.A.B. (2016) *Handbook of Research on Global Fashion Management and merchandising. Business Science Reference.*

3. *Norwegian Trash.* Available at: https://www.norwegiantrash.no/ (Accessed: December 10, 2022).

4. *Om gruten.* Gruten. Available at: https://www.gruten.no/om-gruten (Accessed: December 10, 2022).

5. Visual feature: Beat plastic pollution. UNEP. Available at: https://www.unep.org/interactive/beat-plastic-pollution/ (Accessed: December 10, 2022).

6. Team, S.E. (2022) What is Life Cycle Assessment (LCA)?, Sphera. Available at: https://sphera.com/glossary/what-is-a-life-cycle-assessment-lca/ (Accessed: December 12, 2022).

7. *Terra stools* Adital Ela. Available at: http://www.aditalela.com/terra-stools-2/ (Accessed: December 11, 2022).

8. Hennessey, J. and Papanek, V. (1973) *Nomadic furniture.* New York: Pantheon

9. History of hemp in the US (2021) Ministry of Hemp. Available at: https://ministryofhemp.com/hemp/history/ (Accessed: December 11, 2022).

10. Jay H. Areharta, William S. Nelson, Wil V. Srubar III et al. (2020) *On the theoretical carbon storage and carbon sequestration potential of hempcrete, Journal of Cleaner Production.* Available at: https://www.sciencedirect.com/science/article/abs/pii/S095965262031893X (Accessed: December 12, 2022).

11. Philipphainke. Available at: https://www.philipphainke.de/portfolio/organico/ (Accessed: December 11, 2022).

12. *Bli Kjent Med Lin og fiberplanter* Naturhistorisk museum. Available at: https://www.nhm.uio.no/arrangementer/0904-lin-og-fiberplanter.html (Accessed: December 12, 2022).

13. *Precious Plastic Recycling Machines.* Precious plastic. Available at: https://preciousplastic.com/solutions/machines/overview (Accessed: December 12, 2022).

14. *Freitag | one-off pieces made from recycled truck tarps.* Available at: https://www.freitag.ch/en (Accessed: December 12, 2022).

15. *Backpack Calima Nukak.* Available at: https://www.nukak.es/en/ (Accessed: December 12, 2022).

16. Klima- og miljødepartementet (2022) *Regjeringas klimastatus og -plan.* Available at: https://www.regjeringen.no/contentassets/fad4e2d774cf45ac8ad0e8cbb1ea093f/no/pdfs/kld_regjeringas_klimastatus_og_-plan.pdf (Accessed: 10 December 2022).