

Emilia Claesson

# RIGHT AS RAIN

RIGHT AS RAIN



LUNDS UNIVERSITET  
Lunds Tekniska Högskola

**TRETORN**

EST. 1891 SWEDEN

Right as Rain  
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Degree Project for Master of Fine Arts in Design, Main Field of Study Industrial Design.  
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## **ABSTRACT**

As global warming continues to threaten our society we must all try to adapt in an attempt to diminish greenhouse gas emission. In order to counteract global warming Tretorn AB has chosen to pursue a more sustainable product line. In this thesis I have worked with a scenario of sudden flooding in an urban environment. I examined urban population usage of waterproof footwear such as rubberboots and other waterproof shoes with a questionnaire. Among other things, the questionnaire found that rubber boots have a low level of usage in the city environment. By ideation, prototyping, sketching and performing a market analysis, a modern “pull on galosh” has been developed which enables the user to maintain their preferred usage of sneakers or non waterproof footwear in wet, or even flooded, city environments.



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# **INTRO: BACKGROUND AND SCENARIOS**

# **1**

# INTRODUCTION

## ***Project Background***

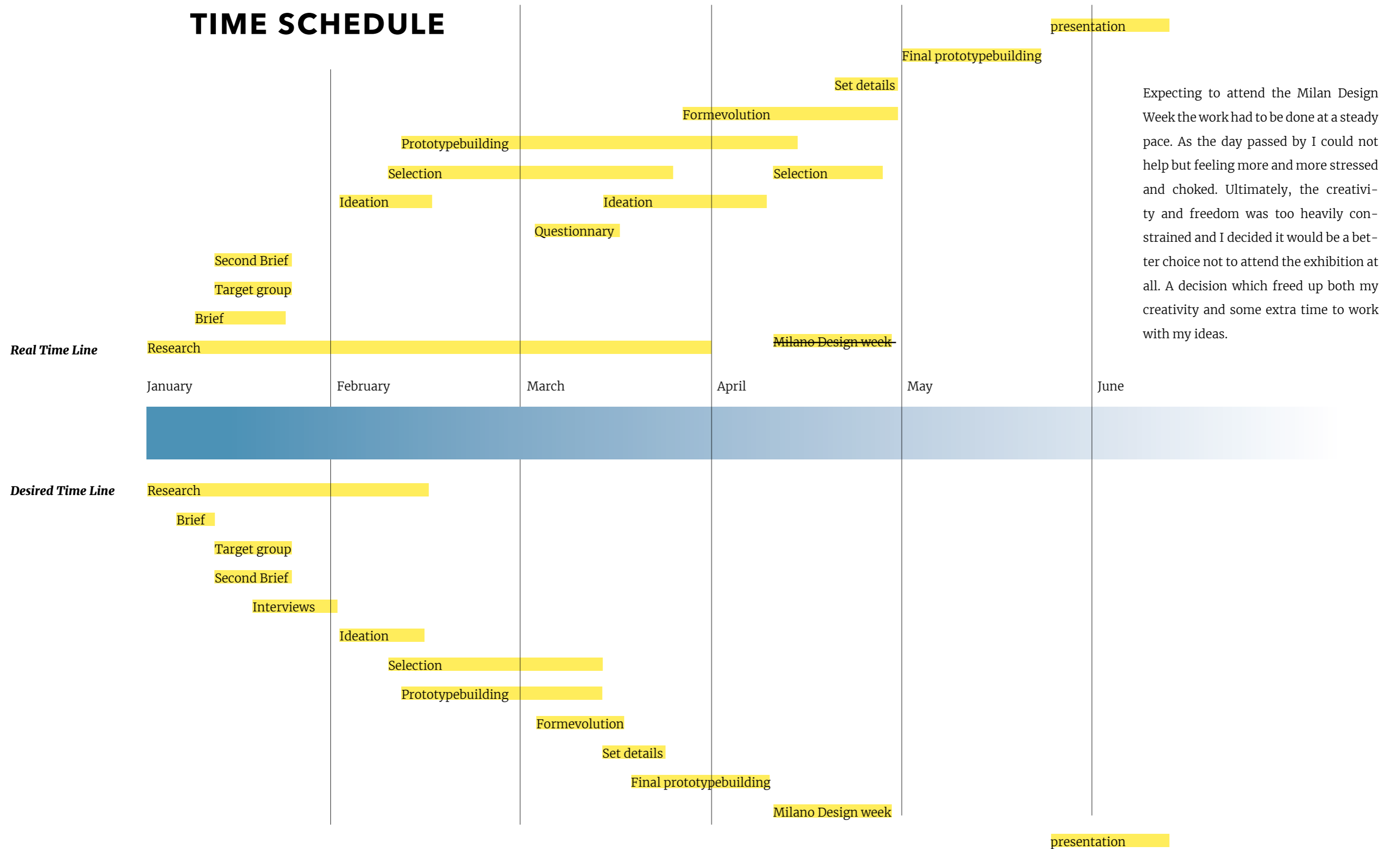
In this thesis I have collaborated with a Swedish company named Tretorn AB in order to develop a concept for new waterproof footwear. The thesis touches three larger topics, namely; climate change and its impact on Swedish weather, the Swedish recycling system and finally how people use rain boots in their everyday life.

## ***Starting Point***

At the start of this project a plan was made for me and four of my fellow students to exhibit at the Milan Furniture Design Fair. Therefore the initial idea was for the five of us to work with a common theme, and in a presentation by my supervisor, Carl Lidgard (2017), a possible common theme with Tretorn was presented. These travel plans were later canceled.

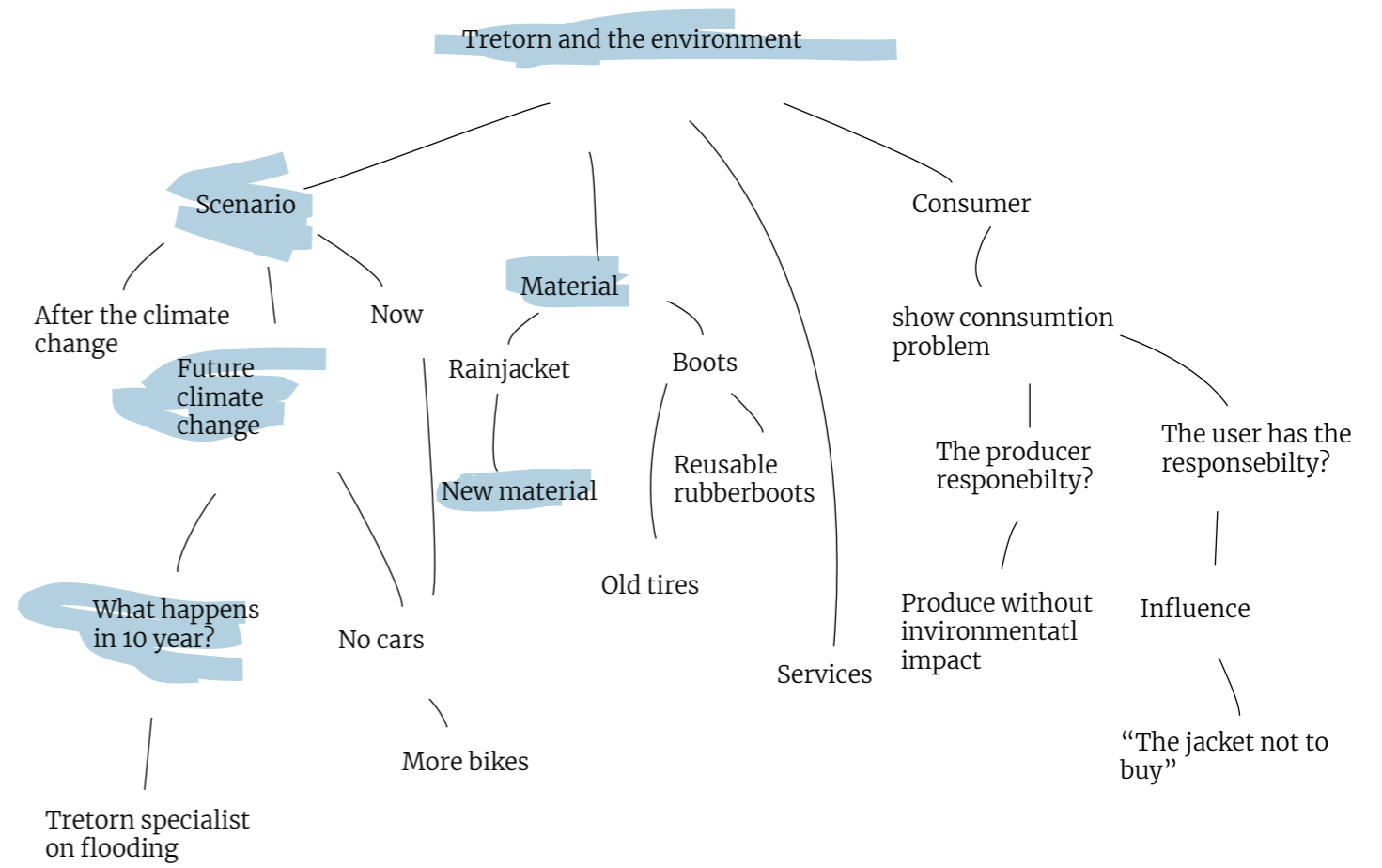
In the mentioned presentation, Carl Lidgard told us about his favorite places in the world, all of which, he claimed, are being destroyed by climate change. As the coastal erosion of the beaches in the south of Sweden are left unchecked the beaches keep shrinking. Carl argues that anyone can see these beaches are not healthy. He then advised us to follow his example and find a topic related to global warming which engaged us on a personal level. Working with a commercial company always means producing and selling products at the end of the day. The thought of developing yet another product to increase sales was challenging for the entire group, as any new product almost by necessity impacts the environment in a negative way. The joint conclusion from these struggles was to pursue a product with as little environmental impact as possible that could also inspire further product lines within the market to reduce their climate impact. An interesting starting point we all agreed.

# TIME SCHEDULE



**Brainstorm Direction**

Three different directions or viewpoints seemed particularly interesting to me during my brainstorm: working with the material, the scenario or the consumer. To see what a scenario could look like I started to investigate how climate change could impact the Swedish weather. Tretorn are interested in innovation and being rainproof and that is why the material could be an interesting way to go. I pinpointed the most interesting thing for me in this mind map and started to think about possible scenarios while simultaneously looking at different materials.



# RESEARCH ABOUT TRETORN

To do a project with Tretorn I needed to get a better understanding of the company. Web based searches relying on Tretorns own webpage were useful. Tretorn as a company has history back to 1890 and the company wants to promote the heritage of Tretorn. In the autumn 2017 Tretorn was part of a course taught by Carl Lidgard. I was a student in the course and had the chance to visit them and hear more about what they as a company are aiming for right now.

## ***Tretorns aim for the environment***

On Tretorns webpage (Tretorn 2017) they have a manifesto in which they declare how they would like to pursue a more environmentally friendly production. With their own words, Tretorn sees themselves as “a culture bearer within Swedish innovation. For them everything starts in their product. They want the product to communicate their history, values and their strong opinion on both style and function. For them it is absolutely essential to act sustainably and take care of the nature as much as they can. They want to use their heritage and knowledge to contribute to a better future. Therefore they have founded Eco Essential Initiative. They see their mission to be role models for how business can interact with nature and create a more circular process. They are inspired by nature’s own ecosystem and they strongly believe in a process where nothing should go to waste. They see it as product should last long, be reused and eventually recycled.”



## ***Tretorn History***

After some research I would say that Tretorn is a company, which started with a focus on materials. Initially they produced galoshes in rubber, from there it has been rubberboots, tennis balls, bathing caps and tires. (Wikipedia 2018)

In 1940 they additionally produced bicycle tires, rain wear, athletic shoes and rubber bands. In 1965 there was a reorganisation into four categories: Footwear in rubber, other footwear, Industrial rubber and Sport and leisure. There was a big loss of workers between 1963-1969. They had to let 3000 employees go. To manufacture a shoe in Sweden at this time cost twice as much as outsourcing the production. In the 1970s a lot of factories closed and in 1981 the company was sold to the Aritmos consortium.

In 2002 Puma acquired Tretorn, only to sell it again in 2015 to Authentic Brands Group. This was the end of the entire Tretorn product line, except for the sneakers as Authentic Brands Group wanted to continue with sneakers in USA (Kolmodin 2017). Around this time Vasko Markovski and Joakim Appelqvist started a new company called Tretorn Sweden AB and bought all the assets except the brand name that was still owned by Authentic Brands Group. The Swedish part of the company has its facilities in Helsingborg. They are now putting new energy and effort into the company and maintaining the extended product line.

## ***Design management course HT 2017 and Tretorn***

In the autumn of 2017 Tretorn was part of a course led by Carl Lidgard. I was a student in the course and had the chance to visit them and hear more about what they as a company are aiming for right now. Their vision is to move away from being a ‘jack of all trades’ into a specialist position. Since the company was forward and innovative earlier in history Tretorn today also wants to be bleeding edge, supporting advanced product lines with an innovative approach. Furthermore they want their products to communicate their history, values and their strong opinion on both style and function.

## FIRST BRIEF

Global warming has reached 2 degrees and a 25-year old student in Kristianstad experiences a heavy rainfall during her walk from school. The product designed for Tretorn will help her stay dry on her way to a cafe in town where she will meet up with a friend.



# FIRST MEETING WITH TRETORN

The 25th of January me, my fellow students and Carl Lidgard went to Tretorn head office in Helsingborg. We all presented our briefs and discussed our projects together with Peter Lindblom and Johanna Wikstrand Gartmyr (Fashion Designer at Tretorn). In my brief we discussed the potential of future flooding in Sweden. I mentioned how Venice is flooded often during the winter (The Guardian 2015). This could possibly be the future for some places in Sweden. When I talked about the flooding in Venice, Carl Lidgard mentioned that during one of his visits in Venice he had witnessed it himself. He told me that in Venice they are selling low cost galoshes to unprepared tourists.



The picture is taken 2012. 70 % of Venice was flooded when the sea level increased 150 cm. (AFP/Getty 2012) This is the footwear that is sold to tourists.

## ***Questions that appeared during my brief in the discussion with Tretorn***

In the discussion with Tretorn and the other students some questions were raised and discussed. The following questions helped me to delve further into the research and decision-making.

- Is it a product the user already wears before she/he knows if it is going to rain?
- Is it a product that you bring in case of flooding or heavy rain?
- Is it going to be a garment?
- Can it be something the private person will not own by themselves?



**Look in Tretorn's archive**

When we visited Tretorn we had the opportunity to look into Tretorn's archive, in which one could find many different models of galoshes and boots with high shafts. The visit made me ponder the historical usage of the galosh, how common it was in the early 1900 and how the demand went down in the 1940s (Wikipedia (2018)). In a blog by Lotten Bergman (2017) it is claimed during an interview that the galoshes stopped selling because all shoes started to be produced with a rubber sole. Previously most shoes were made in leather and the galoshes helped to protect both the sole from wear as well as the feet from getting wet.

It was inspiring to see how many different rubber shoes Tretorn had produced and sold throughout the years. Maybe I could use some of the old aesthetics or functions as inspiration for my project?



# **DESIGN PROCESS**

# **2**

### ***Design process***

Background research was made in the area of global warming and how it may or may not impact the Swedish weather. This is an important element of the thesis in order to visualise what the future use of footwear may look like.

I have also investigated the Swedish recycling system, in order to see how we recycle different types of material and products. Tretorns product line includes both clothes and shoes and hence I wanted to investigate how we recycle and reuse these kinds of products in Sweden.

By the use of a questionnaire I was able to gather relevant information about rubber boots and how people use them in everyday situations. The questionnaire was distributed via Facebook yielding a total of 215 replies. The questionnaire clearly showed that the majority of the participants chose to refrain from using rubber boots when traveling to school or work even though they own such products and the weather conditions suggest they are a suitable choice of footwear.

With the Swedish weather, recycling and the questionnaire results in mind I was able to limit the scope of the project and thus advance in the design process.

I also performed a so-called 'function analysis' where I formulated the head function and necessary functions of the product.

By ideation and sketching I visualised different products that could work in a flooded city, of which I kept the two most promising ideas for further design.

After this I started to construct mock-ups and functional models.

The idea of something that you can pull over your ordinary shoes in order to protect the shoe and the feet from rain was had, and I wanted to get more information about the galosh.

I further investigated the historical use of the galosh as well as the current market of galoshes. Furthermore I investigated the durability of various galosh products in relation to their respective storage volume.

Mock-ups and prototyping was necessary to find the right function and look of the product. Throughout the project I have been turning both to the Tretorn brand and style as well as some other products to get new ideas and inspiration.

# RESEARCH

# 3

# HOW CLIMATE CHANGE IMPACTS SWEDEN

I have studied how the Swedish weather is affected by global warming currently as well as how it will be affected in the future. In order to get a more specific scenario I wanted to zoom in on a specific Swedish city. Of all Swedish cities Kristianstad lies at the lowest altitude under the sea level, which is why they are already suffering from flooding.

## **Today**

Man made climate change is already impacting the global weather. According to SMHI (2017) the global mean temperature has increased with 1 degree and in some parts of Sweden the increase ranges up to 1,5 degree. The study used data from 1991 to 2016 to form a current mean temperature and data from 1961 to 1990 compute the comparative value. Referring to the same time periods the combined rainfall and snowfall has increased with 10 percent nationally. During the Swedish winter season the largest difference in average temperature increase was between the south and north of Sweden with a 1,5 and 3 degree increase respectively. The downfall has increased the most in Skåne.

## **The Future**

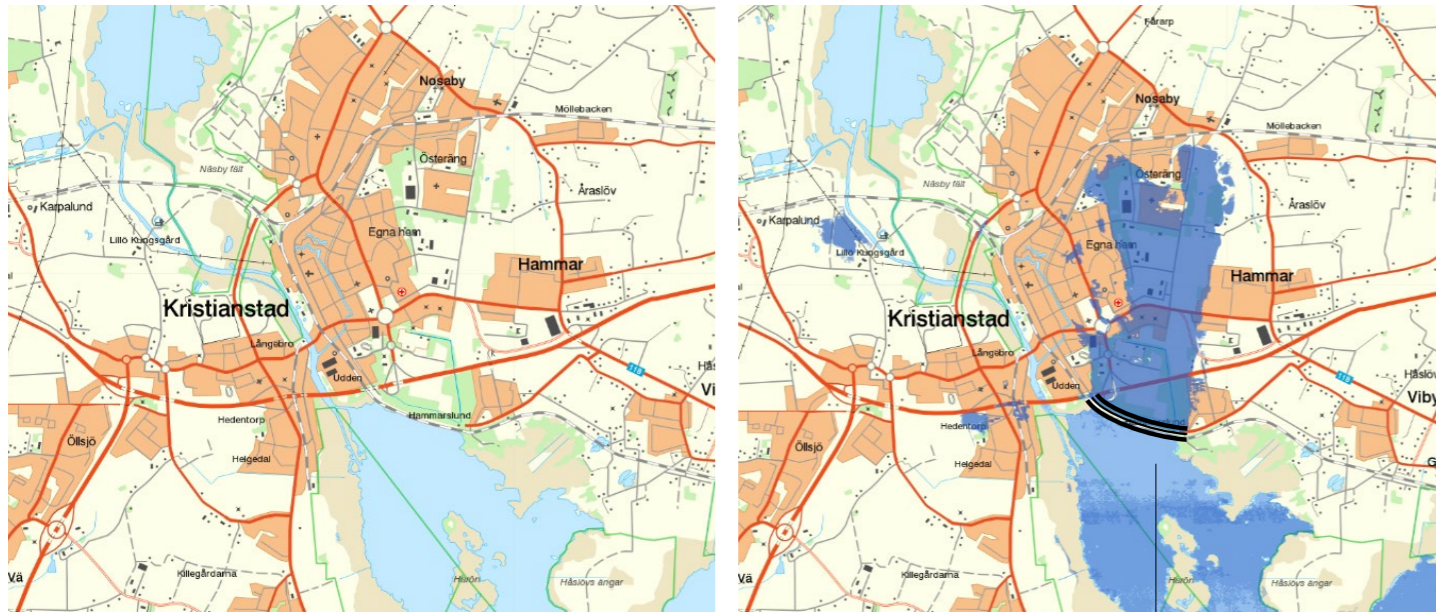
Naturvårdsverket (2017) claims that even if the emissions of greenhouse gas from man made sources were to come to a halt today, it would still affect mankind for many years to come. It would take several years for Earth to stabilise and maybe a 100 or 1000 years to see how emissions actually affected Earth. The sea level will increase between 0,52 m and 0,98 m from year 2005 to year 2100. This is going to affect cities already close to the sea level and cause flooding. However, not only the coastal cities are going to be affected since heavy rain and more droughts will result in more flooding in general (SMHI 2015). SMHI's predictions tell us that during the winters to come there will be 10-20 percent more rain and snow when the global temperature reaches a two degree increase compared to pre industrial values.



### **Kristianstad**

The maps show how large parts of Kristianstad may be covered in water in 2050 (SMHI, SGI, Lantmäteriet, 2018). FNs Climate panel has made four different scenarios, “Representative Concentration Pathways” (RCP), assuming various ratios of greenhouse gases present in the atmosphere (SMHI, Naturvårdsverket 2015). Four scenarios were presented of which RCP 2.6 had the lowest greenhouse gas ratios and corresponded to a drastic reduction in greenhouse gas emissions before 2020. I have chosen to use scenario RCP 2.6 as this represents what at least will happen, the aspirations from 2015 United Nations Climate Change Conference in Paris, should they be met, also correspond to this scenario.

### **Kristianstad today and 2050**



The wall Kristianstad is building

### **Building a wall**

In Kristianstadsbladet (Carlsson 2017) we can read about how Kristianstad is preparing for such a scenario by building a wall to protect the threatened parts of the city, seen in the right picture. The wall will be 10 kilometres and there will be six pumping stations. According to Kristianstadsbladet, they are preparing for an imagined worst-case scenario, corresponding to a rise in water levels of approximately 4 meters. However, in the very same article, Karl-Erik Svensson, project leader for building the wall claims that they are expecting some parts of the city, like the city park -Tivoliparken-, to be flooded even with the wall in place.



Tivoliparken, Kristianstad year 2002 when the city was under a flood. The water level was measured to be 2.15 meters over the sea level. (Carlsson, 2017)

# RECYCLING IN SWEDEN

While speculating about the future use of materials I asked a question: “What if the laws regarding use of virgins materials are changing? What if we were to have very strict laws limiting the use of virgin materials?”. In order to better understand how we recycle clothes, shoes and various other things today I devoted some time into research. This research later became valuable to the project.

## Recycling in sweden

The Swedish recycling system can be considered high quality in part. Below follows some general information about the recycling system in Sweden.



Paper: Around 80 % of the magazines we use in Sweden are recycled.

Paper fibre can be recycled up to seven times.



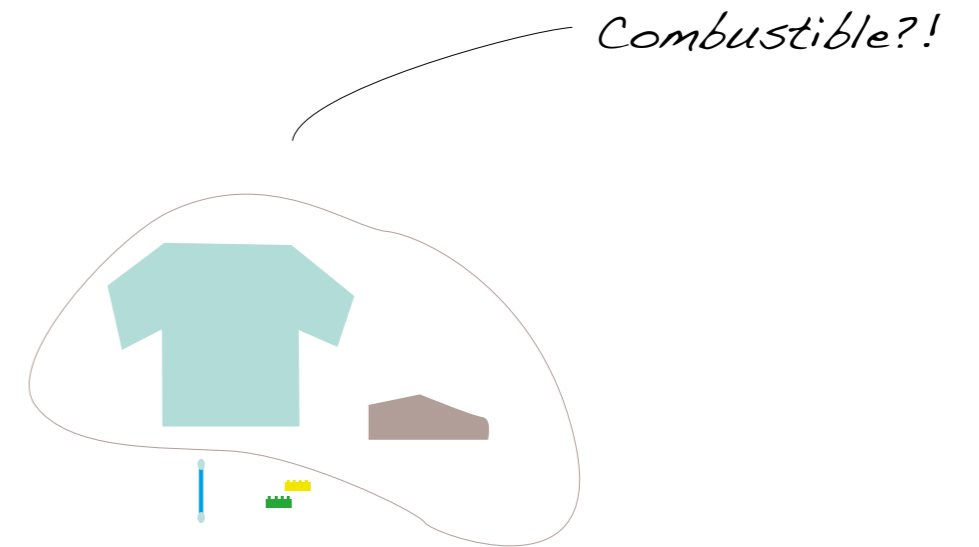
Plastic: We are recycling 40 % of the plastic containers in Sweden. 1 kg recycled plastic reduces the emissions of CO by 2 kg compared to new manufactured plastic.



Glass: In Sweden 93% of all glass containers are recycled. When recycling glass you save 20% energy compared to producing it anew. The recycled glass may be recycled several times.



Metal: 73% of all metal containers are recycled. By recycling aluminium containers 95 % of the energy is saved compared to new production.



Combustible: Products that are not containers in wood, rubber, plastic and textiles are put here. Like dish brushes, vacuum cleaner bags, clothes, shoes, envelopes, pencils, toys, etc.



# SUSTAINABLE CLOTHES

## *Recycle Clothes?*

The materials for clothes and shoes we use and produce today are very hard to recycle. Especially for shoes. The Swedish recycling system is not adapted for the recycling of clothes and shoes. At “Sveriges Konsumenters” webpage it is stated that it is forbidden to put anything but food containers in the recycling bins today. Shoes and clothes should be put together with combustible waste. According to Swedish consumers (Sveriges Konsumenter, n.d) webpage swedish citizens purchase 13kg clothes per person and year of which 8 kg is finally put aside as combustible waste. Many choose to leave their clothes for second use and also in recycling stations made available by various clothes stores. The question of where these clothes end up is raised? According to The Mistra Future Fashion research (2015) it is very time consuming to sort clothes. In fact most of the sorting is manual. Therefore all sorting of clothes are placed in countries with cheap man labor. Still it remains very difficult to recycle textile fibres into new textile fibres. Ultimately it is a question of profit, and it is not so profitable as the recycled fibres are very weak.





### **Other ways to sustainable fashion**

In the future fashion manifesto (2015) a list is presented on how we may lead a sustainable life today. Some of the points made are useful for my project. The highlighted points will be considered in this project.

- Care for it to enable re-use by others
- Enable further use by providing it to resellers
- Consider transportation mode when shopping
- Ask producers for more information on their sustainable work
- Utilize wearing as a statement of being sustainable
- Invest into garments that are of high quality (to enable long life-span)
- Ask social bodies for standardized infrastructure for worn-out garments/ waste

### **How does it influence in the climate?**

Mistra fashion Future (2015) gives an example: if we use garments 3 times longer than we do today, we reduce its influence on climate change with 65% and its water usage with 66%.

### **Fashion in reused plastic**

For now it is much easier to recycle fabrics made in plastic. In Asia recycling of Polyester fibres is quite big already. For instance the project Ghost Net Collection by Tretorn is made of reused fishnets. In the area of waterproof garments, plastic is easier to use as a reused material.

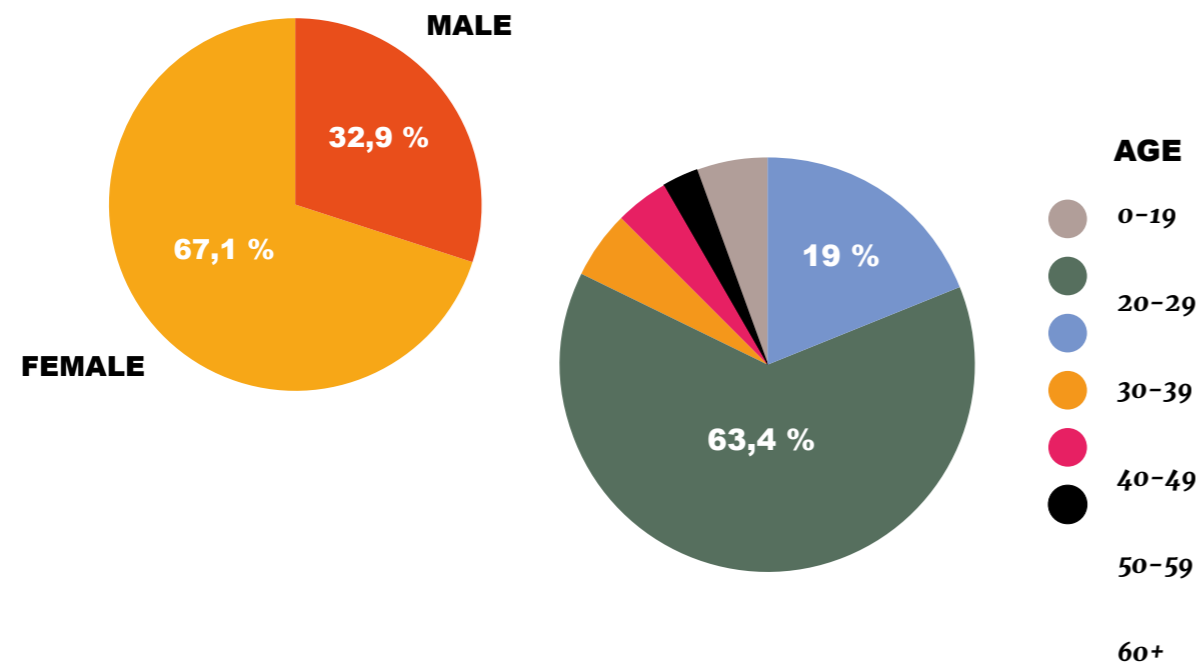


**EXECUTION**

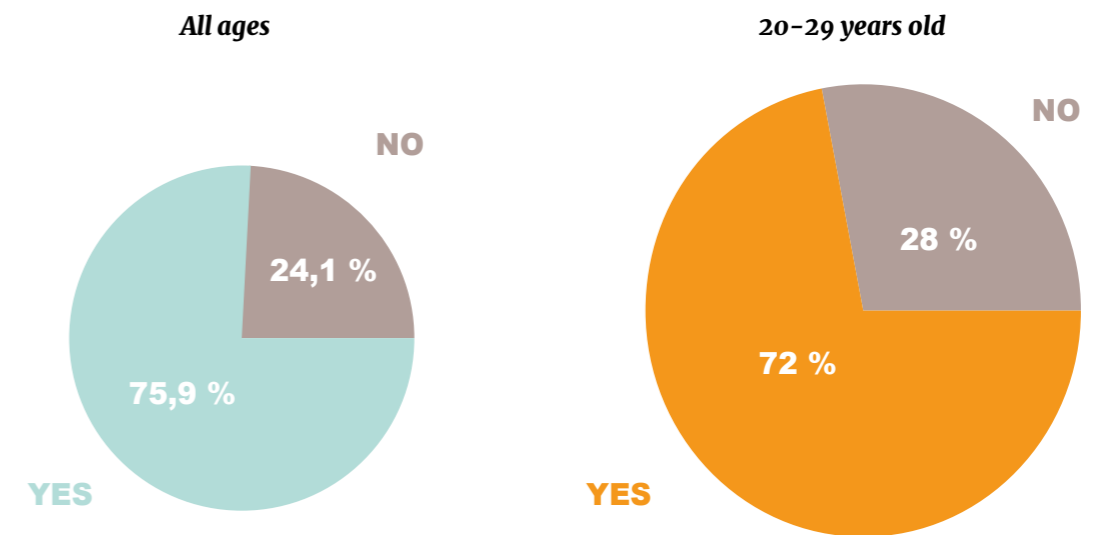
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# QUESTIONNAIRE ABOUT RUBBER BOOTS

213 persons have answered the questionnaire. 65% were females and 62% were aged 20 to 29. Among the group who did not possess a pair of rubber boots the most common stated reason was that they didn't feel a need for it or that they had other shoes that were waterproof.



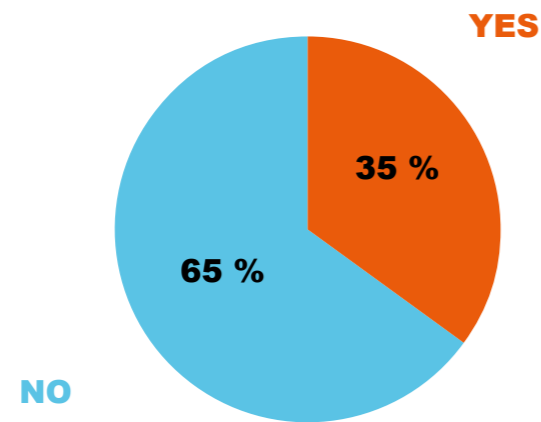
Do you own a pair of rubber boots?



## AGE 20-29

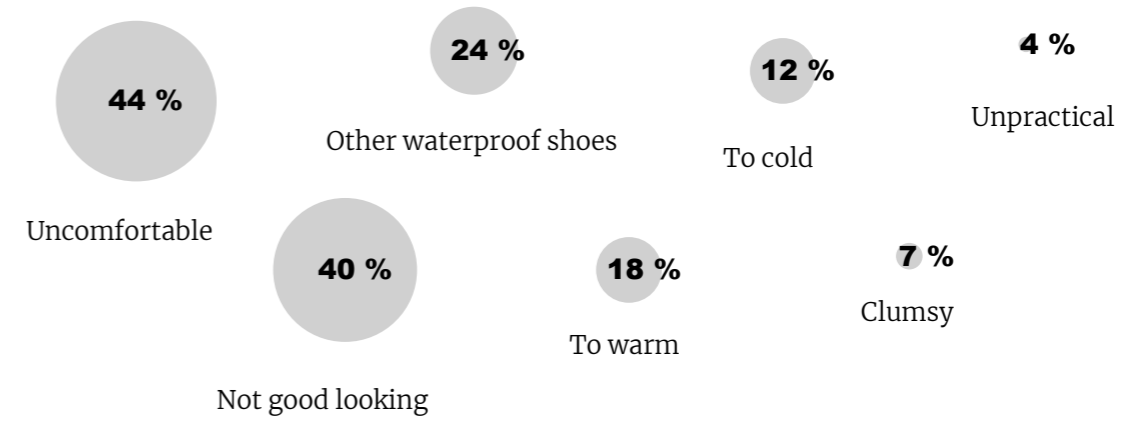
100 pers 20-29 years old

If it rains when you are going to school or work, do you use your rain boots now and then?

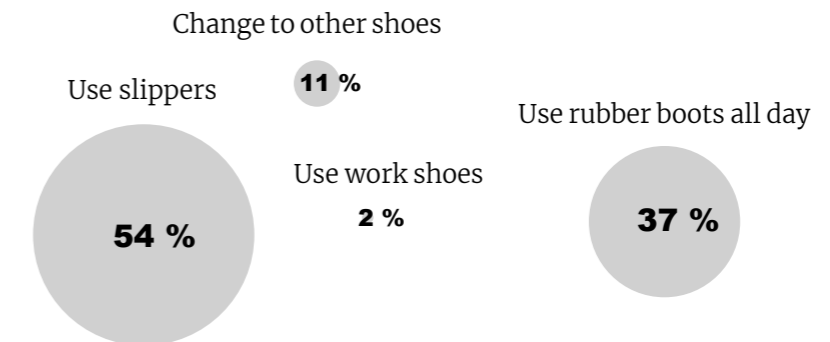


There were 100 persons aged 20-29 who answered that they did possess a pair of rubber boots and 65 percent of this age group did not wear their boots traveling to or from school or work. Of the 65 persons almost half of them declared that the reason for not using them was because they found them ugly or uncomfortable, while 16 answered that they had other waterproof shoes.

If it rains when you are going to school or work and you are not using your rubberboots, Why not?

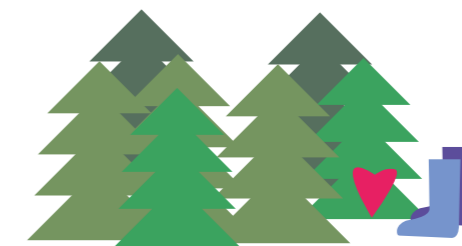


If it rains when you are going to school or work and you are using your rubberboots, how will you use them during the day?



26 of 65 persons that do not use rubber boots are traveling daily by train and 19 of them are biking and walking as well.

Many people seemed to use their rubber boots in the forest or in the garden.



## BRIEF

Global warming has reached 2 degrees and a 25 year old student in kristianstad experience a heavy rainfall in an afternoon in march. The product designed for Tretorn will help her feet stay dry on her way to a cafe in town with a friend after work.



## FUNCTION ANALYSIS

In a functional analysis different functions are analysed. They are described by nouns and a verb and are finally valued as necessary or Desirable and The head function is also marked.

<i>Keep foot dry</i>	<i>HF</i>
<i>Environmentally friendly</i>	<i>N</i>
<i>Easy to access</i>	<i>N</i>
<i>Prolong shoe life</i>	<i>N</i>
<i>Allow natural movement</i>	<i>N</i>
<i>Attract target group</i>	<i>N</i>

# DEMARCATIONS

To limit the purpose and make the product more specific, demarcations were made. The demarcations were motivated by the presented background research.

## ***Keeping the foot dry***

The focus will be on the foot. The feet are the part of the body that is the most exposed when the flooding occurs. The product should be able to keep the users feet dry during a 20 cm flood

## ***No electricity***

The usage of the product should be independent of electricity, in order to avoid a conflict with the brief and ease the strive towards sustainability.

## ***Easy to access***

The product should either be accessible all the time or easy to access when there is a sudden flood.

## ***Sustainability***

In the research area regarding sustainable clothes I have chosen to include the list produced by mistra fashion future (2015) which was made to help consumers act more sustainable. How can this product be developed to help people act more sustainably? According to Mistra Fashion Future (2015) it is important that we use our clothes for a long period of time. Therefore the product should be durable and high quality and/or protect other shoes in order to extend their lifetime. An additional way is to let this product be developed to be produced by recycled materials and/or materials that are easy to recycle.

## ***For the private consumer***

The focus is on a product for the private consumer, just like the Tretorn business model works today.

## ***For 20-29 years old***

Tretorn has today several products designed to attract young urban users. Still the questionnaire shows that many in this particular target group avoid using rubber boots. The focus should be on young people and a product that will fit this target group.

## ***For the urban consumer***

The questionnaire indicates that many people choose not use their rubber boots when travelling to school or work. Even among the people who answered that they did, many did not want to wear them once they arrived at school or work. The urban person travels from one point to another. When they get inside they do not want to wear their rubber boots.

The focus of this thesis is therefore to develop a waterproof product that urban people would want to use more than today's rubber boots. This aligns with the aspiration of Tretorn, who claims they want to be a specialist in their field. In other words they do not want to produce general products. This product could very well be more of a specialist product, designed for the urban use case.

# IDEATION

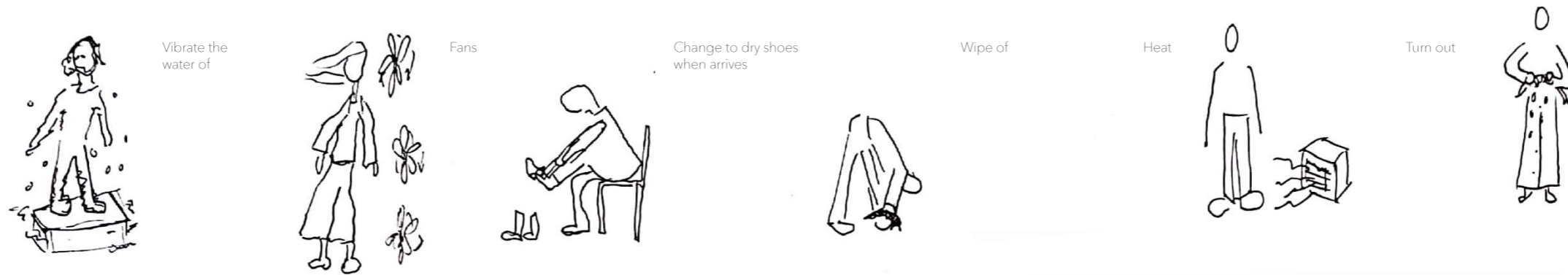
## Dry when you arrive or dry all the time?

When I started with the ideation it was not decided that feet should be dry all the way from travel point A to travel point B. The only thing decided was that the user should be dry when he or she arrives at travel point B. It was explored if this could be achieved in multiple ways.

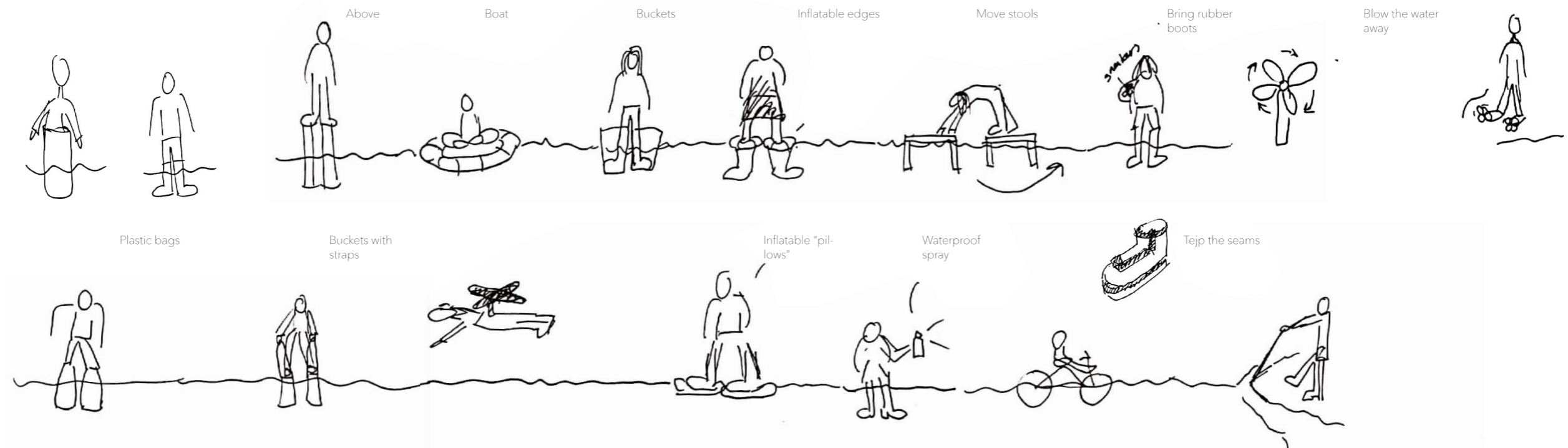
## Demarcation

After the ideation I decided to continue in the direction that the user should be dry at all times. To be wet while moving outdoors is bound to be cold and result in sore feet.

DRY WHEN YOU ARRIVE



DRY ALL THE TIME



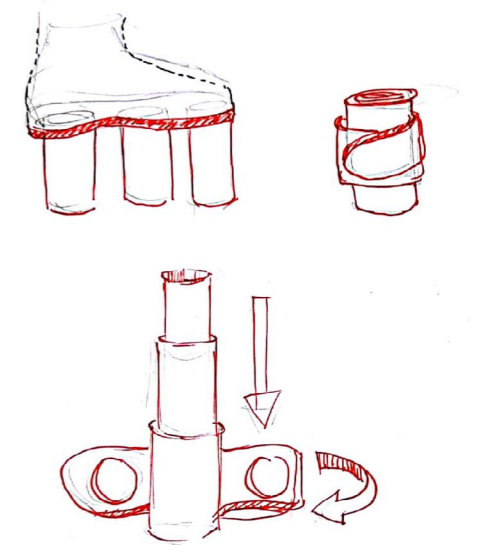
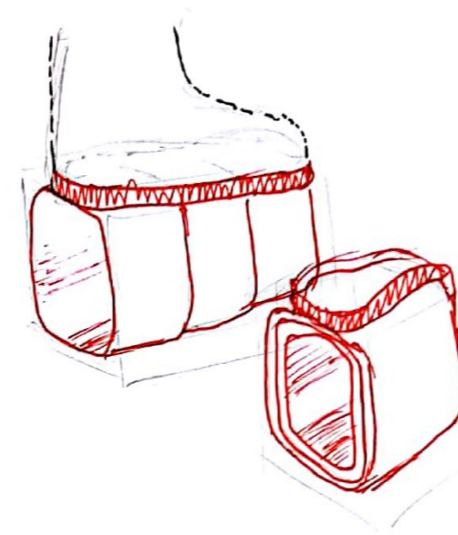






**Building mockups**

Since the product should not take up overly much storage space I wanted to start building mock-ups quite fast in order to be able to actually try out how to achieve a platform design while keeping the storage space small. Maybe it could be something foldable or inflatable? By using paper, cardboards and balloons I experimented and built prototypes going from something flat to a platform shoe.





## IDEA 2 THE BAG SHOE

Something that you can pull over your shoes. It works almost like a plastic bag. In fact, it is similar to something that has been on the market for many years. I decided to look into the history of similar products as well as today's market.



As mentioned in the beginning of this project, people in Venice purchase these “foot bags” when the city is flooded. In The Guardian (2015) it is described how floods are most common during winter due to high tides and strong winds in the Venetian lagoon.



Photograph: AFP/Getty



## SELECTION OF IDEA 2

I can't help returning to the galosh. There are many upsides and good arguments for developing this idea further.

- **Comfortable.** Many people in the questionnaire answered that rubber boots were too uncomfortable. If you use a galosh, the comfort is not in the galosh, it is in the shoe underneath, the shoe, which you have chosen by yourself.
- **Cold or warm?** The galosh is just on your feet while you are outdoors. You are not supposed to wear it for a longer time and it is the shoe underneath that is the shoe, which is important.
- **Protecting the shoe underneath.** In Mistra Future Fashions listing of what is important for a more sustainable use of clothes, one of the guidelines is to take off the clothes and shoes. The galosh is protecting the shoe that is not made for water.
- **Easy to access.** Most people would not wear their rubber boots if it were not already raining. If it is possible to create a galosh that is easy to bring (like a small umbrella) people are more likely to be prepared for sudden flooding.
- **Heritage of Tretorn.** Heritage is important for Tretorn. 50 years ago and ranging back to almost 100 years ago Tretorn was a big seller of galoshes. Maybe it is time to bring them back?
- **Style.** What is style? Style is subjective, and the rain should not affect yours. The galosh is enabling you to maintain your style when arriving at work or school.



## BUT WHO WANTS TO COVER THEIR FEET WITH PLASTIC BAGS?

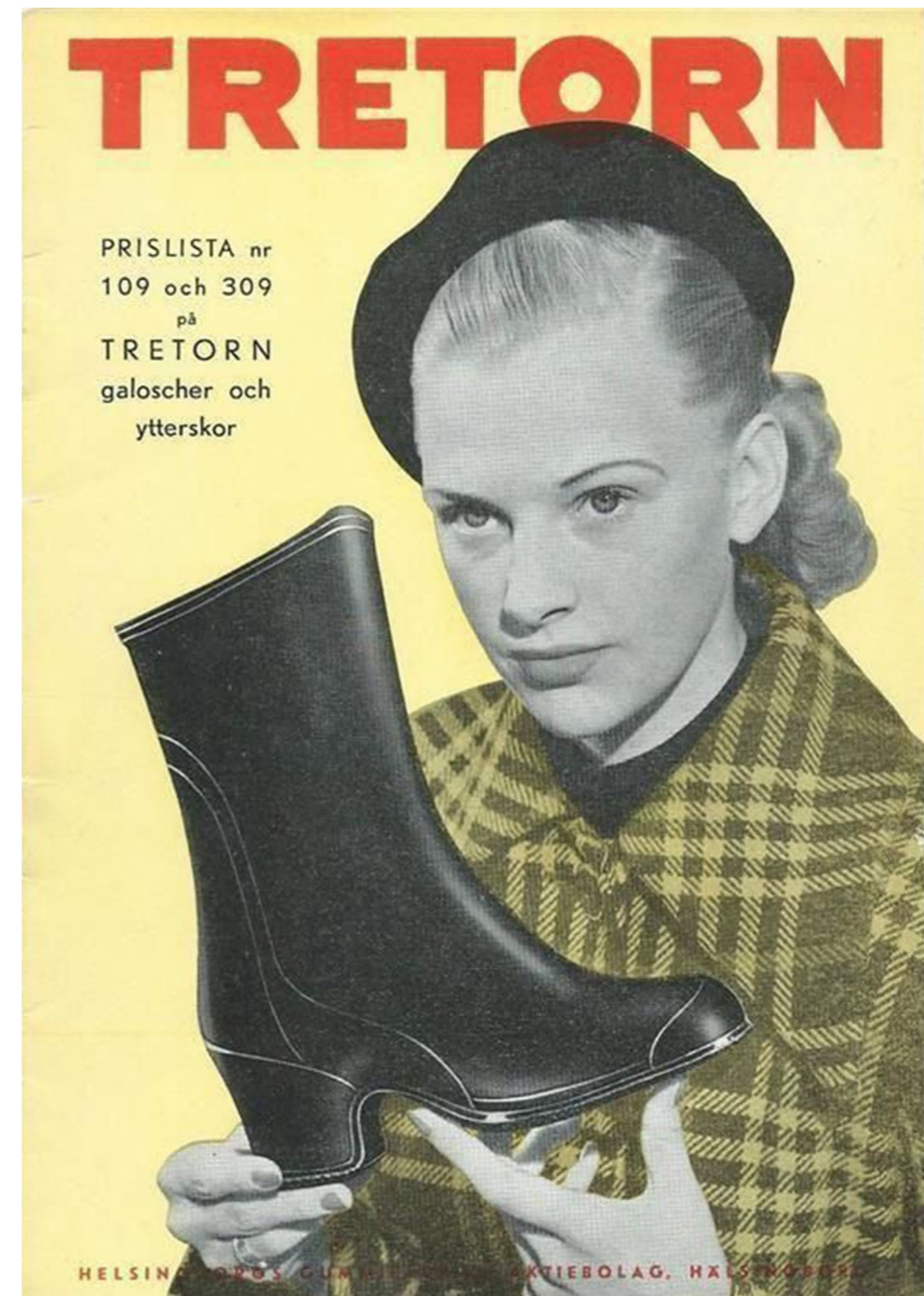
Even though the shoe underneath is in focus it is important for the developed product to present a nice look in the urban environment. Recall from the questionnaire that many refrained from using their rubber boots simply because they did not like their appearance. I experimented with plastic bags and a piece of fabric. The first picture is simply a plastic bag wrapped over my foot and it also looks like a plastic bag. In the second picture there is a rubber strap around the plastic bag and the appearances change a bit. It now looks more like a shoe. In the third picture I used a green plastic bag in a fabric-like material, wrapped it around the shoe and attached it with tape. This drastically changed the appearance and made it look even more like a normal shoe.



## THE GALOSH

*“The galosh is something you put outside the shoe to protect your other shoes from getting destroyed. They galosch has been around since medieval times” (The Nordic Museum, 2017)*

In order to further pursue a galosh like product I needed to extend my research on the history of the galosh as well as the current state of the market for galoshes.





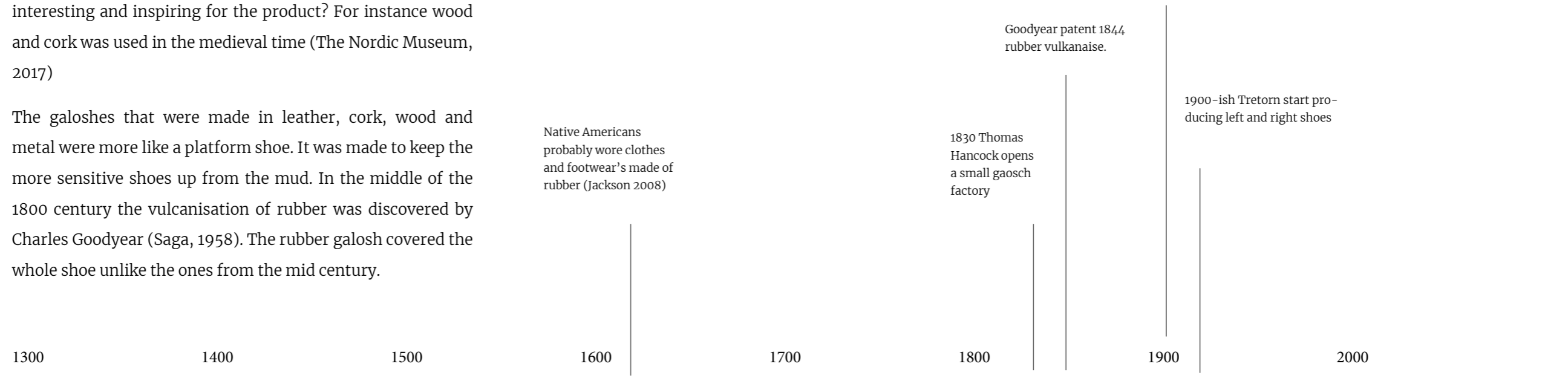
# HISTORY ABOUT THE GALOSH

I made a timeline with all the information I could find about the galosh. Some things were more interesting for the project. Is there some previously explored material that could be interesting and inspiring for the product? For instance wood and cork was used in the medieval time (The Nordic Museum, 2017)

The galoshes that were made in leather, cork, wood and metal were more like a platform shoe. It was made to keep the more sensitive shoes up from the mud. In the middle of the 1800 century the vulcanisation of rubber was discovered by Charles Goodyear (Saga, 1958). The rubber galosh covered the whole shoe unlike the ones from the mid century.



Goodyear galoshes 1911



1351 Galosh is a French word and was used a shoe with thicker sole

The galoshes was made of leather, cork and wood

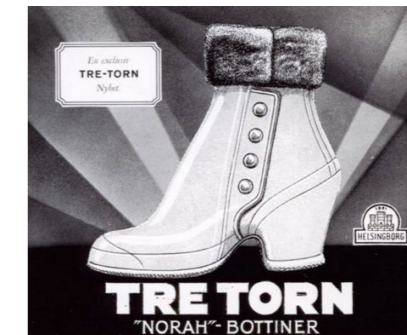


At the 18th 19th century it was more common that they were worn by the women because their shoes didn't had thick soles.



1850 rubbergaloshes started to be produced in Europe

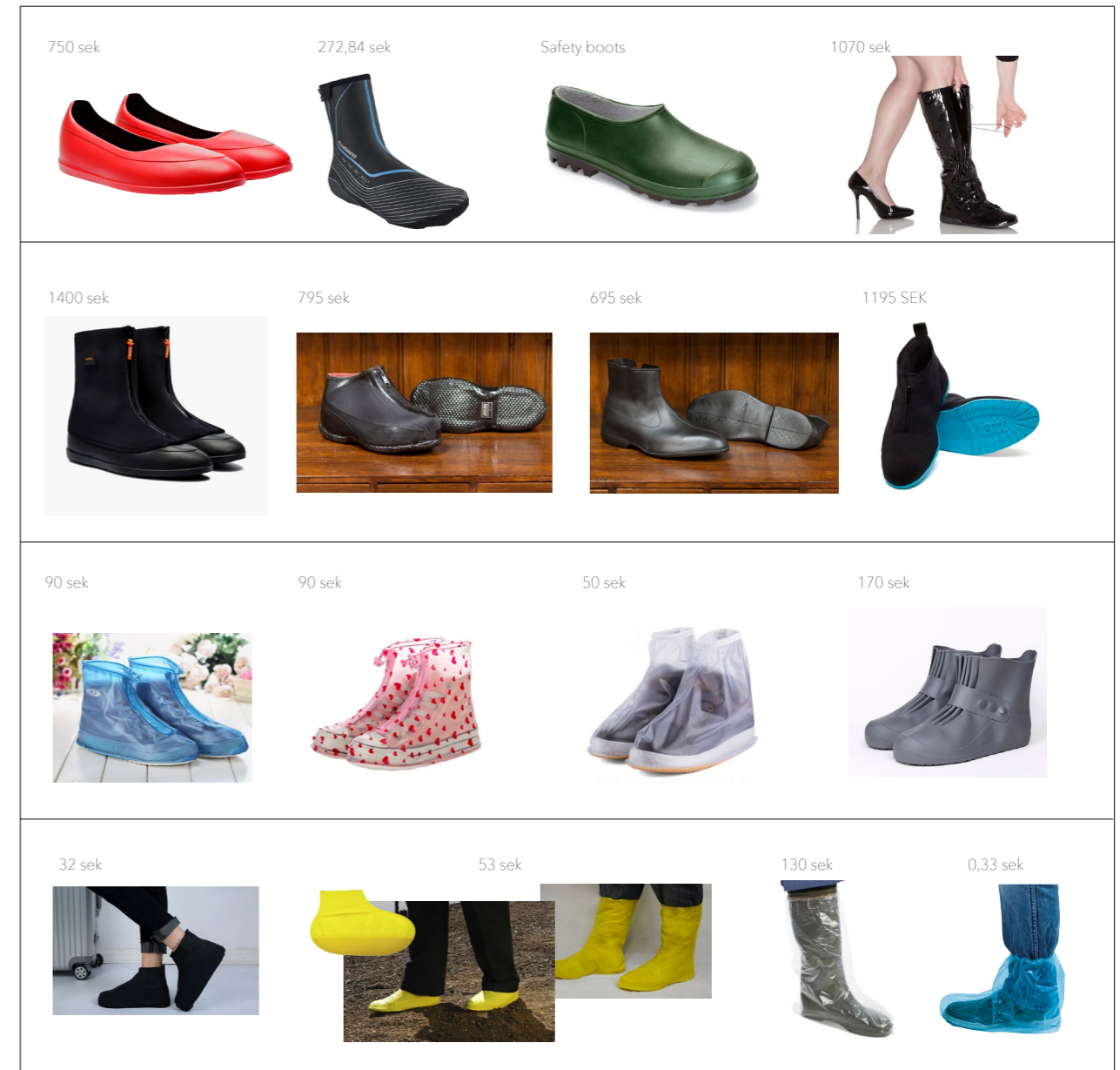
1890 Tretorn start a galosh factory in Sweden





# MARKET ANALYSIS OF THE GALOSH

A look into the current market revealed quite a big range of different products. The variety is however not found in Sweden, but instead mostly at online shops like Alibaba and Ebay which work with a lot of different suppliers. Because of this the quality varies a lot. In Sweden the most common galosh is the low galosh that protects the shoe with a leather sole, as you can see in the first picture on next page.



### **A gap in the market**

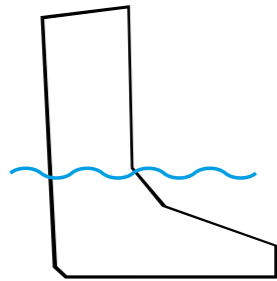
My hypothesis looking into the galosh market is that most durable models are taking up a lot of space when they are not in use. I believe that the ones having a lower volume when not in use are of a more disposable kind, and the more durable ones are from retailers, which are often not very reliable. The most durable ones are similar to the galoshes produced during the 1930's, which also take up a lot of space. From my demarcations and the function analysis I conclude that the product I am designing should be easy to bring but also environmentally friendly. Therefore I sorted all the found galoshes into two different categories: Durable-disposable and Small volume-Big volume. Volume here refers to storage volume or volume whilst not in use.

### **How can I use this information?**

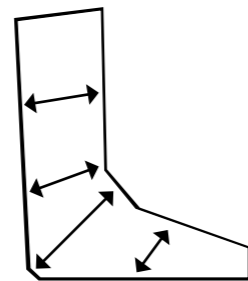
In the chart it is clear that the corner where the galoshes are both durable and have smaller volume is empty. There are no products that fit in here. I believe this area is interesting for Tretorn. In order to start producing a new galosh there has to exist a strong market. The product has to stand out from the other galoshes already on the market. The easy to bring and durable galosh is unique.



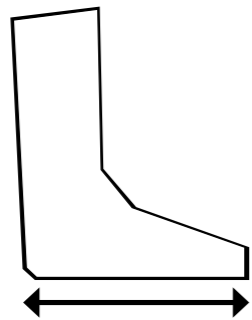
# WHAT IS IMPORTANT FOR THIS GALOSH?



Waterproof



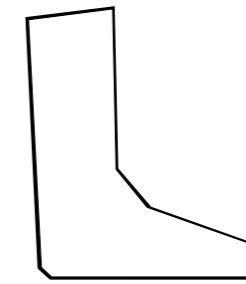
Directions where the galosh has to be big enough for the foot and then be tight again when it is on the foot.



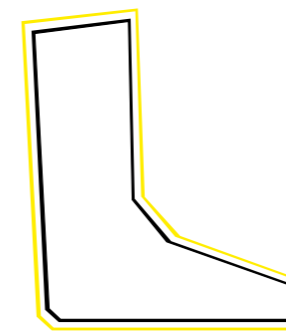
It is not going to be one size fits all but it is important that it fit one person's different shoes



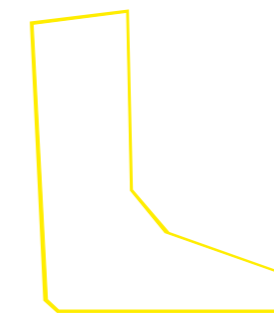
Need to protect the galosh from the ground and have some grip. It also need to to be protected from the inside.



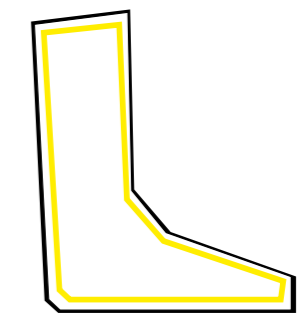
Be tight around the foot when it is on. This could be made in different ways.



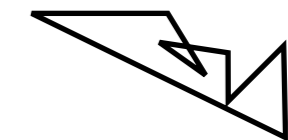
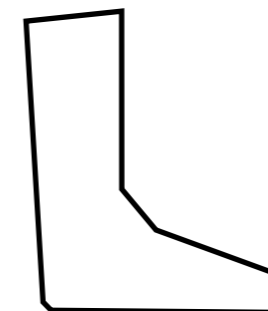
The outside can be flexible or stretchy



The hole shoe can be flexible or stretchy.



The inside can be flexible or stretchy.



## VISIT AT CLAES LUNDH IN BORÅS

Me and my fellow student's who worked with Tretorn had the opportunity to meet the textile agent Claes Lundh. When we arrived I told him about my idea of a modern galosh and raised the question of what fabrics there are on the market.

Are there lightweight fabrics, durable fabrics and Waterproof fabrics? He replied that all of the mentioned exists but I must know exactly what I want. I thought that I knew well enough what specifications I was after, however upon conversing with Lundh I realised that the possibilities were more or less end-less. Ultimately it seemed to be a matter of cost, this visit was somewhat confusing.

I thought that I would use "good" fabrics and base my further work on what the fabric market had to offer, I quickly realised that this was a poor way to work. It seemed now a better Idea to go back and specify what I wanted and then see if this could be achieved.

### **Reflections**

For me this was a good learning experience. The textile market is big and complicated and an expert is required in order for competent decisions to be made. I would have to revisit Lundh and ask for advice again later, which I also did.

### **Demarcation**

Claes Lundh also explained that a stretchy fabric is weaker than a stiff fabric. Striving for durability I decided to continue further work with stiff fabrics.



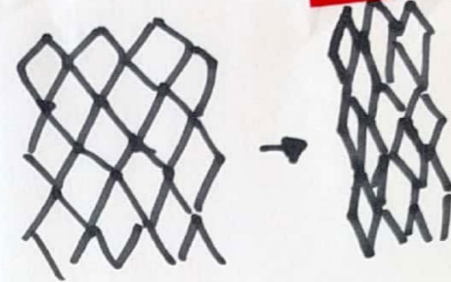


# INSPIRATION

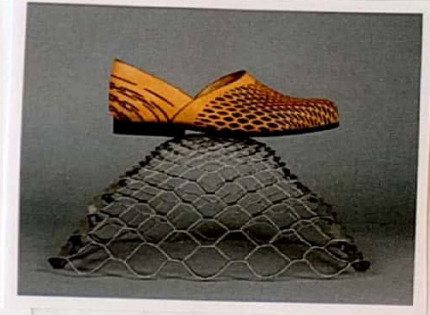
These are pictures that inspired me during the project. The theme is mainly about how to tighten the shoe when it is on the foot. Should it be a zipper, buttons or a folding technique? Later in the process these pictures inspired several sketches and models.







Ha tyg under  
töjort nät?



Kolla  
gamla metoder  
för Skosömnad



## SKETCHING IDEAS

I sketched on ideas continuously throughout the project. On the right you can see a summary of my ideations and ideas that formed during the project. Some of the ideas inspired me more than others and for these I started sewing mock-ups.





# MOCKUPBUILDING

- 1 The folding: Upon discussion with Peter Lindblom regarding this idea we concluded that it would be difficult to make a fold of this kind that would also be waterproof. All the seams would have to be taped which would make it very clumsy and difficult to manage. After the discussions I thought of other materials and alternatives to make the folding design viable but found them all lacklustre, so I decided not to pursue this design any further.
- 2 The rubber band: This design was inspired by the old sami beak shoes. As can be viewed at the inspiration board on page [83], this model did not keep it's good looks switching from a leather design to a softer material. I decided not to work any further with this design.
- 3 The net: The net design is keeping the inner cloth part nicely tuck to the shoe. It has the clear benefit of fitting most types of shoes. This concept felt new and fun but I did not yet know how to resolve the technical challenges regarding the sole, which could not be in the netlike material, as it would be torn apart fast. I thought of how to attach a net to a sole and if the net and the waterproof part should be all in one piece.
- 4 The buttons: The mock-up with the buttons work well on shoes with different heights and different sole sizes. There is a lot of room for experiment here as the buttoning could be made in many different ways. In the next step I started sketching on this Idea again.

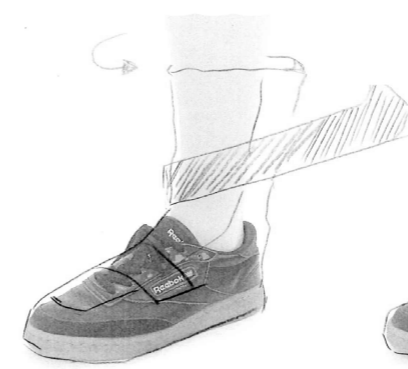
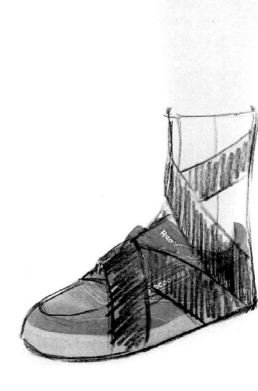
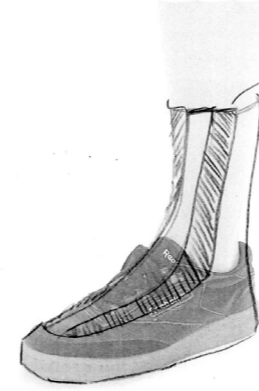
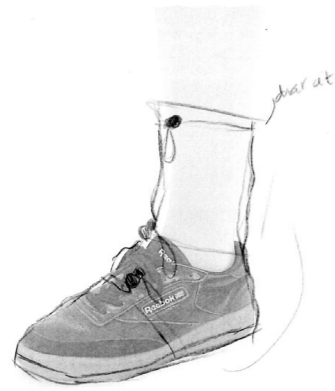
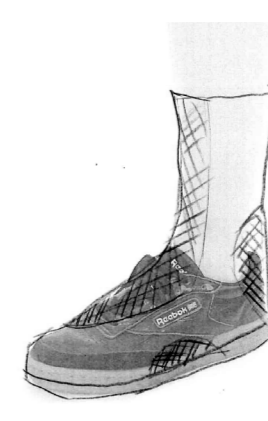
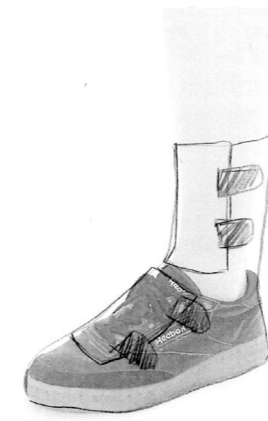
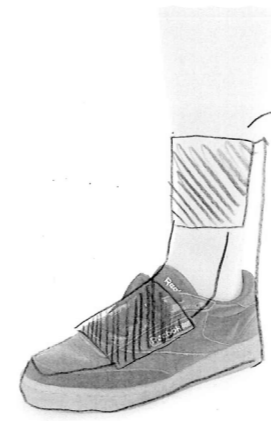






# SKETCHING AGAIN

After some sewing I went back to sketching. The sewing took a lot of time, during which several new ideas were formed. The sketches show different ideas of how to tightly wrap a stiff fabric around a shoe. In the sketches you can see buttons, velcro, zippers, rubber bands and other things that could be used to tighten the fabric to the shoe. Keep in mind that it is important that the galosh is flexible for different kinds of shoes.



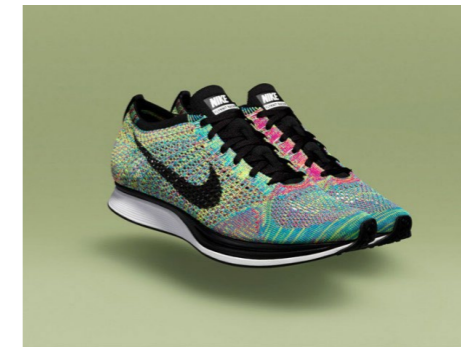
## PRODUCING THE NET?

For me the net was interesting and I showed it to my supervisor Charlotte Sjödel and we discussed production techniques. It would be beneficial if the current design could be kept such that there exists two parts, one that is waterproof and one that keeps the galosh together and enables fitting for a variety of shoes. We discussed if it could be 3D-knitted or 3D-printed. I immediately was interested in the 3D printing option.

### **3d knitting or 3d printing the shoe?**

#### **3d knitting**

A method where the knitting machine creates a knitted product from a pre defined digital file. The final garment does not carry any seams.



+ It is currently cheaper than 3d- printing.

#### **3d Printing**

A 3D printed object is also created from a digital file. It is possible to 3D print in a wide range of materials.



+ The sole and the net can be printed as a single piece.  
+ It is possible to print in rubber-like materials.

## GO FOR THE NET!

By 3D printing the net and sole they could be produced in one piece. This realisation was the key to making me want to pursue the net design further.

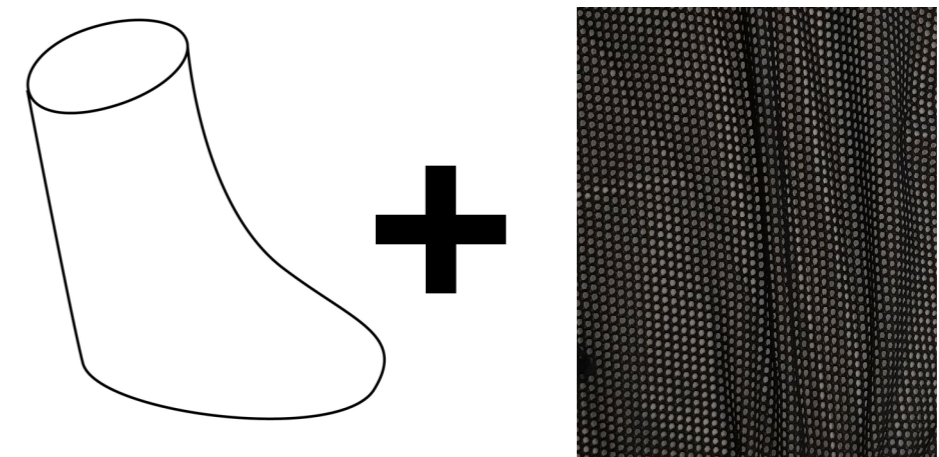


The concept of a two-part galosh have the advantage of:

- Not needing any glue or adhesive
- Being easier to disassemble for possible recycling.

## TWO PART GALOSH

One part that is waterproof and one part that gives structure and protection



### **Analysis**

Is it possible to produce and sell a shoe that comes in two parts? Almost all shoes on the market are in one piece. However shoes produced in a single piece are difficult to recycle, as I mentioned earlier. Perhaps this would rather be a major benefit to the two-part galosh?

**MATERIAL**

**4**

# WHAT 3D PRINTING METHOD SHOULD BE USED?

## ***Digital Light Synthesis (DLS)***

This is a 3D printing method that uses light and oxygen for construction. (carbon 2019) This printing technique behaves consistently in all directions unlike most other 3D printing methods. Carbon is a company that produces 3D printers adapted for mass production. Recently they have worked with Adidas who are launching the first mass produced shoe with a 3D printed sole.



## ***Material Jetting (MJ)***

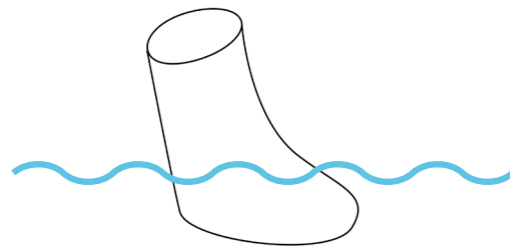
This 3D printing method works similar to a regular inkjet printer. The material gets printed layer by layer building up the structure which is then hardened by a UV light. (Additive Manufacturing Research Group 2019)

## ***SLS (Selective Laser Sintering)***

Uses lasers to sinter the powder exactly where the 3D model prescribes. This producing method has mostly been used for rapid prototyping.



# THE WATERPROOF INNER PART

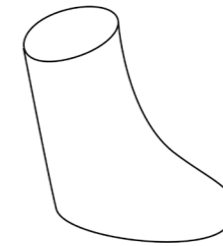


## **Talking to Claes Lundh about fabric again**

During my second discussion with Claes Lundh I had a clearer vision of what I wanted.

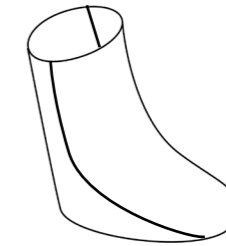
The final product must be water resistant enough to enable the user to be standing in a puddle of water for some time without leakage. For durability concerns the final product must not be made out of a stretchy fabric since, as Claes Lundh put it, “all stretch makes it more weak”. The fabric should be as soft as possible to easily be shaped according to the shoe form. Claes claimed that it probably has to carry a density of at least 150 g/m<sup>2</sup> to endure the use case scenario. We also discussed how the fabric could be chosen environmentally sustainable. There exist many ways to label a fabric sustainable. It could be recyclable, toxic free or biodegradable. Claes mentioned a fabric displayed at the textile tech fair which is free from toxins and I decided to look more into detail regarding this fabric.

## **Two possible ways:**



### **OC2PUS**

Vertex has a patent on a solvent free PU coating technology. With this technology it is also possible to cast the “sock” in one piece. Unfortunately no products exist on the market yet.



### **With seams**

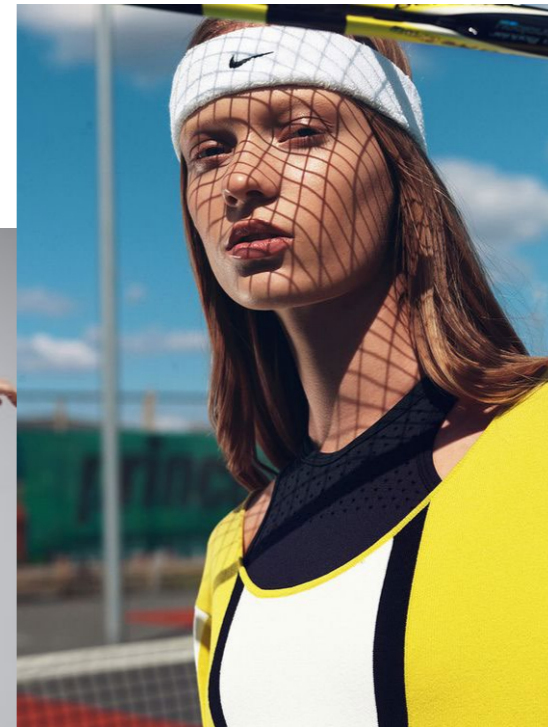
Use a polyester fabric from recycled polyester, which is possible to yet again recycle. This will require seams, which then would have to be taped or welded.

**FINALIZE**

**5**



## EXPRESSION



To work further with the design and expression I looked into Tretorns assortment. As this product will be aimed towards people that mostly use sneakers and not rubber boots, I studied Tretorns sneaker products. Tretorns history with tennis balls and tennis makes their sporty part strong. I also looked at city architect patterns for inspiration.



# ANALYSIS OF SNEAKERS

To find a suitable expression I studied a variety of sneakers using different kinds of nets and meshes. I believe that the net and the mesh express sportiness. I guess that the mesh was supposed to be a breathing material when it started to be used in sports wears. Now it is used for both aesthetic and breathable purposes. 3D knitting has also contributed towards making the mesh more attractive. I analyzed different sneakers with mesh like appearance.

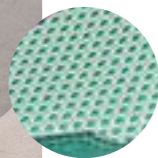
## Holes



Some of Tretorns sneakers have a mesh appearance, constituted by a pattern of round holes.



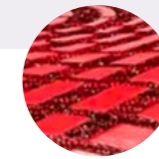
## Mesh



## Net



## Print

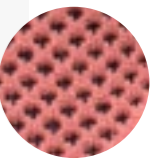
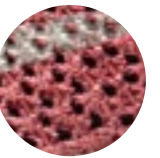
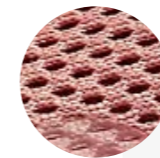


Look like net but are just a print.

## 3D knitting

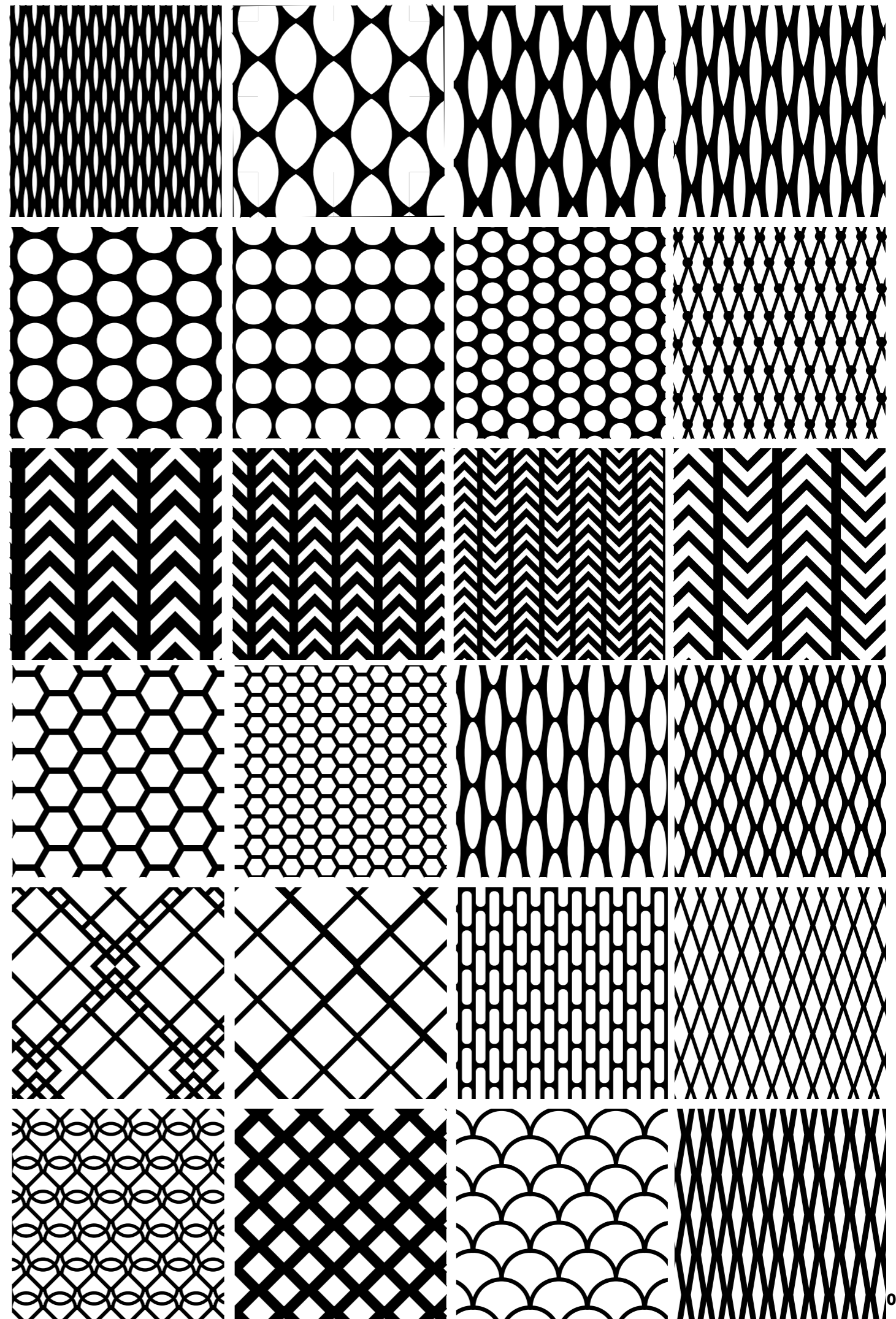
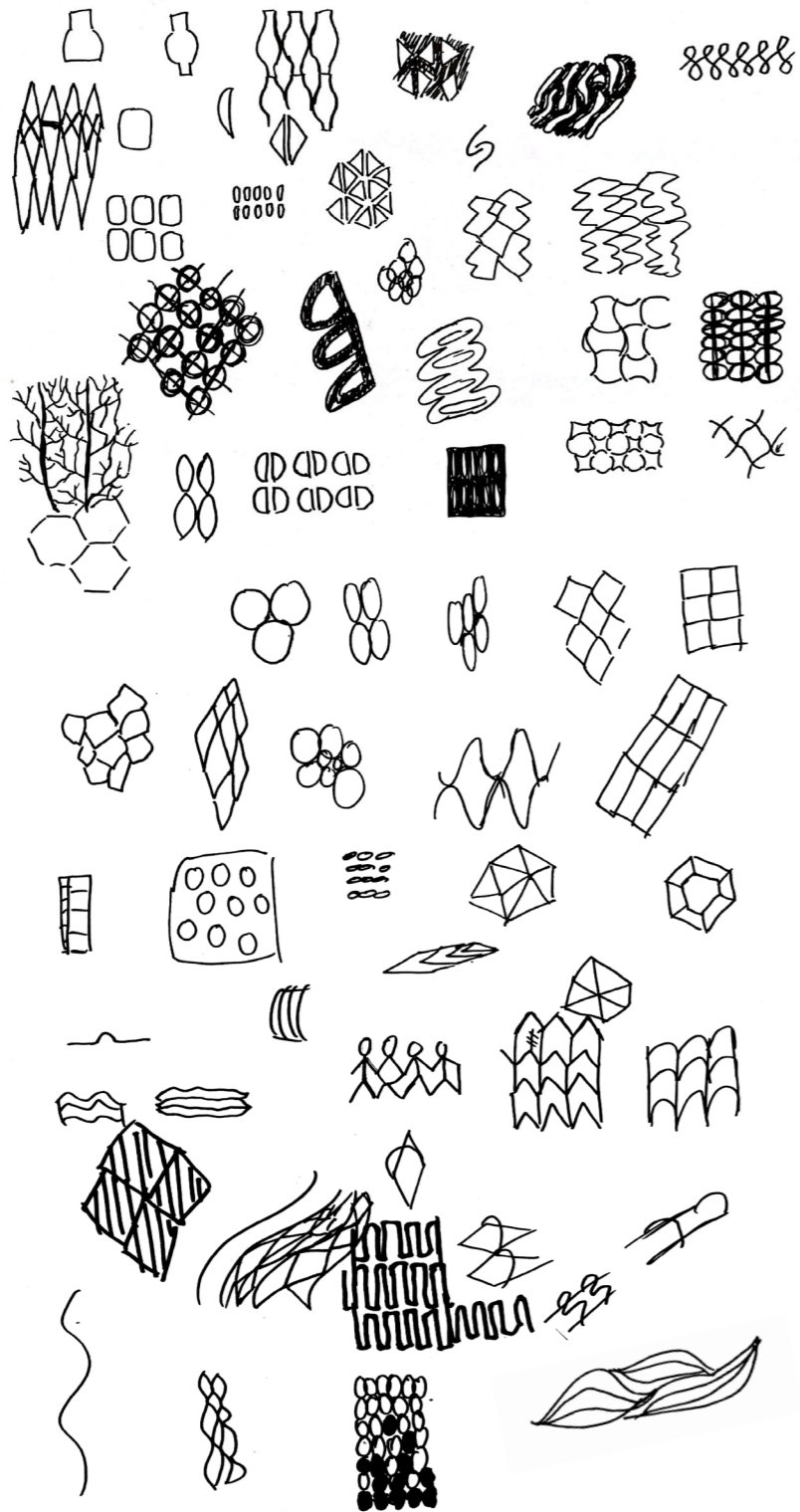


These shoes are 3D knitted. The blue one has a dense structure like a sock.



# SKETCHING AND DEFINING NET

I started sketching on different net designs and then defined my ideas via graphical illustrations.





# NET

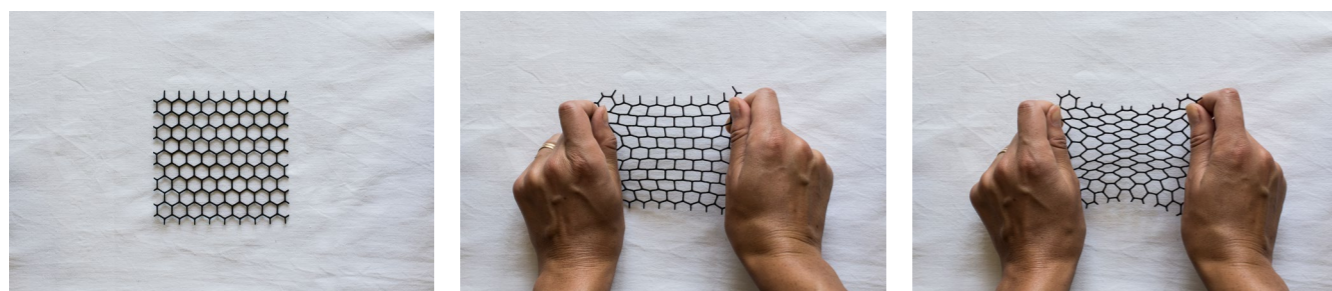
By overlay sketches I could more clearly see how the net would look on the shoe and feet. I also needed to find a net that had the right function. For instance the mesh with the circles that was similar to one of the Tretorn sneaker meshes was not stretchy enough.



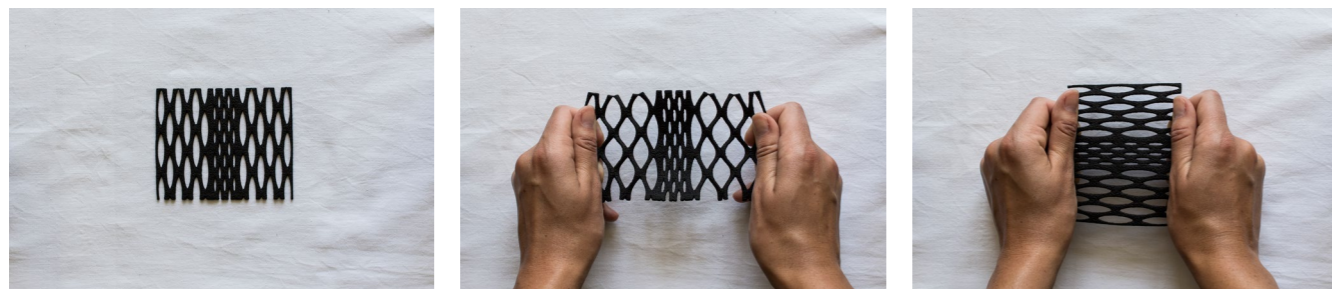
## 3D PRINTED NET

In order to investigate how much stretch different mesh patterns would give I ordered a series of test pieces. I found that the key for a stretchy design was to print the mesh with small holes. The second design has some stretch but not quite enough. The fourth one had no stretch at all.

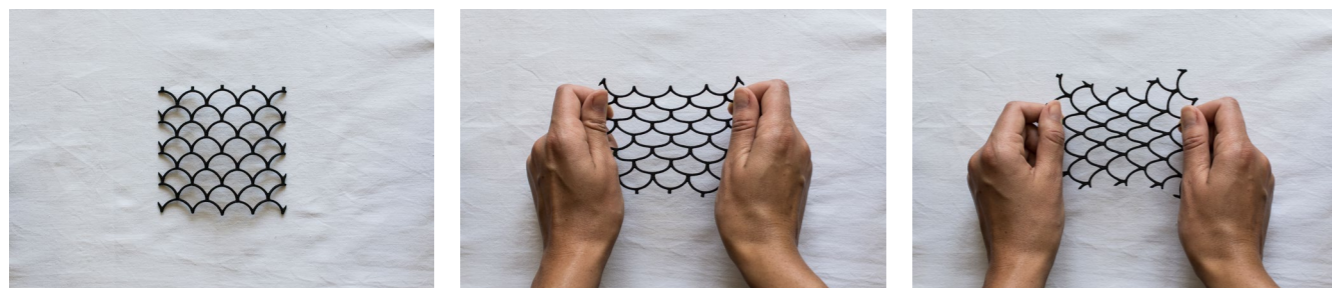
1



2



3

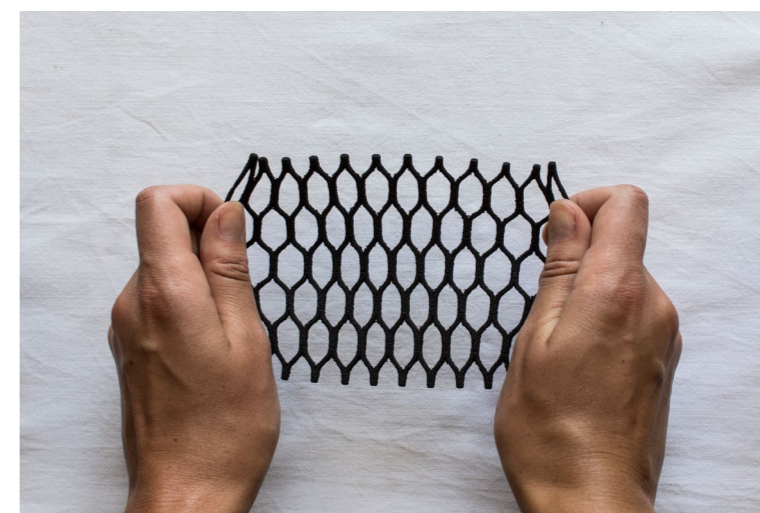
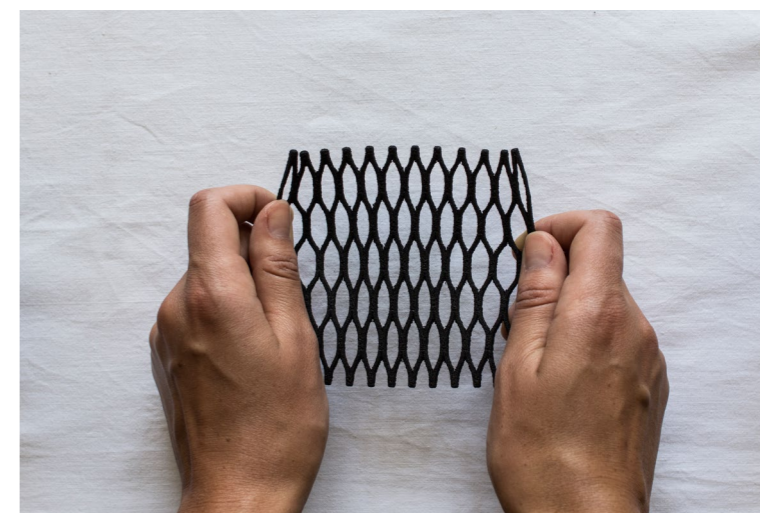
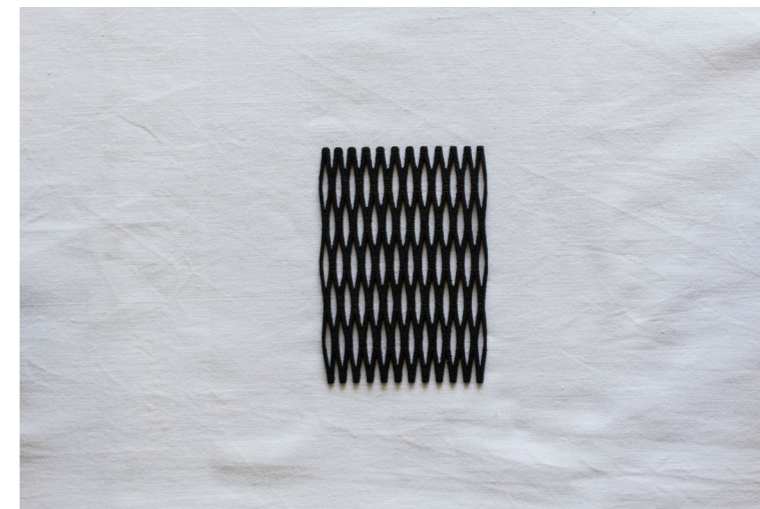


4



The fifth, rhombus, design appeared to be the right pattern for the net. This pattern had a natural force pulling it together upon stretching.

5





## DESIGN

To further visualise the detailed design I made a mock-up with paper. I used a smaller pattern to create detail on the galosh. At this stage I wanted to keep the simple look of the net but still have some details to make it feel like a shoe. The line of smaller patterns at the front of the shoe combined these two things nicely.

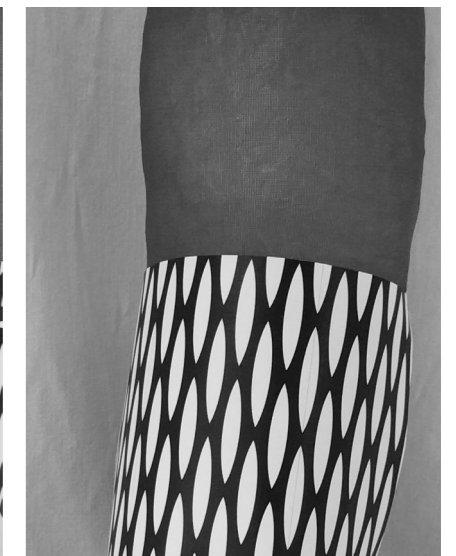


In this one I tried yet another pattern as detail on the shoe. However patterns of the like had already been used commercially and I decided it was ultimately too similar to be used.

I tried to fit a detail similar to the one found on Tretorns most common sneaker nylite. I did not like the mimicry feel produced by this design.



This one utilises the same net with a smaller mesh running as a stripe across the shoe for detail. I chose this one due to the simplicity of it.

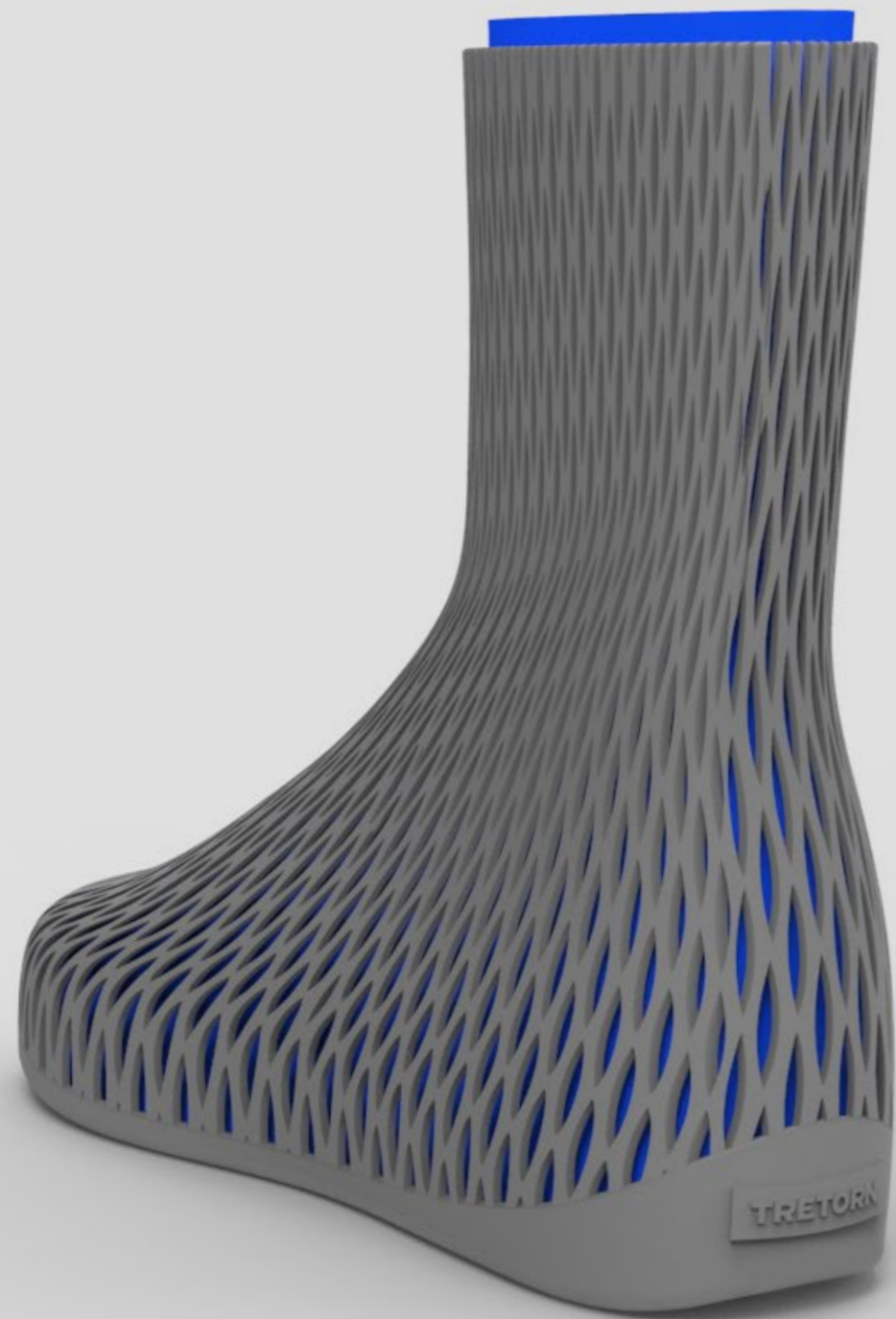


I wanted to try to have some detail situated at the top of the galosh. This design is detailed with a smaller mesh cut in a jagged pattern. I found this to give an all to sharp appearance.

With a smaller net cut in a straight line the looks were more pleasing. However when I received the test samples from the 3D printer it felt too small to put on the galosh.

It was also difficult to fit it to the bigger pattern without destroying the overall flexibility.

Ultimately I decided to not include any detail at the top of the galosh. This will make it easier to pull the galosh over the shoe.

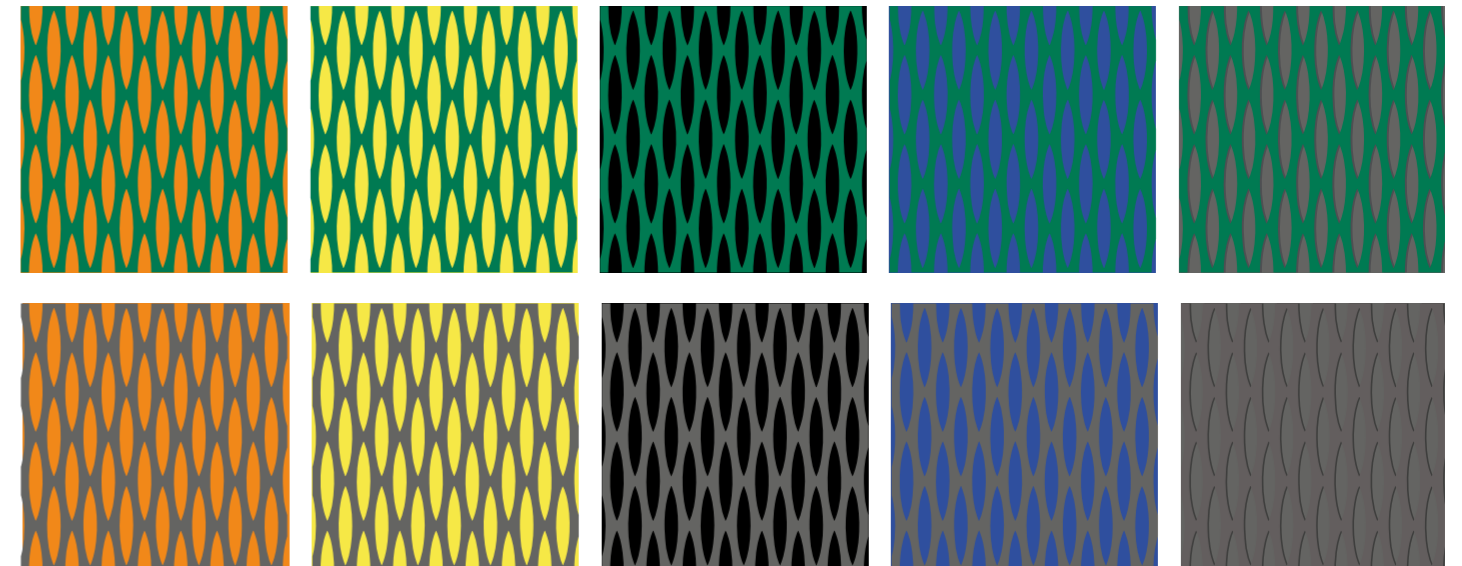


**RESULT**

**3**

## THE RESULT

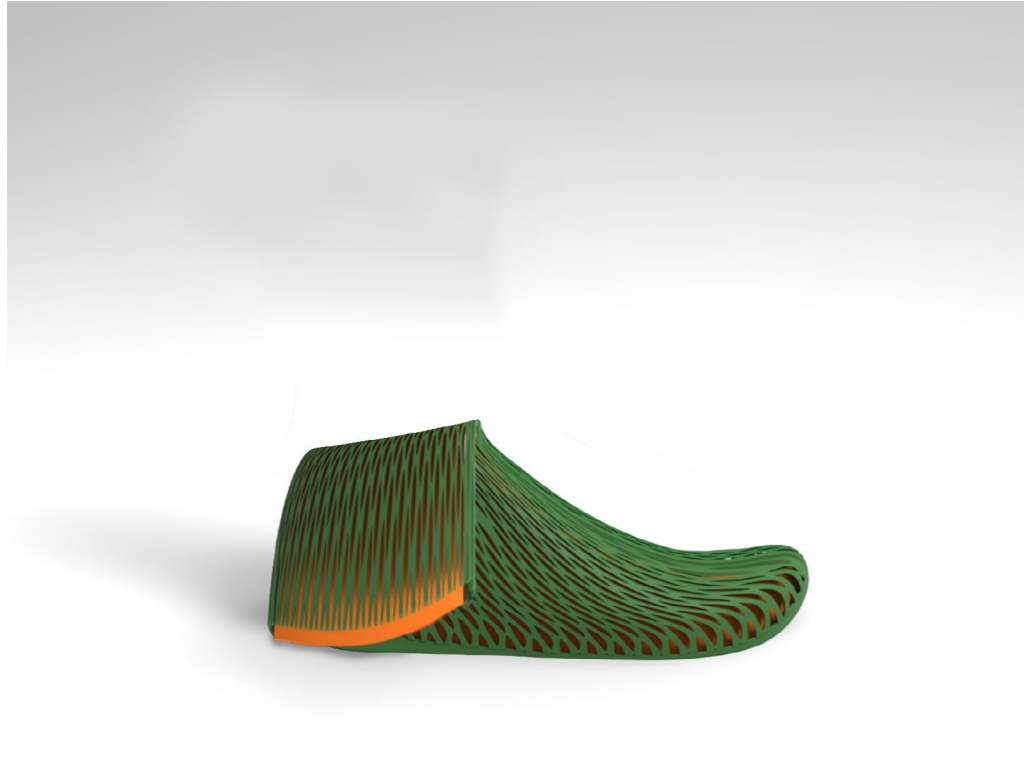
The result is a waterproof and flexible galosh. It is made of two parts, each of which is constituted of a single material. The inner part is waterproof and made in a solvent free PU coating. The outer part is made in a 3D printed rubber like material, which makes it easy to fit on a variety of shoes all the while keeping the stability of the galosh. The outer part is protecting the inner part and provides good grip via the sole. The final product is easy to recycle thanks to the avoidance of glue, buttons and zippers.



### Colours

I chose two colours for the net in order to give the user some room for personal expression. One is colourful and popping, the other more discreet. Using a contrast colour for the inner sock the structure of the net is brought to life, something which could be good from a seller's point of view. Many companies, Tretorn included, often choose to make some colourful product versions to get attention and attract customers, even though it is known that most people end up choosing to buy the black or grey version. I chose to have the inner sock available in five colours: the discreet black or grey as well as three clear colours. Any combination of net colour and inner sock colour is possible.



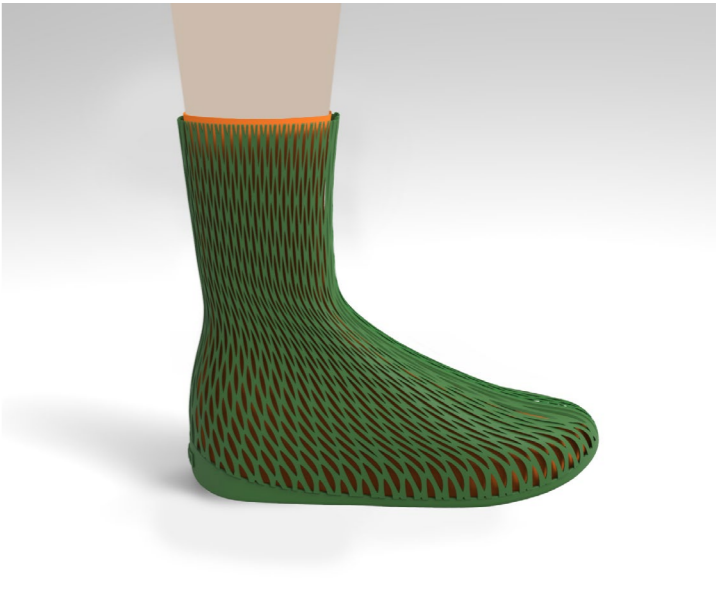
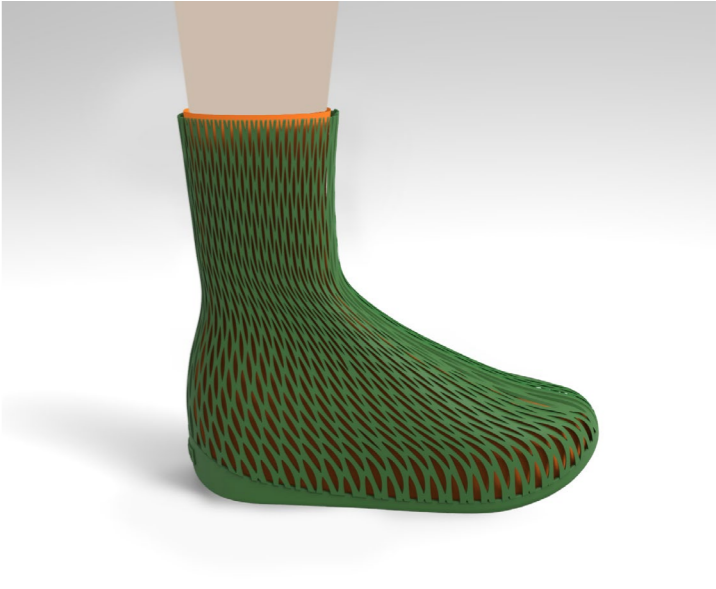
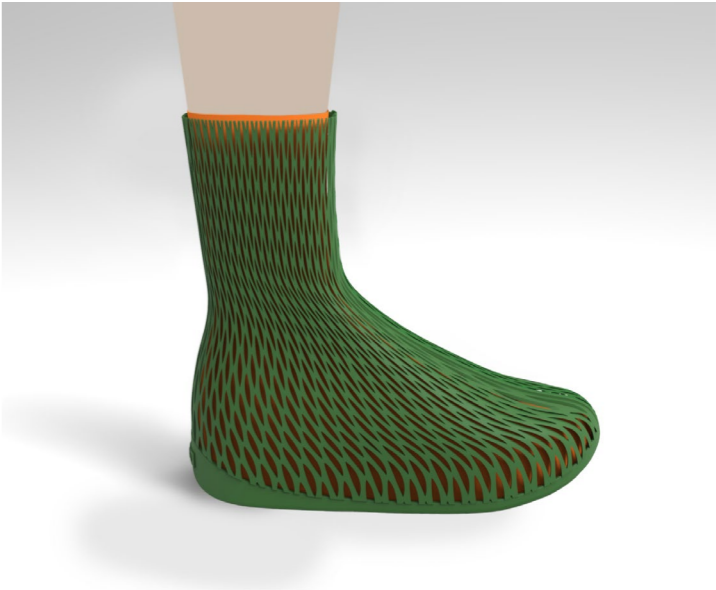


***The net***

When the galosh is not in use the net contracts and the galosh can be folded and bent to minimise storage space. This makes it a more practical option to bring when it is not raining compared to a pair of rubber boots.

**Shape affected by the inner shoe**

On the right page you can see how the net looks carried over different kinds of shoes. As the net wraps the shoe the galosh is allowed to fit a variety of shoes.



## REFLECTIONS

Due to time constraints I decided not to focus on how to store the galosh when it is not in use. The 3D modelling of the net and how the net should work was of a greater importance. If I were to develop this product this would be an important aspect.

Working with environmental issues is difficult. I had to make sacrifices pushing the design forward. In order to continue working with 3D printing I had to settle for the products available on the market today, and it was difficult to find out if the materials are easy to recycle or not. However the current trends seem to indicate that 3D printing material in a short period of time will be easy to recycle.

I am quite happy with the aesthetics of the galosh, but at the same time I would also like to work further on the design and the 3D printing. Much more potential development resides here, for instance the net could be of variable thickness along the shoe surface in order to make it even more stable.

Although a CAD model of the final product has been made, the fact that no final physical prototype exists makes it difficult to investigate the true net behaviour of the net design. Indeed to realise a physical prototype is expensive from a student's perspective and before setting out to do so more prototyping and testing would be desirable.



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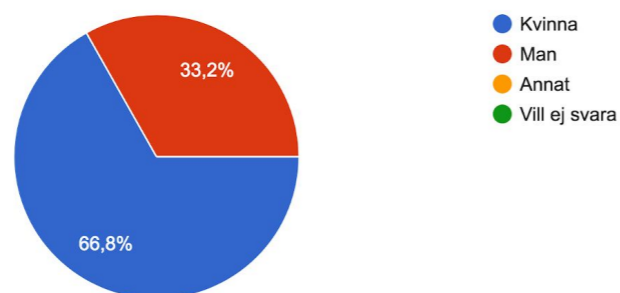


# APPENDIX

## The questionnaire

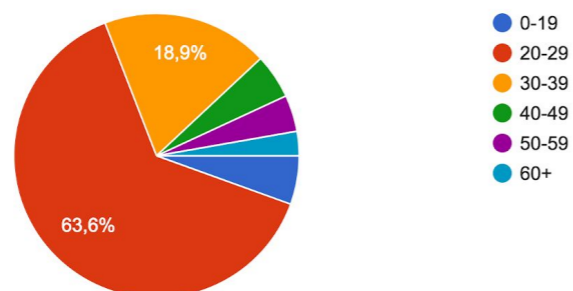
### Kön

217 svar



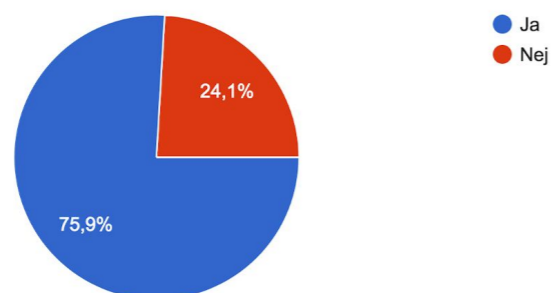
### Ålder

217 svar



### Äger du några gummistövlar?

216 svar



## Om nej: Varför inte?

Inget behov för det

Dom gamla har precis gått sönder. Ska önska mig nya i födelsedagspresent.

Har inte haft så stort behov av det

Har inga praktiska kläder

Blundstones löser biffen

Dels för att jag associerar dem till småbarn som leker i vattenpölar snarare än något en vuxen kvinna använder, och dels för att jag uppfattar att jag håller mig ren och torr med andra typer av stövlar ändå, såsom skin/läder.

För att jag inte köpt, fått, stulit eller tillverkat några.

Jag har aldrig haft behov av några i vuxen ålder, har istället vandringskängor jag använder när jag skall gå ut och vandra i våt mark, eller vinterkängor som tål vatten på vintern. Jag går sällan i regn på sommaren, och när jag gör det bryr jag mig inte om jag blir lite blöt även om skorna.

Jag har inte kommit mig för att köpa gummistövlar. Oftast har jag skor som är hyfsat vattentåliga, vilket gör att behovet av dem minskar. Jag tycker gummistövlar är superfina oftast, men som student har jag inte råd att köpa skor som jag bara använder väldigt sällan...

Ingen bra anledning, borde ha införskaffat mig ett par

Känner inget behov

Går sällan i så blött. Räcker med kängor.

Har vattentäta kängor.

Har inte behövt några sedan jag växte ifrån de senaste som passade

Tråkigt att lägga pengar på

Inte köpt några

Har kängor istället

Tycker väl smorda kängor bättre passar mina behov av vattenskydd av fötter

Bor i stan nu och har dem inte här, utan hos mina föräldrar på landet, där jag använder dem.

Använder vattentåliga kängor istället

Känner inget behov av dem.

För att det är klumpigt lökigt lch inte så snyggt.

Hittar inga som är tillräckligt vida för mina vader

Fult och obekvämt.

I used to, but when I moved I got rid of them

Jag bor i stan och behöver inte såna skor om jag inte ska t.ex. ut och hajka eller jobba länge i blöta miljöer.

Har inget behov

Har inte hittat vad jag är ute efter

Kängor/andra skor har samma funktion för mig.

Väldigt enkelt: När det regnar går jag inte ut. Liksom jag inte äger några regnkläder.

Tänker att jag ska men det blir aldrig av...

Inte lagt pengar på det och har inte tillräckligt stort behov. Men ett par färgglada är jag sugen på.

Kängor räcker

Sönder och har inte köpt nya

Vet ej

Tycker dom är obekväma

Det är för kallt. Har varmfordrade stövlar, som ska vara vattentäta.

Dyrt med bra

Ägde när jag var mindre, undviker plaskpölar idag

Sällan ute i regn.

Undviker att gå ut när det regnar och anser mig därmed inte behöva stövlar.

Mina gamla gick sönder och jag har inte prioriterat att köpa nya till mig själv. Har tre barn som måste ha gummistövlar.

Behöver sällan, kan låna.

Jag har vattentäta skor med Goretex och då klarar jag mig när det regnar. Hade jag dock haft en trädgård hade jag nog haft ett par stövlar.

Jag har kängor istället.

Känner inget behov av det jag har vanliga skor och vandringskängor.

Har inte plats för dem och associerar det mest med att vara i skogen, och där är jag sällan ;)

Anser inte att de behövs. Det är svårare att gå hundpromenader generellt men särskilt hos mina föräldrar i skogen.

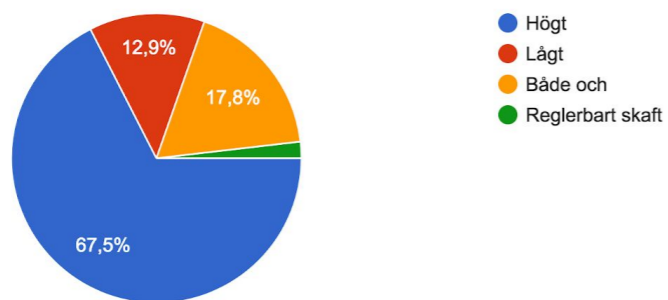
Ser inte behovet av ett par stövlar i mitt liv nu. Otypligt att ha i stan

De snygga är så dyra och jag har inte prioriterat att köpa

Jag är student, och det har inte blivit så att jag köpt några.

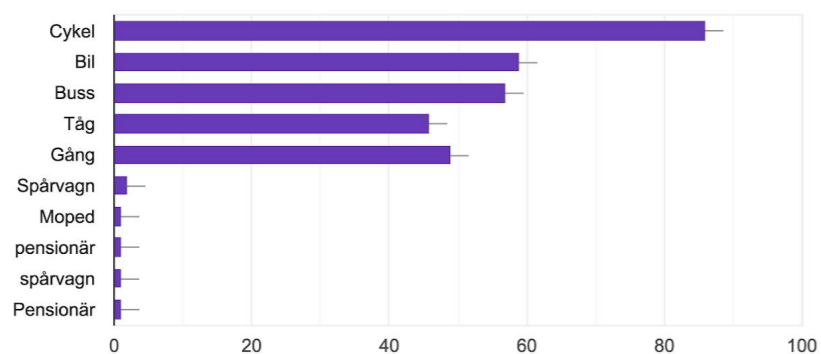
### Om ja: Har de högt eller lågt skaft?

163 svar



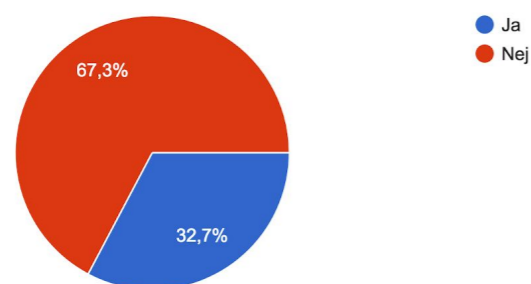
### Hur tar du dig till arbete eller skola? (Du kan fylla i flera alternativ)

172 svar



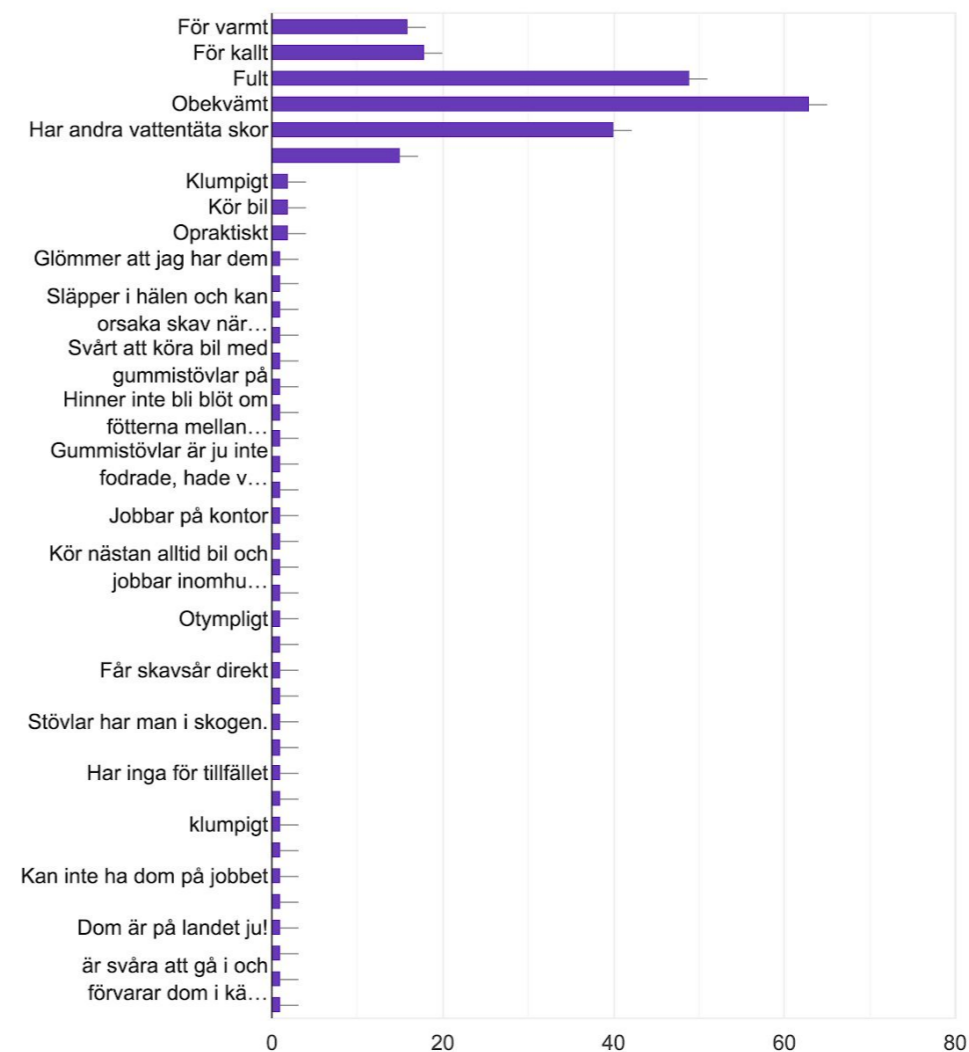
### Om det regnar när du ska till skola eller arbete, händer det att du använder dina gummistövlar då?

168 svar



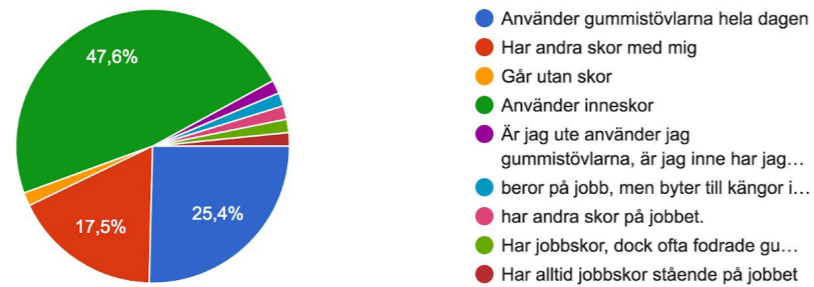
### Om nej: Varför använder du ej gummistövlar om det regnar när du ska ta dig till arbete eller skola? (Du kan fylla i flera alternativ)

120 svar



Om ja: Har du andra skor och byter med när du kommer fram eller har du gummistövlarna på dig hela dagen?

63 svar



Vid vilka tillfällen använder du dina gummistövlar? (Du kan fylla i flera alternativ)

168 svar

