To what extent is it possible for a denim company or department to implement a fully sustainable denim development process?

Process Book

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19/05/2016
STRUCTURE
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Research Proposal – First Draft

Is it possible to make a fully sustainable denim brand?

Rationale
What are the reasons why there is an issue to explore?
What is the broader relevance of your findings?

- Sustainability originates from fashion industry
- Achilles heel
- Generation Z more aware and conscious of decisions
- Already possible to have partly sustainable – want to find out if it is possible to push it further (internal and external)
- Processes are out there, just need to put them together
- Experiment with bringing internal and external elements together (sustainable offices and practices) e.g. Stella McCartney
- Cotton is one of the biggest problem fibres (20 million tonnes US grown every year, can need 20,000 litres of water for 1kg of cotton, 1kg of cotton makes around 1 pair of jeans & a simple t-shirt. Cotton makes up around 50% of all fibres used in clothing and other textile materials.
- One of the biggest users of cotton is the denim industry, therefore a fully sustainable denim product would have a huge impact

Aim
What is the practical goal and target of your advice?
What will be the product?

• Research Report & Business Plan for a new sustainable denim company

Questions
What do you have to find out to reach that aim?
What are the – four or five – questions you need to ask to give an answer to the main one?

- What is the definition of “sustainable”? 
- What is the definition of “denim”? 
- What does sustainability mean for the internal workings of a company?
- What does sustainability mean for the external workings (e.g. outsourced processes) of a company

Methodology
For each (sub)question: what information do you need and where are you going to get that?
Structure
What will be the logical structure of the report?

Definition of denim
Definition of sustainability
Traditional Processes in regards to the Denim Product (Fibre through to Post Consumer Use) and their sustainable counterparts
Traditional Processes in regards to Internal Office Workings (Design through to Sales) and sustainable options within these departments.

- **EXTERNAL PROCESSES INCLUDE:**
  - **Fibre to fabric** (growing the cotton, harvesting the cotton, transporting the cotton, cleaning the cotton, twisting the yarn, dyeing, weaving)
  - **Fabric to Garment** (mercerising, cutting, sewing, trims, transporting, threads, patterns, waste fabric, labour conditions)
  - **Finishings** (sandblasting, bleaching, stone washing, enzyme washing, drying, softening, coatings, hand scraping, painting..)
  - **Garment to Store** (transport, reconditioning, online sales, resources used by stores, workers in the stores)
  - **After Use** (post consumer use – recycling, reusing, returning?, transport to recycling facilities)

- **INTERNAL PROCESSES INCLUDE:**
  - **Design**
  - **Product Development**
  - **Production**
  - **Merchandising**
  - **Sales & Marketing**
  - **HR**

Rationale: Sustainability is a concept often described as a selling point created by the fashion industry. However due to the current rise of awareness through Generation Z of the impact of their decisions, and the general zeitgeist of well being (both mentally, physically and environmentally) this concept has taken on it’s own form. Spreading through all product categories and igniting fires in the average consumer, sustainability is still a key issue in today's society. For fashion, sustainability is an Achilles heel, especially for fast fashion brands. A particular area of focus is the fibres used to create the garments, and the ethical, social and environmental impact that they have. A particular problem child of the fibre world is cotton. Around 20 million tonnes (US) of cotton are grown every year across 90 countries. This cotton then represents about 50% of all fibres present in clothing and other textile materials worldwide.

**Tutor Meeting, Ligia & Jacqui 04/02/16**

18/02/16 – Research Proposal hand in
- Highlight where you will start, where you will go and what your aim is

Final products
Check thesis’s and research reports of previous generation
Research Report = conclusions and findings from research
Process Book = primary research but NOT articles, can be digital AND physical, make a navigation through the book
Literature research is important too, need to link to theories
DO PRE-RESEARCH

FEEDBACK
How did I come to the idea of denim & sustainability?
- Substantiate it with literature
RESEARCH QUESTION IS “HOW TO MAKE A FULLY SUSTAINABLE DENIM PRODUCT”
Make feasibility a sub question – how much would it cost a company to develop this product
Check recycling thesis for post-consumer use
Think about the expo – eyecatcher product, showcase, make it as interesting as possible
In research proposal explain how you are going to research each question, e.g. interviews, empirical research
Check assessment form and what is required

Initial Research


http://amfi.nl/fashion-food-wear/ (Wilting)

**Initial Survey Results & Analysis**

See Appendix 1

**Research Proposal – Second Draft**

**How is it possible to make a fully sustainable denim product?**

**Rationale**
What are the reasons why there is an issue to explore?
What is the broader relevance of your findings?

How did you come to this question?

- personal experiences

Why Sustainability?

- Sustainability originates from fashion industry (find out when first “sustainable” product was)
  - Achilles heel of fashion?
  - Generation Z more aware and conscious of decisions (market research, articles proving this)
  - Already possible to have partly sustainable (give examples)— want to find out if it is possible to push it further (internal and external)
  - Processes are out there, just need to put them together
  - Experiment with bringing internal and external elements together (sustainable offices and practices) e.g. Stella McCartney

Why Denim?

- Cotton is one of the biggest problem fibres (20 million tonnes US grown every year, can need 20,000 litres of water for 1kg of cotton, 1kg of cotton makes around 1 pair of jeans & a simple t-shirt. Cotton makes up around 50% of all fibres used in clothing and other textile materials.
- One of the biggest users of cotton is the denim industry (back this up with figures, how much cotton is used by the denim industry), therefore a fully sustainable denim product would have a huge impact
- facts and figures about denims impact (compared to other fashion industries?)

**Aim**
What is the practical goal and target of your advice?
What will be the product?
• Research Report & Extended Thesis / Article
• practical goal is to see whether it is possible to create a fully sustainable denim product, and conclude whether it would be a feasible product for the market.

Questions
What do you have to find out to reach that aim?
What are the – four or five – questions you need to ask to give an answer to the main one?

• What is the definition of “sustainable”?
- What is the definition of “denim”?
- How do the internal workings of the company affect the sustainability of the product?
- What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?
- What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?
- Is a fully sustainable denim product a feasible one to bring to market?

Methodology
For each (sub)question: what information do you need and where are you going to get that?

• What is the definition of “sustainable”?

Need:
Official definitions
Consideration of topic (which factors will there be a focus on? human? environmental?)

Through:
Primary Research
Secondary Research

- What is the definition of “denim”?

Need:
Official definitions

- How do the internal workings of the company affect the sustainability of the product?

Need: Opinions
Through: Primary Research, Interviews, Denim fairs (Amsterdam Denim Days, Kingpins)

- What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?  
  Need:  
  Through: Denim fairs (Amsterdam Denim Days, Kingpins)

- What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?  
  Need:  
  Through: Denim fairs (Amsterdam Denim Days, Kingpins)

- Is a fully sustainable denim product a feasible one to bring to market?  
  Need: Opinions, Precedent  
  Through: Interviews, Primary Research, Denim fairs (Amsterdam Denim Days, Kingpins)

**Structure**  
What will be the logical structure of the report?

Definition of denim  
Definition of sustainability  
Traditional Processes in regards to the Denim Product (Fibre through to Post Consumer Use) and their sustainable counterparts  
Traditional Processes in regards to Internal Office Workings (Design through to Sales) and sustainable options within these departments.

- **EXTERNAL PROCESSES INCLUDE:**  
  **Fibre to fabric** (growing the cotton, harvesting the cotton, transporting the cotton, cleaning the cotton, twisting the yarn, dyeing, weaving)  
  **Fabric to Garment** (mercerising, cutting, sewing, trims, transporting, threads, patterns, waste fabric, labour conditions)  
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  **Garment to Store** (transport, reconditioning, online sales, resources used by stores, workers in the stores)  
  **After Use** (post consumer use – recycling, reusing, returning?, transport to recycling facilities)

- **INTERNAL PROCESSES INCLUDE:**  
  **Design**  
  **Product Development**  
  **Production**  
  **Merchandising**
Sales & Marketing
HR

Rationale: Sustainability is a concept often described as a selling point created by the fashion industry. However due to the current rise of awareness through Generation Z of the impact of their decisions, and the general zeitgeist of well being (both mentally, physically and environmentally) this concept has taken on it’s own form. Spreading through all product categories and igniting fires in the average consumer, sustainability is still a key issue in today’s society. For fashion, sustainability is an Achilles heel, especially for fast fashion brands. A particular area of focus is the fibres used to create the garments, and the ethical, social and environmental impact that they have. A particular problem child of the fibre world is cotton. Around 20 million tonnes (US) of cotton are grown every year across 90 countries. This cotton then represents about 50% of all fibres present in clothing and other textile materials worldwide.

NOTES

Struggling with research question
Feedback was make it a “how” question without a yes/no answer.

Initial: Is it possible to make a fully sustainable denim product?
Suggested Direction: How to make a fully sustainable denim product?
Options: To what extent is it possible to make a fully sustainable denim product?
How sustainable is it possible for a denim product to be?
Decision: work forward with To what extent is it possible to design, develop and produce a fully sustainable denim product?

Questions for Simon:

• what % of the recycled cotton denim is recycled cotton?
• is it possible to create a fabric that is a recycled/BCI blend?
• could you expand on how you don’t have a negative impact on the surrounding environment? for example what happens to the wastewater and residual chemicals
• how much electricity does the company use over a month?
• is it possible to split this figure between the offices and the processing facilities?
• do you have any alternative energy solutions like wind turbines or solar panels?
• what transport company do you use? do they offer greener alternatives to their regular transport

Research Proposal Rationale - 3rd Draft

Rationale
What are the reasons why there is an issue to explore?
What is the broader relevance of your findings?

Why Denim?
Growing up I was part of a family that focused on organic, locally sourced and fairtrade food before the trend of sustainability became a worldwide phenomenon. Although my initial contact with the concept came through food, through my studies my interest soon grew to sustainable fashion, and eventually has culminated in a more specific interest in sustainable denim.

Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer. The sustainable angle is mainly fuelled by the following three elements;
1. the fact that there are many “green” alternatives to current fabric choices and production processes but these are often not combined
2. there is no responsibility or accountability for the effect of the back office on a garments sustainability
3. and that future generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making

The research put towards this question will also be very relevant due to the current zeitgeist of well being, both mentally, physically and environmentally. Spreading through all product categories and igniting fires in the average consumer, sustainability is still a key issue in today’s society. A particular area of focus is the fibres used to create the garments, and the ethical, social and environmental impact that they have. A particular problem child of the fibre world is cotton. Around 20 million tonnes (US) of cotton are grown every year across 90 countries. This cotton then represents about 50% of all fibres present in clothing and other textile materials worldwide.

Cotton is one of the least sustainable natural fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to GM crops, exploitation of farmers to use of harmful chemicals.

Around 20 million tonnes (US) (18,14 billion kg) of cotton are grown every year, and these fibres are present in over 50% of all clothing and other textiles. An example of how inefficient growing cotton is, it takes around 1514 for a simple cotton t-shirt, and around 6814 litres of water to fully process a pair of jeans. Growing even 1kg of cotton requires around 20,000 litres of water, so the total amount of water needed per month is staggering. This 1kg of cotton then only represents the equivalent of 1 t-shirt and 1 pair of jeans.
One of the biggest users of cotton is the denim industry (back this up with figures, how much cotton is used by the denim industry), therefore a fully sustainable denim product would have a huge impact. Facts and figures about denims impact (compared to other fashion industries?)

Research Proposal Rationale – 4th Draft

Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant. Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer. The sustainable angle in this research is mainly fuelled by the following three elements:

1. the fact that there are many “green” alternatives to current fabric choices and production processes but these are often not combined
2. there is no responsibility or accountability for the effect of the back office on a garment’s sustainability
3. and that it is proven that future generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making

A large part of the sustainable solutions that are coming out of the industry focus on the fibres used to create the garments, and the ethical, social and environmental impact that they have. Aside from the petroleum based obvious “bad guys” like polyester, cotton is one of the least sustainable fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to the controversy of GMO crops, exploitation of farmers to the widespread use of harmful chemicals.

Around 20 million tonnes (US) (18.14 billion kg) of cotton are grown every year, and these fibres are present in over 50% of all clothing and other textiles. An example of how inefficient growing cotton is, it takes around 1514 for a simple cotton t-shirt (including all processes) and around a staggering 6814 litres of water to fully process a pair of jeans. Growing even 1kg of cotton requires around 20,000 litres of water, so the total amount of water needed per month is staggering. This 1kg of cotton then only represents the equivalent of 1 t-shirt and 1 pair of jeans. Just over 1 billion pairs of jeans are sold annually on a global scale, which gives a rough total of around 1 billion kilos of cotton being affected by the denim industry a year.

Tutor Meeting, Ligia & Jacqui 10/02/16

- write small clarification of “fully” after the research question
- per “design/development/production” split costs for feasibility
- maybe don’t use order quantities, keep it loose
- end product - advise for companies (broad)
- definition of denim NOT as a sub question, just put it in
- don’t use the word industry?
Research Proposal – To what extent is it possible to design, develop and produce a fully sustainable denim product?

Rationale
Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant.
Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer. The sustainable angle in this research is mainly fuelled by the following three elements;
1. the fact that there are many “green” alternatives to current fabric choices and production processes but these are often not combined
2. there is no responsibility or accountability for the effect of the back office on a garments sustainability
3. and that it is proven that future generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making
A large part of the sustainable solutions that are coming out of the industry focus on the fibres used to create the garments, and the ethical, social and environmental impact that they have. Aside from the petroleum based obvious “bad guys” like polyester, cotton is one of the least sustainable fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to the controversy of GMO crops, exploitation of farmers to the widespread use of harmful chemicals.
Around 20 million tonnes (US) (18,14 billion kg) of cotton are grown every year, and these fibres are present in over 50% of all clothing and other textiles. An example of how inefficient growing cotton is, it takes around 1514 for a simple cotton t-shirt (including all processes) and around a staggering 6814 litres of water to fully process a pair of jeans. Growing even 1kg of cotton requires around 20,000 litres of water, so the total amount of water needed per month is staggering. This 1kg of cotton then only represents the equivalent of 1 t-shirt and 1 pair of jeans. Just over 1 billion pairs of jeans are sold annually on a global scale, which gives a rough total of around 1 billion kilos of cotton being affected by the denim industry a year. This shows that steps taken to reduce denims impact can have large scale consequences.
Aim
This project will culminate in an extended thesis and a set of advices written for each part of the process (design, development and production). These advices will not be aimed at a specific company, but will be applicable for various denim brands or departments.
Questions
The sub questions that I have set myself in order to answer my research question are as follows:
· What is the definition of “sustainable”?
- How do the internal workings of the company affect the sustainability of the product?
- What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?
- What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?
- Is a fully sustainable denim product a feasible one to bring to market?

These questions will not only allow me to directly address the existing alternatives to traditional denim design, development and production, but will also allow me to highlight areas which are currently stuck in an unsustainable state.

**Methodology**

My methodology will mainly consist of primary research, secondary research and interviews with denim professionals. To answer “What is the definition of sustainable?” I will refer to existing definitions by academics, retailers, brands and consumers, as well as considering the relevance for this particular topic. To answer “How do the internal workings of the company affect the sustainability of the product?” I will primarily do interviews with professionals in various product segments to gain a general view through visits, email and visiting fairs such as Amsterdam Denim Days and Kingpins. I will also study various companies, such as Stella McCartney, to see if a sustainable approach to the internal workings of the company benefits the products. In order to answer “What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?” and “What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?” I will interview denim professionals and consumers to understand their view on the issues, as well as doing primary research. The majority of the alternative solutions will be found through primary research and interviews with the companies providing the sustainable services. The final question, “Is a fully sustainable denim product a feasible one to bring to market?” will be answered through researching precedent, analysing the costs of the product and opinions of various denim professionals.

**Structure**

The structure of my report will be as follows:

1. Introduction
2. Definition of denim
3. Definition of sustainability
4. Explanation of traditional processes in regards to designing a denim product and the sustainable alternatives
   - timeline of design
   - sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives
5. Explanation of traditional processes in regards to developing a denim product and the sustainable alternatives
   - timeline of development
sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives

6. Explanation of traditional processes in regards to producing a denim product and the sustainable alternatives
   - timeline of production
   - sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives

7. Explanation of feasibility of a fully sustainable denim product for a brand
   - costs of all alternative processes
   - which price bracket the product would be in
   - conclude what type of brands would be able to produce the product

8. Conclusion

Tutor Meeting, Ligia 15/02/16

- hand in research proposal digitally by 12pm
- hand in research report, process book and product (extended thesis)
- can also make advice for companies but only bring this at the defense so you have something new

Why this research question?

I have chosen the research question ‘To what extent is it possible to design, develop and produce a fully sustainable denim product?’ I chose this question because the ones I was working with previously were too broad, and required only a yes/no answer. In order to challenge myself I changed the wording of the question to give a chance at a more in depth answer. In order to make my research clearer, I specified which aspects of the denim supply chain I would be looking into.

Research Proposal - To what extent is it possible to design, develop and produce a fully sustainable denim product?

First Edit by Ligia

Research Proposal – Emi K-T

To what extent is it possible to design, develop and produce a fully sustainable denim product?

Rationale

Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant. Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer. The sustainable angle in this research is mainly fuelled by the following three elements;
1. the fact that there are many “green” alternatives to current fabric choices and production processes but these are often not combined
2. there is no responsibility or accountability for the effect of the back office on a garments sustainability
3. and that it is proven that future generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making

A large part of the sustainable solutions that are coming out of the industry focus on the fibres used to create the garments, and the ethical, social and environmental impact that they have. Aside from the petroleum based obvious “bad guys” like polyester, cotton is one of the least sustainable fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to the controversy of GMO crops, exploitation of farmers to the widespread use of harmful chemicals.

Around 20 million tonnes (US) (18.14 billion kg) of cotton are grown every year, and these fibres are present in over 50% of all clothing and other textiles. An example of how inefficient growing cotton is, it takes around 1514 for a simple cotton t-shirt (including all processes) and around a staggering 6814 litres of water to fully process a pair of jeans. Growing even 1kg of cotton requires around 20,000 litres of water, so the total amount of water needed per month is staggering. This 1kg of cotton then only represents the equivalent of 1 t-shirt and 1 pair of jeans. Just over 1 billion pairs of jeans are sold annually on a global scale, which gives a rough total of around 1 billion kilos of cotton being affected by the denim industry a year. This shows that steps taken to reduce denims impact can have large scale consequences.

Aim
This project will culminate in an extended thesis and a set of advices written for each part of the process (design, development and production). These advices will not be aimed at a specific company, but will be applicable for various denim brands or departments.

Questions
Mention also here the research question
The sub questions that I have set myself in order to answer my research question are as follows:
- What is the definition of “sustainable” in the case of my research?
- How do the internal workings of the company affect the sustainability of the product?
- What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?
- What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?
- Is a fully sustainable denim product a feasible one to bring to market?

These questions will not only allow me to directly address the existing alternatives to traditional denim design, development and production, but will also allow me to highlight areas which are currently stuck in an unsustainable state.
Methodology
My methodology will mainly consist of primary research, secondary research and interviews with denim professionals. To answer "What is the definition of sustainable?" I will refer to existing definitions by academics, retailers, brands and consumers, as well as considering the relevance for this particular topic. To answer "How do the internal workings of the company affect the sustainability of the product?" I will primarily do interviews with professionals in various product segments to gain a general view through visits, email and visiting fairs such as Amsterdam Denim Days and Kingpins. I will also study various companies, such as Stella McCartney, to see if a sustainable approach to the internal workings of the company benefits the products. In order to answer "What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?" and "What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?" I will interview denim professionals and consumers to understand their view on the issues, as well as doing primary research. The majority of the alternative solutions will be found through primary research and interviews with the companies providing the sustainable services. The final question, "Is a fully sustainable denim product a feasible one to bring to market?" will be answered through researching precedent, analysing the costs of the product and opinions of various denim professionals.

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   · timeline of production
   · sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives
7. Explanation of feasibility of a fully sustainable denim product for a brand
   · costs of all alternative processes
   · which price bracket the product would be in
   · conclude what type of brands would be able to produce the product
8. Conclusion
To what extent is it possible to design, develop and produce a fully sustainable denim product?

Rationale

Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant.

Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer. The sustainable angle in this research is mainly fuelled by the following three elements;

1. the fact that there are many “green” alternatives to current fabric choices and production processes but these are often not combined
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3. and that it is proven that younger generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making

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Around 20 million tonnes (US) (18,14 billion kg) of cotton are grown every year (wwf.panda.org, 2016), and these fibres are present in over 50% of all clothing and other textiles (cottoninc.com, 2016). An example of how inefficient growing cotton is, it takes around 1514 litres of water for a simple cotton t-shirt (including all processes) and around a staggering 6814 litres of water (TreeHugger.com, 2016) to fully process a pair of jeans. The amount of cotton needed for 1 t-shirt and 1 pair of jeans is 1kg (wwf.panda.org, 2016), and just over 1 billion pairs of jeans are sold annually on a global scale (statisticbrain.com, 2016), which gives a rough total of around 1 billion kilos of cotton being affected by the denim industry a year. This shows that steps taken to reduce denims impact can have large scale consequences.

Aim

This project will culminate in an extended thesis and a set of advices written for each part of the process (design, development and production). These advices will not be aimed at a specific company, but will be applicable for various denim brands or departments.

Questions
In order to answer my research questions “To what extent is it possible to design, develop and produce a fully sustainable denim product?” I have set myself the following sub questions:
- What is the definition of “sustainable” with regards to my research?
- How do the internal workings of the company affect the sustainability of the product?
- What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?
- What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?
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These questions will not only allow me to directly address the existing alternatives to traditional denim design, development and production, but will also allow me to highlight areas which are currently stuck in an unsustainable state.

Methodology
My methodology will mainly consist of primary research, secondary research and interviews with denim professionals. To answer “What is the definition of sustainable?” I will refer to existing definitions by academics, retailers, brands and consumers, as well as considering the relevance for this particular topic. To answer “How do the internal workings of the company affect the sustainability of the product?” I will primarily do interviews with professionals in various product segments to gain a general view through visits, email and visiting fairs such as Amsterdam Denim Days and Kingpins. I will also study various companies, such as Stella McCartney, to see if a sustainable approach to the internal workings of the company benefits the products. In order to answer “What are the current environmental and ethical issues facing the denim industry, and are there solutions exist to combat these?” and “What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?” I will interview denim professionals and consumers to understand their view on the issues, as well as doing primary research. The majority of the alternative solutions will be found through primary research and interviews with the companies providing the sustainable services. The final question, “Is a fully sustainable denim product a feasible one to bring to market?” will be answered through researching precedent, analysing the costs of the product and opinions of various denim professionals.

Structure
The structure of my report will be as follows:
1. Introduction
2. Definition of denim
3. Definition of sustainability
4. Explanation of traditional processes in regards to designing a denim product and the sustainable alternatives
   - timeline of design
   - sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives
5. Explanation of traditional processes in regards to developing a denim product and the sustainable alternatives
· timeline of development
· sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives
6. Explanation of traditional processes in regards to producing a denim product and the sustainable alternatives
   • timeline of production
   • sub chapters dedicated to each process, states traditional process and then describes sustainable alternatives
7. Explanation of feasibility of a fully sustainable denim product for a brand
   • costs of all alternative processes
   • which price bracket the product would be in
   • conclude what type of brands would be able to produce the product
8. Conclusion

Email to Kingpins

Dear Sir or Madam,
My name is Emi Kenny-Troughton and I am currently writing my thesis as part of my fashion and management studies, at the Amsterdam Fashion Institute. My topic focuses on denim products, and more specifically to what extent they can be “sustainable”. With this in mind, I would very much appreciate the chance to come to Kingpins to further my research with regards to fabric and trims production.
If you have any questions please do not hesitate to contact me,
Kind Regards,
Emi K-T
+31624495105

Notes

• Emailed kingpins to try and get an invite
• Bought tickets to Blueprint, need to find exhibitors and make a plan of who to target with questions
• struggling with using sources list - need to annotate them to be able to use them properly

What definitions are needed for the research?

As the research question is ‘To what extent is it possible to design, develop and produce a fully sustainable denim product?’, there are many terms that need to be defined within the context of this research. The first is the definition of denim, as it originally started out as a very simple product, but can be attributed to many different types of fabric nowadays. It will be important to clarify which fabrics will be included or excluded from this research. The second definition will be ‘fully sustainable’ as this can be seen as a very ambiguous phrase. In order to keep my research and findings relevant and be able to analyse and compare them, it will be
important to clarify what ‘fully sustainable’ can be measured by. The last definition will be clarifying what processes come under the headings of Design, Development and Production. In order not to have an overlap and to be able to establish research parameters, I will define these sections by the tasks performed in them (e.g. pattern making would be under Design)

**Denim definition research**

http://www.merriam-webster.com/dictionary/denim
("Definition Of DENIM")
DEFINITION OF DENIM

http://www.thefreedictionary.com/denim
("Denim")
DEFINITION OF DENIM

http://dictionary.cambridge.org/dictionary/english/denim
("Denim Meaning In The Cambridge English Dictionary")
DEFINITION OF DENIM

http://www.historyofjeans.com/
(historyofjeans.com, 2016)
HOW DENIM GOT IT’S NAME

(Burford)
HISTORY OF DENIM FABRIC

(denverfabrics.com, 2016)
DENIM FACTS

**Designer Survey Results & Analysis**

Timeline of Personal Design:
Most common route was inspiration, research (trend, garment), sometimes sketching, sometimes a fabric focus (e.g. prints, fabric manipulations), toiling, sketching continues through toiling, prototyping, fittings.

**Timeline of Commercial Design:**

Similar, had more focus on financial aspects (e.g. fabrics), more focus on 2D development. One participant pointed out that every designer has a slightly different process (e.g. hers required a longer research period, whilst the designer she worked for was more focused on concepting).

**Conclusion:** It will be hard to make a definite timeline of design as it obviously changes per person/company. However it is important to pull out the key common areas and address them as individual and interchangeable segments, therefore giving more flexibility to the reader of the thesis or advice and allow them to place weight where applicable.

**Resource Use**

The answer as to which resource was used most by a designer during the design process was split between energy (electricity) (36%), fabric (45%) and paper (18%). The options also included ink (printers ink) and water. When asked if there were any other key resources that were used throughout the process the responses tended to be negative although a couple mentioned extras like haberdasheries and trims.

**Conclusion:** Fabric is the most commonly used resource in the design process, however this may be biased by the fact that it is easy to see how much fabric is physically being used, and understanding how much energy (electricity) is being used is relatively difficult to put into perspective. Also considering the fact that in industry there is more 2D development, there is a chance that fabric may play a less important role in larger scale processes.

When it came to the amounts of resources they used, the participants showed relatively varied answers except when it came to water and fabric use. An almost unanimously agreed upon figure for fabric consumption through the design process of one garment was in the range of 0-25m (91%), meaning it is potentially the most reliable figure to use. However it is important to note that this is in a personal design process setting and should be considered carefully when put into a professional/industry context. Water use was generally considered to be at about 0-2 litres per garment (for washing) (82%), however the question did not specify that the garment in mind should be denim so this figure is not particularly helpful. Hours of energy use per day (e.g. for sewing machines, laptops etc) ranged from 0-4 hours (9%) all the way up to 16-20 hours (9%), with the most popular choice being 4-8 hours (36%). When asked how many of these hours they were using 2 or more electric machines simultaneously, answers ranged from 0-4 hours (27%) all the way up to 16-20 hours (18%), with the most popular choice being 0-4 hours. An
observation to note is that the wording of the questions left some ambiguity (1. How many hours in a day do you use electricity when designing one garment? AND 2. How many hours in the day are you using more than one electrical device?) which led to some answering the second question with a higher number of hours than the first. Disregarding participants who answered the second question with a higher answer, the survey shows that just over half the time spent on electrical items was actually spent on 2 or more machines simultaneously. Paper is another basic resource in many work processes, however the majority of participants chose the minimum option (0-50 sheets, 55%) when answering how many sheets of paper they used in the whole design process of one garment (e.g. for sketching etc). Printer ink was also a resource under question due to personal experience both with the personal design process and the professional one. Given that printing a page of colour uses (approximately) just under 1ml of ink, (http://blog.coastalbusiness.com/how-many-prints-can-you-get-out-of-your-ink-cartridge/) participants were asked how many ml of ink they would estimate they used in the design process of their garment. Again, the (narrow) majority of participants used 0-50ml of ink (45%) with 27% using 51-100ml. Given that INSERT COMMENT ON PRINTER INK ENVIRONMENTAL IMPACT HERE, this is an area that can significantly be improved upon.

Overall Conclusion: The two main outcomes of this survey are clarifications of the timeline of design, and what resources are most applicable to use to judge the stages against.

Timeline: The timeline is different for every company but this section should include research, paper use (sketching & concepting), toiling and prototyping. Although fabric choices were mentioned, this section fits better in the development stage and will be explained alongside more product choices like trims and washes.

Resources: Designers themselves view fabric, energy and paper as the three most used resources when designing. Reduction or increase in use of these three items can be key indicators in whether a process is becoming more or less sustainable.

Defining Segments of Thesis

“Design” - from concept through to prototype incl. office impact, sketching & toiling

“Development” - from the finalised prototype through to final changes on salesman sample incl. prototype adjustments, sampling, washing, fabric choices (cotton, making threads, dyeing, weaving), trims choices

“Production” - from the production order to receiving the goods incl. production processes (cut, make & trim), packaging, transport (duties for cost?), reconditioning
DEFINITION “DESIGN PROCESS”


DEFINITION “DESIGN PROCESS”


DEFINITION “DESIGN PROCESS”


DEFINITION “DESIGN PROCESS”

Design

- Office impact - lighting, heating, food (e.g. meatless mondays) ?
- Sketching - paper waste, pens/pencils
- Toiling - fabric waste

Development

- Prototyping - fabric waste, transport, trims waste
- Sampling - fabric waste, transport, trims waste
- Washing - water waste, effluents, heat, time, chemicals
- Fabric - COTTON - water use, chemicals, ethical, THREADS - energy, water?, DYEING - water use, indigo/dye, chemicals, energy, WEAVING - energy, efficiency?
- Trims - material made from, reusability, durability

Production

- Production Processes - CUT - inlay, stacking height, effect of order quantity & size range?, MAKE - machine energy, ethical issues, heating/air con, lighting, number of rejected?, TRIM - number of faulty, machine energy, heating/aircon, lighting
- Packaging - materials, reusability/durability
- Transport - CO2 emissions, how does this affect timeline.. Does it cause less changes if by air or by boat?
- Reconditioning - chemicals, water use, energy

Defining ‘sustainable’ version 1
GENERAL DEFINITIONS

‘the ability to be sustained, supported, upheld, or confirmed’ - dictionary.com

Simple Definition of sustainable - merriam webster
: able to be used without being completely used up or destroyed
: involving methods that do not completely use up or destroy natural resources
: able to last or continue for a long time

Sustainability could be defined as an ability or capacity of something to be maintained or to sustain itself. It’s about taking what we need to live now, without jeopardising the potential for people in the future to meet their needs. - http://www.landlearnnsw.org.au/sustainability/what-is-sustainability

Conclusion - they are too broad, not specific enough for this research question

General definitions of ‘sustainable‘ include words and phrases such as “the ability to be sustained” (dictionary.com) or “involving methods that do not ... destroy natural resources” (merriam-webster.com). They suggest notions of longevity and the consciousness and acknowledgement of objects, peoples or actions impact. These ideas have been translated across to the fashion world by the likes of Frida Giannini, ex-creative director of Gucci, (“this concept of sustainability, symbolised by a timeless handbag that you wear again and again”) and Oscar de la Renta who both view a sustainable garment or accessory as a timeless, durable one of good quality. Another view is that of Dries van Noten who ponders, not only, for example, the quality of fabric that arrives at a factory, but also the impact it had travelling there, which resonates with the acknowledgement of an object’s impact across its lifetime. Green Strategy, a consultancy firm specialising in sustainability in the fashion industry highlights the importance of “taking into account both environmental and socio-economic aspects”, adding an extra dimension to the traditional green/environmental view of sustainability. Since the Rana Plaza collapse in 2013, the ethical side of fashion has been jerked to the forefront yet again, and has forced many companies to publicly deal with the situation. More recently the release of the documentary “the True Cost’ by Andrew Morgan in 2015 exposed the depths to which the fashion industry has influence, and empowered consumers with clear and understandable knowledge about the facts behind their fast fashion purchases.

As this research focuses on denim fabric and products from design through to production, from fibre through to final product the definition of ‘sustainable’ will be as follows:

‘Sustainable’ within the context of this research is defined as “having 0% environmental or ethical impact”
FASHION RELATED DEFINITIONS

More sustainable fashion can be defined as clothing, shoes and accessories that are manufactured, marketed and used in the most sustainable manner possible, taking into account both environmental and socio-economic aspects. In practice, this implies continuous work to improve all stages of the product’s life cycle, from design, raw material production, manufacturing, transport, storage, marketing and final sale, to use, reuse, repair, remake and recycling of the product and its components. From an environmental perspective, the aim should be to minimize any undesirable environmental effect of the product’s life cycle by: (a) ensuring efficient and careful use of natural resources (water, energy, land, soil, animals, plants, biodiversity, ecosystems, etc); (b) selecting renewable energy sources (wind, solar, etc) at every stage, and (c) maximizing repair, remake, reuse, and recycling of the product and its components. From a socio-economic perspective, all stakeholders should work to improve present working conditions for workers on the field, in the factories, transportation chain, and stores, by aligning with good ethics, best practice and international codes of conduct. In addition, fashion companies should contribute to encourage more sustainable consumption patterns, caring and washing practices, and overall attitudes to fashion. (Green Strategy, June 2014) - http://www.greenstrategy.se/sustainable-fashion/what-is-sustainable-fashion/

Have to look at and analyse what is unsustainable fashion to be able to understand what is therefore the sustainable alternative - http://www.huffingtonpost.co.uk/livia-giuggioli/livia-firth-sustainable-fashion_b_8152496.html

HAS GOOD QUOTES

“How would you define sustainable fashion?”

Frida Giannini, Gucci creative director: “Quality items that stand the test of time – it is this concept of sustainability, symbolised by a timeless handbag that you wear again and again, and can pass on, that I am always thinking of when I design.”
Oscar de la Renta, designer, brand founder: “Sustainable fashion implies a commitment to the traditional techniques, and not just the art, of making clothes. I work today in the same way that I first learnt in the ateliers of Balenciaga and Lanvin 50 years ago. We need to ensure that the next generation of seamstresses and tailors have the skills necessary to develop clothes that are not only beautiful but extremely well made.”
Anya Hindmarch, designer, brand founder, and initiator of the “I am not a plastic bag” initiative: “I would define the ideal as locally sourced materials that don’t pollute in their creation or demise (preferably recycled) and with limited transportation to achieve the completed product.”
And, lastly, designer and brand founder Dries van Noten: “Most of what we may currently refer to as sustainable fashion is a contradiction in terms. It refers to how the fabric used for a new garment has been produced ... Yet, I believe, we need to consider this issue from a more macro and profound perspective. Though a cotton
may be unbleached, we need to examine how it arrives to the manufacturer or to us the wearer. What was the ‘carbon imprint’ of its delivery, for example?”

while the London College of Fashion defines “sustainable” as “harnessing resources ethically and responsibly without destroying social and ecological balance”, it does not go so far as to pin down how that might evolve when attached to the word “fashion”.

http://www.ft.com/cms/s/2/2b27447e-11e4-11df-b6e3-00144feab49a.html

**Defining ‘sustainable’ version 2**

General definitions of ‘sustainable’ include words and phrases such as “the ability to be sustained” (dictionary.com) or “involving methods that do not ... destroy natural resources” (merriam-webster.com). They suggest notions of longevity and the consciousness and acknowledgement of the impact of objects, peoples or actions. These ideas have been translated across to the fashion world by the likes of Frida Giannini, ex-creative director of Gucci, (“ this concept of sustainability, symbolised by a timeless handbag that you wear again and again”) and Oscar de la Renta who both view a sustainable garment or accessory as a timeless, durable one of good quality. Another view is that of Dries van Noten who ponders, not only, for example, the quality of fabric that arrives at a factory, but also the impact it had travelling there, which resonates with the acknowledgement of an object’s impact across its lifetime. Green Strategy, a consultancy firm specialising in sustainability in the fashion industry highlights the importance of “ taking into account both environmental and socio-economic aspects”, adding an extra dimension to the traditional green/environmental view of sustainability. Since the Rana Plaza collapse in 2013, the ethical side of fashion has been jerked to the forefront yet again, and has forced many companies to publicly deal with the situation. More recently the release of the documentary ‘the True Cost’ by Andrew Morgan in 2015 exposed the depths to which the fashion industry has influence, and empowered consumers with clear and understandable knowledge about the facts behind their fast fashion purchases.

As this research focuses on denim fabric and products from design through to production, from fibre through to final product the definition of ‘sustainable’ will be as follows:

‘Sustainable’ within the context of this research is defined as having either a neutral or positive environmental or ethical impact. For the purposes of this research products and processes will be categorised as:

- ‘Unsustainable’
- the product or process has a completely negative environmental and ethical impact
• ‘Less sustainable’
  - the product or process has a completely negative environmental or ethical impact
  - the product or process has a mostly negative environmental and ethical impact

• ‘More sustainable’
  - the product or process has a completely neutral positive environmental or ethical impact
  - the product or process has a mostly neutral or positive environmental and ethical impact

• ‘Fully sustainable’
  - the product or process has a completely neutral or positive environmental and ethical impact

Dyeing Research

http://textiles.archroma.com/advanced-denim/
(Archroma Textiles, 2016)
Archroma advanced denim

http://facweb.cs.depaul.edu/sgrais/indigo.htm
(facweb.cs.depaul.edu, 2016)
Commercialisation of indigo process

http://www.dystar.com/denim-solutions/
(DyStar, 2016)
DyStar indigo vat 40% solution

(DyStar, 2016)
DyStar indigo vat 40% solution

http://www.wildcolours.co.uk/html/indigo.html
(wildcolours.com, 2016)
NATURAL VS SYNTHETIC INDIGO
http://source.ethicalfashionforum.com/article/natural-vs-synthetic-indigo-dyes
(McGinn, 2013)

NATURAL VS SYNTHETIC INDIGO

http://www.independent.co.uk/environment/harming-the-environment-jean-greenie-411294.html
(Greenie)

NATURAL VS SYNTHETIC INDIGO

(Barker)

ENVIRONMENTAL IMPACT OF INDIGO

REPORTS
(Adolf Baeyer 1883)
Adolf Baeyer (1883) "Ueber die Verbindungen der Indigogruppe" [On the compounds of the indigo group], Berichte der Deutschen chemischen Gesellschaft zu Berlin, 16 : 2188-2204 ; see especially p. 2204.

Date of synthetic indigo

(Mahapatra, 2016)
“In 1897, 19,000 tons of indigo were produced from plant sources. Largely due to advances in organic chemistry, production by natural sources dropped to 1,000 tons by 1914 and continued to contract.”

Denim Wash Research

Types of Washes:

MECHANICAL:

Stonewash: This process involves putting the fabric/garments into a large washing machine along with pumice stones or volcanic rocks in order to create a natural-look fade and a soft hand feel. The longer the wash time the lighter the colour, the more abrasions and holes you will have in the fabric/garment and the more likely that the fabric or garment will be destroyed too much. This process is relatively expensive and needs high capital investment.
Sand Blasting: This process has been banned in most laundries due to a media storm over the health issues that became apparent in workers who were not following/were not educated in the proper safety protocol when using the machines. This process creates lightened patches on denim by blasting small sand particles at high velocity against it. When not wearing the proper safety equipment the sand particles can be inhaled, causing damage to the lungs and throat, and can attack the skin on the hands and arms of the workers. Although when conducted under proper safety regulations the wash is as safe as many others that are still in use, media pressure led to the practice being disbanded. There are alternatives to sand blasting that can be found easily e.g. potassium permanganate.

Laser: Patterns or fades can be essentially “engraved” onto denim by using laser. The beam burns the top layer of the fibres, removing the indigo on the surface of the threads. By adjusting the intensity of the laser, you can change how deep it burns and therefore the colour change (e.g. minimal to extreme). With current lasers it is also possible to create abrasions and holes with lasers. A rinse wash is necessary after this procedure to remove any loose fibres, indigo dye and burn marks.

Abrasion (Scraping/Grinding): Abrasion isn’t a “wash” that requires a washing machine, but actually involves a lot of hand labour. This usually involves the jeans being placed on a machine that blows up to imitate a person wearing the garment or a flat plank. The worker then uses sandpaper, and occasionally metal tools, to create the worn or destroyed look desired. The jeans then need to be rinsed to remove any loose threads and excess dye.

Atari: This Japanese term means “fades”. It is a relatively broad term and refers to all location specific fades, e.g. whiskers (thigh and crotch fades), stacks (ankle fades) and honeycombs (back of knee fades).

Iro-ochi: Another Japanese term, this one means the fading of indigo dye in denim. It specifically relates to fading in exposed areas and not across the entire garment.

Tate-ochi: A Japanese term which means the occurrences of ‘Iro-ochi’ have formed in vertical lines in vintage denim. This is due to the difference in the thickness of thread in vintage denim, and the thicker areas of thread tend to fade faster.

CHEMICAL:

Enzyme Wash: Enzymes are obtained as a protein from bacteria and fungi that occur naturally. They are living organisms that will attack a specific molecular group (e.g. cellulose on cotton). For use in denim washing there are 3 main types; neutral, acid and bio-polishing enzymes. Using enzymes is relatively complex as they are very sensitive to a wide range of parameters such as time, temperature and pH levels, meaning that this process uses more resources than others. This requires a lot of water, and an extra step after bleaching to neutralise the enzymes in the fabric.
Bleaching: This process aims to lighten the fabric through using a range of chemicals such as household bleach, hydrogen peroxide, potassium permanganate or sulphuric acid derivatives. This requires a lot of water, and an extra step after bleaching to neutralise the chemicals in the fabric.

Rinsing: This process simply requires the fabric or garment to be washed with water to remove any excess dye that is on the surface. It also reduces the starchiness of the warp thread resulting in a softer hand feel. It is also used as a post-wash to remove things like excess tints, small pumice stones or any extra debris from treated fabric.

Acid Wash: In order to achieve an acid wash finish, one must soak pumice stones in chlorine and then wash the denim with the stones. This produces a snowy or marbling bleach pattern across the denim with a slight yellow tinge.

Tinting: This process is essentially a weak form of re-dyeing the garments, most often giving it a different tint than it’s original indigo. This can be used to restore the indigo colour after washing or to give a non-denim hue such as pink or orange to create a unique look.

Raw: The fabric has not been washed and is in its raw, natural state from the mill. This means that it has a stiff hand feel and is likely to bleed dye onto other fabrics and surfaces it comes into contact with. Many denim purists prefer raw denim as they can then “create” their own unique wash by constantly wearing the jeans and seeing the patterns formed. This can be considered one of the most environmentally friendly washes as it does not require any energy or washing.

Coating: For this a film of PU (polyurethane) is placed over the denim to give a more plastic/wet look finish. This does not harm the denim and can last for the entire lifetime of the garment.

Ozone: Ozone treatment for denim is an increasingly common option, and is in fact already greener than it’s chemical or mechanical counterparts. This treatment involves wetting the denim, exposing it to ozone and then rinsing. This process uses 50% less water and 100% less chemicals than traditional bleaching techniques. More benefits to ozone washing include sanitizing the denim, and the only “waste” is clear, pollution free oxygenated air.

River Washing: This process combines stone washing and enzymes to create a very soft, faded vintage look. The fabric or garment goes through 2 washes, the first with only the pumice stones and the second with enzymes & the pumice stones. Double washing means that there is a higher use of water, and this doesn’t include the rinse/neutralise wash necessary afterwards to rid the fabric of small pumice stones and the enzymes.

http://www.greentechcorp.net/our-technology/dry-ozone-for-denim/ (Green Tech Corp)

http://www.fibre2fashion.com/industry-article/4146/ozone-a-tool-for-denim-processing?page=1 (Keshan)


SUSTAINABLE WASHES - jeanologia offers eco alternatives

http://rivetandjeans.com/jeanologia-eliminates-pp-spray/ (Velasquez)

SUSTAINABLE WASHES - elimination of potassium permanganate

http://rivetandjeans.com/can-water-brush-revolutionize-the-abrasion-process-in-denim/ (Vitone)

SUSTAINABLE WASHES - alternative to hand made abrasion


DENIM WASH SUSTAINABLE ALTERNATIVE

Fibre Research

Extract from iNDiViDUALS research
Recycled Cotton
Recycled Cotton is graded A as it uses recycled fibres from previously worn garments. The process of recycling cotton involves shredding the fabric back up into fibre-sized pieces and remaking the yarns. The main issue with this process is that it produces fibres that are shorter than that of the original cotton, making the resulting fabric feel itchier and less comfortable. This can also only be done a finite amount of times before the fibres are too short.

In Conversion Cotton
In Conversion Cotton is graded B as although the farmers have ceased using pesticides and fertilisers, the soil that the plants grow in may still have residue in it. This cotton is seen as the stepping stone between conventional and organic cotton.

Cultivation: A
Processing: B
Finishings: B
Durability: B

Organic Cotton
Organic Cotton is graded B as although it requires the same amount of water and energy as conventional cotton, there are no harmful or toxic chemicals (e.g. chemical pesticides) used in the cultivation of the crop.

Cultivation: B
Processing: B
Finishings: B
Durability: B

Organic Flax (Linen)
Organic Flax is graded B as the fibre is relatively fast growing (it can be harvested after around 100 days) and requires very little water or fertilisers, but needs a lot of pesticides. Currently 2/3 of flax is grown in a belt across Northern France up to the Netherlands, but is then processed and woven into fabrics in China, increasing it’s carbon footprint. Due to the fabric wrinkling easily and losing shape quickly, flax is often blended with other fibres – also an unsustainable option.

Cultivation: B
Processing: C
Finishings: -
Durability: B

Natural Bamboo
Natural Bamboo is graded B as the plant needs only 1/3 of the water necessary to grow cotton, does not need pesticides and requires less dye than cotton to achieve the same colour intensity. The way bamboo grows is also environmentally friendly as the root systems of bamboo are thickly clumped balls, which keep the soil together. The debris that falls from the plant is also good because it fertilizes the ground at the base of the plant, and stops the ground becoming overused.
However it is important to note that iNDiViDUALS must make sure of 2 things when considering a bamboo fabric:

1) that the fabric itself is actually made from bamboo and it is not bamboo viscose, or bamboo rayon (see Bamboo Viscose – Grade E)
2) that the fabric has come from land that was not intended for crops, and not from felled forest. As the bamboo business becomes more lucrative, it becomes more of a problem that farmers are choosing bamboo crops over edible crops and therefore leading to food shortages, and cutting down forests to make more room for the bamboo.

Cultivation: B  
Processing: B  
Finishings: B  
Durability: B

**Bamboo Viscose**

Bamboo Viscose is graded E as the process of producing the threads requires the use of many harmful chemicals such as lye, carbon disulphide and strong acids.

Cultivation: B  
Processing: E  
Finishings: -  
Durability: D

**Better Cotton Initiative Cotton**

BCI Cotton is graded B as the initiative focuses on growing cotton with a focus on improving the environmental, economic and social aspects that surround the fibre. BCI Cotton sells to many companies, but it is very rare to find a 100% BCI cotton fabric. It is commonly mixed with either recycled or conventional cotton, in this case please check the iNDiViDUALS policy on fibre blends.

Cultivation: A  
Processing: B  
Finishings: B  
Durability: B

**Conventional Hemp**

Conventional Hemp is graded B as the plant requires little to no pesticides, fungicides or herbicides as it grows so fast it leaves all other weeds in the shade. The process of turning the bast fibres from the hemp plant also requires no chemicals.

Cultivation: A  
Processing: B  
Finishings: -  
Durability: B

**Conventional Flax (Linen)**

Conventional Flax is graded C as the fibre is relatively fast growing (it can be harvested after around 100 days) and requires very little water or fertilisers, but needs a lot of pesticides. Currently 2/3 of flax is grown in a belt across Northern
France up to the Netherlands, but is then processed and woven into fabrics in China, increasing its carbon footprint. Due to the fabric wrinkling easily and losing shape quickly, flax is often blended with other fibres – also an unsustainable option.
Cultivation: C
Processing: C
Finishings: -
Durability: C

**Ramie**
Ramie is graded C as although there is an organic and environmentally friendly way to transform the fibres into a yarn, on a mass scale this process often involves chemicals, making it an unsustainable option. A benefit of ramie is that unlike flax or cotton, it is naturally very white meaning that there is no need for bleach in the dyeing process.
Cultivation: B
Processing: D
Finishings: A
Durability: B

**Conventional Cotton**
Conventional Cotton has been graded E as the growing of the fibres requires a large amount of water and an increasing number of harmful or even toxic pesticides. Although there is an increasing awareness about the negative side effects for the environment and the workers, there is still a very negative situation surrounding the growth of cotton, especially in developing countries. One very large problem is the rise of pesticides that large corporations sell to farmers. The more of the pesticide that the farmer uses, the more the pests get used to it, resulting in the farmer having to use even more pesticides. This leads to a toxic level of pesticides regularly being used by people that do not have adequate protection. Once this vicious cycle starts there are two possible outcomes for the farmer, either he develops an illness (most likely cancer, and the corporations that sell the pesticides most often also sell the treatments for the illnesses that the pesticides create) or he becomes bankrupt which often leads to them taking their own lives. Overall, conventional cotton has an incredibly negative and unsustainable effect on both the environment, and the people involved in the industry.
Cultivation: D
Processing: E
Finishings: E
Durability: C

**Recycled PET**

[bionicyarn.com, 2016](http://www.bionicyarn.com/flx.html)
Bionic yarn mechanically recycled polyester
Recycled polyester (PET) is a fibre that has been brought to consumer’s attention by brands like G-Star Raw and their “Raw for the Oceans” campaign in collaboration with Pharrell Williams. Polyester can be recycled in two ways: mechanically and chemically. Chemically recycled PET also requires less energy to make than virgin PET, and is recycling a durable and already existing fibre/filament. To create chemically recycled polyester the existing material is broken down on a molecular level and re-attached together to make a yarn as strong as the original. However this practice is currently very rare due to it being incredibly expensive. Mechanically recycled PET is the better of the two, as it requires less energy to make than virgin PET, and is recycling a durable and already existing fibre/filament. To create mechanically recycled PET the existing material is melted down and reshaped, therefore does not require the use of any chemicals. However this process can only be performed a few times before the molecular structure of the PET is broken beyond repair. This is the process currently used by Bionic Yarn, the thread manufacturer working with G-Star Raw (bionicyarn.com, 2016). Mechanically recycled PET is a fully sustainable fibre (as long as the energy used to create it is renewable) as it has a positive environmental and ethical impact by reusing plastic waste, preventing it from ending up in landfill or the oceans.

**Cotton Research**

Cotton Cultivation Timeline

**SPRING**
- Plant seeds
- Plant starts showing sproutlings
- Water
- Remove weeds, add fertilisers, herbicides & pesticides
- Flowers appear and are pollinated by bees and other insects

**SUMMER**
- Water
- Remove weeds, add fertilisers, herbicides & pesticides
- Plant grows into a shrub about a metre high
- Cotton bolls grow, they then split open to show the fluffy white cotton and seeds
- Prep crop for picking

**AUTUMN**
- Harvest the crop
- Pack seed cotton into bales
- Send bales to the gin
- Gin the cotton to separate seeds and lint (fluffy)
- Repack into bales
WINTER

- Bales sent overseas to spinning mills
- Prep the soil for the next season’s crop

(Cotton Australia)

http://cottontoday.cottoninc.com/agriculture/water/
("Cotton Today – Water")
WATER USE - how much water does cotton actually need to grow

(Person)
COTTON - facts about cotton

("CHAPTER 2: CROP WATER NEEDS")
WATER USE - how much water does cotton actually need to grow

(Laws)
WATER USE - how much water does cotton need to grow

(Russell, 2016)
Cotton prices

Alternative Fibre Research

Alternatives
Hemp

Nettle

Tencel

(Lenzing, 2016)  

Modal

(Lenzing, 2016)  

Modal fibre

Cotton Initiatives Research

BCI

“BCI operates as a not-for-profit organisation. Through a cooperation with a multi-stakeholder group of organisations, together we defined what a better, more sustainable way of growing cotton would look like. We call this definition “Better Cotton”.

Members of the global cotton supply chain are now collectively addressing the negative impacts of mainstream cotton production by supporting this globally recognised definition, generating market demand for Better Cotton, and sharing information and knowledge to enable continuous improvement on everybody’s part.”

http://bettercotton.org/about-bci/who-we-are/  
(Better Cotton Initiative)  

LEADS

“Cotton LEADS™ is a program committed to responsibly-produced cotton. Built upon core principles that are consistent with sustainability, the use of best practices and traceability in the supply chain, the Cotton LEADS™ program offers cotton users the confidence and knowledge that their raw material is responsibly produced and identified.
Commitment

to the social, environmental, economic and regulatory factors required to produce world-class cotton.

RECOGNITION

that sustainable and responsible cotton production requires continual improvement, investment, research and sharing of best practices information among growers and industry.

UNDERSTANDING

that leading change in responsible and sustainable cotton practices will have the most positive impact when implemented in collaboration among farm, regional, national and international programs.

BELIEF

in the benefit of working cooperatively with similar programs that seek to advance responsible and sustainable cotton production in an effort to keep global cotton competitive in world fiber markets.

CONFIDENCE

in cotton identification systems that ensure traceability from farm to manufacturer."

http://www.cottonleads.org/what-is-cotton-leads/principles/
(Cotton LEADS)

E3

What is Bayer CropScience’s sustainable cotton? It’s e³™.

What’s special about e³? Farmers sign up to commit to grow cotton more efficiently and without harming the environment.

What does e³ mean? Third-party, independent auditors certify a farmer’s commitment to grow e³ cotton in an environmentally responsible, economically viable, and socially equitable manner in the United States.

Why does e³ matter? The acres used to produce e³ cotton today will be available to produce e³ cotton tomorrow, to meet the needs of an increasingly sophisticated and environmentally attuned consumer.

How is e³ different? e³ is U.S. grown from superior seed which produces high-quality fiber and yarn. Certified and transparent, the e³ program supports farmers with the latest techniques. e³ also meets the needs of consumers by
providing enormous quantities of sustainably produced cotton.

OWNED BY BAYER - check into bayer's background, seems legit BUT they do make GMO things and POTENTIALLY are doing the same as Monsanto? Bayer pesticide being pulled off the market? Affects USA cotton crops mainly in Cali & Arizona.

http://www.reuters.com/article/us-usa-epa-bayer-idUSKCN0W353F
(Plume)

https://www.itg-global.com/cone-denim-partners-with-e3-sustainable-cotton-program/
(Cone Denim)

http://rivetandjeans.com/wrangler-joins-the-sustainability-consortium/
(Levin)

SUSTAINABLE INITIATIVES

**Denim Timeline Research**

**Cotton Cultivation**
Plant seeds in spring (fertilisers, can plant on corn stubble for extra nutrients)
Water
Pesticides
Herbicides
Time of growth - needs 120 to 180 days frost free from planting to harvesting

http://www.cottonspinning.com/grow/plantingcottonseeds.html
(Ruane)

Methods of picking

**Fabric Manufacturing**
**Raw Cotton**
**Bale Plucker** - Blends the Cotton Qualities on a bale level
**Blow Room** - Opens tufts, cleans the cotton (gets rid of vegetation) and blends different qualities on a fibres level
Carding - Combs tufts, aligns the fibres and turns them into sliver ropes. 6 sliver ropes are wrapped together to create a single drawing sliver

Drawing Frame - slivers are blended and the fibres are straightened again

Roving Frame - roving process twists the slivers into an unfinished yarn and stretches out the fibres, this is then wrapped around a small bobbin

Ring Spinning - thins out, refines, lengthens and strengthens the yarn, final yarn design

Winding - the yarn goes through “optical clearers” that clip off any anomalies, after this the yarns are spliced back together and wound back onto a bigger cone

Open End Spinning - repeat of all previous steps to make sure the yarn is strong and refined - OPTIONAL?

Storage - storage of all yarns

Warping - transferring yarns onto beams (in prep for dyeing) by pulling them in a parallel motion and dragging them through a comb to separate them

Dyeing - all yarns from all beams run into the dyeing range

Beaming / Slashing - After dyeing the yarns are rearranged onto the beams and coated with a starch and wax solution to help prevent them breaking during the weaving process

Weaving - selvedge denim vs full width denim - style of cloth chosen here

Finishing - giving dimensional stability to the fabric (sanforising), enhancing the touch and aesthetics of the fabric (softener etc)

Quality Control - testing all the physical properties of the fabric

Quality Inspection - visual inspection of shade classification and physical properties (marks or loose threads)

http://www.tellason.com/the-journal/denim-production-timeline/
(Tellason.com, 2015)

(Denim North America)

(Candiani S.p.a.)
Candiani S.p.a., Candiani Denim - Production Process. Print.

Garment Production
Cutting
Making
Trimming

Design & Development
Patterns
3d?
Fit
Trims development
Fabric choices
Wash development
Who knows what

Sustainable Fabric Alternatives - Candiani, Made-By, Mud Jeans, KOI
Sustainable Wash Alternatives - Martelli, Blue Lab, KOI
Sustainable Trims Alternatives - Danceney, YKK
DESIGNING PROCESS - FIONA, Hattie, design students, joanne?
CMT - guido to eroglu?, penny jeans?, missing socks?
Office Impact - Stella McCartney, KOI, Candiani
Packaging - dave from de nederlandse, DHL
Transport - DHL, UPS, Greenway, shipping companies
Reconditioning - Dave from de nederlandse
Sustainable brand - Tony's Chocolonely

What to ask who

Candiani

http://rivetandjeans.com/candiani-opens-l-a-garment-center-av/
(Velasquez)
Candiani Design center in LA - uses 50% less water than a local dry cleaners - uses Tonello & Jeanologia machines

- Sustainable alternatives
- What is their most sustainable fabric
- How much more sustainable would you say your XXX fabric is compared to a traditional denim?
- More explanation of their office space in a protected area?
- Do you think that the office itself impacts the sustainability of your product? E.g. does the electricity/paper/ink etc you use on a daily basis affect the overall sustainability of the product? Or does it affect the brand?
- Are there any "green" initiatives amongst the staff e.g. Meat Free Mondays (Stella McCartney)
- Any idea of their electricity usage
- What water usage
- How much waste do they put out? What percentage is already clean by the time it leaves?
- Are their machines energy efficient?
- Is selvedge denim more or less efficient than wide loom denim?
- Are they planning on opening more Design Centres? (congrats on LA)
- Why do they use Tonello & Jeanologia machines? Anything aside from water conservation?
- How did you get to the figure that your LA design centre would consume 50% less water than a typical dry cleaner in the area?
• What company do you use to ship your fabrics? Is there a sustainable option you use?

Made-By
• ??

Mud Jeans
• How many returned jeans do you actually receive?
• Do you have a threshold of jeans you have to receive before you send them to get upcycled/recycled?
• How close to achieving a fully carbon neutral pair of jeans are you?
• Do you think that the office itself impacts the sustainability of your product? E.g. does the electricity/paper/ink etc you use on a daily basis affect the overall sustainability of the product? Or does it affect the brand?
• How do you ship the jeans? Do you use sustainable transport methods?
• Would you consider your jeans the most sustainable ones on the market? How would you compare yourself to e.g. KOI?
• Are you looking to expand the the US or Asian markets? Do you think your concept would be as well received there as it has been in Europe?
• Do you use natural or synthetic indigo?

K.O.I.

("Kings Of Laundry")
KOI only use laser & ozone....?

("Sustainability - Kings Of Indigo")
KOI - fabrics they use, packaging they use, production facilities & practices they use

("Natural Indigo | Kings Of Indigo")
KOI - use of natural indigo

https://www.kingsofindigo.com/en_NL/triple-r.html
("Triple R - Kings Of Indigo")
KOI - recycling
• Which company do you work with for your packaging?
• How do you ship the products? Do you use sustainable transport methods?
• Do you think that the office itself impacts the sustainability of your product? Or does it affect the brand?
• Already use solar panels (Y) but do you recycle paper? Paperless systems?
• Are there any “green” initiatives amongst the staff apart from personal transport e.g. meatless Mondays (Stella McCartney)
• You say that you recycle old KOI jeans, how many pairs do you receive back on average? Where do you recycle them?
• Can’t find anything about sustainable/recycled trims on your website. Do you offer these? If yes what, if no why not?
• Do you use BCI cotton? If not why not?
• How sustainable would you say your jeans are compared to others on the market? E.g. Mud Jeans
• Do you only use laser and ozone to wash? What about physically intensive treatments like scraping?

YKK
• Do you only have sustainable zippers? (Natulon)
• Are there any other products e.g. rivets or buttons that are sustainably sourced/produced?
• How do you ship the products? Do you use sustainable transport methods?

Designing Process
• Please explain your design process in stages, from concept through to prototyping
• Please add in as much detail about the amount of materials you use (e.g. paper, printer ink, fabric etc)

Fiona
• Please explain your design process in stages (and the variations from company to company), from concept through to prototyping
• Please add in as much detail about the amount of materials you use (e.g. paper, printer ink, fabric etc)

Stella McCartney

("A VEGETARIAN COMPANY - Stella Mccartney")

("MEAT FREE MONDAY - Stella McCartney")

**STELLA MCCARTNEY** - meat free monday

(“RESPONSIBLE SOURCING POLICIES - Stella McCartney”)


**STELLA MCCARTNEY** - responsible sourcing

(“ETHICAL TRADE - Stella McCartney”)


**STELLA MCCARTNEY** - ethical trade

(“ORGANIC COTTON - Stella McCartney”)


**STELLA MCCARTNEY** - organic cotton use

- Do you think that the office itself impacts the sustainability of your product? E.g. does the electricity/paper/ink etc you use on a daily basis affect the overall sustainability of the product? Or does it affect the brand?
- Is Meat Free Monday enforced in the office or is it just promoted by the Stella McCartney brand?
- Are there any employee initiatives that have a sustainable focus?
- Do you use BCI cotton?
- Any idea of energy usage? Do they use green power?
- You have a focus on ethical working conditions in your production facilities, but do you also have a focus on sustainable production practices? If not why not?
- On the charity section of your website you have many charities listed, but it doesn’t characterise the link between them and the brand. Is it a donation based relationship, a partnership or simply the brand endorsing the charities.

Dave from De Nederlandse

- How much water does the company use (through steam etc)?
- How much energy does the company use?
- Do they use any renewable or “green” sources of energy?
- Are there any “green” reconditioning techniques or alternatives?
- Do you use any chemicals in the reconditioning process?
- Do you reuse any of the packaging that the clothes come in? If yes, how? If no, why not?
- What packaging company do you use? Do they offer sustainable solutions?
• Have you made any changes to the traditional processes or machines to make reconditioning more sustainable?
• Are there any changes that you could make to make sure that de Nederlandse is a more sustainable operation? If yes, why have you not implemented them yet?

Email Drafts

Candiani

Dear Simon,

Sorry I didn’t get back to you sooner, thank you so much for the information you sent! It was incredibly helpful and gave me a really good insight into the processes and mindset of Candiani. After reading through the material and considering my research question I was wondering whether it would be possible to ask a few more questions? I’m not sure that they will be from your department, so please let me know if there is anyone else I should contact with them!

First of all congratulations on opening a new Design Centre in LA! I had a couple of questions about the facility:
• Are you planning on opening any other Design Centres in Asia/Europe?
• In the following article, Mr Candiani states that “the amount of water consumption of the facility will be less than 50 percent of a standard downtown dry cleaner”. How was this figure calculated (e.g. based on daily figures) [http://rivetandjeans.com/candiani-opens-l-a-garment-center-av/](http://rivetandjeans.com/candiani-opens-l-a-garment-center-av/)
• Are there other reasons for using Tonello & Jeanologia machines aside from water conservation? E.g. quick return on investment, better value for money etc

In terms of your headquarters (offices & production facility), you are obviously already incredibly advanced with regards to behaving responsibly and with an environmental focus. If there is any more literature on this topic that you could send me it would be very much appreciated! However I was wondering if you could answer the following:

• Do you use any sustainable or renewable forms of energy? (e.g. Solar, wind power etc)
• Does Candiani think that the office itself impacts the sustainability of the products? E.g. does the electricity/paper/ink etc you use on a daily basis factor into the overall sustainability of the product? Or is it seen as affecting the sustainability of the brand of Candiani?
• Are there any “green” initiatives amongst the staff? E.g Meat Free Mondays like Stella McCartney
With regards to your production facilities I was wondering whether there were any solid figures for the following (for the first five please try and indicate a timeframe, e.g. per month):

- Amount of energy used (office and/or production facility)
- Litres of water used (new water being introduced, not recycled water)
- Litres of water that are recycled or reused
- Amount of solid waste materials discarded (e.g. cotton)
- Litres of wastewater discarded
- Is there a difference between how many metres of selvedge denim or full width denim can be made in an hour? If yes, what’s the difference?
- Related to the previous question, how much energy is required to run the two different types of machines? Is one of them more energy efficient than the other?
- When you are shipping the final products to your clients, do you use a specific transport company?

Thank you for your patience, I hope this isn’t too many questions! Any answers you have will be very much appreciated.

Kind Regards,
Emi K-T

YKK

Dear Sir/Madam,

My name is Emi Kenny-Troughton and I am a graduating Fashion Management student at the Amsterdam Fashion Institute. I am currently writing my thesis on the subject of sustainability in denim products, and I was wondering whether it would be possible to get some information from you regarding your more environmentally friendly fastenings.

- On your website you highlight and explain the standards with which you work (Oeko-Tex® Standard 100, ISO 9001:2008, ISO 14001:2004, OSHMS (OHSAS 18001/JISHA OSHMS), ISO/TS 16949:2009), but is there a table or chart that can clearly show which of your products are produced according to these standards?

- Although you have sustainable options for zippers (Natulon) do you also have sustainable or environmentally friendly alternatives for denim related trimmings such as rivets and buttons?

- Could you inform me of the transport company you use to deliver your products from the factories to storage facilities/clients? Has YKK already considered using ‘greener’ forms of transport (e.g. biofuel based vehicles)?
Thank you for your time, I look forward to hearing from you soon.

Kind Regards,
Emi K-T

Kings of Indigo

Dear Sir/Madam

My name is Emi Kenny-Troughton and I am a graduating Fashion Management student at the Amsterdam Fashion Institute. I am currently writing my thesis on the subject of ‘sustainability’ in denim products, and I was wondering whether it would be possible to get some information from you regarding your brand.

An environmentally conscious approach in all aspects of the company is something that is difficult to achieve, yet essential to Kings of Indigo. Due to this mindset I feel that K.O.I. is an important brand to study in order to achieve a deeper understanding of the realities of designing, developing, producing and retailing environmentally conscious denim.

You are clearly already a brand that takes an environmentally friendly and ethical approach to the “behind the scenes“ are of fashion, however I still have a couple of questions regarding this topic:

• In a general sense, do you think that the office (electricity use, paper waste etc) impacts the sustainability of your product? Or does it affect the brand?
• You have already shown awareness of the impact of your head office (implementation of solar panels) but do you have any other practices such as recycling paper, limiting printing or staff initiatives such as Meat Free Mondays (e.g.Stella McCartney)
• Which company/agency do you work with for your ‘green’ packaging?
• How do you ship the products? Do you use sustainable transport methods?

In terms of your products, you are vocal about using 90% organic cotton, less harmful washing treatments such as laser and ozone and have a recycling initiative. I was wondering whether it would be possible to find out a bit more detail on this topic through the following questions:

• I can’t find anything about using environmentally friendly/recycled trims on your website. Do you offer these? If yes, which brand do you use?
• Do you use BCI cotton?
• Do you only use laser and ozone to wash? What about physically intensive treatments like scraping?
• You say that you recycle old KOI jeans, but is it an initiative that is currently viable? (e.g. how many pairs do you receive back on average?)
• In response to the above question, in which facility do you recycle them?

Thank you for your time, I look forward to hearing from you soon.

Kind Regards,
Emi K-T

De Nederlandse

Dear Dave,
My name is Emi Kenny-Troughton, I am a student at AMFI and we were in contact through iNDiViDUALS last semester. I hope everything is going well! I am currently writing my thesis on the topic of sustainability in denim products, and I was wondering whether you would be able to help me.

Having visited your facility in January, I already have some insight into how the process works. However I hope it is alright to ask you some more specific questions in order to understand it on a deeper level:

• How much water does De Nederlandse use through its reconditioning systems?
• How much energy does the company use?
• Do you use any renewable or “green” sources of energy?
• Are there any “green” reconditioning techniques or alternatives?
• Do you use any chemicals in the reconditioning process?
• Do you reuse any of the packaging that the clothes come in? If yes, how? If no, why not?
• What packaging company do you use? Do they offer sustainable solutions?
• Have you made any changes to the traditional processes or machines to make reconditioning more sustainable?
• Are there any changes that you could make to make sure that de Nederlandse is a more sustainable operation?

Thank you for your time, I look forward to hearing from you soon.

Kind Regards,
Emi K-T

Fiona Cullen

Hi Fiona,

My name is Emi Kenny-Troughton, you taught me in the Denim minor at AMFI last year. I hope everything is going well! I am currently writing my thesis on the topic of sustainability in denim products, and I was wondering whether you would be able to help me. As a management student I have some idea about the designing process,
but none of the specifics. Would it be alright if you could answer the following questions in as much detail as possible?

- Please explain your design process in stages (and the variations from company to company), from concept through to prototyping (e.g. research - concept - sketching etc with a short explanation of what each point means for you)
- Please add in as much detail about the amount of materials you use (e.g. paper, printer ink, fabric etc)

Thank you for your time, I look forward to hearing from you soon.

Kind Regards,
Emi K-T

Leather Research
http://www.all-about-leather.co.uk/what-is-leather/how-is-leather-made.htm

Process

- Curing
Raw hides and skins must be preserved to stop them deteriorating before the leather-making process can begin. Methods of preservation include salting, chilling, freezing and the use of biocides.

- Soaking
Cured hides or skins are soaked in water for several hours to several days. This allows them to reabsorb any water they may have lost in the curing process or during transportation. It also helps to clean them of salt and dirt.

- Painting
Painting is a method by which wool can be removed from sheepskins using a sulphide based mixture.

- Liming
Liming removes the epidermis and hair. This also results in alkaline swelling of the pelt to cause a controlled breaking of some of the chemical crosslinks of the collagen.

- Fleshing
After liming the pelt is passed through a machine to remove fleshy tissue from the flesh side. Hides may be split into layers at this stage or after tanning.

- Deliming
The principal action of deliming is to gradually neutralise the alkali in the pelt, avoiding rapid changes in pH which could lead to distortion or disruption of the tissues.

- **Bating**
A long delime can significantly improve the removal of any remaining lime, scud (miscellaneous debris) and residual components broken down during liming. Bating - based on the use of enzymes - completes this process so that the pelt is flat, relaxed, clean and ready for pickling and tanning.

- **Pickling**
Weak acid and salt solutions are used to bring the pelt to the weakly acid state required for most tanning processes. Stronger pickling solutions are used to preserve pelts so that they can be stored or transported in a stable form over periods of several months.

- **Degreasing**
Solvents or water-based systems can be used to remove excess grease before tanning.

- **Tanning**
Tanning converts the protein of the raw hide or skin into a stable material, which will not putrefy and is suitable for a wide variety of purposes. Tanning materials form crosslinks in the collagen structure and stabilise it against the effects of acids, alkalis, heat, water and the action of micro-organisms. The main types of tanning materials are:
  - **Mineral tannages**
    Most leather is tanned using salts of chromium.
  - **Aldehyde and oil tannages**
    Tanning with aldehydes and oils produce very soft leathers and this system can be used to produce drycleanable and washable fashion leathers and also chamois leather.
  - **Vegetable tannages**
    Various plant extracts produce brown coloured leathers which tend to be thick and firm. This type of tannage is used to produce stout sole leather, belting leather and leathers for shoe linings, bags and cases.

- **Splitting**
A splitting machine slices thicker leather into two layers. The layer without a grain surface can be turned into suede or have an artificial grain surface applied.

- **Shaving**
A uniform thickness is achieved by shaving the leather on the non-grain side using a machine with a helical blades mounted on a rotating cylinder.

- **Neutralisation**
  Neutralisation removes residual chemicals and prepares the leather for further processing and finishing.

Additional tanning material may be applied to give particular properties which are required in the finished leather.

- **Dyeing**
  The dyeing of leather into a wide variety of colours plays an important part in meeting fashion requirements. Some leathers are only surface dyed, while others need completely penetrated dyeings, as is the case with suede leathers.

- **Fatliquoring**
  Fatliquoring introduces oils to lubricate the fibres and keep the leather flexible and soft. Without these oils the leather will become hard and inflexible as it dries out.

- **Samming**
  This process reduces water content to about 55% and can be achieved by a number of machines, the commonest being like a large mangle with felt covered rollers.

- **Setting out**
  The leather is stretched out and the grain side is smoothed. This process also reduces the water content to about 40%.

- **Final drying**
  Leather is normally dried to 10-20% water content. This can be achieved in a number of ways and each method has a different effect on the finished leather:

  - **Staking and dry drumming**
    A staking machine makes the leather softer and more flexible by massaging it to separate the fibres. To finish off the leather may be softened by the tumbling action inside a rotating drum.

  - **Buffing and Brushing**
    The flesh surface is removed by mechanical abrasion to produce a suede effect or to reduce the thickness. In some cases the grain surface is buffed to produce a very fine nap, e.g. nubuck leathers. After buffing the leather is brushed to remove excess dust.

- **Finishing**
The aims of finishing are to level the colour, cover grain defects, control the gloss and provide a protective surface with good resistance to water, chemical attack and abrasion.

• Final grading

Leather will be graded before despatch to the customer. This grading may consider the colour intensity and uniformity, the feel of the leather, softness, visual appearance, thickness, design effects and natural defects such as scratches.


Ethical impact of leather
• Predominantly tanned in third world or developing countries (e.g. in Bangladesh leather exports count for around $600 million in 2014) so workers rights and safety regulations are not strict OR enforced
• Injuries at work very likely e.g. slips on badly drained floors, “exposure to lime, tanning liquor, acids, bases, solvents, disinfectants, and other noxious chemicals; injury from heavy machinery or flaying knives; drowning, being boiled alive, or buried in lime”

Problems with Chromium
• Chromium is the worst - acts as a carcinogen & irritates the lungs causing “asthma, bronchitis, polyps of the upper respiratory tract, pharyngitis, and the enlargement of the hilar region and lymph nodes” as well as increasing the risk of cancer in the lungs, nose or sinuses. Inhaled as a fine powder.
• When absorbed through the skin causes “chrome holes” (ulcers on the skin that won’t close, irritation, dry/cracked/scaly skin and allergic dermatitis.

Raw Hides
• Anthrax can be passed from raw hides to humans via aerosolized pollution BUT this has been reduced significantly in Western tanning as they have started to disinfect the hides before sending them to tanneries.

Environmental impact of leather
• Tanning one ton of hide produces, on average, 20-80 cubic metres of wastewater which include high levels of chromium and sulfide concentrations, as well as the pesticides added to the hides to stop them decomposing in transit.
• Around 70% of an untreated hide becomes solid waste matter (hair, fat, sinew and meat)
• Elevated chromium levels in wastewater contribute to damaging fish gills “incite respiratory problems, infections, infertility, and birth defects. It can also instigate a number of serious cancers in animals throughout the food chain.”
• Cancers linked with the tanning industry are testicular, nasal, bladder, lung and pancreatic.

Green Alternatives
• Direct recycling - using the same chromium bath for both the initial tanning and re-tanning stages can reduce the presence of chromium in wastewater by up to 21%
• A 2002 study which tested in 540 Indian tanneries implies that you can achieve incredibly similar results with a mix of 70% new chrome and 30% reclaimed chrome as with a wash of 100% new chrome. http://wedc.lboro.ac.uk/resources/conference/28/Rajamani.pdf
• You can also reclaim chromium by mixing the acid bath with sodium hydroxide or sodium carbonate (rapid precipitation) or magnesium oxide (slow removal). With these methods the study says that you can reclaim at least 25-20% of the acid bath’s chrome.

https://prezi.com/uqsw_ex0oa0a/social-and-environmental-impacts-of-the-leather-industry/
(Walker)
- 2 areas of leather impact: agricultural and tanning process
- major waste issues (291 billion lbs of waste per day from US farms)
- waste contaminates water with hormones, antibiotics, ammonia & pesticides
- sustainable alternatives are free range and grass fed
- chrome tanning produces 20-80m3 of untreated water waste per metric ton of hide
- solid waste = 70% of the original wet hanging weight
- tanneries in Bangladesh produce 21600m2 liquid waste and 150 tons of solid waste
- sustainable alternatives are vegetal or brain tanning which are very labour intensive but don’t produce toxic waste

https://www.youtube.com/watch?v=ayHE2rEyvJU
(Crane. TV, 2015)
Crane. TV,. From Pineapple To Puma. 2015. Web. 18 May 2016.

Piñatex is a leather made from pineapple leaves
- environmentally friendly because uses waste from pineapple industry & is a renewable sources
- ethically friendly because extra income for pineapple farmers

http://www.unido.org/fileadmin/user_media/Publications/Pub_free/Chrome_management_in_the_tanyard.pdf
(Ludvik, 2016)
Effect of chrome in tanning processes, how to dispose of waste

(Greenpeace, 2009)

(Wieczorek-Ciurowa and Famielec)

WASTE FROM THE LEATHER INDUSTRY

Ecotoxicological diagnosis in the tanning industry
(Mwinyihija, 2010)

http://www.peta.org/issues/animals-used-for-clothing/leather-industry/leather-environmental-hazards/
(PETA)

ENVIRONMENTAL IMPACT OF LEATHER

http://www.fao.org/wairdocs/lead/x6114e/x6114e03.htm
(fao.org, 2016)

EFFECT OF WASTE FROM LEATHER INDUSTRY

(Bloch, 2012)

LEATHERS IMPACT & ALTERNATIVES

(Stanford)
LEATHER ALTERNATIVE

http://www.ananas-anam.com/pinatex/
("Introducing Piñatex - Ananas Anam")

LEATHER ALTERNATIVE

http://www.all-about-leather.co.uk/what-is-leather/how-is-leather-made.htm
(W-Fowler)

HOW IS LEATHER MADE - STEP BY STEP PROCESS

http://www.theecologist.org/News/news_analysis/1651375/toxic_chemicals_used_for_leather_production_poisoning_indias_tannery_workers.html
(Bengsten)

PEOPLE NOT WANTING TO INVESTIGATE LEATHERS IMPACT

http://wedc.lboro.ac.uk/resources/conference/28/Rajamani.pdf
(Sustainable Environmental Sanitation and Water Services)

LEATHER - a mix of 70 percent new chrome and 30 percent recaptured chrome produces nearly identical results as using 100 percent new chrome.

Ethical Organisations Research

Previous Research done for iNDiViDUALS

Made-By

Made-By offers certified social and fibre benchmarks which can be used for free, alongside a plethora of information on the current situation of labour rights, social standards and fibre standards all on a global scale. Examples of how brands working with Made-By have been benchmarked can also be found online and provides a useful outline and structure for iNDiViDUALS. Made-By offers 6 different consultancy packages; Detox, Sustainable Collection, Cotton Options, People, Leather and Performance Package. If iNDiViDUALS were to opt for one of these packages, the suggested one would be “Sustainable Collection” as it focuses on the whole process, from fibre to after care. Most of the other packages are also too heavily focused on areas that iNDiViDUALS either does not require, or does not require consistently enough.
Global Organic Textile Standard

The Global Organic Textile Standard focuses on ecology and social responsibility, and is the world’s leading processing standard for textiles made from organic fibres. iNDiViDUALS can use this standard to their advantage by focusing on using GOTS certified fabrics in the collection. Using a GOTS certified fabric means that we can know the following;

- it is composed of a minimum of 70% organic fibres
- all the dyestuffs and auxiliaries (added chemicals) have met strict environmental and toxicological criteria
- any wet processing has had the water treated by a waster water treatment plant
- all processors have at least met the minimum social criteria

Ethical Trading Initiative

The Ethical Trading Initiative is an established initiative that focuses on making sure workers worldwide receive the rights and respect that they deserve. They work with NGOs, trade unions and companies, however unfortunately in order to join the ETI as a company we must have an annual turnover of over £1.000.000. They state the reason as “in our experience, companies with a turnover under £1 million rarely have the resources to be an effective member of ETI”. They go on to say that smaller companies and non-member organisations can contribute to the cause by participating in ETI training courses.

Fair Wear Foundation

The Fair Wear Foundation is an independent, non-profit organisation that works with companies and factories to improve labour conditions for garment workers. If iNDiViDUALS was going to aim for a certification, the most recommended and feasible (this may be subject to change) would be the “Young Designer” standard offered by the Fair Wear Foundation. This opportunity offers the chance for iNDiViDUALS to search for new, ethically approved production facilities and broaden its network within the sustainable/ethical community. It also offers us the chance to use a logo that we can use in our marketing strategy to easily communicate the steps we are taking to be a more environmentally and ethically conscious brand to our consumer. Another bonus is that the headquarters of the Foundation are based on the Prins Hendrikkade, and so are easily accessible for talks or appointments. Unfortunately the contact person for FWF is out on maternity leave and her temporary replacement does not have time to answer questions. This will need to be followed up (see questions at the end of this document).

WellMade
WellMade is a project run by the Fair Wear Foundation that is dedicated to informing companies about how to improve the working conditions in their supply chains. They offer free seminars at trade fairs and meetings throughout Europe. The suggestion would have been for WellMade to have them come in for a presentation at the beginning of each semester, as their talk encompasses points from designers through managers to branders and is an easy way to inform the entire company about the effects their decisions can have. Unfortunately the project is being shut down as of 2016.

SA8000

The SA8000 is a central document at Social Accountability International. SAI is a non-governmental, international, multi-stakeholder organisation dedicated to improving workplaces and communities through developing and implementing socially responsible standards. The SA8000 is a voluntary standard based on ILO and UN conventions and is recognised as one of the strongest workplace standards globally. Its intent is to provide an auditable, voluntary standard, to empower and protect all personnel within an organisation’s control and influence who provide products or services for that organisation, including personnel employed by the organisation itself and by its suppliers, sub-contractors, sub-suppliers and home workers. It is intended that an organisation shall comply with this Standard through an appropriate and effective Management System. The website for SAI says that the SA8000 “It is universally applicable to every type of organisation, regardless of e.g., its size, geographic location or industry sector”.

Fair Labour Association

The FLA is a collaborative effort of universities, civil society organizations and socially responsible companies dedicated to protecting workers’ rights around the world. The FLA places the responsibility on companies to voluntarily meet internationally recognized labour standards wherever their products are made. They offer:

- A collaborative approach allowing civil society organizations, universities and socially responsible companies to sit at the same table and find effective solutions to labour issues;

- Innovative and sustainable strategies and resources to help companies improve compliance systems;

- Transparent and independent assessments, the results of which are published online; and

- A mechanism to address the most serious labour rights violations through the Third Party Complaint process.

The FLA has its headquarters in Washington, D.C. and offices in China, Switzerland and Turkey, showing it’s international reach.
Business Social Compliance Initiative

The BSCI is a business driven initiative supporting retailers, importers and brands to improve working conditions in supplying factories and farms worldwide. It is an initiative of the Foreign Trade Association and all BSCI members are also FTA members. BSCI’s vision is a world of free trade and sustainable global supply chains, in which national labour legislation and ILO conventions effectively protect workers rights. BSCI offer a code of conduct, an implementation system and various tools and activities to support companies and producers no matter the product type or sourcing country. They do not do audit companies themselves but refer clients to external parties.

BSCI offers three main areas of services; Monitoring, Empowering and Engaging. Monitoring includes activities such as a comprehensive database of accredited auditing companies, checklists for buyers and self-assessment forms for producers. Empowering involves offering a broad range of workshops for participants and their business partners, guidance through manuals and briefings and individual, personal advice given by the secretariat. Finally Engaging allows participants to come together at a national level and discuss experiences and best practices, have crisis management training and improve relationships with stakeholders. All three would be incredibly useful for individuals, however joining the FTA even as an associate member would mean an annual fee of £3000 which is something that iNDiViDUALS can’t afford at the moment.

Business Environmental Performance Initiative

The BEPI is the environmental version of the BSCI. It is also an FTA initiative supporting retailers, importers and brands, but its focus is on improving environmental performance. It offers one implementation system and one comprehensive view on 11 environmental performance areas as well as various tool and activities to support companies and producers, no matter the product type or sourcing country. BEPI offers a similar set of services split under the same names as BSCI, namely Monitoring, Empowering and Engaging. Of the 11 environmental performance areas, only one is mandatory (environmental management system) and then a further 4 are selected for each specific participant.

WRAP is a registered charity that focuses on three main areas, food & drink, clothing & textiles and electricals & electronics, to reduce their impact. Unfortunately the programme is very UK-centric, but it shows the collective impact through figures as the three areas make up 25% of UK carbon footprint, 80% of UK water footprint and 40% of UK household waste. They work by forging strong and beneficial partnerships between governments, businesses, communities, thinkers and individuals to support more sustainable economies and society. The most important initiative for iNDiViDUALS run by WRAP is the Sustainable Clothing Action Plan (SCAP). The aim of this plan is to improve the sustainability of clothing across its lifecycle. Within this plan there 4 groups; the re-use recycling group, the influencing consumer behaviours group, the metrics group and the design for longevity group.
Unfortunately signing up to SCAP requires you to be a UK based business, and a commitment to reducing the carbon, waste and water footprints of clothing iNDiViDUALS receives by 15%, starting from a baseline year of 2012. Considering that iNDiViDUALS does not have an indepth knowledge about the impact of its collections, it would be hard to reduce the impact without knowing our baseline.

15

Questions to ask at Denim Days

Fabric Suppliers / Mills
• What does the word ‘sustainable’ mean for you in a denim context?
• Do you offer any ‘sustainable’ denims?
• What are the costs for you compared to unsustainable denims?
• What are the differences in final cost between a ‘sustainable’ and unsustainable denim?
• Are they made from cotton fibre?
• What transport company do you use?
• Do you think sustainability is just a trend or a long lasting phenomenon?
• Do you have any knowledge about the washes used on these samples? Have you used any ‘green’ alternative washes?

Trims Suppliers
• What does the word ‘sustainable’ mean for you as a professional?
• Do you offer any ‘sustainable’ trims?
• What makes them ‘sustainable’?
• What are the costs for you compared to unsustainable trims?
• What are the differences in final cost between a ‘sustainable’ and unsustainable trims?
• What transport company do you use?
• Do you think sustainability is just a trend or a long lasting phenomenon?
• Do you work with any particular denim brands?
• Do you have any green or ethical certificates?
• Where is everything produced?

Laundries
• What does the word ‘sustainable’ mean for you in a denim context?
• What would you say is the most popular wash at the moment?
• Does it have a ‘sustainable’ alternative?
• Do you offer ‘green’ washes? How are they ‘green’? Do many companies ask for green washes?
• What are the costs for you compared to unsustainable washes?
• What are the differences in final cost between a ‘sustainable’ and unsustainable washes?
• Do you think sustainability is just a trend or a long lasting phenomenon?

**Changing research question & sub questions**

I have decided to change my research question as the previous one covered too many topics and therefore my research could not be as in depth as it should be due to time constraints. The proposal below was accepted.

**Research Question Change Proposal**

**Proposal**

I would like to propose changing my research question from:

‘To what extent is it possible to design, develop and produce a fully sustainable denim product?’

to:

‘To what extent is it possible to develop a fully sustainable denim product?’

**Rationale**

Through my research period I have found that my initial research question had too broad a scope, and therefore I could not dedicate enough time to each section to develop an in depth understanding and draw meaningful conclusions for my sub questions. Also due to a lack of access to useful information regarding topics such as design and production process, my primary focus would be the development stage. Over the coming weeks I will have access to many industry professionals through meetings and denim events which will allow me to access a higher level of data and therefore provide more accurate and relevant advice as my final product.

**Research Proposal – To what extent is it possible for a denim company or department to implement a fully sustainable denim development process?**

**First Draft**

1.1. Introduction

1.2. Background paper idea

1.3 Opportunity Statement / Problem Statement

1.4. Relevance of the research report + goal(smart)
Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant.

Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer. The sustainable angle in this research is mainly fuelled by the following three elements;

1. the fact that there are many “green” alternatives to current fabric choices and production processes but these are often not combined due to lack of communication between parts of the supply chain and the brands (Veenhoff, 2016)
2. there is little to no responsibility or accountability for the effect of the production facilities on a garments sustainability or ethical standing
3. and that it is proven that younger generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making

A large part of the sustainable solutions that are coming out of the industry focus on the fibres used to create the garments, and the ethical and environmental impact that they have. Aside from the petroleum based obvious “bad guys” like polyester, cotton is one of the least sustainable fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to the controversy of GMO crops, exploitation of farmers to the widespread use of harmful chemicals. Around 20 million tonnes (US) (18,14 billion kg) of cotton are grown every year (wwf.panda.org, 2016), and these fibres are present in over 50% of all clothing and other textiles (cottoninc.com, 2016). An example of how inefficient growing cotton is, it takes around 1514 litres of water for a simple cotton t-shirt (including all processes) and around a staggering 6814 litres of water (TreeHugger.com, 2016) to fully process a pair of jeans. The amount of cotton needed for 1 t-shirt and 1 pair of jeans is 1kg (wwf.panda.org, 2016), and just over 1 billion pairs of jeans are sold annually on a global scale (statisticbrain.com, 2016), which gives a rough total of around 1 billion kilos of cotton being affected by the denim industry a year. This shows that steps taken to reduce denims impact can have large scale consequences.

This project will culminate in a thesis and a tool to educate denim companies or departments of different sizes and for them to use to create a more sustainable, or fully sustainable denim development process.

1.5. Research question and sub-questions

The research question is:

To what extent is it possible to implement a fully sustainable denim development process?

The sub questions are:
• What is the definition of “sustainable” with regards to this research?
• What is the definition of “ethical” with regards to this research?
• How do the internal workings of the company affect the sustainability of the product?
• What traditional development processes does a denim product go through, and are there new, ethical or sustainable alternatives?
• Is it feasible to implement a fully sustainable and ethical denim development process?

1.6. Methodology

The methodology will mainly consist of primary research, secondary research and interviews with denim professionals. To answer “What is the definition of ‘sustainable’ with regards to this research?” and “What is the definition of ‘ethical’ with regards to this research?” I will refer to existing definitions by academics, retailers, brands and consumers, as well as considering the relevance for this particular topic. To answer “How do the internal workings of the company affect the sustainability of the product?” I will primarily do interviews with professionals in various product segments to gain a general view through visits, email and visiting fairs such as Amsterdam Denim Days and Kingpins. I will also study various companies, such as Stella McCartney, to see if a sustainable approach to the internal workings of the company benefits the products. In order to answer “What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?” I will interview denim professionals and consumers to understand their view on the issues, as well as doing primary research. The majority of the alternative solutions will be found through primary research and interviews with the companies providing the sustainable services. The final question, “Is it feasible to implement a fully sustainable and ethical denim development process?” will be answered through researching precedent, analysing the costs of the product and opinions of various denim professionals.

1.7. Organization of the report

The report will follow the below structure:

Introduction / Executive Summary
Definition of denim
What is the definition of “fully sustainable” with regards to this research?
What is the definition of “ethical” with regards to this research?
What is the definition of “development processes” with regards to this research?
What sustainable or ethical impact can facilities involved in denim development have?
What traditional development processes does a denim product go through, and are there new, ethical/sustainable alternatives?
Is it feasible to implement a fully sustainable and ethical denim development process?
Conclusion

1.8. Limitations of the research

- Student so companies won’t respond
- Companies advertise themselves as sustainable but don’t live up to it in every aspect
- Rare that companies are transparent
- Hard to measure how much energy/water you save

_Tutor Meeting, Ligia & Jacqui 19/04/16_

restart research report

either start with broad question and narrow down

or start with narrow question

CHECK EMAIL ABOUT INTRODUCTIONS

- keep definition of denim short
- finish definition of sustainable (include ethics?)
- define ethics regarding denim development
- type up denim days notes in process book, refer to them in research report NOT to process book
- mention CSR in the thesis
- start with sustainability, then narrow it down to what’s relevant to my research
- advice for denim companies/ denim departments/ developers & thesis

- final product can also be a book of all fabric choices

- show choices in each section

- missing a red thread through the report - link to the question, make conclusions

- check dlwo for business ethics (semester 4)
  venn diagram model for ethical decision making

- thesis is basically research report but with a nicer structure (beginning, chapters, end etc)

.Buttons & Rivets Research

_http://qz.com/492510/compostable-jeans-are-a-thing-now/_
_(Avins, 2015)_

Unscrewable buttons

http://www.theguardian.com/environment/2006/nov/24/ethicalliving
(Osborne, 2006)
Sustainable button

Zippers Research

(sourcedenim.com, 2015)
YKK and TYT zippers

(tyttrend.com, 2016)
TYT zippers

(ecofashionworld.com, 2008)
TYT zippers

http://www.designlife-cycle.com/zippers/
(Tribuzi, 2014)

(World Polyester Fiber Report 2010)

("Sustainability / YKK FASTENING PRODUCTS GROUP")
TRIMS - sustainable alternatives
Research Proposal – To what extent is it possible for a denim company or department to implement a fully sustainable denim development process?

First Draft with Feedback from Ligia

Executive Summary
Introduction

1.2. Background paper idea

1.3. Opportunity Statement / Problem Statement

1.4. Relevance of the research report + goal(smart) Make goals separate

Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant.

Sustainability is a key factor in the current zeitgeist of mental, physical and environmental wellbeing. The concept has spread through all product categories and is igniting fires in the average consumer PROVE. The sustainable angle in this research is mainly fuelled by the following three elements;

1. the fact that there are many "green" alternatives to current fabric choices and production processes but these are often not combined due to lack of communication between parts of the supply chain and the brands (Veenhoff, 2016)

2. there is little to no responsibility or accountability FOR WHO? for the effect of the production facilities on a garments sustainability or ethical standing

3. and that it is proven SOURCE? that younger generations (e.g. Generation Z) are a lot more aware of the impact of their choices and therefore look for garments that reflect this conscious decision making

A large part of the sustainable solutions that are coming out of the industry focus on the fibres used to create the garments, and the ethical and environmental impact that they have. Aside from the petroleum based obvious “bad guys” like polyester, cotton is one of the least sustainable fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to the controversy of GMO crops, exploitation of farmers to the widespread use of harmful chemicals.

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around 1 billion kilos of cotton being affected by the denim industry a year. This shows that steps taken to reduce denims impact can have large scale consequences.

This project will **culminate (change this word)** in a thesis and a tool to educate denim companies or departments of different sizes and for them to use to create a more sustainable, or fully sustainable denim development process.

1.5. Research question and sub-questions

The research question is:

To what extent is it possible to implement a fully sustainable denim development process?

The sub questions are:

- What is the definition of “sustainable” with regards to this research?
- What is the definition of “ethical” with regards to this research?
- How do the internal **workings (change this word)** of the company affect the sustainability of the product?
- What traditional development processes does a denim product go through, and are there new, ethical or sustainable alternatives?
- Is it feasible to implement a fully sustainable and ethical denim development process?

1.6. Methodology

The methodology will mainly consist of primary research, secondary research and interviews with denim professionals. To answer “**What is the definition of ‘sustainable’ with regards to this research?’**” and “**What is the definition of ‘ethical’ with regards to this research?’**” I will refer to existing definitions by academics, retailers, brands and consumers, as well as considering the relevance for this particular topic. To answer “**How do the internal workings of the company affect the sustainability of the product?’**” I will primarily do interviews with professionals in various product segments to gain a general view through visits, email and visiting fairs such as Amsterdam Denim Days and Kingpins. I will also study various companies, such as Stella McCartney, to see if a sustainable approach to the internal workings of the company benefits the products. In order to answer “**What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?’**” I will interview denim professionals and consumers to understand their view on the issues, as well as doing primary research. The majority of the alternative solutions will be found through primary research and interviews with the companies providing the sustainable services. The final question, “**Is it feasible to implement a fully sustainable and ethical denim development process?’**” will be answered through researching precedent, analysing the costs of the product and opinions of various denim professionals.
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• Student so companies won’t respond
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• Rare that companies are transparent
• Hard to measure how much energy/water you save

Write in a more storytelling fashion, get rid of the bullet points

**Interviews at Kingpins**

Lenzing - Michael

What does the word ‘sustainable’ mean for you in a denim and professional context?
• Nothing is fully sustainable
• Humans are always making an impact, even when they’re making huge efforts not to
• Having a sustainable denim product means looking at every aspect e.g. fibre choice, fabric production, dyeing and finishing
• Check what reverse osmosis is, it sounds bad
• Sustainability in the denim industry is not driven (yet) by consumers, it’s more driven by the businesses. They’re putting investments in now so that when consumers demand it, it’s already there

• Lenzing produces viscose (over 100 years old), modal (50 years) and tencel (lyocell) (for 23 years)
• They produce 90% of the global production of lyocell
• Lyocell is a completely closed loop process
• Viscose and modal are both energy intensive
• All by-products that are produced by lenzing are refined, used or sold on, e.g. acetic acid goes to the food industry - this obviously adds to profit!
• The Austrian production facility uses 90% green energy (they have plants in Austria, UK, Alabama, China and Indonesia which allows them to
• Tencel is the primary fibre used in denim due to it’s durability and resistance to chemicals (useful in the washing process)
• Modal is added to stretch denims as it gives an extra softness and bulk to the fabric
• There is essentially no price difference between tencel and modal
• Tencel is about 10% more expensive than a clean bale of cotton

Absolute Denim - Vichai

• They focus on sustainable dyeing (reusing chemicals, no wastewater)
• Their most sustainable dyeing technique is rope dyeing which gives the darkest shade of blue
• As their focus isn’t on fibre, organic cotton represents only roughly 10% of the collection
• 5-8% difference between buying organic and regular cotton
• 5-8% difference between selling organic and regular cotton fabrics
• They view sustainability as a phase with the potential to turn into something bigger
• 2 reasons that companies become more sustainable:
  • 1) if the country is more developed the government places pressure on companies to be sustainable to protect themselves
  • 2) if the country is less developed the companies become greener as a marketing tool

Indigo Istanbul - Taksin

• They create fabrics but don’t own their own mills
• They sometimes focus on sustainable elements like organic cotton, but this focus comes from them, not from consumer demand
• He estimated that around 30% of their clients actively asked for ‘sustainable’ fabrics
• Their organic fabrics were not only made from organic fibres, but they classed all the processes the fibre went through as ‘organic’ (e.g. the chemicals etc) ??
• The difference per metre for organic vs regular was between €0,50 - €1,00

Blue Farm Textile - Bert

• No focus on sustainability (company owners don’t find it important)
• Despite this he admits there is demand from the market
• They have the possibility to use organic cotton if the client asks for it specifically
• There is a 5-10% price difference between organic and regular cotton, both in buying the fibre and selling the fabric
• They have a focus on the construction of the fabric (still not in a sustainable manner)

Canatiba Denim Industry - Fabio & Felipe

• They produce around 10 million metres per month (?) of around 1000 different fabrics
• They don’t have a specific focus (e.g. fibres, construction etc) when it comes to the fabrics they develop and produce
• All of the fabrics they offer have an element of sustainability in them
• They recycle 30% of all water used
• They have their own water treatment plant
• Wood furnace
• Even their finishings use less water
• They focus on reverse transport, e.g. they use biodegradable or reusable dye containers so they don’t have to ship the empty ones back or put them in landfill
• They don’t use any fossil fuels, ALL ENERGY IS RENEWABLE e.g. the smoke from the wood furnace goes into the water treatment system to balance the pH, and the heat gets reused and transported around the facility to warm dye baths etc
• They also focus on using sustainable partners e.g. Dystar, Archroma, Lenzing
• They agree that the fibre choice has the most impact on the final price of a fabric
• They can use a dyeing process which uses 90% less water but is no more expensive than a regular dyeing procedure

Tintes Egara - Armand & Nacho

• Natural dyeing (same cost as regular dyeing), uses steel oxide
• Main colours are blue, red, yellow and brown
• Can dye around 300-400 pairs in 40 minutes
• There is a small liquid ratio and no energy necessary (don’t need to heat the water, it can be dyed in cold water)
• They dye and finish garments, not fabrics
• They have a big focus on sustainability and the majority of their practices don’t use water or hot air
• The cost of natural dyeing 1000 pc jeans would be around €2000

Royo

• Their facilities are ‘Level 2’ on sTep (OekoTex)
• They offer a fabric made from only organic cotton & recycled denim

YKK - Simone Herbig

• Sustainable options for metal trims = not plating (baking?)
• Uses 70% less chemicals and 54% less water than regular metal trims
• Costs up to 10% more
• Varnishing trims also uses less water

Cone Denim - Kara

• Natural indigo fabric - uses natural indigo grown in Tennessee
• Sustainblue - mix of recycled and sustainable yarns (sustainable yarns = tencel, recycled PET, earth spun yarns, reprieve (?) yarns
• They recycle the cotton in the US and in China
• In terms of office impact they try to recycle as much as possible (e.g. paper) and use things like low energy lighting
• The Chinese factory has skylights to help reduce electricity use
• The US factory uses methane gas collected at a local landfill as an energy source
• They do not use sustainable fibres across the whole collection but they have access to BCI and e3 cotton if the customer requests it
• They have 1 facility in the US, 2 in Mexico and 1 in China
• There is a big focus on keeping the price of sustainable fabrics comparable to the regular fabrics in order to encourage people to buy them

Tonello - Alice

• Develop and produce machines for laundries
• Launching ‘Safe Garment’ initiative to help brands communicate a greener wash to their consumers
• They offer the water brush (like scraping/laserling, makes abrasion) which is a closed loop process (they constantly reuse the water).
• They also offer the ‘NoStone’ alternative to stone washing. This comprises of an abrasive drum which can be fastened into any Tonello washing machine cylinder, that is easily removable, takes about an hour to set up or take out. This reduces water consumption, production costs, emissions, processing time and manual labour, as well as not damaging the machines or producing dust or sludge like using stones would. An added benefit is that it creates a uniform effect in both sampling and production machines, guaranteeing that the final product will resemble the agreed upon sample.

Interviews at Blueprint

G-Star - Bart

- G-star raw foundation, have an entrepreneurship programme in their production facilities for workers and their families - active in the ethical side
- They don’t actively use any green transport, mostly by boat or plane from factory to warehouse, and then from warehouse to stores/consumers they use DHL
- In terms of transport they did try to do deliveries by bike in Amsterdam in 2014 but stopped the project as there were many difficulties including the parcels being too large and the delivery time not being accurate enough
- Known as a ‘green’ company - before Pharrell driven by 70% consumer demand and 30% business ethics, After Pharrell driven by 60% consumer demand and 40% business ethics

Calvin Klein

- Because part of PVH, the sustainable side of them strongly comes from company ethics although obviously there is some response to the consumer demands. They see themselves as innovators, ahead of what the consumers want
- Nearly all cotton used is organic, they actively choose for washings that use less water, they reuse water, use less packaging (e.g. cut down on packaging individual pieces), use less transport
- In terms of transport they still use regular air freight and ships, but actively use greener trucks
- For them, sustainable is a standard not a sub line (e.g. H&M) so sustainability can be found across all products
- They design the product and then see how they can make it more sustainable

Bossa Denim - Ipek

- Every season they offer a few fabric concepts and one is always ‘RESET Collection’ which is made up of sustainable fabrics
- Includes: recycled cotton, recycled PET, tencel, Modal, Escafe? (made from used coffee beans, makes a naturally anti-odour fabric)

Kings of Indigo - Tony

- They promote a sustainable office atmosphere - solar panels, public transport/cycling, all lunches are catered using majority organic foods
• The stitching of the jeans is done in Tunisia and the washing is done in Tunisia and Italy
• They are linked to the FairWear Foundation and have just been reinstated as members
• 80% of their collection is denim
• For them environmental issues have more effect than ethical ones (because they are already covering that by working with FWF approved facilities)
• Washings: definitely never use bleaching or sand blasting, focus on laser and ozone, sometimes use PP spray afterwards to make the colour pop
• The sustainable focus comes from the business side (and Tony, he worked for Kuyichi for 7? Years before setting up KOI)

Lectures at Blueprint

Towards a brighter blue - how to save a million gallons of water - James Veenhoff

• In the past 20 years (1995-2015) there has been €5 bil brought in by brands based in Amsterdam
• Pollution in Pearl River (nicknamed Cowboy City)

• Use about 5-7,000 litres of water per garment
• Dark side of denim covers: water use, pollution, working conditions and energy/waste issues
• There is a lack of: collaboration, knowledge and courses of action (all parts of the industry keep to themselves but if there was more communication it would be easier to make the whole process greener)
• House of Denim mantra: Dryer, Cleaner, Smarter
• He estimates that we grow/use around 26,400,000,000k of cotton a year
• He also estimates that we produce around 1.2 billion garments a year
• THEREFORE 1,200,000,000 x 7,000 (litres of water) = 8,400,000,000,000 (8.4 trillion) litres of water used per year
• Recycling 1 t-shirt saves 2.100 litres of water
• PCR = Post consumer reuse/recycled
• Red Light Denim - 19% pre worn denim, €4,80 per yard (normal is €3) which gives an end product of around €100-€120 per garment, saves around 0,57 kg od CO2 and 750 litres of water per garment
• Red Light Denim #2 - 25% PCR, 20% hemp, 55% organic cotton, over 1000 litres of water saved per garment BUT PRICE IS HIGHER, FIBRES ARE SHORTER AND VOLUMES ARE LOWER
• 1 star denim - 5% PCR (saves 250 litres of water), more accessible to clients as price is lower and volumes are higher
• IMPORTANT NOTE: can still recycle garments with up to 5% other fibres in them but need 95%+ cotton
• There is new tech being developed which checks garments with an infra red light and, based on what gets reflected back, the machine can tell what the fibres are composed of. It is a completely automated procedure

The Nudie Jeans Eco-Cycle

• Using 100% organic cotton since 2011/12
• Part of their approach to social responsibility is having long term relationships with their suppliers
• They have a completely transparent production line (can check the audits performed on their supply chain on their website)
• They offer a free repair service (unlimited use)
• They resell second hand products (that have been returned by customers and patched up in their repair stores)
• They recycle their own worn out products (offer 20% discount for returning items)
• They are a member of the Fair Wear Foundation

Research Proposal – To what extent is it possible for a denim company or department to implement a fully sustainable denim development process?

Final Draft

Chapter 1 – Introduction
1.1. Background paper idea

Through researching articles for the Inspiration Book project in my first few weeks as an AMFI student, I uncovered an interest in the sustainability issues faced by the fashion industry as a whole, which has progressed over the years to a focus on the sustainability issues in the denim industry. As the issue of sustainability is still a very relevant one, and my previous experience with the denim industry has been in a product development and production capacity, this led to the final research question.

1.2. Opportunity statement / problem statement

Within the denim industry there are many “green” alternatives to current fabric choices and production processes but these are often not combined due to lack of communication between parts of the supply chain and the brands (Veenhoff, 2016). This disconnect opens up an opportunity to research the feasibility of a fully sustainable denim development process, and produce a tool that helps to fill this gap.

1.3. Relevance of the research report

Sustainability is a key factor in the current global zeitgeist of mental, physical and environmental wellbeing (Forbes, 2015). The concept has spread through all product categories and is steadily becoming a regular feature through special collections, e.g. H&M’s ‘Conscious Collection’, or through a brand’s entire collection, e.g. Nudie Jeans only using organic cotton (Nudie Jeans, 2016). Sustainability and denim are two areas of fashion that are currently going through revolutionary stages in their relationship with the industry, making this topic incredibly relevant for denim companies or departments.

The sustainable angle in this research is mainly fuelled by the lack of communication among the denim supply chain, but is also inspired by the little to no responsibility or accountability held by the facilities used by brands for the effect they have on the garments through a sustainable or ethical standing. After the Rana Plaza catastrophe in 2013 many end consumers were shocked to find out the circumstances in which their clothes have been made, and as a response scores of brands pledged to improve working conditions for their employees. 3 years on and many brands haven’t followed through on their promises (International Labour Rights Forum, 2016), so it is of high importance that these issues are not forgotten.

This research report is also very relevant to the denim industry due to a large part of the sustainable solutions currently offered focus on the fibres used to create the garments, and the ethical and environmental impact that they have. Aside from the petroleum based obvious “bad guys” like polyester, cotton is one of the least sustainable fibres currently in use by the clothing industry. Issues with the fibre range from enormous water usage to the controversy of GMO crops, exploitation of farmers to the widespread use of harmful chemicals. Around 20 million tonnes (US)
(18,14 billion kg) of cotton are grown every year (wwf.panda.org, 2016), and these fibres are present in over 50% of all clothing and other textiles (cottoninc.com, 2016). An example of how inefficient growing cotton is, it takes around 1514 litres of water for a simple cotton t-shirt (including all processes) and around a staggering 6814 litres of water (TreeHugger.com, 2016) to fully process a pair of jeans. The amount of cotton needed for 1 t-shirt and 1 pair of jeans is 1kg (wwf.panda.org, 2016), and just over 1 billion pairs of jeans are sold annually on a global scale (statisticbrain.com, 2016), which gives a rough total of around 1 billion kilos of cotton being affected by the denim industry a year. This shows that steps taken to reduce denims impact can have large-scale consequences.

This research report is therefore very relevant for denim companies, departments and professionals as it highlights and tackles both environmental and ethical issues within the context of denim development processes.

1.4. Goals

This project will produce a research report and process book, and as a final product an online tool to educate denim companies or departments of different sizes. This will also have the function of allowing them to create and develop a more, or fully, sustainable denim development process through showcasing existing products currently offered by a range of denim mills, laundries and trims manufacturers.

1.5. Research question and sub-questions

This research aims to uncover to what extent a denim product can be developed in a sustainable manner, which has lead to the research question of “To what extent is it possible for a denim company or department to implement a fully sustainable denim development process?”. In order to have a well rounded answer this, I will use the following subsidiary questions: “What definitions are required by this research?”, “What environmental or ethical impact can facilities involved in denim development have?”, “What traditional development processes does a denim product go through, and are there new, ethical/sustainable alternatives?” and “Is it feasible for a denim company or department to implement a fully sustainable denim development process?”.

1.6. Methodology

The methodology will mainly consist of primary research, secondary research and interviews with denim professionals. To answer “What definitions are required by this research?” I will refer to existing definitions by academics, retailers, brands and consumers, as well as considering the relevance for this particular topic. To answer “What environmental or ethical impact can facilities involved in denim development have?” I will primarily do interviews with professionals in various product segments to gain a general view through visits, email and visiting fairs such as Amsterdam Denim Days and Kingpins. I will also study various companies, such as Stella McCartney, to see if a sustainable approach to the internal workings of the company
benefits the products. In order to answer “What traditional processes does a denim product go through, and are there new, innovative/sustainable alternatives?” I will interview denim professionals and consumers to understand their view on the issues, as well as doing primary research. The majority of the alternative solutions will be found through primary research and interviews with the companies providing the sustainable services. The final question, “Is it feasible to implement a fully sustainable denim development process?” will be answered through researching precedent, analysing the costs of the product and opinions of various denim professionals.

1.7. Organization of the report

The report will start with an executive summary and introduction (Chapter 1), followed by highlighting and defining key terms related to the research (Chapter 2). This will give the reader a basic understanding of the topic and the terms used often in the report. Each chapter will have a small conclusion to help solidify the findings for the reader. Chapter 3 will uncover the sustainable and ethical issues that can be presented at or by facilities related to the denim development process, and give examples on what facilities are currently doing to combat them. This will then lead to Chapter 4, which discusses the traditional denim development processes, the current alternatives and questions how sustainable these alternatives are. In order for this report to be relevant for denim companies and departments, Chapter 5 outlines the feasibility of creating a fully sustainable denim development process. Finally Chapter 6 concludes report and gives an outline on the final product and how it can be used.

1.8. Limitations of the research

Due to this report focusing on both what needs to be changed and also the feasibility, there are some unavoidable limitations to this research. As much of the research on what the issues are and how to combat these is freely available online and in print there are not many problems. However it is important to review sources of information carefully, e.g. information about a product from the company that creates it is likely to have a positive bias. The research on the feasibility has more drawbacks, such as the difficulty in measuring amounts of energy or water saved and the exact costs of subjective tasks like washing denim. This research is by no means a definitive report on the feasibility of a fully sustainable denim development process, and the conclusions drawn have been based on the information that has been available.

Final Product

Due to the existence of many sustainable alternatives, but a lack of communications within the denim industry there is an opening for a platform that can educate and connect denim professionals with the goal of establishing a more sustainable denim development process as the norm. Therefore my final product will be a model
website, designed to be as clear and intuitive as possible to use. It will contain an educational side available to all and a business-to-business purchasing side which allows a wide range of professionals, student and even consumers to access the information.

**Final Fabric Research**


(Agarwal)
FABRICS / SUSTAINABLE ALT - about Orta's new sustainable fabric alternatives

**Extra Links**


(Forbes, 2015)
Health trend is continuing


(Fashion Revolution, 2016)
Transparency in fashion brands

**OTHER**

(Candiani S.p.a, 2016)

**PRESS RELEASE**

https://www.itg-global.com/cone-denim-partners-with-e3-sustainable-cotton-program/

(Cone Denim)

**REPORTS**
(Luiken, 2016)

(Luiken, 2016)

(Bednarz et al., 2003)

APPENDIX

1) Initial Survey and Analysis
Q1

What is your age?
Answered: 67  Skipped: 0

Answer Choices  
- 17 or younger  5.37%  4
- 18-20  4.48%  3
- 21-29  73.13%  49
- 30-39  2.99%  2
- 40-49  2.99%  2
- 50-59  7.46%  5
- 60 or older  3.23%  2

Q2

What is your gender?
Answered: 67  Skipped: 0

Answer Choices  
- Female  68.66%  46
- Male  29.85%  20
- Other  1.49%  1

Total  67
What is your occupation?
Answered: 65  Skipped: 2

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<th>Responses</th>
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<td>Full time employment</td>
<td>15.38%</td>
</tr>
<tr>
<td>Part time employment</td>
<td>24.62%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>7.69%</td>
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<tr>
<td>Student</td>
<td>69.23%</td>
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Total Respondents: 65

Comments (52)
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<th>Process Book</th>
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<tr>
<td>Emily Kenny-Troughton</td>
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<tr>
<td>officer netherlands army</td>
<td>3/2/2016 5:37 PM</td>
<td>View respondent's answers</td>
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<td>Military</td>
<td>3/2/2016 1:22 PM</td>
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<td>Fashion Design</td>
<td>3/2/2016 11:26 AM</td>
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<td>home manager</td>
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<td>3/1/2016 8:42 PM</td>
<td>View respondent's answers</td>
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Topshop jewellery sakes assistant | 3/1/2016 8:39 PM | View respondent's answers |
| science                        | 3/1/2016 8:39 PM | View respondent's answers |
| Architecture                   | 3/1/2016 8:30 PM | View respondent's answers |
How many denim products do you own? (including all garments e.g. jackets, shirts etc)

Answered: 66  Skipped: 1

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<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
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<td>0</td>
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<tr>
<td>1-3</td>
<td>24.24%</td>
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<tr>
<td>4-6</td>
<td>31.82%</td>
</tr>
<tr>
<td>7-9</td>
<td>28.79%</td>
</tr>
<tr>
<td>10-14</td>
<td>7.58%</td>
</tr>
<tr>
<td>15+</td>
<td>6.06%</td>
</tr>
<tr>
<td>Total</td>
<td>100.00%</td>
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Total responses: 66
Which brands are these denim products from?

Answered: 65  Skipped: 2

<table>
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<th>Responses</th>
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<td>Levi's</td>
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<td>G-Star Raw</td>
<td>9.23%</td>
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<tr>
<td>Diesel</td>
<td>10.77%</td>
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<td>H&amp;M</td>
<td>47.69%</td>
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<tr>
<td>Zara</td>
<td>26.15%</td>
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<tr>
<td>Tommy Hilfiger</td>
<td>10.77%</td>
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<tr>
<td>Lee Jeans</td>
<td>6.15%</td>
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<td>Cheap Monday</td>
<td>18.46%</td>
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<tr>
<td>Other (please specify)</td>
<td>61.54%</td>
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Total Respondents: 65
What is the average amount you would pay for a pair of jeans?

Answered: 66  Skipped: 1

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<td>€/£ 21 - 30</td>
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<td>€/£ 31 - 40</td>
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<td>€/£ 51 - 75</td>
<td>12.12%</td>
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<td>€/£ 76 - 100</td>
<td>13.64%</td>
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<td>€/£ 101 - 125</td>
<td>4.55%</td>
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<td>€/£ 126 - 150</td>
<td>1.52%</td>
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<tr>
<td>€/£ 151+</td>
<td>3.03%</td>
</tr>
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Total 66
What elements make up a "sustainable" garment? e.g. ethically sourced fibres

Responses (55)

PRO FEATURE
Use text analysis to search and categorize responses; see frequently-used words and phrases. To use Text Analysis, upgrade to a GOLD or PLATINUM plan.

Categorize as... Filter by Category

Showing 55 responses

Have not checked
3/17/2016 12:23 PM View respondent's answers

sustainable fabrics and trimmings, ethical production environment
3/16/2016 10:55 AM View respondent's answers

The renewability and source of a product and the working conditions of the people producing them
3/15/2016 10:22 PM View respondent's answers

Material (e.g. hemp, bamboo), organic, fair trade, non-exploitative labor
3/15/2016 11:30 AM View respondent's answers

less chemicals biodegradable recycled fibres raw denim vintage clothes/ second hand clothes
3/15/2016 6:17 AM View respondent's answers

Ethical production chain throughout
3/14/2016 8:33 PM View respondent's answers

Ethically sourced fibres, ethical working conditions and pay for garment makers
3/14/2016 9:07 PM View respondent's answers

Made in factory where people are treated fairly and paid a living wage, organic fibres
3/14/2016 6:20 PM View respondent's answers

- Ethically sourced fibres (yaaaaaaSSSSS) - Sustainable production process (e.g. minimum water waste within denim industry) - Garments are manufactured in factories who work according to national labour laws
3/14/2016 4:24 PM View respondent's answers

produced by people who get to work safely and get paid enough.
3/14/2016 10:40 AM View respondent's answers

using less water to make it, having little waste materials, recycling and using organic fibers
3/13/2016 12:14 PM View respondent's answers

Ethically sourced fibres. Properly disposed of/recycled by products Eco friendly dyes Repair/recycling service for end of life
3/12/2016 10:33 PM View respondent's answers

Fair trade, non toxic dye, ethical production process
3/12/2016 8:05 PM View respondent's answers

Fair wage paid for workers
3/12/2016 6:43 PM View respondent's answers

Good quality material, strong fabric that doesn't break easily or rip.
3/12/2016 6:09 PM View respondent's answers

nicely sourced materials, fair to their producers
3/12/2016 5:16 PM View respondent's answers

I don't know
3/12/2016 5:06 PM View respondent's answers

no child labor, no pollution (use of toxics)
3/12/2016 4:10 PM View respondent's answers

IT has to Be made to be made again
3/12/2016 4:09 PM View respondent's answers

What you said. Environmentally, socially and financially responsible sourcing of materials and work force.
3/12/2016 3:34 PM View respondent's answers
<table>
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<th>View respondent's answers</th>
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<tbody>
<tr>
<td>workers rights, e.g working hours, conditions, wages. strict controls on effluent discharges from mills (eg from &quot;stonewashing&quot; processes)</td>
<td>3/3/2016 9:51 AM</td>
<td>View respondent's answers</td>
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<td>Recycled garments (charity shops) or fabrics like hemp.</td>
<td>3/2/2016 6:23 PM</td>
<td>View respondent's answers</td>
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<td>Colour and fabric endurability</td>
<td>3/2/2016 5:40 PM</td>
<td>View respondent's answers</td>
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<td>Child Labour</td>
<td>3/2/2016 1:25 PM</td>
<td>View respondent's answers</td>
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<tr>
<td>fibres &amp; recyclability&amp; ethical labour circumstances</td>
<td>3/2/2016 11:30 AM</td>
<td>View respondent's answers</td>
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<tr>
<td>Ethically and ecologically sound fibre production, living wage and conditions for workers, use/recycling of scrap/waste in production and 'sustainable' method/efficiency of processes, low carbon transport, advertising and promotion &quot;sustainable aware&quot; (eg carbon offset, digital rather than printed focus), shop premises (eg don't leave doors open in winter), encourage culture of recycling/up cycling of unwanted/worn clothes - online community of tutorials/sellers</td>
<td>3/3/2016 10:27 AM</td>
<td>View respondent's answers</td>
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<td>environmentally well sourced and fair trade materials,</td>
<td>3/12/2016 3:26 PM</td>
<td>View respondent's answers</td>
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<td>I think most sustainability can be gained by looking at the production process from start to end to see which areas can be improved.</td>
<td>3/12/2016 3:23 PM</td>
<td>View respondent's answers</td>
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<tr>
<td>ethically sourced fabric and well paid/treated workforce, locally made if possible</td>
<td>3/12/2016 3:14 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>ethically sourced fibres no child labor fair working conditions</td>
<td>3/10/2016 9:55 PM</td>
<td>View respondent's answers</td>
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<td>raw material extraction, textile production (water and energy used in production) and what can be done with the garment when its been worn-out (turning it to a new raw material)</td>
<td>3/8/2016 10:33 AM</td>
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<td>Organic</td>
<td>3/3/2016 7:07 PM</td>
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</tr>
<tr>
<td>Organic cotton, good working conditions for factory workers, recycling</td>
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<td>View respondent's answers</td>
</tr>
<tr>
<td></td>
<td>3/2/2016 8:24 AM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>I have no idea</td>
<td>3/2/2016 7:55 AM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Fair wage for workers Trying to minimize impact on the enviroment during production</td>
<td>3/1/2016 11:10 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Correct working ethics and fair compensation</td>
<td>3/1/2016 10:52 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Colour, model</td>
<td>3/1/2016 10:42 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Able to be recycled</td>
<td>3/1/2016 10:40 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Recycled fabrics, natural dye, biodegradable packaging.</td>
<td>3/1/2016 8:43 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Ethical sourcing, environmentally sustainable sources</td>
<td>3/1/2016 8:33 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>Topic</td>
<td>Date</td>
<td>Time</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Eco friendly dyeing process, amount of chemicals used in washing, amount of fabric waste</td>
<td>3/1/2016</td>
<td>10:22 PM</td>
</tr>
<tr>
<td>Ethically sourced fibres, no child work involved in the prod process</td>
<td>3/1/2016</td>
<td>10:11 PM</td>
</tr>
<tr>
<td>Recycled materials, ethically sourced fibers, fair trade employment</td>
<td>3/1/2016</td>
<td>9:58 PM</td>
</tr>
<tr>
<td>No Idea</td>
<td>3/1/2016</td>
<td>9:50 PM</td>
</tr>
<tr>
<td>Bionic Yarn, sustainable garment production</td>
<td>3/1/2016</td>
<td>9:33 PM</td>
</tr>
<tr>
<td>'Good' working conditions, as low as possible negative impact on environment during production process (fibre to yarn to cloth to garment)</td>
<td>3/1/2016</td>
<td>9:30 PM</td>
</tr>
<tr>
<td>Materials sourced through sustainable methods, profitable for both company and material suppliers, and favourably affects consumer and stock holder thoughts of the company.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibres, workplace regulations, finishing techniques</td>
<td>3/1/2016</td>
<td>9:27 PM</td>
</tr>
<tr>
<td>Second hand!</td>
<td>3/1/2016</td>
<td>8:13 PM</td>
</tr>
<tr>
<td>- sourced - workforce treatment - water - dye</td>
<td>3/1/2016</td>
<td>9:12 PM</td>
</tr>
<tr>
<td>Ethically sourced fibres, good working/production enviroments. Price tag percentage given to charities/supporting 3rd world issues.</td>
<td>3/1/2016</td>
<td>9:11 PM</td>
</tr>
<tr>
<td>Ethically sourced fibres, recycled materials, alternative dyeing methods to save water in the process etc.</td>
<td>3/1/2016</td>
<td>9:00 PM</td>
</tr>
<tr>
<td>fair labour</td>
<td>3/1/2016</td>
<td>8:48 PM</td>
</tr>
<tr>
<td>Something that doesn't harm the environment and production is able to happen continuously</td>
<td>3/1/2016</td>
<td>8:46 PM</td>
</tr>
</tbody>
</table>
Are you aware of any environmental or ethical issues facing the fashion and/or denim industry?

Answered: 55  Skipped: 12

Showing 55 responses

Making the jeans look older includes some heavy chemicals and is not environmentally friendly
3/17/2016 12:23 PM  View respondent's answers

Yes, the crazy amount of water being used, a lot of waste, pollution of both water and air, bad working environments, low wages for the factory workers
3/16/2016 10:55 AM  View respondent's answers

Sweatshops ... People paid poorly and working in bad working conditions, in certain countries.
3/15/2016 10:22 PM  View respondent's answers

Growing cotton is very water-intensive, the washes and effects are done with chemicals that are detrimental to the environment and health of the factory workers
3/15/2016 11:30 AM  View respondent's answers

Water usage when producing cotton products cheap labour child labour toxic chemical usage bad working conditions fast industry etc
3/15/2016 6:17 AM  View respondent's answers

Yes, poor and unsafe employment conditions, HSE not considered
3/14/2016 9:33 PM  View respondent's answers
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/14/2016</td>
<td>9:07 PM</td>
<td>Poor working conditions for workers</td>
</tr>
<tr>
<td>3/14/2016</td>
<td>6:20 PM</td>
<td>High production and high turnover of cheap garments is damaging to the environment. Factories which are dangerous and treat workers unfairly.</td>
</tr>
<tr>
<td>3/14/2016</td>
<td>4:24 PM</td>
<td>Yes. Ya'll gotta work on your water wastage. + Nasty chemicals and pesticides etc in sourced cotton.</td>
</tr>
<tr>
<td>3/14/2016</td>
<td>10:40 AM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>10:33 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>8:05 PM</td>
<td>Miniature child denim slaves?</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>6:43 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>6:09 PM</td>
<td>Mistreatment and poorly paid in developing countries</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>5:16 PM</td>
<td>Not really?</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>5:06 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>4:10 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>4:09 PM</td>
<td>Not really. I guess sweatshops are still a major problem and maybe environmental issues?</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>3:34 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>3:26 PM</td>
<td>No</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>3:23 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/12/2016</td>
<td>3:14 PM</td>
<td>Amount of water that it takes to wash the jeans</td>
</tr>
<tr>
<td>3/10/2016</td>
<td>9:55 PM</td>
<td>Yes, all of them. The fashion industry basically sucks.</td>
</tr>
<tr>
<td>3/8/2016</td>
<td>10:33 AM</td>
<td>YES</td>
</tr>
<tr>
<td>3/3/2016</td>
<td>7:07 PM</td>
<td>View respondent's answers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>View respondent's answers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pesticide use affecting workers, insect populations etc. + see 7, above. Monoculture fields affecting biodiversity.</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------</td>
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<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>6:23 PM</td>
<td>Overuse of pesticides on crops like cotton. Appalling pay for garment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>industry workers. Unhealthy and unsafe environments for workers and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>use of child labour.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>View respondent's answers</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>5:40 PM</td>
<td>No</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>1:25 PM</td>
<td>Yes, But care, I do not.</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>11:30 AM</td>
<td>Yes....</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>10:27 AM</td>
<td>Washes use a lot of water and harmful chemicals Rivets make it hard to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>recycle</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>9:20 AM</td>
<td>Horrible working conditions, toxic dyestuff</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>8:24 AM</td>
<td>Yes! I've seen de documentaries on tv about the horrible circumstances</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the people work in to make money.</td>
</tr>
<tr>
<td>3/2/2016</td>
<td>7:55 AM</td>
<td>Mostly ethical issues regarding employment</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>11:10 PM</td>
<td>Yes, possible child labour, production of denim costs a lot of water,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>use of possibly harmful chemicals.</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>10:52 PM</td>
<td>Bleaching, sanding, other environmentally dangerous treatments used to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alter raw denim</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>10:42 PM</td>
<td>Yes</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>10:40 PM</td>
<td>No</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>10:22 PM</td>
<td>Yes</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>10:11 PM</td>
<td>I may have heard that a really toxic product is used on jeans during</td>
</tr>
<tr>
<td></td>
<td></td>
<td>their making</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>9:58 PM</td>
<td>Child labor, minimal pay, no days off, inhumane working conditions,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>environmentally destructive fertilizers, incorrect waste disposal</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>9:50 PM</td>
<td>No</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>9:33 PM</td>
<td>Yes - especially through documentaries</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>9:30 PM</td>
<td>Yes, the basics of it, in terms of how wasteful and damaging the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>industries are and how workers are being exploited most of the time.</td>
</tr>
<tr>
<td>3/1/2016</td>
<td>9:27 PM</td>
<td>Concerns over exploitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
Try not to think
3/1/2016 9:13 PM View respondent's answers
- water consumption - pollution - sweat shops - fur - workers rights
3/1/2016 9:12 PM View respondent's answers
None other than factory/child labour & pay in such places
3/1/2016 9:11 PM View respondent's answers
The denim industry causes a significant amount of wastewater and greenhouse gases
3/1/2016 9:09 PM View respondent's answers
cheap labour being used to cut the cost of production.
3/1/2016 8:48 PM View respondent's answers
Nothing facing the denim industry. There are the obvious ethical issues with using fur. And I am aware of the
organic cotton v cotton thing.
3/1/2016 8:46 PM View respondent's answers
Over-production = a lot of waste Cheap labour Poor quality
3/1/2016 8:43 PM View respondent's answers

How much workers are paid, where materials are sources from
3/1/2016 8:33 PM View respondent's answers

Q9

Would you buy a denim product simply based on the fact that is is "fully sustainable"?
Answered: 55  Skipped: 12

Yes

No

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>32.73%</td>
</tr>
<tr>
<td>No</td>
<td>67.27%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

Comments (51)
. 85% of people surveyed showed that they would pay more for a fully sustainable product, but 70% of those who were willing to pay more said they would only be willing to pay around €10-€20 more for a fully sustainable version of an existing product

**RED/GREEN FEEDBACK**

Main feedback points:
- more numbers necessary to show research depth (try and estimate the cost of a fully sustainable denim)
- include interviews & survey information
- restructure Chapter 3 to include more ethical issues and show how to combat issues
Dyeing
pigment based inks are more sustainable + cheaper
than dye based inks

dye based
- requires lots of post processing cleaning + washing
- many costs of post processing can add $20-30,000
  a year + extra time to production runs.
- post processing procedures require a lot of energy
  + produce waste water waste which has depletions,
  nuisances + other chemicals poor present.

pigment based
- one step process very fast; less capital investment
  + running costs plus decreases production time
- has no environmental impact
Overall: conc. → better to reduce effluent use more than treat after

- reuse of all chemicals + water would also lead to significant reduction in waste + energy use.
  + cost reduction

Cotton

- 3% of the world’s crops but 15% of world’s insecticide spraying
  - about 70% of cotton picked is by hand (manual weavers)

- Bt mosquito controls about 80% of Bt cotton commercially grown cotton

Waste

- waste from combing 12-25% → M. Joseph, A. Paul, Genetic engineering of quality in cotton, Melbourn 1st Int. 2007
  + Paul R. Joseph M.
  + Genetic engineering for cotton development, Asian Text J. 2003

Dyeing

- loop dyeing has 20% lower maintenance + energy costs
  - smaller dye bath (1500 L)
  - less chemical consumption
  - higher chance of breaking thread
  - slower dyeing only over 500 m

Rope + slasher dyeing

95% of worldwide dyeing
Denim market = 3% of entire textile market

Textilwirtschaft, 2014 → 81% of people want to have a pair of jeans for less than €100

Anon. Back to the Roots, Branchreport. Das Runde Muss Ins Blaue. vol 20.15
Textilwirtschaft, May 2014

Major producers of cotton are China, India, US, Pakistan & Brazil (80% of global production)

90% of global denim textile production is in Asian countries

→ Textiles Intelligence, 2012

Textiles Intelligence. Wilmington.

Survey et al. 2006: organic vs regular cotton: one same quality - more
value for farmers - manufacturers - consumers - retailers - stylists

Nudie Jeans used 100’s recycled yarn in 2013

Sustainable trend to extend the usefulness of denim products by apparel

companies

→ Szmydle, 2013

Szmydle, P. European men’s green upscale. WWD.
April 17, 2013
Washing

Denim Care can save 50% water compared to usual dyeing laborious, 50% + 15% electricity,

\[ \text{no dyeing enzymes} \]

only 1700 litres not 3700 litres of water.

Levi's average water use in finishing was 42 L per garment at 2013. 2018 waterless campaign reduced

is by 28-96%.

Jeanologie launched Environmental Impact Measurement

Low impact process - less than 35 L per garment.

G2 tech from Jeanologie in an stone machine

Leco certified (FHR N)

Laser - Jeanologie Twin 45 requires only 1 worker

per shift to do up to 4000 pairs per day.

Resources

M. Montazer
A.S. Morgan

Dyeing

Cold Dyes (9)

Soat Wash

Cold Rinse

Soaping

Cold Rinses

Spin Day

Tumble Dry

Spunge

Neutralising

Cold Annealing

Softening

Spin Dry

Tumble Dry

= 91 L

improve
**RESOURCES**

M. Montazer A cleaner production of daim gamut only
A.S. Maryan one stop treatment w. .... 2013

Desizing
Cold Rinses (x2)
Stone Wash
Cold Rinses (x2)
Soaping
Cold Rinses (x2)
Spin Dry
Tumble Dry
Sponge w. PP
Neutralizing PP
Cold Rinse (x2)
Softening
Spin Dry
Tumble Dry

laser
desize + stonewash
cold rinse (x2)
softening
spin dry

= 24 l of water

% reduction

= 91 l water

improve re-liquability by: irreversible bitter
- print composition / care label
- actual product
- no linen label
- hot melts instead of sewing

mechanical recycling
MODAT EcoTool v. 2.0

- use of recycled flaxen saves:
  - 3.25 kg of CO₂ equivalents
  - 47 MJ of energy
  - 7000 L water

- championship process saves:
  - 3.2 kg
  - 59 MJ
  - 130 L

\[\text{recycling 1 kg of drain}\]