AHL 2100/ENG 3100/DTI 6304: STEAM Design

Project Deliverable C1: Develop a second prototype

Group SDG 12B:

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1. Topic

Our group is working on the Sustainable Development Goal 12: Responsible Consumption and Production. Inside this topic, we want to explore more about the environmental impacts of fast fashion, showing how it contributes to microplastic pollution, which affects marine life and comes back into our lives when we ingest contaminated food. This is especially true for indigenous people who heavily rely on foods from the ocean.

With our project we want to tell the story of how fast fashion is related to microplastic pollution and how that affects not only the environment but also our lives, closing the full circle: from microplastic production to pollution to consumption.

Hence, we want to visually and artistically represent how vast microplastic pollution is, to the point that it reaches isolated parts of the ocean such as the Arctic Ocean and show the correlation between:

- pollutants from factories and food contamination
- increase in fast fashion brands and microplastics in ocean and air microfiber pollution
- increase in fast fashion production and increased clothes waste in landfills
- increase in fast fashion production and increase in CO2 emissions
- increase in fast fashion production and increase of toxic found in global wastewater

2. Datasets

In this section, we identify chosen datasets that contain the data necessary to support the visualization we intend to create to represent our topic. For each dataset, we provide some information we know so far about the datasets, including their description, authors, content, etc.

About: This dataset provides data on microplastic particles in an isolated part of the Canadian arctic. The motivation was that the Canadian Arctic Archipelago (CAA) is becoming increasingly connected to the rest

of the world, so the researchers wanted to monitor the possible impact of this connectivity. The authors argue that there is not enough research on the potential for increases in localized sources of plastic pollution resulting from the increasing navigability of the remote north. The authors investigate microplastic samples collected aboard the Canadian Coast Guard Ship (CCGS) Amundsen in the summer of 2018 using the underway pump and a filtration system with Fourier transform infrared analysis. We investigate the character, abundance, and distribution of microplastic particles and fibres in the sub-surface waters across the Canadian Arctic and add to the limited dataset on plastic pollution in this region.

Data Creation Range: Data collected in 2018. Published on the website in 2021.

Created By:

- Kirstie Jones-Williams, British Antarctic Survey (BAS) - Arctic Working Group
- Tamara S. Galloway, College of Life and Environmental Sciences, University of Exeter
- Victoria L. Peck, British Antarctic Survey (BAS) - Arctic Working Group
- Clara Manno, British Antarctic Survey (BAS) - Arctic Working Group

Content: Excel sheet. Downloadable Excel file.

Source:
https://frontiersin.figshare.com/articles/dataset/Data_Sheet_2_Remote_but_Not_Isolated_Microplastics_in_the_Sub-surface_Waters_of_the_Canadian_Arctic_Archipelago_xlsx/14767653/1

About: This dataset presents data on plastic pollution, with a focus on the pollution of the environment. The researchers' goal was to give an in-depth overview of global plastic production, distribution, management, and impacts through data visualizations and explainers, providing data and context needed to understand the problem of global plastics.

Data Creation Range: 1950 - 2018. 2018 was the year when the dataset was published. There are also some projections up to 2050.

Created By:

- Hannah Richie, Senior Researcher and Head of Research at Our World in Data
- Max Roser, Founder and Director of Our World in Data

Content: Text, charts, maps, tables, images. All data shown can be downloaded.

Source: https://ourworldindata.org/plastic-pollution

About: Carbon Dioxide Emissions from Clothing Industry and wastewater from clothing dye. The author believes Fast fashion is both an economical and sociological phenomenon that has grown to epic proportions. What is cut in costs for garments is borne twice over by the planet, and it is absolutely crucial for the author that people change regulations and behaviors. The author believes in empowering people with knowledge, therefore in the article the author lists 9 biggest fast fashion statistics. The statistics are important information for this project.

Data Creation Range: 2000 - 2015

Created by: Owen Mulhern, biologist and author at earth.org

Content: Text, charts, maps, tables, images. All data shown can be downloaded.

Source: https://earth.org/data_visualization/the-9-biggest-fast-fashion-statistics/

About: Consequences of Apparel Overproduction. The author collects data and information on mounting piles of deadstock and incinerations of unsold clothes. Landfills overpacked with textiles and calls for sustainable fashion are all over the news. The author decided to put together the most important and up-to-date information about the problem. This article is important as it covers the scale, causes and consequences of apparel overproduction.

Data Creation Range: 2018

Created by: Olena Rudenko, author at ShareCloth

Content: Text, charts, images. All data shown can be used as reference.

Source: https://sharecloth.com/blog/reports/apparel-overproduction

About: Fashion on climate. As the need to address climate change becomes more urgent, industry sectors are working to reduce their carbon emissions. Fashion makes a sizeable contribution to climate change. McKinsey research shows that the sector was responsible for some 2.1 billion metric tons of greenhouse-gas (GHG) emissions in 2018, about 4 percent of the global total. To set that in context, the fashion industry emits about the same quantity of GHGs per year as the entire economies of France, Germany, and the United Kingdom combined. This report aims to show how the fashion industry can urgently act to reduce its greenhouse gas emissions.

Data Creation Range: 2018 – 2020. Published in 2020. There are also some projections up to 2030.

Created by:

- Achim Berg, Senior partner and leader at McKinsey & Company
- Karl-Hendrik Magnus, Senior partner and leader at McKinsey & Company
- Sara Kappelmark, Partner at McKinsey & Company
- Anna Granskog, Partner at McKinsey & Company
- Libbi Lee, Associate Partner at McKinsey & Company
- Corinne Sawers, Associate Partner at McKinsey & Company
- Poorni Polgampola, Engagement Manager at McKinsey & Company
- Morten Lehmann, Chief Sustainability Officer at Global Fashion Agenda
- Holly Syrett, Senior Sustainability Manager at Global Fashion Agenda
- Gizem Arici, Sustainability Manager at Global Fashion Agenda

Content: Text, charts, diagrams. All data shown can be used as reference.

Source:
https://www.mckinsey.com/~/media/mckinsey/industries/retail/our%20insights/fashion%20on%20climate/fashion-on-climate-full-report.pdf

3. Analysis

In this section we will explain how we are conducting our data analysis so far, what we have learned from our analysis, and we will present some charts we created to better visualize our data.

3.1. How we have analyzed data

First, we compiled all of the sources and datasets found by our team members into the same Excel spreadsheet. We then analyzed through each source and dataset to determine if they are relevant to our topic. The focus primarily is to collect data that represents our story which is the consequences of fast fashion overproduction and the geolocation of those countries that have an unsustainable process.

Based on the data analysis, we managed to keep the sources and data relevant to this project. The data includes textiles and clothes waste, microplastic found in rivers and ocean, global CO2 emissions, global wastewater and others. Next, we trimmed the data and kept only the important values including: country names, latitude, longitude, apparel overproduction in tons, percentage of CO2 emissions and others. Therefore, we can segregate any other un relevant data for data processing in the data visualization phase.

Lastly, we made sure to correlate our main topic's data with the environmental causes' data to make sense of the story we are about to tell later in the presentation. A mind map is created to correlate all of the information and data gathered.

3.2. What did we understand from it

From the data analysis we are able to understand that there are 92 million tons of clothes waste each year dumped into the landfills. This act alone is causing many environmental impacts all over the world. From increasing toxic found in the rivers and ocean, increasing our landfills, and CO2 emissions. These environmental impacts are supported by various sources mentioned in section 2 in this document. Also, there are some solutions we want to explain to reduce the amount of clothes waste to improve environmental sustainability.

Below are some screenshots of the Excel file we created. The file can also be accessed through the link: Data Analysis.xlsx

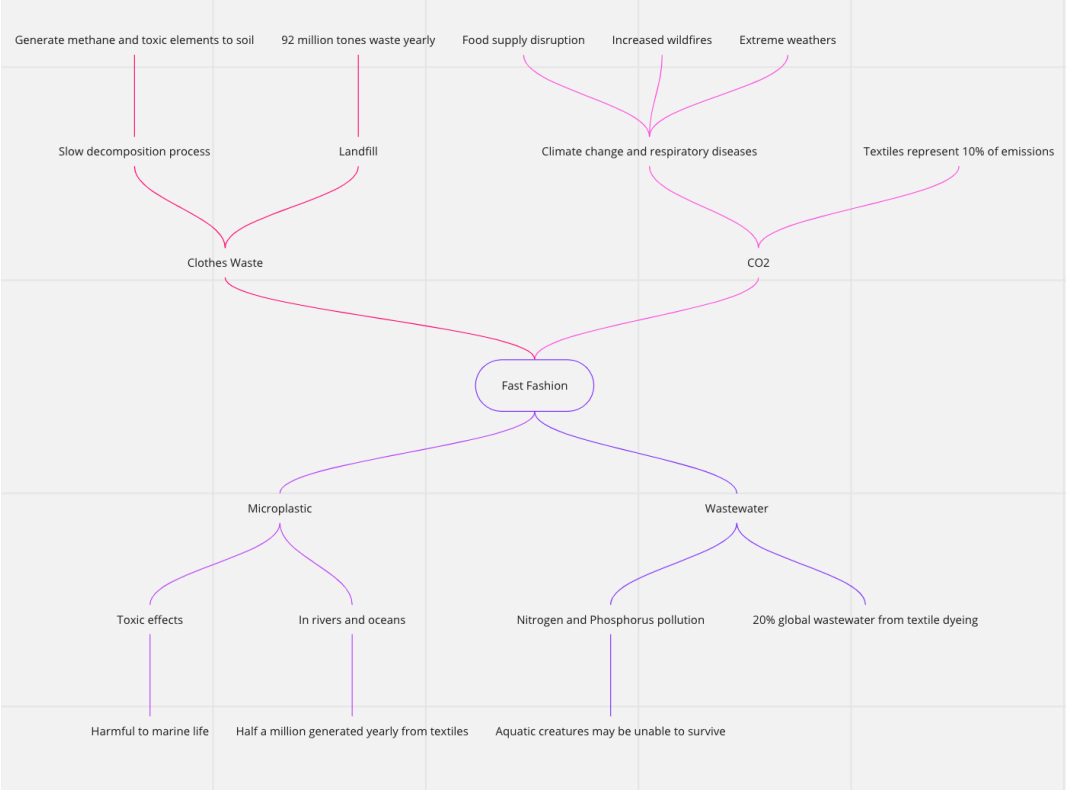


Figure 1: Mindmap correlating fast fashion with environmental impacts

A	B	C	D
Entity	Year	Primary plastic waste generation (million tonnes)	Waste Percentage from Overall Production
Additives	2015	17000000	0.68
All industrial sectors	2015	302000000	0.742014742
Building and Construction	2015	13000000	0.2
Consumer & Institutional Products	2015	37000000	0.880952381
Electrical/Electronic	2015	13000000	0.722222222
HDPE	2015	40000000	0.769230769
Industrial Machinery	2015	1000000	0.333333333
LD, LDPE	2015	57000000	0.890625
Other polymer type	2015	11000000	0.6875
Other sectors	2015	38000000	0.808510638
PET	2015	32000000	0.96969697
PP	2015	55000000	0.808823529
PP&A fibers	2015	42000000	0.711864407
PS	2015	17000000	0.68
PUT	2015	16000000	0.592592593
PVC	2015	15000000	0.394736842
Packaging	2015	141000000	0.965753425
Textiles	2015	42000000	0.711864407
Transportation	2015	17000000	0.62962963

Number Format

Figure 2: Trimmed dataset for plastic waste generation

Entity	Year	Plastic mass input from rivers
Yangtze (China)	2015	333000
Ganges (India, Bangladesh)	2015	115000
Xi (China)	2015	73900
Huangpu (China)	2015	40800
Cross (Nigeria, Cameroon)	2015	40300
Amazon (Brazil, Peru, Colombia, Ecuador)	2015	38900
Brantas (Indonesia)	2015	38900
Pasig (Philippines)	2015	38800
Irrawaddy (Myanmar)	2015	35300
Solo (Indonesia)	2015	32500
Mekong (Thailand, Cambodia, Laos, China, Myanmar, Vietnam)	2015	22800
Imo (Nigeria)	2015	21500
Dong (China)	2015	19100
Serayu (Indonesia)	2015	17100
Magdalena (Colombia)	2015	16700
Tamsui (Taiwan)	2015	14700
Zhujiang (China)	2015	13600
Hanjiang (China)	2015	12900
Progo (Indonesia)	2015	12800
Kwa Ibo (Nigeria)	2015	11900

Chart Area

Figure 3: Trimmed dataset for plastic mass found in rivers

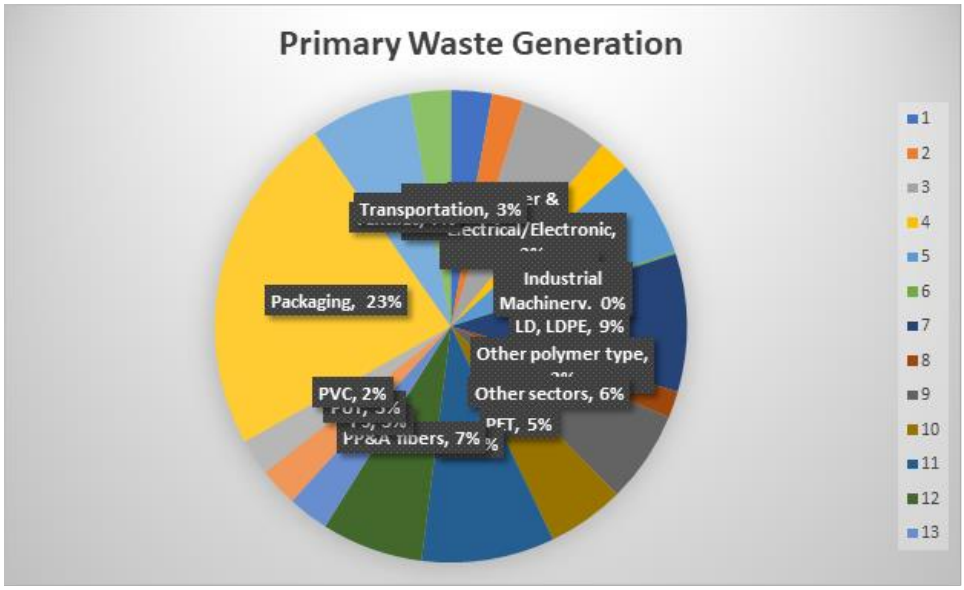


Figure 4: Pie chart representing plastic waste generation by sectors

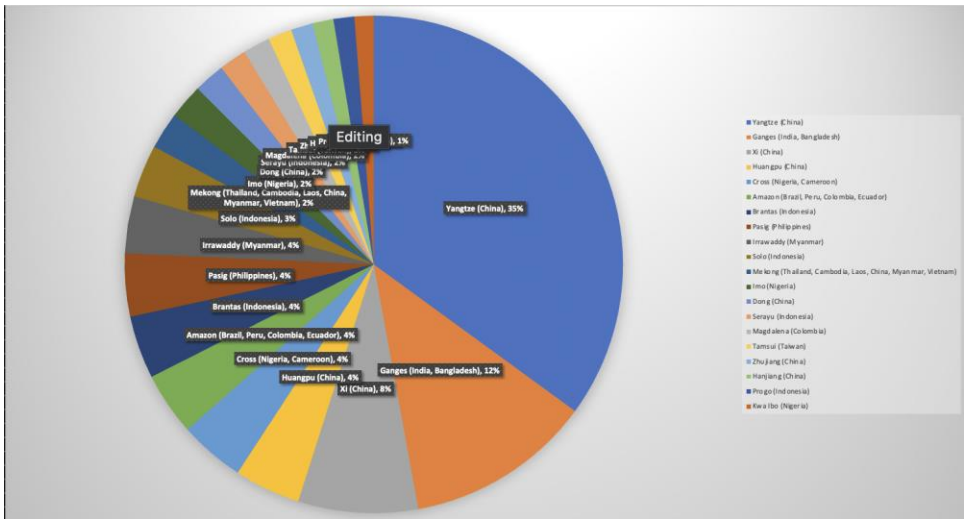


Figure 5: Pie chart representing locations that have most polluted rivers and oceans

4. Prototype

After abstracting ideas, thinking of analogies and iterating on our initial prototype, we developed our second prototype, which presents various environmental impacts by fast fashion represented by a tree. Initially, we also proposed a geospatial map, however now we cannot see how the geospatial map adds value to our tree representation and, therefore, this idea will be put on hold for the time being.

As we previously mentioned, the tree sketch represents the resource extraction (bottom portion of the tree) and the environmental impact caused by the fast fashion industry. Each branch represents each aspect of fast fashion pollution, with different colors and shapes representing differences among the different aspects. The roots of the tree represent the resources consumed to produce clothing and the branches and leaves represent the pollution spread by the industry. The “leaves” of the tree are common clothing items, such as T-shirts and pants rather than actual leaves, to further represent the impact of the fashion industry on the environment. We chose these items because they are known for requiring a lot of water to produce and are often used as an example of inefficiency.

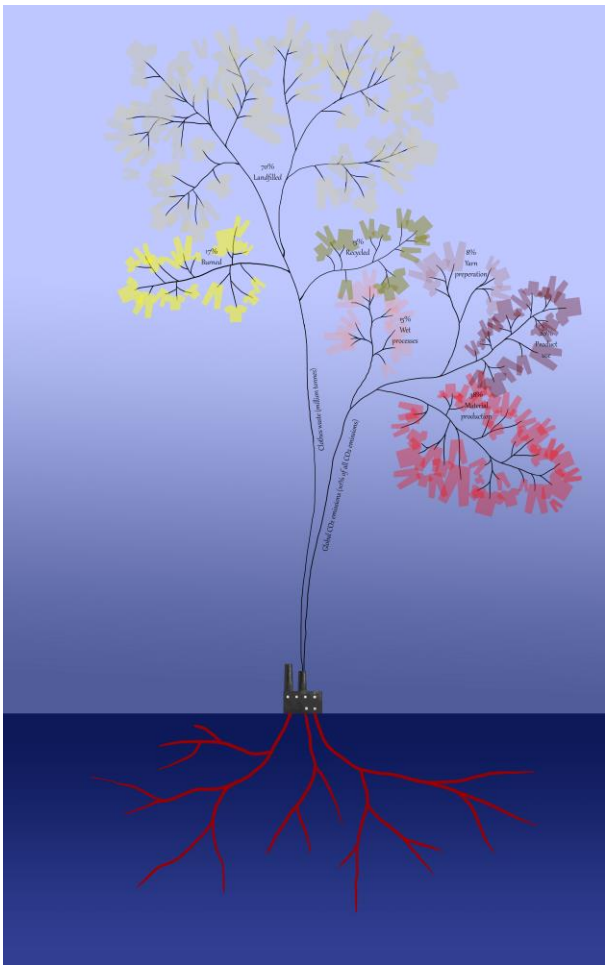


Figure 6: a Tree sketch representing fast fashion (root cause) and its several environmental effects in each branch

5. Tools

Initially, the tools we used were paper and pencils, for the first sketch of the visual representation. Then for the first prototype, we recreated the sketch digitally. For the second and the final prototypes, we will be using Adobe Photoshop. It is a versatile software that will allow us to represent our ideas in digital form. We chose this software because we have plenty of experience using it. Additionally, because it is a digital prototype, it leaves a smaller carbon footprint than painting or drawing.

6. Missing Elements

Even though our prototype has evolved, there are still some missing elements that are needed for the final prototype. Since the last prototype, we have improved and worked mostly on the upper portion of the tree, which is the impact of fast fashion and microplastic pollution on the environment. However, we still have to visually represent how fast fashion takes resources from the environment,

which is the bottom portion of the tree. Our group has been looking for datasets that contain this type of information since our original chosen dataset did not provide the information needed on resources extraction specifically in this industry. But our research has not provided the necessary results so far and we have yet to find this dataset. Hence, the bottom portion of the tree is an element that we will work on for the final prototype.

GROUP ETHICS STATEMENT CONCERNING ASSIGNMENTS

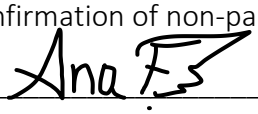
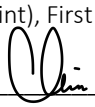
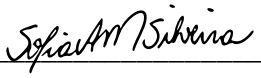
Group Assignment:

By signing this Statement, I am attesting to the fact that I have reviewed not only my own work, but the work of my colleagues, in its entirety.

I attest to the fact that my own work in this project meets all of the rules of quotation and referencing in use at the University of Ottawa, as well as adheres to the fraud policies as outlined in the Academic Regulations in the University's Undergraduate Studies Calendar Academic Fraud Webpage.

To the best of my knowledge, I also believe that each of my group colleagues has also met the rules of quotation and referencing in this Statement.

I understand that if my group assignment is submitted without a signed copy of this Personal Ethics Statement from each group member, it will be interpreted that the missing student(s) signature is confirmation of non-participation of the aforementioned student(s) in the required work.

	March 22, 2022
Signature	Date
Frenkel, Ana	300208486
Last Name (print), First Name (print)	Student Number
	March 22, 2022
Signature	Date
Tjen, Monica	300270173
Last Name (print), First Name (print)	Student Number
	March 22, 2022
Signature	Date
de Almeida Machado da Silveira, Sofia	300258870
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	March 22, 2022
Signature	Date
Song, Yuxiao	300243065
Last Name (print), First Name (print)	Student Number
Signature	Date
Last Name (print), First Name (print)	Student Number