

A woman with her eyes closed, wearing a black Speedo swimsuit and a swim cap, posing against a textured, light-colored wall. Her hands are on her hips, and she has a confident, relaxed expression. The lighting is soft, highlighting the contours of her body and the texture of the wall. The background is a solid light beige color.

# Bridget Grace Upton

## Portfolio

*Sustainable & Ethical  
Fashion Design (MA)*

# The Sustainable Swimwear Guide



## Improving the sustainability and durability of performance swimwear through fabric innovation and consumer knowledge.

*How can we align a relationship between the purpose of swimwear and fashions contribution to environmental pollution?*

This paper evaluates the issues within the performance swimwear industry that led to its contribution to environmental pollution. Aiming to create possible solutions through a series of recommendations to industry. The research problems brought to light are, the reliance on synthetic fibres, the rapid deterioration of fabrics and the lack of knowledge from consumers on how to reduce the garments environmental impact. The three main issues that frame these issues are, fabric innovation and sustainable choices, durability and longevity and aftercare of garments.

The study begins using secondary research, in the form of a comprehensive literature review. This dissects the issues at hand and begins to deliberate possible solutions. Gaps in knowledge are identified within the review, in which interviews were conducted to address these gaps. Semi-structured interviews gain first-hand insight from consumers of performance swimwear. A brand analysis is then formulated to ascertain the movements already being made by brands and where they could improve. Finally, all primary and secondary data is analysed so that conclusions can be established.

The findings suggest that there is a lack of communication from brands around aftercare and consumer knowledge is lacking. This leads the researcher to believe that common areas of wear and lack of knowledge, result in premature disposal of swimwear. It is discovered that consumers would be open to a market of sustainable swimwear, that could utilise bio-designed innovation and other design methods. Through fabric innovation the solution of biomimicry and biodesign is explored, as well as recycled fabric alternatives. The suggestion of designing for emotional durability and/or design for disassembly creates a solution to the lack of durability. Finally, improvements in aftercare such as better communication and access to information is recommended.

The suggested audience for this paper concentrates on, brands within the performance swimwear industry, consumers of these products, such as swimmers at any level and researchers of this field.

**Key Words:** *Performance Swimwear, Sustainability, Biomimicry, Biodesign, Biofabrication, Durability, Longevity, Emotional Durability, Aftercare, Care Labels, Fabric Innovation.*

# Abstract



# The History of Swimwear

## All about Modesty

voluminous skirt of victorian era using tightly woven fabrics were hard to move in when water logged.



1

## Invention of The Bikini

The invention of the first bikini. When Louis Reard first designed the bikini it was banned on most beaches. "a bikini isn't a bikini unless it can be pulled through a wedding ring."



3

## Wool Knit

wool is one of the only fibres available to knit with but allows a more flexible fabric then weaving. 1927 the first line of knit swimwear is produced.



2

## Pin-up Curves

Nylon, elastic and jersey came into use, designs moved away from practicality and towards a pin-up girl aesthetic, using boning to accentuate curves.



5

## Setting Records

The thong is invented and string bikinis become popular. Speedo adds elastane to suits breaking records in 1972 Olympics. In 1973 German swimmers adopted "skinsuits" that became transparent when wet. Causing outrage, but setting 7 world records.



1960

## Invention of Monokini

The use of Lycra begins, suits became tighter and smaller and bikinis become mainstream. Rudi Genreich invents the monokini.



6

For some reason, the best looking Speedo suits are often worn with accessories.

## The use of Nylon

The 1980s swimsuits can be termed the most athletically inclined in history. High leg and high neck swimsuits became popular. An influx in the use of Nylon, once again popularised by Speedo.



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## Invention of The Tankini

The Tankini is invented and popularised by Anne Cole capturing nearly a third of the swimsuit market. The TV show baywatch increases trend in high cut V shaped swimsuits.



FAST (body) SKIN

FAST (knee) SKIN

FAST (leg) SKIN

FAST (hydra) SKIN shoe

8

## Speedo's Fastkin

In 2000, Speedo launched the Fastskin suit series that mimicked shark skin. Those suits were approved for the 2000 Olympics, where they helped win 83% of the medals won.

# Framing the problem





## Swimming Bans High-Tech Suits, Ending an Era



Dara Torres wore a swimsuit made by Jaked, an Italian-based manufacturer, at U.S. Nationals in July.  
Darron Cummings/Associated Press

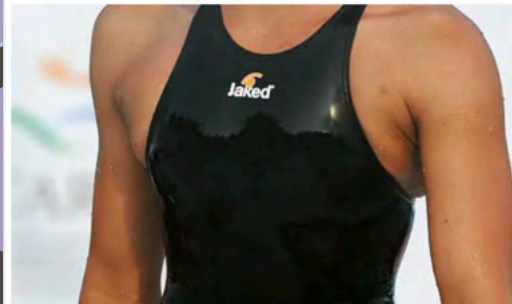
By Karen Crouse  
July 24, 2009

ROME In an effort to clean up its sport, [the international governing body of swimming](#) will require its athletes to show more skin. By an overwhelming vote Friday at its general congress, FINA officials decided to ban the high-tech swimsuits that have been likened to doping on a hanger.

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### Fina agrees new rule to end swimsuit controversy

- Suits added to rule governing devices in swimming
- 'We felt like that was a good victory' says US coach



French swimmer Coralie Dural wears the Jaked swimsuit, which has caused great controversy in recent months. Photograph: Alberto Pizzoli/AFP/Getty Images

A proposal from USA [Swimming](#) to rein in swimsuit technology has been approved by Fina's technical congress.

New swimsuits have caused great controversy, with dozens of world records smashed by athletes wearing new designs that have undoubtedly improved performances by significant margins, and many in the sport object to their use. The introduction of the new rule could signal that the debate is moving on towards some sort of conclusion.

The new rule states: "No swimmer shall be permitted to use or wear any device or swimsuit that may aid his speed, buoyancy or endurance during a competition."

11

## Full Body Swimsuit Now Banned for Professional Swimmers

Ban comes after unprecedented number of swimmers set world records.

By KRISTINA WONG

29 December 2009, 00:49 • 4 min read



WASHINGTON, Jan. 4, 2010— -- The full body swimsuit made famous by [Michael Phelps](#) and other [Beijing Olympians](#) in 2008 won't be seen on anywhere on deck this year.

Beginning this year, [swimmers](#) are banned worldwide from wearing polyurethane and neoprene suits during competition.

10

# An opportunity to improve textile advancements through natural textiles

After FINA release new guidelines



12



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# The big Change

# Training Suits



15

range of motion

durability

chlorine resistance

comfort

fewer sizing options

# Racing Suits



16

high compression

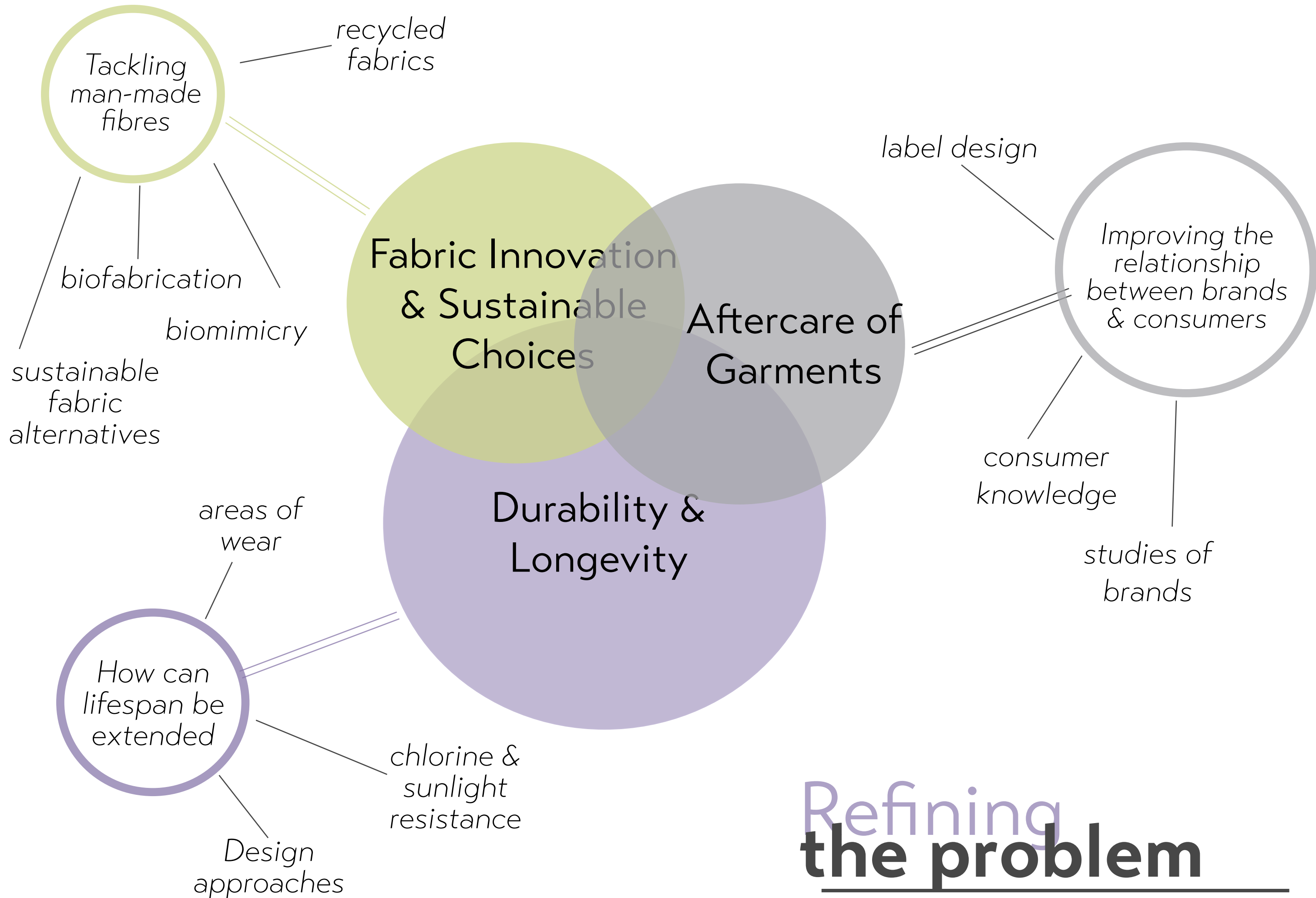
technology

chemical coatings

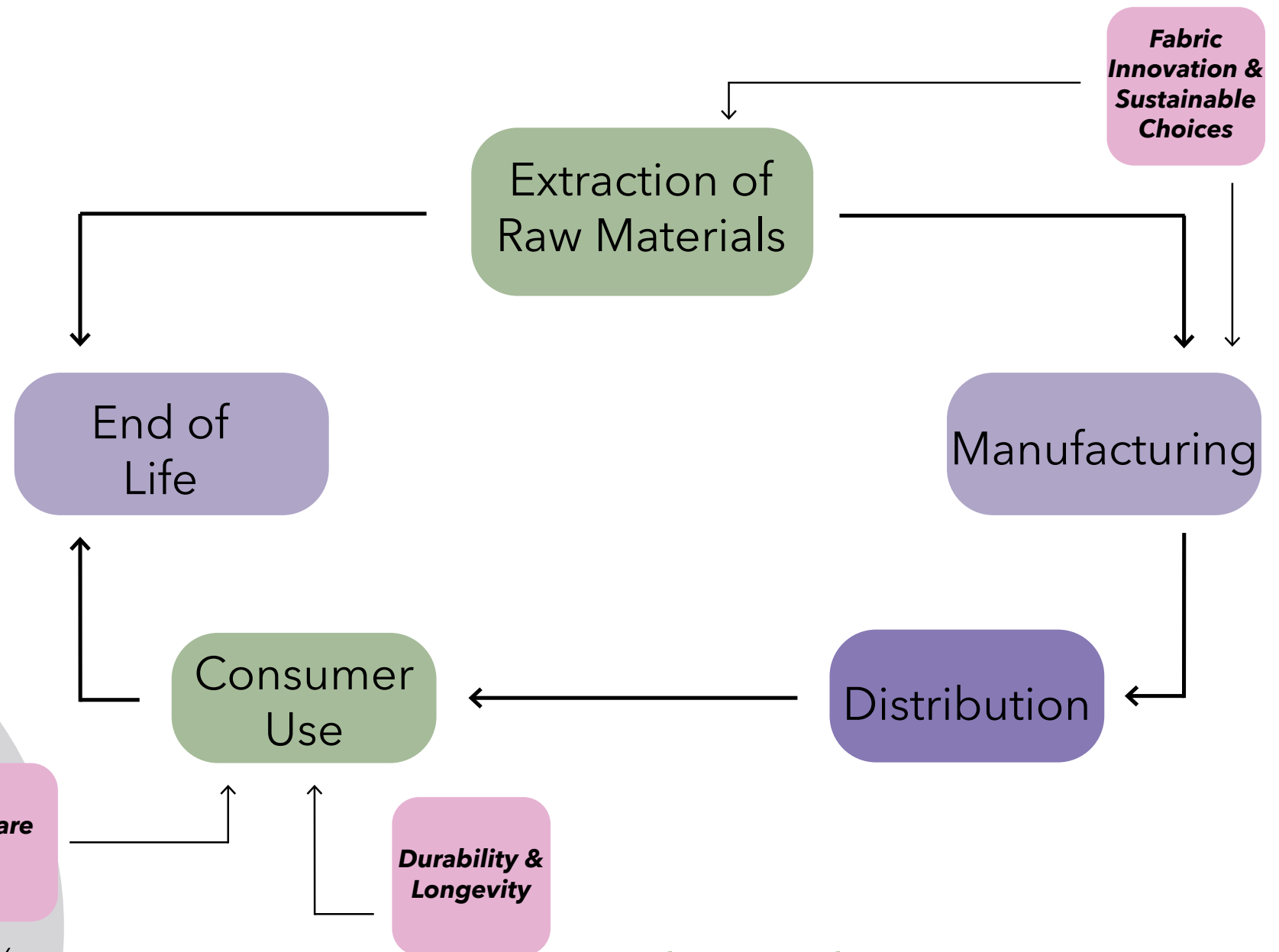
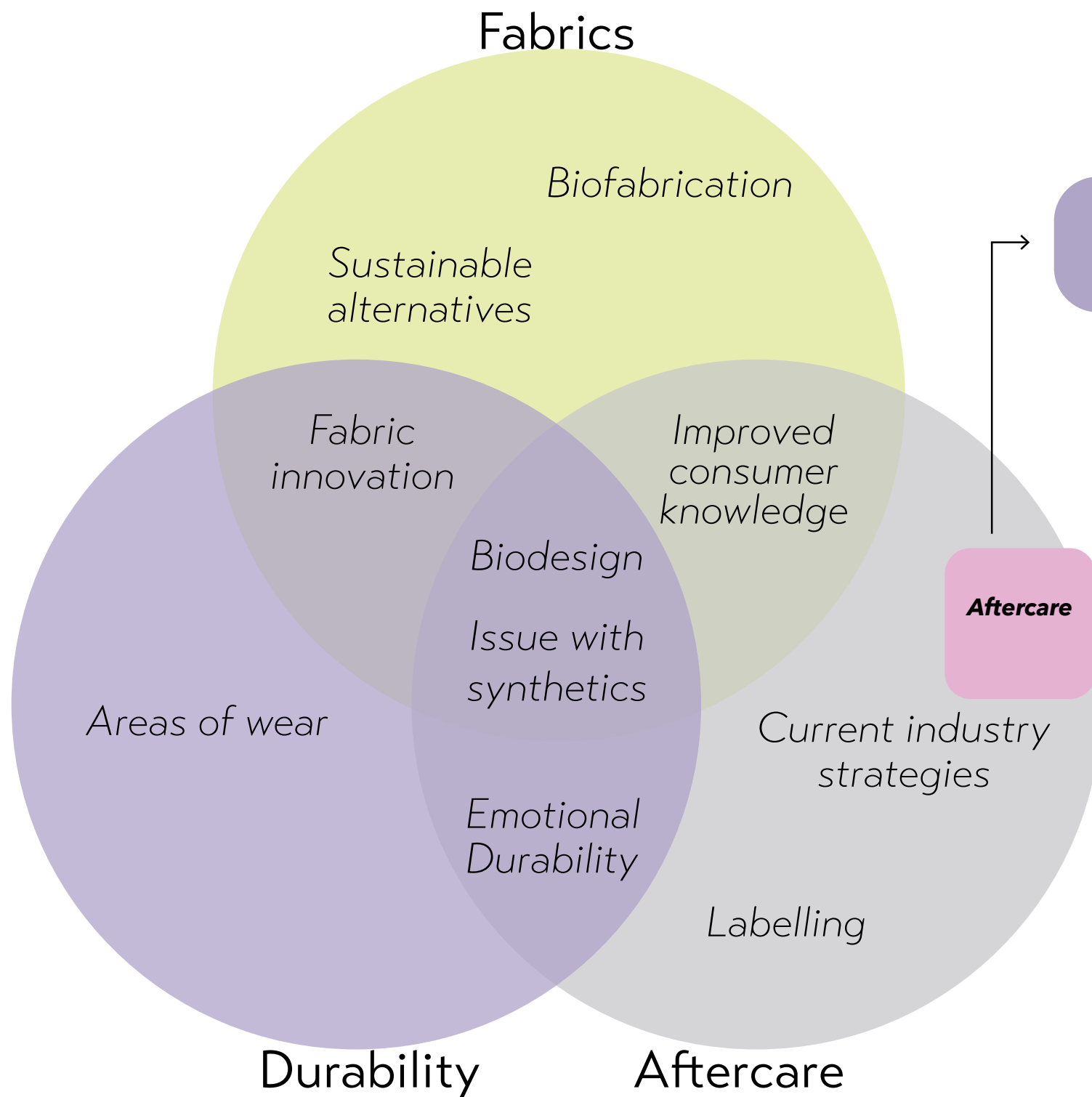
drag reduction

water resistance





# How do these topics relate?



## How do these topics fit into the product life-cycle?



# Why

## Why is Research Needed?

*Lack of knowledge on how to care for swimwear.*

*Lack of sustainability in performance swimwear industry.*

*Lack of responsibility or acknowledgement for sustainable swimwear.*

## Broader Discourse

*Influence brands to improve on fabric choices, chemical coatings and move towards using nature as a model.*

# Purpose

## Key Issue

*Sustainability & care of performance swimwear. - manufacturing pollution, sea pollution, micro fibre pollution.*

## Primary Purpose

*To reduce negative impact & improve sustainability of performance swimwear.*

## Aim to Achieve

*Inform & reduce use of synthetic fabrics.  
Improve consumer knowledge around after-care of swimwear.*

# Purpose

## Audience

### Outcome Audience

*Swimmers and swimwear manufacturers*

### Secondary Audience

*Swimwear brand & manufacturers*

### Primary Audience

*Swimmers - professional & amateur*

# Beneficiaries

## Overall Beneficiaries

*Swimmers, brands, sea life, natural world, garment workers, people living in developing countries.*

## Groups/Individuals

*improve the life of swimwear therefore benefitting swimmers.  
Improve lives of garment workers and people worst affected by climate crisis.*

# Bio-Inspired

## 1. Nature as a Model

- “where nature is imitated or used as a source of inspiration for designs and processes to solve human problems, e.g. a solar cell inspired by a leaf.”

## 3. Nature as a Mentor

- “where nature is viewed and valued in a new way. It introduces an era based not on what we can extract from the natural world, but on what we can learn from it, e.g. developing solar technology that can be installed close to point of use, rather than developing desert wilderness areas into solar panel farms.”

## 2. Nature as a Measure

- “where nature is used as an ecological standard to judge the ‘rightness’ of our innovation, e.g. considering how much energy (and what type) does the solar panel use in its production and whether the energy it saves during use justifies this investment.”

‘the only way to keep learning from nature and its wellspring of ideas is to safeguard its naturalness’

(Benyus, 2009)

# Fabric Innovation & Sustainable Choices

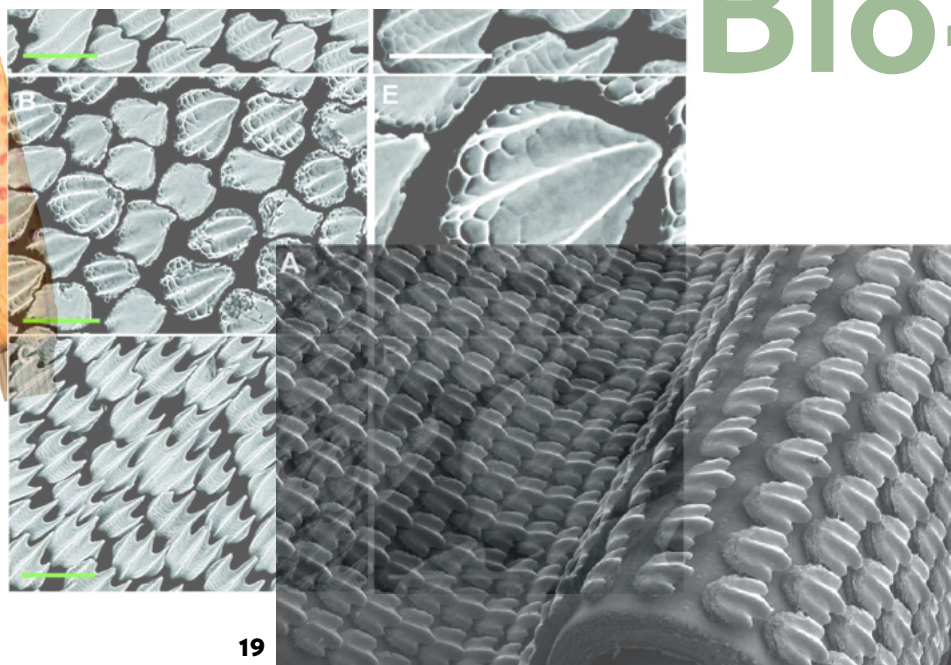


# Fabric Innovation & Sustainable Choices

17



"If we applied the same energy as we do suppressing life, towards cultivating life we'd turn the urban jungle into one that thrives and embodies the living world." (Lee, 2019)



19

# Biofabrication

Bio-based  
Biomimicry

Biodesign



# Issues with Durability

## 1. Physical Durability

this can be choosing fabric that can handle wear and tear and is sturdy, but also enabling repair. Enabling repair could be allowing extra seam allowance, providing buttons and threads and clear label instructions

## 2. Style Durability

the garment should be carefully designed. The colours should be intentional and the shape and fit considered and precise, the garment cannot be designed to fit a fad, or trend of the moment, it should be timeless.

## 3. Emotional Durability

although not as easy to design for, it is designing with a user-centred approach to bring joy to the consumer

## Physical Durability

Timeless



20

Enabling Repair  
Shape



21

Colours

User Centered  
Care Labels



22

Precise

Considered  
Durability

Emotional Durability



"Garments could represent an accomplishment and include the effort invested"

(Niinimäki & Armstrong, 2013)



23



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"emotional durability: how to make everyday items both functional and emotionally compelling enough that people want to hold on to them longer."  
(Spanne, 2015)

Emotional  
Durability



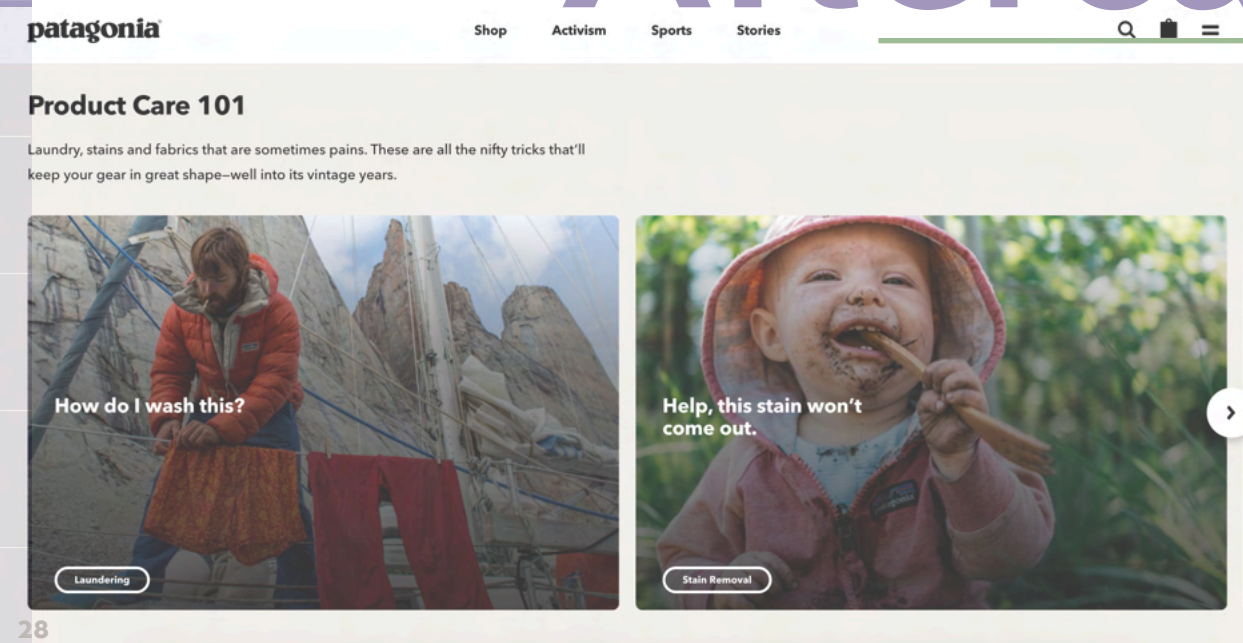
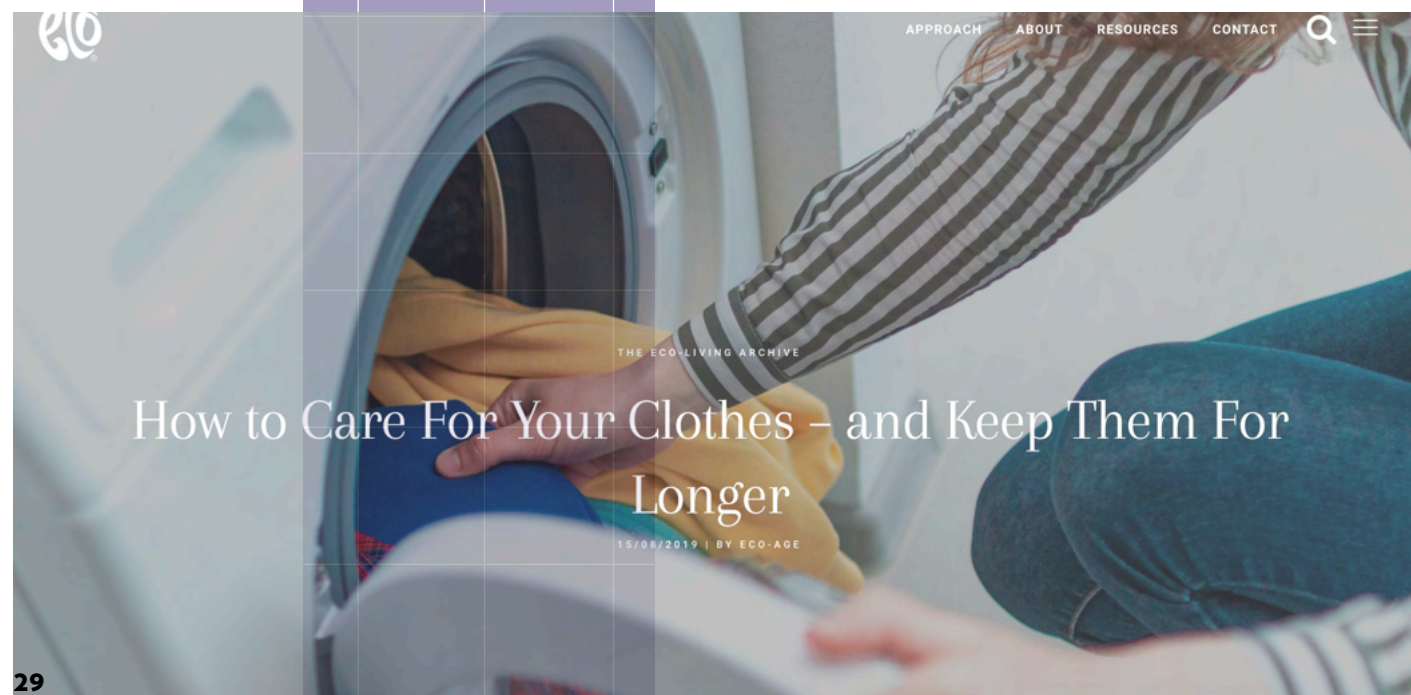
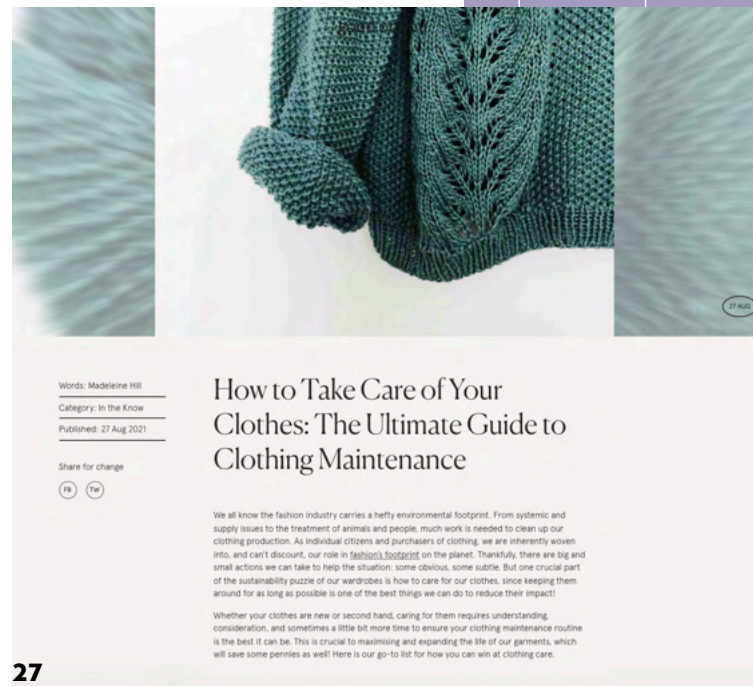
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# Aftercare Of Garments



# Aftercare

Brands often use care labels as a form of protection of their brand, to reduce returns, rather than using it as an informative tool.

(Webb, 2020)





# Interview Themes

## Relationship with Swimwear

- 1** Factors of Choosing Swimwear
- 8** Emotional Attachment
- 6** Willing to change Attitudes

## Consumer Knowledge on Sustainability

- 2** Usage
- 4** End of Life

## Responsibility

- 5** Responsibility
- 7** Hierarchy of Influence

## Durability

- 3** Deterioration

Findings & Discussion

## Care Labels Washing Habits

"all that my mom ever told me, you should get it out when you get home, wash it in the sink, hanging up to dry, don't leave it sitting in chlorine"

None of the participants had ever sought out information on caring for their swimwear

End of Life

Consumer Knowledge on Sustainability

Usage

End of Life

Never looked at a care label

Doesn't understand care labels

Washing Habits

Doesn't know how to dispose of swimwear

Bin swimwear

aftercare isn't easy to find.



# Are there any areas you find show deterioration first?

'the white starts to come through'



fabric pilling and wear on bum area



Comparison of very worn costume (left) and newer costume (right)



"it gets furry on the bum"



# Interview Findings

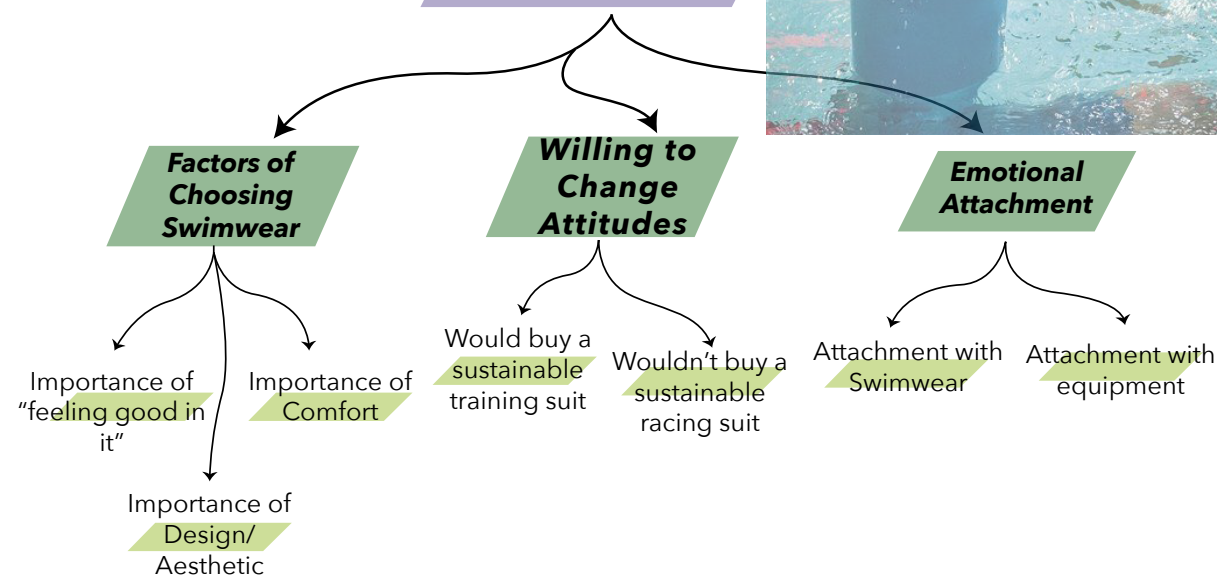
Comfort

if you can't swim comfortably without exposing yourself it isn't fitting its purpose.

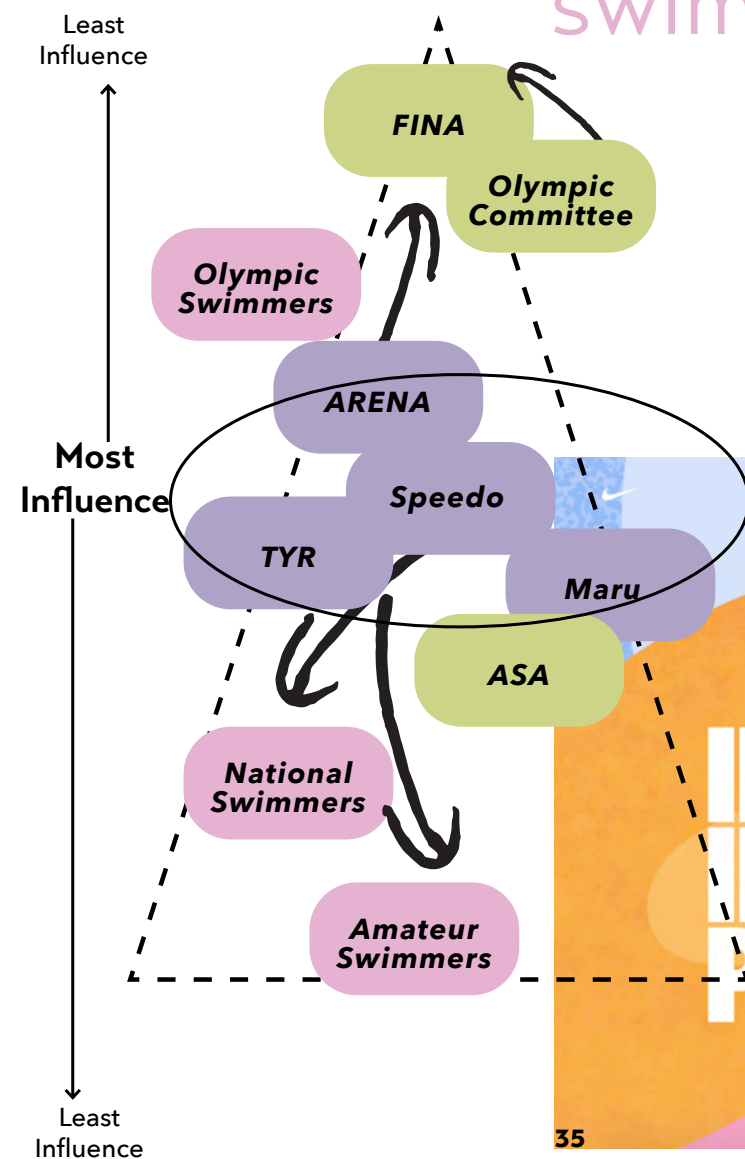


Design/Aesthetic  
'Feel Good'

"even if its maybe not in as good condition anymore, sometimes it doesn't matter how good the quality is, it's about how it makes you feel mentally".



not only could well-known swimmers be advocates for sustainability, but so could any swimmer at any level.



# Responsibility



# Analysis Of Brands

Little to no  
information  
addressing issue,  
no transparency.

1

Some  
information and  
transparency,  
little action.

2

Some  
actions, some  
transparency.

3

A lot of  
transparency  
and information,  
significant  
action.

4

Complete  
transparency,  
taking action  
required to  
make change.

5

## Nike

	0	1	2	3	4	5
Use of recycled fabrics						
Use of other eco-friendly fabrics						
sustainability goals for the future						
water & chemical usage						
Labour Standards						
Supply chain transparency						
Carbon Footprint/Goals to reduce carbon footprint						
Accessible aftercare information						

## Arena

	0	1	2	3	4	5
Use of recycled fabrics						
Use of other eco-friendly fabrics						
sustainability goals for the future						
water & chemical usage						
Labour Standards						
Supply chain transparency						
Carbon Footprint/Goals to reduce carbon footprint						
Accessible aftercare information						

## TYR

	0	1	2	3	4	5
Use of recycled fabrics						
Use of other eco-friendly fabrics						
sustainability goals for the future						
water & chemical usage						
Labour Standards						
Supply chain transparency						
Carbon Footprint/Goals to reduce carbon footprint						
Accessible aftercare information						

## Speedo

	0	1	2	3	4	5
Use of recycled fabrics						
Use of other eco-friendly fabrics						
sustainability goals for the future						
water & chemical usage						
Labour Standards						
Supply chain transparency						
Carbon Footprint/Goals to reduce carbon footprint						
Accessible aftercare information						

## Funkita

	0	1	2	3	4	5
Use of recycled fabrics						
Use of other eco-friendly fabrics						
sustainability goals for the future						
water & chemical usage						
Labour Standards						
Supply chain transparency						
Carbon Footprint/Goals to reduce carbon footprint						
Accessible aftercare information						

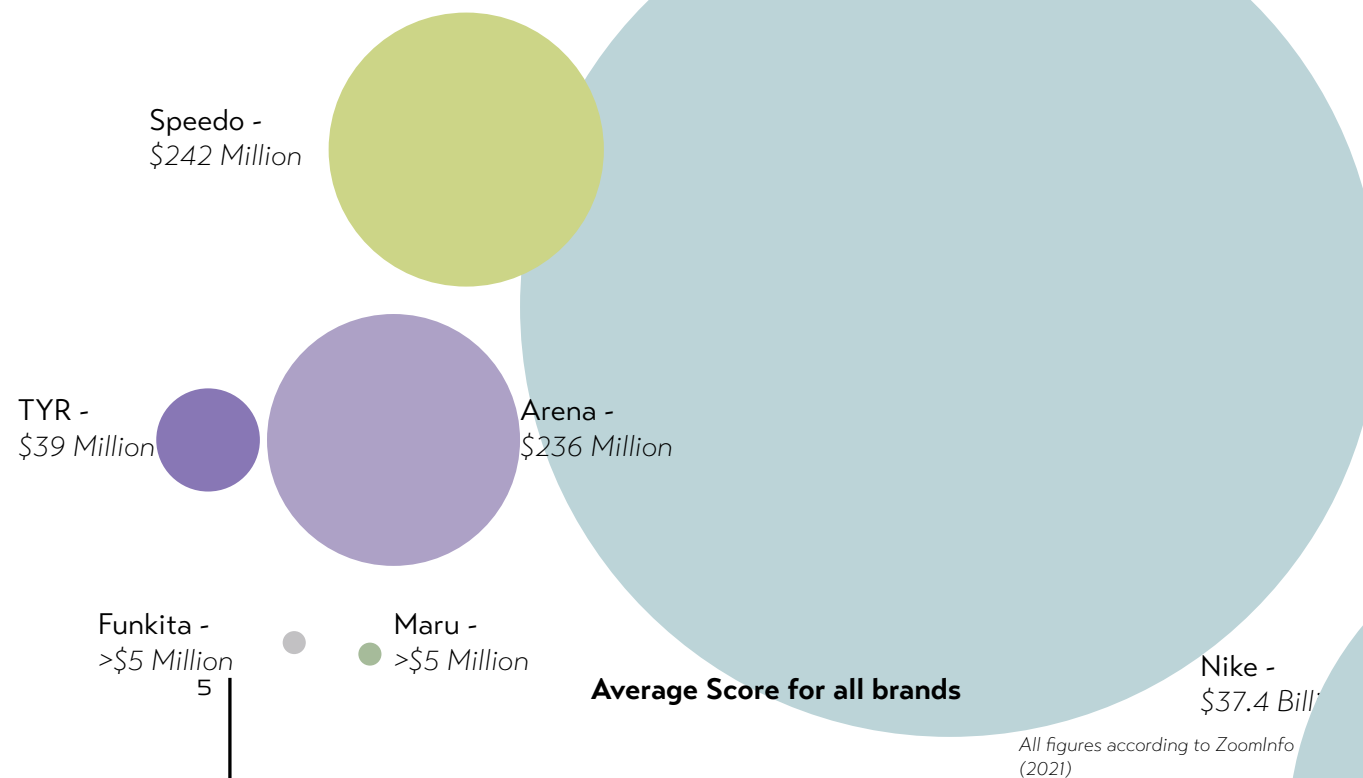
## Maru

	0	1	2	3	4	5
Use of recycled fabrics						
Use of other eco-friendly fabrics						
sustainability goals for the future						
water & chemical usage						
Labour Standards						
Supply chain transparency						
Carbon Footprint/Goals to reduce carbon footprint						
Accessible aftercare information						



# Analysis Of Brands

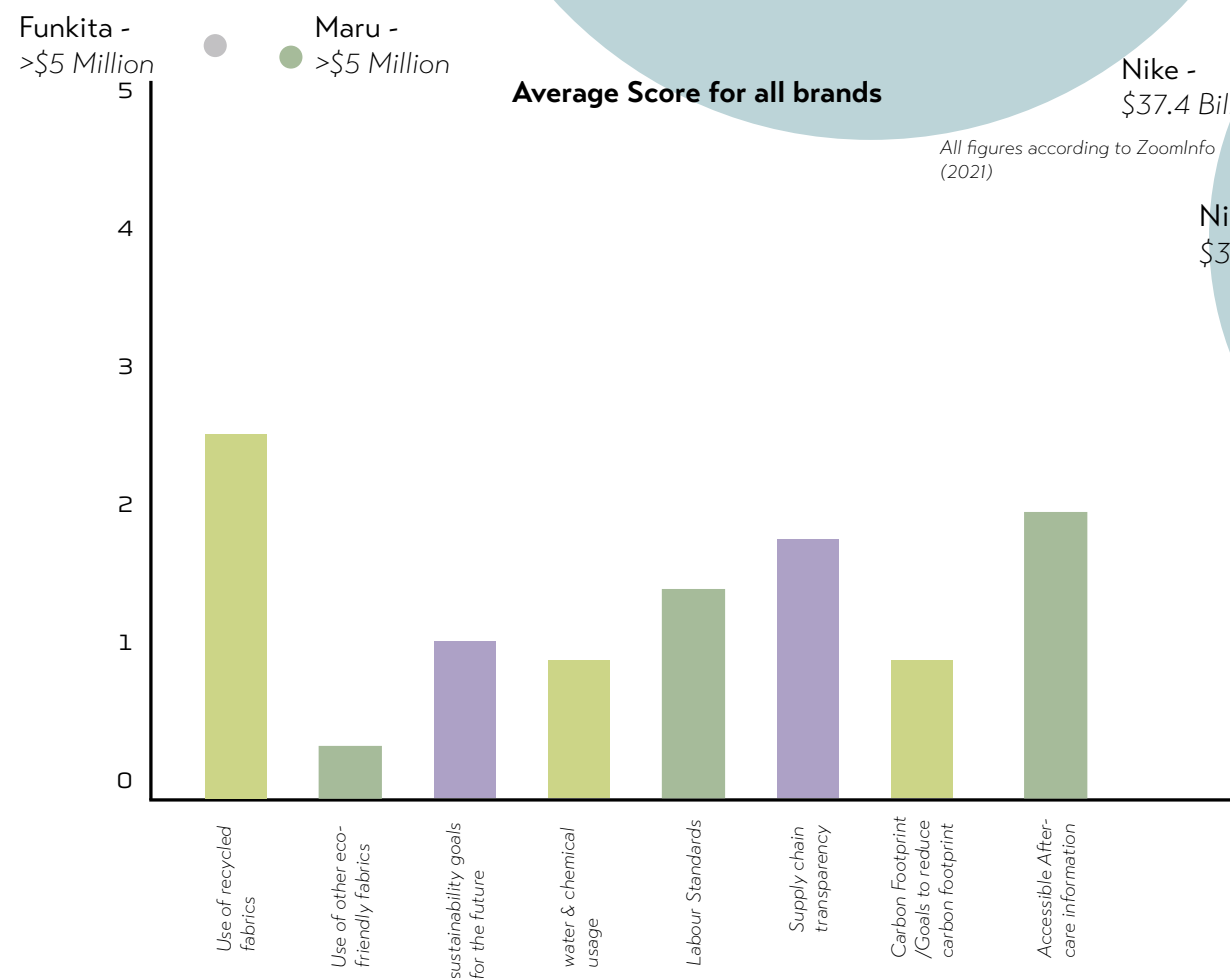
## Estimated Revenue of Brands



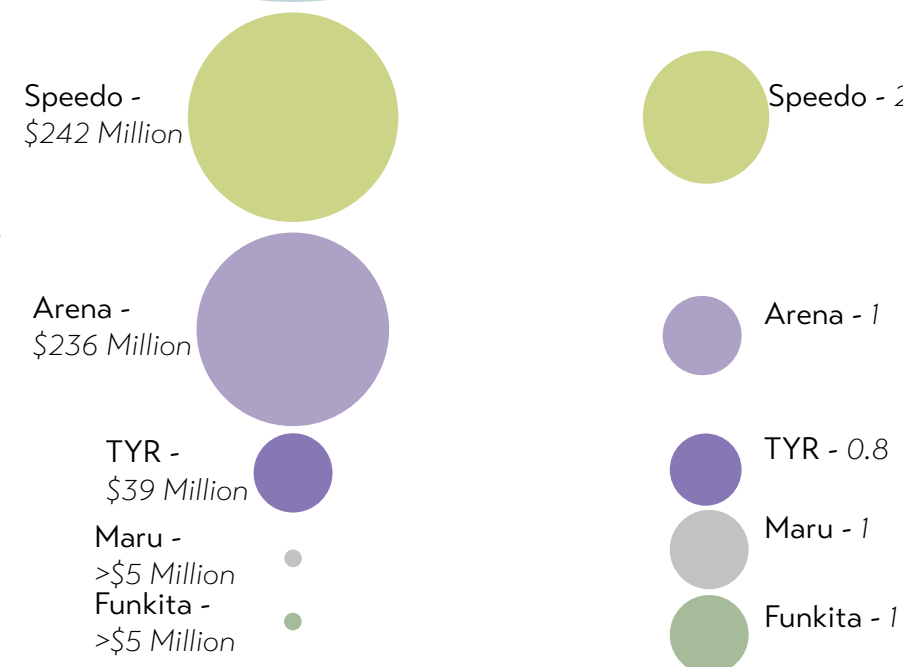
bigger brands proved to have more transparency, they didn't necessarily have sustainable solutions implemented

## Brands Revenues

## Brands Average Scores



All figures according to ZoomInfo (2021)



low score for brands developing biodesigned or eco-friendly fabric options

# Recommendations for Industry

1.

Provide aftercare information that is specific to individual products and fabrics and is easily accessible to consumers.

2.

Improve the communication of aftercare from brands to consumer, specifically provide links between the physical garment and the information online.

3.

Implement upcycling and recycling schemes to reduce waste and increase awareness on how to dispose of swimwear in more sustainable way.

4.

Create a balance between designing for function, comfort and aesthetics. A bigger differentiation between the needs of a training costume and a racing costume could improve this.

6.

Invest in biodegradable and/or bio-based fabric innovation. Move away from the reliance on virgin synthetic fibres and revolutionise sustainable fabric solutions.

8.

Lead the way in change, take responsibility for action and devise strategies to encourage others to do the same.

5.

Implement different design strategies such as designing for disassembly, design through biomimicry and biodesign and designing for emotional durability.

7.

Be mindful within sponsorship deals, reduce the amount of free product sent out. Create a more meaningful relationships with athletes to promote sustainability, rather than capitalise on overconsumption.

Recommendations



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