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Master of Science . *Design for the Fashion System*
Area. Sportswear & Activewear

Project .
Better Wa(y)ve. Riding on the crest of Sustainability.
Surfing as the *litmus paper* for Pollution detection

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To the *Ocean* . .

. . and to the *Earth*

A.1 Abstract English Version

"To suit" into the project

"In quanto surfisti, ci immergiamo letteralmente nell' Oceano,
siamo completamente esposti all' Oceano.
Se l' Oceano è malato, lo siamo anche noi."

Fernando Aguerre

L' idea è nata quando ho cominciato a surfare in Liguria. Per la prima volta ho sentito surfisti parlare di acque inquinate, di condizioni pericolose, elevati rischi batteriologici, e nonostante tutto, questi ragazzi entravano in mare ogni weekend piuttosto di rinunciare a quella forte passione. Considerando il ***surf*** in modo profondo - non solo come un' attività fisica ma come un modo di sentire la forza della Natura, di essere connessi con essa - allo stesso modo considero il ***Design*** e le sue possibilità: non è solo una questione di produrre qualcosa di nuovo o originale, ma un' attività sacra, animata dal desiderio di essere d' aiuto per l' uomo, rispettando l' ambiente e senza dimenticare le proprie origini. Questo è il motivo per cui ho deciso di abbinare il rispetto per il mare e la fiducia nel Design in funzione di un capo simbolo di questo sport acquatico: ***la muta da surf***. Non un semplice indumento, ma una seconda pelle, che permette all' uomo di soddisfare il suo desiderio di affrontare condizioni oltre l' ordinario, sentendosi in armonia con la forza della Natura. Il Design può ampliare le possibilità umane, ma cosa succede quando in quel futuro le onde saranno impraticabili ed il mare inaccessibile a causa dell' eccessivo livello di agenti inquinanti? Mi chiedo cosa accadrebbe vedendo quell' inquinamento "invisibile" concretizzarsi sulla propria pelle, o se non altro, sulla propria "seconda pelle". Il problema con l' inquinamento dei mari è che non si vede, il che induce a convincersi che non esista. Per tale motivo *ho visto in questo capo tecnico la possibilità di diventare uno strumento per la sensibilizzazione, la "cartina tornasole" per la rilevazione di agenti inquinanti dannosi.* La muta è una battaglia visiva per la sostenibilità, è lo step che la precede, ma quello necessario per renderla desiderabile. Rispondere alla questione della sostenibilità nel nostro settore può assumere molteplici forme, ma dopo una profonda indagine la mia conclusione è che ancor prima del prodotto sostenibile debba venire il sostegno per quel prodotto - e non un sostegno di nicchia, ma di massa, poichè il potere per il cambiamento risiede nelle mani del consumatore, e il potere di plasmare tale "consumer mindset" risiede nelle mani delle industrie creative, che non devono sottovalutare questa forza, che è un potere.. e un dovere.

La parte teorica della tesi si muove attraverso le origini del surf e del suo indumento simbolo, l' analisi di ricerche scientifiche circa la questione dell' inquinamento dei mari, il relazionarle alle più recenti soluzioni nel Design, per giunge poi alla parte progettuale: il "sensibilizzare l' occhio" si concretizza nell' elemento chiave del progetto - una muta da surf in grado di rilevare la presenza di agenti inquinanti nel mare tramite un cambiamento di colore della superfice.
E' stata una conseguenza naturale quella di allargare successivamente il progetto al nostro contesto quotidiano: la città, in cui le onde inquinate dell' Oceano si materializzano nelle onde inquinate del traffico.
La capsule collection risponde ai bisogni "allargati" del mio target consumer, una persona che non rinuncia a surfare tra le onde marine ed urbane e al contempo vuole essere consapevole dell' inquinamento che le caratterizza.
I capi chiave del progetto, capitanati della muta, sono stati sviluppati grazie alle preziose collaborazioni con aziende professionali operanti nel nostro settore e non, che hanno visto in questo progetto fin dai suoi esordi un interessante stimolo per l' avanzamento di nuove ricerche: SLAM S.p.A. per il product development, SHEICO Group per la prototipazione, FRAMIS S.p.A. per le rifiniture dei capi tecnici, RES S.p.A. per la fornitura dei materiali e gli esperimenti sul neoprene, che ad oggi continuano ad essere condotti nei laboratori dell' azienda con l' intento di raggiungere nuovi risultati.
Questa tesi èsolo l' inizio di una ricerca che ad oggi è in evoluzione, al fine di raggiungere risultati sempre più soddisfacenti e, si prevede, delle possibilità in termini di produzione industriale nel prossimo futuro.
Questa tesi è il simbolo della fiducia nel potere del progetto per una *better way* ed una *better wave*.

Chiara De Vescovi

A.2 Abstract Versione italiana

"Introdursi" nel progetto

As I consider ***surfing*** in a deep way - not only as a physical activity but as a way of experiencing the strenght of Nature, of being connected with it - in the same way I consider ***Design*** and its possibilities: it is not just a matter of producing something new, or original, but it must be a sacred activity that is animated by the desire of being helpful for man, respecting the environment, without forgetting the origins.
This is why I chose to bring together the care for the oceans and the love for design into a garment symbol of this watersport .. That' s why my project is about a ***wetsuit***. The wetsuit is not simply a garment, it is a second skin for man to satisfy his desire of connection with nature, it makes possible, safer and easier men' s choice of facing extraordinary conditions. Design can expand man's possibilities, now and for the future, but what about a future in which there are no more waves to ride because of hazardous levels of pollution in the water? I feel there is a direct correlation between the health of the oceans and the health of the surf industry. *That' s why I saw in this technical garment the possibility of becoming a way of rising awareness, of being the litmus paper for the detection of hazardous pollutants.* The idea came when I started to go surfing in Liguria. For the first time I heard surfers talking about polluted waters, unhealty conditions, high-level risks of getting bacteria and despite all of this, they were entering the waters rather than renouncing to that strong feeling. But surfing on polluted waves is not a challenge, is not a healthy pushing of athlets limits, is not a choice. "Water quality testing is rare. Public access to water quality testing results even more rare. We need to monitor pollutants in the oceans so we get a better understanding of the issue"(2). The worst is that most of the times you don't see the real water conditions. Monitoring does not prevent harm, but it's the first step toward finding solutions. Because if we know, and if we see better.. we do better. So this Wetsuit is a visual battle for sustainability, is the step before it, but the needed one to make sustainability desirable. *I want to fight the "unseen".* I wander what happens once you see that pollution concretizing on your skin.. or at least on your 'neoprene skin'. The surfer becomes the "message bearer" for all the people around him, because the power for change lies in the hands of the consumer, and the power to shape this new consumer mindset lies in the hands of the creative industries.
The idea was moving from some questions. "What can be challenging to the sustainability of surfing? What are the transitions to sustainability in my area of expertise? Are there any transitions I can drive with the instruments I have?" *Focusing on my area of expertise*, that is to say the Design practice, transitions to sustainability can concretize into many shapes; but after all the research I' ve been 'swimming through', after having realized that greener proposals are not just into brands agendas but have already entered the commercial chain, I concluded that most of them remain trophies to admire, or choices of few. But sustainability is not a matter of an exclusive niche. It has to be a *mass phenomenon, a global, worldwide FASHION*. And to make this possible the first thing is niether producing "the zero-impacts product of the year", it is raising awareness, knowledge into people, until your desire gets so strong and your eye so trained to these concepts that you won't have to choose but you'll pick that option without wondering "if".
I see awareness as a powerful instrument for the growth of sensibility and the desire of changing, improving. In this project surf is not just a sport but a wave of life that is an environmental story, a business story and a cultural story. Surfing culture, business and environment become the pillars of the theoretical part of this thesis: after moving from the study of the origins of this activity and of its symbol-garment, paddling through a deep analysis of the market and the study of the last innovations in the sector, adding the scientific studies regarding the issue of the Ocean pollution, putting them in relationship with the design latest solutions, we finally get to the project's wave, the concrete part of the thesis. This concept of "training the eye" concretizes into the key element of the project: the wetsuit for surfers that raises awareness towards the theme of the ocean pollution thanks to the detection of hazardous chemicals in the water through a visual color shifting. Then, it was a natural consequence to enlarge it to our most common daily landscape: the city context, in which the polluted ocean waves materialize into the polluted traffic waves. The key garments, captained by the wetsuit, have been developed through challenging collaborations with professional companies active in this field, that found in this idea a spark for new researches: SLAM S.p.A. for the product development, SHEICO Group for the prototyping, FRAMIS S.p.A. for the finishing, RES S.p.A. for the material furnishing and the surface-treatments experiments, today still under testing in their laboratories. To close the cyrcle of this journey a capsule collection answers to my 'enlarged' target consumer's needs, the ones of those men looking for a better way, surfing inbetween the sea and the urban waves.
This thesis is just the starting point of a proposal and a research that keeps evolving today, to achieve growing results and hopefully a possibility in terms of industrual production in the next future. Let' s now dive into the rip curls of this wave called 'project' and of its technical and emotional commitment of looking for a 'better future' raising awareness. Because 'I do believe in the power of designing for a *Better Way*.. and for a *Better Wave*'.

Chiara De Vescovi

"That first wave - on the North Side of Huntington Beach - I was hooked.
Absolutely unapologetically hooked.

That launched my migration to coastal living
and gave me the most important job of my career.

I have not looked back since that first wave.
Surfing has become a part of my DNA and I am a better man for it."

"Transitions to sustainability" Derek Sabori

1.INTRODUCTION

1.1 Note from the author

A breezy introduction to the journey

Why I do believe in a "Better Wa(y)ve"

As I consider surfing in a deep way - not only as a physical activity but as a way of experiencing the strenght of Nature, of being connected with it - in the same way I consider Design and its possibilities: it is not just a matter of producing something new, or original, but it must be a sacred activity that is animated by the desire of being helpful for man, respecting the environment, without forgetting the origins.

Chiara De Vescovi

I really believe that when you work on something that is your passion or that stimulates your desire of trying to make a difference, to make a step forward, you can achieve an honourable result. Maybe someone already had that idea, maybe someone already gave an answer, but that is definitely going to be different from your conclusion. Why ? Because a project, of whatever nature, if totally personal and deeply felt as part of your soul, rises from the interaction of multiple elements and sources that can be common between people but anyway unique, beacuse part of that person. So as everything else in our lives, also the design process is the result of a *cross fertilization* that is unique, because each individual lives his own unique path, made up by different experiences and different ways of approaching them.

Of course the seaworld is a huge world itself, so in this particular case what I need to do is to focus on a part of it, but the choice almost comes out naturally.
I recently discovered my passion for a *dicipline* - surfing - that really changed my life.
I accurately decided not to call it a *"sport"* because it would be too easy to define.
As I consider surfing in a deep way - not only as a physical activity but as a way of experiencing the strenght of Nature, of being connected with it - in the same way I consider Design and its possibilities: it is not just a matter of producing something new, or original, but it must be a sacred acyivity that is animated by the desire of being helpful for man, respecting the environment, without forgetting the origins.

That' s why my project is about a wetsuit.

Because this "piece of clothing" deeply stimulates my desire for research so I really believe I can work on it with all of my passion.
It is linked to my love for the sea, the bound with the water I feel - it could be my hometown, Venice, it could be my father' s practice of scubadiving, it could even be my zodiac sign for those who believe in that, so that in a way as a little "human fish" I would be naturally intrested in that type of garmen, that was born to provide more comfort in the water for a longer time.

But which should be the Wetsuit I would be interested in imagining, investigating, developing . . ?

This childhood imprinting - the *love for the sea* - that could simply have existed in my life as millions of others, not only remained in my daily life as a need, a spiritual guide, an inspiration, but became almost unespectedly an element of investigation and a source of ideas for what could be said my *professional life*: Design.

I would want to go deeper in this world of the ocean and of the *sport activities* connected to it, that I started to appreciate not only through books, studies and movies, but through the real experience. Through trips that brought me at the origins of this reality, at the core of these places - like Australia and the American West Coast - I could *collect stories* from people that, as me and actually more than me, made of this reality their everydaylife and passion.

Photographs by **Chiara De Vescovi**

All the pictures have been taken during the American Coast to Coast Trip between January and June 2016.

Previous Page
Top. **Seashore** (backlighting shot)
Santa Monica, CA
June 3, 2016 - 6.30pm
Centre. **Surfers Family**. A dad and his son washing the surfboard from the sand.
Venice Beach, CA
June 1, 2016 - 6.18pm
Bottom left. Street sign "**Surf Av**", the main street in Coney Island.
Coney Island, Brooklyn, NY
May 14, 2016 - 5.36pm
Bottom right. **Venice Beach Skate Park**. The World most famous skate park by the Ocean, captured at sunset.
Venice Beach, CA
June 4, 2016 - 8:06pm
On this Page
Top left. **Children silhouettes** playing on the Santa Monica seashore at sunset.
Santa monica, CA
June 3, 2016 - 6.31pm
Centre left. **Skater** training at the Venice Skate Park.
Venice Beach, CA
June 5, 2016 - 4.10pm
Centre right. **Surfer** riding his board surfing on a little wave in Santa Cruz.
Santa Cruz, CA
May 28, 1.18pm
Bottom left. **Sunset** on Venice captured from a rooftop.
Venice Beach, CA
June 4, 2016 - 7.36pm
Bottom right. **Surfer's feet** captured while climbing the stairs of a little beach.
Santa Cruz, CA
May 28, 11.20am

I would like to start a research that horizontally touches those that are the main points of interest to me.
The research should cross the history of the wetsuit, of its innovations, not only in terms of design, shape and materials, but in terms of how it has been produced, enlighting those aspects as the interest in *human safety* in waters and in *environment safety* and preservation.
So this is going to be the starting point of a research that is not totally new in my mind and in my life, but that I feel I want to explicit, giving to it a concrete story and shape.

When I' m talking about activities that are made "inside" nature I definitely give for granted this kind of approach to the project.

As a Fashion Design student with relative available instruments, my project has not the intent of proposing a new chemical fomula for an innovative less polluting material, niether is taking the already well explored path of the recycling materials. After a deep analysis of the brands' acutual solutions regarding the planet health I decided to give voice to this message in a different, more visual, direct and impressive way . .I do believe that one of the first steps to make a change is getting aware of a problem. Not just in words but facing it, looking at it in its eyes, feeling it "on your skin" so that it fastly becomes YOUR problem and not just A problem of someone else far from you. Awareness as a powerful instrument for the growth of sensibility and the desire of changing, improving..

From the Ocean Waves to the Urban Waves, from the Ocean pollution to the Air pollution, from a *wetsuit* to stay "wet but safe" in the sea to a *(wet)suit* to stay "safe not getting wet" on the street, my research offers the combination of high - tech professional garments for *riders of whatever wave* but adding to the main need of this category of garments - functionality and performance - a *sensitive meaning* related to the quest of the critical environment conditions.

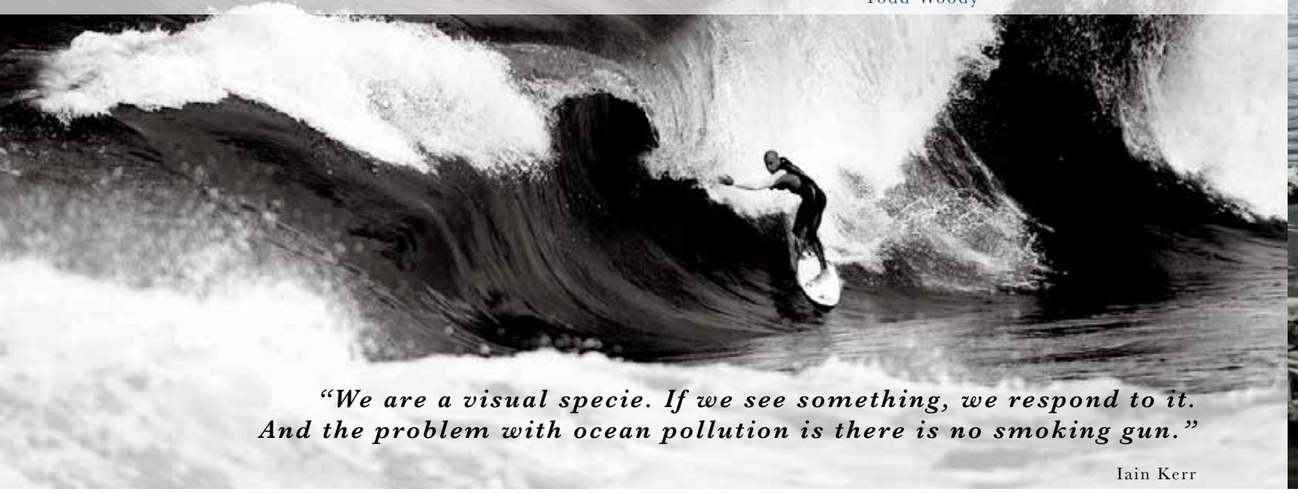
1.2 Below the surf-face

The Project's H_2OMolecula:idrogen-2-oxygen? Health-to-Ocean!

Sustainability, Ocean Care & the Surfing World as Soul of the Design process

By framing surf as not just a sport for the pros but as a *wave of life* that is an environmental story, a business story and a cultural story, *sustainability* becomes a far more interesting and multi-faceted tale that can have real-world impacts.

Todd Woody



"We are a visual specie. If we see something, we respond to it. And the problem with ocean pollution is there is no smoking gun."

Iain Kerr

I do not consider this as a conventional work. I tried to shape these years of passion and these months of deep technical research into a personal stream of conciousness balanced through deep studies and a personal interpretation of them into a design proposal.
The first half of the thesis is dedicated to the sum up of the main researches, analysis, data, essays, scientific publications, books and documents I' ve been running through during these months and that became my notional and emotional substratum for the birth of the design idea and the Better Wa(y)ve Project development and realization.
. . *It was born out of passion.* . passion for the Ocean and for a discipline - surfing - that is deeply connected to its streght and that became the instrument to me, as a Fashion Designer, to give this passion a shape into a wearable object
. . *and also out of necessity.* . whith the intention of raising awareness about Ocean Pollution, enlighting problems and suggesting solutions.

My proposal has not the intent of giving a definitive answer, niether of being "the" solution, because I do believe not in the existance of one single path but in the values and in the final results, that can be achived through infinite paths depending on every person's knowledge.
I am not a scientist, I am not an engineer, I am not a biologist or a chemist and unfortunately I am not an environmental expert for now nor a professional surfer, *I am a passionate lover of both nature and surfing and this love pushed my desire of trying to give my part, to be "MAD" (to Make A Difference)* with the instruments I have in my hands: fashion design education, oriented to the sportswear, the activewear, the innovation and technology in material performances and a great dose of enthusiasm.

I am not inventing a revolutionary formula for a new material that can substitute the current ones, I have not such a knowledge or such an eterogeneous working team to experiment with - but I wish I' ll be into one in the next furute.

What I am following is the actual belief that without awareness, education and knowledge, without concious eyes we cannot hope to make a great change, that is what our environment needs from our unsustainable practices.

What I observed in these months of researches is that not the right amount of dedication is referred to living and producing in a sustainable way, and even when some sparks of this care concretize into brave brands' practices and proposals, the consumer is not ready for that, due to lack of awareness or lack of facing how big the problem really is.

something that can be delaied.
But I wander what happens once you see that pollution on your skin . .
or at least on your "neoprene skin". I do believe that the biggest barrier to build, or better, to globally broadcast sustainability into surfing today, is "education".
Jacques Cocteau said that you need to know something to love it and to defend it. The more people know the ocean and get aware of its unhealthy conditions induced by human footprint, the more defenders of the ocean there will be. If you know, you care, and if you care, you conciously act. What I am focusing on is the "knowledge", the rising of it. Science research, technological advancements, social will, cultural and behavioural change are all same-weight ingredients in my thesis.

The pillar is the emotional commitment of looking for a better future.. for a Better Way.. and for a Better Wave. Here comes the name of the project as a mixture of these two main words.

My proposal has not the intent of giving a definitive answer, niether of being "the" solution, because I do believe not in the existance of one single path but in the values and in the final results, that can be achived through infinite paths depending on every person's knowledge.

From here was born my idea of working on a wetsuit for surfers that could detect hazardous pollutants in the ocean through a surface color changing, as a sort of litmus paper, withthe addition of a reversible capacity.

Mine is a visual battle for sustainability, is the step before it, but the needed one to make sustainability desirable. I wand to fight the "unseen", that is the reason why we are not sensitive towards some issues. Until you know but your eyes don' t see it, the problem remains as

The beautiful thing about surfing is that it cannot be univocally labelled and "paddles" through the world of science, sport, art, environment .. And as such the voices that could contribute to the debate could and should be multiple, different, collaborative and, together, stronger.

As surfers, we literally submerge ourselves in the ocean, we are completely exposed to the ocean. If the ocean is sick we get sick.

Fernando Aguerre

"It's my belief that if we can make pollution visible, and let people know what small things they are doing are actually making an improvement in this incredible environment, it could make a huge difference. It can be a game-changer."

E. Widder

In my 2013 SIMA Waterman of the Year acceptance speech, I cite one of the articles of the Declaration of Indipendence -the uneliable right to the pursuit of happiness. When we go surfing we are pursuing happiness, so we also need to ensure the stoke and happiness of people in the water. It' s great to get waves, but we must also give some waves."

Fernando Aguerre
"Surfing, Sustainability and the pursuit of happiness", 2.2, p.37

The future of sustainability in the surfing industry must be innovative, adfirms Nev Hyman. I agree with that, together with London based designer Bentel's belief that o***ne of the ways to get people to look at information is to embed the technology into the objects they use and they love.***
The hope is that the wetsuit can be a starting point.

At the origins of my research, when I already knew the main pillars of my work, I run into a Shamanic description of this ancient art of expression . .
"In Hawaiian surfing is called He' e Nalu. Literally translated, it means, 'to slide on churning water'. However its significance is reflected in the deeper meaning of one of its roots words: nalu, which also means 'amniotic fluid'. When we are born we can be thought to he' e nalu. To the hawaiian sensibility, surfing is a mean of celebrating life.

To go into nalu is to return to the womb, to cleanse, is to be born anew. The ancient hawaiian ritual of Pi kai, or Pi wai, is the practice of cleasing in the water to wash away negativity and impurity."*

And this really struck me, because we are at the opposite situation now: *instead of purifying ourselves from impurities going inside the water, we are taking for granted to absorb impurities by diving into water.*

"In my 2013 SIMA Waterman of the Year acceptance speech, I cited one of the articles of the Declaration of Indipendence - the uneliable right to the pursuit of happiness.
When we go surfing we are pursuing happiness, so we also need to ensure the stoke and happiness of people in the water. **It' s great to get waves, but we must also give some waves.**"**

How to give **not just waves but better waves?** How to go in the direction of a better way?
The idea inception happened when I started to go surfing in Liguria, a beautiful region in the north west of Italy. *It was there that I started to hear for the first time surfers talking about polluted waters, unhealty conditions, high-level risks of getting bacteria, and despite all of this, they entered the waters every weekend rather than renouncing to that strong feeling.*

How could all of this be possible, from the pollution we created - that I finally saw "beyond my door" and not on the other side of the world just in pictures captured from National Geographics reporter - to the acknowledgement of the problem but anyway the choice of living the risk rather then renouncing to that practice.

I could not accept this condemnation. I felt I wanted to work to make a difference, even if small, even if not resolving. I could not keep my hands still.

"I hear this everywhere I go, this sense of 'I'm too small to make a difference,' and yet somehow, collectively, humanity has created the problems that we have. So somehow, we all do make a difference."
Chris Jordan

"Above all, I believe you have to do what you think is good and you have to do what you think is going to make a difference. I think that' s a simple philosophy to live by, in and out of water, in and out of business."
Shaun Tomson

Previous Page
Image. **Morgan Maassen** Photograph
morganmaasen.com

Current Page
Image. **Surfer and a seashore of pollution**. Taken from adidas.com/us/parley
Quote.* Taken form chapter 8 of "Stoke in a sea of uncertainty" by **Kevin Lovett that also refers to Surferspirit Surfrider of Hawaii, from the book "Sustainable Stoke. Transitions to sustainability in the surfing world" by Gregory Borne, Jess Ponting, 2015
***Quote.* Taken from "Surfing, Sustainability and the pursuit of happiness" by **Fernando Aguerre**, chapter 2.2 , p.37 of the same book.

Surf companies need to ask themselves what their mission is.
It shouldn' t be just profit, sales and growth.

Their mission should be to inspire people to surf.
And this doesn' t mean pushing for a gazillion more guys in the water,

but inspiring people to relate to the surfing sensibility that is being connected to Nature and freedom.

Shaun Tomson

2.THE DESIGN WAVE

2.1 The Origins Birth and development of the Surf Suit

When the passion becomes the will for design innovation

"A piece of clothing usually made from rubber that covers the whole body closely and is designed to keep you warm when you are swimming, especially in the sea, for long periods".

Words by **Cambridge Dictionary**

This is the definition taken from the Cambridge Dictionary for the word 'wetsuit'.
To Start from a definition is always a good method.
The second point I want to underline is that Wetsuits help to keep you warm by working in several different ways. But firstly lets dispel a common myth by making it clear that it is not the water that enters a wetsuit that keeps you warm. Indeed a wetsuit would be warmer if no water entered it at all, but then it would be a drysuit; an entirely different piece of equipment. Just to concentrate on the right item we are analyzing.

A main element that really makes me enjoy studying this *"piece of clothing"* is that not so unexpectedly the history of the garment teaches us that the main inventors or innovators in this sector, especially at the biginning, have always been lovers of these diciplines, *passionate for the watersports,* and this has been the reason why they were so interested in pushing forward the boundaries of these items trying to make them everytime safer, more comfortable and able to make them stay in water as long as possible!

In fact, most beaches on the California coast were simply too cold for surfers to get their fix, and this inspired pioneers like Meistrell to start tinkering with some creative solutions.

When Bob Meistrell started surfing in Northern California during the early 1950s, twenty minutes was about all he could stand in the frigid coastal waters. Despite the constant rush of adrenaline, after three or four good waves, he was hightailing it back to a dry towel in the warmth of his car. With water temperatures near Santa Cruz hovering in the mid-50s, the surf was cold enough for a swimmer to catch hypothermia in an hour.

However, the first neoprene wetsuit wasn' t developed by a surfer, but by a Berkeley physicist named Hugh Bradner.

In 1951, Bradner was working in conjunction with researchers at University of California, Berkeley, and the U.S. Navy to design a diving suit for the military that didn' t need to prevent water intrusion to keep the wearer warm.
So now we know why the name "wetsuit"!
In Ocean Beach, San Francisco, the same years we had an avid surfing and diving enthusiast, O'Neill, who had been testing various methods to keep warm while surfing off the Northern California coast (like soaking sweaters in kerosene to make them more water resistant and experimenting with rubber drysuits). The two-part frogmen outfits were tightly sealed at the wrists and ankles to prevent water from entering the suit, and worn over long underwear to stay warm.*

Supplementary Box 1

An interesting point that I want to focus on is the importance of collaboration:
Bradner was suggested by another researcher to try a foamed neoprene material made by a company called Rubatex. This is what we call the "cross fertilization".
So, at the time, extruded neoprene strips were primarily used as a sealant around gaskets for automobiles and airplanes!

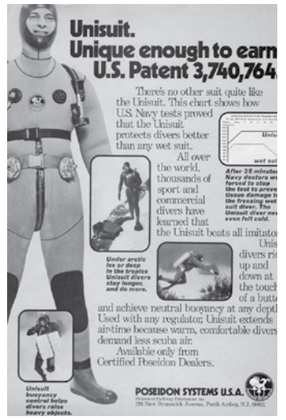
Neoprene was filled with tiny, uniform air bubbles that helped insulate against the cold, even without being skintight.

Divers working with the **Scripps Institution of Oceanography** tested Bradner' s early prototypes, and his best designs utilized the thick, foam-rubber material with fantastic results! As in each great discovery, there is always a team working together, each member has his own knowledge but the desire of achieving is common and shared.

Left. Two divers wear **frogmen-style drysuits**, like those worn by O'Neill during his early surfing days.
Image courtesy of Scripps Institution of Oceanography Archives, UC San Diego Library.
Right. **The Skin Diver Magazine**, Agust 1954

"You' d be good for half an hour it would fill up with water, and you' d be lucky to survive. You can imagine how dangerous that was."

Brian Kilpatrick, O'Neill's Director of Marketing Communications



2.1 The Origins Birth and development of the Surf Suit

When the passion becomes the will for design innovation

O'Neill applied a thin layer of PVC plastic sheeting to one side in order to strengthen the material, and then hand-cut neoprene panels to the desired size.

Beginning with a swimsuit brief and vest, **O'Neill** constructed and tested his first wetsuit designed himself. And from 1956, the orders started rolling in!

The red thread of a passion that filters through these experiments touches Bob Meistrell and his twin brother Bill, who had been experimenting with their own wetsuit designs.
The brothers were two of the first certified SCUBA instructors in the state. But years after they had fallen in love with the sea, they still couldn' t stay in the cold water as long as they wanted to!

"I surfed in Pleasure Point near Santa Cruz for two years at night by car light with just a sweater on, an army-issued wool sweater".
Bob Meistrells

In 1953, their friend Bev Morgan opened the original Redondo Beach **Dive N' Surf shop** creating his own wetsuit prototypes for close surfers friends, and soon asked the Meistrells to become partners in the business and help produce his wetsuits.
The earliest benefits of the first wetsuits first of all weren' t reaching all the surfers, there was not a sort of product official develpment, and last but not least these early designs restricted mobility, the lack of zippers made them difficult to put on and their rough rubber interiors irritated the skin.
The design needed to improve.
That equipement still could not be compared to modern wetsuits of today.
Most of the wetsuits were still stiff and did not often fit very well.
Neoprene used to make them was raw foam-rubber neoprene, totally unlined.
The problem of unlined neoprene was that it was very sticky and very fragile, so surfer used talcum powder to slip into their wetsuits.
Next step was the nylon . .
Then nylon was developed and it was a perfect solution for a backing material. A layer of nylon was applied to one side of the neoprene (it is still used today, but its performance is much improved). Single nylon lined neoprene made 'putting on a wetsuit' much easier than it was before. But the outer side of neoprene was still exposed and the first nylon was very inflexible, so the wetsuit were still quite stiff.
Double lined neoprene was "invented" in the 1970s and it was protected with nylon from both sides. Protection and tear - resistance of the neoprene was increased, it was also possible to color the outer nylon layer and make colorful wetsuits. . witnesses are the brilliant fluorescent colors common in the 1980s.
Bill began searching out a lighter, more stretching material, which took him back to the headquarters of Rubatex in Bedford, Virginia, to learn about their different rubber products and work with the company to produce the best possible wetsuit fabric.
The new Meistrell suits "fitted like a glove" and that was the reason why the logo labelled "The Body Glove".
Also the seams - problem was not understimated and a lot of innovation and improvement was referred to this part of the wetsuit too.
At the biginning the wetsuit neoprene sheets were simply overlapped at the edges.
Punching holes all the way through both layers of neoprene opened the inside of the wetsuit to the environment. The result was lot of flushing through the seams, so another method of sewing neoprene had to be developed.
It came the 'seam taping'. Seams were taped with a strip of nylon that sealed the seam and stopped the water. The tape was actually melted into the neoprene by heat. When the neon color revolution came, the tape had to be moved to the inside of the wetsuit where nobody could see it.
Then it came the 'seam gluing'. The idea was to glue the neoprene sheet edges together instead of sewing them. This stopped the water and the seams were smooth and flat. But big problem was that neoprene/glue/ neoprene combination wasn't strong enough and could tear. Cutting the neoprene panels from the neoprene sheets was done by hand and if two panels were not cut well there were still holes along the seams. Finally we got to the 'blindstitch revolution'. After nylon - backed neoprene was invented, the blind stitch sewing was developed.
A new curved needle was designed not to go all the way through the neoprene but just under the surface of the material coming back up on the same side. No holes – no water. Blindstitch seams were also flat and more comfortable. (Today blindstitch is the primary method of sewing wetsuits, especially wetsuits for warmer conditions).As wetsuits improved it was only a question of time for the ultimate solutions. By the 80s watersports enthusiasts had a variety of suits to choose from, and no longer needed to

"The wetsuit changed watersports in a huge way."
Bev Morgan

trek across the globe to avoid colder waters. Surfing took off, in reality and in the popular imagination, growing into a professional sport and international pastime. What I care to underline now is that the real value in the innovation, again, is the expansion of possibilities for man, the opening - up of new horizons, not only in terms of numbers but in terms of safety and comfort. Today there is no place that is off limits due to water temperature. In the northeast, in Iceland, in Antarctica, they surf in the snow! Russia, Alaska, Norway, Iceland, Chile, Faroe Islands and all the unknow places in between. The season expanded to become year - round, for all watersports. The wetsuits life - saving capability reached is a benefit that goes far beyond the physical comfort they provide for divers and surfers.

"I remember being a little kid and my first wetsuit was just the jacket. Trying to make it through winter with just that and with no shorts was a nightmare.
I never surf without a wetsuit today. I can' t believe how far we' ve come. All these minor adjustments and improvements on material, durability, entries and exits, and even your knee pads, your wrist seals, all this fine-tuning of these minute details really improves the user experience and makes your session much more fun." Kilpatrick, O'Neill publicist

When I think about this new push for discovery that of course moves from human aspirations but that brings together the need of specific equipements, I cannot stop thinking of that interview I run into few years ago. It was Chris Burkard** speech at TED Talks related to the theme of "surfing in cold waters". "I look at this Arctic selfie. It was the coldest I've ever been. But even with swollen lips, sunken eyes, and cheeks flushed red, I have found that this place right here is somewhere I can find great joy." After years of surfing photography in exotic and turistic places he began craving wild, open spaces to find the places others had written of as too cold, too remote, and too dangerous to surf,and this is a challenge that actually intrigues every surfer. Only a third of the Earth' s oceans are warm on a thin band around the equator and here comes out the midset of the pure soul-surfer, the one that, looking for the perfect wave, leaves for adventures in remote and rugged parts of the world.

"In life, there are no shortcuts to joy.
Anything that is worth pursuing is going to require us to suffer just a little bit,
and that tiny bit of suffering that I did for my photography,
it added a value to my work that was so much more meaningful to me
than just trying to fill the pages of magazines.

See, I gave a piece of myself in these places,
and what I walked away with was
a sense of fulfillment
I had always been searching for."

Chris Burkard

A main point I would underline from the wetsuit history is the fact that this piece of clothing is not simply a garment that provides some protection/function.

Of course the research, the innovation and the new studies and designs are unprecedented and fundamental but the concept we could learn is the power of designing garments that can really expand man possibilities.

The wetsuit is not simply a garment, it is a second skin for man to satisfy his desire of connection with nature, it makes possible and safer and easier man' s choice of facing a particular condition:

The wetsuit is not simply a garment, it is a second skin for man to satisfy his desire of connection with nature.

in the same way this is transferred in this project for a wetsuit that wants to answer to the new environmental dangerous conditions surfers have to face. The one of polluted oceans is not a choice of danger, is not a challenge, is not a healthy pushing of athlets limits.
It is a fact, and it is getting worst, all over the oceans.
And because the first step for changement is getting aware, is facing what is around you with your eyes, I decided to work on a visual effect on wetsuits to give alarm of the danger and make people really see the pollution we are all swimming in.

I do believe that design can have its valuable part in making our life better.


Supplementary Box 2

The more the surf industry was growing, the more production was needed, the more the most famus spots were becoming crowded, the more professional surfers started to feel this desire of pushing themself far and beyond and the more high - tech professional equipment was needed to be develop. And this is the attitude the great surf brands have now.

During the speech, I could totally feel his desire of pushing his limits, getting to new pure places, where nature and its power still have their untouched beauty.

I think his words inspired my desire for designing this kind of stuff. Surfing, Nature as a spiritual guide and challenging conditions with the common need of faithful technical equipement.

Previous Pages.
Left.
Diver John Foster wears two of Bradner's early neoprene wetsuit prototypes, circa 1952. Images courtesy of Scripps Institution of Oceanography Archives, UC San Diego Library.
Right.
Body Glove's first wetsuit size chart used this photographic diagram. Image courtesy of Body Glove.
The Unisuit
1976 Skin Diver Magazine

Benefits of wetsuit
O'Neill and another surfer demonstrate the immense benefit of wetsuits by leisurely reading the paper at sea.
Meistrell Advertisment
Bill and Bob Meistrell pose in a mid-1950s ad for Dive N' Surf.
O'Neill's earliest wetsuit prototype
It was this vest coated in PVC plastic, circa 1953. **Surf development in the Sixties**
By the 1960s, surfers were familiar with the wetsuit-clad Body Glove surf team.
SF trade show 1956 Jack O'Neill's kids floated around in their custom wetsuits at a 1956 trade show in San Francisco.

Surf Advertisment 1
1969 O'Neill
Surf Advertisment 2
1976 O'Neill
Current Pages.
Left. **Meistrell brothers**
Old picture capturing the Body Glove' s founders posing at the beach during summer, 1952.
Surf Advertisment
The Body Glove Advertisment "The winter Gang", 80s

*For the full and in - depth history of O' Neill go to the paragraph 2.2.1

**Chris Burkard - surf photographer. Chris Burkard travels to remote, risky and often icy locations to capture stunning images that turned the idea traditional surf photography and the traditional surfing imaginative cliché.

Supplementaty Box 1
Two divers wear frogmen-style drysuits.
Image courtesy of Scripps Institution of Oceanography Archives, UC San Diego Library.
The Skin Diver Magazine, Agust 1954
Supplementaty Box 2
Chris Burkard Surf Photography
2013, Iceland

2.2 Surf Soul & Design Soul

Those that bubbled to the surface. Two case studies

2.2.1 O' Neill. It' s always summer on the inside

O'Neill is celebrated as a pioneer, if not inventor, of the wetsuit, which opened up colder waters to surfers, and the company that grew out of his tiny surf shop went on to sell sportswear that captured the imagination of surfers and skateboarders, eventually becoming a sought-after fashion brand.

"The ocean is alive and we've got to take care of it"

"I just wanted to surf longer"
A simple quote changed the world of water sports forever, more than 60 years ago..
Jack O'Neill, who has been at the origin of the oldest surf brand in history, is still a source of inspiration for today's water and winter sports lovers, who went on in later life to champion marine environmental causes, even if unfortunately he died of natural causes on Friday 2nd of June 2017 at his, of course, oceanfront home in Santa Cruz, California, at the age of 94.
One summerday in 1934 around his twenties O'Neill tried bodysurfing in Santa Monica for the first time.. that has then become Jack's second birth date, when **he discovered his true passion.**
He moved to Oregon to study business at Portland University and first encountered colder waters. After graduating in 1949, O'Neill settled in Ocean Beach, working as a lifeguard, longshoreman, fisherman, taxi driver and salesman.
He continued to surf; in fact *in his biography he recalled being fired from one job when he expelled salt water from his nose during a sales meeting.* As a sign he could now entirely dedicate on the opening of **the very first surf shop ever in 1952**, in San Francisco. He started shaping some surfboards and sold some accessories like paraffin wax, in the meanwhile realizing that even in California the ocean was not an enjoyable place to swim into during winter. *Frustated with having to freeze in order to surf, Jack went about designing a solution…*
Why shoud we accept as inevitable to freeze in order to surf? Sea and Innovation in the veins
Just one year after the opening of the shop, in **1953** Jack revolutionized water sports forever by inventing the very first wetsuit. Can we imagine this moment? The spark of a legendary revolution in the surf world.
O'Neill developed the wetsuit out of necessity: "I just wanted to surf longer," he explained. At that time, O'Neill and his surfers were struggling, trying to handle surfing even in the icy waters of northern California.
A primordial idea was soaking sweaters in oily water sealants. But as every great invention that values shows us, it is when you start thinking out of the box, even getting to what really seems a paradox, that you may find the greatests solutions: because what you innovate, even before a product, is its meaning, the traditional and common way of reasoning on it.
So it was the realisation that you do not need to stay dry in order to stay warm (hence the term "wet" suit) that carried him to the use of neoprene, in 1951. The first neoprene wetsuit smart, true and logical slogan was *"It's always summer on the inside"*.
A paradox that opened up the doors to a revolution in thinking about given-for-granted concepts. As every incredible but also uncertain hypotesis also the idea of neoprene had to be tested so *O'Neill had first tried stuffing PVC into swimming bodysuits, but* as it absorbed water, it added too much weight to allow surfing. The question of invention, or where the idea for neoprene came from, is a moot point. O'Neill originally claimed to have discovered **neoprene in aeroplane carpets**, but the flammable substance was never used for that.
He later attributed it to *a tip from a pharmacy student at San Francisco State University, Harry Hind*. Once found, he ordered masses of the material and started stiching it together to make vests, and later suits. **Jack's original surf vest** was made from these sheets of PVC foam but that lacked in tensile strenght because of the closed-cell foam. So the idea was to cover it with clear plastic sheeting that allowed the vest to shed water faster, thus limiting the cooling effects of evaporation. After these first experimentations and evolutions with details and finishes improvements, the vests started selling and this allowed Jack to decide to go into the wetsuit business, definitely an adventurous decision because it was new for him and also because friends didn' t support its will, keeping asking him what would have happened after the surfers of the area would have bought their one wetsuit.

Previous Page.
O'Neill in his house in front of the sea, Pleasure Point, Santa Cruz, CA
oneill.com/history

Current Page.
From Top Left.
O'Neill Supersuit
oneill.com/history
O'Neill Boots. O'Neill launches the world's first split - toe surf boot
O'Neill Neoprene Snow pants
oneill.com/history
Jack and a group of children pioneering the O'Neill Sea Odissey Program
oneillseaodissey.com

Other than that, competing claims came from Bob Meistrell, who, as we saw in the History section, with his brother started Body Glove in Redondo Beach, LA. Meistrell and O'Neill traded threats of legal action for years until the Meistrells' top surfer, Bev Morgan, revealed he had suggested neoprene to them after reading a paper by a University of California scientist, Hugh Bradner, who had successfully tested neoprene diving suits in 1950. **O'Neill may not have been first, but it was his melding of a nylon interior to the neoprene shell that made the wetsuit suitable for the sport of surfers!**
Not only a dreamer, as every good eneterpreneur he was, but also a young open mind with a long vision: he confered the surfboards production to talented shapers so that he could focus on wetsuits, developing the Design part: from short/long john to long-sleeved beaver - tail jackets. As Jack improved his wetsuits - new styles, features, accessories, surfers' territories expanded.
It was a snowball effect as we would say also in the managerial language: soon more surfers were riding more waves, riding them better - or we could say "in a better way" - because they could now enjoy longer sessions in cold waters, thanks to Jack's neoprene suits.
Guys were surfing New Hampshire and Rhode Island in January! Explorations opened up Oregon, Washington, and Canada.
Meanwhile, also divers, waterskiers, snow - skiers, and windsurfers were wearing wetsuits. So the improvement and high - quality of its main focused business became something attractive even for "neighbours".

Out of business . . Who?
His friends' sentence "Jack, you'll sell to five friends on the beach and then you'll be out of business" totally fell. In 1970, Jack invented the **supersuit**, a new piece of neoprene in which you could blow air to get more comfortable and recognizable in case you are lost in the ocean, waiting for rescue and in 1971, Jack's son, Pat, invented the first surf leash. Since then, nobody imagines a surf deck without it to prevent you from losing your board. What was just described is *the aim of innovation, I believe. The introduction of an invention as an answer to a lack that no one else perceived, and the exploitation of this invention that has shown its strenght and possibility of being replicable, scalable into the market becoming an essential and undeniable element.*

This was a great invention, that cost Jack the right eye during an accident, but niether this could stop the passion for surfing, and the innovation kept on going! **What about the incredible man's ability in exploitation of contingencies?**
He just turned the drama of the eyepatch into the symbol of his company.
In 1976, O'Neill took over the mountains by launching the very first **noeprene snow pants** while the 1980's witnessed the appearances of the first rashguards and **split-toe surf boots**.
By the 1980s, when his was the largest - selling wetsuit in the world, the surf brand embraced also the aspect of a "fashion accessory". By that time, Jack O'Neill's surf shop had morphed into a thriving international company, dominating the world's wetsuit and beach lifestyle sportswear market in U.S., Japan and Europe.

"A Sea Odyssey". O'Neill believes in a better way and in a better wave.
After being recognized as a true avant-garde and legend of the riding world, Jack's new challenge was to build and transmit a sustainabale legacy to the coming generations. The main goal was to enhance the importance of caring for our oceans and environments. Since 1996, children of California learn about those responsobilities with the O'Neill Sea Odyssey. A living classroom was created on board a 65 - foot catamaran sailing the Monterey Bay National Marine Sanctuary where 4th - 6th grade students from schools throughout Central California receive *hands - on lessons* about the marine habitat and the importance of the relationship between the living sea and the environment. Nowadays the program is still free of charge and conducted on board the catamaran with follow - up lessons at the shore - side Education Center at the Santa Cruz Harbor. The three main subjects are marine science, marine and watershed ecology, and navigation/ mathematics but the approach of litterally experiencing them is the valuable part, that lasts a lifetime. OSO has served *90,000 students* since its inception.
In 2004 the program received the prestigious California Governor's award in Economic and Environmental Leadership, in 2005 it received US Senator Barbara Boxer's Conservation Champion award, and in 2013 OSO received the Silicon Valley Business Journal's Community Impact Award.
We cannot just believe in a better wave, **we need to act** practically to build it up and keep it beautiful and alive.

2.2 Surf Soul & Design Soul Those that bubbled to the surface. Two case studies

2.2.2 Rip Curl. The passion for 'the Search'

"That idea of adventure, looking for and surfing good waves, having a few beers and a good time at night and then getting up the next day and doing it all again. That's how we live our lives. This is the essence of Rip Curl. We want to get this pureness into what we do".

"Do you want to start making surfboards together?"
In March of 1969 two surfing friends, Doug "Claw" Warbrick, that had just finished a summer shaping stint and Brian "Sing Ding" Singer, a science teacher, bumped into each other in Torquay. It was during that conversation that Claw posed the question that started something great..."Do you want to start making surfboards together?" he asked. Two days after Brian was resigning from teaching. This was the way in which this huge brand, that nowadays is worldwide known, was born. **Mowing and shaping foam and having a space (Brian's garage) where the only resources the crazy couple had at the biginning of their journey**, something that should make us, youg free - minded generation, think. *After all, the main ingredient for a succesfull company I do really believe is passion, even before tools, resources and competences.* It is not a coincidence that after just one mont they were already producing four boards a week for the best surfers in Torquay. This actually shows how efficient is the enterpreneurial attitude that moves from the quest of "who I am, what I know, whom I know" rather than analyzing markets and competitors. The following months were used for product testing, that ment a lot of time spent inside the waters of Bells Beach, in other words just pure happiness for the two guys, until they realized they needed a more appropriate space and finally managed to rent an old and small bakery where *they could make a step forwards in terms of professionality and technology, adding a proper shaping bay, glassing and sanding rooms, lifting production to 12 boards a week.*

From surfboards to wetsuits
In December **1969** the duo started making wetsuits collaborating with another local surfer, Alan Green, that had experience from few years at a wetsuit dive company - Australian Divers.
Again, **with just a "Pffaf 138 zig zag" able to sew on a thick rubber sourced in Melbourne**, the trio reframed the activity expanding into the sector providing one of the main things every surfer needs right after the board:
the **wetsuit.** I think here lies one of the main keys of their success:
because they realized outsourcing the work was bringing them far from the quality they wanted, they decided to do it all themselves so the wetsuit operation moved into their garage again.

"Follow your dream and Make a Splash!" - 101 Surfcoast Highway
Greeny left Rip Curl in April 1970 to do his own thing, forming Quiksilver, with Claw and Brian as equal partners, but *they refused their shares and went on following their dream.* They found in John Law a trusty partner, the old bakery became the headquarters of the activity with surfers gravitating around it and the adjoining house became the wetsuit main factory producing always more innovative and performant **wetsuits thanks to the new "1910 Singer Up The Arm Zig Zag" - new for them, old itself, this machine was used to sew flying boots for airmen in World War II !** The original "long Jhon" wetsuits made in the latest Rubatex neoprene from the US became a hit, or.. we shoud say.. *made a splash!* "It was a house for all the drop-outs that came down from Melbourne surfing!" recalls Brian, laughing. With Quiksilver opening next door, in 1980 the company left the old bakery for the current Rip Curl HQ at 101 Surfcoast Highway, Torquay.

The wave of social change
In the '80s the duo of the well established *company was focusing on a more professional formulation of what we could nowadays define as "vision and mission"* of their brand. ***"How we had always been and how we wanted to continue to be at Rip Curl?"*** At the time, Brian and Claw had many philosophical discussions about surfing culture. The wave of social change inbetween '70s and '80s as the flower power movement, the rejection of post war consumerism and the push for revolution suited surfers and encouraged many of them to live the life of travel and adventure, moving out of the cities to live on farms, or in tree houses, with the defining movie of the era being Alby Falzon's "Morning of The Earth." Then the '80s and their "money, money, money" came in and companies where trying all they could to make profit out of their products. Considering these two main points, so the fast changing of society costumes and attitudes and values on a side and the current '80s materialism on the other:
"We thought that after a decade of greed, people might reject all of it greeting the '90s going back to some values of the '70s. *And underneath we genuinely believed that the true spirit of surfing and the behaviors of surfers and what they really liked, had not changed all that much".*

"Rip Curl is a company for, and about, the crew on "The Search". The products we make, the events we run, the riders we support and the people we reach globally, are all part of the Search that Rip Curl is on. The Search is the driving force behind our progress and vision. When crew are chasing uncharted reefs, untracked powder or unridden rails, we want to arm them with the best equipment they'l l need. No matter where your travels lead you, we'll have you covered. We've been the market leaders in surfing wetsuits for over 30 years, and our ultimate stretch neoprene and zip-free entry technologies have set the standard for wetsuits of the future."
Rip Curl Vision & Mission

Previous Page.
Claw, the pirate
1991
John 'Sparrow' Pyeburne (still at Rip Curl now) cutting wetsuits at the Old Bakery
Current Page.
Rip Curl store and HQ, Geelong Road, Torquay 1980
'One of **Rip Curl last campaigns** "Surfing is everything"
ripcurl.com/history

The company at the beginning of the '90s was already international, with Australia, USA and Europe as the three main regions. All the main figures of the different departments where into the International Meeting on a boat direct to Sumbawa when they finally got how to express their values.. All that was needed was the name.***"The Search"*** was decided as the best way of summing up what they were trying to say. "It was perfect. We had always been on the Search" Brian added. The idea became true concretizing into a series of short movies and ads that expressed a way of living even before a product. **By the end of the 1970s, Rip Curl had become, in every way, the surfer's company.** Again the team found the "better way" of exploiting their limits and fulfilling missing points of their strategy. In fact the campaign and the advertising was a success and became a constant source of inspiration and brand communication since then.

"Oversee" the values "Over Sea". Don' t forget your "soul"
Competitive surfing in the early 1970s was still in its embryonic stage, with only a few dedicated amateur administrators and no sponsorship support. Warbrick and Singer approached the Australian Surfriders Association offering to make it Australia's first professional surfing competition. So **the first Rip Curl Pro**, won by the legendary Michael Peterson in 1973, attracting most of the finest surfers from around the world, **represented the real beginning of the story of surfing's conversion to professionalism.** *Even if Rip Curl's involvement in competitive surfing was clearly evident, Warbrick and Singer were firmly determined to remain loyal to the philosophy of "The Search".* Their cornerstone of surfing was solid if they had to work on testing pre-eminented equipment for world surfing elite or support soul surfers. *Soul Surfing always oversees the business in Rip Curl values.* This never limited the pursuit of innovation and technology: **by 1977 the company was producing wetsuits for windsurfers, sailors and water skiers** as well as surfers. Each division required a different technological approach and a completely different marketing strategy. That' s the reason why Rip Curl found in selling technology, designs and ideas under licence in the country where it was needed; this reduced the costs and increased/ensured top quality. Today, nine corporate Licensees make and sell Rip Curl products in USA, France, South Africa, Japan, Indonesia, Brazil, Argentina, Peru and Chile and *surfers in the most remote corners of the planet can be seen using Rip Curl products, sharing the spirit of The Search.*

Respect the swell.. long waves and lasting companies
"Working in close proximity to the best surf still makes as much sense as it did when Rip Curl was born. *After 48 years, Rip Curl offices around the world are still empty on some days.* Those special days, when it's clear and cold, there's a brisk wind, not too strong, but coming straight off the land. And a six foot swell made clean and straight by its long march.
Some days, only one type of work needs to be done..."

Supplementary Box

Rip Curl. The name.

The name "Rip Curl" actually came about in **1967**. Claw and Brian were agents for Danny Keyo selling the Bob McTavish designed "Fantastic Plastic Machine." Claw at that time had a McTavish Plastic Machine that *Simon had previously painted with the words* ***'Rip Curl Hot Dog'.*** The Plastic Machine became unexpectedly a hit and they had a lot of orders but demand was high and supply short, so the pair thought they would do a model of their own and get it made elsewhere!
They contacted Shane Stedman who jumped on the plan.
It was done!
They just needed a name to sell the surfboards under.
One afternoon down in the shop, Claw and Brian and another local surfer, Simon Buttonshaw, were sitting around tossing up names for the board. Somewhere in the mix that afternoon, and in the ensuing discussion around names and surfing vocabulary, the winning combination of "Rip Curl" bubbled to the surface and became the name of the board model.

2.3 Those who "paddle out"! Surf Design Innovations Today

2.3.1 SIMA & Awards. Support the surf industry and its bright future

This study was not just a way for me to better understand SIMA's voice importance in terms of defining "the best" brands or innovations, but also to realize how a single and easy passion, like the love for the sea and its preservation, can call up for cooperation thousands of single figures as well as companies with totally different businesses but at the same time with one common business: answering to the "ocean call".

"There is a direct correlation between the health of the beaches and oceans and the health of our industry. *How can an organization as SIMA* (Surf Industry Manufacturers Association), *that is for all intents an organization for the business of surfing that promotes its growth work, if beaches are closed and it's not possible to surf in the sea?* We don't have an industry without this. **SIMA' s job is to ensure that we remain committed to keeping beaches clean and oceans uncontamined and open for surfing.** A big part of our commission at SIMA is to give back to the environment that supports our industry.

We bring in the best minds to talk to our industry, to enlighten and educate about sustainable practice in manufacturing processes and, as a result, we have seen a dramatic change. All the inks, all the glues, all the fabrics are now being influenced by science in terms of sustainability.

But it is a long road.

Sustainability is something each brand should practice, it is something it should be incorporated into everything, without having to pay extra for it. But the cost is high and people are not ready to pay more for that."*

SIMA has been able through the years to gather under this "ocean call" thousands of surf brands building up a community that shares the same values.

SIMA Awards. An important tool for the *Better Wa(y)ve* research's origins

Introduced in 2003, the goal of the SIMA Awards is to identify the surf industry's most influential companies and recognize them for their efforts to advance and grow the industry over the past year. The contest is organized every year so actually the current **2017** Awards have been the **14th edition**. Every SIMA Award is launched in November, when the nominees for each sector are announced and finally winners are presented the following March.

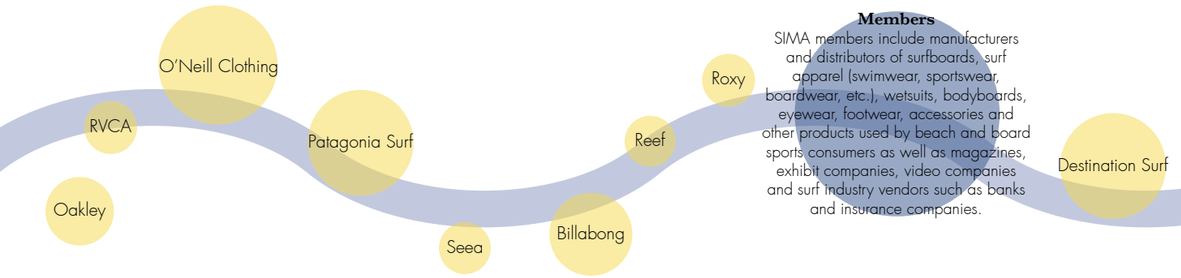
I elected these Awards for my research, as an essential instrument to study the technologies and innovations of the sector, in terms of design, materials and performances. During this part of the research I analyzed in depth those that are considered the pillars of the sector, because "learning" from the great ones is a smart starting point for the proposal of something new.

For this first part of the thesis, in which I mainly concentrated on the WETSUIT, that remains the key element and glue for the entire journey, I accurately selected the brands and product' s innovations related to this garment, as the Awards cover a huge segment of the market - so what is going to be presented is a selection of categories more attractive for me and my destination.

This analysis helped me to focus on the last researches and elements on the market that must guide my project, that has an ethical/environmental aim but also wants to position itself at the top of the market for performance, design and look.

Of course the following brands, in terms of categories that do not refer to the wetsuit but to other products/features helped me in a second moment when I started developing the other garments gravitating around the key one.

"A big part of our commission at SIMA is to give back to the environment that supports our industry"



Members

SIMA members include manufacturers and distributors of surfboards, surf apparel (swimwear, sportswear, boardwear, etc.), wetsuits, bodyboards, eyewear, footwear, accessories and other products used by beach and board sports consumers as well as magazines, exhibit companies, video companies and surf industry vendors such as banks and insurance companies.

What is SIMA

"Sustainability is something that each brand should practice. Our industry needs to come to understand that sustainability is not about charity, it is not about altruism and it is not about phylantrophy. It is about smart business. And as long as we keep our focus on providing beautiful coastlines and amazing waves all over the world, the surf industry will have a bright future. We have many young talented people who are passionate about our culture, the culture of the ocean". Doug Palladini, SIMA President

The Surf Industry Manufacturers Association, founded in **1989**, is the official working trade association (a non-profit organization) of more than 300 surf industry suppliers. It promotes and fosters the growth of the surf industry. It is also aware that there is a direct correlation between the ealth of the beaches and the ocean and the health of this industry. That' s why SIMA' s job is also to ensure that we remain committed to keeping beaches clean and oceans uncontamined and open for surfing.

Together with many other activities, SIMA actively supports oceanic environmental efforts through its charitable environmental foundation, the *SIMA Environmental Fund*. In the past 26 years, SIMA's Environmental Fund has raised more than $7 million for environmental groups seeking to protect the world's oceans, beaches and waves. It' s actual President is Kelly Gibson from Rip Curl.

SIMA Mission Statement

The Surf Industry Manufacturers Association (SIMA) is the trade association of competing surf industry product suppliers working together to support, unify and ensure the sustainability of the surf industry through:

- Support surfing and all other forms of wave riding, in regard to the sport, lifestyle and industry
- Unify our surf industry and support through member brand growth, networking and education
- Ensure the sustainability of our industry by supporting environmental and humanitarian organizations that are surf related.

This overview of the selected categories and list of nominees and winners refers to the two last editions of SIMA to stay on the ultimate wave of innovations in the market. A deep analysis of the Winner Wetsuits follows, while other sources of inspiration are discussed in the next paragraph "On the same wave lenght".
Additional garments that become part of the collection like boardshorts or other pieces are discussed in Chapter 4, paragraph 3, in relationship with sustainability in surf design brands.

SIMA Awards 2015
11 November, 2015 - *"The Surf Industry Manufacturers Association (SIMA) is proud to announce the nominees for the 2015 13th SIMA Image Awards".*
The nominees have been honored and winners announced at the SIMA Image Awards ceremony on February 11, 2016, at The City National Grove of Anaheim in Anaheim, CA.

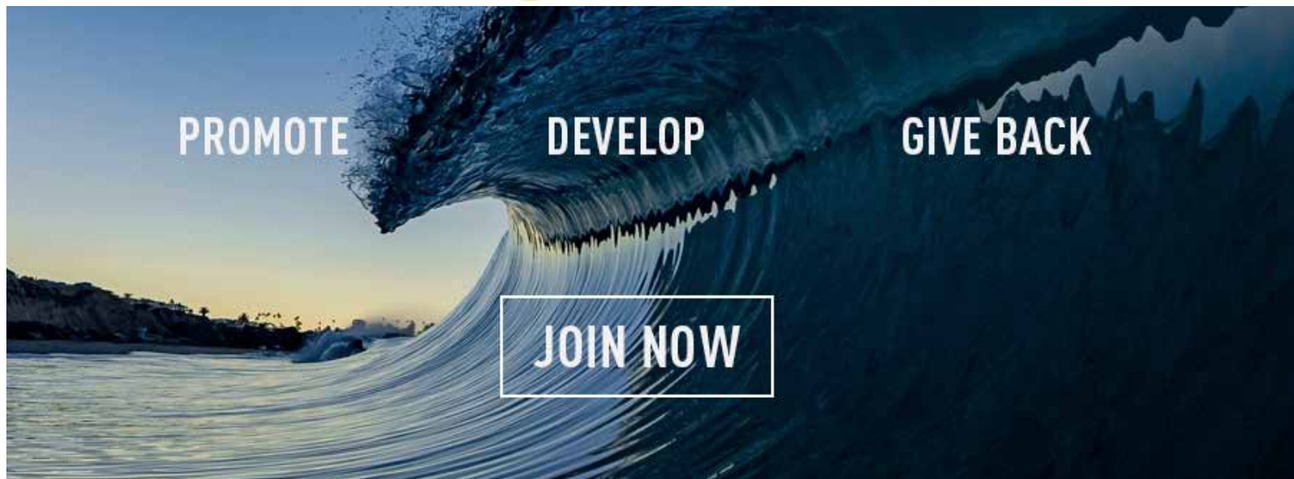
2015 SIMA Image Awards Winners & Nominees

1. OVERALL AWARD
Breakout Brand of the Year
AMUSE SOCIETY
DEPACTUS
OTIS
Roark Revival
SUN BUM
2. MEN'S AWARDS
Men's Apparel Brand of the Year
Billabong
DEPACTUS
RVCA
Vissla
Volcom
Men's Boardshort of the Year
Lo Tides by Billabong
HyperFreak by O'Neill
Mirage MF Driven by Rip Curl
Skeleton Coast by Vissla
Mod-Tech by Volcom
Men's Marketing Campaign
Life's Better In Boardshorts by Billabong
Creators & Innovators by Vissla
WHERE LAND MEETS SEA by DEPACTUS
Volume 9: "Himalayan Halfway House" by Roark Revival
Uncommon by Stance
Creators & Innovators by Vissla
4. PRODUCT AWARDS
Environmental Product of the Year
Billabong Recycler Series by Billabong
TimberTek technology by Firewire Surfboards
G7 by Mizu
R2 Yulex/Nexkin front zip full suit by Patagonia
Upcycled Coconut Boardshorts by Vissla
Wetsuit of the Year
Psycho Series by O'Neill
R2 Yulex/Nexkin front zip full suit by Patagonia
Flash Bomb Zip Free by Rip Curl
7 Seas Wetsuit by Vissla
Drylock TDC by Xcel

SIMA Awards 2017
March 31, 2017 - *"Seventy-five nominees representing 2016' s best from the surf industry were honored last night at the 14th Annual SIMA Awards ceremony."*
The latest appointment for celebrating their outstanding innovations and contributions made to the surf industry.
Rancho Las Lomas in Silverado, CA

2017 SIMA Image Awards Winners & Nominees

1. OVERALL
Breakout Brand of the Year
Corkcicle
OTIS
Richer Poorer
Seea
Slater Designs
2. MEN'S AWARDS
Men's Marketing Campaign
LIFE'S SHORT by Billabong
THE SEARCH by RIP CURL
Volume 11: "Hellbound In Clayoquot Sound" by The Roark Revival*
Wildly comfortable, comfortably wild by Stance
Creators & Innovators Dream Steeple Campaign by Vissla
Men's Apparel Brand of the Year
Billabong
The Roark Revival
RVCA
VANS
Vissla
Men's Boardshort of the Year
TRIBONG by Billabong
HyperFreak by O'Neill
Mirage MF Focus Ultimate by RIP CURL
Vissla Upcycled Boardshorts
Stripey Slinger by Volcom
4. PRODUCT AWARDS
Environmental Product of the Year
Waterman Collection by Corkcicle
Patagonia Fall 16 – Yulex Wetsuits by Patagonia
Algae Traction Pads by Slater Designs
Upcycled Coconut Boardshorts by Vissla
ECO Infiniti Comp by Xcel Wetsuits
Wetsuit of the Year
Furnace Carbon X by Billabong
Men's R1 Yulex Front-Zip Full Suit by Patagonia
Flash Bomb Plus Zip Free by RIP CURL
7 Seas Wetsuit by Vissla
Infiniti Comp TDC by Xcel Wetsuits



2.3 Those who "paddle out"! Surf Design Innovations Today

2.3.1 SIMA & Awards. Support the surf industry and its bright future

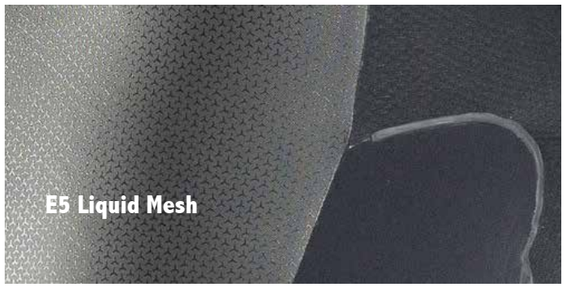
Let' s go into the deep blue sea of the Winners
Less magic in this paragraph and more technical informations for the further development of my wetsuit design. What I care to underline is the fact that my intent from this analysis has been to capture the last innovations in the sector so they can be a valid and solid pillar for the development of a piece that wants the last avant-guards but that also will differentiate for other specifics, that is to say the reaction to pollutants in the water. The zip free entry system of Flashbomb by Rip Curl and the zero - seams front and back panel of the Infiniti Comp by Xcel are studied and applied into my design while the Patagonia Yulex main characteristic, the "neoprene free" material, is studied and kept as inspiration for the quest of the environmental health, while my answer, as a student with limited possibilities in patenting a new formula for a totally new material, will be more related to the intent of the awareness, of the visual reaction; a sort of calling, a strong message against the poisoning of that Nature that gives us "waves of life".

SIMA 2015 WETSUIT OF THE YEAR - *Flashbomb Zip Free Wetsuit by Rip Curl*

The world's fastest drying wetsuit, the Zip Free Flash Bomb is a lightweight competition oriented suit that focuses on unrestricted performance. The lower three quarters of the suit are super warm and cozy, lined with E5 Flash Lining and internally sealed with E5 Flash Lining Tape. The upper quarter of the suit gives you maximum maneuverability with high stretch E5 Neoprene that moves seamlessly with your body while retaining a secure fit. The zipper-less entry system allows for quick, fumble free changes, making the Flash Bomb Zip Free Wetsuit a top choice for everyday wave chasers that prefer a super light and stretchy suit.

FEATURES
•Zip Free Entry System. The new entry system offers unrestricted, lightweight performance and its refined entry/exit zipperless pattern is designed for maximum stretch, warmth, and comfort, increasing the performances of a chest zip.
•E5 Liquid Mesh. All new Rip Curl exclusive super stretch E5 liquid mesh smoothly provides 25% more stretch without compromising durability. The mesh absorbs solar heat and reduces wind chill.
•E5 Flash Lining. The Rip Curl new and exclusive E5 Flash Lining has 25% more stretch. Two engineered layers funnel water rapidly out of the suit making it the warmest and most comfortable lining available but also the lightest.
•E5 Flash Lining Tape. 25% more stretch, faster drying time, and lighter weight for the ultimate seam seal
•Aquaban Plus Tape. This is a slimline liquid tape technology for ultimate sealed seams. Featuring a low bead to increase stretch performance, it acts as an external barrier to cold water by further increasing the integrity of the seam.
•Glued and Blind Stitch Seams. This triple glued, double stitched seam only penetrates one side of the material, providing a high stretch, high strength and water sealed seam.
•Lock Slide Design Closure. Adjustable shock cord closure system in chest zip and zip free suits to prevent flushing.
•Stress Point Tape. Taping in high stress point sections of the wetsuit maximize durability and stretch.
•Magnetic Stash Pocket. Magnet closure stash pocket with key loop.


Zip Free Entry System


E5 Liquid Mesh


E5 Flash Lining & Tape


Aquaban Plus Tape


Glued and Blind Stitched


Stress Point Taped

"The future of the surf industry is very bright. We have many young talented people who are passionate about our culture - the culture of the ocean.

As long as we keep our focus on providing beautiful coastlines and amazing waves all over the world, the surf industry will have a bright future."

Doug Palladin**


Lock Slide Design Closure


Magnetic Stash Pocket

2.3 Those who "paddle out"! Surf Design Innovations Today

2.3.1 SIMA & Awards. Support the surf industry and its bright future

SIMA 2017 WETSUIT OF THE YEAR - ***Infiniti Comp TDC fullsuit by Xcel***

The most flexible of all Xcel fullsuits, the Infiniti Comp gets its name from the TDC Thermo Dry Celliant technology and for the large front and back "comp"(etition) ready panel that has zero seams from the upper chest to the knees for maximum range of motion.

FEATURES
•Xcel exclusive TDC's clinically proven Smart Fiber Technology recycles your body heat into infrared energy for maximum warmth and enhanced performance. In the Infiniti Comp, TDC is featured in an infrared print low pile from the upper chest all the way down to the ankles.
TDC is driven by Celliant's patented, so mineral blend is embedded into the cores of TDC's smart fibers. The powder is processed into masterbatch (resin) and embedded into the cores of staple fibers. Finally, these fibers are spun into Celliant yarn to create the final TDC smart fiber lining. Because TDC's active ingredients (Celliant minerals) are embedded into the smart fiber cores, TDC technology will never wear off or wash out, so its benefits last for the lifetime of the wetsuit. The minerals are naturally occurring and thermo-reactive (heat activated). They have been carefully selected for their ability to convert body heat into infrared energy (is a medically proven vasodilator). This means that it improves circulation and increases tissue oxygen (TCPO2) levels, which in turn are proven to increase warmth and stamina and fend off fatigue to then redirect that energy back into your skin and muscle. TDC begins to work from the instant it is worn against the skin. It does not require a minimum body heat or baseline activity level to be activated.
"The cold air and/or water conditions that necessitate a wetsuit are the same conditions in which you'll benefit from improved circulation and greater tissue oxygen. So for surfers and divers, this means quick and easy access to these performance benefits, simply by putting on their wetsuit."
David Horinek, Celliant Inventor
•all-way stretch, lightweight, durable interior seam tape creates an even better seal that keeps warmth in and water out. The tape is either infrared patterned (products with TDC) or yellow (non-TDC products).
•A thin band of liquid neoprene ("NexSkin") in the inner wrists and/or ankles forms an excellent seal and helps minimize flushing.
•Neoprene panels are glued and pressed together, then blindstitched (needle doesn't fully penetrate neoprene, keeping more water out).
•Engineered large, seamless body panel maximizes core range of motion. Available exclusively in the Infiniti Comp series wetsuits (Smarter product design means minimizing seams to maximize stretch. Any seams used are always pre-bent and contoured for a truly engineered fit)
•Comfortable, durable knee panels.
•Behind-the-knee cutouts are designed for maximum flexibility.
• Magnetic Zip - Innovative zipper closure features double magnets on the zipper pull tab and attached zipper flap that securely lock the zipper in place, for easier and quicker release than traditional snap locks.


TDC Thermo Dry Celliant


TDC internal seam tape


liquid neoprene band

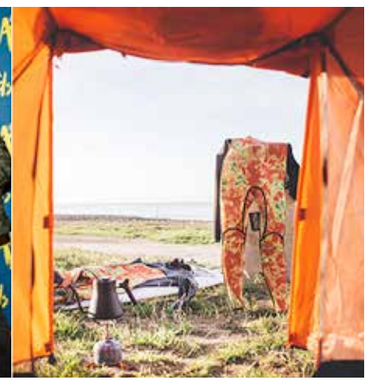

Essential cuts and seams


Super stretch Knee Pads


Cutouts


Magnetic Zip

"I'm so thrilled with the turnout at last night's event. It was incredible seeing everyone come together and celebrate the amazing brands and products that define our industry. The SIMA Awards is not just a celebration of the brands nominated, but also a celebration of all the people behind those nominated brands."
Johnny Gehris, SIMA Awards Chairman and President of Vestal



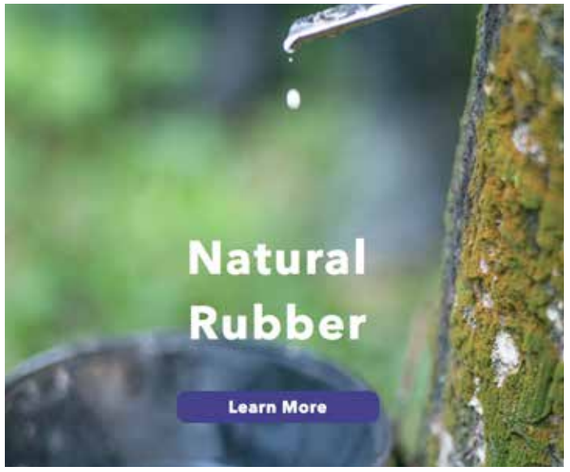
2.3 Those who "paddle out"! Surf Design Innovations Today

2.3.1 SIMA & Awards. Support the surf industry and its bright future

SIMA 2017 ENVIRONMENTAL PRODUCT OF THE YEAR - *Yulex© Series by Patagonia*

"Surf industry is dependent on the latest technologies. But asking "how can we do to make each product not just more tech-innovative but also more environmentally respectful" does not mean distance yourself from the innovation's path. Natural fibers strated to be replaced by water-repellent synthetics during the sport industry development and many of today' s surf products are petroleum base. Next stage is to make products that can reliably perform while being eco. The challeng now is to use technology to help us use resources sparingly, as well as to make natural and recycled materials perform as well as chemical-based products." ***
Here is a perfect example of this.

2015 Yulex® R3 and 2017 Yulex® Series by Patagonia
Made with neoprene-free 85% Yulex® natural rubber, and selected in 2015 as the "Environmental Product of the Year" was Patagonia Yulex R3 wetsuit. In 2017 the award was won again by the brand becuse of the extension of the new sustainable solution to the entire series of wetsuits for that season. That is why I choose not to differentiate and split into two points the awards. Every detail about the new natural material introduced in substitution to neoprene and about wetsuits features are deeply investigated in Chapter 4, because this innovation belongs to the "Environmental Wave" discussion and the environmental - oriented Design solutions.



Pag.27
SIMA Organization
first website page screenshot
sima.com
Pag.28-29
Rip Curl Flashbomb Zip Free Wetsuit,
SIMA 2015 Award,
Front and back views plus details
ripcurl.com
Pag.30-31
Xcel Infiniti Comp TDC Wetsuit,
SIMA Award 2017,
Front and back views plus details
Xcel Team at the SIMA "017 cerimony
Pag.32-33
Patagonia Yulex Wetsuits Series,
SIMA Awards 2015 and 2017,
Front and back views, eterior and lining
Patagonia Campaign for the Environment

*From "Sustainable Stoke. Transitions to sustainability in the surfing world" by Gregory Borne, Jess Ponting - 2015, p.30
** From "Sustainable stoke. Transitions to sustainability in the Surfing World" G. Borne, J. Ponting - Ch.2, p. 32)
***Rob Machado - Sustainability in the Surf industry (3.4 paragraph of the book "Sustainable stoke")

Our desig philosophy is simplicity. We found that by taking rubber from havea trees and then using Yulex purification, which is really clean and simple, we could cut back a lot of the process and reduce the carbon footprint"
Tetsuya O'Hara - Director of Innovation Research at Patagonia

2.3 Those who "paddle out"! Surf Design Innovations Today

2.3.2 On the samw wave lenght. Winners, anyaway

"The surf industry is dependent on the latest technologies. Foam replaced wood in surfboards many years ago because of its superior performance. Natural fibers were replaced by water-repellent synthetics. The next stage is to make products that can reliably perform while being environmentally friendly. Many of today' s surf products are petroleum-based. The challenge now is to use technology to help us use resources sparingly, as well as to make natural and recycled materials perform as well as chemical-based products."

Sustainability in the surf industry Rob Machado - Jessica Toth

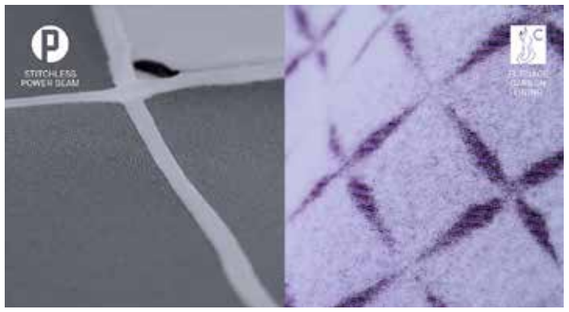
In the previous paragraph I introduced the SIMA influence on surf industry especially in terms of design, research and innovation and I went through the barrel of the Awards winners, capturing the reasons why they were selected. In this section I want to give a little bit of space also to some others of the all - valuable competitors, that are winners anyway because of their desire of making a step forward in name of their passion for the ocean.
The 'Design wave' section proposes the zipless system by Billabong and the unconventional design solution adopted by Vissla in its Japanese fullsuit developed in collaboration with Rash Wetsuits, while the 'Eco wave' section focuses on Vissla Eco Wetsuit and on a brave little brand, Picture, that decided to totally invest on this eco-path, even if it is harder to follow, especially in terms of economic investment and having to compete with "bigger fishes" in the sea.

The Design Wave

1.1 BILLABONG FURN PRO 504 ZIPLESS

Heat and flexibility are taken to the ultimate level of performance with the Furnace PRO. The Furnace PRO combines Furnace Carbon lining - the warmest thermal lining available - with engineered seam placement for maximum flexibility, and a Drymax Zipperless entry system. The ultimate lightweight, cold water wetsuit.

FEATURES
•Long sleeve fullsuit.
•5/4 mm 100% neoprene.
•Drymax zipperless entry.
•Lightweight engineered stretch: supreme heat with lightweight flexibility.
Furnace Carbon lining - carbon threads maximize warmth and minimize weight
•GBS seams Impact welded & heat taped.
•Stress point reinforced.
•Triple glued and blind stitched seams for added watertight flexibility.
•Knee pad - supratex abrasion resistant jersey for flexibility and strength
•Cout Outs for flexibility - back knees



1.2 VISSLA SHONAN JAPANESE 3.5 fullsuit

Vissla collaborated with Rash, premium Japanese wetsuit makers, on the "Shonan" wetsuit.
The "Shonan" VISSLA wetsuit by RASH Japanese Manufacturing Company is made from the highest quality kobe limestone (instead of the classical petroleum) neoprene. It's universally known that while Japanese-made suits have always been difficult to come by, they're also the best quality. Japan is like the golden triangle in Paris for wetsuits. The fit, flexibility, thickness, water-permeability, and stretch are designed to keep you, the surfer, the warmest and most comfortable for the longest period of time. Born out of necessity, but sustained by craftsmen expertise in a small wetsuit factory across from the legendary Inamura surf break, RASH has dedicated itself to perfecting the Japanese surfing wetsuit for almost 40 years. These wetsuits are crafted one at a time, hand made in a small factory near the beach by Japanese craftsmen who are core surfers. They use three-dimensional cutting and patterns developed over decades to make the best fitting most comfortable wetsuit for performance surfing imaginable.

FEATURES
WARMTH & STRETCH
•Made for cold water: 51 - 58° F / 11 - 14° C
•Made of 100% Kobe Japanese neoprene
• 99.7% water impermeable because of its cell structure. This translates into a lighter, warmer, more flexible, and more durable wetsuit
• Ultra stretch Japanese stretch jersey for knee-pads protection and anti-abrasion
FIT
• Entry: "Triangle No Zip" is the easiest suit to get on and off. Vissla' s premium Japanese collection of suits provides a less restrictive closure on the shoulders, which decreases resistance and allows for maximum freedom for paddling.
DURABLE & WATERTIGHT
• The "Shonan" wetsuit is glued, blind-stitched, and taped in high-stress areas using Reinforcement Tape. After vigorous testing in a temperature controlled facility, RASH developed an exclusive glue and gluing process that is so effective, that it eliminates the need for fully taped seams, allowing for increased flexibility and watertight seams.
• Wrist Ring: Our exclusive double cuff design prevents any water from entering the sleeves of the wetsuit.

Note: "The limestone is sourced in the Kurochime Mountains area in Niigata, Japan. They were originally plankton piled up over 300 million years ago in the Pacific Ocean, making it one of the highest degrees in purity. The limestone is heated with cokes (fuel with few impurities) to make a carbide bond. Then the carbide is processed with acetylene gas and hydrochloric acid to make polychloropene. To heat the materials, the factory uses only hydroelectric power that comes from 15 power stations located in the Hida Mountains. This makes it self-sustainable and eco friendly. Corn oil is used as softener instead of petroleum additives."

2.3 Those who "paddle out"! Surf Design Innovations Today

2.3.2 On the samw wave lenght. Winners, anyaway

The Eco Wave

2.1 VISSLA ECO SEAS WETSUIT

3/2.5 Full Suit made for cold waters 55 - 64° F / 10 - 16° C
Advanced environmentally conscious materials designed & constructed for colder waters.

FEATURES
• NaturalPrene (85% Natural Rubber / 15% Synthetic Rubber): After years of development Sheico finalized NaturalPrene™. This cutting edge material is a Natural Rubber Foam harvested from renewable rubber trees that replaces traditional neoprene.
• Natural Glue: Aqua-A™ lamination glue is water based and completely solvent free with no harmful chemicals. Aqua-A™ replaces traditional solvent based glues in the lamination process.
• Upcycled Jersey in thermal bamboo charcoal fibers (45% Recycled Polyester / 47% Nano Bamboo Charcoal Polyester / 8% Spandex): Upcycled Ultraspan™ water repellent jersey made from recycled bottles replaces traditional petroleum based fabrics. Each wetsuit uses approx. 45 Recycled bottles to make up the material used in the jersey lining.
• Knee pads (88% Recycled Polyester / 12% Spandex)- Upcycled Supratex abrasion resistant jersey for flexibility and strength
WARMTH & STRETCH
• Upcycled Thermal Bamboo Charcoal fibers lining insulates heat and dries fast. The fibers combined with recycled poly fibers made from recycled plastic bottles, saving materials that could end up in landfills. The Thermal Bamboo Charcoal lining has antimicrobial functions and has excellent heat retention, helping improve wetsuit warmth and resulting in a more environmentally friendly product.
DURABLE & WATERTIGHT
• PK S-LOCK - Chest-zip entry with Cris-X panels for easy entry and minimal bulk with a perfect fit
• Power Seams are an advanced, flexible, waterproofing sealant used on the outside of the seams for added durability and warmth
• Tripled glued, double blind stitched seams
• Upcycled Supratex Knee pads - Upcycled Supratex abrasion resistant jersey for flexibility and strength
• Glideskin on the cuffs seals to skin to prevent flushing

Vissla helps leading in innovation and advancement towards more environmentally-friendly high performance wetsuits with the introduction of the Eco Seas.
The Eco Seas wetsuit is developed in conjunction with Sheico to utilize some of the most earth conscious materials and production techniques, including natural rubber instead of neoprene, water based glues rather than solvent based materials for laminating & recycled plastic bottles used for the interior & exterior jerseys. The suit goes even further with subtle embossed branding, eliminating the need for any unnecessary solvent based printing.

2.2 PICTURE NATURALPRENE TECHNOLOGY 3/2 MM CIVIC WETSUIT

Neoprene Free, Solvent Free, Petrol Free. "We challenge ourselves to develop eco-friendly products". This is an authentic commitment for Picture Organic Clothing.

FEATURES
•Picture NaturalPrene Technology 3/2 mm
•Neoprene Free, Solvent Free, Petrol Free
•Drain holes
•Dry Now Technology
•Zip free . Inspired from triathlon technologies, we developed a specific stitch-free ""motion fit"" (motion pattern) construction, which improves your shoulder's mobility.
•Fuze cut
•Glue (solvent-free water based glue) & blindstiched
•Embossed flex
•Power grip (We also developed the "power grip" technology which creates friction with water and improves your paddling)
•Knee pads
•Glideskin neck seal
•Key pocket

MATERIALS
85% natural rubber from a Malaysian plantation, and 15% synthetic chlorine-free rubber. To guarantee our wetsuits elasticity, we have set up a crafty and revolutionary production process that consists in integrating micro particles, enabling NaturalPrene to extend up to 4 times its original size.
•20% Recycled Polyester
•70% NaturalPrene Rubber
•10% Synthetic Rubber

Pag.34-35
Billabong Furn Pro 504 Zipless
Furn Pro lining material, disposition on body and wetsuit front and back final view
Vissla Shonan Japanese 3.5 fullsuit
Back and front view plus lining design vew on the "entering" upper part in transparency and wetsuit inner and outer details

Pag.36-37
Vissla Eco Seas Wetsuit |
Front and back view plus Naturalprene
Picture Naturalprene CIVIC wetsuit
Back and front view plus abstract from the campaign, details about Naturalprene and CO_2 footprint

"The world's oceans - their temperature, chemistry, currents and life drive global systems that make the Earth habitable for humankind.

Careful management of this essential global resource is a key feature of a sustainable future."

UN - Goal 14 - Conserve and sustainably use the oceans, seas and marine resources

3.THE ENVIRONMENT WAVE

3.1 Ocean Pollution

Oceans are doing us a tremendous favour, but it is not a free gift

3.1.1 "My options are plenty but my choices are few"
Types of Ocean pollution

In Quartz, Atlantic Media' s global business news site, I have written about the impact of climate change on surfing in the wake of scinetific studies predicting that sea level rise will affect wave heights in different parts of the world.

"Time to bring the image of the Surf into the 21st century" Todd Woody

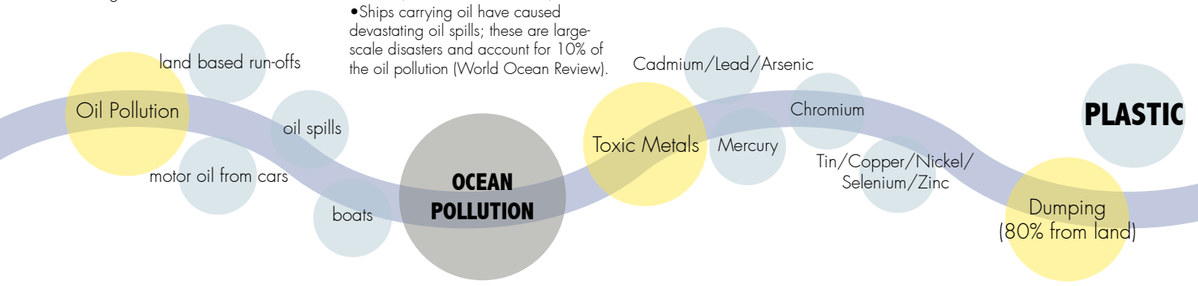
3.1.1 Types of Ocean Pollution.
What we call 'planet Earth' is, in fact, 'planet Ocean'. More than seven-tenths of the earth's surface is covered in water. The oceans regulate the climate, house 99% of the biosphere, control the weather and provide oxygen for every other breath we take. Life exists above the blue surface because of the life beneath it. Pollution of the oceans can take several forms. Once contaminated by these pollution sources, many delicate ecosystems need a long time to recover. Leading environmentalists see the end of most sea life happening within the next 6–16 years. Diminishment of biodiversity in our ocean, human over-population and over-consumption of resources are primary threats and they bring chemical, oil, noise and plastic pollution with them. Global warming, oceanic acidification, over-fishing, agricultural run-off .
The threats are many, but so are the solutions. To better understand this wide, difficult scenario and insert this project consistently, the first step I moved was towards having an overview of ocean pollution - the types, the sources, the agents, the dangers - and, adquired this basic knowledge, selecting between the unfortunately infinite options the one to focus on, to further establish a relationship between it and the wetsuit to be designed.

Oil Pollution
Natural oil makes up 47% of the oil in the ocean. About 600,000 metric tonnes of oil enters the ocean naturally each year by seepage through many cracks in the seafloor (NRC 2003), but input from each is typically slow (Wells 1995) and natural seepage is not considered to be pollution.
The other half of the oil comes from anthropogenic sources, including boats, land-based runoff and, to a lesser degree, oil spills.
Petroleum products used for fuel are mined from the earth deep below the ocean surfaces. Oil can end up polluting oceans in many ways:
•Oil seepage like oil leaks from cars and machines on the roads which are washed by rain into drains (National Geographic)
•Americans discard 180 million gallons of used motor oil each year (Execute Office of Energy and Environment Affairs of Massachusetts)
•The shipping industry causes 35% of oil pollution (World Ocean Review)
•Leaching from factories, "municipal and industrial effluents," discharge from oil rigs, and burning of volatile oil are responsible for 45% of oil in waters. This includes cooking oils and grease thrown down the sink drains in people's homes. (World Ocean Review)
•Ships carrying oil have caused devastating oil spills; these are large-scale disasters and account for 10% of the oil pollution (World Ocean Review).

Toxic Metals
Metals are chemical elements that are toxic if they change the structure and function of proteins and enzymes. Metals found in the ocean that are highly toxic on their own include mercury, cadmium, lead, arsenic, tin, copper, nickel, selenium, and zinc. Mercury, cadmium, and lead can become even more highly toxic in combination with organic compounds. For example, mercury can form neurotoxic compounds such as methylmercury (CH3Hg), when combined with carbon.
Arsenic, copper, nickel, selenium, tin, and zinc are not highly toxic by themselves but are able to react with organic materials, creating very toxic compounds (UNEP 2006).
Pollution triples mercury levels in ocean surface waters and 96% of mercury enters the ocean via atmospheric input (GESAMP 2001).
The amount of mercury near the surface of many of the world's oceans has tripled as the result of our polluting activities.
This metal is toxic to humans and marine life, and accumulates in our bodies over time as we are exposed to sources of it. ****

Persistent Organic Pollutant
Persistent Organic Pollutants (POPs) are chemical compounds that are toxic to humans and wildlife.
POPs include pesticides such as DDT, herbicides, PCBs (a component found in many coolants, flame-retardants, adhesives), and BPA (a compound found in plastics – primarily in plastic bottles).

Pollution From Dumping
National Oceanic and Atmospheric Administration (NOAA) says 80% of the pollution in oceans comes from land, and only 20% occurs in the oceans itself. Like the rest of the pollution, most of the garbage that is found in the oceans comes from land (California Coastal Commission). Dumping is a large part of the problem.
•Plastics represent form the 65% to 90% of this garbage (Plastic Pollution).
•Industrial waste is one of the major issues when it comes to ocean dumping. Until the mid 1970s it was legal to dump industrial waste including nuclear material into oceans, and some illegal dumping still continues (MarineBio).
•Sewage is extremely dangerous (it comes from human dumping and brings high risks for health, introducing bacteria and causing infections)



Note 1. Iain Kerr, CEO of Ocean Alliance, has spent the last couple decades using unobtrusive methods to better understand what's out there, and what it means to the animals. At Parley Wall Street, he shares key findings from the Voyage of the Odyssey, a 5 ½-year journey of 87,000 nautical miles spent collecting the first-ever global data set on toxic contaminants by studying the sperm whale. As the CEO of Ocean Alliance, Iain has lead research expeditions all over the globe. (parley) The 2000-2005 Voyage of the Odyssey expedition gives an opportunity to put whatever data found in regional studies (such as the Gulf of Mexico) into a global context. In this paper the team from the Wise laboratory compared levels of heavy metals found in sperm whales.
Article Abstract - "Concentrations of the Genotoxic Metals, Chromium and Nickel, in Whales, Tar Balls, Oil Slicks, and Released Oil from the Gulf of Mexico in the Immediate Aftermath of the Deepwater Horizon Oil Crisis: Is Genotoxic Metal Exposure Part of the Deepwater Horizon Legacy?" Concern regarding the Deepwater Horizon oil crisis has largely focused on oil and dispersants while the threat of genotoxic metals in the oil has gone largely overlooked. Genotoxic metals, such as chromium and nickel, damage DNA and bioaccumulate in organisms, resulting in persistent exposures. (ACS PUBLICATIONS - Environmental Science & Technology)

Note 2. "Ocean Alliance, under the leadership of world-renowned marine scientist Dr. Roger Payne, embodies an extraordinary combination of innovative scientific research and an informed environmental advocacy. It has as main aim to determine baseline levels of pollutants in the ocean environment." Joel Reynolds, Senior Attorney, Natural Resources Defense Council (NRDC), 2009

Note 3. We, swimmers and surfers. Sunscreen is a lesser known source of pollution. The chemicals in sunscreen worn by swimmers and divers washes off into the ocean water, coating plant-life on coral reefs and suffocating them. Oxybenzone (and many other chemicals) are the problem (TIME reported that 4000 to 6000 tones of screen lotions entered coral areas each year by 2013. They found some areas have more than 10 times the permissible level of oxybenzone in oceans).

I have been called to give evidence at the Inquest into the death of an eight-year old girl who had died from E.Coli 0157 poisoning. The corner ruled that contact with raw sawage at a combined sewer powerflow was a possible route of infection. We knew there was a problem but we probably didn' t quite realise just how big the problem was.*

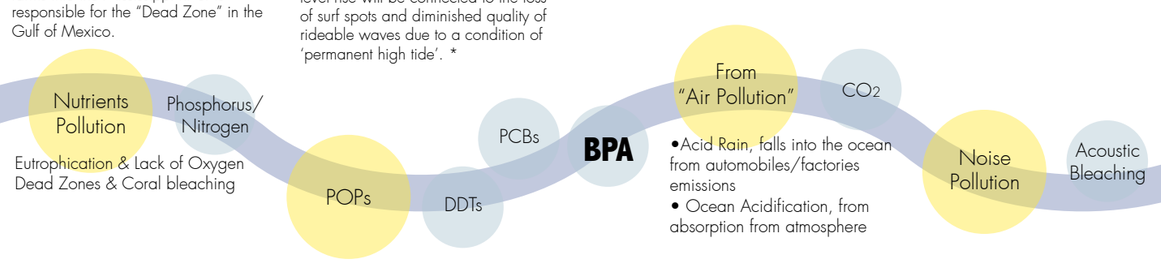
Nutrient Pollution
Several forms of everyday waste produced on land end up in the ocean coming from streams and rivers (WWF - Marine Problems Report).
This leads to an increase in nutrients especially nitrogen and phosphorus that causes eutrophication and lack of oxygen. This is called nutrient pollution according to the U.S. Environmental Protection Agency (EPA) and the result is dead zones (there are 400 dead zones in the world!) and coral bleaching .
Sewage is one of the main source of nutrient pollution. The EPA's Nutrient Pollution Sources and Solutions report finds that the runoff from Midwestern farms into the Mississippi River is responsible for the "Dead Zone" in the Gulf of Mexico.

Ocean & Air Pollution
As we' ll see also in depth in the chapter related to this theme, "air pollution" and "ocean pollution" are inextricably linked. Since most of the pollution starts either through land, air and water, preventing these forms of pollution also helps the ocean (Greenpeace).
Emissions and pollutants discharged by factories, agriculture and vehicles, have two major effects:
• Acid Rain - Pollution from automobiles and factories is translated into acid rain, which falls into the ocean and mingles with its waters (Integrated Ocean Observing Systems)
• Climate Change and Ocean Acidification - Half of the billions of tons of carbon dioxide emissions released by human activities have caused climate change by increasing global temperature (NASA) and have been absorbed by oceans.
When carbon dioxide dissolves in water, carbonic acid is produced and alters the chemestry of the oceans (National Geographic). The PMEL Carbon Program estimates the increase in acidity is 30% and will continue to rise with continuing emissions.
Ocean acidification and warming will be connected to the health of coral reefs, the waves they create and the ecosystem for fish and mammals they provide. Sea level rise will be connected to the loss of surf spots and diminished quality of rideable waves due to a condition of 'permanent high tide'. *

Noise Pollution
Sound waves can come naturally from earth-quakes (National Geographic), but their intensity and frequency in recent decades is increasing. It is called acoustic bleaching and is as much of a threat to marine animals as plastic and chemical pollution. There are two types of noise pollution: the "chronic sound" at low frequencies (ships and oil rigs) and the "acute and loud noise" (seismic air guns that use sound waves to locate fossil fuels in the seabed). Because of it marine animals cannot hear each other 50% of the times and this leads to the marine animal lost, beach and death (Study published by Yale in 2016 - "How Ocean Noise Pollution Wreaks Havoc on Marine Life" - Yale Environment 360).

"The impact of human activities on the oceans has increased dramatically, particularly the cumulative impacts, and the oceans' carrying capacity is near, or at its limit."
From the World Ocean Assessment, June 8th, 2017- UN Secretary - General' s message for 2017

KISS !**
Surfing as a culture is at risk of losing the very thing it' s centered on - good, clean waves. Let' s keep things simple, or KISS (Keep It Simple Surfer) !
•no waves should be lost
•all waves and coastlines should be accessible
•all nearshore ocean waters should be clean
Water is not clean and there is very little intelligence to know how dirty it is. Change is hard but change is also absolute.
Surfrider activists perform tousands of water tests every year via Blue Water Task Force.
'We rountinely confirm dirty water and work with various entities to have such issues adressed. Beyond Europe, US water and a handful of other First World nations water quality testing is rare. Public access to water quality testing results even more rare.'



Note 4. "For now the Oceans are doing us a tremendous favour"
In a very recent paper published in the journal Nature the authors and scientist studied ocean absorption of human carbon pollution.
"Recent increase in oceanic carbon uptake driven by weaker upper - oceanic overturning" - Scientific paper by T. DeVries, Mark Holzer & Francois Primeau published on Nature Journnal Jan, 2017

About 40% of the carbon dioxide actually gets absorbed in the ocean waters. The amount of carbon dioxide that the ocean can hold depends on the ocean temperatures. Colder waters can absorb more carbon; warmer waters can absorb less. So, as the oceans warm, they will become less and less capable of taking up carbon dioxide. As a result, more of our carbon pollution will stay in the atmosphere, exacerbating global warming. So for now we can be grateful that the oceans are doing us a service by reducing the amount of carbon dioxide in the atmosphere. It buys us more time to reduce our dependency on fossil fuels. On the other hand, it isn't a free gift. The increased carbon uptake by the ocean means that the ocean waters will become acidic more rapidly than they otherwise would.

3.2 Plastic Pollution

Today, simply an expected part of our experience

3.2.1 From the global issue to the role of outdoor apparel

Why are we talking about plastic pollution? After the brief analysis of the ocean pollution in general, the next step I wanted to achieve was to select a restricted "type" of pollution, because what I finally have to come out with is a chemical agent that, detected from my wetsuit surface treatment, can make it react and change color, to advise of hazardous levels of pollutants in the sea water.

Here are the problems our oceans face in terms of plastic garbage:
A massive amount of plastic trash ends up in our oceans every year.
The ocean currents have formed five gigantic, slow moving whirlpools where the plastic collects, nicknamed Vortex. The majority of the plastic debris remains in the Vortexes, however a significant percentage of it washes onto our coastlines daily. ***After sunlight photodegrades the plastic into small pieces, the microplastics, those you cannot see and that are even worst than the ones you do see.***
"We're the big brained animals on this planet and we're putting everything in danger because we don't really understand the planet as a whole and we human beings, through our consumption and our waste, are messing with the system."Graham Hawkes

Plastic . .
Global production of plastic materials increased twenty-fold in the last five years exceeding 300 million tonnes in 2015. Demand is growing exponentially and production is expected to quadruple by 2050, taking up 20% of total oil consumption and 15% of the global carbon budget. Single use packaging applications represent the largest share of the European plastic market, accounting for 40% of the total production and for more than 10% of the municipal solid waste. As a result **275 million tones of plastic litter were generated in 2010 by the world' s coastal countries, of which 4.8 to 12.7 million tonnes were estimated to have ended up in the oceans.**

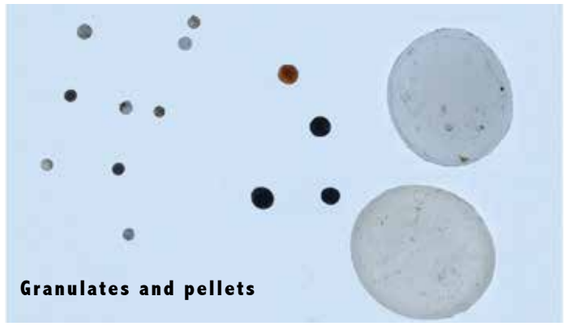
And Microplastics . .
Old plastic never dies, it just fades away…into tiny pieces called "microplastics." **Microplastics are fragments of plastic that measure less than 5 mm** (as defined by NOAA). The abundance of microplastics in the oceans has grown steadily over the last few decades, as plastic use continues to rise. ***Plastic microfiber pollution is a new topic of environmental and human health concern.***
"They split off from products made of synthetic plastic material, including your favorite workout clothes made from nylon, fleece, and polyester and because they are so small, they escape wastewater treatment facilities and enter the ocean."

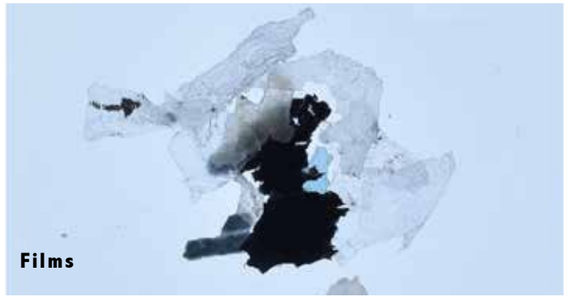
Over 92% of all plastic items found at sea are generally smaller than 5mm, so they are microplastics.
Microplastics can act as dispersal vectors of chemical additives, organic and metal pollutants accumulated from surrounding waters and provide habitats for a wide range of rafting organisms and microbial communities.
And the good news is that the classification of plastic waste as hazardous has been recently suggested.
From the article: "Classify plastic waste as hazardous" - by A. Browne, B. Halpern, L. M. Rios, H. Takada - published on Nature Journal February, 2013:

"Studies in humans and mussels have found that ingested and inhaled microplastic gets into cells and tissues. According to a hazard-ranking model based on the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals, the chemical ingredients of more than 50% of plastic are hazardous. These chemicals can accumulate in the blood. In laboratory tests monomers and other ingredients of PVC, polystyrene, polyurethane and polycarbonate can be carcinogenic and can affect the organism in a similar way to the hormone oestrogen. Let' s consider that 78% of priority pollutants listed by the EPA and 61% listed by the European Union are associated with plastic debris."

I decided to go deeper into the problem reading and analyzing some recent and specific scientific publications regarding the theme, and what I found out is that first of all plastic pollution is the main problem related to human insesitivity and lack of care (so actually easy factors to overcome on a side), and also because is the one that is most related to the fashion industry, that is . . 'my field'!

I knew this was a big issue, I had discussions with people I met along my trip, but the more I investigated the more I discovered, the more I realized how many are those involved in this mission.


Granulates and pellets


Films


Rigid Fragments


Fishing Lines
2mm

By reading articles, consulting websites, by personal trips (as the one along the coast of California), I had the opportunity to run into this issue, percieving the strenght and presence it has in daily life and job activities for many companies and associations that, not for coincidence, are organized ***by / for surfers*** *and ocean lovers.*

Pag.42-43
Words
*from 5.6 "Transforming surf culture towards sustainability: a deep blue life" Kevin Whilden, Michael Stewart, p. 136
**from 5.2 chapter "Protecting the waves we love so much" by Jim Moriarty, p.110
***From Chapter 8.3 "Surfing can change the world" by Chris Hines - founder of SAS, p.249
**** From "Toxic metal threatens marine life as it accumulates faster in shallow layers than in deep sea" by environment correspondant for The Guardian Fiona Harvey

Pag.42-43
Pictures
The different categories of microplastics found in the Arctic Ocean, from "The Arctic Ocean as a dead end for floating plastics in the North Atlantic branch of the Thermohaline Circulation" image from article Science Magazine - advances.sciencemag.org
Plastic pieces in the ocean damage wildlife and enter the food chain when ingested by fish. Ph: Bryce Groark/Alamy theguardian.com

Pictures 40-41
Thirteen-year-old plastic picker in Manilla, 2013 from plasticsoupnews
Dying (March 2016) and dead (May 2016) coral - Lizard Island, Australia's Great Barrier Reef. Ph. the Ocean Agency

"In 2050 there will be more plastic than fish in the sea"
Report from World Economic Forum

"The world is flooded with plastic garbage."
CNN

"Plastic pollution has sadly become synonymous with all of our favourite coastal activities - from surfing to swimming, beach holidays to wildlife watching - it is simply an expected part of our experience. But one that we should not, and do not, accept."
SAS - Surfers Against Sewage

3.2 Plastic Pollution Today, simply an expected part of our experience

3.2.2 Global Plastic Soup
3.2.3 Mediterranean Plastic Soup

Here I propose a selection of the main articles I' ve been studying and that I found most "interesting" - or I should say "perturbing".
The idea is to follow a path moving from the global issue of ocean plastic pollution (3.2.1), to the local - the Mediterranean Sea - (3.2.2), to the translation of this matter into a discussion on fashion and the relationship between this sector and the environmental issue (3.2.3.).

3.2.2 Global Plastic Soup

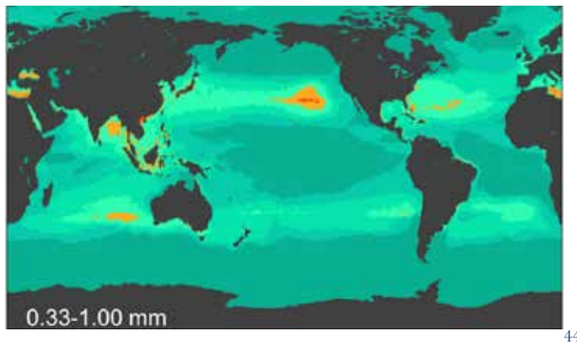
From the study:
"Plastic Pollution in the World' s Oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea"
by M. Eriksen, L.C.;. Lebreton, H.C. Carson, M. Thiel, C.J. Moore, J. C. Borerro, F. Galgani, P.G. Ryan, J. Reisser
published December 10, 2014
on PLOS ONE

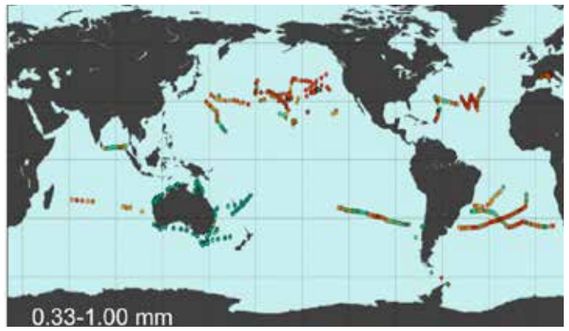
"This is problematic due to the chemicals contained within plastics, as well as the pollutants that plastic attract once they are in the marine environment. When plastic gets into the water it acts like a magnet for oily pollutants. Lots of things are used once and then not recycled. We need to improve our use of plastic and also monitor plastics in the oceans so we get a better understanding of the issue."
Reisser

Research. The research is the first study to look at plastics of all sizes in the world's oceans. Plastic pollution is globally distributed across all oceans due to its properties of buoyancy and durability and the sorption of toxicants to plastic while travelling through the environment have led some researchers to claim that synthetic polymers in the ocean should be regarded as hazardous waste. Through photodegradation and other weathering processes, plasics fragments disperse in the ocean, converging in the subtropical gyres. Generation and accumulation of plastic pollution also occurs in closed bays, gulfs and seas surrounded by densely populated coastlines and watersherds.
In the study, using the published new data - particularly from the Southern Hemisphere subtropical gyres and marine areas adjacent to populated regions - the researches developed an oceanographic model of debris distribution, to estimate global distribution and count and weight densities of plastic pollution in all sampled size classes.
The oceanographic model assumes that amounts of plastic entering the ocean depend on three principle variables: watersherd outfalls, population density and marine activity. This model is based on expeditions from 2007 to 2013 surveying all five sub-tropical gyres - North Pacific, North Atlantic, South Pacific, South Atlantic, Indian Ocean - and extensive coastal regions and enclosed seas - Bay of Bengal, Australian coasts and Mediterranean Sea.
The data included net tows and visual survey transects for large plastic debris, totaling 1571 locations in all oceans.
The study also compared plastic pollution levels between oceans across four size classes:
0.33 mm to 1.00 mm = small microplastics
1.01mm to 4.75 mm = large microplastics
4.76 mm to 200 mm = mesoplastics
> 200 mm = macroplastics

For deductions and coclusions after the measurements the results have been adjusted considering some important factors like wind-driven mixing of the surface layer, frictional velocity of water and wind stress values.

Results. The scientists estimated that at least 5.25 trillion plastic particles weighing 268,940 tons are currently floating at sea. The estimates suggest that the two Northern Hemisphere ocean regions contain 55.6% of particles and 56.8% of plastic mass compared to the Southern, and in depth the North Pacific contains 37.9% and 35.8%. Also the Indian Ocean appears to have a greater particle count and weight than the South Atlantic and South Pacific oceans combined. It is to be added that this pattern has confirmed the prediction: ocean margins are areas of plastic migration, while subtropical gyres are areas of accumulation. The 891 visual surveys reveal that foamed polyestyrene items are most frequently observed microplastics (1116 out of 4291 items) while derelict fishing buoys accounted for most (58.3%) of the total microplastic weight.
The data from the size classes were run separately through the model producing four maps each for count and weight density and combining the two microplastic size classes they account for 92.4% of the global particle count.
Also it is iteresting to notice that it came out a pattern of material loss from the sea surface.
The demonstrated gap between "the expected" quantity and "the measure" one, together with the similarity of these results with other researches regarding this matter, give further confidence in the estimation and support of the hypotesis that the ultimate fate of buoyant microplastics is (1) not only at the ocean surface and (2) that processes of UV degradation, biodegradation, ingestion by organisms and beaching fragment of already brittle microplastics, ***breaking them further down into even smaller particles, would make them unavailable for the "capturing" through nets . . and through eyes. .***





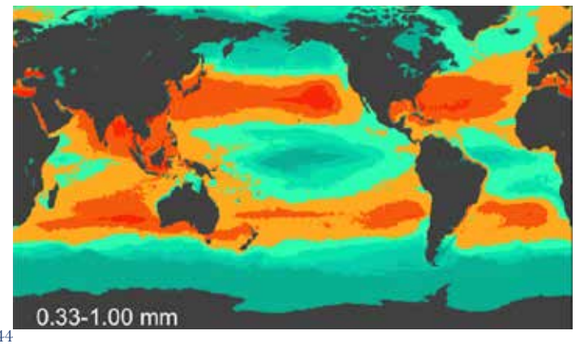
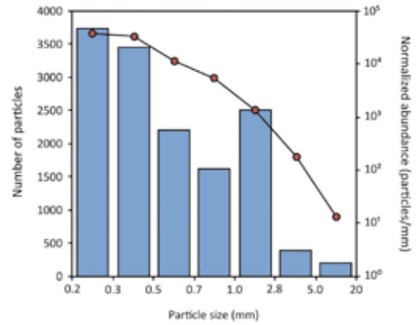
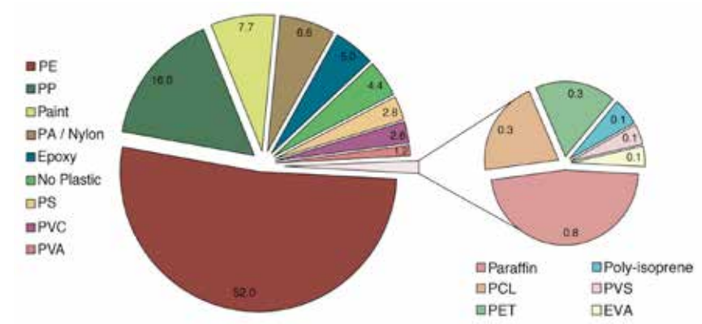


Fig.1. Field locations where count density was measured. Count density (pieces km -2, see colorbar) of marine plastic debris measure at 1571 stations fom 680 net tows and 891 visual survey transects for each of the four plastic size classes.
Fig.2. Model results for global count density (g km-2)
Fig.3. Model results for global weight density (g km-2) The majority of global weight is from the largest size class.





3.2.3 Mediterranean Plastic Soup

From the study:
"The mediterranean plastic soup: synthetic polymers in Mediterranean surface waters"
by G. Suaria, C.G. Avio, A. Mineo, G. L. Lattin, M.G. Magaldi, G. Belmonte, C.J. Moore, F. Regoli, S. Aliani
published November 23, 2016
by Nature Journal and platform

The Mediterranean Sea has been recently proposed as one of the most impacted regions of the world with regards to microplastics, however the polymeric composition of these floating particles is still largely unknown. This studio is the result of a large-scale survey of neustonic micro- and meso-plastics floating in the Mediterranean waters providing the first extensive characterization of their chemical identity as well as detailed informations on their abundance and geographical distribution.
Global models predict some of the highest concentrations of floating plastics in the world to occur in the Mediterranean Sea, to the extent that, together with the main five oceanic gyres, it has been proposed as the sixth great accumulation zone for marine litter. Substantial amounts of marine litter are accumulating in the Mediterranean basins, which according to the most recent simulations is retaining between 21% and 54% of all plastic particles and between 5% and 10% of the global plastic mass. The European Marine strategy Framework Directive highlighted concerns for the environmental implications of marine litter and underlined the urgent need for member countries to "Determine trends in the amount, distribution and composition of micro-particles in European waters and to establish baseline quantities, properties and potential impacts". The importance of this issue has been acknowledged by the Contracting Parties to the Barcelona Convention and by the G7 world leaders who committed to a global action plan to combat marine litter. Most of the surveys conducted so far, however, mainly relied on the visual identification of particles or characterized only a restricted subset of samples.
Thus, detailed informations on the actual polymeric diversity of these emerging pollutants is lacking.

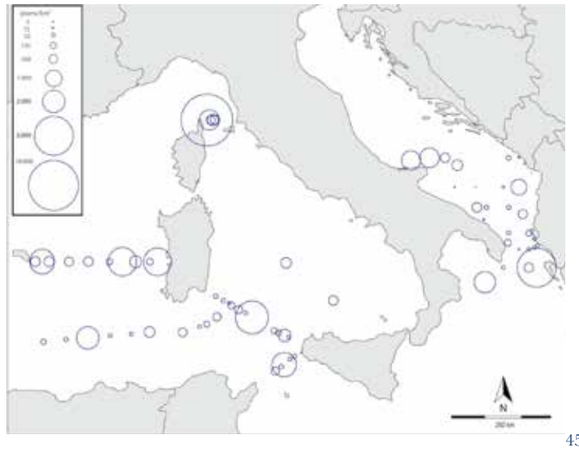
The study presents the results of a large-scale survey of micro (<5mm) and meso-plastics (5-20mm) occurrence in central-western Mediterranean waters, providing the largest polymeric characterization of floating microplastics ever performed (4,050 particles).
In agreement with numerical predictions, it is confirmed that the Mediterranean Sea is severely contaminated by plastic pollution and it is described the complex mixture of synthetic polymers floating on its surface.

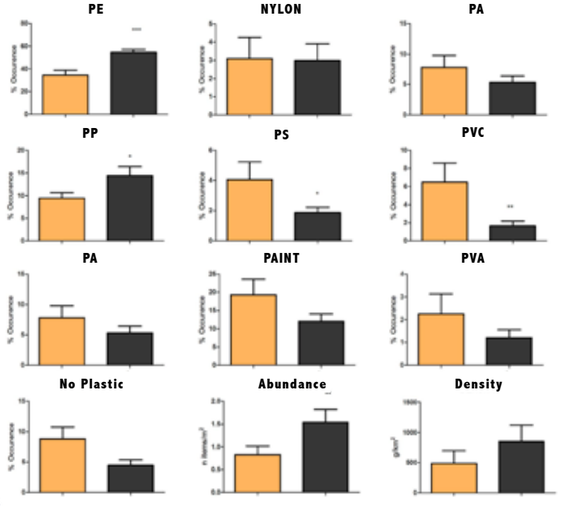
Results. A total of 74 neuston samples were collected. Plastic-like particles were found in all samples. Most of these particles (93.2%) were visually classified as irregular shaped fragments, while pellets/films/foams constituted only a small fraction of the total (all fibers and filaments were removed from the dataset and not considered in density calculation because of the high risk of external contamination). The overall size-class distribution revealed a prevalence of smaller particles. The polymeric identity of all particles >700µm was verified (through ATR FT-IR analysis = Fourier Transform Infrared Spectroscopy) and 16 different polymer typologies were identifies. Polyethylene (HD-PE and LD-PE) was the predominant form with an overall frequency of 52%, followed by polypropylene (PP) and polyamides (PA).

Conclusions. The results demonstrate the pervasiveness of plastic pollution in the Mediterranean waters and, confirming model predictions, provide further evidence that in this basin, microplastic abundance are amongst the highest in the world. The Mediterranean Sea is the largest and deepest enclosed sea on earth. Being one of the busiest navigation crossroads and top turistic destinations in the world, surrounded by heavily populated and industrialized coastline, it is not surprising that in this basin the impact of human activities are proportionally stronger than in any other sea.

The polymeric characterization of plastic particles is of paramount importance for a proper assessment of plastic contamination in the marine environment and for the effective identification of specific solutions and alternatives, reminding that the problem of plastic pollution is, first of all, a social and behavioural issue.

Fig.4. Size distribution of all particles collected during the survey. Normalized abundance valueas (red dots) were obtained by dividing the total number of particles counted in each size class (ble bars) by the width of the respective size bin expressed in mm. (Secondary vertical axis is in logaritmic scale)
Fig.5. Polymeric composition of all particles >700 micrometers characterized through ATR FT-IR analysis. Values are expressed in %. (Identification of polymers was performed by comparison with a library of standard spectra and only polimers matching reference spectra for more than 60% were accepted).
Fig.6. Map of the central-western Mediterranean Sea showing the location of all sampling stations and the distribution of un-corrected plastic densities expressed as grams of plastic per km2. Size of the circles is propostional to measured concentration values on a logarithmic scale. Particles <700 micrometres and sythetic fibers were not included. Data were plotted usig GPS Visualizer and post-edited in Ai.
Fig.7. Differences between Adriatic (orange) and western Mediterranean samples (black) in the relative frequencies of the most common types of polymers identifies through FT-IR analysis. Abundance and density are also shown.

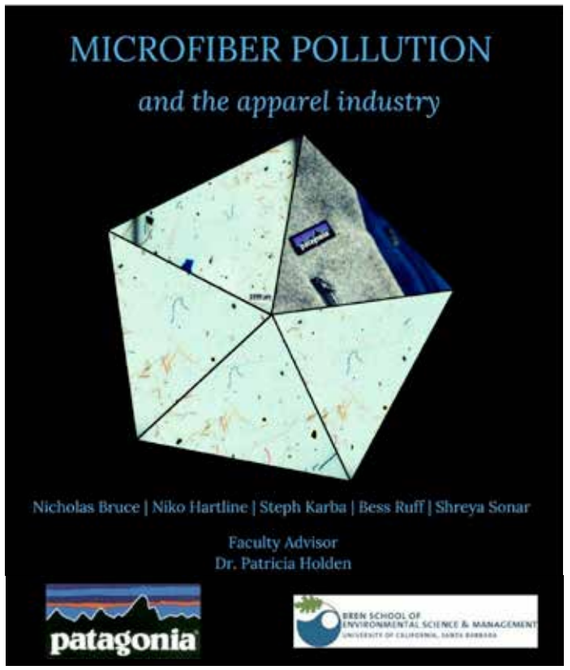




3.2 Plastic Pollution Today, simply an expected part of our experience

3.2.4 A focus of the apparel industry. Patagonia study on microfibers.. and microplastics

"While monitoring does not prevent harm, it is the first step toward managing the issue".
surfriders



3.2.4 The focus on the apparel industry. Patagonia study on microfibers . . and microplastics
From the study:
"MICROFIBER POLLUTION and the apparel industry"
by Patagonia and MEMS Program from the Bren School of the University of California 2016

A lot of fashion brands became sensitive to the microfiber cause, because it is the first and main damage caused to the evnvironment by this industry. This interest lead for example to the creation of manufacturer collaborations working to coordinate research efforts and develop solutions. One of these associations is the Outdoor Industry Association (OIA) Microfiber Task Force, and includes 150 adventure retailers and suppliers like The North Face, Patagonia, and Burton. Since the 2016 Patagonia study, there has been a concerted response from the outdoor retailer, entrepreneurial, and scientific community to better understand the issue and identify solutions.

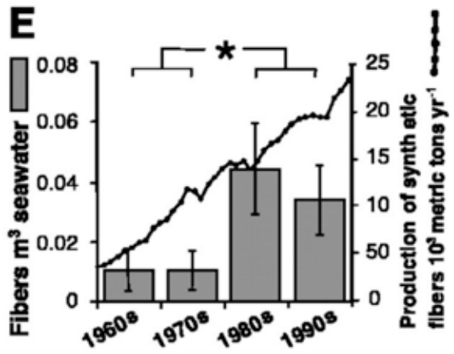
The textile industry is considered one of the most polluting in the world. Harmful chemicals and high-energy use in addition to water consumption, waste generation, transportation and non-biodegradable packaging materials are responsible for the resource heavy life cycle of textiles and clothing.
Muthu 2014
Textiles used in the manufacturing of garments are often processed with hazardous chemicals throughout production and finishing. This is especially true for Patagonia products that are designed to withstand extreme outdoor conditions. The study hypothesizes that microfibers serve as a mode of transport for these chemicals into the marine environment, impacting also on humans.
The Study "MICROFIBER POLLUTION and the apparel industry" was conduced by Patagonia in collaboration with the University of California, Santa Barbara. The Group Project required participation from all students in the Master of Environment Science and Management (MESM) Program (Bren School).
The key questions focused on what factors significantly impact shedding, where are the fibers present, how they have grown exponentially according to the Technon OrbiChem' s 2014 presentation of their technical report on the textile industry, what are the ecological impacts, what must be further researched. The point is that microplastic particles have been found on beaches and agricultural lands as well as in lakes and oceans across the globe, making this an international problem, and what Patagonia underlines is that, on our side, there is a lack of knowledge in terms of our role in microfiber pollution as apparel industry.
In fact, while for example cosmetic industry was able to replace microbeads with natural alternatives such as sand and nut shells that provide the same functions as their plastic counterparts, the apparel industry faces a more difficult situation and alternatives to synthetic textiles are limited and struggle to mimic the performance capabilities of materials like polyester, limiting its replaceability.
Microfibers are a subcategory of microplastics and are an emerging pollutant with widespread distribution in the environment and negative ecological impacts. This project tries to analyze and contextualize microfiber pollution from synthetic clothing. The experimental analysis of shedding from synthetical jackets supports shows that apparel is a substantial contributor to microplastic pollution. The research focused on microfibers from synthetic clothing and textiles, the most prominent of these being polyester, acrylic, nylon and ryon.

As an outdoor clothing company that relies heavily on synthetic materials, Patagonia, Inc. is increasingly concerned about their contributions to microfiber pollution. So to better understand the impacts the Company asked researchers at the UC Santa Barbara' s Bren School to investigate on their behalf.
The project objectives were to understand the ecological impacts of microfibers in the environment and quantify the release of fibers from jackets, designing an innovative and replicable experiment that can be used by various companies interested in exploring their contribution in the pollution issue.

First of all we have to consider that since its invention in the 1940's the use and demand for polyester-based clothing polyester was two to three times that of all other fibers over the course of the last five years, and by 2025 its production is expected to reach 84 million metric tons. As demand for polyester rises, its life cycle impacts should be of increasing concern to policy-makers.

Through the literature review the team found out that microfiber researches focused on four main categories: chemical substances coating, wastewater treatment plant, distribution of microfibers in the environment and potential ecological impacts.
Informations captured:
•The majority of chemical used in textile production occurs during "wet processing" which includes dyeing, washing, printing and fabric finishing; technical garments wash-outs determine the transportation of these substances to the marine environment via microfibers.
•WWTPs play a critical role in the fate and transport of microfibers into the environment. Of course it depends on whether wastewater from washing machines is treated and the effectiveness of treatment.
•WWTP can send fibers directly into the marine ecosystem via discharge pipes or to the terrestrial ecosystem as biosolids. The "beaches point" is fundamental for us. Initial research on distribution of microplastic by Thompson et al. (2004) found microfiber pollution on all 17 beaches studied around the world, revealing that they contain nylon, polyester and from this, suggesting the linkage between apparel industry and microfiber pollution. About the "surface water point" Thompson found that microfiber concentrations in historical surface water samples correlated with the production volume of synthetic fibers in manufacturing. Regarding the "deep sea point" it is confirmed that thousands of tons of microfibers are "missing" from the surface because they are sinking through the water column and settling in deep-sea sediments (as we saw also in the 3.2.1 paragraph).
•About the ecological quest it is shown that microfibers could contribute to the alteration of the physical properties of beaches and consequently a variety of shoreline taxa. For example from the Carson et al. (2011) study it is revealed that shoreline sediments contaminated by microplastics are more permeable and warm more slowly so this change of thermal properties has significant consequences on sea turtels reproduction.

But also microfibers allow the absorption of more amounts of toxic compounds; bacterial assemblages have been found on the surface of microplastic fragments and fibers but these are new communities from the normal ecosystem ones.
So this contamination of aquatic habits and the introduction of non-native bacteria impact on human health.

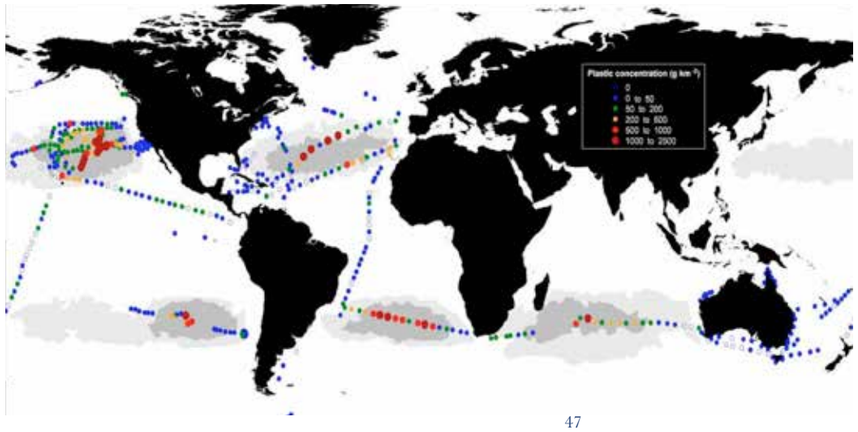


(One of the most prominent bacteria assemblages found on the microplastic particles was from the family Campylobacteraceae that includes multiple taxa associated with human gastrointestinal infections).

The experiment. Wash trials were conduced by Patagonia' s testing facility at their headquarters in Ventura, California. Four types of synthetic jackets were selected (A=100% nylon fibers; B,C,D=100% plyester blends), they were washed in two types of washing machines (front-load and top-load) and also in two "simulated" aging periods, that is to say that the test was done on the four new jackets washed for the first time and on the same four jackets after an "aging treatment" (a killer wash that stimulates the aging of a garment after a lifetime of laundering). The shed fibers were collected each time by removing them from filters through disiccation.
Results:
•Jackets washed in top-load machines shed 430% more fiber mass.
•Aged jackets shed 80% more fiber mass than new.
•None of the jackets across any treatment grouping were significantly different from each other.
•Approximately 125% more fiber mass shed onto 333 µm filters than 20 µm filters.
•Averaging the results: washing 100,000 Patagonia jackets one time, 170 kg of microfibers go into the sewage system and depending on the effectiveness of filtration between 17kg and 59kg go into the aquatic environments. Assuming an average fiber size of 0.7mm, this is approximately 27,000,000 to 119,000,000 microfibers entering rivers, streams and oceans. So, can we imagine this from a global perspective?
This is a concerning issue.

From the literature, the theme analyzed for the study and the experiment, I kept some pills as sparks for further reflections. From the appendix A2 about chemical substances:
•"UV-absorbent, antimicrobial, water-repellent and other types of functional dyes for technical textile applications" by N. Sekar
This paper summarizes the substances used in these types of finishes. UV-absorbing (benzophenone, hindered amine, benzotriazole derivates), antimicrobial dyes (cyanines, hemicyanines, other cationic dyes), water-repellent dyes (perfluorobutamido acid derivates of H-acid, gamma acid, J-acid, M-acid, p-alkyl anilines, trifluoromethyl aniline), fluorecent dyes (xanthene, naphthalimide, perylene, thioxanthone, benzothioxanthone, benzathrone, anthraquinone, carbonyl colorants, naphtholactam dyes, methine dyes, oxazine dyes, thiazine dyes)
•"The use of enxymatic techniques in the finishing of technical textiles" by R. Paul, E. Genescà
This paper analyzes enzymatic techniques for finishing of technical textiles for surface modification and functionalization of synthetic fibers: for PET lipases - cutinases and laccases, for polyamide - proteases, amidases, cutinases; for polyacrylonitrile - nitrilases, esterases, cutinases.•"Leaving traces: The hidden hazardous chemicals in outdoor gear" by M. Santen, K. Brigden, M. Cobbing (Greenpeace 2016).
This paper tested a range of outdoor gear for hazardous pre and polyfluorinated chemicals (PFCs). PFOAs (perfluorinated carboxylic acids), PFOSs (perfluorinated sulfonic acids) and FTOHs (fluorotelomer alcohols). Out of the 40 products that were tested only four were found to be free. The study showed that chemicals that are known to be hazardous are still being widely used for products sold by outdoor brands.
•"Synthetic fibers in atmospheric fallout: a source of microplastics in the environment?" by D. Rachid, J. Gasperi, M. Saad, C. Mirande, B. Tassin (Marine pollution bulletin 2016).
The paper focuses on quantifying microfibers in the atmosphere of Paris investigating the contribution of their fallout as potential vector of plastic pollution (during rainfall periods fallout went up to 355 particles/m2/day.
•"Accumulation of microplastic on shorelines worldwide" by M. Browne, P. Crump, S.J. Niven, E. Teuten, A. Tonkin, T. Galloway, R. Thompson (Environmental Science & Technology 2011).
The purpose was to quantify and describe contamination of shorelines by microplastic particles exploring the role of textile industry in microplastic pollution. All 18 shorelines were found to be contaminated with microplastic pollution ranging from 2 to 31 particles per 250 mL of sediment: polyester 56%, acrylic 23%, polypropylene 7%, polyethylene 6%, polyamide 3%. The table related to the data taken from different sea areas reports that in Venice (location), in the Lagoon sediment (sample environment) they found 672 to 2175 particles*kg-1 of 32 µm (size) and with the following percentages for chemical composition - 48% PE, 34% PP, 5% polyethylene-co-propylene, 4% polyester, 3% PS, 3% polyacrylonitrile.

Note 1. Bren School of Environmental Science & Management aim is to produce professionals with unrivaled training in environmental science and management who will devote their unique skills to the diagnosis, assessment, mitigation, prevention and remedy of the environmental problems of today and future.
Note 2. Acronyms: WWTP (Wastewater Treatment Plant), PBT (persistant, bioccumulative and toxic substance), PCB (polychlorinated Biphenyl), PP (polypropylene), PE (polyethylene), PS (polystyrene), PA (polyamide), PET (polyethylene terephthalate), EPS (expanded polystyrene), PVC (polyvinyl chloride), EVA (ethylene-vinyl acetate), EPDM Rubber (ethylene propylene diene monomer rubber), PUF (polyurethane foam).



Pages 46-47
Cover page of the study
History. Relationship between microfibers in historical seawater samples and volume of synthetic fiber production.
Source: Thompson et al., 2004
Pathways of chemical release from textiles.
Source: Luongo 2015
Concentrations of plastic debris in surface waters. The map shows average concentrtions in 442 sites, grey areas indicate accumulation zones.
Source: current study

3.3 Make a choice in this ocean of chemicals

Why pellets over POPs

Dr. Tadaka researches and Bisphenol A

From the study:
"Plastic Resin Pellets as transport Medium for toxic chemicals in the marine environment"
by Dr. Tadaka*
Published December 8, 2000 by Environmental - Science & Technology publications (online and journal)

"While a major portion of microplastics comes from the degradation of plastic products into smaller fragments, I have focused on the small resin pellet that is the industrial feedstock of plastic products. Since the pellets are durable and accumulate persistent organic pollutants (POPs) in the environment, they are a good vehicle to track these pollutants"

The relationship between Plastic pellets and POPs.
Plastic resin pellets are small granules generally in the shape of a cylinder or a disk with a diameter of a few mm. These plastic particles are industrial raw material (also called virgin plastic) transported to manufacturing sites where "user plastics" are made by re-melting and molding it into the final products. Unintentionally, the pellets are spilled into the environment. These tiny travellers have grown ubiquitous on beaches around the world and, as they float in the sea, pellets accumulate persistent organic pollutants. POPs are hazardous human-made chemicals that are resistant to degradation in the environment. Polychlorinated biphenyls (PCBs), different sorts of organochlorine pesticides (e.g. DDTs and HCHs) and brominated flame-retardants are all POPs.
Because they are basically lipophilic, so they have a high affinity for oils and fats, POPs accumulate in fatty tissues of marine organisms. They have the potential to cause many adverse effects in wildlife and humans. ***Lipophilic plastic pellets have an extremely high affinity for POPs*** and that is why Dr Hideshige Takada, professor of organic geochemistry at Tokyo University of Agriculture and Technology, has been examining them.
The project. In 2005, Takada founded International Pellet Watch (IPW) to track and study plastic resin pellets. It was asked citizens across the globe to collect plastic resin pellets from the beaches visited and send them to the laboratory. This made possible to analyze the POP content of the pellets, and its global distribution.

Pellet samples from approximately 200 locations in about 40 countries have been analyzed. POPs were detected in every one of those 1000 pellet samples from around the world. In this way, IPW has been able to create a global POP pollution map at a very low cost.

In addition, by engaging non-specialists in the process of sample collection and analysis, the IPW has increased public awareness of plastic pollution and the chemical risk associated with POPs in microplastics.

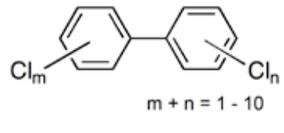
BPA. In Japan up to 150,000 tons of plastic wash on shore each year and much of it is Styrofoam, a type of polystyrene plastic. In lab a new chemical technique to ***simulate the decomposition of polystyrene plastic in the oceans*** at 30 degrees Celsius (86 Fahrenheit) was used to ***reveal and study the potentially toxic chemicals, including bisphenol A (BPA)*** and PS oligomer. When the scientists analyzed samples of ocean water from the United States, Japan, India, Europe and elsewhere, they found traces of these and other plastic degradation byproducts, including styrene monomer (SM), styrene dimer (SD) and styrene trimer (ST) — none of which are found normally in nature. "Previous experiments have shown that, when heated in the microwave or under other conditions, plastics leach BPA and other compounds" said John Meeker, an epidemiologist at the University of Michigan School of Public Health in Ann Arbor. So, it's not surprising that the same thing might happen in the ocean.
"Dr. Saido's study ***means that marine plastic debris could be the dominant source of degradation products, such as styrenes and BPA in remote coasts and the open ocean"*** says Dr Takada.
Nonylphenol and bisphenol A cause endocrine disruption, so they interfere with body processes mediated by hormones. The potential damage from this can be impaired brain development, disabilities in learning and behavior, malformations of the body and limbs, disruption of normal sexual development (including feminization of males or masculinization of females) and increased incidents of cancer (breast and prostate cancers).

So this is why BPA is the chemical that has been selected as main pollutant to be detected by the wetsuit in ocean waters and to develop the surface treatments for color reaction.

("Project section" for results and Chapter 4. - "Sensors Paragraph" for example of application of Bisphenol A detection through sensor on wetsuit).

*Dr. Hideshige Takada is an Environmental Organic Geochemist at Tokyo University of Agriculture and Technology and Founder of International Pellet Watch (IPW)
Pages 48-49
Microplastics in the tidal wrack line along a beach in southern Oregon
Spatial patterns of POP concentrations Defined sing pellets. For example, PCB concentrations were two to three orders of magnitude higher in highly-industrialized areas (e.g., Los Angeles, Boston, Tokyo, Athens), where a legacy of PCB pollution of PCBs has been observed (3). Although usage of PCBs was banned in these countries in the 1970s, they accumulated in the bottom sediments in coastal zones, due to their persistent and hydrophobic nature. They are easily re-suspended and remobilized by physical processes. In this way, the PCBs in the pellets continue to contaminate coastal waters.
Professor Takada collecting samples with students. © Hideshige Takada
Schemes from Takada study "Chemical in marine plastic: carrier of toxic chemical to marine organisms."*

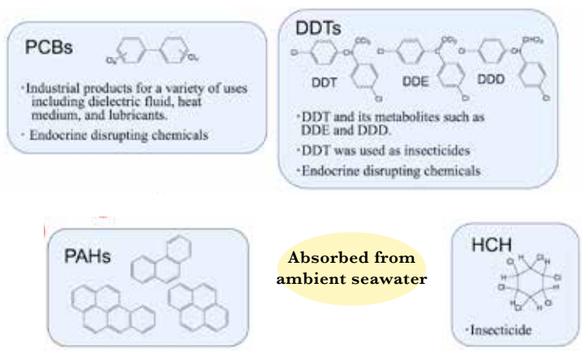
Polychlorinated Biphenyls PCBs



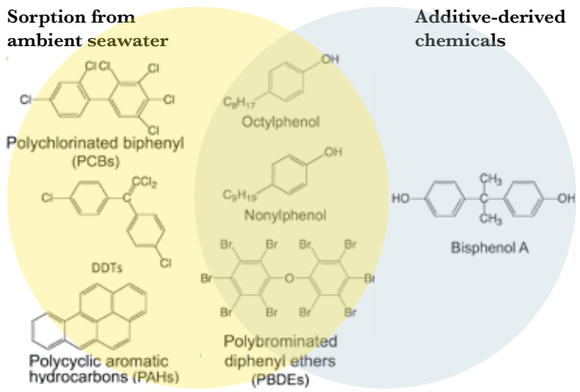
Commercial PCBs mixtures were used in a wide variety of applications, including:
Heat transfer fluid
Copying paper
Carbonless copy paper
Adhesives
Sealant
PCBs were used from 1950s to early 1970s in industrialized countries. Their usage uas banned in 1970s.

POPs from seawater are accumulated by pellets

POPs like PBCs, DDTs, HCH, PAHs are man-made chemicals. persistent (stable, resistant to degradation, toxic to human and marine organisms. hydrophobic (lipophilic)



Marine plastics carry 2 types of chemicals



3.4 Athletes & Water: when pollution is on your skin The case of Rio Olympics 2016

3.4.1 The dark side of the medal
3.4.2 Astonish me! 80'' on a dirty 'Wave' is enough

"The waters where Olympians will compete in swimming and boating events next summer in South America's first Games are rife with human sewage and present a serious health risk for athletes."

The Associated Press - New York Times

The hazardous conditions of Rio de Janeiro waters where the Olympic athelets had to train and compete caused tons of complaints, critiques, perturbing articles at the time. Of course we must discuss about the issue, but the pure moaning is not bringing us far. When will we start to feel that we are all in this together? There is not a guilty part and a saviour part. Everything that enters the ocean, wherever this happens, becomes a global issue, as all the studies and researches previously synthesized shew us.
The method of "throwing judgements" is just too simple, while *this thing of easily "washing the hands" addressing to others the fault is not such a resolution thing to do, especially if we are talking about dirty waters! Washing your hands with dirty water keeps them both - hands and water - dirty!*
There is need for action, there is need for talking when talking becomes constructive, when it wants to rise awareness and find solutions.
That' s why in this paragrpah I dedicate some space to Rio de Janeiro Olympic Games scandalous regarding water conditions, to show, after a brief introduction of the context through an abstract of the New York Times Associate Press article, ***the example of someone that in his way, with its instruments, wanted to astonish more than with simple words, to move displeasure and desire of changing through the communicative power of the image.***

3.4.1 The dark side of the medal

From the article
"Filthy Rio de Janeiro Water: a Threat at 2016 Olympics"
by The Associated Press - New York Times - July 30, 2015

"This is by far the worst water quality we've ever seen in our sailing careers" Ivan Bulaja - coach for the Austrian team, while training on the Guanabara Bay. A.P. testing over five months did not find one venue suitable for swimming or boating, according to international experts, who said it is too late for a clean-up. ***"Some competitors who have been training in the polluted waters of Rio de Janeiro have fallen ill with fevers, vomiting and diarrhea."***

RIO DE JANEIRO - The waters where Olympians will compete in swimming and boating events next summer in South America's first Games are rife with human sewage and present a **serious health risk for athletes.**
Water pollution has long plagued Brazil's urban areas, where most sewage is not collected. In Rio, much of the waste runs through open-air ditches to fetid streams and rivers that feed the Olympic water sites and blight the city's beaches.
Prime beaches remain deserted because the surf is thick with sludge, and periodic die-offs leave the Olympic lake littered with rotting fish. Dangerously high levels of viruses and bacteria from sewage have been detected. Over the summer an entire U.S. rowing team fell ill after a competition was held in Rio's Freitas lagoon. This condition could prevent an athlete from competing for days.

"I've had high temperatures and problems with my stomach. *It's always one day completely in bed and then usually not sailing for two or three days"* says David Hussl, sailor.
The A.P. conducted four rounds of tests starting in March. The results have alarmed international experts and dismayed competitors training in Rio de Janeiro. "What you have there is basically raw sewage" said John Griffith, a marine biologist at the independent Southern California Coastal Water Research Project. Griffith examined the protocols, methodology and results of the A.P. tests. In other countries, Griffith said, areas with such levels of contamination "would be shut down immediately."
More than **10,000 athletes** from more than 200 countries are expected to compete from August 5 to 21 in the 2016 Games. **Nearly 1,400 of them will come into contact with water contaminated by sewage** as they sail in Guanabara Bay, swim off Copacabana Beach, and canoe and row on the brackish waters of Rodrigo de Freitas Lake.
One element of the effort to build values and culture that I think is way underutilised is athlete environment. That' s very powerful and in my view can drive a lot of change everywhere at the consumer level, retail level and internally at the product and operations level.
I think if a bunch of the top tier riders took some time to understand what it takes to build the boardshorts they wear, not to mention wetsuits, boards, tees.. and became advocates for lowering environmental and social footprints, that would be very powerful, as the involvment of Conrad Anker with North Face.*

An astonishing message to make "visible on human skin" the water conditions during Rio Olympic Games.

To face, to SEE the problem, to perceive it as something that is ON YOUR SKIN too, is the first stone for the building up of "the pillar of awareness" that can help us getting to the heights of great solutions.

"To get something done, you have to first trudge (or surf) through a load of rubbish before people start to take notice".

3.4.2 Astonish me! 80 seconds on a 'dirty Wave' is enough.

It is not easy to change actual conditions. All of this is the result of years and years of wrong behaviours and lack of attention and environmental sensitivity. Of course it is not late to go back to the right path, but because of the huge dimension of this issue, *what is really important is that this action doesn' t remain a niche quest but that it becomes a global action.* ***The main step to move at first is rising awareness.*** In whatever way we can, whatever our possibilities are. To face, to SEE the problem, to perceive it as something that is ON YOUR SKIN too, is the first stone for the building up of "the pillar of awarenes"s that can help us getting to the heights of great solutions.
An exemple I want to give space to is what I would define "**an astonishing message**", rather than "a simple video work", launched by brazilian Instituto-e **to make "visible on human skin" the water conditions during Rio Olympic Games.**

Surf's up? No. It's down. Down and dirty, hazardous.
"We wanted to show the contrast between the beauty of surfing and the truth of some of the beaches next to big cities. We want people to be shocked with the reality, and sometimes you look at the ocean and just don't see it."
Brazilian directing duo 300ml Instituto-e, a Brazilian-based eco advocate group, has tapped big wave charger Carlos Burle for their newest PSA.
Tipically Burle is known for surfing one of the biggest waves ever at Nazaré. Now he becomes the subject for the 80-seconds spot titeld "Wave". He is riding an unusual "pipe" made of 20-meter-high canvas instead of water: the material takes life, pulsating slowly and with vague menace, as Burle passes across its surface.
Burle emerges into the sunlight, with his body covered by fetid sludge.
300ml coated Burle with a mixture of mild organic materials "as we didn't want to cause any skin problems."
Unfortunately, surfers and swimmers at Brazil's beaches aren't given the same courtesy. .
The petition shows that "to get something done, you have to first trudge (or surf) through a load of rubbish before people start to take notice".
It would be impossible to mention all the worldwide associations, big and small, that made of the Ocean Health their daily action and motivation.
I would underline again that it is not a coincidence that most of the athletes involved in these programs are actually professional/non professional surfers, that again, ***even befor the love for their sport, feel the love for that thing that makes it possible: the Ocean*** . . and Nature. That' s why they are not just "surfers" but "soul surfers" to me. It seems that the options are two: keep surfing/entering seas with the high risk of getting sick or stop enjoying one of the best things on earth, the Oceans.**Do we want to just accept** and choose one of these two, **or do we want to work and believe in a better wave ?**

Previous page
*__"Transitions to sustainability: if not us, then who?"__ Jeff Wilson, chapter 3.2 p. 53
Young canoeists captured at Rio trainings
Ph. Ricardo Moraes
businessinsider.com
Current page
Carlos Burle covered by sewage in Instituto-e astonishing video "Wave" against sewage at Rio 2016
Note 1. VIDEO CREDITS. Client: Instituto E, Fundação SOS Mata Atlântica and Uma Gota no Oceano - Agency: OM.art - Production Company: Paranoid - Writers/ Directors: 300ml (Manitou Felipe and Bernardo Dutra) - Title: "Wave" - Executive Producer: Egisto Betti and Heitor Dhalia - Script and Film Director: 300ml - Producer: Luiz Armesto and Bia Caldas - Editor: Breno Moreira e Rami D'Aguiar - Music: Zoë Keating & Track: Escape Artist
Note 2. About Instituto-E. Instituto-E is an OSCIP (Civil Society Organization of Public Interest) which believes that sharing information is the first step towards achieving sustainable human development. The institute uses alternative communication and multimedia to stimulate the public to take action in the protection of the country's biodiversity, the right to information, the right to education and of Brazil's historical and cultural heritage. Instituto-E fulfills its mission by creating and managing a network that links different initiatives to social agents. The institute was born from 'e-brigade', an environmental activist movement that transforms concept into attitude. This movement takes action according to the six ideal "e"s: earth, environment, energy, education, empowerment and economics.
Next Page
Surfing at Tokyo 2020 Olympic.
Occiacial IOC conference and announcement. August 03, 2020
olympic.org

Climbing, skiing, snowboarding, surfing, fly fishing, paddling and trail running. These are all silent sports. None require a motor; none deliver the cheers of a crowd. In each sport, reward comes in the form of hard-won grace and moments of connection between us and nature.

Patagonia

"The International Olympic Committee (IOC) today agreed to add baseball-softball, karate, skateboard, sports climbing and surfing to the sports programme for the olympic games Tokyo 2020."

olympic.org - August, 03, 2016

The surfing environment is more than the physical environment. It' s the spiritual environment, the aesthetic environment, the social environment.

Fred Hemmings

"I'm a designer and strategist originally.
When I met Paul Watson in Frankfurt in 2012 I realized that
I'm way more committed to the environmental cause than I ever saw.

I was so busy making my own career and making money
and winning awards and just ego-shooting in a way.

I felt that I was prepared to take on a total different challenge,
to own the territory of finding a solution for the oceans,
fighting the environmental threats that we are facing right now."

C. Gutsch

4. DESIGN, SURF& OCEAN POLLUTION

Eco rather then *Ego* Brand's Philosophies

4.1 Design marries Love for the Oceans

Parley & adidas. Negotiating Peace between Human activity & Nature

4.1.1 When business ecosystem & nature ecosystem follow the same path

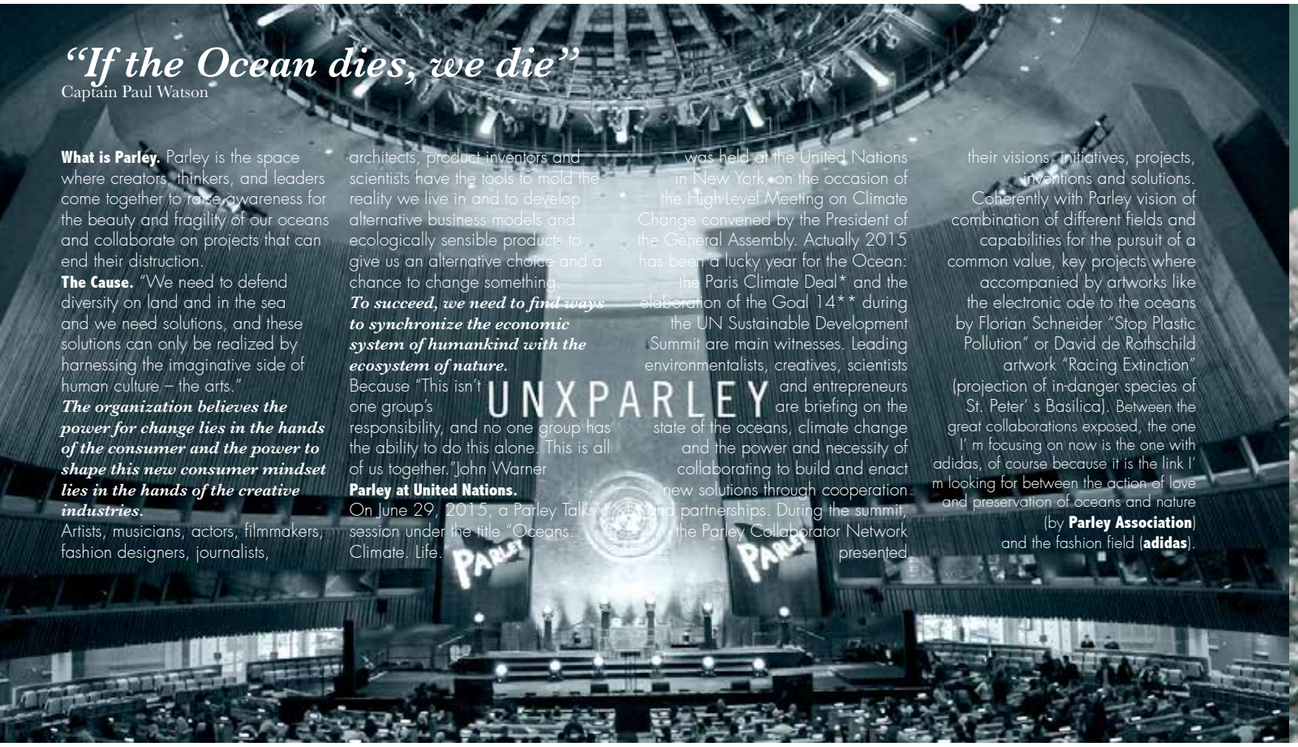
Shoes for the Ocean . .
These shoes become the proof that business innovation, product redesign and meaningful impact can meet in ways that scale positive global change to one of the most critical issues of our time.

"I converted from a design company to an ***environmental organisation*** pretty much overnight. My partners and I decided that we were going to stop what we were doing, ***and now fight for the sea*** and create a new form of an environmental organisation."

C. Gutsch, Parley for th e Oceans founder

"It is responsibility of big companies to help protect the oceans"
"We are creating new standards, new materials and technologies that are so different to those the sporting goods industry is used to."

C. Gutsch



What is Parley. Parley is the space where creators, thinkers, and leaders come together to raise awareness for the beauty and fragility of our oceans and collaborate on projects that can end their distruction.
The Cause. "We need to defend diversity on land and in the sea and we need solutions, and these solutions can only be realized by harnessing the imaginative side of human culture – the arts."
The organization believes the power for change lies in the hands of the consumer and the power to shape this new consumer mindset lies in the hands of the creative industries.
Artists, musicians, actors, filmmakers, fashion designers, journalists, architects, product inventors and scientists have the tools to mold the reality we live in and to develop alternative business models and ecologically sensible products to give us an alternative choice and a chance to change something.
To succeed, we need to find ways to synchronize the economic system of humankind with the ecosystem of nature.
Because "This isn't one group's responsibility, and no one group has the ability to do this alone. This is all of us together."John Warner
Parley at United Nations.
On June 29, 2015, a Parley Talks session under the title "Oceans. Climate. Life." was held at the United Nations in New York on the occasion of the High-Level Meeting on Climate Change convened by the President of the General Assembly. Actually 2015 has been a lucky year for the Ocean: the Paris Climate Deal* and the elaboration of the Goal 14** during the UN Sustainable Development Summit are main witnesses. Leading environmentalists, creatives, scientists and entrepreneurs are briefing on the state of the oceans, climate change and the power and necessity of collaborating to build and enact new solutions through cooperation and partnerships. During the summit, the Parley Collaborator Network presented their visions, initiatives, projects, inventions and solutions. Coherently with Parley vision of combination of different fields and capabilities for the pursuit of a common value, key projects where accompanied by artworks like the electronic ode to the oceans by Florian Schneider "Stop Plastic Pollution" or David de Rothschild artwork "Racing Extinction" (projection of in-danger species of St. Peter' s Basilica). Between the great collaborations exposed, the one I' m focusing on now is the one with adidas, of course because it is the link I' m looking for between the action of love and preservation of oceans and nature (by **Parley Association**) and the fashion field (**adidas**).

"I feel that the creative community has a very big responsibility to own the environmental cause and to make it a movement."

"Show your love for our blue planet while you defeat the pace clock"

Notes
*The Paris Climate Deal is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gas emissions mitigation, adaptation and finance starting in the year 2020. In the Paris Agreement, each country determines, plans and regularly reports its own contribution it should make in order to mitigate global warming. It shows how 2015 has been a crucial year not only for climate change negotiation but also for our Oceans.
** Three months after UN x Parley, world leaders convened at the September 25 UN Sustainable Development Summit to adopt a new agenda that will guide action for people and the planet through 2030. The ambitious agreement sets forth 17 new Sustainable Development Goals; crucial is the inclusion of the first ocean-specific development objective, Goal 14. Goal 14 is focused on the conservation and sustainable use of "Life Below Water", but what is better to underline is that each of the 17 goals is inevitably linked to the other by a vital truth: We are all connected to the oceans. The successful realization of any goal to protect the future of humanity is inevitably and inherently dependent on the great unifier: the sea.

Photograph
Parley at UN conference on Climate Change, June 29, 2015

Note.
Photograph.
Adidas first prototype of sneakers made out of Parley ocean plastic, concept presented at UN conference.The first experiment became a limited edition series and it has been followed by :
•Adidas Parley editions of Game - Changing Running Footwear UltraBOOST, UltraBOOST X and UltraBOOST Uncaged, all in a fresh blue colorway inspired by the shades of the ocean. April 21, 2017
(Every model is released reusing an average of 11 plastic bottles per pair in the upper/ laces, heel webbing, heel counter, heel lining and sock liner covers are made in recycled PET material/ Primeknit material wraps the foot to supply lightweight comfort and fit and it is made of 95% Parley Ocean Plastic™)
•Adidas new white Parley edition of its pinnacle running footwear models UltraBOOST, UltraBOOST X and UltraBOOST Uncaged that, to distinguish from Parley collection released in May and inspired by the blue colour of the Oceans, recall the coral bleaching crisis threatening the oceans, and is also symbolic of the white flag humanity should raise in order to make peace with the oceans.
June 1, 2017

4.1 Design marries Love for the Oceans

Parley & adidas. Negotiating Peace between Human activity & Nature

4.1.2 "The threat into the thread"

The concept. Sports brand Adidas and environmental initiative Parley for the Oceans are actually transforming plastic pollution into high performance sportswear. How? They have released the first batch of running shoes with uppers made using recycled plastic recovered from the sea.
Coinciding with World Oceans Day held on June 8, the Adidas x Parley trainers have been launched as a limited edition of 50 pairs. Designed by London - based Alexander Taylor, ***the shoes are made using Adidas' existing footwear manufacturing processes but the usual synthetic fibres are replaced with yarns made from the recycled Parley Ocean Plastic.*** Even if he also stressed that . .

"While recycling is a key part of helping to contain the issue, Parley's ultimate aim is to invent an environmentally friendly replacement for plastic. Plastic was not supposed to be out there in these quantities, it's just too successful, a mistake that became a superstar. Our strategy to end plastic pollution is to recognize the problem and really accept that plastic is a design failure" adfirms Gutsch. The trainers were first unveiled as a prototype during an event at the United Nations headquarters in New York on June 29, 2015. In December, a version that combined the recycled uppers with soles 3D-printed from ocean plastic was also revealed.
Where does this plastic come from. Everything was collected around Maldives, thanks to the collab between the association and the governamnet.

- Large quantities of fish nets. To be noted that a gill net is a mass-murder machine. It had been put on the bottom of the sea bed and it kills everything that passes by, but they only want to kill one fish known as the Chilean seabass. The 72-kilometre-long, illegal gill net has been pulled out by the partner organization Sea Shepherd, for a total of 70 tonnes of material.
- Microplastic, floating around everywhere
- Tonnes of plastic trash, washed on beaches from the sea or tossed there by locals and turists who often use beaches as dumping sites

How is the shoe made. The upper on the new design is entirely recycled plastic: about 16.5 old bottles and 13 grams of plastic from gill nets go into a single upper on one shoe.

The only virgin material in the footwear is the thermoplastic polyurethane in the Adidas foam pellet Boost sole, which gets fused together with biowaste-powered steam.
The shoe is made of two kinds of recycled plastic: PET, used most commonly for water bottles, and nylon from gill nets. PET is relatively soft, easier than most to melt and reincarnate into fibers, while gill nets are made from a heavy duty nylon that's designed against dissolving in the ocean's salty, crushing waves; making the nets soft enough for athleticwear requires grinding the plastic into a powder and then extruding it - a process that required new partnerships with materials engineers from across the United States, Germany, and Asia. ***Crossing competences, again . .***

"Everything that is synthetic is something that can be replaced with our plastic."

C. Gutsch

Swimwear for the Ocean . .
Following the release of ocean-plastic shoes, past February 2, 2017 Adidas has again teamed up with Parley for the Oceans to create a collection of the first high-performance full swimming collection made from upcycled fishing nets and debris Parley Ocean Plastic material, featuring olympic bronze medallist and ocean activist Coralie Balmy (just an additional example of the importance of collaboration and of the relationship between athletes connected to the ocean and the desire on innovation for the sea health).
"It's possible to make over 1,000 swimsuits from a large fishing net. This is an initiative of passion. We are innovating for all future athletes by guarding their oceans." Roger Hahn design director at Adidas
According to the sports giant, 50% of all its swim apparel is already made from recycled material, and 76% of its Pool collection incorporates recycled polyamide. The company hopes to recycle all its swimsuits. Here the ocean plastic is converted into a technical yarn fibre named Econyl, which offers the same properties as the regular nylon used to make swimwear. The material is just as "cutting-edge as its polyester counterparts".
"It's important to remember Adidas is designing a whole range of swimwear from top elite swimmers to recreational users. For swimming training and the long hours of dedication it takes, it's important that our swimsuits are resistant to extended periods in chlorine water." - Haan
Designed for high-mileage, high-intensity workouts, the swimwear pieces features are:

- INFINITEX®+ PULSE: a 100% chlorine-resistant compression fabric has extra stretch for performance training and features recycled nylon content
- ECONYL® regenerated yarn is made from recycled fishnets and other discarded nylons
- 80% recycled nylon / 20% elastolefin tricot

"It's possible to make over 1,000 swimsuits from a large fishing net. This is an initiative of passion. We are innovating for all future athletes by guarding their oceans."

Roger Hahn design director at Adidas

Pag. 58-59
Adidas Sneakers & Swimwear
from adidas.com/parley

4.2 Ride the Clean Wave Surf Industry & Sustainability against Pollution

4.2.1 Caring for the environment through a wetsuit: Patagonia R3 Yulex

"Our design philosophy is simplicity. We found that by taking rubber from hevea trees and then using Yulex® purification, which is really clean and simple, we could cut back a lot of the process and reduce the carbon footprint."

T. O' Hara, Director of Innovation Research at Patagonia

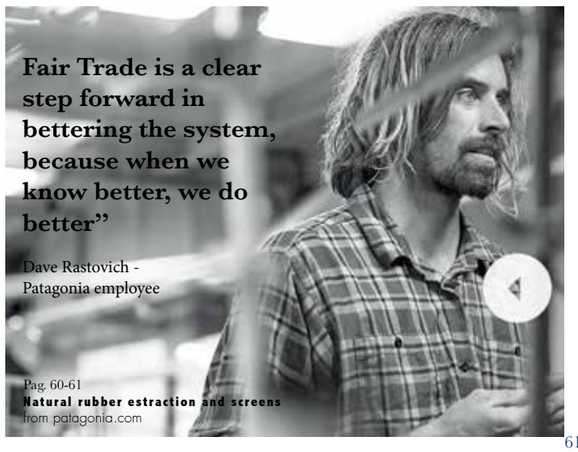
Patagonia' s Values. Founded by Yvon Chouinard in 1973, Patagonia is an outdoor company based in Ventura, California. The company is recognized internationally for its commitment to authentic product quality and environmental activism, contributing over $82 million to date in grants and in-kind donations to date.
Patagonia grew out of a small company that made tools for climbers. Alpinism remains at the heart of a worldwide business that still makes clothes for climbing – as well as for skiing, snowboarding, surfing, fly fishing, paddling and trail running.
These are all silent sports. None require a motor; none deliver the cheers of a crowd. In each sport, reward comes in the form of hard-won grace and moments of connection between us and nature.
The company' s values reflect those of a business started by a band of climbers and surfers, and the minimalist style they promoted. That' s why the Mission is: "Build the best product, cause no unnecessary harm, use business to inspire and implement solutions to the environmental crisis."

Ethics as the guide for innovation.
"We know that our business activity – from lighting stores to dyeing shirts – creates pollution as a by-product. So we work steadily to reduce those harms. We use recycled polyester in many of our clothes and only organic, rather than pesticide-intensive, cotton."
New natural resources: **Patagonia Men's R3® Yulex® Front-Zip Hooded Full Wetuit**
Surfers have been relying on neoprene for more than 60 years, but it is a nonrenewable material with an energy-intensive manufacturing process.
In 2008 the company started experimenting with renewable natural rubber to reduce reliance on petrochemicals.
"I've been working with wetsuits since the early '90s, and being part of the team that's taking a big piece of the process and replacing it with something plant-based and less carbon-intensive is the coolest thing I've ever done."
Hub Hubbard, Wetsuit Development Manager at Patagonia
Using natural rubber in place of nonrenewable, energy-intensive neoprene means up to ~80% less climate-altering CO2 is emitted in the polymer manufacturing process, causing less harm to the planet we love and the oceans that give us waves to ride.
R&D team reveals that all of this was possible because the polymer was produced in trees instead of factories, using solar energy instead of generated electricity - the Yulex emulsion removes over 99% of impurities and delivers a stronger, non-sensitizing natural material.
Plant sources are irrigated by ambient rainfall and a recycled water supply is used in manufacturing.
Wetsuit Specifics
(1) Features
•Made with neoprene-free 85% Yulex® natural rubber/15% synthetic rubber by polymer content that meets our rigorous standards for performance, durability,warmth and sustainability
•Natural rubber is derived from sources that are Forest Stewardship Council® certified by the Rainforest Alliance; synthetic rubber is chlorine-free
•Torso/thighs/hood have 51% recycled polyester/44% polyester/5% spandex inverted microgrid thermal lining that minimizes weight, dries fast and offers excellent flexibility
•High-stretch 100% recycled polyester jersey lining in the arms/legs improves flexibility and dry time; exterior face fabric made with 85% recycled polyester/15% spandex is durable, stretchy and water-resistant
•100% external seam sealing; all seams are triple glued, blindstitched and 100% internally taped
•Supratex kneepads and ankle cuffs for maximum durability and anatomic fit
•Floating front-zip with corrosion-proof Salmi® zipper / adjustable hood opening with cord lock
•Suggested water T: 46-55° F/9-13°
•Weight: 1564g
(2) Materials
•Torso/thighs: 4.5mm (hood: 3mm) 85% Yulex® natural rubber/15% synthetic rubber by polymer content,
•lined with 51% recycled polyester/44% polyester/5% spandex inverted microgrid; arms/legs: 3.5mm 85% Yulex natural rubber/15% synthetic rubber by polymer content, lined with high-stretch 100% recycled polyester jersey
•exterior face fabric: 85% recycled polyester/15% spandex

*FCS standards certification. Certified to Forest Stewardship Council standards by the Rainforest Alliance, natural rubber sources are compliant with strict social and environmental guidelines for responsible forest management. Accordance with the principles and criteria of the Forest Stewardship Council® ensures that the source plantation isn't contributing to deforestation, and that it's managed in a way that maintains the ecological functions and integrity of the forest. The FSC standards require that forest management operations "enhance the long-term social and economic well-being of forest workers and local communities, and that they meet or exceed all applicable laws covering the health and safety of employees and their families."

*Fair Trade USA is a nonprofit organization that promotes sustainable livelihoods for farmers and workers; protects fragile ecosystems; and builds strong, transparent supply chains through independent, third-party certification. Its trusted Fair Trade Certified™ label signifies that rigorous standards have been met in the production, trade and promotion of Fair Trade products from over 80 countries across the globe. Recognized as a leading social venture by the Clinton Global Initiatives, the Skoll Foundation and Ashoka, Fair Trade USA also provides critical capacity-building programs at origin, and educates consumers about the power of their purchase.

"For us at Patagonia, a love of wild and beautiful places demands participation in the fight to save them, and to help reverse the steep decline in the overall environmental health of our planet."
Patagonia



Pag. 60-61
Natural rubber estraction and screens
from patagonia.com

Appendix. The importance of the production cycle - PATAGONIA and its changing of the surf and apparel industries values
"For a long time now, there's been too little transparency in the garment industry."
This spring 2017 Patagonia has taken an important step to change the surf and apparel industries, making its full line of board shorts Fair Trade Certified™. The Fair Trade certification is one of the many points of difference that set Patagonia's swim and surf collection apart. These products are field tested by some of the best surfers in the world and incorporate recycled nylon or recycled polyester fabrics or printed using a laser process that minimizes fabric scraps and waste.
"When we buy clothing, we're often oblivious to the reality of how it was made—not to mention the true human and ecological costs of the manufacturing process. The factories we rely on aren't just full of machines; they're also full of people." Dave Rastovich, global surf activist at Patagonia.
For every product made at a Fair Trade Certified factory, Patagonia pays a premium that workers can use to elevate their living standards, and the money goes directly to the people whose hands brought that specific product to life. In addition to the benefits paid directly to workers, Fair Trade Certified factories are required to adhere to Fair Trade USA's strict standards for safe working conditions and environmental responsibility. An example are the Patagonia Men' s Stretch Hydro Planing Board Shorts - 21", made of quick-drying and superlight 100% recycled polyester with 2-way mechanical stretch, a DWR (durable water repellent) finish and 50+ UPF sun protection.

4.2 Ride the Clean Wave Surf Industry & Sustainability against Pollution

4.2.2 Vissla and the "upcycling" in boardshorts. A Nature' s little miracle

Thanks to the Cocotex® process, the overlooked "waste" is turned into an activated carbon fabric. And the properties of this fabric are everything you could ever wish for in a pair of trunks.

Vissla Team

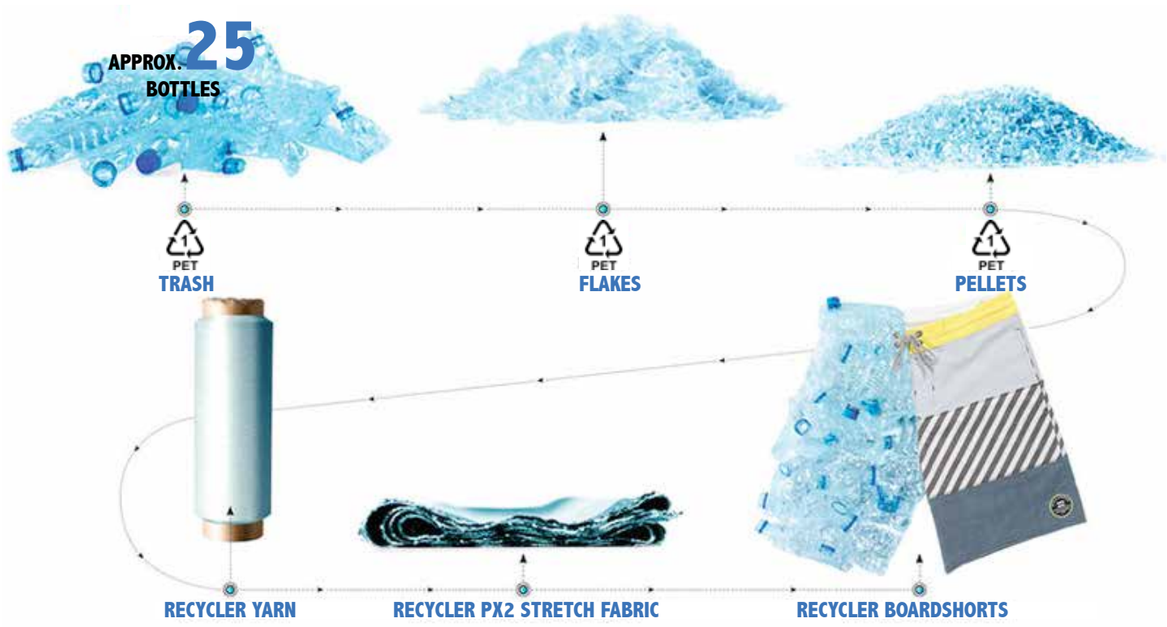
Current page
Vissla Coconut Boardshorts
from vissla.com
Next page
Billabong Recycler series process and boardshorts
from billabong.com

We already went through the brand attitude in the "Design Wave" chapter, taking in consideration as high examples of eco-wetsuit the ECO-SERIES promoted by Vissla in collaboration with Sheico. Advanced environmentally conscious materials designed & constructed for the waters regard not just wetsuits but all ranges of swimwear promoted by the company. As reported in this paragraph, the Vissla interest in this case is referred to the upcycling process, another way of walking the ethical and sustainable path. It is then not just a matter of what you design but also a matter of what you do, as a brand, to sustain the beliefs you have. Coconuts Upcycled Boardshorts are a Nature' s little miracle. Each year, the Earth gives us more than 20 billion of coconuts to use as we please. Most of the time, the inner portion of the nut is made into food, medical and cosmetic products. The outer husk is considered waste and discarded, transported to sit and rot in a landfill. This is an inefficient process that brings unwarranted harm upon the environment.
Turns out that coconut husks blended with polyester are a perfect material to make boardshorts out of! Here comes the concept of "upcycling".
The process of upcycling converts waste into want. In making these garments, coconut husks were upcycled into an odor-resistant, fast drying, Cocotex® yarn. They are then blended with Repreve® recycled polyester yarns to create the perfect performance boardshort fabric. They stretch, they breathe, they fight odor and they last, but all of this is done naturally, reducing the amount of waste in the oceans and in landfills. An example are Hells Swells 18.5" Boardshort: they are wavy, washed 4-Way stretch boardshorts made with upcycled/recycled fibers - 36% Coconut, 34% Recycled Polyester, 20% Cotton, 10% Spandex - featuring all over wave print with contrasted solid tethered waistband, side entry pockets and back pocket with pocket flap and Vissla woven labels.

Appendix.
Vissla & Surfrider Foundation.
We share a love of sea and surf and have a stake in preserving them. Vissla partnership with the Surfrider Foundation in conjunction with the Surf Industry Coastal Defender Program is a great example of why I selected it as a source of inspiration. The Surf Industry Coastal Defenders program is a collection of thought leaders who have aligned to fortify Surfrider Foundation's mission to protect and enjoy our ocean, waves and beaches. This new program gives surf industry companies the opportunity to give back to the place where they work and play. If beaches are closed, the water is polluted or surf breaks are lost due to coastal development, the surf industry as a whole is impacted - not just in the revenue bottom line but also in the loss of the special places that make the sport so unique.

4.2.3 Billabong and the "recycling" in boardshorts

Saving millions of bottles from our oceans and landfill & winning four back-to-back SIMA awards for the "Environmental Product of The Year"



"As surfers, we are passionate about making environmental changes, and are honoured to be recognised for our ecological efforts by the Surf Industry Manufacturers Association (SIMA), winning four back-to-back awards for the "Environmental Product of The Year." It' s 2014. From boardshorts to t-shirts to boxers, Billabong has a range of garments which have been developed from environmental - friendly fabrics and fibres to lesson the impact on the environment and create greater awareness of responsibility to preserve the planet. Improved production techniques and a growing demand for these alternative products have seen them progressively introduced into the Company's product range. As other surf brands Billabong is an active partner of the Surfrider Foundation, and many others*. Billabong has been a proud partner of Surfrider Foundation for over a decade. They have worked together to move forward the mission of protection for oceans, waves and beaches.

A reflection of this partnership is the Recycler boardshort collaboration series: in the series, 87% of the boardshorts are made from recycled polyester and every Billabong product is shipped with an hangtag describing the Surfrider's mission statement. Approximately 1,500 PET bottles are littered in our oceans every second. So, considering that a single plastic bottle takes hundreds – up to thousands – of years to breakdown, we all need to make a change. Because part of the brand's corporate social responsibility strategy is to reduce carbon footprint, the brand is proud to have pioneered a way to give these waste a new lease of live by recycling them into Billabong products. Not only they are ultilising waste material to create new, innovative products, but this process also helps to save 50% - 60% of the energy required to make goods out of virgin materials. Up to 25 PET bottles are ultilised in a single product. To date, the brand has recycled over 57 million bottles, and this number is increasing everyday. The recycling of old plastic soda bottles lead to a fabric called Eco-Supreme Suede to manufacture Billabong Eco Boardies, like the example proposed here: **Billabong Method Boardshorts.**

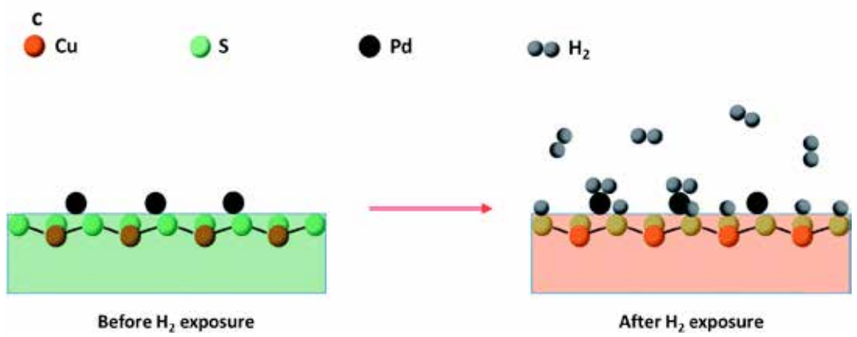
Note. Billabong collaborate with different associations like WWF or SASSI (WWF's Southern African Sustainable Seafood Initiative). One of the collaborations with WWF was the "Go Blue – Save The Coral Reef" programme, set up in April 2013 by Billabong to show its support towards ocean conservation. The brand and its customers have successfully helped the "Go Blue Mission" by adopting and replanting a total of 577 pieces of coral in Tanjung Kotal, West Bali. Studies found by the Indonesian Institute of Sciences (LIPI) have shown that over 70% of Indonesia's coral reefs have been damaged. Billabong participated at the project together with the Coral Reef Community, Turtur Dive and Earth Hour Denpasar WWF organisation, Waka Shorea Resort and of course, its loyal customers, showing that we can all be an integral part in conserving our surround reefs and ocean inhabitants.

4.3 Translate the environment into a visual representation. A connection between Design, Surf & Ocean Pollution

4.3.1 "Extraordinary collectors of experience" Emotional environment and environmental design

The current paragraph has the role of going into a specific sphere of the design practice and research: the ***cross-fertilization*** between ***scientific studies*** and discoveries and their application on ***apparel Design*** in terms of ***smart materials***.

This long chapter's journey brought us through a selection of different Design approaches and solutions regarding the theme of the pollution of the Oceans. The current final paragraph has the role of going into a specific sphere of the design practice and research: the cross-fertilization between scientific studies and discoveries and their application on apparel Design in terms of smart materials.
This will help me to introduce **the main peculiarity of my project: the wetsuit's reaction to hazardous chemicals detected in the water through a color changing.**
While the application of these studies to my wetsuit is exposed in the specific section of the "Project Development", *this paragraph synthesizes my researches regarding the facinating world of collaboration between Science and Design.*



The following section is an integration of ***the book "Materials that change color - Smart Materials, Intelligent Materials" by M. Ferrara and M. Bengisu*** with my studies, researches, considerations and the analysis of scientific publications related to this theme I' ve run into during the past months.
The reading was fundamental for a more sensitive and professional approach to the theme of "materials that change color" and the effect they can induce or produce in design and users, theme I was really interested in. Going through a deep analysis of the different types of effects and methods, the classification of the chromogenic materials and their manufactuing process and applications and the selection of some case studies, *this research helped me in the comprehension of specific techniques but also in the "expression through proper words" of some philosophical concepts related to this interesting subject.*

Extraordinary collectors of experience. From the beginning of the book, the main theme seems to be not only the reflection on which opportunities are offered by smart materials to designers but the user - product interaction. An interesting point comes when the author underlines the fact that, as it happens with all that is new, the use of smart materials depends on their acceptance and familiarity.
I think that the first steps for changements must be moved starting from small early adopters that are really sensitive to the meaning of the new product you are proposing, even if this niche won' t be the answer for the big changement, they are the fundamental substrate to then reach a wider segment. **That' s why I decided to work on such a specific garment, like a wetsuit for surfers,** to send the message against ocean pollution: because I found in this community around the world a logical, if we want, natural and sincere interest upon this theme, that touches the main divine source of surfing activity: the sea.

Even if it' s going to be the surfer the one who is interested in the wetsuit, he becomes a "message bearer" for all those that are around him.
Wouldn' t you be impressed by looking at a surfer entering the water of the same beach you are at, with a blue simple wetsuit, and realizing after some time that the wetsuit turned yellow ?
By reading the popped-up message *"I believe in a better wave"* wouldn' t you be interested in knowing what does that stand for? And once known that this reaction is related to the hazardous pollutants present in the same water you were swimming minutes before, wouldn' t you be touched by this visual demonstration and maybe interested in *doing something for a less polluted and better wave?*

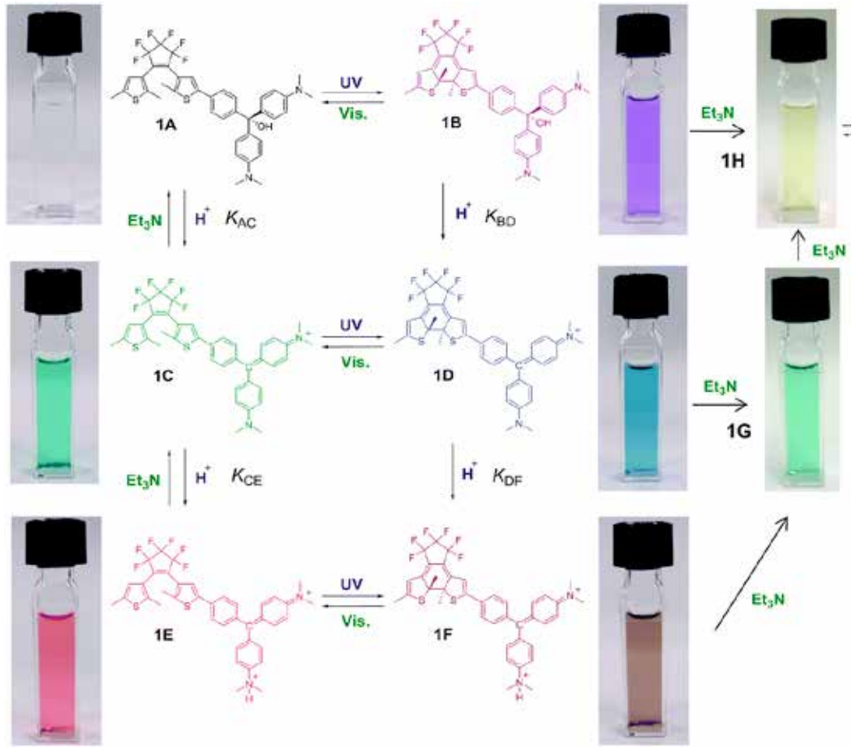
What is intended by "smartness" of a material.
The smartness in a material is determined by the relationship between properties, state and energy applied directly to the material. If the relationship influences the internal energy of the material, altering both the molecular/crystal structure as well as the microstructure, then the input will cause a change in the material properties (if the machanism modifies the state of energy of the material but doesn' t affect the material itself, the reaction is about exchanging energy from one form to another but the material remains the same and in this case this class is not considered "smart"). *Smart materials have been specifically engineered to accomplish a particular performance objective thanks to their capacity to respond dynamically to the environment, their ability is to detect and respond to stimuli from it providing a specific and reversible reaction.*
Studies so far undertaken demonstrate that these materials, if suitably applied, increase the functional performance, aesthetics and communication skills of objects while saving energy respect to traditional systems. ***Nothing seems better than this for my intent and what I am asking to my wetsuit.***

The role of designers. The point is that these smart materials are the witnesses of a new chapter in the history of design, proposing **a new framework in which designers can collaborate with other actors of innovation to imagine a new interactive nature of products.** *Most of the publications on smart materials are scientifically and technically oriented, while the cultural, poetic and practical aspects are still not deeply explored.* ***And this is the reason why my project is about surfing AND ocean pollution, because I found in this union the perfect marriage between a "soul need" and a "technical answer"***, believing that one would be blind and not - so - strong and determined without the other. Designers have the responsibility to find ways to develop applications to ensure that they can become available for the improvement of our daily lives. It is a matter of ***"emotional involvement"*** of users.

Here it comes the power of color and, applying color possibilities in design, of color chromogenic materials, potentially promising for that design - driven innovation that aspires to an emotional involvement. A question is what is the meaning of color for designers and what can be the added value of color changing in the design world.
I found this a great poin to meditate on . .

Current page
Eye-readable gasochromic effect and optical hydrogen gas sensor based on CuS–Pd effects. From 'Advances Journal publications' - RSC publications
Next page
Photo - and halochromic multicolor switching system consisting of diarylethene and malachite green moieties effects. From the 'Journal of Chemestry' - RSC publications
Sun-reactive swimsuit by Amy Winters
Hydrochromic inks effect on umbrella

Actually the possibility of having a dynamic range of colors instead of a fixed and static one in something quite new. Humans experience things through their senses and according to their own culture they have sensations, feeling, thaughts, they give meanings to the objects and even in the context of globalization something culturally peculiar remains. Designing with materials that change color not only lead to experimantation and innovation, but to new poetics of design, different interpretations of everyday life. ***A sentence that cauched my attention is that dynamic materials*** with their capacity of continuous adaptation and harmonic transition ***are "extraordinary collectors of experience"***, gradually ***shifting from a technical centered approach to a user centered one.***
Also in chapter 4 another valuable concept is introduced. Referring to the Italian Design research in history, the author underlines the particular interest in some theories of "design primario" focusing on *soft qualities of products* - which include color of course. Cause they are qualities related to material characteristics/interaction with environment, they become the heart of human experience in the artificial environment because they affect user' s perception and the concious or unconcious meaning transmitted by the design.
So shifting the focus from structural qualities/functional requirements to "soft" ones, Design concentrates on expressiveness of products, physical and environmental experience,



emotional value of material, raising the quality of the relationship between man and the world around him. In this poetic paragraph the author mentions Trino Clini Castelli, a designer that devoted its research on these issues, coining terms like "emotional identity", "aesthetic sustainability", "ecology of emotionality" to enlight the "surface" design, because ***"the field of design is human perception, we not only design forms by creating a shape or an object, but we also design how it feels"*** (Kenya Hara - Japanese designer, creative director at Muji).
"I believe that technology will bloom when planted on this sort of sensory perception" (Z. H.)

In depth on the types.
Materials that change color are termed **"chromogenic materials"** and they are described as ***chameleontic*** because they reversibly change color as a response to changes in environment conditions. The study of them starts with a comprehension of the natural laws expressed by the theory of color: the visible light that appears to us white is formed by various colors. The physical cause that produces the sensation of color is the interaction of luminous radiation with the electrons of the external substance or object we are looking at; the color that we observe is the light radiation reflected from surfaces, made of a complementary color to the absorbed radiation. The technical principle is called ***chromism*** and it involves the change in the microstructure or electronic state of substances (we have an alteration in the equilibrium of electrones caused by a stimulus with a consequent modification of optical properties - reflectance, absorption, emission, trasmission). Many of the natural compounds and a number of artificial compounds of specifically characterized chromic properties have been synthesized.

Focus. By studying the classification of chromogenic materials I focused on some categories that are more linked to my project.
1. chemochromic materials. *They respond to chemical changes in the environment by changing color.* They split into different categories, but those that I found more interesting for this project are:
1a. halochromic materials. *They change color according to the changes in the acidity of the surrounding medium.* The color change occurs by a chemical reaction which binds hydrogen ions to hydroxides in the solution altering the electrons flux and so the absorbed light and so the emitted color. *They are used as pH indicators/sensors* (the halochromic material is compared to reference colors related to a precise pH value). Fabrics treated with these dyes have been used in geotextiles/protective clothing that measure pH alteration in air in real time (so this is strictly related to the section of my project that "cross-fertilizes" the concept of the hazmat suits with the (wet) suit inspirations). Also currently many researches are developing applications of halochromic dyes in textile products to realize flexible pH sensors.

4.3 Translate the environment into a visual representation. A connection between Design, Surf & Ocean Pollution

4.3.1 "Extraordinary collectors of experience" Emotional environment and environmental design

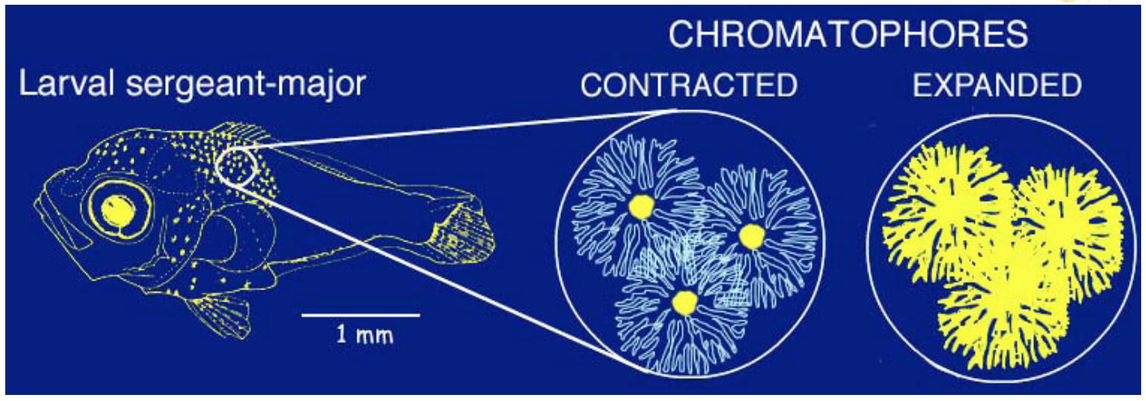
Case Study 5.3.6 Pollution Monitoring Fashion by Sue Ngo and Nien Lan. The couple mixed their designing and programming skills to give birth to a prototype series, called "Warning Series", of pollution monitoring sweatshirts during their Master in Interactive Telecommunications Program at NYU. From the white surface of the sweatshirts stand out hearts/ set of lungs in thermochromic fabric. When in contact with high levels of CO (20 - 2,000 ppm) the firstly invisible vains of the organs start to assume color, switching from "healthy" pink to "dangerous" blue. This process is possible thanks to a smart system hidden between the two layers of fabric, that is MQ - 7, a gas sensor made of a semiconductor layer of tin dioxide (SnO2), together with a powerful micro-controller, a connector wires and thermochromic ink.
Definitely ***a strong way to make you realize the inner effects that you cannot see but that are happening.***
I really believe that making visibly explicit some conditions can be a strong way to produce a reaction. Because the point here is niether the unawareness. Even if concious, sometimes you need an astonishing push to realize with you eyes the size of a problem. (Related to this point in which we discussed about pH indicators/sensors and smart systems is *Appendix 1: the sector of the "printable sensors" was at the origins of the project a possible way for detection of hazardous in waters through the wetsuit.* It seemed an interesting alternative to pigments and chemochromic dyes, especially after I run into the study "Wearable electrochemical sensors for in situ analysis in marine environments". *This of the printable sensors remains an explored but not experimented alternative*, because of many specific reasons and deductions taken together with the company partner RES in the development of my project. *The suggestion and final decision was to follow the idea of the surface treatments on neoprene because of the ease in terms of experimentations and amount of investment, at this embrional stage of the project).*

1b. hygro-chromic materials. *They change color in response to the presence of moisture or to contact with water.* It comes out easily why I considered also this type of effect in my researches: an integration of the technologies oriented on the color changing with the ones oriented to the effects induced by water/wet conditions must be one of the main paths for my type of wetsuit behaviour. *These materials containing the chromatophore groups are sensitive to the polarity of a specific solvent (water in this case) that functions like a constant electrical field and determines the change in color effect.* They are normally opaque and white but they become transparent in water. Until today most of the applications have been on already colored surfaces, so the white film, rejecting light waves, impedes them to reach with the printed image. At the moment in which the surface is wetted with water the film adquires a viscosity becoming permeable to electromagnetic frequencies and letting light waves filter through making the color image underneath become visible. When the surface is dried the ink film returns to its light impermeable condition becoming white and opaque again. The best results with hydrochromic inks in terms of applicability and durability are on polyester fabric and soft PVC. The inks can be applied by screen printing or spray coating (followed by passing it through a forced hot air tunnel).

Case Study 5.1.1 "Sun-reactive/ water-reactive dresses and swimsuits" by Amy Winters. New dimensions are added to garments and swimsuits through the use of hydrochromic and photochromic inks. Different methods are used, from the ***screen-printing*** to the ***sublimation printing***. The effect can be really different: from transition to one colour to another, to the reveal of a pattern/ writing treathened with the ink that allows these parts to not get wet so that they pop up lighter compared to the rest of the non-treathened swimwear, to the idea of covering parts of the design piece with white hydrochromic ink: when this treatment gets in contact with water it "disappears" becoming transparent and revealing what is underneath, so the Rainforest swimsuit, getting wet, shifts from white to purple.

2. biochromic materials. *They detect and report the presence of pathogens with a color shift.* They have been studied starting from specific biological membranes mimicking their structure and effects. Conjugated polymers such as polydiacetylene (PDA) and plythiophene (PT) are commonly investigated for these purposes. PDA has the ability to self assemble into organized vescicles and films and to show a drastic color change from blue to red under heat/mechanical stress/ molecular recognition of pathogenic agents. PT is an organic polymer and shows chromic transitions upon excitation by heat/metals/chemicals/proteins. *PT - based materials functionalized with carbohydrates such as sialic acid absorbance were registered for detection of toxins.*
The colorimetric response of PDA films occurs within several minutes and it depends on the interaction of bacterially secreted membrane-active compounds (bacteriocins/receptors) or on the insertion of hydrophobic peptides and proteins into the PDA membrane. The color change is irreversible in PDA supramolecular assemblies while the color strenght depends on the species/ strains/growth rate/population of the pathogens. ***These types of treatments can become really fundamental for health and quality concerns. That' s why I wanted to go deeper in this point.***

3. Dynamic color in Nature. This as been an inspiring section and a source of new discoveries for me. Because of the spirit of my project and of my interest, passion or even more, love for Nature, I could not overcome it so *I decided to analyze this section, even if not strictly related to the final process selected for the thesis, because anyway it remains for me a valuable inspiration and research material*. Nature hosts many exaples af animals and plants that change color because of this phenomenon.

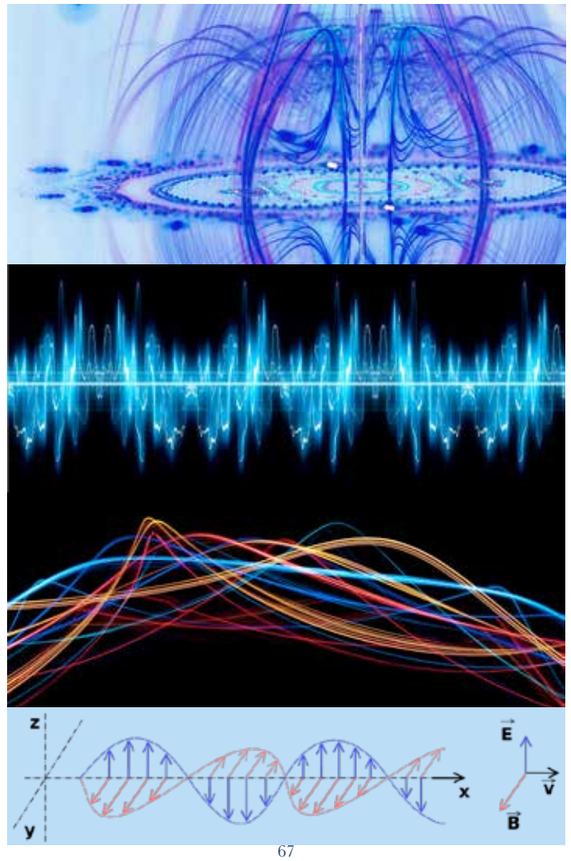


Chameleons, octopuses, squids, flatfish display rapid change in their skin color. The "guilty part" are pigments contained in cells called ***chromatophores***. There are two mechanisms that lead color change in the skin: it can depend on relaxing/ contractin muscles (when muscles relax pigment sacs of chromatophores shrink and concentrate the pigment - active neurophisiological control), or you can have simple dispersion of pigment within chromatophores (and this is under neural/endocrine control). An additional feature is creating patterns for communication and camouflage. Various patterns can be created but the number is fixed and it is not just a matter of chromatophores but also of ***leucophores***, ***iridophores*** and ***skin muscles***. So it seems that designers could learn a lot from nature for research, development and design chromatogenic materials. I' ve been studying different scientific papers regarding this theme and in Appendix 2 I selected some Case Studies I found valuable to cite during this journey of reacting colors.

Manufacturing&Application. One of the difficulties in the use of chromogenic pigments or dyes is their incorporation into a bulk material or into the surface without harming the chromogenic features.
Microencapsulation is a key process. It can assume different names; coacervation (used for the first time in the 50s for carbonless copy paper - and we go back to the concept of cross-fertilization!) or *melamine-formaldehyde systems* go through chemical reactions to produce capsules containg the dye in emulsion. Microencapsulation allowes more flexibility in manufacturing and product use and it is commercialy available in form of microencapsulated liquid crystals (adhesive sheets/ready to spray slurries/water-resistant microcapsules).
Chromogenic inks propose an alternative path. They contain leuco dyes and liquid crystals and the colorants used can be under the form of *pigments* (insoluble in liquid/solid mediums - due to this they reduce transparency because of diffraction and they have softer effects) and *dyes* (soluble - they can give transparency and they provide brighter colors - disadvantage is the lower heat stability and their migration in certain polymers such as PVC and polyolefins). The pigment/dye is dispersed in suitable vehicles that can be resins dissolved in solvents or oils and then we have to underline that the ink formulation is also related to the type of *printing method*. The author underlines the resistance of these treatments that can go *from six months to years depending* on exposition of sun/UV/wash cycles and this is a main point in my type of garment thai is ment to be inside water/under the sun/washed often.

Methods. About the methods, printing and coating are mentioned. More that the traditional *offset printing* (the most diffused for simplicity/low cost/ durability/versatility, based on positive and negative images on a flat plane), more than the *screen printing* (or serigraphy), interesting is *flexography*, a high quality printing process applied on a wide range of materials, together with *coating*, which main purpose is to impart new characteristics to the substrate or to protect it from environmental effects keeping flexibility as a main property.
To end this section the author refers also to the *chromogenic textile*, that is interesting for the fact that it can be an *alternative to printing*, incorporating the chromo pigments already into molten polymers, with the advantage of a longer effect because the pigments are not on the surface but within the structure and also of an easier way of obtaining the desired effect wherever on the product (especially in areas where printing would not be possible or easy or perfectly done).

To conclude this important pharagraph I inserted **Appendix 3**, a selection of three case studies I' ve been running into during my researches, that I found valuable in terms of strenght of the message and technology experimented.
The "additional" **Appendix 4** is inserted at the end of the paragraph. It is related to some interested discoveries I' ve been reading about fabric treatments to arise performances in terms of 'taking inspiration from Nature'.
These examples are not related to the color change but they can be interesting studies to consider in depth in terms of inspiration for different wetsuit performances.



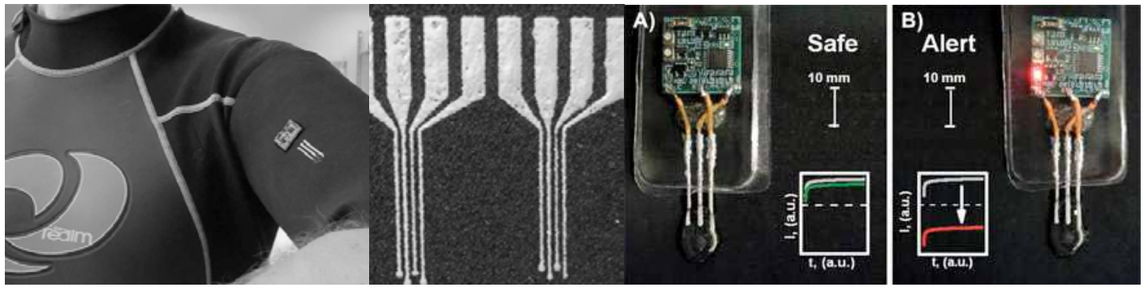
"There are many waves, in science, in the quantum world, in light and energy, in sound. . there are infinite variables of waves.. it could be said that all sentient beings are surfers of the standing waves of possibility."

Kevin Lovett."Stoke in a sea of uncertainty"

Previous page 66
Stone Island Marina Jacket, heat reactive
Blue Lined Octopus from smithsonianoceanportal.com
Current page 67
Color mechanism on reef organisms, from BCCR
Types of waves in science: quantum, sound, light, electro/magnetic waves

4.3 Translate the environment into a visual representation. A connection between Design, Surf & Ocean Pollution

4.3.2 Soul needs and technical answers. Case studies



Appendix 1

Detecting pollution through printable sensors.

From the Study
"Wearable electrochemical sensors for in situ analysis in marine environments"
by Kerstin Malzahn, Joshua Ray Windmiller, Gabriela Valdés-Ramírez, Michael J. Schöning and Joseph Wang - published by Royal Society of Chemestry July 3, 2011 and on Analyst Journal

The concept discussed here is integration into dry- and wetsuits worn by divers and recreational surfers/swimmers, with the intent of providing the ability of continuously assessing their surroundings for environmental contaminants and security hazards.
The interest was to develop wearable screen-printed electrochemical sensors on underwater garments, able to determine the presence of environmental pollutants and security threats in marine environments. Owing to its unique elastic and superhydrophobic morphology, neoprene is an attractive substrate for thick-film electrochemical sensors for aquatic environments and offers high-resolution printing with no apparent defects. The neoprene-based sensor was evaluated for the voltammetric detection of trace heavy metal contaminants and nitroaromatic explosives in seawater samples and the research was also the first example of enzyme (tyrosinase) immobilization on a wearable substrate towards the amperometric biosensing of phenolic contaminants in seawater.
Wang, professor in the Department of NanoEngineering in UC San Diego's Jacobs School of Engineering, noted that many members of his team - involved in UCSD deep waters tests checking the presence of explosives - were surfers, and also noted that for these kind of expetidions the detection was conduced by divers carring with them heavy bulky devices. It was a logical leap to see if it would be possible to print sensors on neoprene, the synthetic-rubber fabric typically used in wetsuits for divers and surfers. The researchers believe that neoprene is a particularly good fabric on which to print sensors because it is elastic and repels water. It permits high-resolution printing with no apparent defects. So Wang, after years of researches, made that step: from nanoengineering rigid circuits to the screen printing of thick-film electrochemical sensors directly on flexible wetsuit material - with the possibility of being pulled, pushed and contorted - paving the way for nano devices to detect both underwater explosives and ocean contamination.
Working principle. A three-electrode sensor was printed directly on the arm of the wetsuit, and inside the neoprene a 3-volt battery and electronics was embedded." The electrochemical sensors are based on applying voltage to drive a reduction-oxidation (redox) reaction in a target threat or contaminant – which loses or gains electrons – then measuring the current output. The wearable microsystem provides a visual indication and alert if the levels of harmful contaminants (or explosives) exceed a pre-defined threshold. It does so by mixing different enzymes into the carbon ink layer before printing on the fabric. (For example, if the enzyme tyrosinase interacts with the pollutant phenol, the LED light switches from green to red. The electronics are packed into a device known as a potentiostat that is barely 19mm by 19mm and the battery is stored on the reverse side of the circuit board. "In the paper we used only one electrode but you can have an array of electrodes, each with its own reagent to detect simultaneously multiple contaminants."
"We still need to validate and test it with the Navy," said Wang, but what the tests show for now is that even underwater and with bending and deformations the sensor performs well . "While the primary security interest will be in the detection of explosives, the Navy in San Diego bay has also detected large concentrations of toxic metals from the paint on Navy ships, so we should be able to print sensors that can detect metals and explosives simultaneously."

Fig1. Three-electrode sensor printed on neoprene wetsuit fabric. The electronic board and battery would be embedded in the fabric, while the sensor remains in direct contact with water.
Fig2. Two arrays of four silver electrodes printed on neoprene
Fig3. Battery-operated electrochemical microsensor includes screen-printed, three-electrode sensor linked to electronics board (potentiostat). A) represents functioning in safe environmental conditions; B) shows red LED, indicating increased current magnitude caused by elevated phenol content in seawater. (Insets) Dashed lines indicate threshold for safe – or hazardous – phenol levels.

Appendix 2

"Riding the wave of integrated science and technology"

A2.1 Illuminating the Perils of Pollution, Nature's Way - Bioluminescent Bacteria to Combat Pollution
By Eric Olsen From Nytimes Publish on December 19, 2011
"It's my belief that if we can make pollution visible, and let people know what small things are causing, this would define an improvement for the environment," she said, "I think it could make a huge difference. It can be a game-changer." E. Widder
The marine biologist Edith Widder has spent a career studying bioluminescent sea creatures. After reading a report by the United States Commission on Ocean Policy that described the perilous state of the world's oceans, she founded the Ocean Research and Conservation Association, or ORCA and she is now using a lifetime studies to fight water pollution. Bioluminescence is an ability shared by creatures around the planet that allows them to generate light (90% of life in the world's oceans possess this characteristic). Whereas most animals use it to help them find food, attract mates, and defend against predators, this marine biologist is harnessing bioluminescent bacteria to save one of Florida's most precious and threatened ecosystems – the Indian River Lagoon.
By mixing bioluminescent bacteria with sediment from the river estuary, renowned scientist Dr. Edith Widder is able to determine how many toxic chemicals are present in the water, by measuring how quickly the light dims as the chemicals kill samples of Vibrio fischeri bacteria. Widder underlines that this method gives scientists a better indication of HOW polluted the water is, rather than simply measuring the level of chemicals in the water.
Speaking to the New York Times she underlined that her studies had already revealed high concentrations of heavy metals and nutrients like phosphorus and nitrogen. Her research has placed sensors all around the estuary in order to beam real-time water data such as current and flow direction to her lab. With these data and the measurements of the river's toxicity, Widder believes she can trace the source of pollution. George Jones, executive director of Indian Riverkeeper, and Bruce Robison, a senior scientist at the Monterey Bay Aquarium Research Institute in California believe the potential benefits of Edie's efforts are huge.

Fig.4 Functionalization of cotton fabric with beta-cyclodestrin polymer. The resulting fabric cacn sequester organic micropollutants like bisphenol A from water or volatile organic compounds (VOCs), then extractable under reduced pressure for reuse. This purification process is scalable and compatible with existing manufacturing techniques. Credit: Juan Hinestroza/Provided

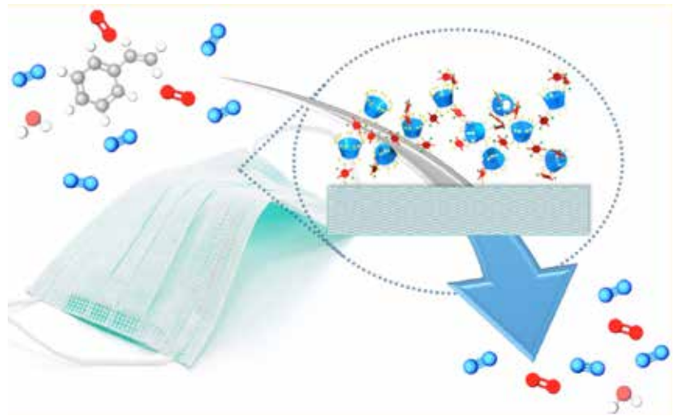
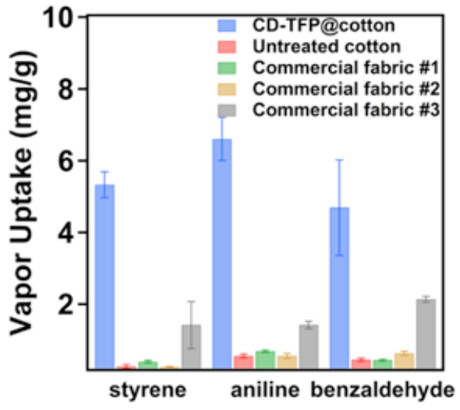


Fig.5 Graphic of saturated VOC uptake of styrene, aniline and benzaldehyde by the CD-TFP@cotton, untreayed cotton and commercial fabrics (1 - 3: 15mg of fabric) after exposure for 10 min.



A2.2 "Bio-inspired approaches to design smart fabrics"
by Ajay V. Singh, Anisur Rahman, N.V.G. Sudhir Kumar, A.S. Aditi, M. Galluzzi, S. Bovio, S. Barozzi, E. Montani, D. Parazzoli - published on ELSEVIER - Materials and Design section, April, 2011

The study goes through a deep analysis of 10 bio-inspired strategies to imply the textile industry, to change the face of fashion and fabrics. The notion of bioinspired smart material design is intended to perform artificial mechanosensing and actuate phenomenon in our daily wearing clothes and apparel for different benefits.
"Chameleon of the sea" reveals its secrets - Harvard-MBL Team
"Nature solved the riddle of adaptive camouflage a long time ago," said Kevin Kit Parker, Tarr Family Professor of Bioengineering and Applied Physics at the Harvard School of Engineering and Applied Sciences (SEAS) and core faculty member at the Wyss Institute for Biologically Inspired Engineering at Harvard. "Now the challenge is to reverse-engineer this natural process in a cost-efficient, synthetic system that is amenable to mass manufacturing."
In a paper published January 29 in the Journal of the Royal Society Interface, the Harvard-MBL team reports new details on the sophisticated biomolecular nanophotonic system, underlying the cuttlefish's color-changing ways, as an instrument for improving protective gears for soldiers and battlefield.
The cuttlefish, known as the "chameleon of the sea," can rapidly alter both the color and pattern of its skin, helping it blend in with its surroundings and avoid predators. To regulate its color, the cuttlefish relies on a vertically arranged assembly of three optical components: the leucophore, a near-perfect light scatterer that reflects light uniformly over the entire visible spectrum; the iridophore, a reflector comprising a stack of thin films; and the chromatophore. When the cuttlefish actuates its coloration system, each chromatophore expands; the surface area can change as much as 500 percent.
"It is extremely challenging for us to replicate the mechanisms that the cuttlefish uses. For example, we cannot yet engineer materials that have the elasticity to expand 500% in surface area. And were we able to do so, the richness of color of the expanded and unexpanded material would be dramatically different - think of stretching and shrinking a balloon!" Evelyn Hu - coauthor and Tarr-Coyne Professor of Applied Physics and of Electrical Engineering at SEAS Deciphering the relative roles of pigments and reflectors in soft, flexible skin is a key step to translating the principles of actuation to materials science and engineering. This collaborative project expanded our breadth of inquiry and uncovered several useful surprises, such as the tether system that connects the individual pigment granules." Hanlon

This work was supported in part by the Defense Advanced Research Projects Agency, the Nanoscale Science and Engineering Center at Harvard supported by the National Science Foundation (NSF), the NSF-supported Harvard Materials Research Science and Engineering Center, and the Air Force Office of Scientific Research.

**Other interesting effects mentioned in the research as case studies are:
5. Pine cone inspired higroscopic movements to design smart breathing fabrics,
7. Self healing fabric design inspired by nature' s healing mechanism in mammalian tissue,
9. Spider silk inspired anti-tear fabric design for mechano-elasticity
10. shark skin and antibacterial effects
But I decided to talk about them in Appendix 4 at the end of the chapter, because they are not related to the color changing but anyway valuable inspirations for high-performance properties in wetsuits

Appendix 3

Applications on Fashion Projects

A3.1 Detect, react, absorb, purify - Functional textiles clean pollutants from air and water
From the Study: "Cotton Fabric Functionalized with a beta - Cyclodextrin Polymer Captures Organic Pollutants from Contaminated Air and Water"
by: Diego M. Alzate-Sánchez
Journal reference: Chemistry of Materials 2016, Provided by: Cornell University

"There's a lot of pollution generation in the manufacture of textiles. It's just fair that we should maybe use the same textiles to clean the mess that we make." Dr. Hinestroza
Hinestroza, associate professor of fiber science and director of undergraduate studies in the College of Human Ecology, worked in collaboration with Cornell chemistry professor W. Dichtel and others to show the ability to infuse cotton with a beta-cyclodextrin polymer, which acts as a filtration device that can work in both water and air. Cotton fabric was functionalized by making it a participant in the polymerization process.
The addition of the fiber to the reaction resulted in a unique polymer grafted to the cotton surface with the result that this "new" polymerized fiber could uptake pollutants in water (bisphenol A) and air (styrene).
The treatment for bisphenol A. Cotton fabric is covalently functionalized with a porous beta-cyclodextrin polymer by including the fabric in the polymerization mixture. The resulting functionalized fabric (CD-TFP@cotton) sequesters organic micropollutants, such as bisphenol A, from water with outstanding speed and a capacity 10-fold higher than that of untreated cotton. Adsorbed pollutants were fully extracted from CD-TFP@cotton under reduced pressure at room temperature, permitting simple reuse. This functionalization approach is scalable, likely to be amenable to other fibrous substrates, and compatible with existing fiber manufacturing techniques.
Hinestroza pointed out two several points that should make this functionalized fabric technology attractive to industry: it is compatible with existing textile machinery, so there is no need for retooling, and it works on both air and water proving that there is the possibility of removing the compounds and reuse the fiber over and over again, hoping that this discovery could play a role in a cleaner, more environmentally responsible industrial practice.

4.3 Translate the environment into a visual representation. A connection between Design, Surf & Ocean Pollution

4.3.2 Soul needs and technical answers. Case studies

"I am not a politician and I'm not an actor so my medium to effect change is design objects."

N. Bentel

A3.2 AEROCHROMICS
Project. A Color-Changing Shirt That Detects Air Pollution

Polluted air yields the most beautiful sunsets? Polluted air yields the most beautiful sweaters.
"I want people to get more familiar with the fact that pollution is everywhere and that we will have to live with it if we don't change our ways. One of the ways to get people to look at information is to embed the technology into the objects they use and they love." says Bentel.
At first glance, the **Nikolas Bentel** line of smart clothing looks unassuming: simply a set of basic all-black/white sweaters. But if you wear them out in the city long enough the black fades into graphic effects like intricate pattern of polka dots, cheetah prints and another labyrinthine design.***The shirts change color when they detect an unhealthy and dangerous concentration of specific pollutants in the air.***

What the 3 sweaters react to:

- carbon monoxide
- particulates (common air pollutants)
- radiations

How:

- For carbon monoxide, Bentel looked to the ink used in common, low-tech household CO detectors and used the same substance - metal salts - in the fabric dye. As the dye comes in contact with carbon monoxide, a camouflage motif appears. As the ratio of oxygen to carbon monoxide increases, another chemical reaction takes place and the fabric returns white.
- For the particulate - matter detecting shirt Bentel embedded sensors in the shirt and a micro-controller in the collar.

Small heat pads are woven throughout the shirt and when the sensors detect an unhealthy level of particulates, the micro-controller sends a signal for those pads to warm up, which activates a thermo-sensitive dye and a polka-dot pattern materializes. (N.C. When the ***Air Quality Index*** detected hits 60, defined by the EPA - Environmental Protection Agency as a "moderate" health concern, the sensors activate the micro controllers. As the AQI approaches 160, which falls into the "unhealthy" interval, the shirt's entire pattern is revealed).

- The radiation - activated shirt, which is still under development, is the only one that doesn't return back to its original state after coming in contact pollutants. "One change is enough because you don't want to get next to radioactivity often!" Bentel says. Using a chemical indicator dye, similar to what's in commercial radiation - detecting products, the shirt detects electron-beam radiation (the same radiation that's sometimes used to treat cancer). Nowadays, there are several ways for people to stay on top of their city's level of air pollution (from websites that map global air pollution in real time to portable sensors and mobile apps), yet that information escapes the general public—and therefore isn't on top of their list of priorities. ***"Seeing your shirt come alive with patterns as you walk through a polluted area sounds horrifying, but that's the goal. That' s the power of the project and of its message."***

A3.3 Using Material to offer an innovative language within visual communication: the Unseen Studio - Wearable Futures.

Alchemist **Lauren Bowker** has embedded the ink that changes colour depending on different climatic conditions. ***At the Royal College of Art she developed the production of this ink that can respond to a variety of different environmental conditions.*** The starting point was related to seven stimuli: heat, UV, pollution, moisture, chemicals, friction, sound. The inks can be applied to most materials using various methods, depending on the characteristics of the surface. They can be screen-print, paint, spray or alternatively they can be used directly on fibers' dyeing process so they are totally embedded inside the structure. *Bowker began her research by creating a pollution - absorbent ink called PdCl2*, which changes colour from yellow to black in dirty conditions then reverts back in fresh air.* After presenting the technology in fashion pieces, it was picked up by a range of companies who asked her to collaborate on projects including a concept airplane cabin by Airbus. The point is find out a scientific method for a process than can not just be replicated but adapted to whatever need: the designer can customise the inks to change colour in specific places by mapping the conditions at the locations and creating an ink to respond to these parameters.

"If you came to me and said 'Lauren, I want my silk jersey to change colour when I'm at Oxford Street, then when I'm at Baker Street I want to be a different colour', I would go out and map the fluctuations in the environment of each tube station then I would create you an ink that responds to those environments". Bowker recently set up The Unseen, a design house for biological and chemical technology embedded id multiple fashion projects.
"I trust in the unseen world around us, it can offer beauty, magic and faith. I want others to see what I see."

Current Page
Aerochromics sweatshirts by N. Bentel
*The multi award winning **PdCl2 ink** is a chromic dye capable of reacting in the presence of carbon emission, presenting a reversible colour change from yellow to black, logically evolving into a platform that aesthetically visualises environmental conditions.
Swarowski Collaborations. (1) A form of wind reactive ink that changes colour upon contact with the air around us was developed intending to reveal the otherwise unseen turbulence surrounding the humans. Presented at London Fashion week 2014. (2) The relationship between gem stones and the world of material science. The research was conducted during a workshop at the Vicenza Fair for jewellery 2014. Being compatible with the human reactions enables each stone, when worn, to act as a conduction insulator, absorbing energy loss from the head to create these pieces, tretened with the 'THEUNSEEN Magick' ink. A colour change gradient dependant on energy loss induces the shift through black > orange > red > green > blue > purple. This fluctuates over areas of the brain in use. When worn the headpiece becomes a reflection of the inner human thaughts. In the future, Bowker hopes the inks will be adopted by the medical industry. "If it goes into a T-shirt that lets you know if you're going to have an asthma attack, that for me is much more successful than having an amazing fashion collection."

Fig. Self healing fabric design inspired by nature' s self-healing mechanism in mammalian tissue. Upper panel exhibits complex mechanism of self healing in mammals. Lower panel gives a physic-chemical route as self healing fabric design

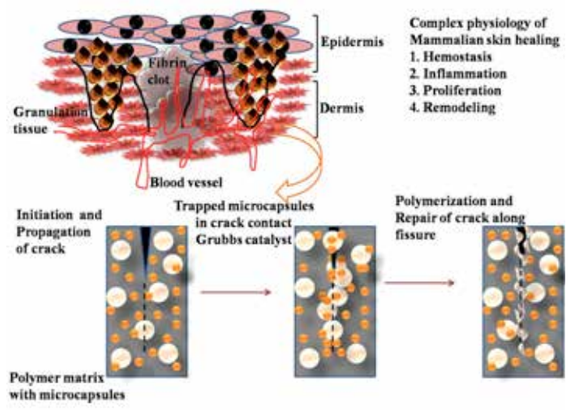
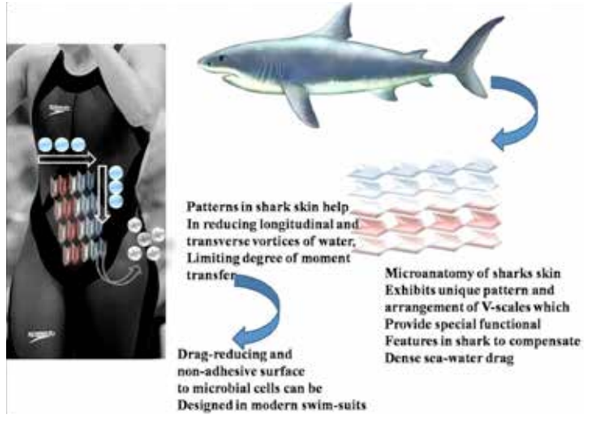


Fig. Shark skin feature inspired low hydrodynamic surface drag: high efficiency swimsuits with antibacterial effect.



Appendix 4

Pills from Nature for new performance possibilities

From the study already discussed in Appendix 2 "Bio-inspired approaches to design smart fabrics" I wanted to develop this additional appendix, that is not properly related to the color changing but that, taken the world of Nature as inspiration, selects some case studies that can be interested for the incrementation of wetsuit multiple tech - performances.

A4.1 BREATHABILITY - Pine cone inspired hygroscopic movements to design smart breathing fabrics
The seed-bearing pine cones are characterized by the hygroscopic movement. This means that they respond to change in relative humidity by opening-closing cone aperture when season changes. This natural phenomenon inspired the researches to mimic the pine cone for desining humid sensitive adaptive cloth, delivering relief from the discomfort caused by moisture in clothing microclimate as experienced in urban environments. The fabric design utilizes two layers: one of thin spikes of wool, another water-absorbent material which opens up when gets wet by the wearer's sweat, like ovuliferous scale in pine. When the layer dries out, the spikes automatically close again. An underneath second layer protects the wearer from the rain and this smart fabric works like breathing cloth, taking dry air in while closing the fabric pores, and moist air out while opening. Such fabric adapt to changing temperatures by opening up when warm and shutting tight when cold, just like pine's bracts.

A4.2 AGAINST COLD - Self healing fabric design inspired by nature' s healing mechanism in mammalian tissue
Nature' s self healing ability has inspired the design of self healing fabric.
Healing process in mammals involves hemostasis, inflammation, proliferation, remodeling; these events take place spontaneusly, evolving around a series of chemical reactions of a series of active enzyme cascades known as clotting factors. Moving from these natural phenomena scientists developed microcapsules reinforced with hollow fibers. These lightweight material exhibits high stiffness and superior elastic strenght over the conventional materials. Microencapsulation of self-healing components involves the use of a monomer, dicyclopentadiene (DCPD), stored in urea-formaldehyde microcapsules dispersed within polymer matrix. When microcapsules are ruptured by a progressing crack, monomer is drawn along the fissure, where it comes in contact with a dispersed particulate catalyst, initiating polymerization, then repairing the crack. A notable advantage of the microencapsulation self-healing approach is the ease with which it can be incorporated into a bulk polymer material which could be a potential self healing reinforcement agent for the future fabrics.

A4.3 ELASTICITY - Spider silk inspired anti-tear fabric design. Apparel with Spiderman' s suit mechano-elasticity
Proteinaceous spider silk is one of the natural silk exhibiting unique material properties with unparalleled combinations of stiffness, strenght, extensibility and toughness. The secret here is that the silk' s strenght and flexibility come from the nanoscale crystalline reinforcement in which stiff nanometer-silk crystallines are embedded and dispersed in softer protein matrices. Inspired by this, engineers modeled in the lab materials which have strenght and stretchability similar to spider silk..
The synthetic nano-reinforced structure emulating natural spier silk provides an opportunity to synthesize and conjugate polymer nanocomposites in future fabrics which will potentially rival the most advanced materials in nature.

A4.4 SPEED AND ANTIBACTERIAL EFFECT

In acquatic environment water drag is the major hurdle for movement. Sharks anti-drag skin design reduces drag by 5-10%. Scanning electron microscope studies have revealed the tooth-like scales of shark skin, called dermal denticles (little skin teeth or riblets) which are ribbed with longitudinal grooves (aligned parallel to the direction of local flow of water). It produces vertical vortices or spirals of water, keeping the water closer to the shark' s body, thus, deducing the surface drag. Another remarkable feature associated with this unique shark scale feature is its microtopography that acts as antibacterial fouling surfaces and microorganisms find it inhospitable to attach on such grooved surface.
Inspired by this natural design, scientists are adding technological improvements to swimming suits by designing antimicrobial fabrics without the chemical treatments.
This phenomenon is known as the Riblet effect.
The microtextured fabric called Sharklet has, as most interesting aspect, the fact that this antimicrobial fabric design does not utilize any chemical to kill bacteria and only prevent the adhesion.

Wouldn' t it be amazing to design a wetsuit that provides great elasticity and strenght reducing the material to the lightness of a spider's silk? Wouldn' t it be interesting, especially in this kind of research related to the problem of the ocean pollution, to develop a wetsuit surface that is able not only to reduce the drag but also to reduce the possibility of adhesion of micropollutants, remaining capagle of reacting with them to detect them? What if the wetsuit could detect the levels of pollutants but then let them shift away reducing the hazardous dangers that these could provoque to men's health? And what about the capability of inducing a reaction that is able to brak chemical bounds reducing the hazardous characteristics of some pollutants, making them harmless for both men's and ocean's health? I think this part of the research, on which I invested a lot of time and energies, especially because of the complexity of some themes and concepts, has been really inspiring for the consideration of possibilities to develop in the current prototypes and experiments or to keep as sparks to be further developed.
Of couse I wish that these kind of inventions to detect/show/fight pollution would not be needed and that the environment we are into was as safe and natural as it was before this increase of chemical pollution . . but we are not here now to imagine a perfect scenarios we are here to design a path to patiently get to that.

"The idea was moving from some questions like
'What can be challenging to the sustainability of surfing?
What are the transitions to sustainability in my area of expertise?
Are there any transitions I am particularly passionate about?
And what is my personal view of these transitions?' "

G. Borne

5. DIVE INTO THE PROJECT

Chapter Photographs
From the Ocean Waves to the Urban Ways
Ph: *Chiara De Vescovi*
Model: *Giacomo Pedretti & Fabio Antonelli*
Subject: *Better Wave Wetsuit & Better Way (wet)SUIT*
Locations: *Lido di Venezia & Milano Darsena*

5.1 Introduction to the project *I believe in a Better WayE*

As Gregory Borne and Jess Ponting point out during the introduction to the book "Sustainable Stoke. Transitions to sustainability in the surfing world" even for me "***the idea was moving from some questions*** like 'What can be challenging to the sustainability of surfing? What are the transitions to sustainability in my area of expertise? Are there any transitions I am particularly passionate about? And what is my personal view of these transitions?' "

Jumping the already deeply discussed quest of the pollution of the oceans, that can definitely be a great challenge for surfing, focusing on my area of expertise, that is to say the Design practice, more specifically the Sportswear and the Activewear Design, transitions to sustainability can concretize into many shapes; there is the material innovation, the recycling and upcycling world, the study of totally new solutions in textile, the sphere of the prototyping and the reduction of wastes or the manufacturing process and the attention to reduce polluting practices, but after all the research I' ve been "swimming through", after having discovered or realized that maybe green proposals are not just introduced into some honourable brands' agendas but also have already entered the commercial chain, reaching the public, *I concluded that most of them remain trophies to admire, valuable examples of "prizes" on the wall, or choices of few. But sustainability is not a matter of an exclusive niche. It has to be a mass phenomenon, a global, worldwide FASHION. Otherwise it remais just a beautiful ampoul of values without any power of making a change.*

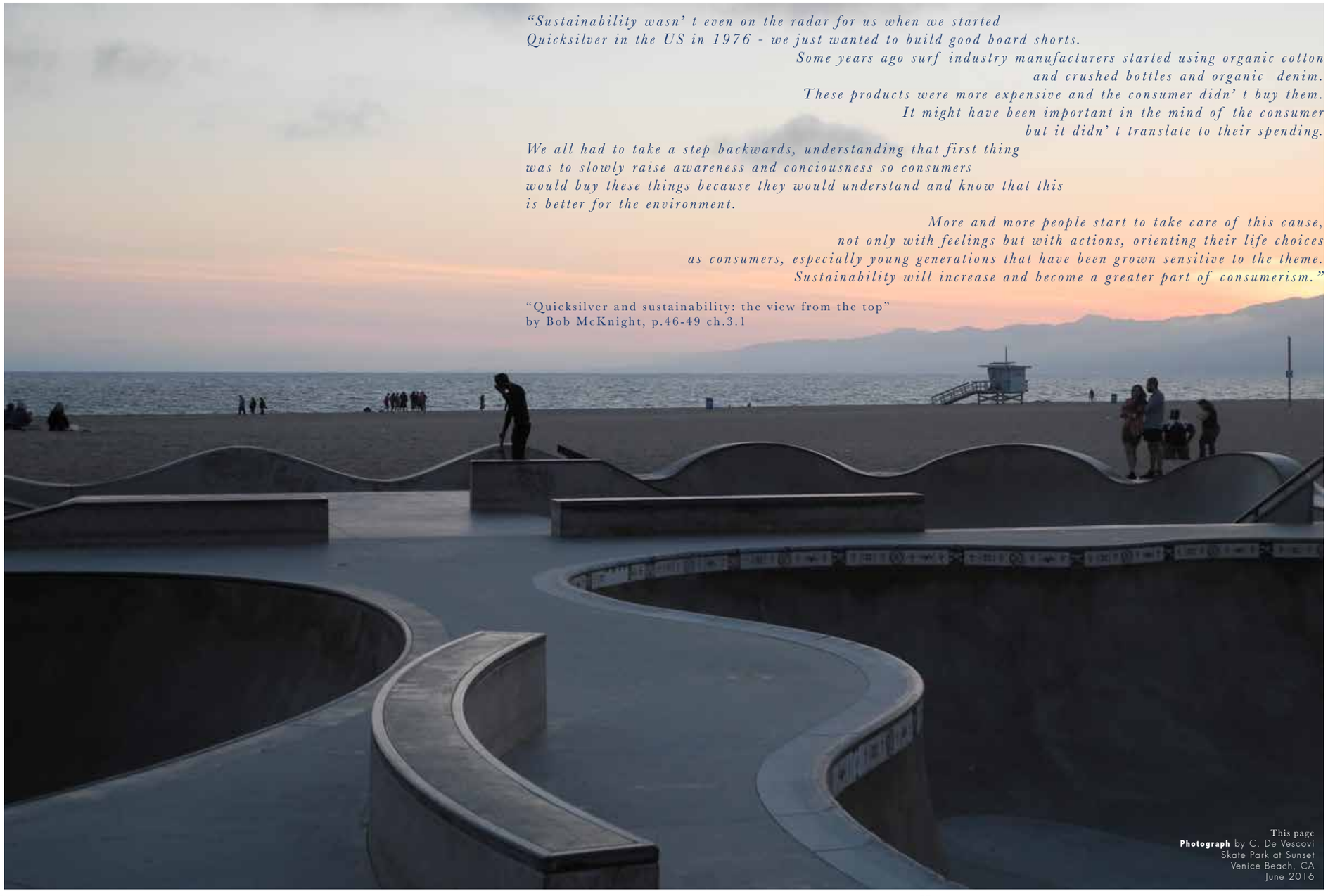
"At adidas we believe that through sport we have the power to foster eco-innovation and enable our consumers to make a difference. ***Our collections aim to make not only a style statement but an environmental one too***."

Unfortunalely but realistically talking, what can drive a change is, as in every fashion phenomenon, something that from an elite of visionaires is diffused, well advertized to be globally known, so that it becomes desirable and in a certain way, niether a choice, but a natural fact.
I want sustainability to become the same, not even a choice but a fact of life.

And to make this possible the first thing is niether producing "the zero-impacts product of the year", is raising awareness, knowledge into people, until your desire gets so strong and your eye so trained to these concepts that you won't have to chose but you'll pick that without wondering "if".

It is safe to say that **sustainability in today' s surfing world** is the creation of a future that will focus on concious consumerism, that includes sharing responsability for the environment in a direct and tangible way. - From chapter 8.2 "The future of surfing is not disposable" by Glenn Hening, p.246

This concept of "training the eye" concretizes into the key element of my project: the wetsuit for surfers that raises awareness towards the theme of the ocean pollution thanks to the detection of hazardous chemicals in the water through a visual color shifting.
My research and thesis is all around this quest, well presented in the next chapter. **Then it was a natural consequence to enlarge it to our most common daily landscape: the city context, in which the polluted ocean waves materialize into the polluted traffic waves.** As I said my intent was not to get to a new chemical formula for an innovative and never explored material, this is not my job, my intent is to diffond this ***call for clean better waves and ways*** (=wayves) translating the selective concept of a small niche of people for sustainability into a mass interest, that is why it was natural to get involved into the project not only the sea, but also the urban reality. **The same concept of the litmus paper applied to the wetsuit to ride the ocean waves is in chapter 7 transferred to the (wet)suit to ride the urban waves**, detecting this time - through the same treatment and color shifting - the hazardous levels of specific pollutants in the air we breath.**To close the cyrcle of this journey in chapter 8 I presented a capsule collection that answers, as many surf and outdoor brands do, to my 'enlarged' target consumer' s needs**, the ones of those *men looking for a better way surfing between the sea and the road waves.*



"Sustainability wasn' t even on the radar for us when we started Quicksilver in the US in 1976 - we just wanted to build good board shorts.
Some years ago surf industry manufacturers started using organic cotton and crushed bottles and organic denim.
These products were more expensive and the consumer didn' t buy them.
It might have been important in the mind of the consumer but it didn' t translate to their spending.
We all had to take a step backwards, understanding that first thing was to slowly raise awareness and conciousness so consumers would buy these things because they would understand and know that this is better for the environment.
More and more people start to take care of this cause, not only with feelings but with actions, orienting their life choices as consumers, especially young generations that have been grown sensitive to the theme.
Sustainability will increase and become a greater part of consumerism."

"Quicksilver and sustainability: the view from the top"
by Bob McKnight, p.46-49 ch.3.1

This page
Photograph by C. De Vescovi
Skate Park at Sunset
Venice Beach, CA
June 2016

5.2 Project Overview

The *Mana* of the *wave* from the Ocean waters to the City streets

5.2.1 The Ocean WAVE and the Urban WAY

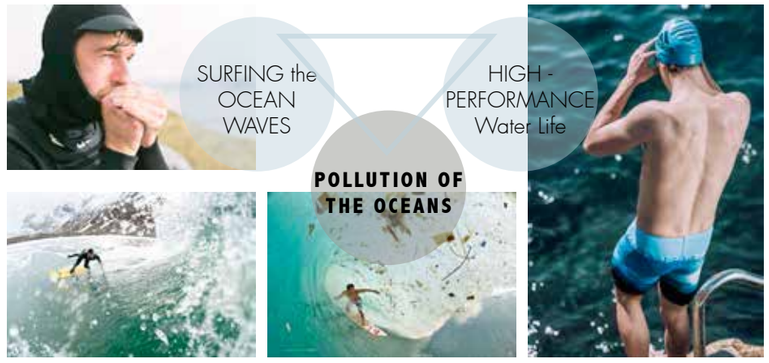
As exemplified in the visual scheme that follows, the problem of pollution and the care for rising awareness towards sustainability - both inside and outside the water - concretize into two areas that run parallel as the two yellow lines on a road, separate but with the same horizon in front of them.

The Ocean Waves line is captained by **the Better Wave Wetsuit**, key element of the Thesis research and proposal and key garment of the entire collection, while ***the Urban Waves line*** is guided by the correspondant 'sister of the wetsuit on the road: **the Better Way (wet)suit**, so called because it turnes upside - down the concept of "getting wet being protected" of the traditional wetsuit, instead providing you protection precisely from the wet of the urban hazardous rain that has everything to do with pollutants and nothing to do with pure water.
Both the wetsuit and the (wet)suit detect pollution in their "field" reacting to that through the color shifting of some parts from deep blue to bright yellow.
The common elements of these key garments - deep design research, details, anatomy, finishing, comfort and cool style that always attracted both the wave and the road riders - shape finally into a collection of high-performance technical garments keeping together these two not so distant worlds through pieces that can be for both sea and urban contexts, ***satisfying the needs of a final user that loves sport, outdoor activities, and an active life, being always on the crest of the wave.***
From the collection, three of the designed pieces have been prototypized and realized - in addition to the wetsuit and (wet)suit : a high - tech rashguard (a personal design, produced by Sheico Group thanks to SLAM S.p.A.), a sleeveless jacket (with RES S.p.A. neoprene) and a pair of transformable trousers that can shift from long legs pants for urban use to water boardshorts (both entirely personally designed and realized, with a final special help in the finishing details from FRAMIS Italia that provided the access to their laboratories for the 'termonastrature').

Let' s now dive into the rip curls of this wave called 'project' . .

FROM THE OCEAN WAVES

"For those who ride the Ocean Waves
For those who ride the Urban Waves
For those who believe in a Better Wa(Y)e"



TO THE URBAN WAVES

This page
Visual Map of the project development in terms of garments genealogy and collection structure

*"Most of the surf industry products are used in the ocean
and that is why the surf industry
has a responsability
in making consumers environmentally aware."*

R. Machado

6. BETTER OCEAN WAVES

The Wetsuit

Chapter Photographs
Better Ocean Waves
Ph: *Chiara & Renato De Vescovi*
Model: *Giacomo Pedretti*
Subject: *Better Wa(y)ve Wetsuit*
Locations: *Lido di Venezia*

6.1 A wetsuit "with an extra oomph" A new concept for wetsuits in polluted waters

6.1.1 The Message

I can' t be the only surfer to have stood, looking at great surf and wondered how many waves, over how many thousands of years must have rolled over the same reef, unridden.
One beautiful Ben Freeston's thought that would probably now be . .
I can' t be the only surfer to have stood, looking at great surf and wonder how many polluted waves, over how many thousands of years will be rolling over the same polluted reef, unridden because unreachable and hazardous. This was the 'more emotional quest' that pushed me into the tube of this Better Wa(y)ve Wetsuit design. Then it also comes out the 'more professional quest', synthesized by Rob Machado in the next few lines:

"Most of the surf industry products are used in the ocean and that is why the surf industry has a responsability in making consumers environmentally aware."
It is true that Surfers represent a peculiar tribe because as not many other sports, they interact with the natural environment in its wild and pure state. They don' t go to train into a building or an equiped pitch, they get out there, with rain or sun, freezing or warmth. And this is not to underline that they are better or braver then others, but that they have more to gain or lose by the state of the environment, so their interest for these issues shoud be natural and already installed. That is why I chose to bring together the care for the oceans and the love for design into a garment symbol of this watersport: the wetsuit.
The "extra oomph" of this wetsuit is emboding the believes I already deeply expressed, becoming my instrument for the rising of awareness, first step in the direction of conscious and sustainable consumers choices. I started my action from one of the most-connected-to-the-sea sport tribes, the surfers, first messagers of what is in the end a global issue.
How this product embodies these believes? The wetsuit, of a deep blue color, the color of the healthy ocean, is able to detect unhealthy levels of specific pollutants in the water, reacting visually through a color shift, from the healthy blue to the hazardous yellow (with reference to the hazmat suits - see chapter 7).
The *idea of the litmus paper* that turns color when dipped in a solution depending on basic/acid concentrations scales *into a technical garmen*t that from its origins helps man enjoyng water longer and that now becomes the litmus paper **for the detection of hazardous pollutants**, changing color.
The wetsuit is an *innovative* litmus paper, because the reaction of the color shifting is *reversible* and because of its power: the power of making visible a problem that is huge, that is out there, but that is silent and so even more dangerous. In the following paragraphs the project is described from each point of view, from the treatment to the design, with the hope of being definitely a strong message and an incentive for knowledge, awareness and push for activism toward sustainability, sustainable brands and design paths and consumers choices, but also *a starting point for further evolutions* rather then just the final output of a research.

Current pages
Never give up on looking for the better wave.
Friends captured in Recco (GE) during a session, waiting for some "good", but surely polluted waves. Ph: C. De Vescovi
Recco (GE), Italy
February 6th and April 22nd, 2017

6.1 A wetsuit "with an extra oomph" A new concept for wetsuits in polluted waters

6.1.2 Investigating the need: the Questionnaire

"A more sustainable way needs to be portrayed as something really cool and exciting, something that is done by surfing models that all other surfers will try to emulate."

Glenn Hening

"Most people coming in here are into the green thing but most probably buy for aesthetics and performance"

Patagonia sales assistant

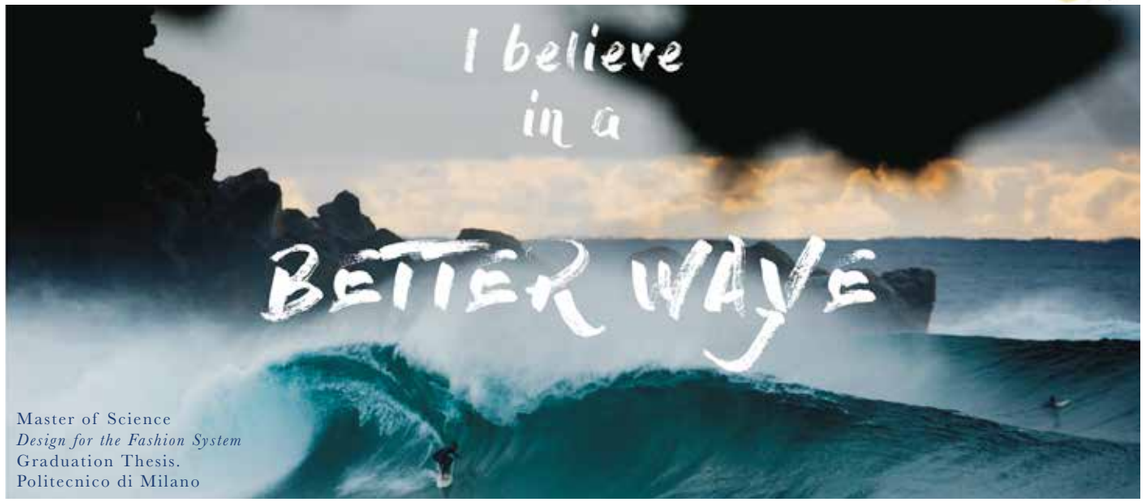
Let' s put the three of them together..

In the course of reporting several stories on sustainable surfing and talking to ordinary surfers, I' ve been stuck by both the lack of awareness about green options and the desire for them.
"Even if we have progress in the products, still sustainability is reallt slowly making its way into the local surf shops, the gateway to reach the average surfer. This is also because surfing is largely a B - to - B business "bro to bro", where personal relationships among a relatively small group of surf insiders influence the industry' s direction.
(From chapter 3.5 "Time to bring the image of the Surf into the 21st century" Todd Woody, p.71)

The first thing I did once I started thinking about all this idea of the reacting - wetsuit and the fact that the main need was raising awareness - even before producing eco-products that would remain prototypes/niche productions for niche consumers/mascots for expos, festivals, campaigns, was to write down a **questionnaire** that could become an interesting source of information for both design preferences and sustainable care directly collected from ***"front - line users"***. I wanted those guys I' ve been knowing during those surfing daytrips from Milan to the coast between freezing January and gloomy June to put black on white answers to some questions, even if I already tested by previous talks with them, wich would have been the result - especially regarding the theme of pollution. Then I decided to send the questionnaire to surfers I have been knowing during these years all over the world, to collect "geographically" different voices.
We always go back to the same conclusion: people are not aware, and when they are, they "close their eyes"- or actually they niether have to do it - in front of a problem, like pollution of the Ocean, that is so easy to ignore because you cannot concretely see it. I' m not complaining about this attitude, because I' ve felt what it means to desire entering the water with all of your heart, when you are in front of a beautiful spot and apparently perfect waves, even if you know the danger . . you accept the risk of getting sick rather than renouncing to your ride.

So here it comes my point: we cannot delate the mess we have done in one day, and anyway we are not renouncing entering the waters because of the danger, so at least let's ***show*** the problem, let' s make it visible so that looking at it materializing on our body through a visible effect, we and the ones around us get more sensitive, aware and determined in the desire of working for a better way.

This page
Chris Hines, founder of SAS, at the House of Parliament.
March 21st, 1991
Into-the-water questionnaire. WSL broadcaster Peter Mel and Jhon Florence reflect on the heat moments after getting the scores at the Billabong pro Tahiti semifinal. August 24th, 2014
Next page
Better Wa(y)ve Questionnaire abstract and relevant answers.



Master of Science
Design for the Fashion System
Graduation Thesis.
Politecnico di Milano

This Questionnaire is directed to professional surfers and lovers of surf/ any other water - based sport.
The mission is to collect as many opinions as possible to design a new wetsuit that can put together the latest innovations of the market in terms of design/performance/function/ comfort with experimentations of new treatments for materials/wearable technologies and with the intent of raising awareness and conciousness about ocean pollution and health risks for both men and environment.

The passion for the sea and the Sustainable Design are the core of this project. And which way could be better than to design a garment, the wetsuit, for a discipline like surfing, that is for its own essence in harmony with Nature and its strenght?

Section 1. DESIGN

•Do you use the wetsuit for job/ hobby?
•How many times per month?
•Which is the model you are using now and, if different, which is your favourite one available on the market and why?
•Do you consider the chest zip as the best method to get inside/outside the suit in terms of comfort and in terms of reducing water passaging?
•Do you consider the research towards the development of a design that is essential in terms of eliminating zip/reducing cuts and seams a valid investment?
•Considering the best suit available, which are the lacks/deficiencies you would enlight desiring an improvement and which are the strenghts/key elements you would never renounce to
•Which is the first thing you look at in a wetsuit?
•If you could design a new wetsuit, which would be the main points you would focus on?

Section 2. SUSTAINABILITY

Ocean Pollution is a worldwide alarm, to be considered as a common danger for men, animals and plant life. As a surfer that for job/passion passes a lot of time inside the water:

•Do you consider Sustainability as a main and valid element on which to invest time, energies and resources to design in an ethical and sustainable way?
•Is the pollution of the seas a quest that touches you in a serious way?
•Wich are the most polluted spots and dangerous in terms of health in which you surfed (in/out of your country) ?
•When you go surfing in a known/ unknown spot do you get informed (and if yes, how) about the dangers your health is exposed to due to the level of toxicity caused by the water pollution of that area?

The first step for a change is getting awareness. Without the right information and the right perception of a problem even the innovation remains powerless, because changing is possible just if the aim is shared and the action comes out from a common will and from a strong co-working.
The awareness towards some themes cannot and do not have to remain circumscribed into isolated elites.
•If, with equal performances in terms of design, function and comfort, you could become part of a project that has as main point the desire of getting people aware and more sensible towards these themes, would you do that?
•Would you be interested in a wetsuit that at the same time, detecting the level of toxicity of the waters and reacting in a specific way to that, could be useful in terms of health care for yourself and those who are around you and also useful in terms of planet care in monitoring the detected data, improving the study of the pollution of the seas and hopefully its improvement?

One of the main problems in the world of the Research & Sustainability is the lack of interest and awareness and when even people care it is not to give for granted that the final action of the client would be to choose that product because necessarily innovation and research have as consequence a price growth.
•Would you invest on a wetsuit of this kind? If yes, give a percentage.

Suggestions/Notes.
For any question/doubt/curiosity feel free to contact me at my email adress.

Thank You for your time.
I believe in a Better Wave, and you?
Chiara De Vescovi
Milano, 03.04.2017

cold
QUIKSILVER SYNCRO HIGH PERFORMANCE
4/3 Ripcurl flash bomb chestzip
C-Skin wired 4/3 chestzip
VISSLA 7 seas 4/3
Billabong Intruder 4/3
Qicksilver Highline 4/3
summer
Billabong revolution 2 mm LS/SL

highest warmth&thinner thickness, elasticity, comfort, warmth, non-invasive zips/systems to help the feet passage, non-invasive pockets for more than the "key-carring" like goPro ecc, different proposals from black color but able to not be ruined by the contact with the wax on the board, style

100% chest entrance and no zip

"I think the wetsuit design shoud be more concentrated on the size quest. Because it is so important the fitting and the adherence to the body a costumized system sustainable in terms of price shoud be developed by the brands"

"The washing method could be improved to get your wetsuit REALLY clean and some more ipoallergenic materials should be adopted"

"Sometimes I check the water conditions, but honestly I 'throw myself into water' hoping it is not too bad"

100% affirmative

Multedo, Genova
Mouth of Entella, Chiavari
Santa Monica, USA
Bidart, France
Seminyak, Indonesia

"In Viareggio i surfed into tar, in Recco I surfed in water polluted by nafta run off a barge that got stuck into cliffs, in Diano I got a cut under my foot and the injury infected because of bacteria inside waters, in some spots in the Adriatic sea I perfectly remember the smell of "chemicals" while I was riding the waves, in Porto I surfed on a sea of sardines killed by polluted waters."

"I am interested in the waters conditions but most of the times I don' t find correspondance between the data published and the real conditions of the sea. I think there might be something between who is administrating the area and who is conducing the analysis. You never have the REAL informations. It would be amazing to have a wetsuit that honestly defines the real conditions."

"I don' t generally check the water conditions honestly, but it depends on where I am. Now in France I don' t, when I was living in Los Angeles, always"

+10%, +30%, +40%, 80%
better if competitive with market

6.1 A wetsuit "with an extra oomph" A new concept for wetsuits in polluted waters

6.1.3 The treatment: research & lab tests at RES S.p.A

This page 88
The reaction process we are working on,
from the dark blue to the yellow panel
and writing pop up.

The collaboration with RES S.p.A. comes here into the game. The first meeting, had thanks to Prof.ssa Maurizia Botti, was in *March 2017*, in the RES S.p.A. office located in Treviso (TV). Doctor G. Spinelli and I discussed the theme of the project, concentrating on what could be the interesting point for the company: the idea of researching on neoprene treatments - one of the main quests that the company is leader for - to give it the peculiarity of reacting to specific pollutants detected in the water. ***The idea was welcomed by the company and the collaboration started.***

•Fist thing deeply discussed was the **"the type" of detection** to work on for the wetsuit. The main roads selected were two:
(1) treatment on neoprene/inside the molecular structure, to give the material the ability of reacting to specific pollutants through a color shifting;
(2) smart sensor embedded in the wetsuit, integrated to detect the selected pollutant/s and that can send the message of the hazarous condition through a led turning-on/off - (2a) eventually inducing again the color - shifting to the neoprene (if a smart treatment is used).
The option of the sensors better answers to our need for many reasons: it more adequately responds to the "problem" of selecting just "one" specific agent (as required, on the opposite side, by the researches to be conduced on neoprene superficial treatments) because the sensor can be the *same technology* embedded in *different wetsuits* and it can be set for *different agents* depending on the area where the surfer is entering the waters (it can be more customized in a way), and it can respond to our ***main peculiar need of reversibility*** (the sensor can easily turn on and off). All points, these, that become harder in terms of amount of research and results with option (1).

•But what we came up with was anyway the **choice** of starting the first experiments with this **option(1)** of neoprene treatments because of one main reason: *the initial investments would have been already considerable following the path of the sensors, while the chemical reactions and their first applications directly on the material could have been economically sustainable by the company without any additional cost.*

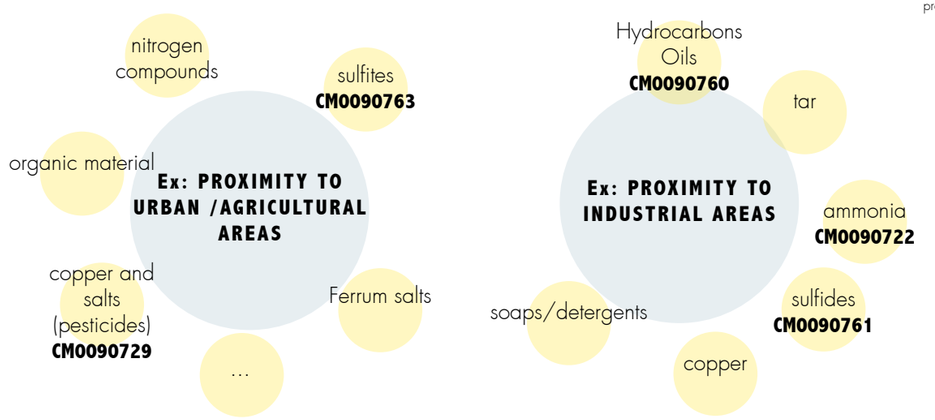
• So in March 2017 we agreed in starting the scientific researches: water conditions/pollution analysis and tests in RES S.p.A. laboratories. And this is what is still going on today.
The first months (from April 2017 until now) have been for me in-depth-studies, partly exposed in the previous part of the chapter. I' ve been asked to focus on the pollution of the seas ans to come out with the *selection of one pollutant*.
The choice was the **Bisphenol A**. ***We needed one specific agent to start the first researches, with the idea of enlarging consequently the process to other chemicals.***
This choice came out accordingly to the logical philosophy and area of expertize of my project:
I'm in the fashion field, one of the main pollutants originated from our industry related to the Ocean Pollution are the microplastics and one of the main concrete answers from the fashion industry, talking about solutions to face the pollution issue, is the ability of recycling a part of the huge amount of plastic in our seas into new fabrics (G-Star Raw denim from ocean plastic - case study p.166, or Billabong Boardshorts series from plastic bottles - case study p.63) and fashion design accessories (Adidas for Parley for the Oceans Sneakers - Case Study p.58). This is the main reason why I selected Bisphenol to start the tests.

The company followed the same path supporting my researches with informations and studies developed with collaborators working in the Environment and Chemical field and with Water Quality experts.

• What we did until today (August 2017):
- We selected some main chemical agents present in the water, together with Bisphenol A, to bring on different parallel options to test, we identified the instruments already existing in the market that are used for this type of detection (litmus papers illustrated), we selected between them the ones that could be appropriate in giving us the proper answer in terms of color-reaction intensity and reaction time (of course the wetsuit needs to react almost immediately to water conditions - or anyway in a short period of time).
- At the same time another main point was analyzed: ***the quest of "reversibility", main innovative point, still not present in the market, at least under this shape/application. This is also the main obstacle that nowadays we are not ready to overcome and main goal to reach with the future researches*** (problem that would not exist with the embedded sensors for example).
We need to reach more certain results to make the step forward, that is to say to apply this method on the wetsuit.
The idea is (1) to apply a thin layer of the chemical reagent - able to stimulate the color shifting - between two layers of neoprene, as an adhesive, that can stimulate the reaction to the external layer (the one visible), or to mix it with the glue used for the external liquid taping that covers every seam of the wetsuit. (2) Or to go back to the sensors. *In both cases we need a higher economic investment that can lead to positive and interesting results and to an international patent.*

• Today, at the current moment of our scientific investigation, what we need is to ensure the right direction of researches, guaranteeing their validity, and this can be achieved through two main actions:
(A) testing the waters (and the early "consumers" interested in the cause - to have also an answer in terms of market reaction to the proposal) *embedding* ***a primordial system*** *into wetsuits without additional costs*: that is to say embedding **a transparent non waterproof pocket with N separate sectors, each one oriented to a different litmus paper that reacts to a specific agent)**. This responds to a better definition of the chemicals that is more useful to detect, it responds to our need of keeping different roads opened for now (not selecting just ONE agent) and it responds to our actual not-achieved "eversibility" of the process and so it responds to our current need of embedding the reaction in the wetsuit without compromizing the entire item and to keep opened also the idea of customization depending on the area of use. Here follows a selection of sensors for substances that are polluting and/or hazardous for man provided by RES S.p.A. after some researches with Tecnolab-Chimicacentro. What we are focused on are those detectors that distinguish for: *(a) reactivity by immersion, (b) short - time reactivity.*
(B) **Keep on going** with the studies and treatment - testing on neoprene, reguarding the reversibility of the color shifting induced from the reaction with chemical agents.

This page 89
Schemes from RES S.p.A. collaboration,
about analysis of chemicals and relative litmus
papers for detection of agents
Figures about papers and table about agents
provided by tecno-lab



Cu (por pesticides)
CM0090729
Color: From white to green
Sensibility: 20mg/L Cu^{2+}

Oil
CM0090760
Color: From light to dark blue
Sensibility:
10mg/L (petrol - benzina)
250mh/L (petroleum ethere)

Ammonium
CM0090722
Color: From white to dark yellow
Sensibility: 10mg/L NH_4

Cartine analitiche per determinazioni qualitative

tecno-lab s.r.l.
Via L.Abbiati, 22/A-B 25131 Brescia E-mail info@tecnolab.it
Tel. 030/2582905 r.a. Fax 030/2582517 www.tecnolab.it

They reveal ions and chemical agents giving informations of their presence over a certain %.

Determinazione	Cartine analitiche	Confezione	Cod. art.
Ioni alluminio (Al^{3+})	ALLUMINIO, cartine analitiche	Scatola da 100 strisce 20x70 mm	CM0090721
Ammonio, ioni ammonio (NH_4^+)	AMMONIO, cartine analitiche	Scatola da 200 strisce 20x70 mm	CM0090722
Cianuri e acido cianidrico (HCN)	CYANTESMO	Contenitore con rotolo da 5 m	CM0090604
Cloro, alogeni liberi	CHLORTESMO	Scatola da 200 strisce 20x70 mm	CM0090603
Ferro (II) (Fe^{2+})	FERRO FERROSO, cartine analitiche	Scatola da 200 strisce 20x70 mm	CM0090725
Floruri, acido fluoridrico gass (F, H_2F_2)	FLORURI, cartine analitiche	Scatola da 200 strisce 20x70 mm	CM0090750
Fosfatasi acida	PHOSPHATESMO KM	Scatola da 25 strisce 15x30 mm	CM0090607
Nichel (II) ioni (Ni^{2+})	NICHEL, cartine analitiche	Scatola da 200 strisce 20x70 mm	CM0090730
Nitrati e nitriti (NO_3^-), NO_2^-)	NITRATESMO	Contenitore con rotolo da 5 m	CM0090611
Olio in acqua o in terreno	OLIO, cartine analitiche	Scatola da 100 strisce 20x70 mm	CM0090760
Piombo, ioni piombo (Pb, Pb^{2+})	PLUMBTESMO	Scatola da 40 strisce 25x40 mm	CM0090602
Potassio, ioni (K^+)	POTASSIO, cartine analitiche	Scatola da 200 strisce 20x70 mm	CM0090727
Ioni nitrito (NO_2^-) acido nitroso (HNO_2) ozono (O_3)	Amido ioduro 816N (sensibilità normale)	Libretto con 100 strisce 10x75 mm	CM0090756
Rame (Cu, Cu^+, Cu^{2+})	CUPROTESMO	Scatola da 40 strisce 25x40 mm	CM0090601
Solfiti (SO_2) anidride solforosa	SOLFITI, cartine analitiche	Scatola da 100 strisce 20x70 mm	CM0090763
Solfuri	SOLFURI, cartine analitiche	Contenitore con rotolo da 5 m	CM0090761

Researching and testing,
looking forwards . .

This pages 90-91
The reaction process (2), the surfer back is shown on the left as total blue (before detection) and as partly yellow (after detection of pollutants)

6.1 A wetsuit "with an extra oomph" A new concept for wetsuits in polluted waters

6.1.4 The Design

Current pages
Better Wa(y)ve Wetsuit Designs, front and back views of the worn wetsuit together with the flats drawings are here shown enlighting the color shifting and printing appearance determined by the clean/polluted conditions of the waters.

From
CLEAN WATERS

To
POLLUTED WATERS

6.1 A wetsuit "with an extra oomph" A new concept for wetsuits in polluted waters

6.1.5 The Prototype development with SLAM S.p.A. and Sheico Group

Current page
Meeting in SLAM, fitting moments captures. SLAM S.p.A., Genova (IT), April 12, 2017

Current & following pages
Overviews of the technical sheets and documents developed for the prototype realization in collaboration with SHEICO (Japan)

Wetsuit 1. Clean Waters

Wetsuit 1
OVERVIEW

The wetsuit appears totally dark blue.

The full colour is interrupted just by the particular wavy CHEST SEAM crossing the chest and the right shoulder, that is refined in bright yellow.

SEAMS:
Tripled glued, double blind stitched, taped seams:

SHEICO POWERSEAMS

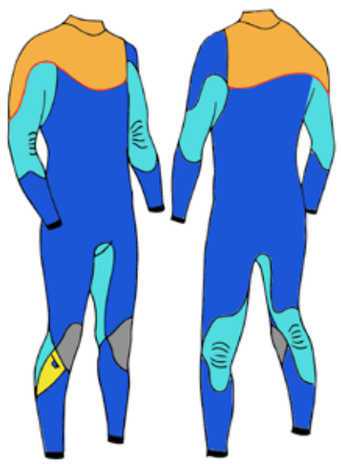
- All the seams in BLUE (same tone of the wetsuit neoprene)
- Chest wavy seam in YELLOW tone

MATERIALS **(4mm torso/thighs - 3mm all the rest)**:

- **NEOSPAN FHY 418 Blue Ribbon**
- **NEOSPAN FHY 320 Luteous**
- **This part needs the stretchest neoprene available! To provide the zipperless system!** The only important thing is that it has to be the same tone of the FHY320 Luteous
- **UV FLEX FJJ 514 Yacht Blue**
- **ABRASION BAX 002 Black**
- **LIQUID SILICON CUFFS**

Wetsuit 1
MATERIALS

OTHERS:
-Liquid Tape wavy Pattern on Opening System
-Logos

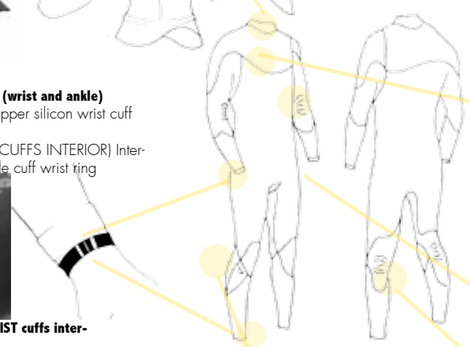


Wetsuit 1
DETAILS for construction

Removable Hood
To provide more protection if needed

Anti-FLushing Cuffs (wrist and ankle)
1.External liquid dipper silicon wrist cuff

2.(Only of WRIST CUFFS INTERIOR) Internal exclusive double cuff wrist ring

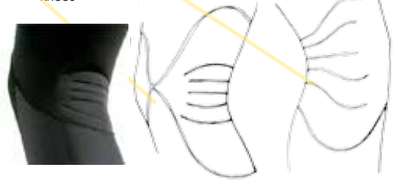


Zipperless method
Take on/off maximum flexibility minimum flushing

Only on WRIST cuffs internal lining

Knee-Pocket
To bring with you the essentials

Cout Outs
To improve flexibility, on elbows "interior" and "back" knees



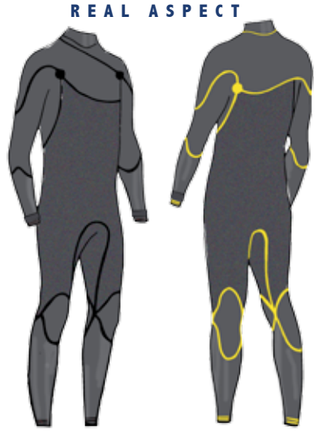
Lining
MATERIALS

MATERIALS:
- **THERMO BGF 115 Charcoal**
- **PLUSH&BRUSH BPX 016 Charcoal**
- **GLIDESKIN internal GDC 016 Charcoal**

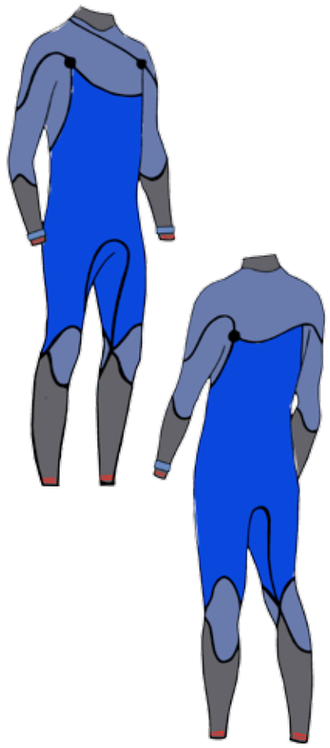
SEAMS:
- **SHEICO POWERSEAMS + NEO TAPE Black or Yellow**

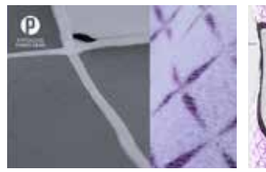
OTHERS:
- **AQUA-BAN double tape (black or yellow)**
- **Stressed Points Rounded Taped**

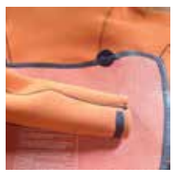
REAL ASPECT



Black Tape or Yellow Tape







6.1 A wetsuit "with an extra oomph" A new concept for wetsuits in polluted waters

6.1.5 The Prototype development with SLAM S.p.A. and Sheico Group

Hood

Hood
MATERIALS

MATERIALS **(3mm)**:

- **NEOSPAN FHY 418 Blue Ribbon**
- **GLIDE SKIN GKA 016 Charcoal**
- **GLIDE SKIN GAM 016 Charcoal**

SEAMS:

- **Zig Zag Seams** (Blue thread)
- **Double Stitch**
- **SHEICO POWERSEAMS** (powerseam in yellow tone if possible, otherwise blue)

HOOD MATERIALS MAP

OTHERS:

-Logo Left ear level (same dimensions of chest logo)

REAL ASPECT

Blue Seam or Yellow Seam

Current pages
Meeting in SLAM, fitting moments captures. SLAM S.p.A., Genova (IT), April 12, 2017
Overviews of the technical sheets for SHEICO

Wetsuit 2. Polluted Waters detected

Wetsuit 2
OVERVIEW

The wetsuit appears dark blue and yellow at the chest panel.

As in Wetsuit 1 it remains the particular wavy CHEST SEAM crossing the chest and the right shoulder, refined in bright yellow.

New element is the big back and front yellow LOGO:

I BELIEVE IN A BETTER WAVE

Wetsuit 2
DETAILS Print

KEEPING ALL THE SAME CHARACTERISTICS OF WETSUIT 1

ONLY DIFFERENCES:

1. NEOSPAN FHY 320 Luteous on chest panel instead of NEOSPAN FHY 418 Blue Ribbon

2. LOGO

Logo 1
Centre Chest

Logo 2
Outer Left Forearm

Logo 1
Hood: Left Ear Level

Logos & Prints
OVERVIEW

LOGO 1: CHEST & HOOD

LOGO 2: LEFT FOREARM

I believe in a BETTER WAVE | Slam

Logos
DIMENSIONS in mm

LOGO 1: CHEST & HOOD

LOGO 2: LEFT FOREARM

Note.
See the separated appendix for materials samples and technical details

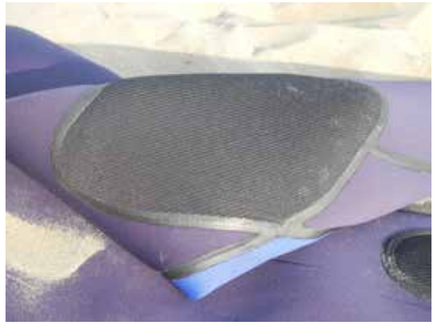
6.2 The BETTER WAVE Wetsuit After Production

6.2.1 Shoots ! Details

Current pages
Wetsuit Details Cuffs, Zipperless entry System, logo print, knee - pads, lining, liquid "wavy" taping for adherence, knee - side pocket.










6.2 The BETTER WAVE Wetsuit After Production

6.2.1 Shoots ! Details

Current pages
Inside the Water! Details Logo print on the left arm, half - worn wetsuit and zipperless entry system, zoom on cuff and knee - pad, focus on knee - side yellow pocket and leg cuffs.

6.2 The BETTER WAVE Wetsuit After Production

6.2.1 Shoots !

Current pages
Entering the Waters The wetsuit is worn and appears all dark blue when dry / not detecting pollution. After paddling for a while the reaction begins: the yellow appear on the chest panel and as the motto "I Believe in a Better Wa(y)ve"

6.2 The BETTER WAVE Wetsuit After Production

6.2.1 Shoots !

Current pages
Pollution detection is ON During the Surfing session the wetsuit keeps reacting to the water conditions, responding to the hazardous pollutants through the "yellow signals".
When you look at your "neoprene skin" you realize the condition of the environment you are into becoming aware and rising awareness for those around you.

Current pages
Better Wa(y)ve Wetsuit the "litmus paper wetsuit" react ! Front and Back Views

Every surfer lives "outside" the ocean too . .
So why not to consider, after the focus on the sea and the key garment related to the sport activity inside water, the development of the technology applied on the surfing suit into a key garment for the active life in the city?

C. De Vescovi

7. BETTER URBAN WAYS

The (Wet)suit

Chapter Photographs
From the ocean waves to the urban waves
Ph: *Chiara De Vescovi*
Model: *Fabio Antonelli*
Subject: *(wet)SUIT*
Locations: *Milano Darsena, Lido di Venezia*

7.1 Introduction to the street (wet)suit

"I istantly saw my surfer that,
taking off on a wave in Montauk East point,
rode it through Brooklyn
and Manhattan
then 'til Fifth Avenue,

I saw that ocean wave slightly materializing
into a traffic wave
made of cars,
morotcycles,
bicycles
and urban noises."

C. De Vescovi

We' ve already deeply analyzed the Ocean pollution in Chapter 3 and also its relationship with Air pollution and the different sources and types.
We saw they are inextricably linked and especially that Air pollution affects the other one.

So why not to consider, after the focus on the sea and the key garment related to the sport activity inside water, the development of the technology applied on the surfing suit into a key garment for the active life in the city?

Every surfer lives "outside" the ocean too, in a urban context or even if he/she was living an uncommon life far from the industrialization, the air as we saw - and as the water in the ocean - moves all over, contamining each corner of the planet, no one excluded.

That' s why after some considerations, as introduced in Chapter 5, I decided to develop the wetsuit theme into a parallel but totally connected sphere: the one of the urban waves. The problems are the same, what changes is just the type of pollutant.

I thought, if we develop a treatment that, applied on the neoprene surface, is able to make the wetsuit detect pollutants in the ocean and react to it/them through a color changing, why don' t we apply this concept as well to a (wet)suit for the urban polluted "air waves"?

In this chapter, following the same but restricted pattern of analysis I used for the Ocean Pollution, I went deeper in the quest of the Air pollution, somehow easier to study because of the existance of international offical indexes and indicatords.

Here follows an overview of the concept of AQI, the Air Quality Index, that helped me in the *selection of the main common pollutants all over the world* and, recalling the "environmental wave" analysis, a parentesis of case studies regarding the relationship between **athlets' health and air pollution** (as in Chapter 3 I proposed the case study of the Rio Olympic Games and its concretization into the "video action" of the brazilian studio, here the Beijing Olympic Games is the instrument for the introduction of another "video denunce" related to athlets' health and pollution).
These the prerequisites for the development of a (wet)suit, the key - garment of the "on the road" collection for the city surfer that rides the urban waves.

Current page
From the ocean waves to the urban waves
Visual Concept - **Surfing in cold waters**
Image taken from tallingtonlakesproshop.com
In Chicago, a lone cyclists navigates the bike path along Lake Michigan at the North Ave. beach. Dec. 18, 2013 from cbsnews.com
Next page
AQI, air quality index general scale and colors
AQI global map from aqicn.org, March 23rd, 2017 h: 18.17

7.2 Research & Analysis Urban Pollution

7.2.1 The AQI - Air Quality Index

There are many human-driven impacts on the ocean' s ecosystem. However, the most significant and widest-reaching impacts on the ocean health are caused by the emission of carbon dioxide from the burning of fossil fuels for our energy use and manufacturing needs.
For surfers specifically, this rapid rise in sea level will swamp out many surf breaks globally, creating a condition of permanent high tide that will diminish the quality and frequency of good surf.
(From ch. 5.6 "Transforming surf culture towards sustainability: a deep blue life" Kevin Whilden, Michael Stewart, p.130)

The AQI is a number used by governament agiencies to report daily air quality. It defines how clean or polluted the air is, and what associated health effects might be a concern.
The AQI focuses on health effects people may experience within a few hours or days after breathing polluted air.
EPA (Environmental Protection Agency) calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established **national air quality standards** to protect public health .*Ground-level ozone and airborne particles* are the two pollutants that pose the greatest threat to human health. We can imagine the AQI as a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy-at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Defining the AQI requires an air pollutant concentration over a specified averaging period, obtained from an air monitor. **Taken together, concentration and time represent the dose of the air pollutant.** To make it easier to understand, the AQI is divided into six categories: each category corresponds to a different level of health concern. The six levels of health concern and what they mean are:
•"Good" AQI is 0 to 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
•"Moderate" AQI is 51 to 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
•"Unhealthy for Sensitive Groups" AQI is 101 to 150. Although general public is not likely to be affected at this AQI range, people with lung disease, older adults and children are at a greater risk from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air.
•"Unhealthy" AQI is 151 to 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
•"Very Unhealthy" AQI is 201 to 300. This would trigger a health alert signifying that everyone may experience more serious health effects.
•"Hazardous" AQI greater than 300. This would trigger a health warnings of emergency conditions. The entire population is more likely to be affected.

EPA has assigned a specific color to each AQI category to make it even easier for people to understand quickly whether air pollution is reaching unhealthy levels in their communities. Because air pollutants vary in potency, the function used to convert from air pollutant concentration to AQI varies by pollutant.

Different countries have their own air quality indices, corresponding to different national air quality standards.
A website allows government agencies anywhere in the world to submit their **real-time air monitoring data** for display using a common definition of the air quality index.

I went through the analysis of the similarities and differences between the countries AQI to find out and identfy the main common pollutants. For example:

Canada
•Name: Air Quality Health Index (AQHI).
•Scale: from 1 to 10+
•Pollutants: nitrogen dioxide (NO2), ground-level ozone (O3) and fine particulate matter (PM2.5)
"Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion."
"Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation."

Hong Kong
•Name: Air Quality Health Index
•Scale: from 1 to 10+
•pollutants: ozone, nitrogen dioxide, sulphur dioxide, particulate matter (PM10, PM2.5). "Reduce or avoid outdoor physical exertion"

Mainland China
•Name: Air Pollution Index (API)
•Scale: from 0 to 300+
•Pollutants: sulfur dioxide (SO2), nitrogen dioxide (NO2), suspended particulates smaller than 10 μm in aerodynamic diameter (PM10), suspended particulates smaller than 2.5 μm in aerodynamic diameter (PM2.5), carbon monoxide (CO), and ozone (O3). An individual score (IAQI) is assigned to the level of each pollutant and the final AQI is the average

India
•Name: AQI
•Scale: six categories - Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe
•Pollutants: PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb

United States
•Name: AQI
•Scale: from 0 to 500
•Pollutants: O3, PM2.5, PM10, CO, SO2, NO2

Mexico
•Name: IMECA - Indice Metropolitano de calidad del Aire
•Pollutants: chemicals ozone (O3), sulphur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), particles smaller than 2.5 micrometers (PM2.5), and particles smaller than 10 micrometers (PM10).

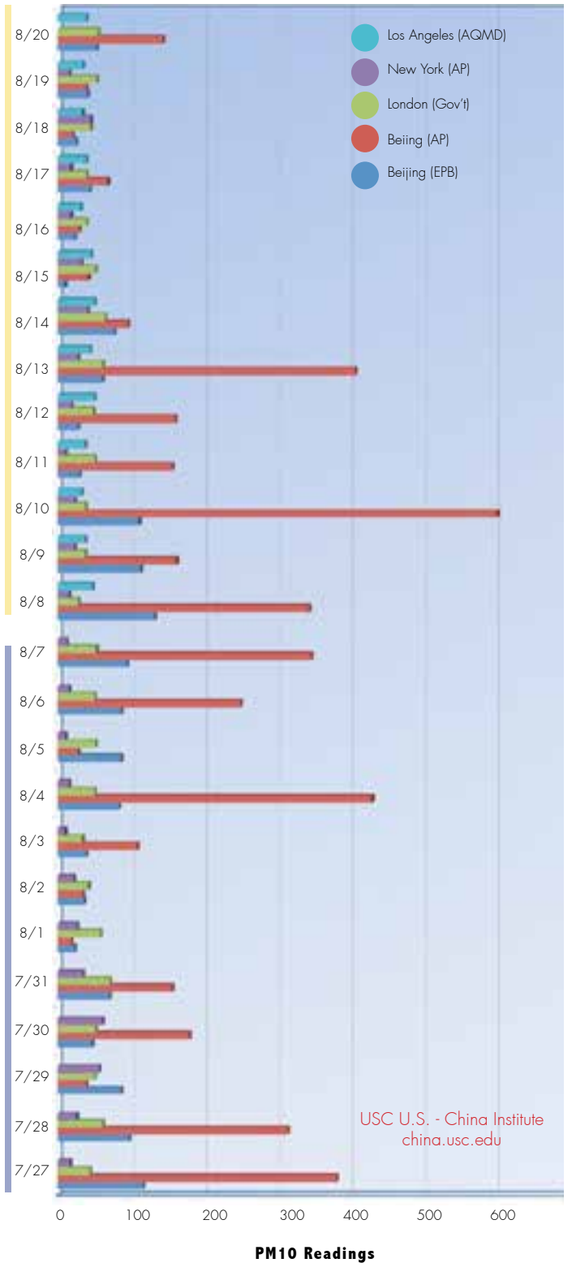
Singapore
•Name: PSI - Pollutant Standards Index
•Scale: moderate, unhealthy, very unhealty, hazardous
•Pollutants: sulphur dioxide (SO2), particulate matter (PM10), fine particulate matter (PM2.5), nitrogen dioxide (NO2), carbon monoxide (CO) and ozone (O3).

United Kingdom
•Name: AQI
•Scale: from 1 to 10
•Pollutants: Ozone, Nitrogen Dioxide, Sulphur Dioxide, PM2.5 (particles with an aerodynamic diameter less than 2.5 μm) and PM10.

Europe
•Name: CAQI - Common Air Quality Index (Types: Hourly index, Daily index, Annual index)
•Scale: from 0 to > 100
•Pollutants: PM10, NO2, O3 (and CO, PM2.5 and SO2)

7.2 Research & Analysis Urban Pollution

7.2.2 Athlets and Air pollution



Here it comes a parallel paragraph that follows the wave we' ve been riding in chapter 3, ph. 3.4, regarding the unhealthy effects that pollution of the environment has on athlets while training and competing.
First, **an article taken from CNN** is resumed to concretize the problem into a worldwide event as the ***2008 Beijing Olympic Games*** and the hazardous conditions of the air, second an example of that "Astonish me!" action we were talking about in 3.4 synthesizes the video-product by Faisal Abdu' Allah **"Double Pendulum"** related to this theme.

2008 Beijing Olympic Games
From the article: "China announces emergency Olympics smog plan. Air Quality At The 2008 Beijing Olympics" by CNN
August, 2008

Chinese officials have announced an emergency plan to deal with Beijing's persistent pollution problem as athletes flock toward the country for the start of the Olympic Games. Much of the air in China is badly polluted and this is especially true in Beijing where a rapid increase in auto traffic has produced much photochemical smog. In Beijing and elsewhere in China, poor air quality shortens lives. In 2007 the World Bank estimated that 350,000 to 400,000 Chinese die prematurely due to air pollution.

As a result, **great attention has been focused on the potential impact of polluted air on the performance and health of athletes participating in the 2008 Beijing Olympic Games** (some countries made arrangements for their athletes to train in neighboring countries and travel to Beijing just prior to the opening ceremony).

Factories in Beijing and the surrounding regions were ordered to shut down weeks ahead of the opening ceremony.
Nineteen days before the Games were due to start, officials implemented restrictions on the use of private automobiles in the city. Technicians practiced seeding clouds to bring cleansing rains.
Nonetheless, air quality at the start of the Games was poor. But then, it started to get better. .
If we think that on July 31, 2008 Chinese environmental authorities put the PM_{10} count at 72 while on August 1 authorities put the PM_{10} count at 24, this shows a drop of two-thirds.

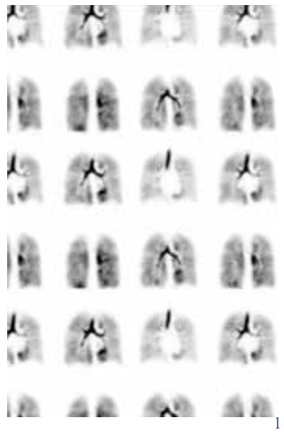
"We are still optimistic that during the Olympics we can reduce pollution well below our target thresholds" said at that time Du Shaozhong of China's Environment Protection Bureau, at that point was optimistic that during the Olympics they could reduce even more the level of pollutants in the air. Authorities, however, wanted to take no chances and **announced the emergency plan.**

"Sport is the mirror to society" ("Women, media and sport. Challenging gender values, thousand oaks" - CA 1994 - P. Creedan) ***".. and wave is the mirror to our souls"***

Previous page
American cycling squad' s member photographed arriving at Beijing's airport wearing a face mask issued by the team officials.
Data and article's informations from CNN, University of Southern California and US China, Beijing EPB and AP data and UK AQI archives. 2008

Current page
Screenshoots from Duble Pendulum, J. Kwakye training and athletes' lungs screenings.
***Sean Brody** Quote
Graphic from Butt's Survey. Carbon footprint in global hecyares(gha) for surfers in each geographical area compared with the carbon f. of the average citizen in the same area.

Astonish me! Pt. II
Double Pendulum. Breathing, movement and air quality.
Despite being invisible, the air that surrounds us is the most valued element that our lives depend on.
With a high prevalence of asthma in elite athletes, and official readings showing an air pollution index of 87 at Beijing's Olympic Stadium in 2008 (the World Health Organisation considers 50 to be high), *air pollution and its effects on our lungs received significant media attention during the Beijing Olympics.*
In the Summer before the 2012 Olympics Artist Faisal Abdu'Allah, one of London's most exciting contemporary artists, created Double Pendulum, a new **film about breathing and movement involving professional athletes** and world - class leading scientists.
It is part of the 'Invisible Dust' project in which artists and scientists are brought together to explore air pollution, health and climate change. Over 500 people attended the premier at the View Tube in June 2011 which was screened outdoors as part of the CREATE 11 Festival against the backdrop of the London 2012 Olympic stadium.
Double Pendulum runs for a duration of 9' 58" (in honour of the 100 - metre sprint world record of 9.58 seconds set by Usain Bolt in 2009) and Abdu'Allah *filmed the training rituals* of athlete Jeanette ***Kwakye***, 2007 British Champion for 100 and 200 metres, footballer Anthony ***Grant*** of Southend United and martial arts 2008 British Gold medalist and European Silver medalist Ammar ***Duffus***. These three very different types of sports professionals illustrate and map the journey that air takes through the human form alongside an engaging narrative from world - leading **scientists from King's College London and Brunel University.** 'Double Pendulum' explores how size, identity, gender, class and geography affect the way we breathe, what we breathe and how we move. Again, we are all in this together. Of course the example I chose relates to athlets training outdoor, but it is easy to understand air quality and its unsafe conditions is something that touches every single being and that must be faced. Again awareness-rising projects like these and ***"astonishing actions" that translate into visible the unvisible problem are the first steps for information and conciusness diffusion.***

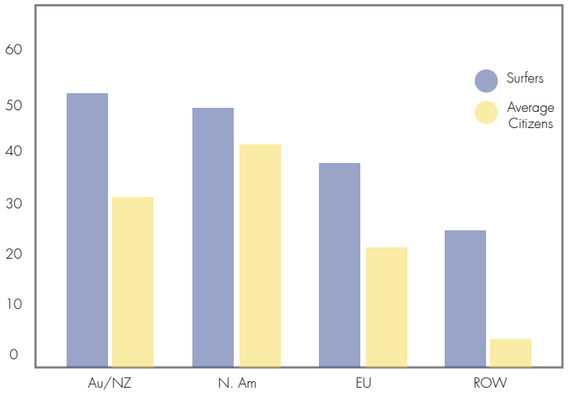


Appendix. "The surfers' footprint. Looking for the perfect wave is just the icing on the cake"*
From a survey developed by Tony Butt and published in the Book "Sustainable Surfing" in chapter 7.3 under the title *"Surf travel: the elephant in the room"*

"Nowadays big - wave surfers monitor conditions around the world to ensure they are in the right place at the right time when the giants come rolling. If only all our relationships with the sea were so benign." From BBC documentary.
The effects of environmental degradation, including the effects of global warming introduced by carbon emissions, will probably be more immediate and more profound on us surfers than on other members of the rich nations of the world. We are more sensitive to things like sea-level rise, storminess, coastal flooding and coastal pollution because we spend our lives right there, on the coast - on the 'front line.'
But are surfers more or less environmentally friendly than average citizen?
Ideally, it ought to be less.
One reason is that surfers ought to be more environmentally aware than most people because they depend on a very fragile part of nature (the coast) and they' ll be the first to notice when things start to change, such as episodic coastal flooding, increased storminess or rises in sea - level. Another reason is that surfing, stripped down to its bare essentials, is a low - carbon activity, similar to walking or cycling.
The act of riding waves itself doesn't burn any fuel, doesn' t result in any emission of greenhouse gases and doesn't cost you anything apart from some wax and the wear and tear on your board and suit.

"When I started surfing I remember thinking how wonderful it was because of that very reason. Of course, at that time, I lived in a city and rode my bicycle to the same beach every day. ."

Butt tested the effects of travelling on surfers' carbon footprints, compared to average citizens.
The graphs, together with the one reported below, show that this is always higher for surfers then for the others, and also another interesting graph is the number of planets we would need if all citizens of the Earth consumed the same as the average surfer or average citizens. Going on "surf trips" to get to those spots, to get to those waves requires energy, of course, the more is the passion, the more is the need of moving across the World taking flights and jumping on cars . .
In summary, the results of this simple survey suggest that, as surfers, the contribution to our ecological footprint due to travelling is higher than that of the average citizen.
We cannot dissociate easily, hiding beyond the surface of being "Nature lovers", we as surfers have our own part and responsability in this.



7.3 A new concept for a Urban (wet)suit

7.3.1 Contamina(c)tion

"Someone rides the Ocean Waves,
Someone rides the Urban Waves . .
. . and Someone rides the Hazardous Waves"

C. De Vescovi

From the Ocean waves to the Urban Waves . .

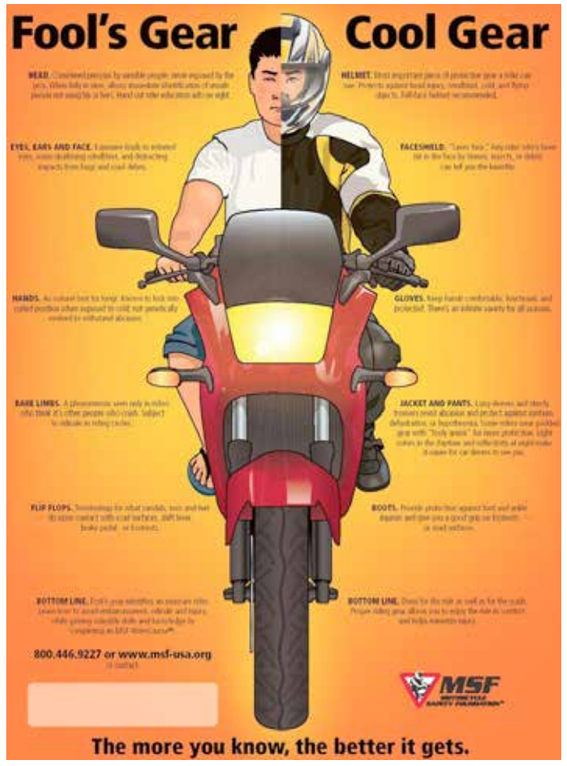
When I started to study the wetsuits for surfing I already knew I wanted to "use" them also to design something that could be more useful for the context in which "we" live, that is to say the city. That' s why I asked myself which could have been the **urban garment** that could have been "cross-fertilized" with the world of the ocean and of the wetsuits. A world that could embrace the same philosophy and approach, the desire of movement, of active life, the sense of freedom and rebellion in a way.
I istantly saw my surfer that, taking off on a wave in Montauk East point, rode it 'til Brooklyn and New York City then, I saw that ocean wave slightly materializing into a traffic wave made of cars, morotcycles, bicycles and urban noises.

The wetsuit for the sea materializes into the urban context assuming the shape of a protective gear for those sport activities that are main mediums of transportation in town (of course for those who cannot stand still on a train or inside a metro!) but that need to feel the speed and the strenght of the wind cutting their face.

I focused on the world of the ***Protective Gears*** because of their function: I was not interested in what is "fashion" to wear while you ride your motor/cycle (as we know when we think about bikers we straight move to the leather jacket and so on) but in what is functional to wear, in which garments satisfy specific needs in specific conditions.
On top of all, the needs of protection from three factors - **hurt, water, pollution** - summarize to me the main points that these kind of *urban activities* have in common with the *surf activity.*

. . passing through the Protective suits for cycling and motorcycling . .

Two - wheels activities have always evoked an image of freedom, individuality and rebellion. With that freedom, there is also the possibility of an injury. Leather suits were the first motorcyclists' garments to be tested using the Cambridge impact abrasion tester. They were one-piece suits or two-piece jackets and trousers worn by motorcyclists, mainly for protection



in a crash. In most cases, the type of leather used was not fashion leather but protective leather, which is thicker, stronger, and only moderately flexible.

Originally, motorcycle leathers were adapted from tank corps gear immediately following World War I cause Duster coats tended to catch in the wheels and were switched for short coats. But with the development of the new materials and textile performances, an alternative to leather became the clothing in man-made textiles, that could offer improved weather protection from heat, cold and water.
Common materials include high density ballistic nylon, Cordura and Kevlar, but also Lycra and waterproof liners made from materials such as Gore-Tex, even if not all protective clothing was exclusively made of synthetic materials; heavy weight waxed cotton was used for many years before the development of modern materials. "Going back to natural offers", even for technical garments, is an attitude that finds lot of brands approaching it nowadays. . solutions are out there, we just need to research, study and not give up. Let' s just go back to Patagonia new "natural-prene" Yulex for wetsuits and the ideao of finding new valid alternatives to neoprene and chemically made materials.
Safety has always been a main point in motorcycling armors, designed to increase the chances of survival in accidents, and this links to the attention not only to the garment but also to the additional protections, like the helmet*.

In this section of the project development, in which the wetsuit for surfing becomes the inspirational idea for the urban context, the bound between the sea and the road remains the idea of protection from the hazardous pollution we are responsible for and that just concretizes into different shapes if we consider water or air, but remains as something dangerous and that we have to protect from while we are looking for solutions for an healthier environment.

The surfing wetsuit shapes into the (wet)suit for the urban waves of traffic and its main protective accessory, the hood, translates into the idea of the motorcycling helmet. The point in my project is the protection from and the detection of hazardous pollution and not from the "crash".
That is why in my urban (wet)suit the concept of protection evolves from the rigid armors into the look, touch and comfort of the "sea"

*Note. Interest in developing helmets began in 1935, when T.E. Lawrence (better known as Lawrence of Arabia) suffered a fatal motorcycle crash. His neurosurgeon, Hugh Cairns, began the research that would eventually lead to the development of the motorcycle crash helmet. The first patent for a motorcycle helmet was submitted in 1953 by Professor C. F. Lombard. The earliest helmets were made of leather, which didnít do much in the way of impact protection, but did prevent abrasions. Later helmets changed radically in design and materials - in the 1960s safety helmets had exteriors made of fiberglass and interiors lined with polyurethane foam or cork.
Most modern helmets are made of plastic, carbon fiber or Kevlar and are designed to be impact and puncture resistant.

.. and passing through the Hazmat suits

Right after my vision of a surfer riding the water wave into the city becoming the rider of a traffic wave, I run into a second vision: that ocean wave was made out of plastic, microplastic and chemical pollution so its urban counterpart would be a traffic airy wave made out of hazardous levels of unbreathable microparticles. Here it comes the other ingredient in terms of inspiration for the concept and design development: the hazmat suit.

Hazmat suits are mostly used by firefighters, Emergency Medical Technicians, Paramedics, researchers, personnel responding to toxic spills, specialists cleaning up contaminated facilities and **"workers in toxic environments"**. . not so far from what we shoud consider ourselves in our everyday urban life.
The United States Department of Homeland Security defines an hazmat suit (hazardous materials suit) as:
"an overall garment worn to protect people from hazardous materials or substances, including chemicals, biological agents, or radioactive materials."

On top of all, the needs of protection from three factors - hurt, water, pollution - summarize to me the main points that these kind of urban activities have in common with the surf activity.

Previous page
Fool's Gear vs Cool Gear -"The more you know the better it gets", MSF motorcycle safety foundation Advertisment for safety in motorcycling.
Current page
Motorcycling under the rain. Guide to Night Motorcycle Riding - BikeBandit.com.
Cycling in the mountains. "Sportful Fiandre Light WS Jacket" developed with Alberto Contador's Tinkoff-Saxo team, from roadcyclinguk.com

BME ProRain Wet-Weather Unisex Suit in yellow color reminding the hazmat suit, 100 % Nylon stretch fabric processed as laminate, from bmwmotorcycle.com
"More than a costume" Hazmat Suit Campaign from Doctors of the World. November, 2014

7.3 A new concept for a Urban (wet)suit

7.3.1 Contamina(c)tion

"Someone rides the Ocean Waves,
Someone rides the Urban Waves . .
. . and Someone rides the Hazardous Waves"

C. De Vescovi

Current Pages 118-119
"Hazmat Surfers" captured inside and outside the polluted waves.
From the photo collection "Hazmat Surfing" by Dyrland Productions in collaboration with Surfriders Foundation.
2014

Seems to be the definition I was looking for in terms of the needs to be faced by my wetsuits.

The hazmat Suit is a piece of personal protective equipment that consists of an impermeable whole-body garment worn as protection against **hazardous materials.**
They provide protection from: chemical agents (through the use of appropriate barrier materials like teflon, heavy PVC or rubber and Tyvek), nuclear agents (possibly through radiation shielding in the lining, but more importantly by preventing direct contact with or inhalation of radioactive particles or gas), biological agents (through fully sealed systems and air purifying respirators with full hoods and protective suits to prevent exposure), fire/high temperatures (usually by a combination of insulating and reflective materials). Such suits are often combined with self-contained breathing air supplies to ensure a supply of breathable, clean and uncontaminated air. About ratings and types the classification of these suits is based upon the degree of protection they provide. They come basically in two variations: *splash protection and gastight suits.* As the name implies, the splash protection suits are designed to prevent the wearer from coming into contact with a liquid while gastight suits additionally protect against gases and dust.The suit is worn on the outside of normal clothing but before gloves, sleeves, shoes, hoods and face masks, that are placed on top of everything to ensure there are no openings where contamination could occur; also it is secured around wrists, ankles, face, neck and waist.

Reflecting on comfort and the point of "how to wear it".
Working in an hazmat suit is very strenuous, as the suits tend to be less flexible than conventional work garments. With the exception of laboratory versions, hazmat suits can be hot, poorly ventilated (their use is usually limited to short periods) and hard to put on/take off. That is why I analyzed the Jhon Hopkins University context for the design of a new, more comfortable suit for Ebola workers.A skunkworks team at Johns Hopkins University has developed a prototype protective suit to better shield healthcare workers on the front line of the epidemic. Wearing hazmats is not enough to protect, the suits also need to be removed safely without contaminating clothing or skin.To design a better suit, the 70 participants had to first single out weak points in current designs. The designers, engineers, and medical students had to stick with the Tyvek or Tychem material currently used to make the suits - changing the manufacturing process too much would make it hard to ship new gear in a timely manner - so they looked to the zippers and fasteners instead.
The key is the zipper. Instead of standard zips that attach at the teeth, the team used a high performance one that breaks open like a Ziploc baggie. (Firemen and emergency workers use them on their gear - the inspiration from other fields keeps being a smart approach for innovative solutions!). Pull straps at each shoulder have a little extra slack, so the wearer bends over, steps on each strap, stands up, and slithers easily out. The suit turns inside out as it is removed, reducing the risk of accidental contamination while disposing it, and it is color-coded to indicate those areas that are safe to touch with gloved hands.
The team solution is the opening. This research has been to me an element of inspiration for the reflection on "how" I wanted my urban (wet)suit to be worn. As we' ll see in depth in the Design details Section the choice came out from two main desires: the desire for a clean look with no visible openings, nor in the front or in the back - to maintain the surfing wetsuit sensation, and the desire of functionality on this urban garment - than concretizes in the concept of transformability. I wanted the (wet)suit to respond to different urban needs, in relation to our lifestyle, full of multiple and different activities and contexts. But we'll go through all of this in the next paragraph.

Appendix.
The connection between Surf Suit and Hazmat Suit : the excessive Pollution as a scenario of our Future
"My Photos predict a poisonous, dark future for our Oceans".
Dyrland Productions partnered with the Surfrider Foundation to raise awareness and capture the reality of where the future of ocean water quality might be headed if we continue to follow the current pollution trends.

The photo collection "Hazmat Surfing" featuring surfers, lifeguards, and beach goers wearing hazmat suits to protect themselves from the contaminated waters around Venice Beach, CA, brings to light a raw view of what beach life may be like in 20 years from now.
"I traveled to Los Angeles in October 2014 to take photos for my childhood friend who lives there. I was really looking forward to this trip because I wanted to make the most of it and try my hand at surfing. One night it started raining really hard. . When I woke up the following morning, I asked my friend when we could go out and he said *"Are you crazy? No one goes in the water after it rains. You could get MRSA, hep C, virus, respiratory infection. ."*
I was shocked. When it rains in LA all the sewage, garbage and oil run right down the streets into the sand and the ocean. During a typical rain storm as much as 10 billion gallons of rain runoff enters the ocean.
I kept thinking about not being able to go surfing while I was down there. The inability to enter the water for three days was crazy to me so I decided to raise awareness surrounding the decreasing water quality of our oceans.
I developed the idea for this photo shoot and called it ***"Hazmat Surfing".***
I think if we continue with this pollution trend we are in right now, in 25 years people will have to throw on an hazmat suit to go surfing in order to protect themselves from all the contaminates and pollution in the ocean."

7.3 A new concept for a Urban (wet)suit

7.3.1 Contamina(c)tion

"Someone rides the Ocean Waves,
Someone rides the Urban Waves . .
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C. De Vescovi

SURFING

POLLUTION OF THE OCEANS

HAZMAT SURFING

FROM THE OCEAN WAVES

TO THE URBAN WAVES

WETSUIT

Current Pages.
Visual Development of the (wet)suit Design.1
From the world of surfing we link to the main garment, the wetsuit.
It transforms in a new suit for the urban traffic waves, designed for those who love action in their dailylife and want to feel the air on their face.
Here comes the problem of pollution; a main point to consider, that ruins the air we breath, the oceans we swim in, the rains we get wet by.
The hazmat suit enters in the project development as the bridge between the ocean and the road; it represents the need of protection, a message of changing and, "designing" talking, the new volume and shape assumed by the (wet)suit for the city.
The Dyrland Productions shooting strongly represents the connection between the two realities of the ocean and of the city and silently adfirms that everything on our planet is connected, that there are no separate realities and this is the reason why we shoud all take more care of this world, because it is the only one we have.

HAZMAT

POLLUTION OF THE CITY

MOTOR/CYCLING

Left. **Cold surfer,** Kinfolk Year-round Surfing web;
Cold weather surfing with Chris Burkard, from outsideonline.com;
Balianese surfer Dede Suryana is engulfed in rubish while surfing off of a remote island near Java, Indonesia, Photograph By Zak Noyle, from nationalgeographics.com
Surfing in hazmat suit, Dryland productions;
Patagoniza Yulex R3 Wetsuit, patagonia.com
Right. **Woman Wears Hazmat Suit** at the Airport from witl.com
Global Ebola Response campaign of UNMEER of Dec, 2014 - from live.cbc.ca
Cycling in the mountains. "Sportful Fiandre Light WS Jacket" developed with Alberto Contador's Tinkoff-Saxo team, from roadcyclinguk.com;
Cycling under polluted rain in hazmat suit, from cyclingnews.com
Motorcycling under the rain. Guide to Night Motorcycle Riding - BikeBandit.com;
Dupont Hazmat Suit, amazon.com
BME ProRain Wet-Weather Unisex Suit from bmwmotorcycle.com
Tour de France wind-jacket for cyclism
Men's Gel Padded Touring Short with Innovative Mesh Pockets by Aero Tech, aerotechdesigns.com
Better Wa(y)s (wet)SUIT front and back views, drawing by C.De Vescovi

HAZMAT SUIT

CYCLING & MOTORCYCLING SUIT

(wet)suit

7.3 A new concept for a Urban (wet)suit

7.3.2 The (wet)SUIT: the application of the principle on the urban context

Current Page.
Visual Development of the (wet)suit Design
The scheme sintetizes the key elements for the development of the research and of the process of designing the suit.
Surfers go to extreme lengths to keep out the cold, from surfingsections.com
One Piece RS5009 Grey Motorcycle Rain Suit from Jafrum, jafrum.com

The "wetsuit" of the surfer becomes the "suit to not get wet" for those riding the "traffic waves" of the city.
Moving from the Ocean waves and taking as inspiration the garment used for one of the main sport activities practiced by man inside water to feel in connection with its strenght, we get to the reinterpretation of this piece of clothing that becomes the starting point to satisfy a completely different context: the urban context.
The "wetsuit" of the surfer becomes the "suit to not get wet" for those riding the "traffic waves" of the city.
The treatment on neoprene, developed in collaboration with RES S.p.A and well described in the previous chapter in relation to the surfing wetsuit, can be transfered and applied to the urban context. So the idea here becomes the detection of the urban air unhealthy and hazardous conditions through the contact of the (wet)suit material contact with both air and water (in form of rain).
The only thing that changes is the "type" of particles' detected: in the surfing wetsuit it was bisphenol A from microplastics' melting in the oceans, here in the city, after the AQI analysis, is the CO together with the microparticles PMs, that we saw are common elements through all the different countries' classifications.
The wetsuit remains as a starting point for shapes, cuts, materials and technical details. Contaminated with the function of the hazman suit - that brings together a reflection on the problem of the pollution of the air and of the oceans and an hidden message to underline our need to face and change this situation - and with the comfort of cycling and motorcycling suits, it gives birth to a new (wet)suit that can face the urban needs. It is designed for both those men and women (even if this first prototype is studied on man anatomy) who love an active life even in town, who want to stay "above" the wave and want comfort, function and syle even in the worst weather conditions.
The suit has a double function: it is a "rain" suit that protects you from the wet while you move through the city on your motorcycle, on your bicycle, on your skate or on whatever thing you want to move and also it becomes a maxi-pockets jacket through the opening of a characteristic zip that goes from one foot to the other.
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One single garment can become two really different ones, so that you can face different daily needs and occasions being appropriate and comfortable without renouncing to function and style.
You can easily wear the suit on your daily outfit and use it depending on your need and desire as a suit that protects you from rain/smog or as a cool sporty jacket.
The suit remembers the wetsuit cuts and details (the curvy seams refer to the ocean waves, as well as the "protection areas" reinforces, like the elbows and knees that are seamed through the **tuck & fold** technique that provides protection and increases elasticity, the yellow piping in contrast with the plain colour of the suit reminds us of the wetsuit contrasting details. The comfort is guaranteed by the elasticity of the fabric chosen (theorically a natural rubber that substitutes the neoprene, taken from the last Patagonia researches about sustainable materials - the prototype is made in a bonded lycra chosen because of its perfect balance in respond to many different needs: elasticity and comfort, lightweight and easy shaping for transformation, proper structural features in terms of reactivity to the color-changing-reaction treatment). The main point is the ***zip***, that goes all along the internal sides of the legs from one malleolus to the other. Opening, flipping and rolling the "legs" all the way up, fixing them one to the other through automatic buttons makes them become the two maxi - pockets of a new garmet that is no more a suit but a jacket.
Another main element is the ***hood***, designed as a protection from rain and pollution (thanks to the attention on details and the elements it is made of: the visor, the adherence guaranteed by the coulisse, the flipping smog-protective collar, the comfort and breathability designed for the parts in contact with the skin, ..). It can be worn underneath the elmet while riding or as a regular hood to protect you from rain/wind, and easily removed (as it is an accessory in addition to the suit). The color palette selected for the garment maintains the link with the "ocean" section; the deep blue ocean runs through the entire garment rippling in parts that remind us of the wetsuit elbows and knees pads while the curvy yellow pipings and the dark grey hidden iternal details at the level of the knees that become visible once we flip the suit into the jacket remind us of the two main colors of the urban roads.
I wanted to work on transformability because having a garment that can be different ones assolving to different functions and adaptable to different situations throughout the same day is one of the main things we need in our frenetic routine, in which we find ourselves facing different contexts without the time to "get ready" for them.

Facing different weather conditions, functions, needs and syles the suit becomes a must have for the riders of the urban waves and that want to be aware of the unhelthy conditions they are into.

7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. Mood

From the **OCEAN WAVES**

To the **URBAN WAVES**

Pages 124-125
Left. **Surfing in cold waters,** Iceland expedition, ph. Chris Burkard, from chrisburkard.com
Impression of warm wave, one of a series of waves photographs that look like oil paintings, by California-based photographer David Orias, from mymodernmet.com
Right. **Mexico City's air,** one of the most polluted on the planet adfirms UN, Ph: Jorge Uzon/AFP/ Getty Images, from theguardian.com
San Francisco' s Fog, Ph. Lorenzo Montezemolo, from wired.com

7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. Mood

From the **OCEAN WAVES**

To the **URBAN WAVES**

Pages 126-127
Left. **Aerial View of the Bondi Beach**, Ph: Bernhard Lang
Ton Heukels for L'Offeiel Hommes Switzerland, spring 2016, from designsfever.com
Bird Eye view of New York City Intersection, Brooklyn-based ph: Navid Baraty, from adelto.co.uk

7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. Mood

From the **OCEAN WAVES**

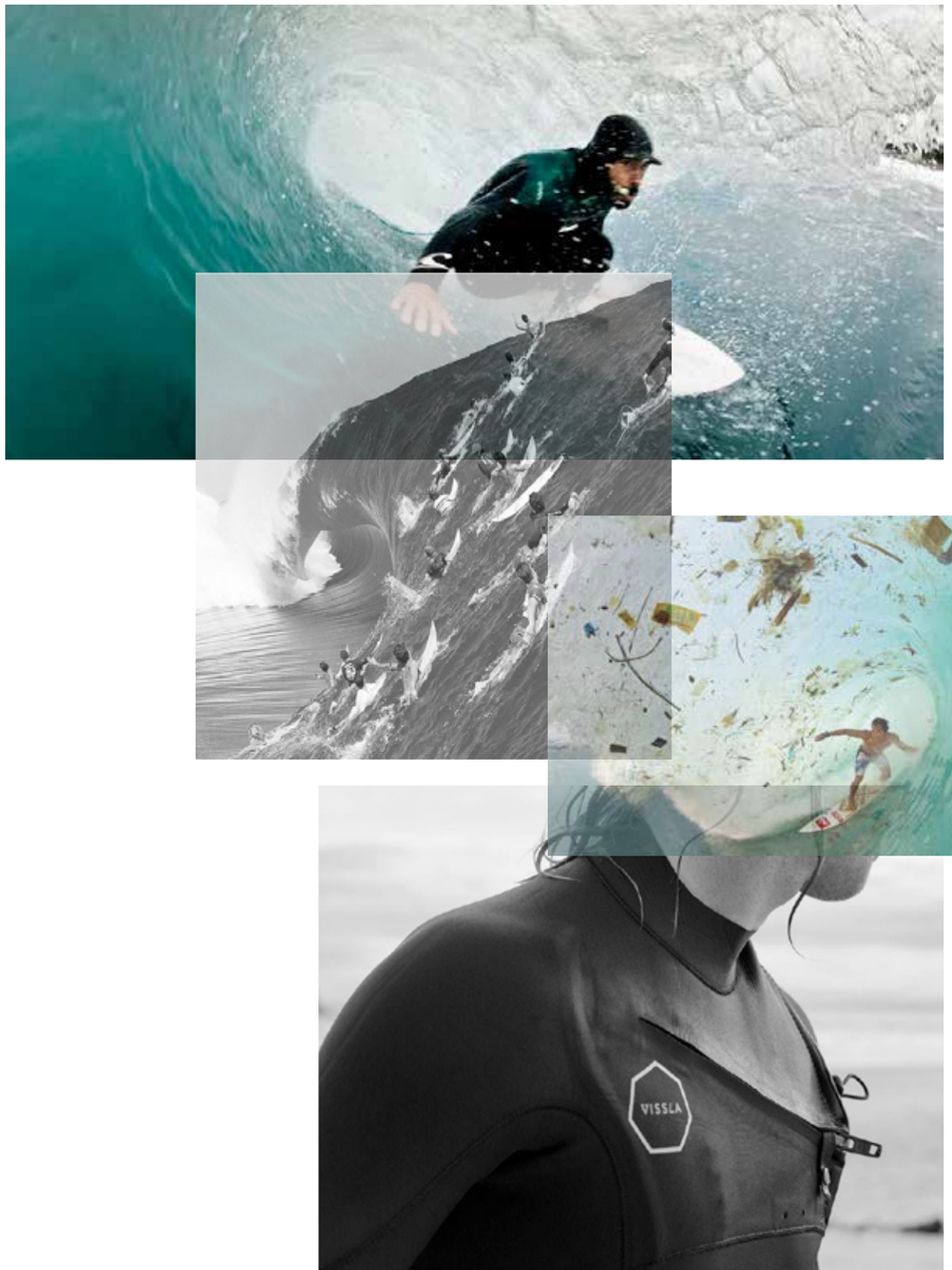
To the **URBAN WAVES**

Pages 126-127
Left. **Impression of warm wave**, one of a series of waves photographs that look like oil paintings, by California-based photographer David Orias, from mymodernmet.com
Cold surfer, Kinfolk Year-round Surfing web
Majestic waves surpassing the depth of the Ocean series, from poredpanda.com
Right. **ALLURE** For millions of people, New York City holds an appeal that is not easy to explain, GettyImages, from nytimes.com
One Piece RS5009 Grey Motorcycle Rain Suit from Jafrum, jafrum.com
Rain drops falling n the street, absfreepic.com

7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. Concept

From the **OCEAN WAVES**



To the **URBAN WAVES**

Pages 128-129
Left. **Surfing in cold waters**
Image taken from tallingtonlakesproshop.com
Surfing Jam in Thaiti, ph. Brent Bielmann
Balianese surfer Dede Suryana is engulfed in rubish while surfing off of a remote island near Java, Indonesia, Photograph By Zak Noyle, from nationalgeographics.com
Vissla Eco-series Wetsuit campaign, from vissla.com
Right. **In Chicago, a lone cyclists** navigates the bike path along Lake Michigan at the North Ave. beach. Dec. 18, 2013 from cbsnews.com
Valdaste Tour 2014, bycicleworld.com
Smoke billows from coal-fired power plant stacks as a Chinese woman wears a protective mask. Ph: Kvin Frayer, from uk.businessinsider.com
3-Layer Waterproof Breathable Cycling Jackets by Showerpass, from showerpass.co.uk

7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. The story of the (wet)suit in Comix

Pages 132-133-134-135
The (wet)suit Comix
The comix strips illustrates the daily use of the garment in the routine of a random urban user.
Drawings by Chiara De Vescovi
Underneath the comix:
Left. **Surfing in cold waters,** Iceland expedition, ph. Chris Burkard, from chrisburkard.com
Right. **Pat Casey, pocket tailwhip air at X Games BMX** Munich in late June, from espn.com

7.3 A new concept for a Urban (wet)suit

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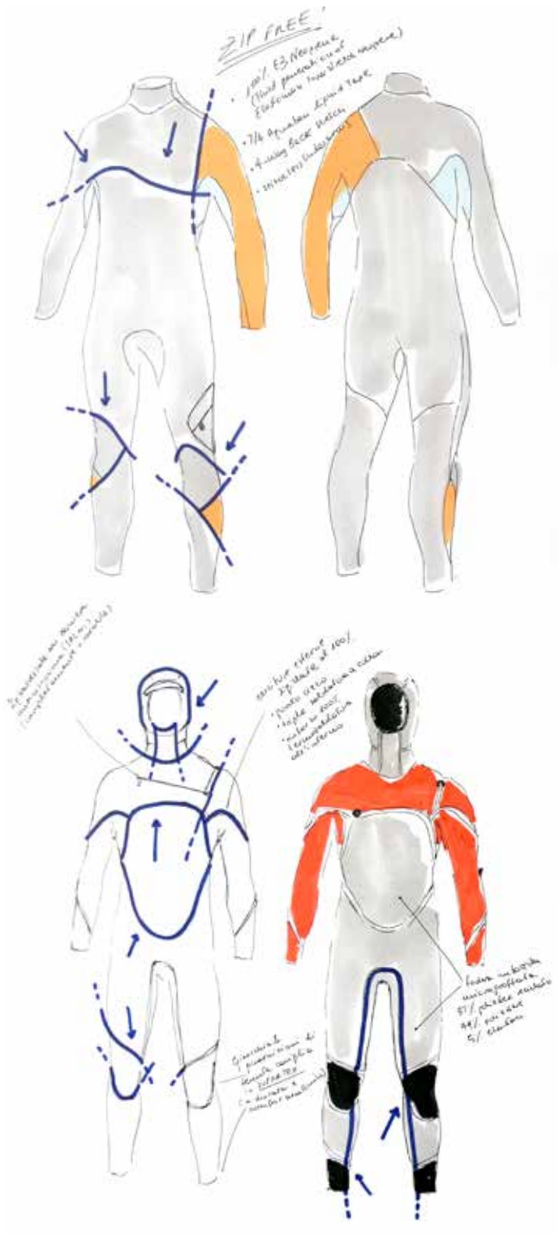
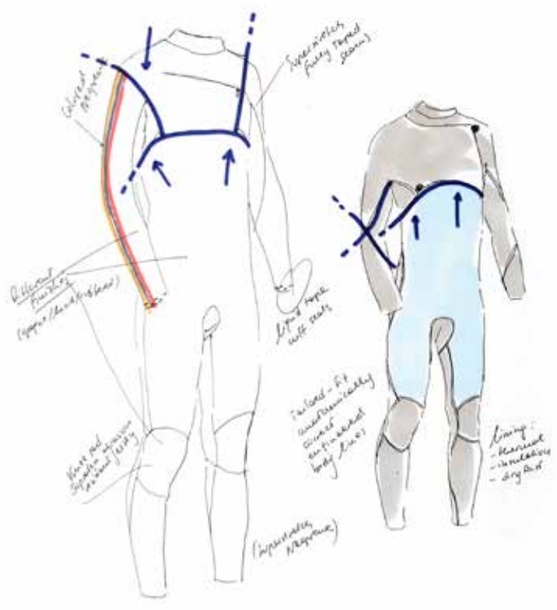
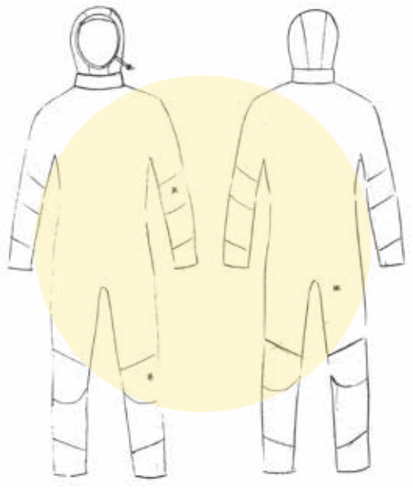
7.3.3 The Design. Drawings



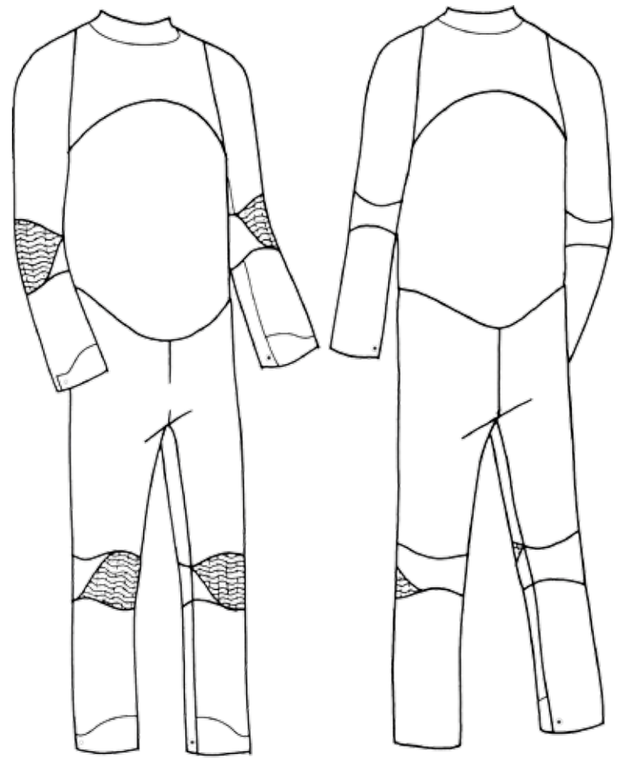
Wetsuit
Design/Cuts
Research



Crossfertilization
With the needs of the
new suit for
the Urban Context



(wet)Suit
for the Urban Waves



Pages 136-137
First studies of wetsuits shapes and how to transfer peculiarities to the urban (wet)suit.
Drawings by: Chiara de Vescovi
Left. **General wetsuits studies**
Right. **First proposals** for the Better Ways (wet)suit

7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. Drawings

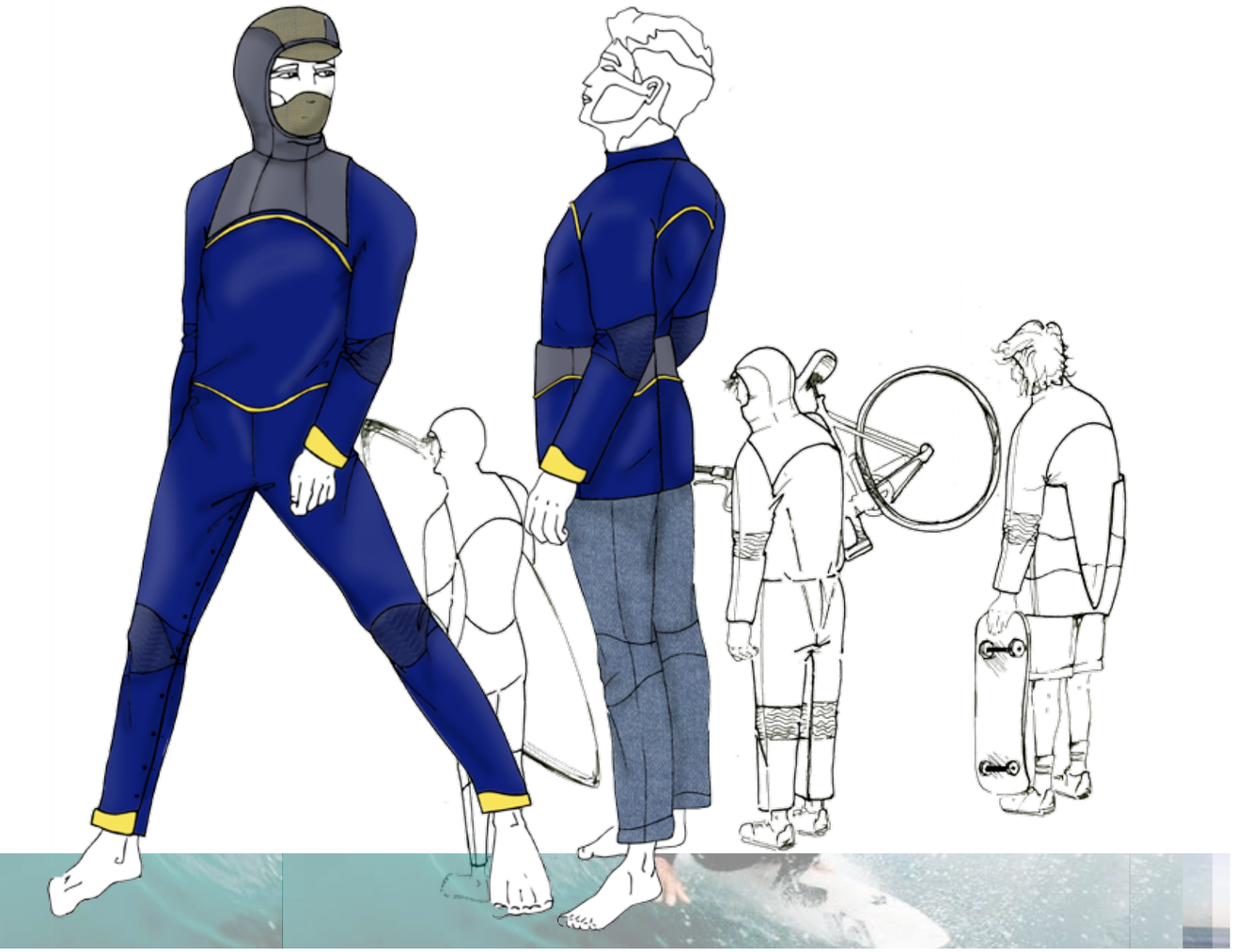
From the **OCEAN WAVES**

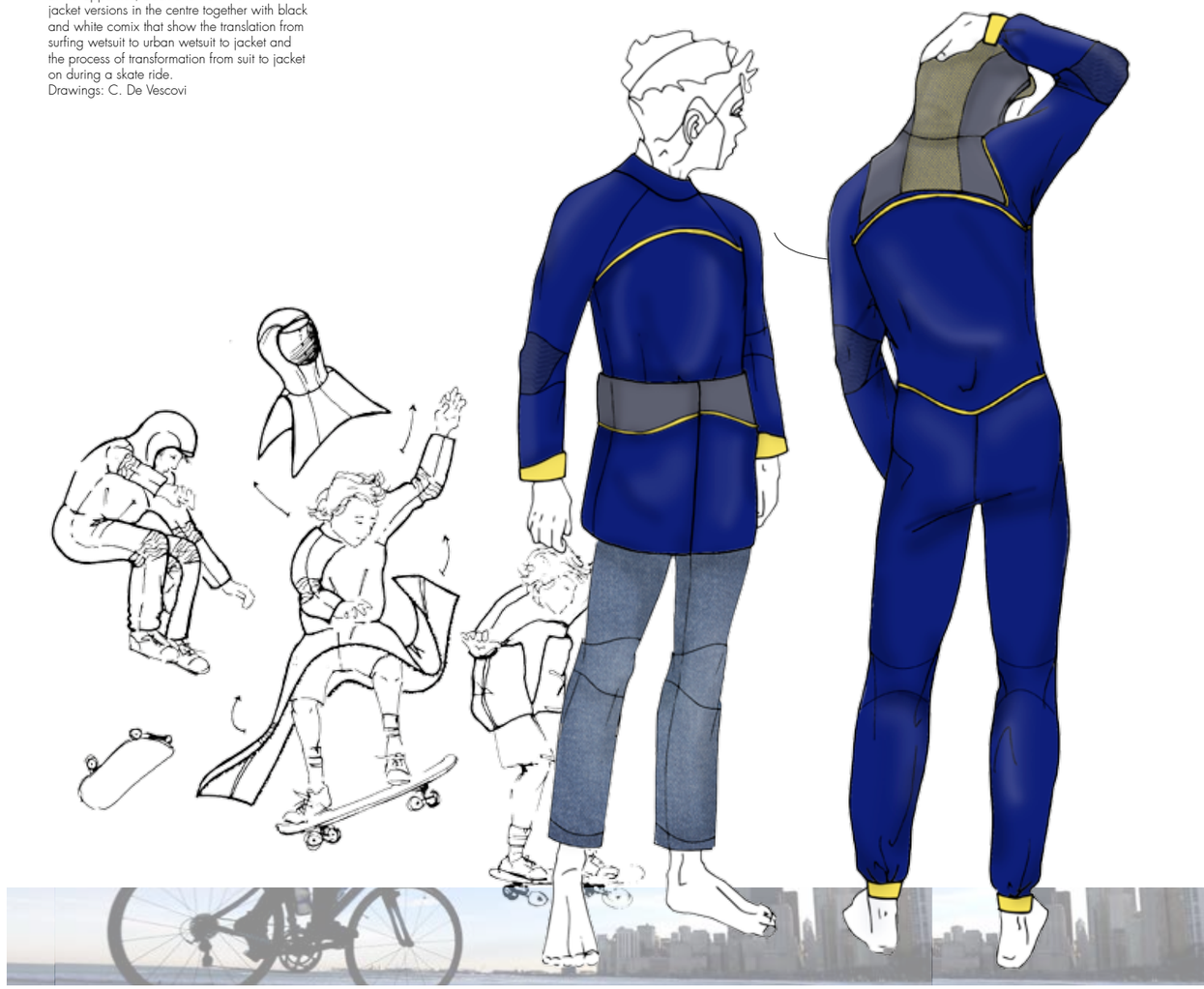
To the **URBAN WAVES**

From the **SUIT**

To the **JACKET**

Pages 138-139
Designs for the Better Ways Urban (wet)suit.
Front and back views of the wetsuit version at the opposites, back and front view of the jacket versions in the centre together with black and white comix that show the translation from surfing wetsuit to urban wetsuit to jacket and the process of transformation from suit to jacket on during a skate ride.
Drawings: C. De Vescovi

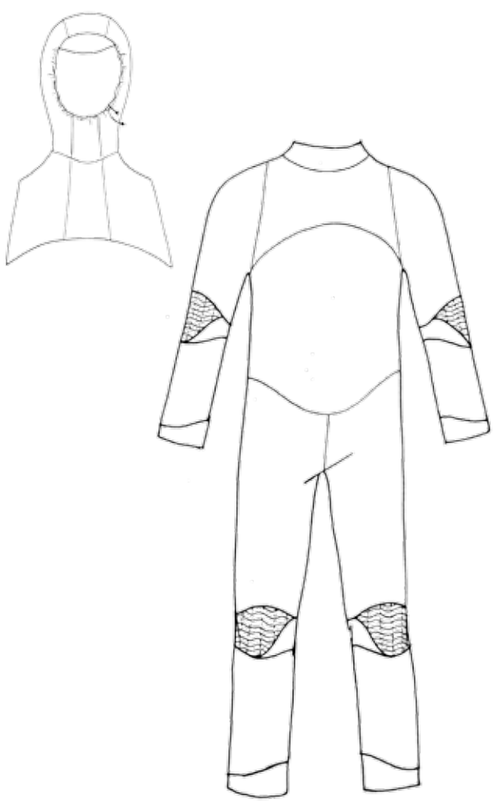


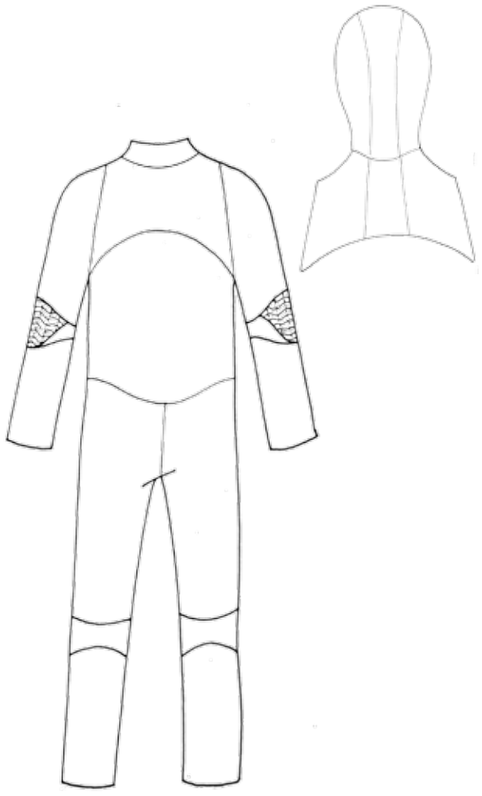


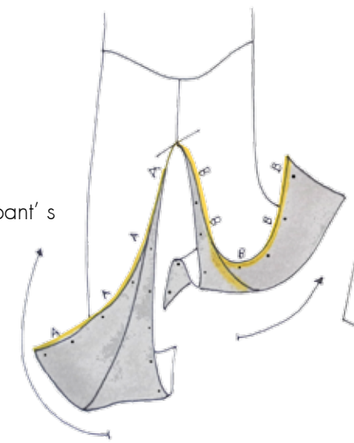
7.3 A new concept for a Urban (wet)suit

7.3.3 The Design. Drawings

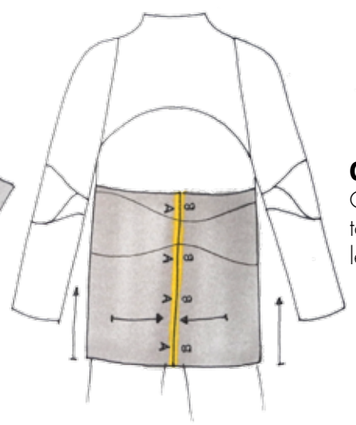
From the **SUIT OVERVIEW**





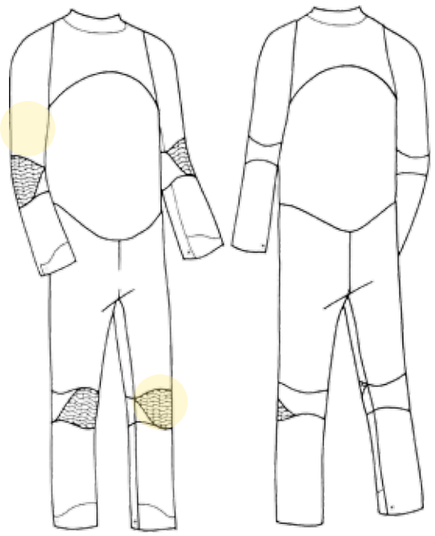


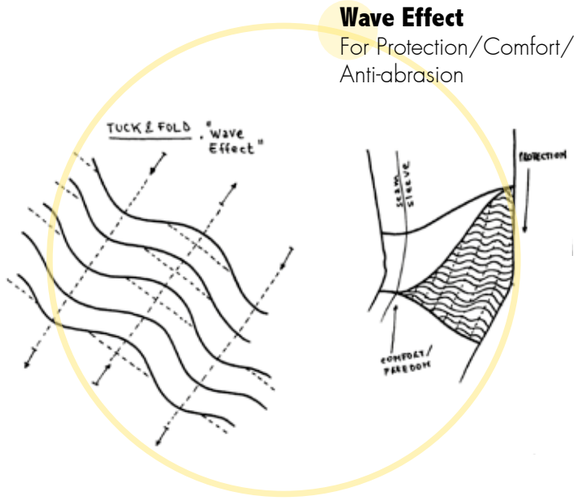
Clips
To keep together pant' s front - front and back - back



Clips
On the bust side seams to keep the legs/pockets up

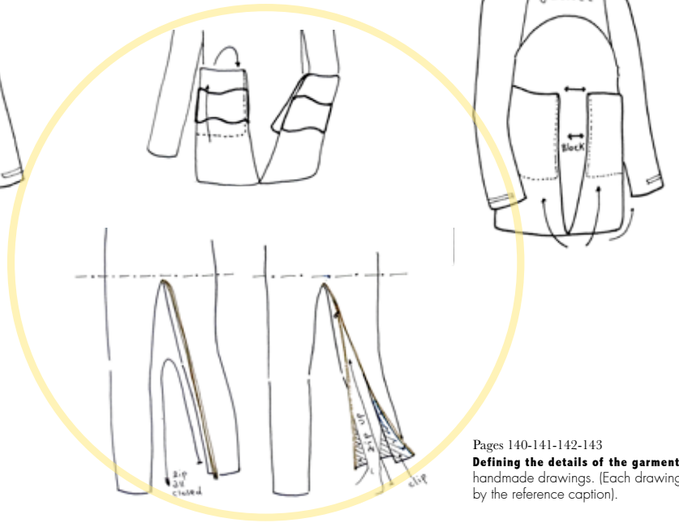
To the **SUIT DETAILS**





Wave Effect
For Protection/Comfort/ Anti-abrasion

The Transformation
Process. Open the zip/ Flip the legs Up/Keep them up through clips

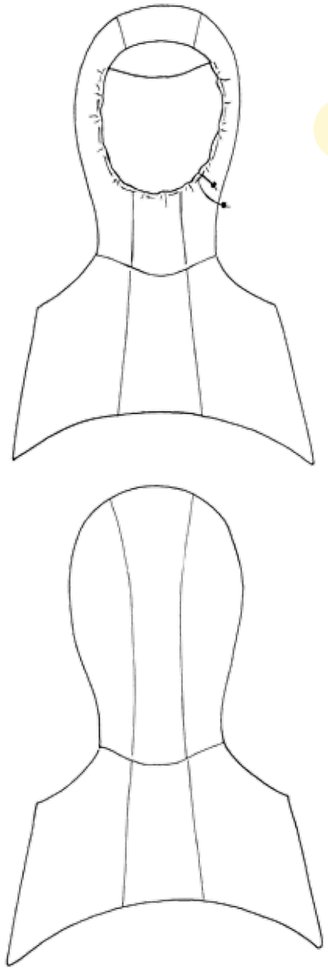


Pages 140-141-142-143
Defining the details of the garment through handmade drawings. (Each drawing is sided by the reference caption).

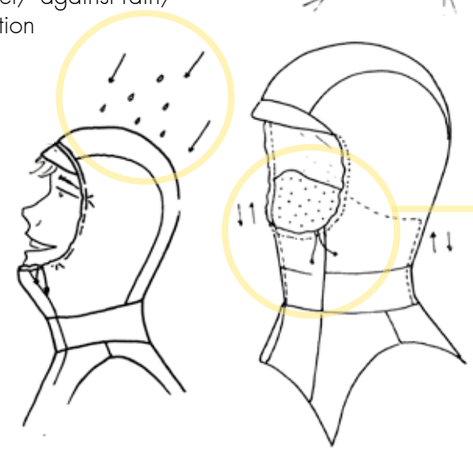
7.3 A new concept for a Urban (wet)suit

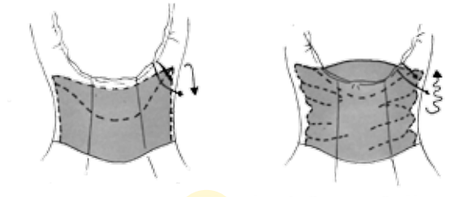
7.3.3 The Design. Drawings

The **SUIT DETAILS**

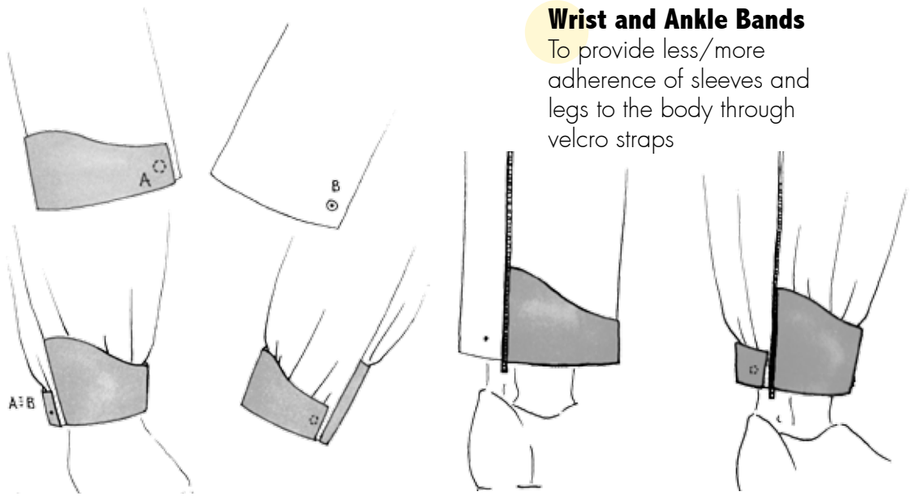


The Removable Hood
For Protection under the helmet/ against rain/ Pollution

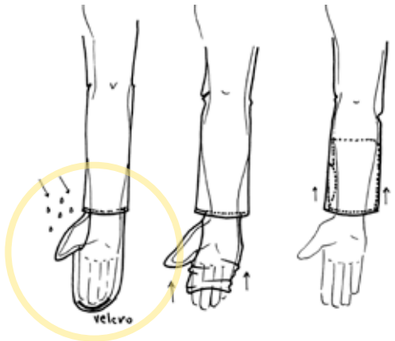




The Anti-Smog Collar
Fixed to the inside of the hood at the level of the neck cut, it can stay flipped and hidden inside or it can be pulled up as a protection against polluted air



Wrist and Ankle Bands
To provide less/more adherence of sleeves and legs to the body through velcro straps

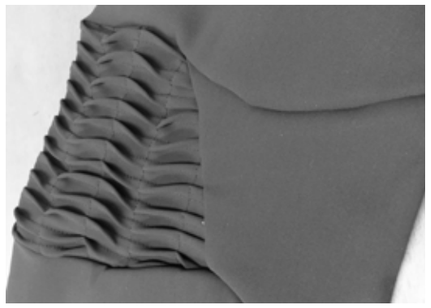


Further Developments
Additional integrated elements of proection to ride the urban waves.

Hands/Shoes coverage

7.3 The Better Urban Way (wet)suit

7.3.4 The Prototype Development. Some shoots



Current page
Tuck & fold detail photographed in black and white during the prototype earlier developments. Detail of the arm.
Transformation process The tree main steps for the (wet)suit shifting from suit to jacket here photographed in a early prototype miniature in denim. November 2016.

Next Page
Paper Patterns black and white detail of the paper patterns placed on fabric at the "cutting" moment.
Removable hood development sequence of the hodd' s details. In - side and out - sides are shown
(Ph: C. De Vescovi - in Laboratory, PoliMi)

7.4 The Better Urban Way (wet)suit

7.4.1 The Prototype Development. Technical Sheets

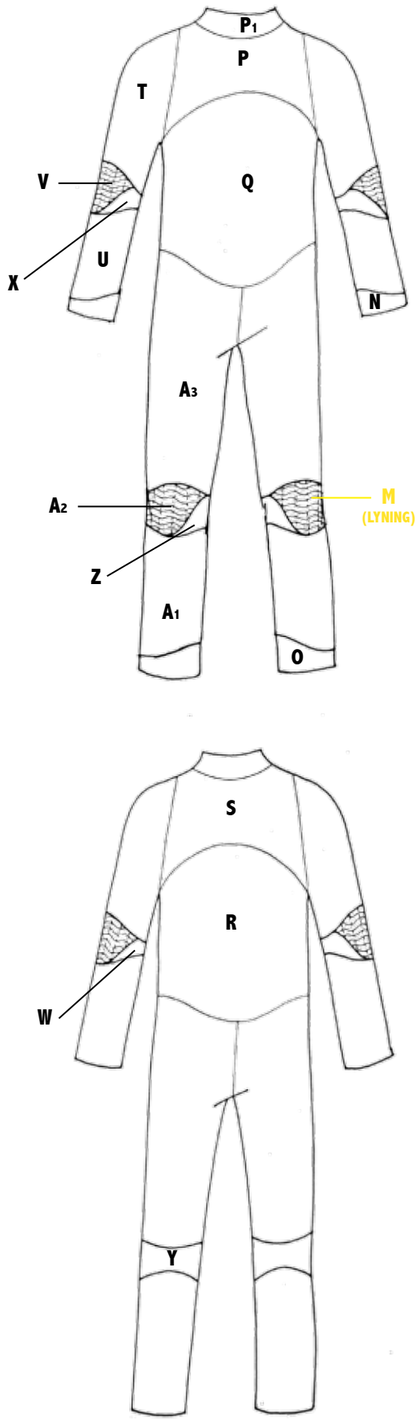
Suit		Tg. Man 50
PAPER PATTERN	Fabric Pieces	Type of Fabric
Paper Pattern M	2	B. S. Grey
Paper Pattern N	2	B. S. Yellow
Paper Pattern O	2	B. S. Yellow
Paper Pattern P	1	B. S. Blue
Paper Pattern P_1	1	B. S. Blue
Paper Pattern Q	1	B. S. Blue
Paper Pattern R	1	B. S. Blue
Paper Pattern S	1	B. S. Blue
Paper Pattern T	2	B. S. Blue
Paper Pattern U	2	B. S. Blue
Paper Pattern V	2	B. S. Blue
Paper Pattern W	2	B. S. Blue
Paper Pattern X	2	B. S. Blue
Paper Pattern Y	2	B. S. Blue
Paper Pattern Z	2	B. S. Blue
Paper Pattern A_1	2	B. S. Blue
Paper Pattern A_2	2	B. S. Blue
Paper Pattern A_3	2	B. S. Blue
TOT.PAPERS 18	TOT PIECES 31	
SEAMS	1 cm (seam allowance - regular linear seams)	
HEM	Row Cut	

Bonded - Dark Blue

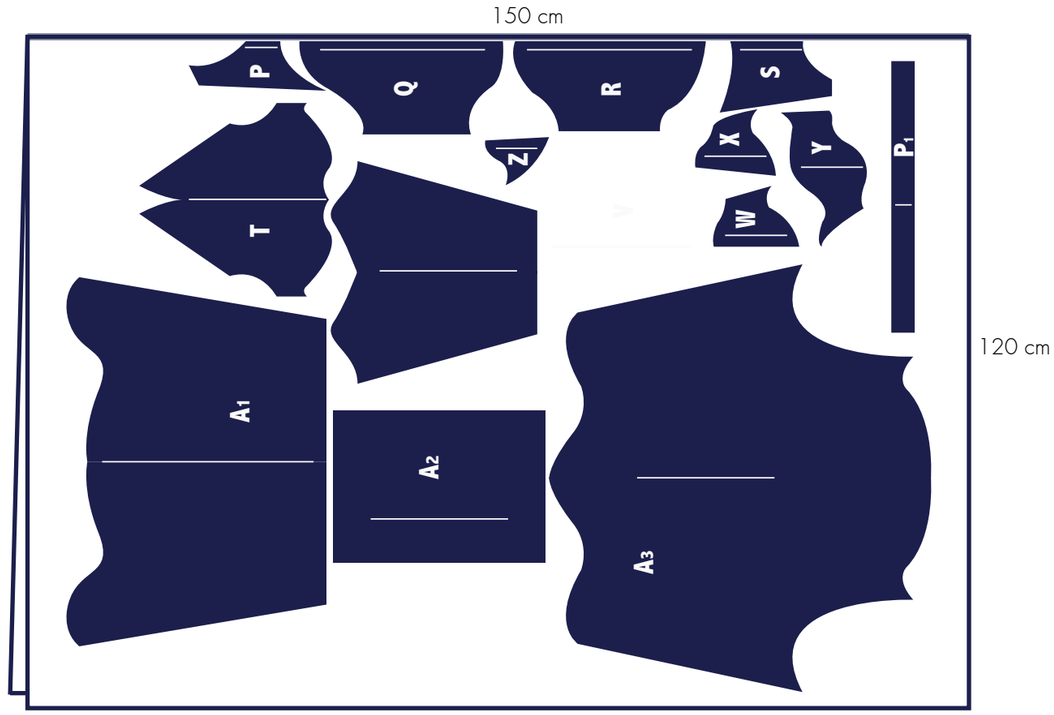
Bonded - Dark Grey

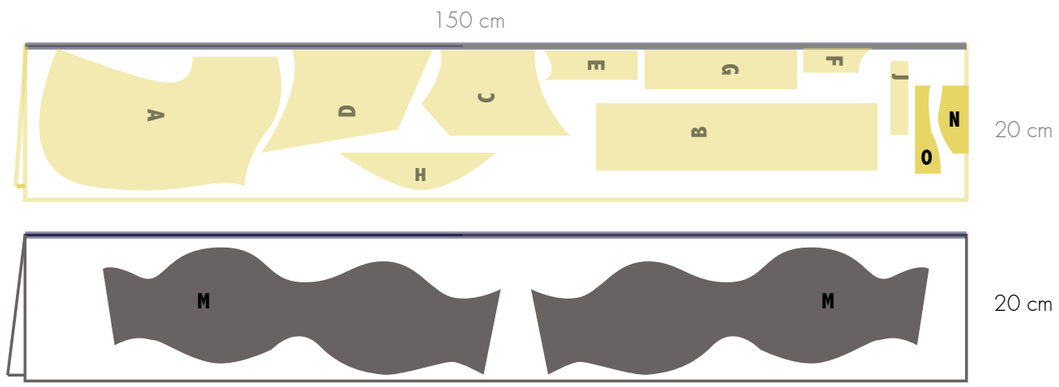
Bonded - Yellow & Sand

CONSUMPTION	ARTICLE	Height (cm)	Quantity (cm)
FABRIC	B. S. Blue	150cm	120cm ON FOLD
	B. S. Yellow	150cm	20cm ON FOLD
	B. S. Grey	150cm	20cm
ACCESSORIES	Clips		32 couples



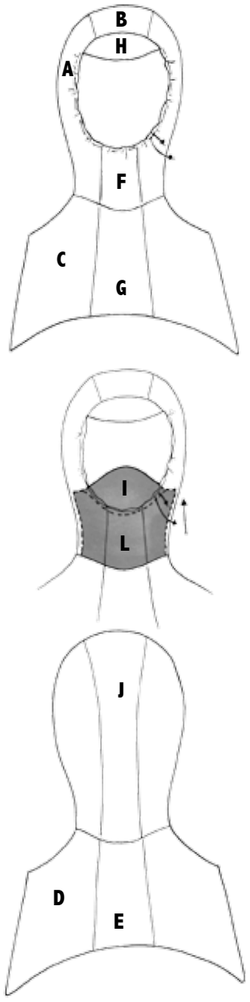
Pages 146-147-148-149
Technical sheets for (wet)suit and hood
developed in Adobe Illustrator. Patterns and placement are shown to analyze the wastes and get the garment ready for industrial production.

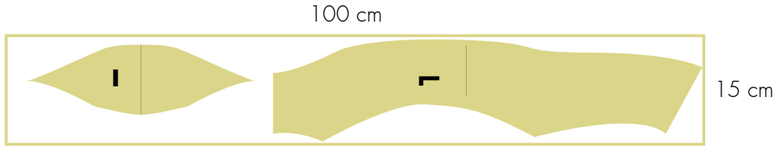


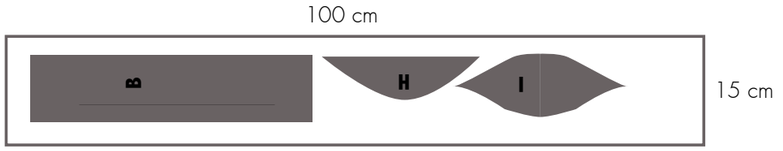


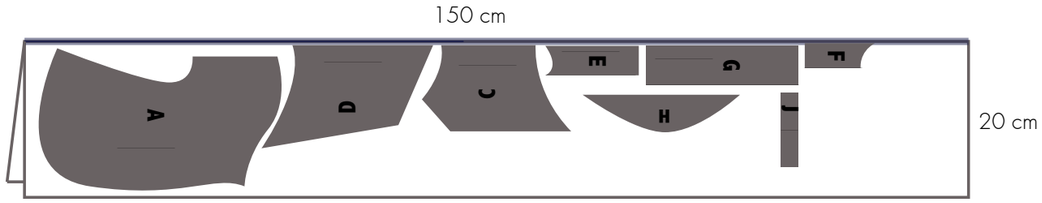
Hood		Tg. Man 50
PAPER PATTERN	Fabric Pieces	Type of Fabric
Paper Pattern A	2	B. S. Grey
	2	B. S. Yellow
Paper Pattern B	1	B. S. Grey
	1	B. S. Yellow
Paper Pattern C	2	B. S. Grey
	2	B. S. Yellow
Paper Pattern D	2	B. S. Grey
	2	B. S. Yellow
Paper Pattern E	1 on fold	B. S. Grey
	1 on fold	B. S. Yellow
Paper Pattern F	1 on fold	B. S. Grey
	1 on fold	B. S. Yellow
Paper Pattern G	1 on fold	B. S. Grey
	1 on fold	B. S. Yellow
Paper Pattern H	1	B. S. Grey
	1	B. S. Yellow
	1	Pierced Grey
	1	Cardboard
Paper Pattern I	1	B. S. Grey
	1	Cotton
Paper Pattern L	1	Cotton
Paper Pattern J	1	B. S. Grey
	1	B. S. Yellow
TOT.PAPERS 11	TOT PIECES 29	
SEAMS	1 cm (seam allowance - regular linear seams)	
HEM	1 cm (folded)	

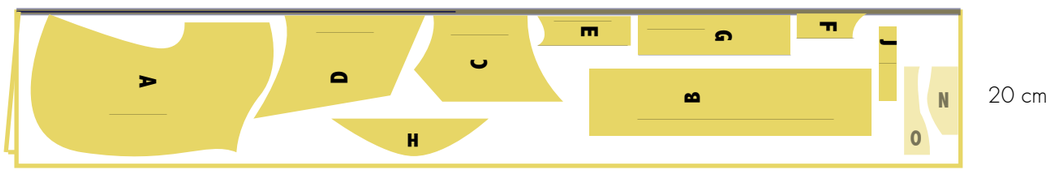
CONSUMPTION	ARTICLE	Height (cm)	Quantity (cm)
FABRIC	B. S. Grey	150cm	20cm ON FOLD
	B. S. Yellow	150cm	20cm ON FOLD
	Cotton	100cm	15cm
	Pierced Grey	100cm	15cm
	Cardboard fabric for visor' s interior	100cm	10cm
ACCESSORIES	Coulisse	60cm	1











Double color Cotton Jersey

Grey Net-Fabric

Bonded - Dark Grey

Bonded - Yellow & Sand

Note.
See the separated appendix for materials samples and technical details

7.4 The Better Urban Way (wet)suit

Shoot ! Details

Pages 150-151
(Ph: C. De Vescovi, Location: Lido di Venezia)
Better Way (wet)SUIT Details.
Left. Views of the hood, of the stretch yellow bands at the levels of the cuffs
Right. wavy seams and tuck&fold technique that reminds of the ocean waves, press buttons and interior FRAMIS taping for seams finishing

7.4 The Better Urban Way (wet)suit

Shoot !

Current pages
The transformation Process
From (wet)SUIT to Jacket for the Urban Waves

Current pages
Better Urban Ways (wet)SUIT details for suit and hood

Current pages
Riding the Urban Waves the suit when worn keeps you protected from raind and gets you ready for the ride in the traffic polluted waves.

8. BETTER WA(y)VES COLLECTION

Making this kind of action was revealing for me, because building up a collection around a specific sport is way different than developing a fashion collection.

C. De Vescovi

Chapter Photographs
Better Ocean Waves
Ph: *Chiara & Renato De Vescovi*
Model: *Giacomo Pedretti*
Subject: *Better Wa(y)ves Collection*
Locations: *Lido di Venezia*

8.1 Introduction to the Collection

"A year ago we presented it (the shoe) as a concept.
But now, it's not a concept anymore,
it's a technology.
We can do high-performance shoes,
sports equipment,

we can do fashion."

Matthias Amm, Product Category Director, adidas Running

The final paddle of this project is the development of a small and focused collection of garments that functionally gravitate arounfdthe two key - pieces I' ve been presenting in the previous chapters: the surfing wetsuit and the urban (wet)SUIT.
As every surf brand I' ve been analyzing during this journey, I wanted to sum up my work into som tech - pieces that could support the wetsuits in an imaginable future launch of the "Better Wa(y)ve" line.
Here I recapitulate the steps that brought me to the collection development.

I care to underline that one of the main conclusions I got after the **Brands analysis** is that of course in this field it works differently from other "fashion productions". . that is to say that I' m not referring to the traditional concept of collection as a series of garments related in a stylistic way but in a functional way. Sport Brands that concentrate on one "new" and "innovative" piece for high performances related to specific sport activities are not working for the creation of collections or at least collection is interpreted in a different way.
And this is the approach I selected too, coherently with what I am proposing: ***after the realization of the two key wetsuits I built up some pieces I thaught can be the logical consequence in terms of my users lifestyle.***

So after the wetsuits the second step has been the design, development and realization of these **three selected tech - pieces**: a **rashguard** specific for the water, a **sleveless jacket** in RES neoprene for windy and wet weather conditions in both city and sea contexts and a pair of **trousers** that, on the same wave - lenght of the transformable (wet)suit, can shift from long - leg pants for riding and skating the urban waves to boardshorts ready to go and get wet inside the sea.

Surrounding all of them, the **design of a street/active - wear collection** that keeps the waves lovers taste relating it to the main stylistic elements already developed in the previous garments.

The wavy line, the yellowish and blue contrast, the anathomical attention into the design and the "surfers" look become the glue for this watery collection.

The presentation of the "tips" taken from brands' analysis, keeping an eye - coherently with the rest of my thesis - on a sustainable brand action related to the ocean pollution and on the quest of the eco product life cycle, energically lead to the "collection" and the shooting of the realized prototypes.

Current pages
Better Wa(y)ve Capsule collection Overview. Rashguard with pants, (wet)suit with hood, wetsuit and sleeveless jacket are shown, lying on the sand.
Face the sea. Rashguard back view is shown. CDV and Slam printed logos are shown.

8.2 Look around before the take-off !

8.2.1 Tips from Surf Brands Analysis

Since its infancy, surfing has grown into a 7 billion dollar a year industry in the US alone, with a massive percentage of revenue coming from apparel.

Pierce Kavanaugh

I went through some main brands to take inspiration for the development of capsule collections both of high - tech pieces for the activewear and streetwear related to the surf context and atmosphere. *A deep brands proposals analysis helped me understand which directions to take to design the most useful garments gravitating around the wetsuit, imagining to launch a new brand.*

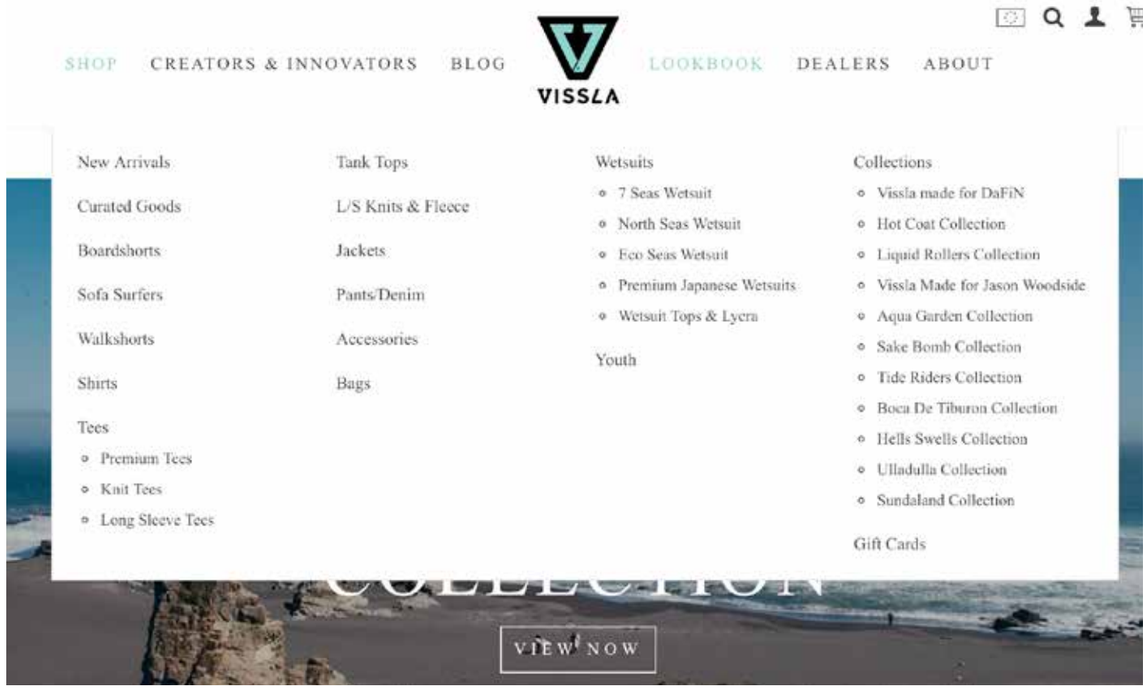
Most of the Surf brands considered keep the same structure in terms of product offer. Billabong, Body Glove International, O'Neill Clothing, Quiksilver, Reef, Rip Curl, Vans, Vissla, Volcom, Xcel Wetsuits. .
Going through the website's maps of these brands it is easy to figure out their common path in the development of the cathegories proposed. ***Making this kind of action was revealing for me, because building up a collection around a specific sport is way different than developing a fashion collection.***

"Wetsuits" voice gains a single proper section, inside which we find the different types: hooded, full, long john, SsLl(short sleeve long leg), LsSl(long sleeve short leg), SsSl(short sleeve short leg), then declined into the winter and summer proposals depending on the thickness (mm). Inside the **"Surf Apparel"** section we can find the main related garments that gravitate around the wetsuit, ***completing the answers to the many needs consumers can have inside/on/close to the sea***: from neoprene comp vests for surfing protection or other related sports like sailing/wakeboarding/windsurfing, to neoprene zip/zipperless tops with/ without sleeves, to lycras and surf tees (long or short sleeves, adherent or loose fit). **"Surf Accessories"** include hoods, gloves, caps and hats, towels and backpacks. Also **"Boardshorts"** have generally their own category, with swimshorts and tanks having different performances depending on the function. Finally the **"General Apparel"** splits into the most interesting names depending on the mood of the seasonal collection, but in the end what comes out going through them are some recurring garments: S/L sleeve shirts, S/L sleeve tees, tanks, hoddies and sweatshirts, cardigans and pullovers, jackets, gilets and windcoats, walkshorts, jeans, trousers with some interesting proposals like *hybrid garments* with innovative features - for example *Billabong "Submersibles"* that can shift from walkshorts to boardshorts for waters. This brands analysis offers me the initial inspirations for a valid selection of designs.

SUPPLEMENTARY BOX

SIMA Study. ***New Consumer Study Shows Nearly One-Third of All Americans are Inspired by Surfing!***
Laguna Niguel, CA (February 22, 2017) - *What has been missing in our industry is independent consumer data and insights that can tell us what is really going on in the surf market – especially the broader consumer base outside of the die - hard surf segment.* Whit this consideration SIMA announced the launch of its first consumer study.
The **SIMA Consumer Insights Study** explores the size of the surf - inspired market in the United States including those who surf, those who are interested in surfing and those who are interested in and/or buy surf brands. In addition, the study provides an in - depth understanding of the segments that make up the surf - inspired market including *surfing behavior, purchase behavior, media consumption, psychographics and demographics.*
SIMA partnered with **Sports Marketing Surveys USA**, a renowned full - service market research organization dedicated to all sports based consumer behaviour, to drive the study. This research quantified for the first time how far the surf lifestyle and surf - inspired products spread into the broader population. Not only SIMA established the size of this market but also found four key consumer profiles.
"We set out to find the messaging that resonates with each profile so that brands can effectively reach out to these consumers," notes Keith Storey, Vice President of Sports Marketing Surveys and lead researcher behind the study.
The study established the size of the U.S. surf - inspired market as 66.5 million adults out of the 239.3 million U.S. adults or 27.8% of the U.S. adult population!
More in - depth informations have to be required.

Current page
Submersibles Boardshorts for land and waters series by Billabong
billabong.com
All the stuff you need Vissla winter Apparel Campaign
vissla.com
Next page
Garments into sections Vissla website overiew
Main garments' families in Surf Brands online sites (here a selection from Vissla and Roark Revival)



8.2 Look around before the take-off !

8.2.2 G-Star RAW Case Study: Ocean Pollution into Streetwear

"Turning the tide on ocean plastic pollution"
On the same wave of what we analyzed during the chapters 3 and 4 related to the environmental situations and the ***design apport for solutions***, here a parenthesis is opened for a related project: **the Pharrell Williams denim line for G - Star RAW obtained by plastic pollution collected from the Ocean.**

On 5th of September, 2016, there has been a two - day event realted to the theme and 23 Wall Street was submerged underwater through an immersive audiovisual art installation in an effort to raise awareness for endangered marine species and ecosystems, and to introduce the kind of solutions that are possible through innovation, creativity and collaboration. As part of Mercedes Benz Fashion Week, guests were invited to walk the 'blue carpet' and kick off the weekend at a Parley Ocean Night, where Pharrell Williams* unveiled the denim line made from recycled ocean plastic fibers, the *spring/summer 2015 G - Star 'RAW for the Oceans' collection*, supporting the Vortex Project, an initiative by **Parley for the Oceans in partnership with Bionic Yarn and Sea Shepherd Conservation Society**.

G - Star Raw first paired up with Williams and NYC - based startup Bionic Yarn** in 2013 (of which Williams is actually the creative director and cofounder).
"They put a very interesting proposal on the table," said Thecla Schaeffer, G - Star Raw' s CMO. That proposal involves ***incorporating recycled ocean plastic that is integrated into Bionic Yarn's patented threads, which are then turned into jeans.*** Raw For The Oceans was born a year later.

"We decided, let' s do it, let' s make the first jeans ever, in the world, made with recycled ocean plastic. We had a radically short research period — it's not like you get a nice, clean package of plastic bottles; we had huge containers (of ocean debris), filled with Barbie heads and lighters, and we had to figure out how to turn that into jeans." said Schaeffer.
Since Raw For The Oceans launched two years ago, there have been **four collections**, which have been comprised of approximately ***10 tons of plastic per collection.***

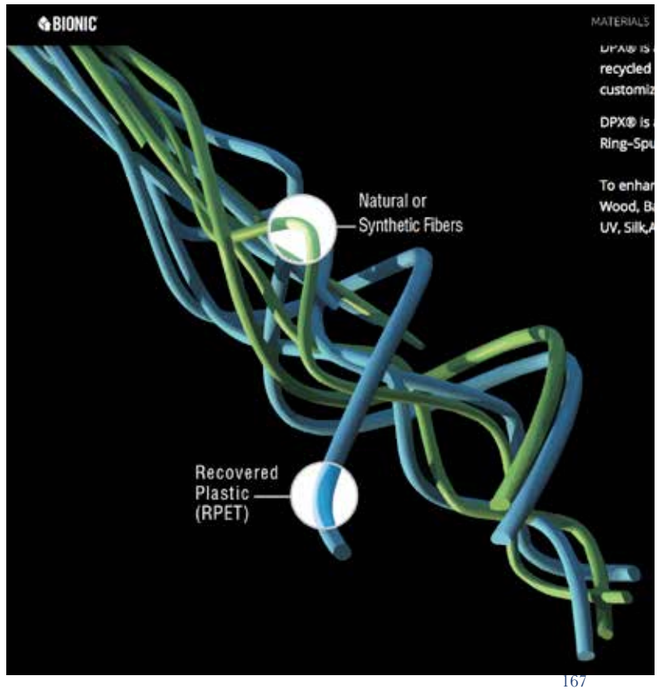
Last year, the brand used an estimated two million plastic bottles and 1,000 tons of plastic debris in its products. *"Companies don't want to make virgin polyester anymore, because that contributes to the carbon footprint. What we'd rather do - at G-Star Raw - is sustain what we have. Instead of using virgin polyester, which is a form of plastic, we just use recycled plastic that's been around the block a few times, ya know what I mean? It's much better."* says P. Williams.

"This smart, sustainable Bionic Yarn material therefore replaces traditional, virgin polyester in all of G - Star Raw's pieces - ***it's a continuous process of getting better***." Schaeffer

The collection includes jeans and denim jackets, as well as T - shirts and sweatshirts, together with denim overalls that, with a different and more fashion function, reminds of my (wet)suit for the riding of the urban waves, while a stripe pattern using the initiative' s octopus mascot follows the nautical theme. In the same way the crossing - the - chest "wave" theme born from my wetsuit' s design becomes the key - element and the glue for the entire collection. With the same philosophy I' ve been sketching the first ideas for the collection, here the **statement garment** is a hooded jacket called the **Occotis HDD Bomber** that, covering most of the face when done up, is designed to look like a cross between a submarine escape suit and a military garment.

Current page
P. Williams wearing a denim jacket made with the recycled material develped in collaboration with Bionic.
Occotis HDD Bomber by G - Star RAW
Next page
Jacket and suit from G - Star collection
P. Williams speech at Prley Ocean Night
BIONIC fiber zoom in
RAW for the Oceans, detail of the label.

*PHARRELL WILLIAMS. Music artist, producer, serial collaborator, and entrepreneur. At Parley Wall Street, Pharrell represented his company Bionic Yarn, the first high-performance ecoyarn. Its patented spinning process is capable of incorporating fibers from recycled plastic bottles into durable and refined quality textiles.
** BIONIC® is a call to action to clean up the environment.Protecting the oceans from plastic pollution, bionic® materials are made with plastic recovered from marine and coastal environments. Fig.
DPX® is a dual staple fiber construction that intimately blends recycled PET with other synthetic or natural fibers to form a highly customizable yarn with soft texture. DPX® is available in stretch, standard, or slub constructions; and in Ring–Spun, Siro-Spun, Airjet, and Open-End forms. To enhance functionality and aesthetics, DPX® can be spun with Wood, Bamboo, Loft,Wicking, Cotton, Bamboo-Charcoal,Wool, FR, UV, Silk,Alpaca, Hemp, Linen, Cashmere, Rami.



8.2 Look around before the take-off !

8.2.3 Product Life Cycle

"Wetsuits are an amazingly damaging product and there's a massive question mark about what happens to a wetsuit at the end of it's life cycle. The biggest issue in the industry that nobody is addressing what to do with a wetsuit at the end of its life. It's a problem every one in watersports has a stake in."

Tom Kay, Finisterre Founder

Get Aware of the unseen process that is beyond your product.
Focus on: materials used, energy required and waste created,production, distribution, lifespan of product, and final product end of life.
Better Wa(y)ve Wetsuit aim is to provide comfort, warmth, strength, durability AND sustainability.
Talking about sustainability we cannot be blind in front of a fundamental factor: the Product Life Cycle.
As many companies are looking towards environmentally sustainable products, also wetsuits must be between this range of items.
I already deeply expressed my interest in Patagonia researches and innovations for wetsuits in terms of sustainable materials and process. From conception, to material, to production, to recycling, Patagonia ensures they have researched every aspect of their product, something that is highly admirable in a society where profit and time are often seen as the most valuable things.
The specific example of Yulex Wetsuits Series comes out again in the current paragraph, where I wanted to give "last but not least" attention to what is a main Design fundamental issue.
I went deeper in this amazing proposal, considering it the ideal and ultimate model for my wetsuit production and life cycle and underlining the need of taking some distance from the actual production of this first single prototype. Because it's an early experiment at its embrional phase I could focus on some aspects (as the main detection of pollutants) but I could not for example determine the manufacturing process of the prototype so I'll use this paragraph to express my ideal Better Wa(y)ve Wetsuit life cycle, looking at someone that gives good waves in our market. *During the Patagonia wetsuit cycle analysis I add some notes strictly related to my new wetsuit proposal.*

Materials contest. Which are the materials used for the wetsuit production and how are they obtained in terms of process and energy waste.

Yulex Rubber allowes to make a wetsuit that is 60% guayule (plant) based and so biodegradable for the same percentage. It is made from a plant called guayule*.
•It requires less water to grow
•it can be grown under arid and semi-arid climatic condition
•it uses no pesticides (its own resins act as natural insect deterrent)
•it has a very clean manufacturing process. (a)The plant material is chopped into pieces so the rubber stems are separated from the leaves, (b) the stems are milled in water to release the rubber particles into suspension - the extraction of the rubber from the plant is a water based method of aqueous milling and centrifugation: there is no pollution of the water, as it is solely plant based materials, and Yulex does not require compounds and chemical solvents other forms of rubber require, which release harmful VOCs in the atmosphere, (c) the milled stem are then pressed to separate the plant fibers and form a purifyed rubber rich liquid.
Yulex bio rubber extraction is a nearly closed loop system that

creates little to no waste in its methods. Primary waste would be that of fossil fuel emissions from agricultural harvesting machinery, and the electrical needs of the processing facility; however, spent guayule plant material is being used to power part of this process as it is an ideal bio fuel for outright burning as biomass, or development into a gas to be used more widely.
For this process we must consider also the transportation by ship, truck and railroad from the plant forests to the manufacturing facility.

Benefits.
•petrochemical free material
•no residual toxic monomers
•Hevea-latex-free (nolatex allergies)
•exceptional physical performance (form, fit, feel and function)
environmentally sustainable/renewable

Neoprene made from limestone
Neoprene is a synthetic material generally made from petrochemicals. *Patagonia mixes it with Yulex to form the majority of the R2 wetsuit foam structure but the neoprene used is not petroleum based. It is obtained from limestone*, a mineral created by the calcium deposits of ancient ocean dwelling organisms, remaining anyway a nonrenewable resource.
The manufacturing of neoprene is a ***energy - waste intensive process***. (a) the limestone must first be extracted from quarries using heavy machinery releasing CO2 into the atmosphere, (b) the limestone is crushed and fed into a furnace and heated to extremely high temperatures (over 3,600°F), (c) components are reacted with other chemicals to make the acetylene gas to form a polychloroprene rubber chips, (d) these are melted and mixed together with foaming agents and pigments - usually carbon black - and baked in an oven to make it expand, (e) the sponge blocks are sliced into sheets, (f) finally the soft sheets are laminated on one or both sides of fabric with high stretch nylon or polyester jersey knit to give them extra strength and prevention from water leakage.
Patagonia admits that neoprene made from limestone is not any better for the environment than petroleum based neoprene, but has the benefits of lacking reliance placed upon oil for production and the risk of oil spills.

Benefits.
•lightweight
•super stretchy
•easy to take on and off
•95% water impermeable
•reduced drag
•increased speed
•remarkably free from impurities

Polyester
Patagonia uses both virgin and recycled polyester in the interior liner of the R2 wetsuit, as well as the exterior lamination of the sponge (Yulex+Neoprene rubber foam), where virgin polyester is blended with recycled polyester for added durability, as well as the stitching used for the seams of the suit. Patagonia uses mostly recycle used soda bottles, unusable manufacturing waste, and worn out garments into polyester fibers to produce many of their new clothes and partnering with **Teijin**, a Japanese company who developed their own closed - loop polyester recycling system, has helped to reduce energy use by 75% and carbon dioxide emissions by 40% making it more sustainable for the environment.
Virgin polyester is a synthetic material derived from coal, air, water, and petroleum by which secondary chemicals form a reaction between an acid and an alcohol. Through polymerization fibers can be formed and woven into a textile material.
The main contributor to waste in the production of virgin polyester is fossil fuel emissions. **Fossil fuels** are the primary materials needed to produce polyester and are the energy needed - for mineral extraction and electrically intensive manufacturing process. Manufacturing of virgin polyester releases CO2, VOCs, particulate matter, and acid gases such as hydrogen chloride into the atmosphere. On the other hand there is very little material waste, and the only water used is for cooling purposes and should not result in water pollution.
Recycled polyester is a much better environmental option as it uses post consumer recycled (PCR) plastic soda bottles or PET. Once used PET can be recycled (1) through washing and re-melting, or by (2)chemically breaking it down to its component materials, being completely recyclable at the end of its life. According to PET Resin Association, PET is the most recycled plastic in the U.S and worldwide.
(1) The first and most common form of polyester recycling is through mechanical

means where the plastic and polyester is melted down and re-extruded into new polyester yarn, but this process is limited in its efficiency due to the fact that every time the plastic or polyester is recycled mechanically it loses quality and strength.
(2) The other type of recycling polyester is chemical; in this process the polyester is broken down to its molecular parts and restructured into new yarn, for infinite times. This method, however, is unfortunately too expensive to currently be the popular choice of the two options.
Recycling polyester uses up to 53% less energy and releases approximately 55% less CO2 emissions than creating virgin polyester, but releases antimony trioxide, a harmful carcinogen, when melting the plastic or polyester.

Nylon is a petroleum-based product to create synthetic fabrics. *Supratex in the Patagonia wetsuit is a nylon material used on the knees of the wetsuit for added durability in high stress parts of the suit.* Nylon is a synthetic material derived from petrochemicals, in much the same way as polyester, but with a more rigid and durable final structure. As with polyester, the majority of waste produced through the production of Nylon is due to **fossil fuel emissions** from mineral extraction and processing. Nylon, however, is more difficult to recycle than polyester, resulting in more material waste, and the chemical production of adipic acid needed for Nylon production frequently creates nitrous oxide, a known greenhouse gas. Water, like polyester, is only used for cooling and should not result in chemical pollution. The 35% of nylon produced is used in the automobile industry but the other percent is for the textile industry: top layer jackets, trousers and boots and the perfect equipment for all active people who are frequently exposed to hard weather conditions. Nylon is made up of amine, hexamethylen diamin and adipic acid. These chemicals go through a polymerizing process**where (a) after the combination of two sets of molecules - one with and acid group and one with an amine group, (b) they are heated in a large vat at a very high temperature, (c) formed into molten nylon, (d) transferred to spinneret for separating the nylon into thin threads (e) and then exposed to air, wound into bobbins and stretched to create elastic and strong fabrics.

Benefits.
•good mechanical and thermal prop.
•high flexible strength
•strong, abrasion resistant, lustrous, easy to wash
•resistant to damage from oil and many other chemicals
•highly water-resistant and breathable

Glues *are used to join the seams, to provide a watertight seal and to laminate the recycled polyester to the neoprene.* The use of these glues **releases VOCs** and other toxins into the air; it is estimated that nearly 800 tons of solvents evaporate into the atmosphere because of current wetsuit gluing and neoprene laminating processes. Non solvent based **eco-glues** are being developed but when asked why they were not being used by the company yet Patagonia answers that *"At this point, unfortunately, current non solvent based glues do not hold up to the high quality expectations Patagonia has for its products."*
(Water-based glues was an option I could pick up from Sheico proposals. Is it possible to see in the tech sheets of the Better Wa(y)ve wetsuit that the use of this type of glue was required).

Also any unuseful **printing** made through *chemical inks is avoided in the Patagonia Wetsuits.*
In my project the only printing used is the one on the left arm, reporting the name of the project and of the participants, and of course the yellow printing of front and back chest reporting the message "I believe in a better Wa(y)ve".
But again, the prototype shoud not be taken in consideration for this analysis, due to my inability of making a different choice. ***In the ideal wetsuit*** the only treatment would be the one on the natural rubber used for the main wetsuit body, the one that determins the reaction to pollutants and that turnes specific wetsuit parts from blue to yellow. The possible care in this embrional phase has been to prefer bio - inks rather than chemical based ones. But my attention for the further developments is to concentrate on research and innovation related to the surface treatment developed in collaboration with RES S.p.A. to obtain the same effect avoiding always more of the non - sustainable factors in the process. Alternative bio - luminescent effects or sensors can be valuable paths to investigate and test in the next - future researches.
So to conclude, while the "litmus paper" effect will follow this approach, for any other additional printing (for logos, ecc..) the choice would be the same one that I reported in the "Eco-Section" for Vissla Eco Suits, that avoid any solvent based ink and prefer the subtle **embossed brand logo.**

Pages 168-169
Left. **Tom Kay,** Finisterre founder, during an interview for the Campaign "WetsuitsFromWetsuits", boardsportsource.com
Right. **SUGA Yoga Mats** innovative process of recycling wetsuits for mats, from kickstarters.com and sugamats.com

8.2 Look around before the take-off !

8.2.3 Product Life Cycle

The lifecycle of the Yulex R2 wetsuit does not end here.
Good news is that Yulex is biodegradable, bad news is that however it cannot be recycled from the Yulex R2 wetsuit because it is mixed with neoprene. There are still improvements to be made.
For now the wetsuit is 60% biodegradable.
That' s the price to pay for the value of research I understoon. You never get to an end, it' s a continuos progress, a series of little goals that help you to get focused on the final big one.
Getting to the substitution of neoprene with total natural materials that can be 100% biodegradable is the next step of this amazing research, I hope to have the chance to give my part one day.

For now, I keep my mission of rising awareness, because brands they cannot do everything on their own, *together with companies sharing and co-working there must be a sensitive and active consumer.* And this is what Patagonia demonstrates too with the Common Threads Garment Recycling Program. Consumers are asked to send back their old garments. Some are recycled into entirely new products at Patagonia Factory, while others are sent to Teijin, the recycled polyester factory in Japan.
So this approach would definitly be applied at my collection
(imaging it in the market chain).
What I imagine is that every unusable piece can be recycled:
(1) by the combination of pieces into new garments/accessories - bags, backpacks, surf accessories (this option is possible from now)
(2) by the recreation of the raw materials for entirely new products (this option is possible finding a collaboration)

While companies must provide transparency - "where our products come from, how they are produced, and what happens to them once we are finished with them" - consumers must get informed, engage and responsible in the recycling programs available.

Transportation. Transportation of materials and products is one of the leading waste producers for Patagonia as nearly all products are outsourced to manufacturers around the world. Over 60% of clothing and gear is made in Asia, and the wetsuits themselves are manufactured in Thailand and shipped to the Port of Oakland where they are trucked to Patagonia's distribution center in Reno, Nevada. **CO2 emissions required are high.** The brand can' t avoid all of them and it' s impossible to conduce all the cycle in a single place but fundamental is the company practice of investigating it' s own actions trying to *reduce at minimum level possible the waste*: Patagonia switched from the Port of Los Angeles to the Port of Oakland in 2011, because trucking releases 4-7 times more carbon emissions than shipping, and they no longer had to truck goods up from L.A. to Reno. *In this way the company was able to reduce its carbon footprint by 31% - from shipments to retailer locations.*

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Manufacturing of the actual wetsuits in Thailand accounts for some of the **lowest percentages of waste** because energy use is low with a mostly hand made product and little material waste. In this case the energy needed is the one to produce high standards for workers environment and safety.

Lifespan Once a Yulex R2 Wetsuit makes it to a customer there is very little maintenance necessary for the life of the suit, it must merely be rinsed off to prevent corrosion from salt water, and if there are issues with the quality, or the suit's structure is compromised, Patagonia will fix.
Better Wa(y)ve wetsuit Lifespan:
The mantainance of the ideal wetsuit can be the same one of a regular wetsuit. It is not more delicate but the main interest is the improvement of the research about water quality and, at the begininng of the product industrial production, the necessity of facing the first results about the "reaction" performance so:
(1)embrional actual stage - wetsuit' s removable part reacted must be sent back to the company that can test the performance of the sheet and can share the informations regarding the pollutants detection (when you buy the wetsuit it a set of "reactive sheets" is provided so you always have a new one to use, and once finished you can require more of them to the company) - In this way we create and stimulate a sense of community, of sharing action, feeling as an important hand for the project.
(2)final stage - wetsuit appears as presented in the thesis so as a total blue suit that reacts when in contact with specific pollutants through and this is a reversible reaction so once washed with clean water the suit goes back to its original state.
The treatment should last for the entire life of the wetsuit. Here the commitment of the consumer is required in terms of giving a short feedback to the company after every surf session in terms of where/how/after how long the suit reacted).

Recycling. Finally, when the wetsuit reaches the end of its working life (that is to say for a wetsuit being uncapable of keeping warm in the water) there are a few options of where it may go. It could get put in the trash ending up in the landfill, it could be incinerated releasing harmful chemicals into the air, or *it could get sent back to Patagonia through direct shipment or retail store drop off to be recycled by the company.*
Better Wa(y)ve wetsuit recycling:
I was touched by **Tom Kay, founder of Finisterre**, talking about the last laung of "wetsuitsFromwetsuits" campaign. *"We're not just taking about making mouse mats or stubble holders – actually turning old neoprene into new neoprene. In this day and age we must be able to do that. So we've partnered with Exeter University and are offering a job for a full time Wetsuit Recycler to finally answer the question once and for all – can you make new wetsuits from old wetsuits?"*
This is a long journey. It is my interest to keep on researching in this field and I' m glad this thesis gave me the opportunity to realize how many initiatives exist out there.
I think that anyway *in the meanwhile* we are looking for better solutions, we must give value to those that are already *possible and real*. So, with the same logics of the "material recycling" the options are (1)saving parts to create new "less-performative" but useful items or (2) partner with a company that is able to recycle the product giving birth to a new material to be used for a new item (not a wetsuit for now but other less tech-stuff at least).
Taking inspiration from some great actions, as **SUGA (Surf+Yoga)** startup. *Suga worked extensively with engineering experts to recycle these petrochemical based landfill neoprene wetsuits into highly functional mats.* Because Suga mats are manufactured from neoprene, they're uniquely closed-cell foam, which means they don't sponge up bacteria, sweat, dust, and dirt, giving non-biodegradable wetsuits a second life by keeping them out of landfills.
"Our net energy consumption is considerably lower than producing conventional mats overseas from raw materials. Also we reuse 100% of our scrap - any scrap cuttings from production go back into the grind for the next production round and every old mat sent back can be recycled again".
With my actual possibilities the idea can be to sustain a Better Wa(y)ve line of *backpacks and covers for boards, skates, car seats,* as shown in the drawings.

The life-cycle analysis is specifically oriented to the wetsuit, key garment of the thesis, but it can be applied to the entire Better Wa(y)ves Collection.
The main thing in the end I think is the realtionship and the transparent and direct communication between the brand and the consumer, that through their combined actions can be close partners with the same goal: the care for the environment.

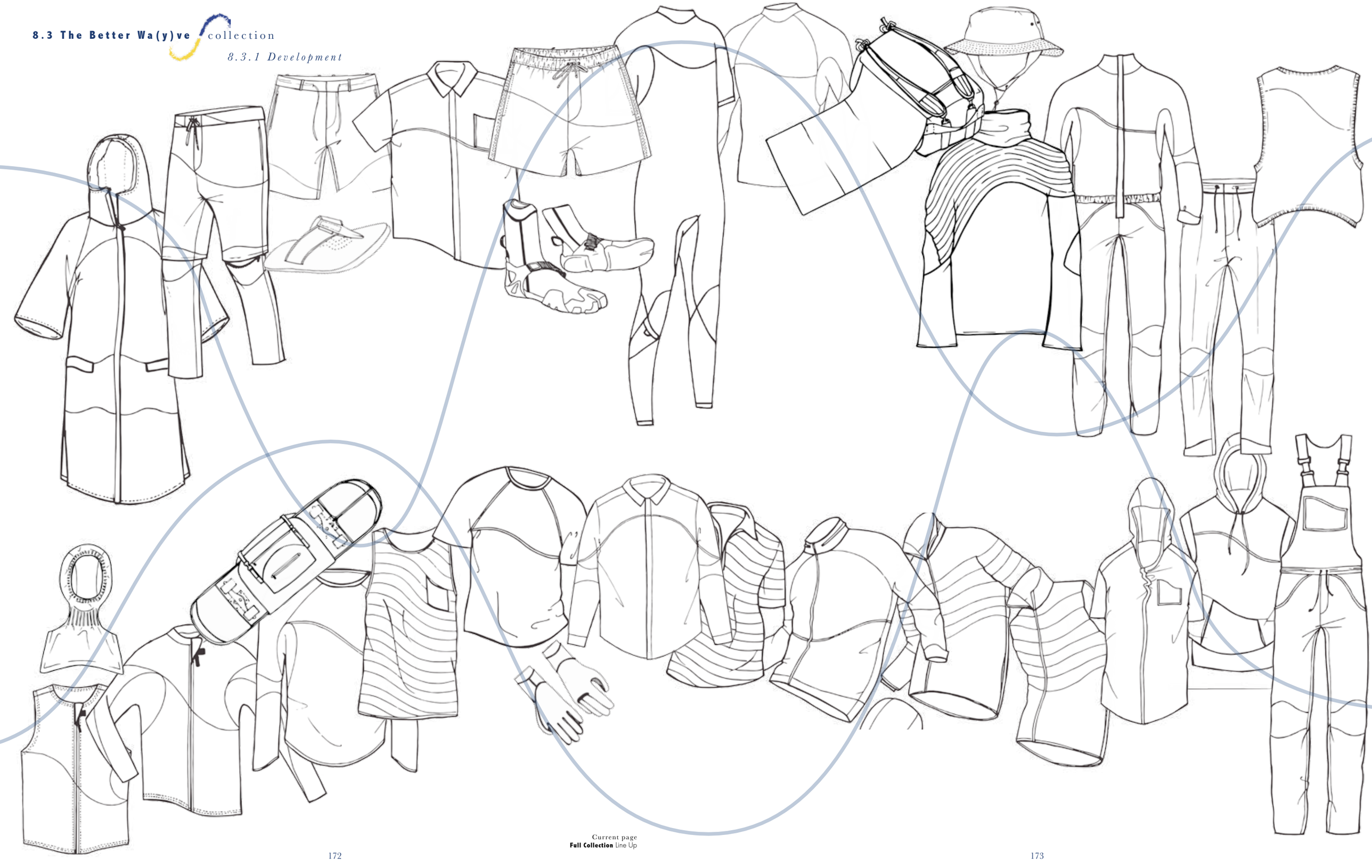
Pages 170-171
Travellig surfboard cover bag, by Migra
Backpacks and skate-cover bags drawings as strating proposals for recycling, C. De Vescovi

"In the UK alone,
surfers are replacing their suits on average every two years,
with no real idea what to do with their old suits.
This is equivalent to more than thirty of London's
double decker buses worth of wetsuits
being discarded every year.
That's 380 tonnes of non-biodegradable
chemical-based waste,
each and every year."

Tom Kay, Finisterre Founder

8.3 The Better Wa(y)ve collection

8.3.1 Development

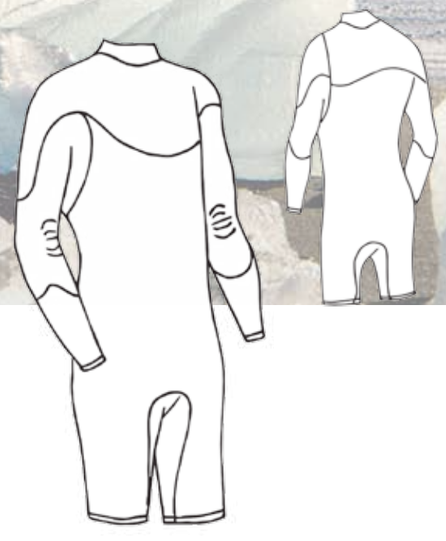


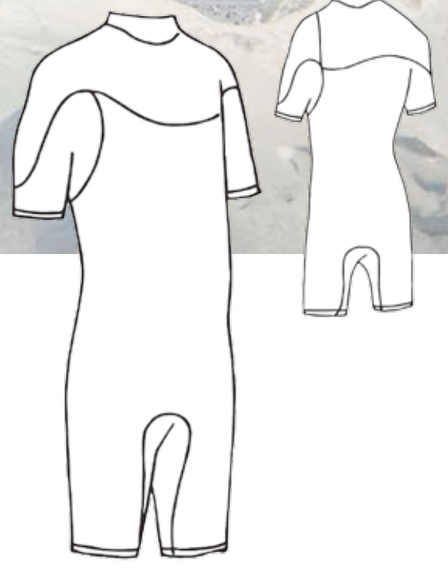
Current page
Full Collection Line Up

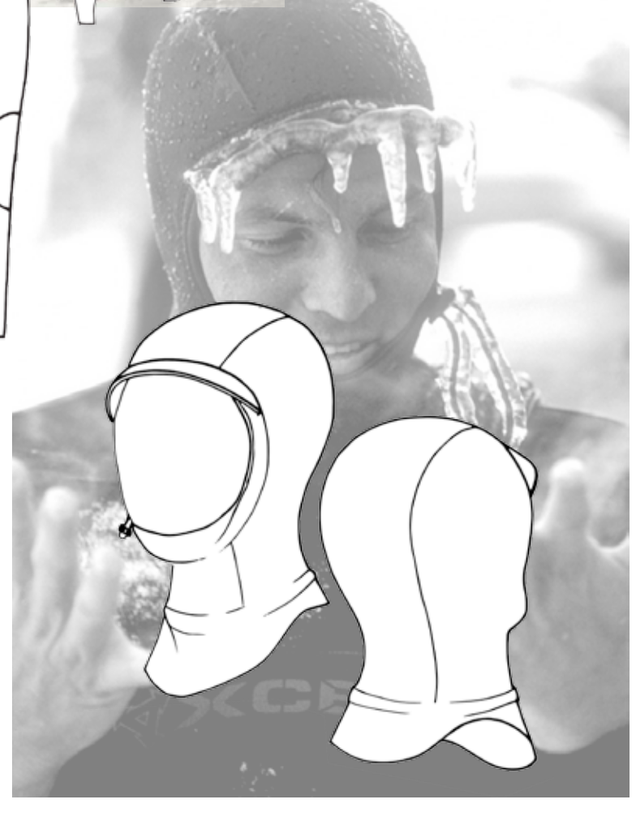
Key Garments
Sleeveless Jacket, Rashguard,
Boardshorts, Wetsuit

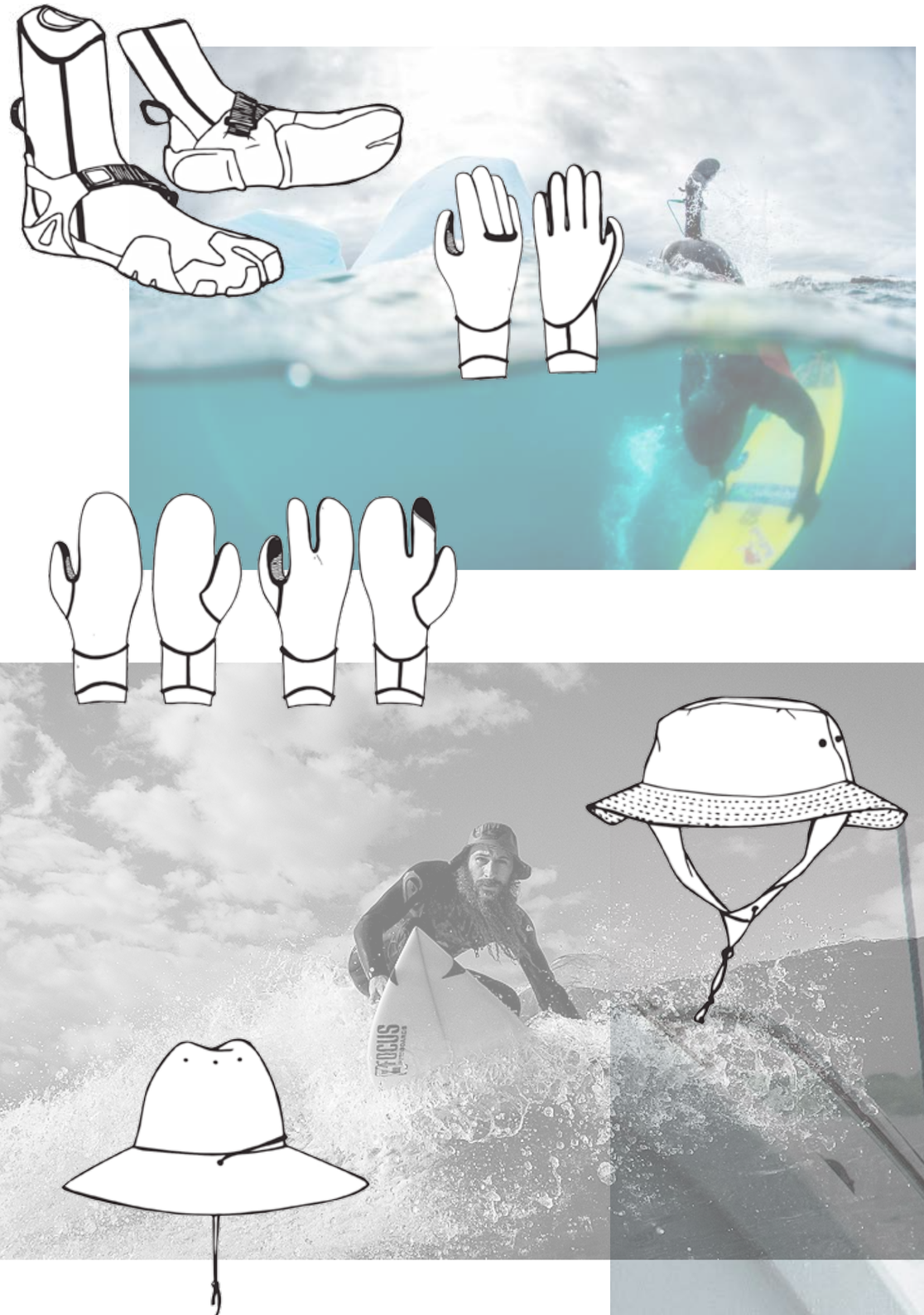
Key Garments
(wet)suit - Jacket, Transformable Pants

Wetsuit for Surfing
Models of Wetsuits

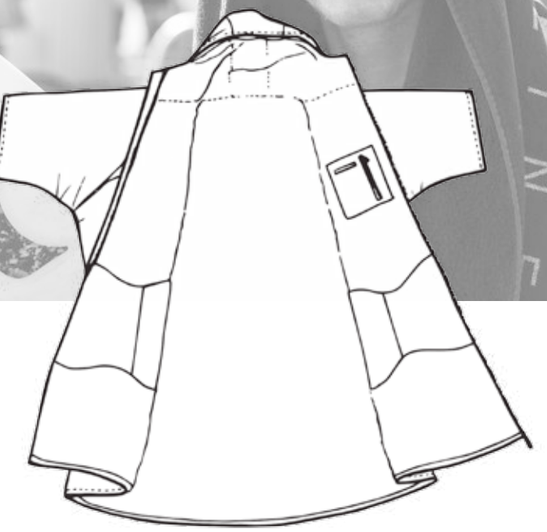








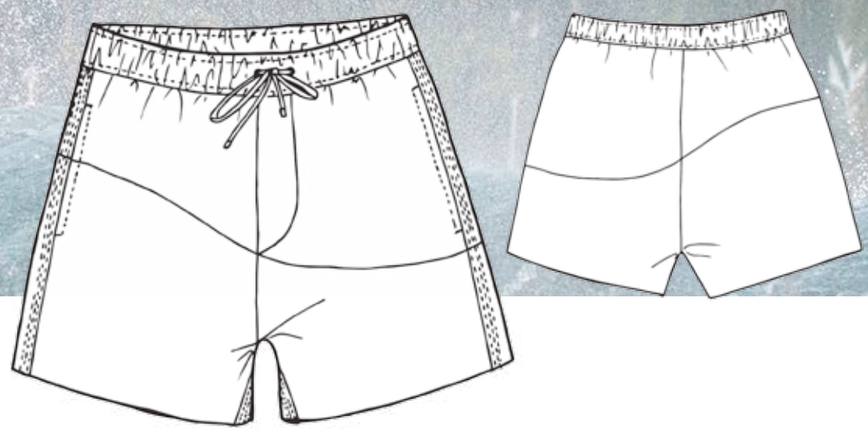
Accessories for Surfing
Boots, Gloves, Hats for Water,
Ponchos, Waterproof Backpacks



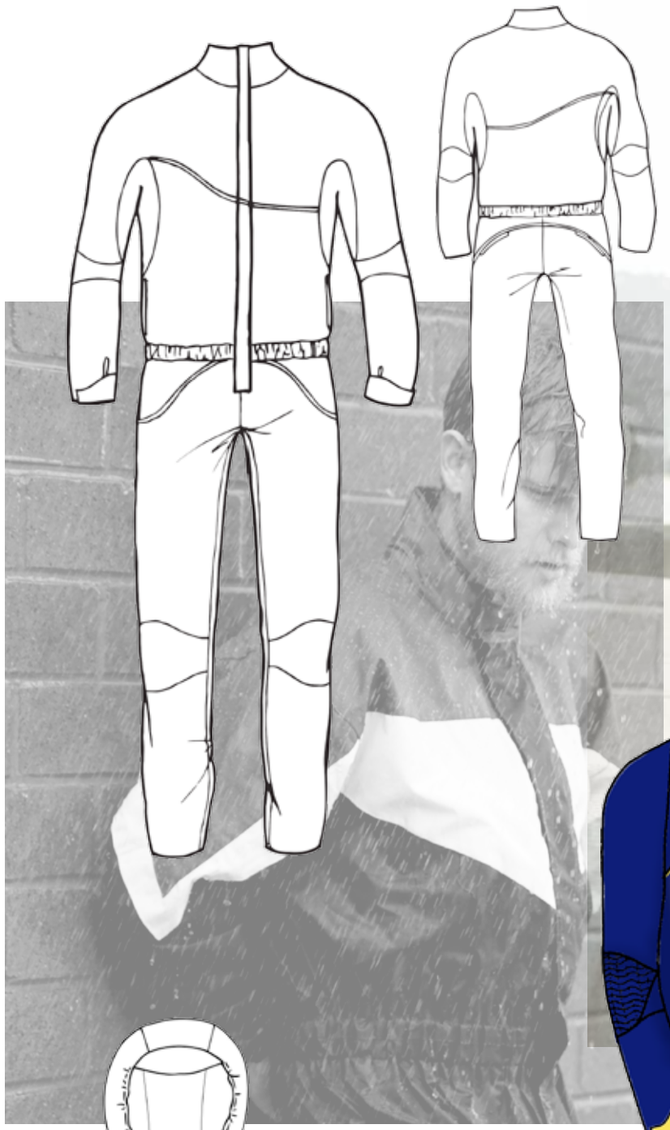
Ocean Waves Tech garments

Neoprene Jackets for surfing, Lycras

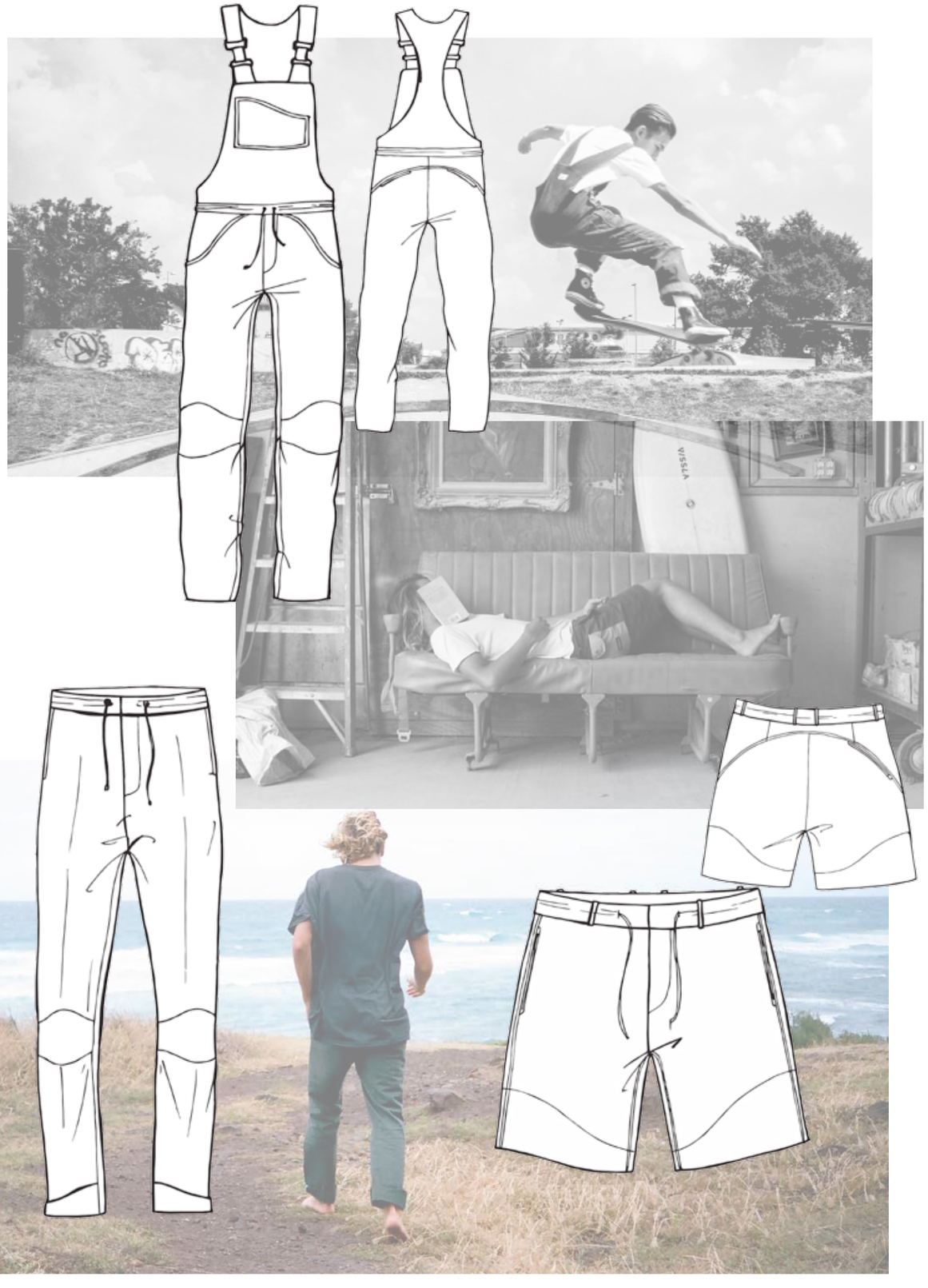
Ocean Waves Tech garments
Boardshorts, Jammers,
High-performance Swimwear



Urban Ways Tech garments
(wet)suit, suits,protective hood and windproof jackets for sport activities in the city



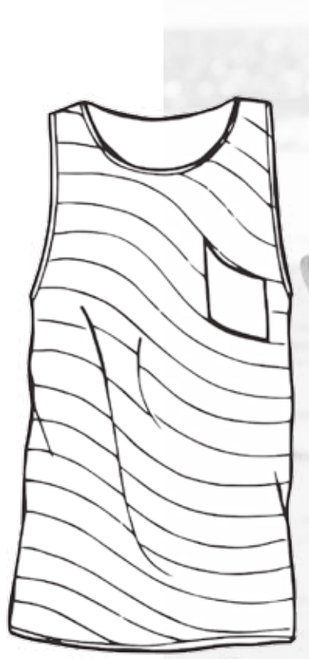
Urban Ways Tech garments
pants, shorts and overall
for sport activities in the city



Urban Ways Chill Garments
A series of useful garments for the waves riders:
Long Sleeves shirts, swetshirts and sleeveless swaters

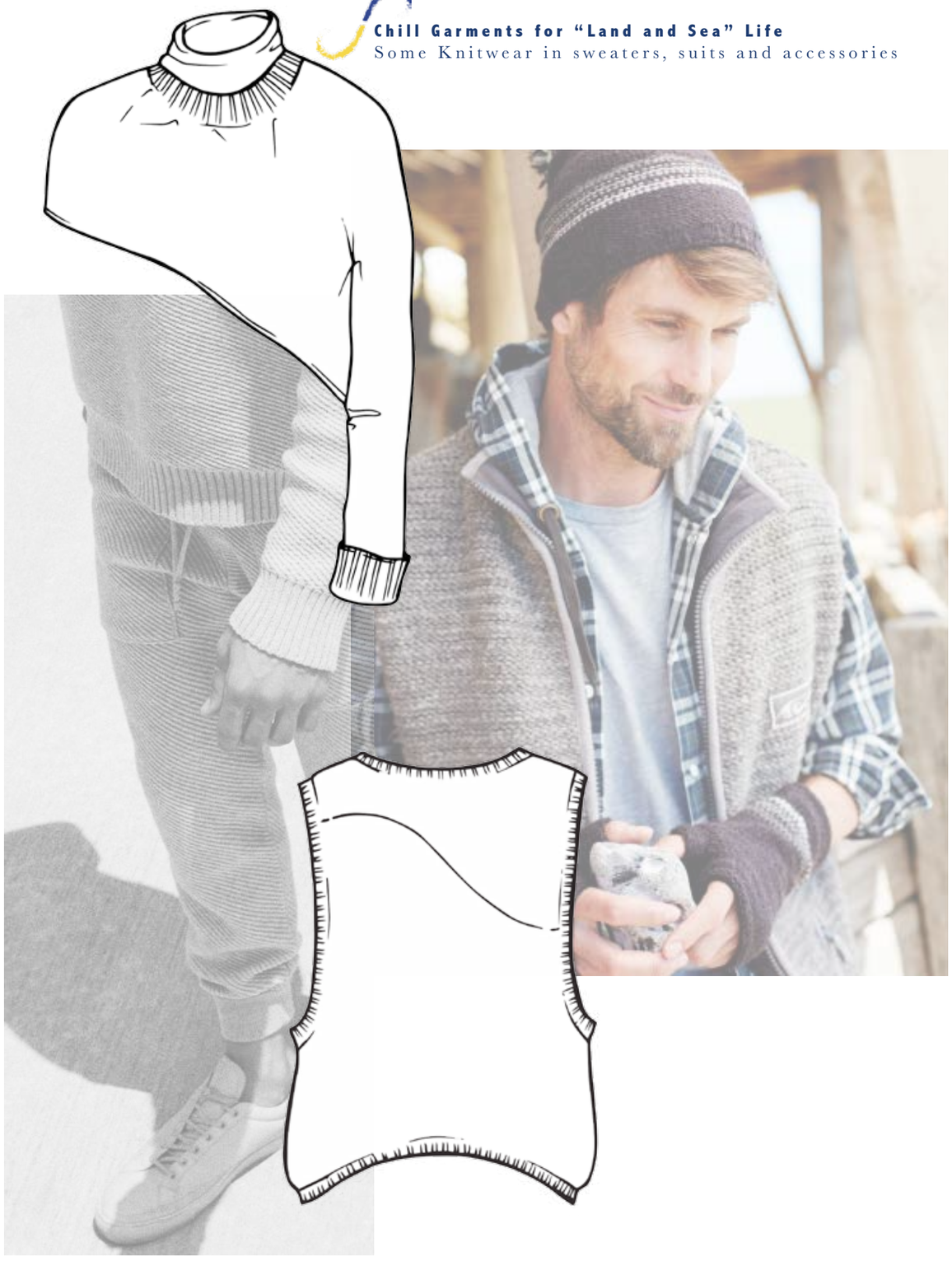
Urban Ways Chill Garments

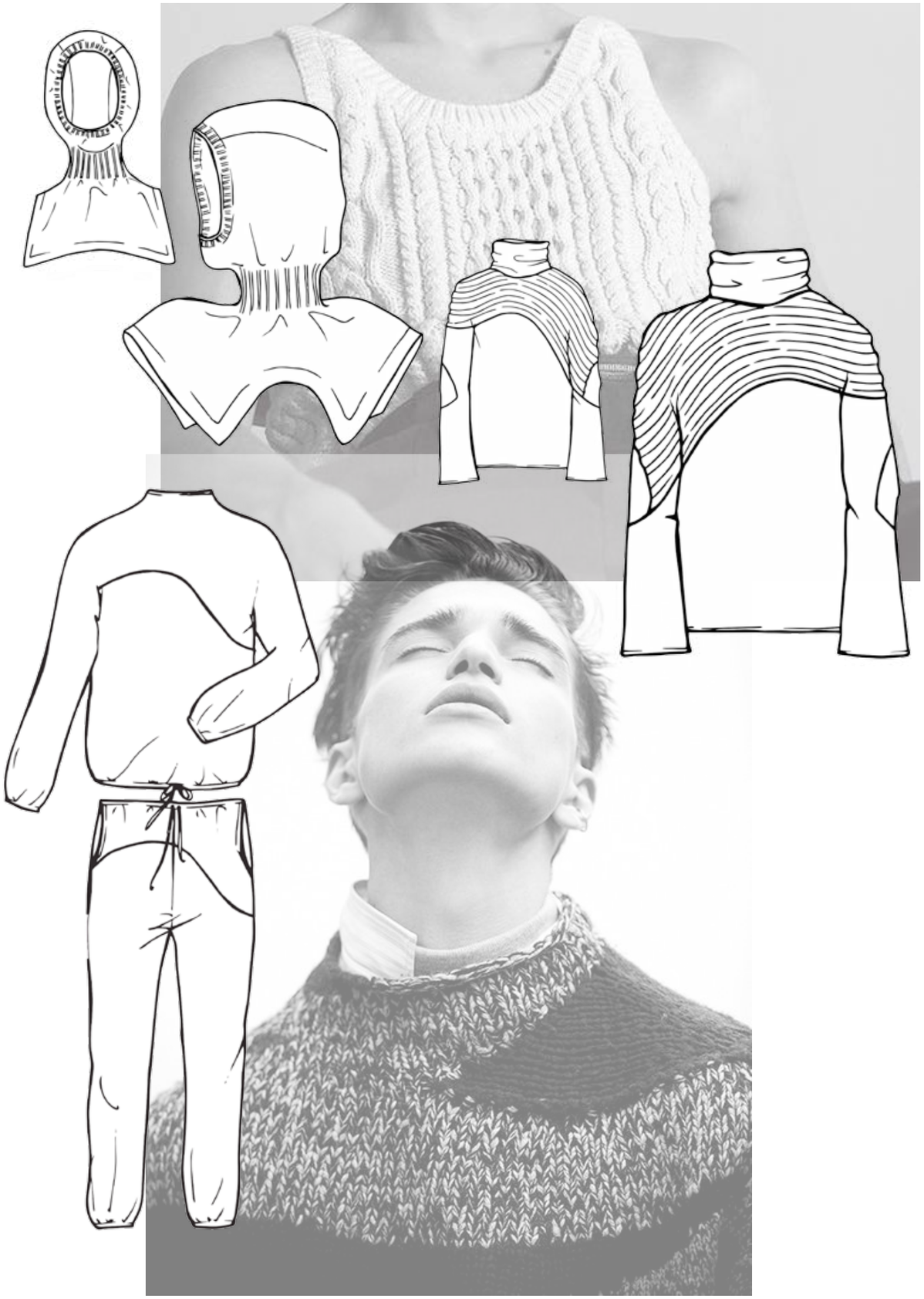
A series of useful garments for the waves riders:
T-shirts and Tees, polos and short sleeve shirts

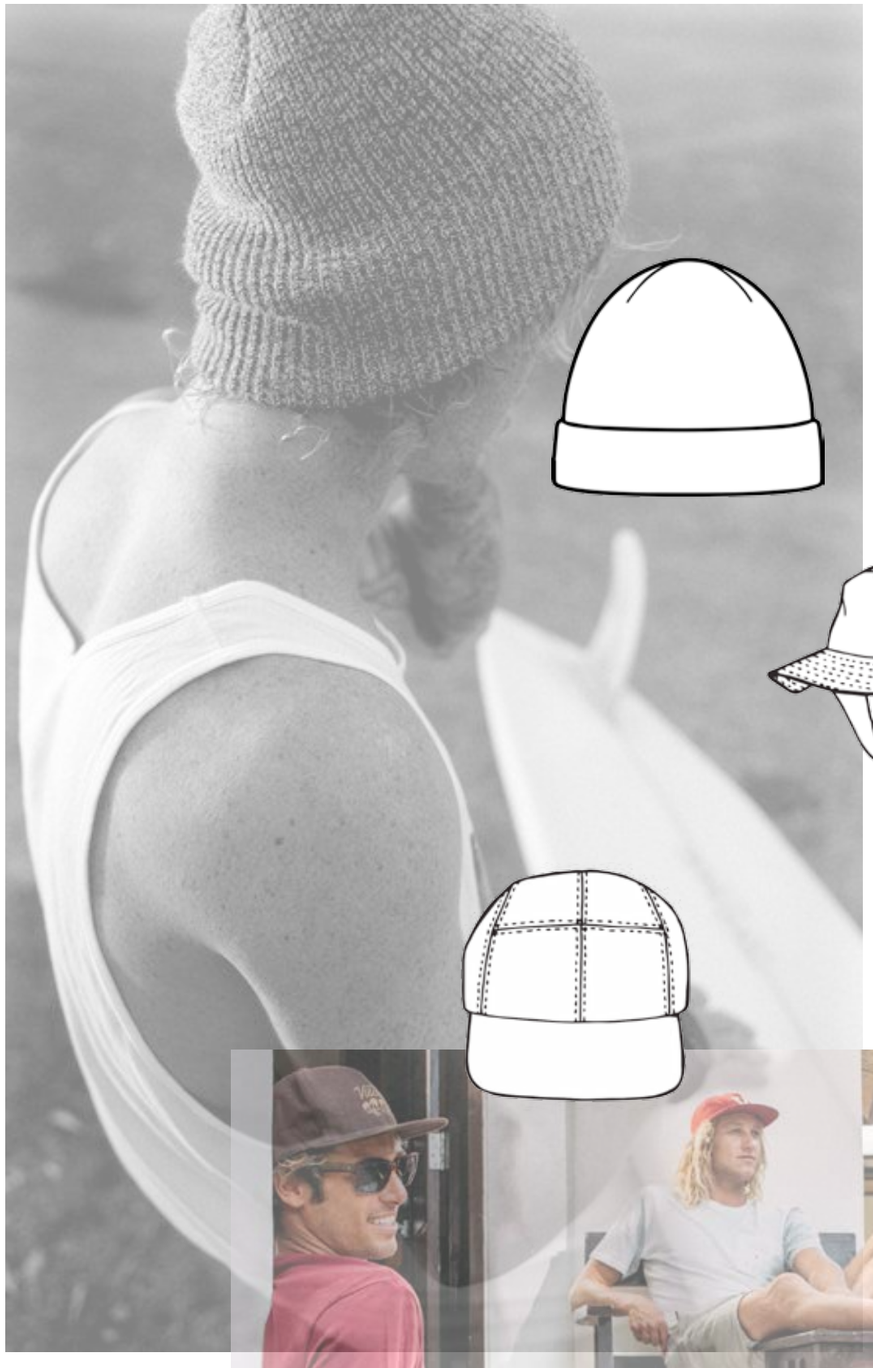


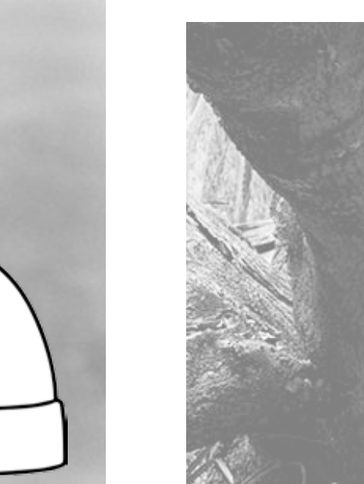
Chill Garments for “Land and Sea” Life

Some Knitwear in sweaters, suits and accessories









Accessories for “Land and Sea” Life

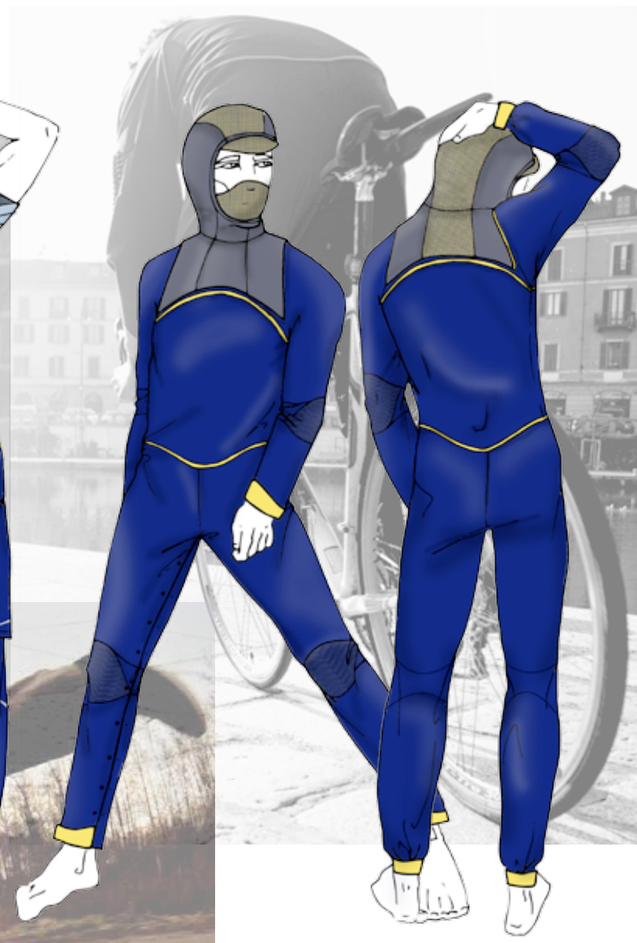
Hats, backpacks and boards-carriers, sandals

8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments: Overview

Hi - Tech **Water**
RASHGUARD

Transformable **Pants into**
BOARDSHORTS



Sleeveless **Neoprene**
JACKET

Better Way **Transformable**
(wet)SUIT into JACKET

Current pages
Key Garments Line Up
Back and Front views of the sleeveless jacket, boardshorts, rashguard, long pants and (wet)suit are shown.

Rashguard

Rashguard
OVERVIEW

MATERIALS
(2mm - Brushed Inside):

- **UV FLEX FJJ 514 Yacht Blue**
- **UV FLEX FJJ 456 Cool White**
- **Sublimation on White in Yellow Code FJJ 228 Buttercup**
- **Breathable Mesh Charcoal Gray Code for color: FJJ 717**

SEAMS:
SHEICO POWERSEAMS
(powerseam in blue if possible, otherwise black)
CLEAN TAPED FINISH, NO BLIND STITCH VISIBLE

SEAMS: YES

SEAMS: NO

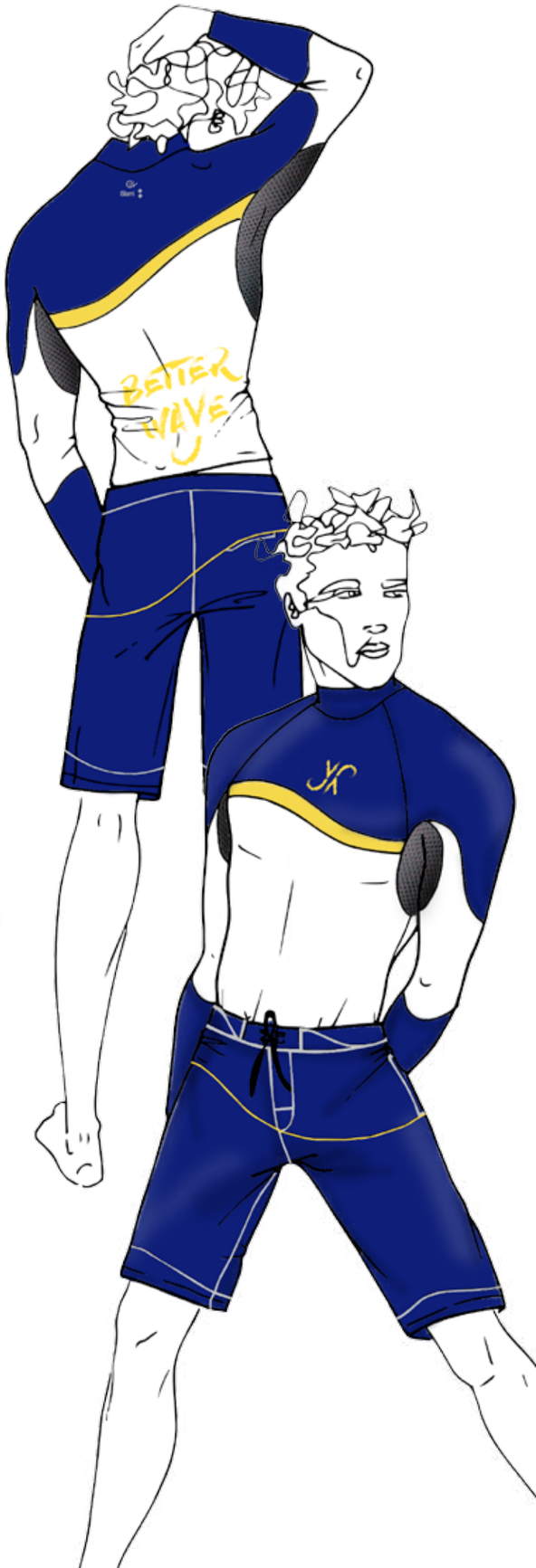
LOGO 1 Back

BETTER WAVE

LOGO 2 Back

Slam

LOGO 3 Front



Current pages
Rashguard Technical Sheet, front and back views are presented.

8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments: RASHGUARD

Current pages
Flat Rashguard Front and Back Views,
Details: three kneedles seams,
Printed Message: Better Wa(y)ve, Better Wa(y)
ve yellow logo, yellow wavy stripe and grey
CDV and SLAM logos at the back. Detail of the
underarm black mesh.
Ph: C. De Vescovi, Lido di Venezia

Pages 180-181
(Ph: C. De Vescovi, Model: Giacomo Pedretti, Lido di Venezia)
Left. **Rashguard** Front and back view of the "worn" garment
Right. **Black and white zoom** on the upper part and mesh underarm part.

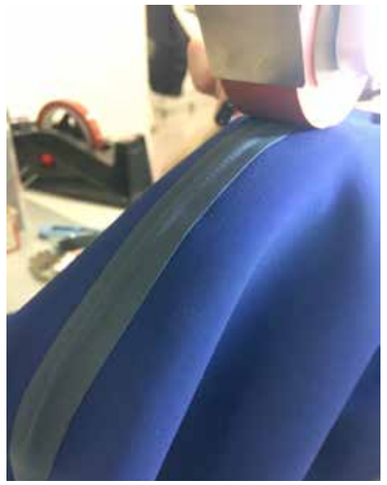
8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments

Prototypes Manufacturing and finishing process
COLLABORATION 4: Framis Italia S.p.A.

(d)

(e)

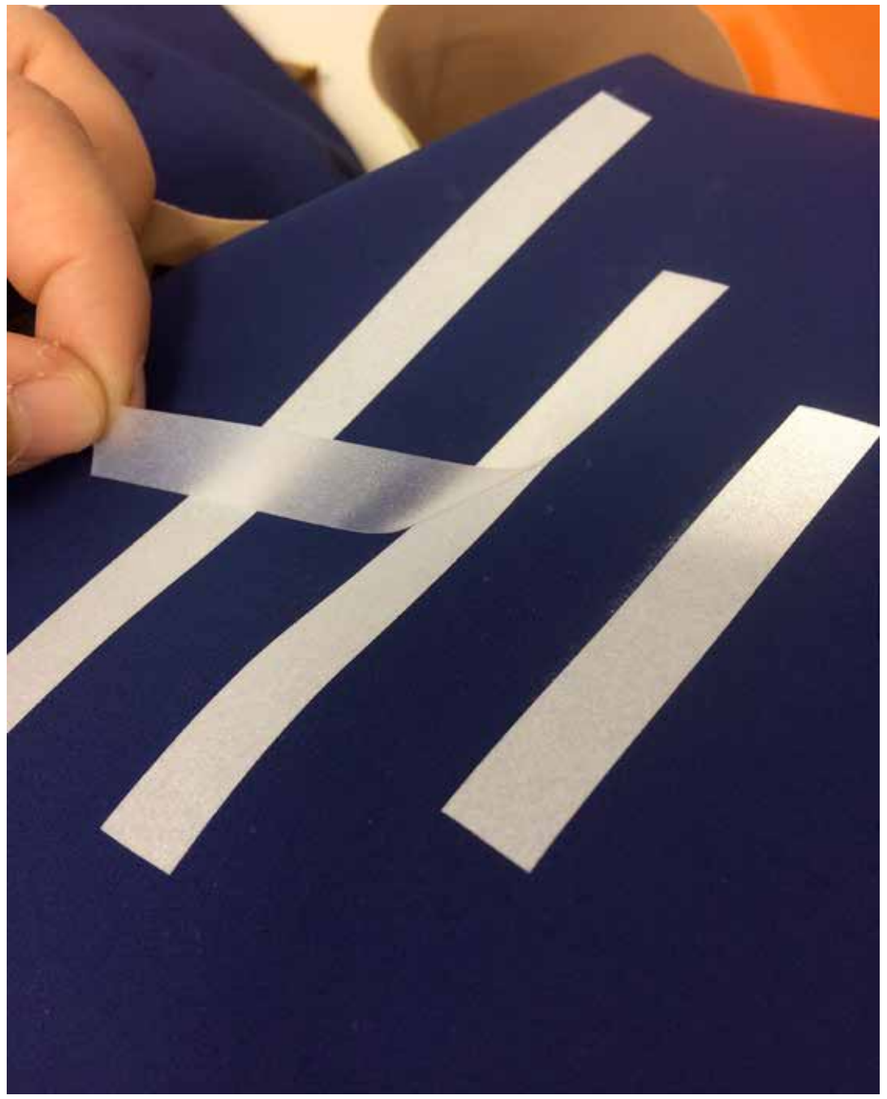


(b)

(a)

(c)

Current pages
Finishings Here the different finishes adopted on the garments at FRAMIS Italia are presented through pictures taken at the factory in Milan



(c zoom in)

Pages 184-185
Finishings Here the finishings are presented from a technical point of view through detailed sheets and drawings that show the placement of the tapings

FINISHING

Inside:
FRAMIS REINFORCEMENT TAPE
on ALL seams and pockets

(a) Taping
Name: Colorado
Color: light grey
Machine Mx2016 - nastratura a caldo

(b) Taping
Name: Portofino
Color: dark grey
Machine Mx210 - nastratura a caldo

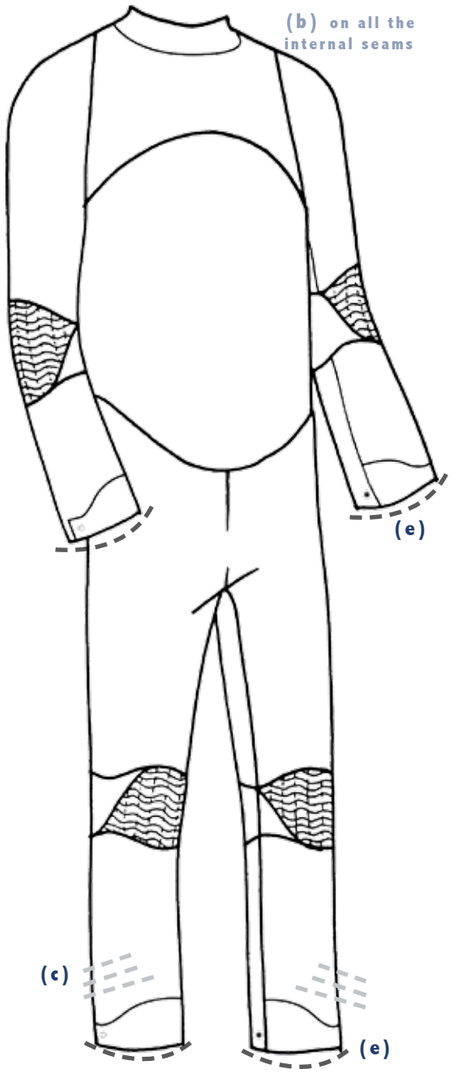
Outside:
FRAMIS DECORATIVE TAPING

(c) high-visibility Tape
Name: Dream
Color: Steal
Application with press

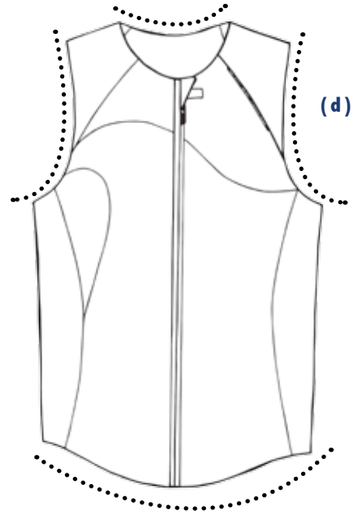
FRAMIS HEM FINISHING raw edge

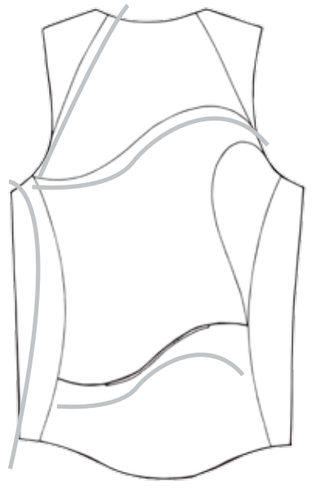
(d) hem-finishing taping
Name: Fit Power
Color: black
Machine Mx208 - edging

(e) hem-finishing taping
Name: Panarea
Color: dark grey
Machine Mx208 - edging

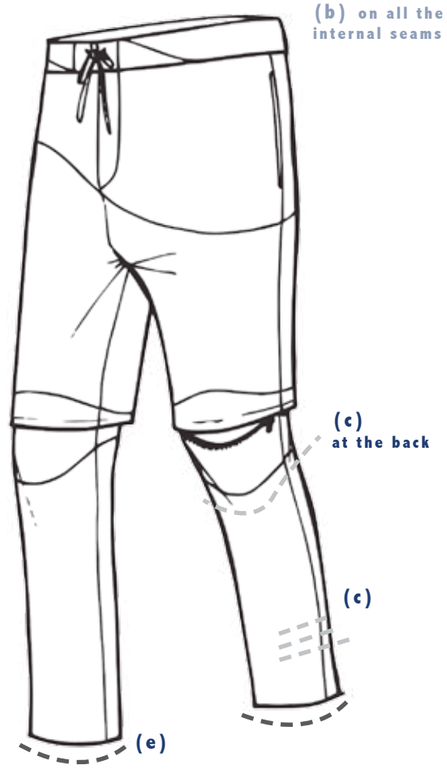


Note. (wet)SUIT
All the internal seams have the **(b) taping** dark grey Portofino finishing





Note. Sleeveless Jacket
All the internal seams have the **(a) taping** light grey Colorado finishing



Note. Transformable Pants
All the internal seams have the **(b) taping** dark grey Portofino finishing

8.3.2 Focus on Key Garments: TRANSFORMABLE PANTS INTO BOARDSHORTS

Transforming Boardshorts

Transforming Boardshorts
OVERVIEW

MATERIALS:
DRYlon Canvas
(Water repellent fabric for Boardshorts)

Mesh for interiors

SEAMS (FRAMIS):
Nastratura Catarifrangente
Nastratura Gialla

LOGOS:

METRAGGIO

DRYlon Canvas **130(h)x200(l)**

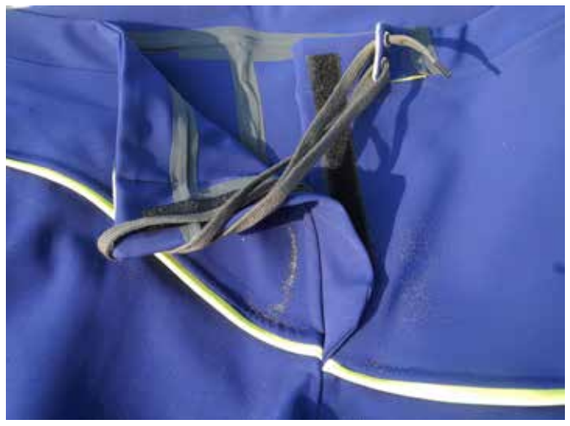
Tech Mesh(interior) **130(h)x80(l)**

ACCESSORIES:
Waterproof Zip:
12cm (x1 - zip dietro)
17cm (x2 - zips lati davanti)
18 cm velcro/cordoncino

Current pages
Transformable Pants Technical Sheet, front and back views are presented.

8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments: TRANSFORMABLE PANTS INTO BOARDSHORTS



Current pages
Transformable Pants Front and Back view of the long version, details of the removable lower part, back view of the boardshorts version. Details: opening flies, ribbon, velcrum, side and back pockets with mesh lining, reflective bands.

8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments: TRANSFORMABLE PANTS INTO BOARDSHORTS

Current pages
Transformable Pants The Transformation Process Removing the lower parts through hidden zip.
Zoom of the front, upper part of the boardshorts The yellow crossing wave, symbol of the entire collection, and the closure system are shown.
Details of the knees and lower level.

Current pages
Side View of the boardshorts with zoom on side pocket entrance
Running on the seashore Overview of the outfit - Rashguard and boardshorts.

RES Neoprene Gilet

Neoprene Gilet
OVERVIEW

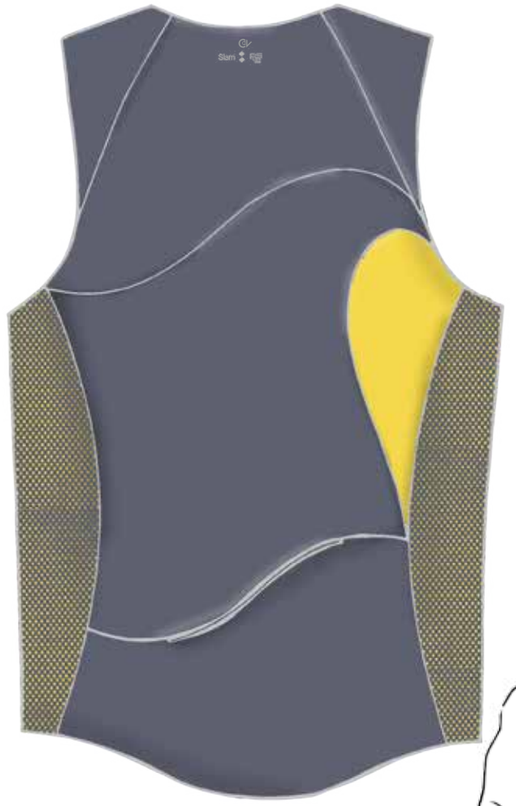
MATERIALS:
- **RES Neoprene (exterior)**
- **RES Neoprene (interior)**
- **Yellow Bonded Lycra**
- **Yellow Lycra Bonded with tech grey mesh**

SEAMS (FRAMIS):
Nastratura Catarifrangente

LOGOS:

METRAGGIO:
- RES Neoprene (exterior) **130(h)x70(l)**
- RES Neoprene (interior) **same**
- Yellow Bonded Lycra **130(h)x30(l)**
- Tech grey mesh **130(h)x30(l)**

ACCESSORIES(waterproof zips):
Zip 60cm/Zip 11cm/Zip 23cm

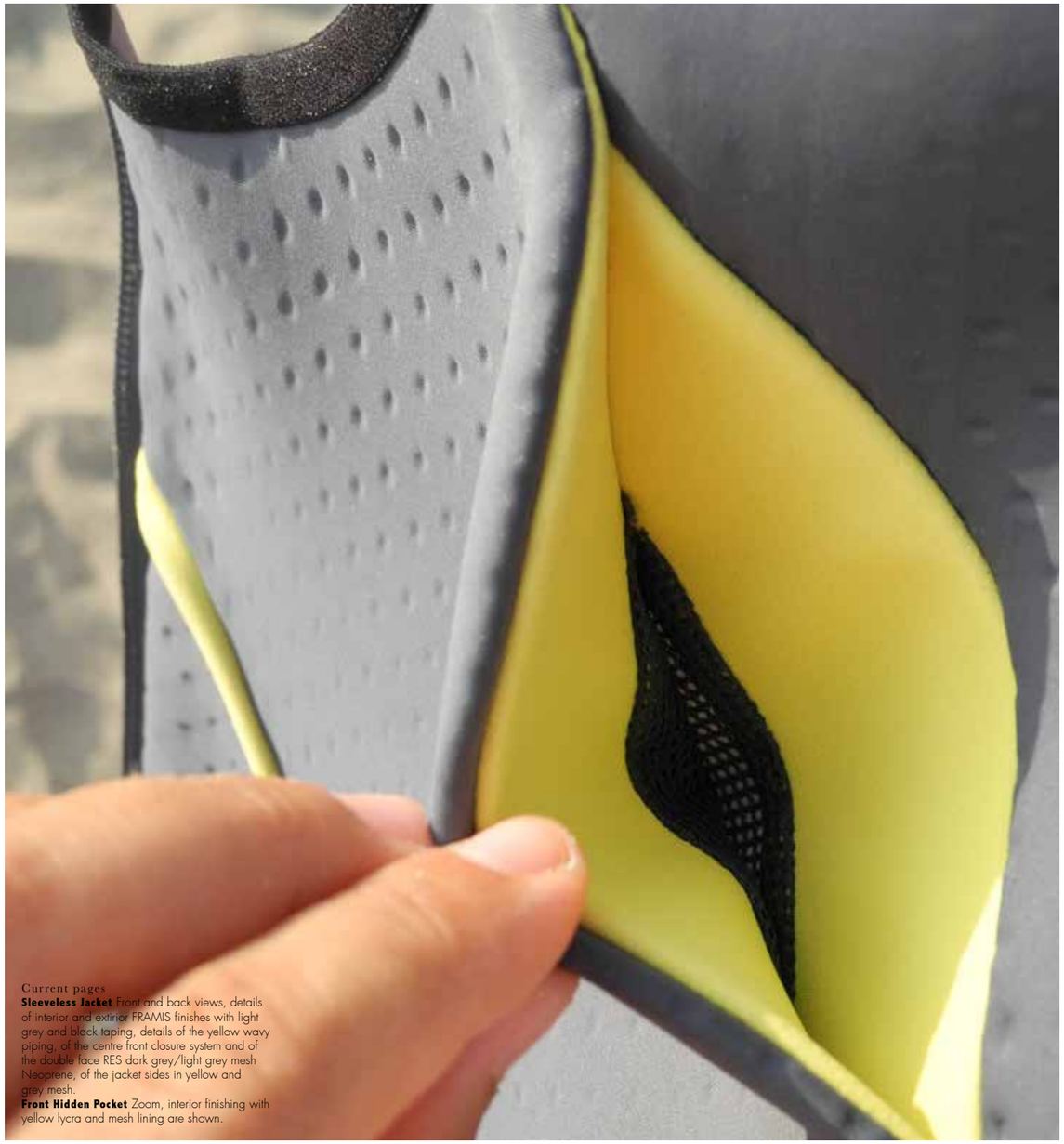


Current pages
Sleeveless Jacket Technical Sheet, front and back views are presented.

Note.
For the surfing WETSUIT and the urban (wet)SUIT the technical sheets are already presented in the related chapters 6 and 7.

8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments: SLEEVELESS JACKET



Current pages
Sleeveless Jacket Front and back views, details of interior and exterior FRAMIS finishes with light grey and black taping, details of the yellow wavy piping, of the centre front closure system and of the double face RES dark grey/light grey mesh Neoprene, of the jacket sides in yellow and grey mesh.
Front Hidden Pocket Zoom, interior finishing with yellow lycra and mesh lining are shown.

8.3 The Better Wa(y)ve collection

8.3.2 Focus on Key Garments: SLEEVELESS JACKET

Current pages
Sleeveless Jacket Front and back views of the worn garment, detail of the internal finishings.
Zoom In of the upper part, with focus on the double sided mesh RES S.p.A. Neoprene

Current pages
Sleeveless Jacket Details of the side in doubled grey - mesh and yellow - lycra, zoom on the frontal yellow piping that reminds of a wave and front closure system with waterproof zip

I'm a living sunset
Lightning in my bones
Push me to the edge
But my will is stone
I believe in a Better Way
Fools will be fools
And wise will be wise
But i will look this world
Straight in the eyes
I believe in a Better Wave
What good is a man
Who won't take a stand
What good is a cynic
With no better plan
I believe in a better Way
Reality is sharp
It cuts at me like a knife
Everyone i know
Is in the fight of their life
I believe in a Better Wave
Take your face out of your hands
And clear your eyes
You have a right to your dreams
And don't be denied

*I believe in a Better Wa(y)ve . .**

"Better Way" - B. Harper
*Words game send back to the Project Title

9. CONCLUSIONS

9.1 Conclusions from the author

Out of sight ? Out of mind !

Conclusions that just mean beginnings . .

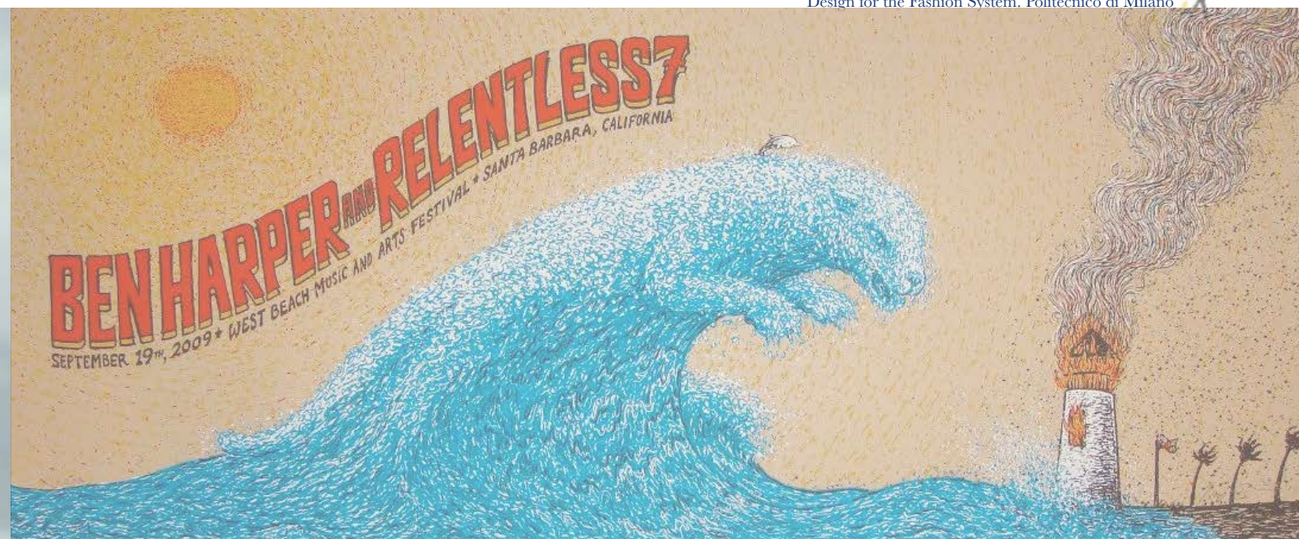
My intention is not to expect you to agree with every single word written or with the proposal offered, referring to the key element of the thesis of course, that is to say the Better Wa(y)ve Changing Color Wetsuit reacting to Ocean Pollution.
My project's intention is, as I expressed from the first chapter, TO make visible the invisible but real problem of the pollution of the ocean and of its implications on human health, TO color the danger giving it a recognizable shape, hoping with this TO overcome the insensitivity of blindness, TO raise awareness, TO provoke actions, TO stimulate the desire of trying to be MAD (Make A Difference).
Even just the interest in finding something more about the issue is a great result for me, and a little step towards a Better Way.
"Pheraps the final tangible achivement of this book has been to positioning the surfing world within this broader and growing debate around sustainability"* giving surf the power of having a valuable role in the round table discussion about sustainability.

"So now what?
You make an inventory assessment in your head as you turn down the last street to your destination . .
boards, wetsuit, fins, leash, wax, sunscreen . .
check, check, check
It' s all there,
waiting for you to do what you' ve been training for.
It' s time now to suit up,
*and for us to get out there and make something happen."***

I hope I' ve been able to show what I do believe: that what all of these "stories" I studied, selected and reported have in common is shared values, common goals and teamwork, and together with this, the power of surfing to connect.
What is sure to me is that without this sharing of abilities, passion is an empty vessel.
"We are not islands" or at least, we don' t want to be islands if our aim is to make a change.
The power of sharing, of exchanging knowledge, ideas and skills, discussions, fields' interconnections - or in our "Design philosophy" crossfertilization - are the key to get to challenging, enreaching and innovative researches and solutions.I already had a strong belief in this concept, and this thesis became a new confirmation of what I already experimented. ***Without passion innovation is coreless, but without collaboration and co-working passion alone cannot reach a satisfying goal.***
Every single person and company that took part to my project is a fundamental and undeniable power, without which the development and realization would have not been possible, or at least, not in such a way!

*"Today there is too much knowledge to be held by one person, one country, one company. We need to be all together. We need an amazing, harmonious concert of brains, knowledge, means. We already have the tools, the knowledge and the motivation. Together we can use them to rewrite the rules. We need to make the most beautiful network of good will to save the Oceans." ****

*From the book "Sustainable Stoke. Transitions to sustainability in the surfing world" by Gregory Borne, Jess Ponting 2015
**From chapter 3.3 "Transitions to sustainability" Derek Sabori
***Patricia Ricard - Parley for the Oceans Member
****From Chapter 8.3 "Surfing can change the world" by Chris Hines - founder of SAS, p.249
***** Wahine Magazine 1998 Aloha Rell Sunn vol.4, no.2



The founder of SAS, Surfers Against Sewage, Chris Hines, has been to me an indefinable source of inspiration, as many others during this "search"- to go back to Rip Curl philosophy and to where we started this journey. ***At the conclusion of my work, that of course is everything but a "conclusion" - I would be right in calling it "the biginning"****, cause this is what it is to me, the first step for further growing developments - I cannot silently overcome one of the main sentences that between the thousands I' ve been reading, definitely catched my attention becoming the spark for my project.*

*This is taken from his speech "Surfing can change the world"**** where he, referring to the foundation of SAS, says:*

"We had a simple aim,
that we held in our hearts and our minds:
to be able to enjoy the coast, beaches and surf for the wonderful thing that it is.
We wanted to be able to go surfing
without fear of infections
but we didn' t just care about us as surfers,
we cared about all the people using the sea
and the health of the oceans themselves.
We were just the litmus paper."

I think this care totally embraces and summarizes the main values that enlighted my road.
The love for the ocean, but also the care for the entire environment, the attention for surfers' safe conditions but also for all the people enjoyng the beauty of our seas, and that "litmus paper" that concretizes inside the reacting-wetsuit concept. The wetsuit' surface becomes the litmus paper that reacts to polluting hazardous agents when dip inside water, having the extra 'oomph' of reversibility. As already said, detection and the turning of pollution into something visible IS NOT the solution for sustainable production, but sustainable production is useless and powerless without consumer's awareness and knowledge.
So, with my wetsuit I started from this consideration.

*"If you share the ocean, well then you' re completely bonded because that's like being blood brothers or blood sisters. And aloha is to keep giving that love and feeling it coming back, until there's nothing else you have to give."******

Let' s try to go back to this, just sharing love, and not pollution, in the sea.
The first step ? Information, education, awareness, consciousness, enthusiastic passion and strong values.
Courage in facing problems and even more courage in proposing solutions, against that common wrong feeling that if something is "Out of sight, -then it remains - out of mind!"

Believe in - and act for - a Better Wave and a Better Way.

Pages 204-205
Left. **Ben Harper,** musician author of "Better Way", main soul of my inspiration in life and for the title of the project facing the Ocean and 2009 Santa Barbara
Right. **Concert Poster** by Marq Spusta.

9.2 Hearthful Thanks

Pages 206-207
Left. **The sea on you skin**. Tattoo of a whale detail, while the surfer is wearing the wetsuit.
Right. The sea on you skin. Tattoo of a whale detail, while the surfer is wearing the (wet)suit.

Professor Maurizia Botti that patiently and enthusiastically followed me during these months, being a continuous source of inspiration and contacts, making my ideas come true into collaborations and researches with different experts of different fields. She has not just been a professor, or my thesis mentor, but a guide inside and outside the academic and work world.
Professor Arturo Dell' Acqua Bellavitis that has been present through all the many stages of this project, kindly available for any question, suggestion, last-call meetings and that is the reason why I contacted Botti.

Project Collaborators
•For the Wetsuit research and prototypes development: Prof. Cerisola, SLAM S.p.A (with a special thank to Valentina Cavanna),
Sheico Group, RES S.p.A, FRAMIS Italia
•For the photo and video making: Jessica Vianello, Giacomo Pedretti

Politecnico di Milano
•All the professors I had during these five years of University adventure (I do believe every course, lecture speech or conferece had its footprint in my view of Design and its possibilities - a special thank to Second year Professors M. Soldati and C. Rivetti that stimulated my passion for sportswear and material research, together with L. Denardo, that has not only been a professor for the course of "Materials and Technologies" but also gave me interesting directions at the biginning of my thesis for the "chemical" aspects) and all the assistants that were always ready for giving advices.
•The experience of International exchage with FIT - Fashion Institute of Technology, NYC
•The conferences organized during the years by Politecnico, through which I had the opportunity to meet on of my guides, Giovanna Villani, in the Ethical approach to Design and that became first my opportunity of Stage, then my opportunity for life - changing experiences, like the trip to India for the Women Empowerment Workshop on Ecoprinting and last but not least a guide in life and a special friend.

My family, that supported me from the beginning, not only of this project and University, allowing me to study in Milan and NYC,
but that thaught me to see the World as a teacher, that opened my eyes through their passion for music, travel, the sea, the environment, that pushes me into always new life adventures being open-minded and ready to give and to listen to others for an endless enriching, that sustained the idea of renouncing to comforts and go . . leaving the attitude of "accepting the first thing, the easiest situation, the faster way", that offered me all they could and more, being also able to say no sometimes, and teaching me to not give anything for granted, that I could do everything, but desearving it with commitment, responsibility and hard work.
Thank you Ornella, Renato, Tiziana, Cinzia, Andrea, you are my undeniable streght because you are to me the power of love, the strongest one I have in life.
My friends, the "geographically close" ones that beared me every single day of this five - year - university adventure, with whom I shared a great part of my life and that became a second family in Milan, Anastasula, Francesco D.G, Edoardo, Chiara, Federica, Francesco L, Michela, Matteo, Giacomo, Salvo. .
and the "geographically far" ones that never failed in giving me support even if kilometers kept us apart, because they always made me feel special and able to do good and do well believing in my values, Beatrice, Giulia, Alberto, and a special thank to Ilaria, friend and soulmate of a lifetime, with whom I rode the waves of youth and adolescence and now adulthood. I hope we'll keep surfing together each future moment of our life.(Of course thank you to those ones who "created" you! Elisabetta, Andrea and Tommaso).

People that inspired me along the way.
It would be an endless list if I had to cite all the people that inspired me along the way, with their 'whatever - shape' work (products, music, art, research, words..)
A special thank goes to Ben Harper, my inspiration, that with his music and his soul is able to give my thoughts and feelings a shape into words and sounds, and that will always be an endless source of positive power in good and hard times.
Thank you for composing ***"(I believe in a) Better Way"****, not just a title for my thesis, but a value in life.*
Finally, Ocean and Nature, main reasons why I can be here writing all of this.

C.D.V.

9.3 Bibliography Sitography & Index of the Captions

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Sitography

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jhu.edu - Jhon Hopkins University (Baltimore - Maryland)
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advances.scientificmag.org
journal.plos.org . PLOS ONE - Accelerating the publiction of peer-reviewed science

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oceanagency.org - The Ocean Agency
olympic.org - Olympic Games
scripps.ucsd.edu - Scripps Institution of Oceanography, UC San Diego
gesamp.org - Group of Experts on the Scientific Aspects of the Marine Pollution (UN)
worldoceanreview.com - Reports
unep.org - United Nations Environment
noaa.org - National Oceanic and Atmospheric Administration
epa.gov - US Environmental Protection Agency
worldwildlife.com - WWF
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yale.edu
parley.org - Parley for the Oceans Organization
sima.com
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Singers cited

Ben Harper
Jack Johnson
Ziggy Alberts
Trevor Hall

Index of the Captions

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Back View of the surfer standing inside the water. Ph: Chiara De Vescovi, Model: Giacomo Pedretti, Location: Lido di Venezia
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Image taken from tallingtonlakesproshop.com
Right. **In Chicago, a lone cyclists** navigates the bike path along Lake Michigan at the North Ave. beach. Dec. 18, 2013 from cbsnews.com
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Left. **Better Wa(y)ve Westsuit**
Front View of the surfer. Ph: Chiara De Vescovi, Model: Giacomo Pedretti, Location: Lido di Venezia
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Surfer paddling out. Ph: Chiara De Vescovi, Model: Giacomo Pedretti, Location: Lido di Venezia
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All the pictures have been taken during the American Coast to Coast Trip between January and June 2016.
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Coney Island, Brooklyn, NY
May 14, 2016 - 5.36pm
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Taken from adidas.com/us/parley
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Images courtesy of Scripps Institution of Oceanography Archives, UC San Diego Library.

Supplementary Box
Left. Two divers wear **frogmen-style drysuits**, like those worn by O'Neill during his early surfing days.
Image courtesy of Scripps Institution of Oceanography Archives, UC San Diego Library.
Right. **The Skin Diver Magazine**, Agust 1954

Right. **Body Glove's first wetsuit size chart** used this photographic diagram.
Image courtesy of Body Glove.
The Unisuit
1976 Skin Diver Magazine
Benefits of wetsuit
O'Neill and another surfer demonstrate the immense benefit of wetsuits by leisurely reading the paper at sea.
Meistrell Advertisment
Bill and Bob Meistrell pose in a mid-1950s ad for Dive N' Surf.
O'Neill's earliest wetsuit prototype
It was this vest coated in PVC plastic, circa 1953. **Surf development in the Sixties**
By the 1960s, surfers were familiar with the wetsuit-clad Body Glove surf team.
SF trade show 1956 Jack O'Neill's kids floated around in their custom wetsuits at a 1956 trade show in San Francisco.
Surf Advertisment 1
1969 O'Neill
Surf Advertisment 2
1976 O'Neill
Pages 20 - 21
Left. **Meistrell brothers**
Old picture capturing the Body Glove' s founders posing at the beach during summer, 1952.
Surf Advertisment
The Body Glove Advertisment "The winter Gang", 80s

Supplementaty Box
Chris Burkard Surf Photography
2013, Iceland

Pages 22 - 23
Left. **O'Neill** in his house in front of the sea, Pleasure Point, Santa Cruz, CA
oneill.com/history
Right. **O'Neill Supersuit**
oneill.com/history
O'Neill Boots. O'Neill launches the world's first split - toe surf boot
O'Neill Neoprene Snow pants
oneill.com/history
Jack and a group of children pioneering the O'Neill Sea Odissey Program
oneillseaodissey.com
Pages 24 - 25
Left. **Claw, the pirate**
1991
John 'Sparrow' Pyeburne (still at Rip Curl now) cutting wetsuits at the Old Bakery
Right. **Rip Curl store** and HQ, Geelong Road, Torquay 1980
One of **Rip Curl last campaigns** "Surfing is everything"
ripcurl.com/history
Pages 26 - 27
Left. **SIMA Organization**
first website page screenshot from sima.com
Pages 28 - 29
Rip Curl Flashbomb Zip Free Wetsuit, SIMA 2015 Award,
Front and back views plus details from ripcurl.com
Pages 30 - 31
Xcel Infiniti Comp TDC Wetsuit, SIMA Award 2017,
Front and back views plus details
Right. **Xcel Team** at the SIMA "017 cerimony from xcel.com
Pages 32 - 33
Patagonia Yulex Wetsuits Series, SIMA Awards 2015 and 2017,
Front and back views, eterior and lining from patagonia.com
Right. **Patagonia** Campaign for the Environment from patagonia.com
Pages 34 - 35
Left. **Billabong Furn Pro 504 Zipless**
Furn Pro lining material, disposition on body and wetsuit front and back final view
Right. **Vissla Shonan Japanese 3.5 fullsuit**
Back and front view plus lining design vew on the "entering" upper part in transparency and wetsuit inner and outer details
Pages 36 - 37
Left. **Vissla Eco Seas Wetsuit** |
Front and back view plus Naturalprene
Right. **Picture Naturalprene CIVIC wetsuit**
Back and front view plus abstract from the campaign, details about Naturalprene and CO_2 footprint

Page 208
Paddling out for a Better Wave. Surfer wearing the reacted wetsuit captured in the sea, the message pops up in yellow.

9.3 Bibliography Sitography & Index of the Captions

Index of the Captions

And this is then more
than just the waves.

The wave is
a shared inspiration
for surfers,
a recognized icon.

It is about protecting
the whole environment
for everyone,
for all times.

Hugo Tagholm

Do You . .

. . *Love*

the ***Ocean***

and could You . .

the ***Ocean***

. . *Love*

with *me* ?

"Simple Things"
from "Land and Sea"
Ziggy Alberts

Chiara De Vescovi

Master of Science . Design for the Fashion System
Section . Sportswear & Activewear

Project .
Better Wa(y)ve. Riding on the crest of Sustainability.
Surfing as the *litmus paper* for Pollution detection

Milano. October 4th, 2017