

POLITECNICO DI MILANO

Re-think Cleanliness

TRANSFORMATIVE PERSPECTIVES WITHIN RADICAL DESIGN



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RE-THINK CLEANLINESS

Abstract

Cultural studies defines cleanliness as a social construct process of “restoring social order and pursuing ideals of purity”. Defining cleanliness as a process of continuous reinforcement of mental values leads to the assumption that for cleanliness activities, the role of water is reduced to the basic function of cleansing agent, which in this case could be replaced if the mental orders remain untouched. This means the possibility to break systems continuity in terms of water consumptions and eventually redefine social fabric and values.

A radical perspective is proposed by transforming a traditional functional unit for cleanliness -shower and baths- to move progressively to a satisfaction unit -restore mental order- with the aim to establish a satisfaction-system approach towards a more sustainable way of living “water preservation”. Nevertheless, this is a design exercise not only for sustainability domains, it is also claims for independence and sets the standards for a cultural shift that can define the values of the new generation: diversity, transformative and regenerative.

Contents

INTRODUCTION	5
Chapter 1: What is clean?	7
1.1 Difference between cleaning and cleanliness.....	8
1.2 Dirt and dust.....	10
1.3 Dirt is relative.....	10
1.4 Dirt is emotional.....	11
1.5 Dirt is contrary to an order.....	11
1.6 Dirt and moral.....	13
1.7 Disgust and moral purity.....	14
1.8 Washing away your sins.....	15
Chapter 2: Cleanliness evolution: from rituality to hygiene	17
2.1 The theory of fourth humors.....	18
2.2 Fear of water.....	18
2.3 The miasma theory.....	19
2.4 The Germ theory and hygiene revolution.....	20
2.5 The Biodiversity hypothesis.....	20
2.6 Targeted Hygiene.....	21
Chapter 3: The culture of Cleanliness	24
3.1 Cultural change precedes market.....	25
3.2 From experts to consumers.....	26
3.3 Cleanliness as a profitable market.....	27
3.4 Cleanliness as a status symbol.....	28
Chapter 4: New perspectives on the human microbiome and the role of targeted hygiene	30
4.1 Hygiene as the key strategy to control infectious disease.....	30
4.2 The rise of allergies in the 20th century.....	31
4.3 From Hygiene hypothesis to Old Friends mechanism.....	31
4.4 Skin microbiota from the perspective of the biodiversity hypothesis.....	33
4.5 Domestic and personal hygiene.....	34
4.6 Targeted hygiene in home and everyday life.....	35

Contents

Chapter 5: Sustainable transformation for tourism activities	40
5.1 Sustainability transformation and radical perspectives.....	40
5.1.1 Alternatives as strategies for radical approach.....	42
5.2 Satisfaction unit and Systems innovation.....	43
5.3 Water and energy consumption in tourism activities.....	44
5.3.1 Accommodation.....	44
5.4 Case studies.....	47
5.4.1 Washing without water technologies.....	47
5.4.2 Mini-mister.....	49
5.4.3 Kunkun body odor detector.....	51
5.4.4 ES-100A compact body smell checker.....	53
5.4.5 'Balance of Being'.....	55
5.4.6 Ruka: refillable edge styler.....	57
5.5 Solution Landscape.....	59
5.6 Define several units of Satisfaction.....	60
Chapter 6: Envisioning future scenarios	63
6.1 Emergent Trends in 2022.....	63
6.1.1 Eco-consumption.....	63
6.1.2 Regeneration and biodiversity.....	64
6.2 Vision statement: Promoting targeted-clean concept.....	66
6.3 Enriching smart hospitality propositions.....	69
6.4 Hypothesis generation.....	70
6.5 User Journey mapping.....	71
6.6 Comparative analysis: environmental footprint.....	72
Chapter 7: The Milan bath: product design	74
Conclusions	92
Reference List	93

RE-THINK CLEANLINESS

Introduction

The cultural study of cleanliness brings into discussion the historical consciousness aspects of human conduct so private, so habitual, so seemingly trivial that at first sight it's hard to believe they have a history. Today cleanliness habits are thought as second nature, if not completely natural, and scarcely worthy of reflection.

One critical part of reality is that such mundane matters, especially in relation with nature, have completely opposite results. Today many cleaning products pollute or endanger the health and promote the pollution of water, soil and air and are related to the loss of biodiversity. The majority of consumers do not know enough about the side effects of cleanliness and personal hygiene habits to make informed decisions. Strong cultural tradition and persuasive marketing lead to consumer skepticism to adopt more ethical solutions.

Moreover, the negative effects of cleanliness practices explained above particularly intensifies in the context of tourism activities, supporting evidence from previous research of the high demand of natural sources by five star hotels and guesthouses, the only certainty is that water will continue to be critical for socioeconomic development, specially for the tourism industry. In a more than ever thirsty world high-engineering solutions are plausible, but not suitable for every tourism destination. Therefore, this study aims to determine if technological fixes are enough or will our hard-wired water consumption habits have to change as well? Are consumers ready to reconsider their cleanliness habits for their sustainable leisure?



RE-THINK CLEANLINESS

To leave the present system unchanged seems increasingly unsustainable in terms of cost as well as the environment. But it is also clear that 'soft engineering' solutions must also be considered: we need to rethink our own behaviors and patterns of water consumption in the years to come to ensure sustainable ways of living.

A systematic analysis is conducted firstly to understand the role of cleanliness as a social construct phenomenon and secondly, to collect evidence that a cultural shift is ready to take place. A radical approach for sustainability is proposed as a way to challenge the status quo -by changing the roots- of existing service models and is taken as specific context to test, create and improve existing systems.

On this basis, using the concept and tools of Circular design, considering the circular approach that leads for transformative, regenerative design systems together with the implementation of quantitative research and experiential learning are seen as complementary approaches to identify various design opportunities. The design of radical alternatives to satisfy cleanliness demand is the main design output, with the objective of challenging traditional assumptions and empowering consumer-decision making to lead the first steps towards a cultural shift for a more regenerative future.

However, research and design for one dynamic perspective is just the starting point of the changing paradigm of design for a sustainable future. Building a holistic and circular design knowledge service ecosystem is the future direction of efforts.

Chapter 1

What is clean?

Between 1750 and 1900 body washing went from being an occasional routine of a small segment of the population to a regular practice of the large majority of the people. The question is how the change came about? The use of everyday things to remove dirt in ourselves, like showers, liquid soaps, shampoos, deodorants and skincare products are shaped by complex belief systems and touch intimate feelings, such as love, identity and self-worth, however also fear and disgust. Cleaning and its performance are subject of consumption, economy and commerce. Instruments, means and performers are part of a global industry. And last but not least, cleaning is the pressure of hierarchy and status, it touches on political issues like discrimination against women, equality and human rights.

Today cleanliness is an essential part of civilization, and the relation with dirt and clean are considered key symbols that demarcate boundaries or lines of division, as culture cleans differently, their studies “provide insights of how collectivities differentiate themselves from other collectivities” (Douglas, 1984), and explores the roots of moral order.



Image 1 A detail of a pottery work attributed to Athenian vase painter Onesimos circa 500 BC. It shows the routines of Ancient Greek athletes, who applied oils before training in the sun, followed by bathing and vigorous scraping with a strigil tool. Source: (Palumbo, 2021)

1.1 Difference between cleaning and cleanliness

For the purpose of this research we use the definition provided by Stummerer & Hablesreiter (2020a) that "cleaning is a socio-political phenomenon. The way society cleans shows their approach to health, religion, family, hierarchy, consumption, environment and society". corresponds to the act of removing dirt 'cleaning' but also includes 'decorating', referring to external activities such as ordering, maintenance and the curation of spaces.

Cleaning in one's own household is an unpaid, often invisible act. Because cleaning takes place behind closed doors. Cleaning is private, the invisibility nature of housework means it might not be perceived as work. Cleaning is also anonymous outside domesticity. Office towers, subways or hospitals are usually cleaned overnight. The cleaning is done invisibly, including the lack of interest in knowing the background of the staff that usually performs these activities.

Can anyone clean? Cleaning requires knowledge, skill and technique, as well as practical skills and experience. Nevertheless, one earns neither good money nor recognition with this work. Cleaning is a trying necessity, not a subject of reflection.

Nobody speaks about cleaning because contains socio-political explosives,

Dirt and its removal touch on its most intimate feelings: fear, love, humiliation, sacrifice for the family and disgust. And it touches on political issues such as discrimination against women, migration, undeclared work and environment protection (Stummerer & Hablesreiter, 2020a).

From cleaning	to Cleanliness
Relative	Abstract
Follows industrial standards	Made of traditions, rituals, habits
Mostly private activity	Invisible, intimate activity
Superficial process, order	Internal process, identity
Evident, subject to economy, hygiene standards	Hardly evident, social norm is individual responsibility
Can never being absolute right or wrong, cleaning is a cultural act	Cleanliness is a social construction that varies greatly culture by culture

Figure 1.1 Comparative analysis between cleaning and cleanliness definitions. Source by author

The discovery of germ theory changed the cultural approach to dirt and the definition of cleanliness as we know today. Cleanliness was equated with sterility and finally replaced the concept of religious purity. According to Stummerer & Hablesreiter (2020a, p. 59) “through the connection with cleanliness and science, health and civilization, cleaning became a natural part of everyday culture”. In this sense, cleaning could be seen as the result of cleanliness perception.

The practice of cleanliness could be described as the pursue of a ‘purity state of mind’ and has much to do with the reinforcement of mental values related with morality, emotions and social order, cleanliness goes from removing toxic contaminants to seeking spiritual purity, which means cleanliness transcend from physical to mental order. Cleanliness is a highly intimate process shaped by individuals’ appreciation and is not constrained in comparison with cleaning activities subjected to specific norms and procedures, cleanliness practice could vary according to the preference and needs of individuals along with time.

To explore systematically the beliefs and meanings for cleaning, it will be useful to begin with the analysis of dirt and cleanliness.



Figure 1.1a Dirt and dust, Image provided by Stummerer, S., & Hablesreiter, M. (2020a).

1.2. Dirt and dust

Dirt in the most common sense could be described as everything that stands in the way of a pure state. It can refer to various subjects, including dust, trash, bacteria, feces, or plain soil. Even though a concrete definition for dirt is actually difficult to embrace. Stummerer & Hablesreiter (2020a, 31) have investigated the dynamic between dirt and dust and makes the following observation:

Dirt and dust are foreign bodies, particles that have come from somewhere else and have been separated, often crushed and mixed together, and do not belong to the object in question, that is, dirty.

The production of dirt and dust is a constant and effective process, not only as the results of biological functions of the body but also in the use of objects and daily activities. Humans constantly lose hair, skin flakes, and microscopic body secretions during the day, even during sleep. On the other hand, clothing also emits fibers to the environment. If we consider the entire lifecycle of dirt and dust we could also observe that microorganisms such as bacteria and mites are fed by organic residuals. At the end, when microorganisms die they become woolly mice that are culturally perceived as dust.

1.3 Dirt is relative

The conception of dirt implies two types of conditions, as dirt could be perceived in and of themselves (Douglas, 1984 p.52). We are able to recognize a dirty pair of shoes, but why are they considered dirty? if it is the dirt “itself” which makes things dirty, in this case why are the same shoes considered dirty when placed on a table, but not when on the floor? This basic example will make clear the importance of location when dirt is prescribed.

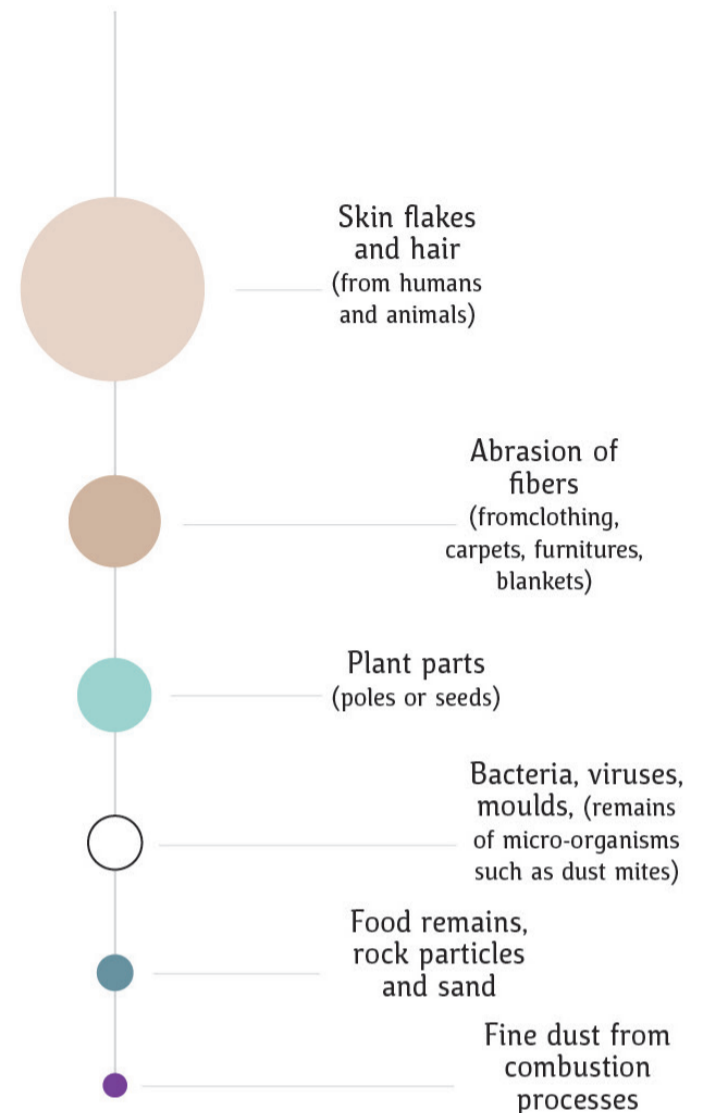
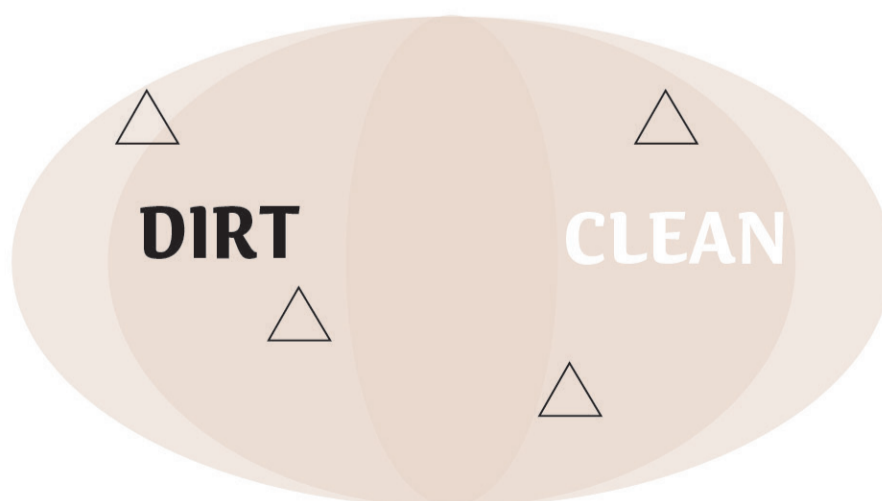


Figure 1.2 Dust composition



△ Individual cultural lens

Figure 1.3 Relativeness of cleanliness

1.4. Dirt is emotional

There is a general assumption that our conception of dirt is entirely rational, logical, and supported by scientific discoveries. However, a closer examination of our cleaning habits reveals that they are driven mostly by emotions composed of habits and social and historical traditions, rather than scientific knowledge.

Emotions play a critical role in the perception of dirt and cleanliness. Several publications support this theory of cleanliness driven by emotions and culture. For example in his book *Just Squeaky Clean: The History of the Vacuum Cleaner*, Swiss writer Friedrich Glauser (2001) once said, "In addition to being logical, our relationship with dirt and cleaning is also emotional."

The relation of dirt with emotions could also be traced by the necessity to reinforce moral order and restore notions of purity,

Cox (2011p.38) describes how "dirt pursues different ideals of purity, which are however considered self-evident and natural within the respective social structure". The absence of dirt has a role in shaping individuals' identity, which determines social interaction by making us feel more attractive to others, these actions are clearly driven by emotions and are relative to identity, gender and social status.

1.5 Dirt is contrary to an order

As previously mentioned dirt could be perceived as a system, not an isolated phenomenon. "Cleanliness requires a systematic ordering of ideas" (Haidt et al., 1997, p.107).



Image 1.4 'Marylin in a Bubble bath' reflect the meaning of bathing rituals as symbols of status, purity and power. Source: (Shaw, 1954)

If we consider the traditional definition of dirt as matter out of place (Douglas, 1984 p.53). We could recognize the tensions between a set of ordered relations, and secondly the contradictions of the same order. In their investigation of the social basis of pollution beliefs, British anthropologist Mary Douglas (1966, p.48) observes that:

Dirt, then, is never a unique, isolated event. Where there is dirt there is a system. Dirt is the by-product of a systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements.

Moreover, other authors complement the analysis of Douglas claiming that dirt is not itself dirt. It is culturally defined as such (Stummerer & Hablesreiter 2020a, p.37)

“Earth, for example, is only a valuable substance in the field. If soil is brought into the home or even onto the dining table, it turns into dirt”. These assumptions highlight the role of culture in the way dirt is perceived and at the same time, dirt has shaped the way we culturally perceive waste.

Concerning the relative nature of dirt Stummerer & Hablesreiter (2020a, p.41) provides an example:

Even the worst dirt, fecal matter, was not primarily dirt but valuable fertilizer for centuries. Until the mid-18th century, for example, the contents of urban latrines were a coveted commodity, sold to surrounding farms as fertilizer. It was only with the rapid growth of cities in the wake of the Industrial Revolution that a different method of disposal became necessary.

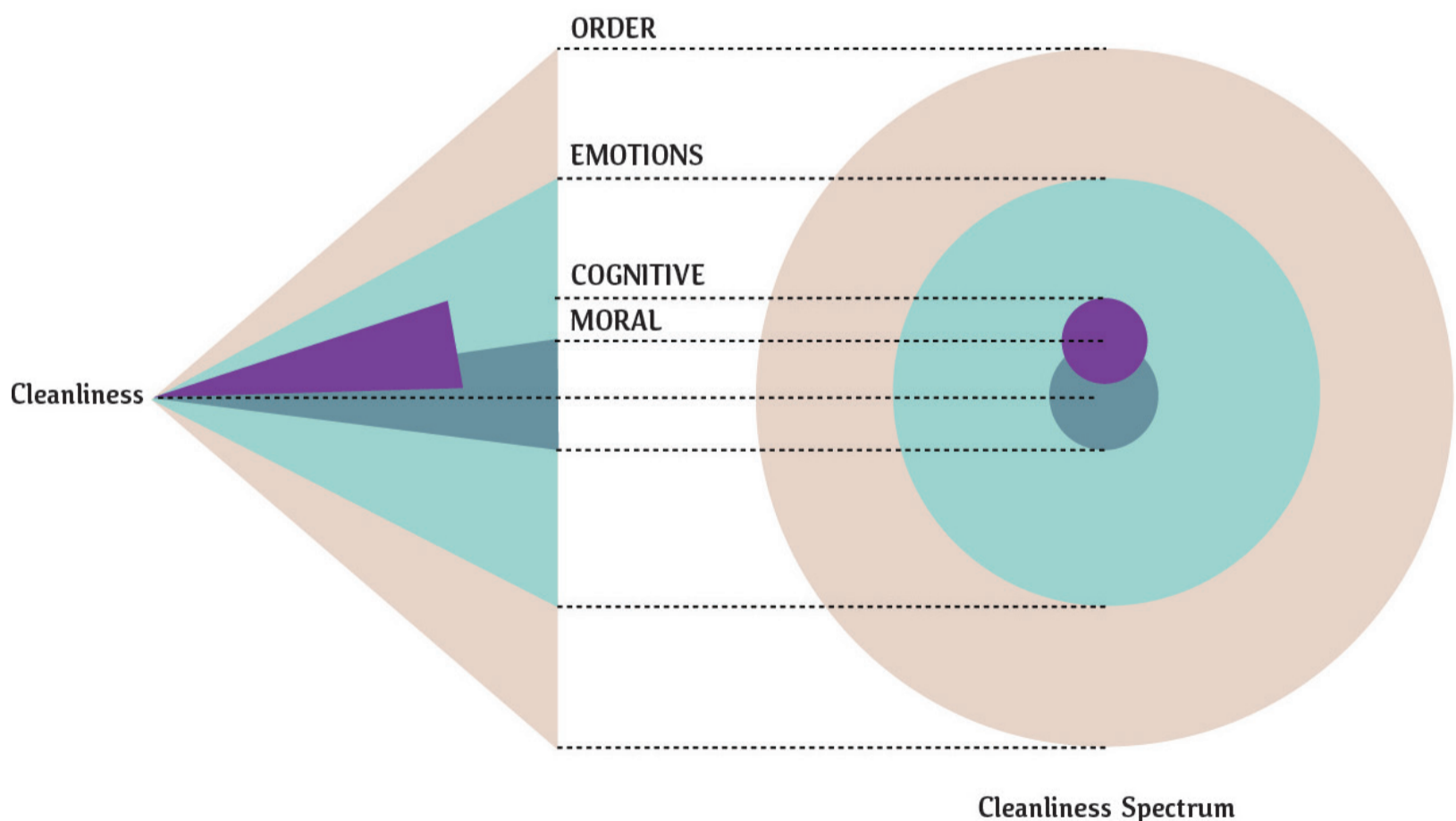


Figure 1.5a The cultural dimensions of Cleanliness, source by Author

Note: A mental model for the cleanliness phenomenon where 4 cultural layers (order, moral, cognitive and emotions) interact and play a role in the building of cleanliness perception.

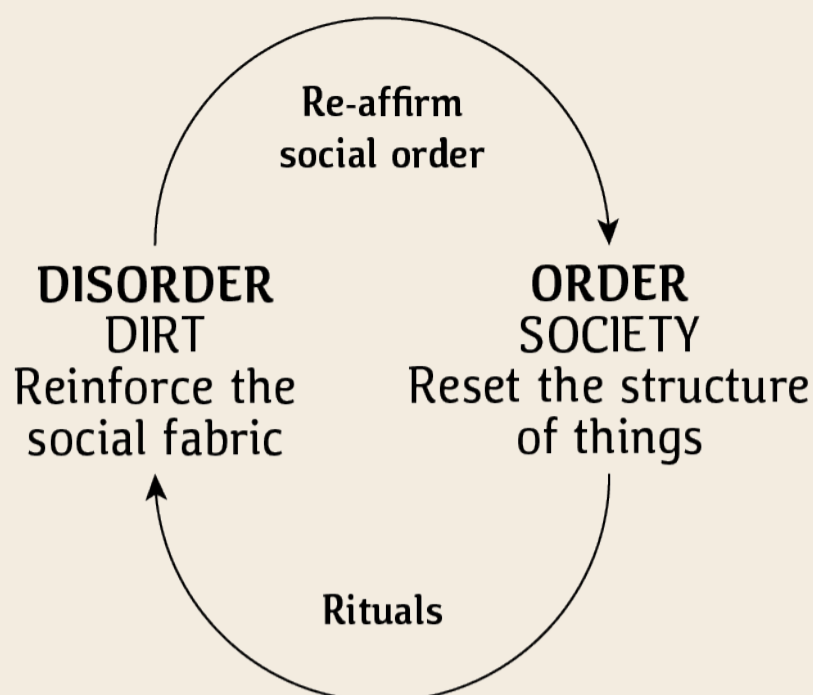


Figure 1.5b Dirt as a symbolic system in relation with order, source by Author

Note: As can be seen in figure 1.5b the act of removing dirt is not the final results, but rather part of a systems. It extends beyond the physical order, the act of cleaning helps individuals to reaffirm mental orders and reinforce the social fabric, rather than linear is a 'ritualistic' continuous process.

The definition of dirt it's not just a matter of specific context or factual location. It's either just a cognitive issue. "It is not that scraps of food are clean when on the plate and dirty when on the table, but that they should be on the plate and not on the table" (Rozin et al., 1994, p. 870). There's a moral dimension in society that makes the question of classification, and misclassifications, also a question of right and wrong. The moral order is bordering with social reality in a way that things have at one and the same time a factual and moral existence.

The moral order is so infused into our structuring of reality that activities such as sorting, tidying, cleaning and setting things in place, act to reinforce not only the structure of social reality but of moral sentiments too.

At that point we are socially obliged to reset the structure of things -create order- and thereby reinforce the fabric of social and moral order - remove dirt -. In theory, every activity that involves bringing some order is something of a social ritual, for the act of re-establishing order is one means for re-establishing society, which is itself nothing but

ordered relations.

In this sense, the order could be associated with the order of life itself, including religious, social, and family order. In this way cleanliness represents ideals of normality, efficiency, and even productivity.

1.6 Dirt and moral

Clean and cleanliness are also made of social rituals, meaning the cultural practices which distinguish a certain group of people and at the same time keeps them together from other groups and cultures.

In this sense cleanliness performs a symbolic function, because cleaning is not only about killing germs, before the hygiene revolution cleanliness serves as a representation, maintaining a pre-defined order serves as a social tool to guarantee access to the most exclusive social circles.

On the other hand, things and actions that do not correspond to the standard order are considered "dirty". Rosie Cox states, "In a figurative sense, the word "dirt" is used to classify and denounce behaviors as unethical". (Cox, 2011)

Cleanliness	Primary action	Complementary action
Emotions	Reinforce moral order	Restore notions of purity
Order	Reset the structure of things	Reinforce social fabric
Cognitive	Reduce physical and moral disgust	Alleviate moral condemnation Restore moral purity
Moral	Social rituals	Cultural differentiator

Figure 1.6 Symbolic framework with primary and secondary action involves the 4 cultural layers of cleanliness, source by Author. Note: The perception of cleanliness is based in primary actions where awareness of individuals takes place, the reaffirmation of mental models are thought as 'complementary actions' and it is repeated in every cultural layer.

There are many examples of this kind of social attribute to dirt, especially in our language, for example: "The moral dimension of dirt manifests itself in language usage in metaphors such as "dirty" sex, which, unlike "clean" sex, is not socially tolerated. Money can also be "dirty" if it comes from a morally questionable source. In this symbol system, cleanliness stands for "virtue" and dirt is immoral" (Stummerer & Hablesreiter, 48).

1.7 Disgust and moral purity

The link between moral purity and cleanliness may have emotional as well as cognitive roots. Disgust, for instance, is an emotion that can be felt in both the physical and moral realms. Haidt further explains:

"Pure disgust originated as a gustatory feeling that evolved to help people avoid eating potentially dangerous foods. It has evolved over time to include broader categories of aversions, such as social and moral violations, at the same time acquiring cultural and societal connotations" (Rozin, Haidt, & McCauley, 2000).

As a consequence, people often report finding immoral acts disgusting.

Indeed, similar neural structures appear to be involved in the experience of physical and moral disgust (Moll et al., 2005). Additionally, there are many similarities between the sense of pure disgust and revulsion associated with moral implications. (P. Rozin, Psychol. 66)

Particularly, prior studies support that moral disgust and pure disgust share brain activity areas, primarily in the frontal and temporal lobes, in addition to similar facial expressions (P. Rozin, Psychol. 870).

Given the overlap between physical and moral disgust on the psychological, physiological, and neurological levels, Cleanliness actions that reduce physical disgust may also reduce social or moral disgust, thereby alleviating moral condemnation.

A research report from the University of Plymouth has demonstrated that incidental feelings of disgust can influence moral judgments and make them more severe (Zhong & Liljenquist, 2006).

The current studies provide evidence that, in the context of morality, purity is not just a metaphor. Presumably, because human beings aim to distinguish themselves from other animals, they attempt to place themselves close to higher spiritual beings by being physically and morally pure. "Because of its potential to lead people to regard moral actions as pure and good, cleanliness might indeed feel as if it were next to godliness". (Haidt, Koller,& Dias, 1993; Rozin et al., 2000)

1.8 Washing away your sins

Cleanliness practice, such as bathing or washing hands, is at the core of many religious rituals. Baptism, for instance, is a water purification ritual practiced by Christians, following the admonition, “Arise and be baptized, and wash away your sins” (The holy bible, Acts 22:16), with faith that through the process of symbolic cleansing of their bodies they might also achieve cleansing of conscience. “Physical cleansing is also central to Islam; Ablution is the Muslim act of washing parts of the body in clean water to prepare for worship. Likewise, Hinduism requires great attention to bodily purity” (Fuller et al., 1992). Thus, many major religions practice bodily purity, suggesting that physical cleansing ceremonies can purify the soul.

A research study published by Science magazine provided evidence for the Macbeth effect: “Exposure to one’s own and even to others’ moral indiscretions poses a moral threat and stimulates a need for physical cleansing in order to wash away moral sins” (Zhong & Liljenquist, 2006)

At the same time “body cleansing wash away moral sins through symbolic self-completion” (Wicklund & Gollwitzer, 1981); that is, people are able to complete their identity (e.g., dancer) when indicators or symbols of this definition are missing (e.g., skills) by engaging in activities that complete the symbols (e.g., training). Consequently, when one’s moral identity is at risk, such as when one has indulged in morally questionable activities, one should naturally be motivated to engage in activities that will restore moral integrity.

Given the association between moral purity and body cleansing, we could state cleanliness practices might also compensate for moral impurity.

Considering the psychological association between physical and ethical cleanliness. Zhong explains:

Threats to moral purity activate a need for physical cleansing, which can assuage moral emotions and reduce direct compensatory behaviors... If even an implicit threat to one’s moral image can produce a psychological need to engage in cleansing behaviors, it is only natural that those who suffer genuine guilt would be all the more relentless in their attempts to restore a pure conscience” (Zhong & Liljenquist, 2006, 1452).



Image 1.8 Jesus Washing Peter’s Feet
by Ford Max Brown, 1852
Source: (Gallery Label,2016)

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The Holy Bible (King James Version), Acts 22:16

Image 1.1 A detail of a pottery work attributed to Athenian vase painter Onesimos circa 500 BC. It shows the routines of Ancient Greek athletes, who applied oils before training in the sun, followed by bathing and vigorous scraping with a strigil tool

Palumbo, J. C. (2021, February 16). What history's bathing rituals reveal about status, purity and power. CNN. <https://edition.cnn.com/style/article/cultural-history-of-bathing-rituals/index.html>

Image 1.4 Marilyn In A Bubble Bath During “The Seven Year Itch.” (2022, July 25). IL FOTOGRAFO. <https://ilfotografo.it/photo-164149-marilyn-in-a-bubble-bath-during-the-seven-year-itch>

Image 1.8 PRIDE: THE ENEMY OF LOVE OF GOD AND LOVE OF OUR NEIGHBOUR. (2021, January 11). Catholics Striving for Holiness. <https://catholicstrivingforholiness.org/pride-the-enemy-of-love-of-god-and-love-of-neighbour/>

Chapter 2

Cleanliness evolution: from rituality to hygiene



Figure 2 Ritualistic cleansing digital collage made by author, original photos provided by (Unsplash, 2019)

For most of human history, cleaning oneself was more about spirituality and ritual than about any modern notion of health or beauty. In the fifteenth century, the Aztecs cut enormous pools into the sides of mountains for rites of purification". Even slaves whom the Aztecs were preparing for sacrifice were purified with holy water. Ancient Egyptians would dress as gods and ritualistically wash their dead to facilitate the transition to the afterlife (Hamblin, 2020,13)

2.1 The theory of fourth humors

The Greek physician Hippocrates promoted baths as a practice that was a little closely related to health. For him, taking a shower involved alternating between a cold and hot immersion to counterbalance the humor. A range of illnesses, including headaches and the inability to urinate, was thought to be helped by warmth. Cold baths instead were treated for joint pain. Fundamentally, the procedures were more about exposure to the elements than they were about getting rid of a specific disease source.

Aristotle studied the heart and believed it was the most important organ in the body. Being a hot dry organ, it was surrounded by other organs whose function was to cool it. He was a proponent of Hippocrates' "humor" theories and believed that the body fluids or humor were composed of varying amounts of blood (warm and moist); phlegm (cold and moist); yellow bile (warm and dry); and black bile (cold and dry). Disequilibrium in their balance was thought to cause disease.

2.2 Fear of water

Such theories survived for well over a thousand years. In the 16th century, people avoided washing themselves or their clothes because the human body was considered to be permeable. As late as 1620, Robert Burton would explain in the *Anatomy of Melancholy* that "humor is a liquid part of the body without which no living creature can survive". And these theories remained part of the medical span until well into the eighteenth century.

At times, bathing was even considered dangerous to health, because it was feared that in the process flush vial substances out of the body and diseases into it. The fact that pathogens such as bacteria or germs can be transmitted through feces and other types of dirt was not yet known (Cox, 2011, 39-42).



Image 2.1 Water in ancient history acquired spiritual properties, generally as a medium between life and death, and represented the unknown. Images provided by: (Unsplash 2015)

2.3 The miasma theory

To better explain contextual facts Hamblin provides us with an historical scenario:

By 1801, London's population had surpassed one million people. It reached more than two million by 1850. Paris and New York would soon follow, as people poured into the cities. They did so faster than the infrastructure could be built. Sudden crowding made environments visibly dirty: the unpaved streets would be dusty in summer and muddy the rest of the year, with horse manure everywhere underfoot and coal fires polluting the air. Alleys became cesspools of human feces, and water supplies became choked with waste. (J. Hamblin, 2022, 22)

These conditions led to outbreaks of transmitted diseases that would change the world, and create the field of public health.

Moreover, as typhoid epidemics ravaged Europe's industrial slums in the 1840s, German physician Rudolf Virchow was able to establish a link between poor living conditions and disease. Because of his work, later on established as the miasma theory, the assumption that diseases were transmitted by bad smells and fetid air, led to the fact that living rooms were frequently ventilated in order to keep them clean. The malodorous exhalations of plants, animals, and humans were called miasma. They were thought to "infect" the air and cause various diseases, including the plague and malaria. Bad smells and stench were sometimes even perceived as a deadly danger.

The best possible air quality was supposed to promote health and prevent epidemics. Ventilation systems and room perfumes gained importance, and airing the room was an important part of cleaning habits. According to the miasma theory, however, the cleaning of surfaces, floors, or objects was not necessary to prevent diseases.

The idea that diseases are transmitted via smells was a huge developmental step toward modern ideas of hygiene. For the first time in history, society established a preliminary division to separate the space categorized by their smelling activities.

In relation with the cultural shift Stummerer and Hablesreiter provides an important observation:

Whereas animals and humans had often lived together in one and the same room, from the middle of the 19th century they were spatially separated from one another. This was the first time that a division into "dirty" and "clean" was created in a way that is essentially still valid today (2020).

2.4 The Germ theory and hygiene revolution

In 1854 the theory of bad air was called into question when physician John Snow traced a London outbreak of cholera to a well. His process of deduction involved detailed mapping and interviewing sick people in search of common habits or exposures. This method would prove so important that it gave birth to the modern field of epidemiology. Even still, he didn't understand how water could be causing disease and his work was not taken seriously. Until two decades after his death, in 1883, German physician Robert Koch saw the cholera-causing microbes under a microscope. Combined with the epidemiology from the London well and subsequent observations, Koch was the first to use the anthrax pathogen to show how a particular bacterium causes disease, solidifying the case that contaminated water was indeed to blame.

"The new medical theories on the transmission of diseases changed cleaning habits permanently" (Cox, 2011, 39-40). The discovery that diseases are caused by invisible organisms such as bacteria brought a fundamentally new attitude towards the dirt.

At the same time when rapid urbanization and population growth increased the risks of infectious diseases, this new "germ theory" slowly began to take root in the public's imagination.

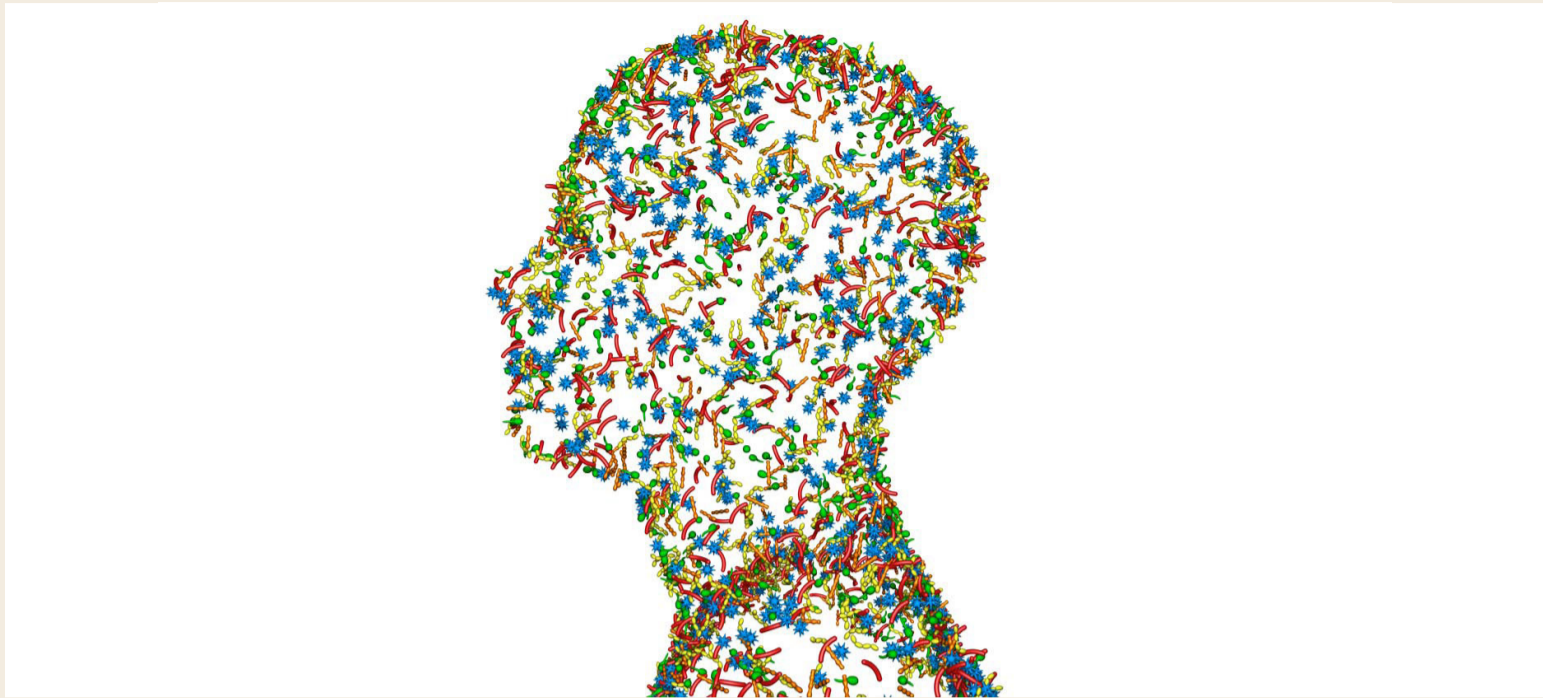


Image 2.4 Note: The skin microbiome is an important part of the skin's barrier and its health. Also known as the microbiota. Source by The Skin Microbiome, (2020)

Around the turn of the century, a time period frequently referred to as the “hygiene revolution,” combating and preventing them would become a crucial component of urban planning. In order to improve fundamental sanitation and hygiene in Europe and the United States, public health emerged as a newly important field. Priorities included installing sewage systems, getting people to wash their hands after defecating, and providing pathogen-free drinking water. Before these modifications, periodic eradication of entire towns or neighborhoods had been accepted as a feature of life. It was revolutionary to realize that this might be avoided. Since ideals of cleanliness aligned with personal hygiene concepts attract the attention of the public imagination as well, the pursuit of a pure state not only becomes a manner of morality, but also becomes embedded with ideals of social progression and status.

2.5 The Biodiversity hypothesis

Recent studies of the microbial world have led to an emerging scientific movement that proposed a change of assumptions concerning today's hygiene habits. Biodiversity on earth is threatened and drastically decreased due to anthropogenic actions. The utilization of natural resources has reached a point of payback in the forms of climate change, diseased crops, and disturbed water cycles. Obviously, these changes influence the wellbeing of mankind. Besides these measurable problems, an invisible world, which covers all surfaces on earth,

is altering.

The human body is a lively ecosystem hosting millions of microbial organisms, which together form the microbiota. These bacterial, viral, fungal, and other microscopic residents are faced with our immune system, challenging their survival. However the relationship between the host and the residents is often not hostile, but in most cases reciprocal (Lethimaki, 2017). Actually, the human immune system has partly shared the responsibility of immune-regulation with commensals. This evolved dependency between human and microbial residents highlights that several health problems may arise if this ancient collaboration is disturbed. Indeed, numerous inflammatory diseases coincide with disturbed host microbiota. These diseases, such as allergies, asthma, inflammatory bowel disease, and cancers, have increased rapidly since recent modernization of human habitats and lifestyle.

The biodiversity hypothesis suggests that change in the invisible world can seriously increase morbidity in human populations. This hypothesis states that the destruction of natural environments has altered our contact with the microbial world, which can disturb our immune function, potentially leading to the development of inflammatory diseases.

The biodiversity hypothesis somewhat relates to its famous predecessor, the hygiene hypothesis, and to newer and more focused the 'Old Friends' mechanism. Recently, scientists have proposed that the hygiene hypothesis should be rejected as it gives a misleading message for the public (Bloomfield, 2016). That is, washing hands and accepting vaccinations are still recommended actions. The 'Old Friends' mechanism emphasizes the importance of varied parasites and microbes, which have co-exist with humans for millions of years, for the immune functions. The change in lifestyle has reduced our contact with these parasites and environmental microbiota (Rook, 2013).

2.6 Targeted Hygiene

One suggested way to preserve positive sides in urban living is 'targeted hygiene' meaning that exposure to infectious pathogens should be limited while maximizing the contact with beneficial microbes (Bloomfield et al. 2016).

Targeted hygiene means focusing on practices that most affect the spread of disease. For example, advocating regular hand washing, and also recommends washing hand towels daily, but acknowledges that bathing and showering may not be strictly necessary. Sally Bloomfield, professor at the London School of Hygiene and tropical diseases states,

We are just beginning to figure out what we should expose ourselves to and what we shouldn't, what we should clean off and what we should welcome. The challenge is one of achieving a healthy balance, not of simply doing more or less (Bloomfield et al. 2016).



Image 2.6 Famous washbasin in the hall of villa Savoye stands as a symbol of hygiene relevance for the time period. Source: (Featured Stories, 2022)

	Miasma theory	Germ theory	Hygiene hypothesis	Targeted hygiene
Scientific principle	-Suggested that diseases are produced due to unhealthy or polluted vapors rising from the ground, or from decomposed material.	-The air contains living microorganisms. Microbes can be killed by heating them.	- Infections in early childhood protect against allergic diseases. The researchers found their hypothesis disproved. - Microbials absence is related to infectious diseases.	- Old friend mechanism - Focusing hygiene practices at the times (moments) and in the places that matter to break the chain of infection and reduce the risk of exposure to harmful microbes.
Cultural believe	Promoted natural light, air ventilation and separated animals from humans.	- Microbes in the air cause decay. - Microbes are not evenly distributed in the air.	- Eliminate 99% of bacterias and germs. - Misinterpreted	- Regular hand washing - Washing hand towels daily
Bathing	- Optional	- Promoted as mandatory	- Promoted as mandatory	- Optional
Disease treatment	- “Bad air” must be responsible for the spread of disease. - Avoid human contact, isolation	- Certain diseases are caused by the invasion of the body by microorganisms, organisms too small to be seen except through a microscope.	- Promote used of antibiotics - Avoid human contact, isolation	- Promote use of natural antibiotics, and early exposure of microbiomes to infants. - Encourage a balance between exposure and prevention.

Figure 2.6 Systematic analysis of hygiene principles since post-industrial times, Source by Author

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Chapter 3

The culture of Cleanliness



Figure 3 Marketing campaigns from the soap industry in the 50's emerges as a combination of hygiene, beauty and cleanliness standards, Digital collage made by author, Original images provided by; (Unilever, 1960, Palmolive 1949, Sunlight soap, 1840, Ivory advertisement campaign 1950).

For most of human history, cleaning oneself was more about spirituality and ritual than about any modern notion of health or beauty. In the fifteenth century, the Aztecs cut enormous pools into the sides of mountains for rites of purification". Even slaves whom the Aztecs were preparing for sacrifice were purified with holy water. Ancient Egyptians would dress as gods and ritualistically wash their dead to facilitate the transition to the afterlife (Hamblin, 2020,13)

3.1 Cultural change precedes market demands

As we can perceive in the previous chapter the concept of cleanliness is not absolute, cleanliness is made by culture, and culture is made by people and therefore is in constant change. The way we achieve cleanliness today is defined by individuals and their specific cultural assets. The transition from religious cleansing rituals to the necessity of killing bacteria is one proof of the constant transformation of clean definitions and their activities.

One example of these transitions is happening in the way Generation Z and Millennials consume self-care products related to skin, today massive markets bar soaps sales are on decline while emergent brands and skincare companies are collaborating with venture capital funding to create alternative care products, who at the same time, are selling and promoted by reels of social media.

The decentralization of information due to technological advances has disrupted the monopoly of attention that big enterprises easily managed by television and radio promotions over centuries ago. This has opened a new opportunity for start-ups, lifestyle gurus, and influencers to guide consumers to their products. But not only are the promotion channels changing, A research from Amberg on personal care products, “there’s a turnover and consumption of natural and organic cosmetics”. (n.d.)

Curiously this consumer behavioral change has its roots in soap history, the culture of cleanliness was not the creation of capitalism in the first place. People did not begin to wash because soap manufacturers conducted a high-pressure advertising campaign. It stands to reason that capitalism could not justify a large investment in soap manufacturing until demand developed. A change of values that made bathing and soap desirable had to precede the organization of a big soap business.



Figure 3.1 Making Old-fashioned soaps, Source; Offthegridnews, (n.d.)

The cultural change preceded the industrial exploitation of cleanliness. Cleanliness started to get strength when religion, gentility and health merged in the writings on cleanliness.

A popular medical book in 1802 opened the chapter on cleanliness with the observation that:

Cleanliness is not only a moral virtue, but has an extensive influence on the preservation of health, so amiable in itself, as well as so productive to comfort, and so inseparable from decency. (Bushman & Bushman, 1988)

Taken altogether the values elaborated made cleanliness a measure of society's rank on the scale of civilization. The different nations of the world are as much distinguished by their cleanliness, as by their arts and sciences. The more any country is civilized, the more they consult this part of politeness. (Ewell, 2022b)

It took nearly half a century, however, for this cultural complex conception to gather sufficient strength to alter the behavior among many citizens of America and Europe.

3.2 From Experts to Consumers

Before industrialization, the majority of cleaning products were homemade. "After centuries of cleaning with brooms, rags, water, sand, and a handful of homemade household and cleaning products, the Industrial Revolution transformed the household from a place of production of necessities to a place of consumption" (Stummerer & Hablesreiter, 2020a).



Figure 3.2 Industrialization together with the hygiene revolution promoted a cultural shift in consumption, creating a transition from home made products to industrialize ones. Images provided by: Mobile Stock photos. (n.d.)



Figure 3.2a Plastic bottles and cleaning supplies for washing, Source: Pexels. (July, 2020.)

Cleaning products that were previously created internally by households became supplied externally by businesses over time. Manufacturers of different kinds of soaps started to appear, using more machinery and importing raw materials from throughout the world (for example tropical palm oil). Some of these manufacturers were so prosperous that they gave rise to modern-day multinational firms like Procter & Gamble, Unilever, or Palmolive.

For example, soap was traditionally made at households, the process began after slaughtering a pig. Take the skin and cut it into strips and put it into a big cast-iron rendering kettle, and put the kettle over the fire for at least 3 hours. The white fat would melt off the skin. The lard was used for cooking, seasoning pans, treating wounds, keeping tools from oxidizing, and lubricating tools. It was also a common practice to store rain water and mix wood ash and lard to make soap, dyes and perfumes from herbs added to the mixture. Carrot or red beet juice coloured the soap, while herbs such as lavender or rosemary provided a pleasant scent. Taken altogether the values elaborated made cleanliness a measure of society's rank on the scale of civilization. "The different nations of the world are as much distinguished by their cleanliness, as by their arts and sciences. The more any country is civilized, the more they consult this part of politeness."(Ewell, 2022b)

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3.3 Cleanliness as a profitable market

Even if today soap is the most important cleansing agent besides water. Soap was not in common use for washing the skin until after the middle of the nineteenth century. In the eighteenth century, soap was used in the household primarily for washing clothes. The broad adoption of soap for the body happened progressively, during the nineteenth-century soap gained precedence, first for cosmetic purposes and then as the necessity to clean the skin. It was not until palm oil, which is controversial today, that soap became a cheap mass product in the course of the industrial revolution.

Body cleanliness required washstands, towels, basins, soap, flesh brushes, tubs, and finally an elaborate plumbing system installed in a room of its own where the cleanliness rituals could be performed. Each one needed its own tools, substances, equipment, and manuals, all in the name of cleanliness and hygienic conditions. As demand grew, industrialists saw their opportunity to exploit a widening common need. They made investments, constructed factories, established business networks, and ran advertising campaigns. In the end, all the forces of industrial capitalism were mobilized to promote cleanliness, not as a moral campaign, but in the interest of firms in the cleaning business.

3.4 Cleanliness as a status symbol

As these concepts of cleanliness and dirtiness became more embedded in health and disease, divisive connotations also spread. To appear clean requires resources, especially money and time. Indicators of personal cleanliness become proxies of status. Such demonstration of cleanliness became even more of a social engineering mechanism for certain professions and social circles.

The working classes become known as the Great Unwashed. In the early 1900s people in Manhattan's middle and upper classes began to wash in their bedrooms, they might bring out a basin once a week to clean the children in the kitchen for example. Ideas about personal hygiene also rocketed to the center of consciousness. A person's cleanliness could be taken as a marker of who was or was not dangerous.

According to Hamblin;

To appear unclean suggested that you could not afford to wash, and that your toilets were the excrement pits in alleys adjacent to your tenement. You may be one of the disease carriers (2021).

On the other hand, appearing groomed with washed clothing, combed hair, and smudge-free skin was a signal of safety. Though grooming was not a guarantee that a person washed their hands or didn't have fleas, the actual disease-causing concerns appear without taking into consideration real standards of hygiene.

Fear and content of the microbial world would play into forces of division from explicit racism to oppressive standards of sexuality. At the same time, they would also be used to selling soaps and later a whole series of personal care products. The new ubiquitous practice of bathing represents a transition not long after running water and bathtubs became common among the working classes a century ago.



Image 3.4 Cleaning helps to differentiate genders and social status. Image provided by Stummerer, S., & Hablesreiter, M. (2020a).

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Chapter 4

New perspective of the human microbiome and the role of targeted hygiene

4.1 Hygiene as the key strategy to control infectious disease

Between the 1950s and 1960s, there was the general assumption that with freely available vaccinations and antibiotics the risk of most infectious diseases would be controlled. In present days, this opinion has been reconsidered. Infectious diseases continue to apply a heavy burden on health. The various infectious diseases issues are more often studied in isolation, but when viewed together, they represent a powerful argument for renewed emphasis on hygiene, “which alongside vaccination strategies remain critical to containing infectious disease” (Bloomfield, 2009; Strachan D, 2000).

Evidence shows that respiratory hygiene involving hands and surfaces can limit spread of respiratory infections, “in particular colds and influenza” (Little, 2015; Winther, 2011; Kirsch, 2012). Bloomfield (2016) explains “Since respiratory and intestinal viral infections are not treatable by antibiotics, prevention through hygiene is the key” and is likely to remain in the following years.

Recent studies suggest that “people with greater susceptibility to infectious disease make up an increasing proportion of the population, up to 20%” (Bloomfield, 2009). The largest proportion comprises the aging segment who have reduced immunity. It also includes the very young and family members with invasive devices such as catheters and people whose immune-competence is impaired as a result of chronic and degenerative illness including AIDS or drug therapies such as cancer chemotherapy.

On the other side emerging pathogens are a significant concern. It is now thought likely that we shall identify many more pathogens, the latest being Zika virus (Jones KE et al., 2008). The WHO (World Health Organization) recognizes that for threats such as new influenza strains, SARS (severe acute respiratory syndrome) and Ebola, “hygiene is a first line of defense during the early stages before mass measures such as vaccination become available.” (Van-Tam, 2005)

Antibiotic resistance is a global priority. According to Bloomfield (2013), “Hygiene addresses this problem by reducing the need for antibiotic prescribing and reducing spread of antibiotic resistant strains in the community and hospitals.”

4.2 The rise of allergies in the 20th century

While infectious disease and hygiene have been key public health issues for centuries (Smith, 2007), allergic diseases have recently been regarded as a significant health burden. The marked increase in prevalence of allergic diseases, such as eczema, allergic rhinitis and food allergy (Asher et al., 2006), has been a prominent trend over the past century in all regions of the world, but mostly in Western countries (Prescott et al., 2013).

Moreover, Bloomfield explains the increased appearance of food allergy over the past decades is a consequence of a progression from allergic airways disease (hay fever, asthma) in parents to a more severe clinical phenotype (food allergy) in their descent (Prescott & Allen, 2011). However, a plausible alternative refers to the interaction between genetic predisposition and environmental influences, in example for food allergy, where immune sensitisation to foods may originate with exposure to food allergens in the environment through the skin, a situation also influence by eczema and reduced skin barrier function (Perkin et al., 2016).

4.3 From Hygiene hypothesis to Old Friends mechanism

Based on the significant amount of research in the last three decades, especially of the Microbial world, has made healthcare specialists reconsider several principles of the original hygiene hypothesis. The Old Friends (OF) mechanism was proposed by Rook and argues that:

The vital microbial exposures are not colds, measles and other childhood infections, but rather microbes already present during primate evolution and in hunter-gatherer times when the huOld Friend microbes could be described as environmental species conformed in his majority by non-harmful commensal bacterias, which inhabit inside the human body and the external environment; they communicate with other humans through the skin, acquired to the gut during infancy and transmit via respiratory canals. In fact during human evolution, before the advent of modern medicine, “the OF also included organisms such as hepatitis A virus that could persist for life in hunter-gatherer groups and that needed to be tolerated” (Rook, 2010).

Their main function is to activate immunoregulatory mechanisms, Nevertheless, many experts support the theory that microbes are so embedded inside our biological ecosystems that they don't need to be replaced, or even that there is any logical way of doing so. One of the principles of the hygiene hypothesis implicated childhood virus infections as the vital exposures derived from evolution, Wolfe (2007) argues “crowd infections were not part of human evolutionary experience because they either killed or induced solid immunity, so could not persist in small hunter-gatherer groups”.

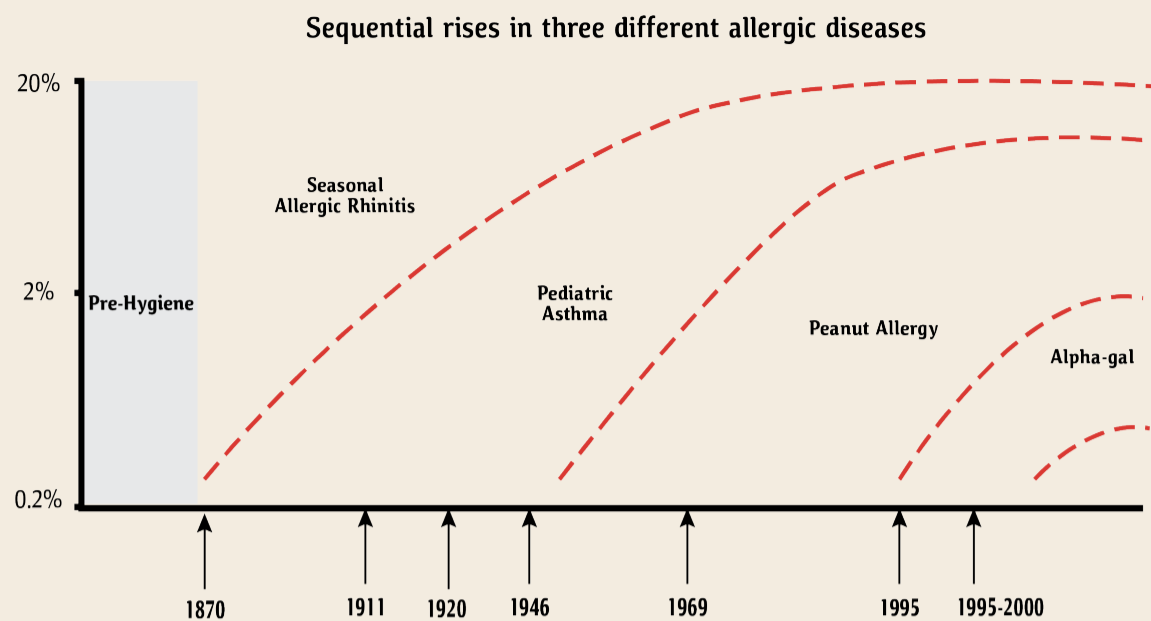


Figure 4.2 Trends in allergic diseases, redraw by autor. Data gathered from (Bloomfield, 2016)

Epidemiological studies from a British Medical Journal now confirm that “childhood infections do not protect against allergic disorders” (Benn et al., 2004; Dunder et al., 2007). Studies show how Old Friends exposures are vital because they interact with the regulatory system in balance and prevent overreaction, which is an underlying cause of allergies. Diversity of microbial exposure is critical. First, immunoregulatory systems start to learn during infancy interacting with harmless bacteria and archaea, this process increases the repertoire of organisms that can be tolerated by the human body. Second, “since all life-forms are building from similar blocks, exposed individuals acquire some memory lymphocytes that recognise novel pathogens or even novel viruses” (Su et al., 2013), which trains immunity systems for adaptation.

The increasing interest to restore the necessary microbial exposures, has led to the necessity to understand the underlying causes of the loss of exposure in the first place. Since allergic diseases are largely conditions of the last 100 years, a logical assumption is that the sanitary revolution is a root cause. Since the 1920’s society has witnessed radical improvements in water, sanitation and hygiene, suddenly huge investments from the government were made to provide cleaner food and water, and progressively clean-up of cities, resulting in “rapid decline in infectious diseases” (Stanwell et al., 2006). However, since microbes occupy the same habitats, it is likely that these changes also inadvertently reduced their exposure.

Furthermore, “transfer of microbiota occurs in the early stage of infancy via the mother’s milk” (Jost et al., 2013). Breast versus bottle feeding has a large influence on gut microbiome, but further studies are needed to confirm any association with allergic disease. “Continuing early-life exposure from the mothers and siblings is also important” (Van Esterik et al., 2010; Hesselmar et al., 2013). Studies show that children from large families are at lower risk of developing allergies, (Ownby et al., 2002; Aichbhaumik et al., 2008) although domestic animals in the home have increased rather than decreased (Pet Population 2013, n.d.). People seem to share their microbiota via dogs (Song et al., 2013), “which greatly increases the microbial diversity at home” (Fujimura et al., 2010; Dunn et al., 2013). There is good evidence that contact with microbial diversity from the natural environment plays an important role for the immune system. Numerous studies now show that exposure to “farm environments during the first 2-3 years of life protects against allergic disorders” (Hagner et al., 2013). Recent studies show that living close to green space and agriculture rather than urban areas increases biodiversity of the skin microbiota and “helps to reduce allergic sensitisation” (Hanski et al., 2012). In fact, New York University had published findings that the remote Yanomami tribe in rural Venezuela had the greatest microbial diversity ever discovered in humans.

Similar biodiversity levels could be found in Amish populations, these facts construct the narrative that the nature withdrawn, post-Industrial Revolution lifestyle had changed our guts and skin. (Hamblin, 2021)

Urbanization has been responsible for the loss of exposure to the natural environment and has created awareness for architects and urban planners to consider strategies to increase biodiversity in major cities. Nowadays in the United Kingdom 82% percent of the population now live in urban areas. with up to 90% of the time spent indoors.

Although research tends to focus on the gut microbiome, much interest is placed in discovering the role of the microbiome of the skin and airways (Bloomfield, 2016). The airways are probably where most of the exposure from outdoor surroundings is acquired. The air contains bacteria, archaea, fungi, spores, pollen, plant biomass and dust. The fact that skin microbiota play a role as part of the old friend mechanism is supported by studies showing that “*acinetobacter* species in skin protects against allergy” (Schuijs et al., 2015).

4.4 Skin microbiota from the perspective of the biodiversity hypothesis

Gut microbiota has been the subject of microbiota research and the fundamentals of targeted hygiene strategies. Even though this research means to reconsider the function of skin microbiota in relation with biodiversity.

Skin microbiota, but not gut microbiota, tends to resemble soil microbiota (Parfrey et al. 2014). Moreover, soil microbiota transferred on human skin can partly persist even a full day (Bateman 2017) suggesting that daily outdoor exposure can provide constant exposure of skin to the environmental microbes. The mixture of transient and permanent members of skin microbiota suggests dynamic interaction of skin microbiota with the environment (Hertzen et al. 2011). Together these findings indicate that environmental microbiota can shape the microbial community on skin.

Therefore, the potential health-benefits intervened by environmental microbes are probably mediated through the skin and respiratory tract. This is supported by recent findings showing that the skin and its microbiota seem to have a systemic role in immune function (Belkaid and Segre 2014). This is supported by research showing that the interplay between skin microbiota and epidermal cells regulates several immunological networks, maintains tissue integrity and keratinocyte homeostasis (Prescott et al. 2017).

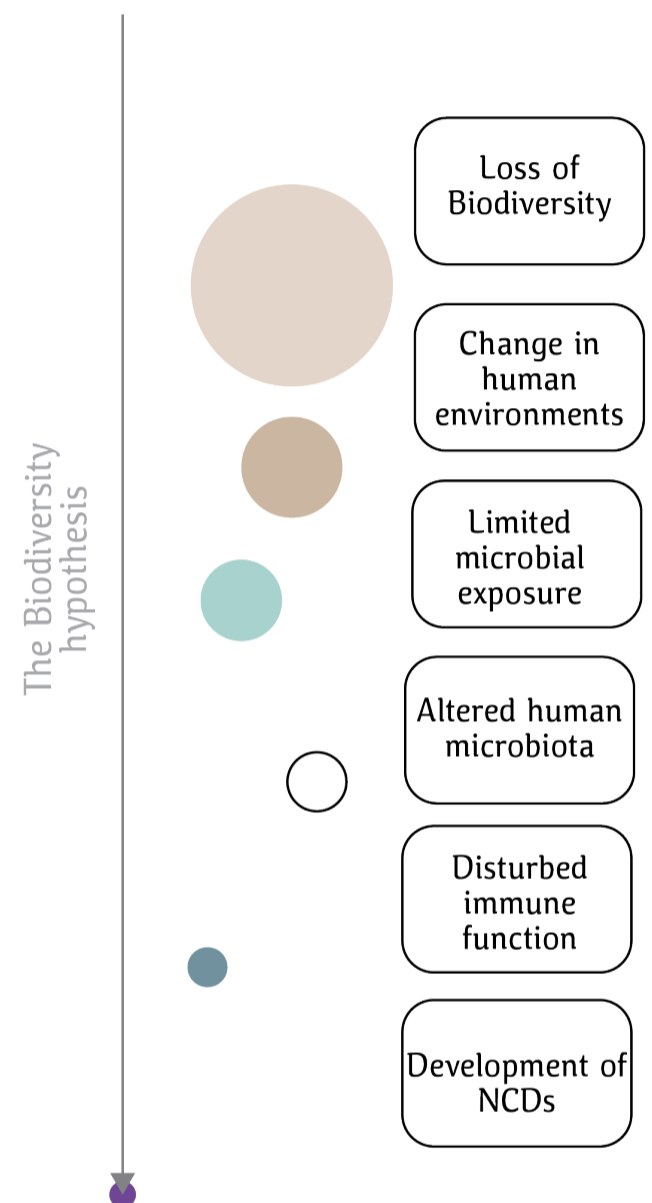


Figure 4.4 Adapted from The biodiversity hypothesis of allergy, by Jenni Lehtimäki, Copyright 2017

skin microbiomes host health..

The skin microbes control the barrier function of the skin, which is central in the development of skin diseases and relates to the systemic responses controlled by immune cells in the skin (Nakatsuji et al. 2017). Together these findings suggest the importance of skin microbial communities for host health.

4.5 Domestic and personal hygiene

The popular notion of ‘being too clean in our own homes’ has almost nothing to do with the reduction of microbial diversity. If this factor contributes, its role is small compared to other factors. A huge amount of data, obtained using high throughput RNA sequencing of samples from US homes, suggests that “modern homes are ‘teeming with microbes’. It also suggests that the bacterial communities found in the home relate to the people and domestic animals living there and the food they eat, together with input from the local outdoor environment” (Dunn, 2013).

Microbiological studies in westernized homes indicate that “routine cleaning habits have no sustained effect on levels of microbes in our homes” (Scott et al., 1984; Rusin et al., 1998; Josephson et al., 1997). The idea that we could create ‘sterile’ homes through excessive cleanliness is implausible; as fast as microbes are removed, they are replaced, via dust and air from the outdoor environment, and commensal microbes shed from the human body and our pets. The ‘higher standards of personal cleanliness’ once promoted by Strachan

(1989) could also contribute to reduced exposure to essential microbes due to the increased of bathing and showering since the 1950s (Stanwell 2006), but even if bathing practice removes large numbers of microbes from the skin, these are rapidly replaced.

Although data from westernized homes suggest that more diverse communities can be found on less-cleaned surfaces (TV screen, door trims, floors) than regularly cleaned surfaces (cutting board, kitchen surface, toilet seat), to date, there is no confirmed evidence of a link between personal or home cleanliness and increased risk of allergic disease. Bloomfield further explains:

Personal cleanliness (e.g. hand washing and showering) is associated with lower levels of endotoxin and muramic acid (bacterial markers) in bedding and floor dust. In comparison, household cleanliness (e.g. cleaning floors and bathrooms, dusting, and changing towels) is associated with less dust but not with lower microbial marker levels. (Bloomfield, 2006)

Microbial content of modern urban homes has altered relative to earlier generations, not because of home and personal cleanliness but because prior to the industrial revolution people lived mostly in rural settlements. This means we now interact with a different and less diverse mix of microbes compared with past generations.

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Microbial content of modern urban homes has altered relative to earlier generations, not because of home and personal cleanliness but because prior to the industrial revolution people lived mostly in rural settlements. This means we now interact with a different and less diverse mix of microbes compared with past generations. In relation with hygiene practice and microbiome Bloomfield clarifies:

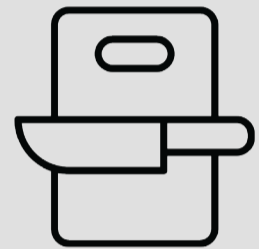
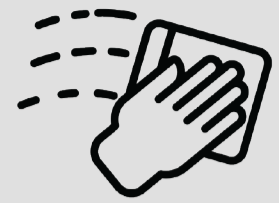
Hygiene is irrelevant to microbiome disruption through altered diet and antibiotics. Also, if contact with the natural environment and microbial components of house dust occurs mostly via the airways, hygiene and cleanliness is unlikely to be responsible for reduced inputs from this key source. (Bloomfield, 2016)

4.6 Targeted hygiene in home and everyday life

Because of the previously mentioned factors, in the last two decades or more, there has been a “resurgence of interest in infection and the importance of hygiene” (Bloomfield, 2019) as well as a realization that the “scrupulous cleanliness” strategy espoused by Florence Nightingale (1859) is no longer applicable. This is good news for hygiene as allergic diseases are not the price we must pay for defense against infection. However, we require a redesigned approach to hygiene based on the most recent scientific data if we are to enhance protection against infection while maintaining exposure to necessary bacteria.

The International Scientific Forum on Home Hygiene (IFH) was established in 1997 with the aim of developing and promoting a more effective approach to hygiene, based on scientific principles and the growing database of evidence about pathogen transmission (Bloomfield, 2012). To achieve this, IFH adopted the principle of targeted hygiene (Scott, 1996), the foundation of targeted hygiene is a four-step risk assessment that includes identifying disease sources and reservoirs, transmission routes, crucial control points, and the right hygiene actions. Targeted hygiene is based on the chain of infection transmission (Figure 1) which shows that pathogenic organisms are continually shed into the environment from sources such as human occupants, pets and raw foods.

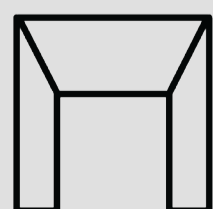
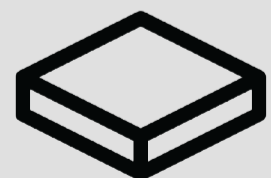
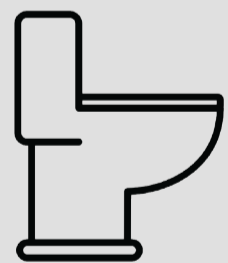
Figure 4.6 The chain of infectious transmissions at home, chart created by author. Adapted from Perspectives in public health, by Sally Bloomfield, (2016 p. 7)



High-risk of transmissions



Middle, Low-risk of transmissions



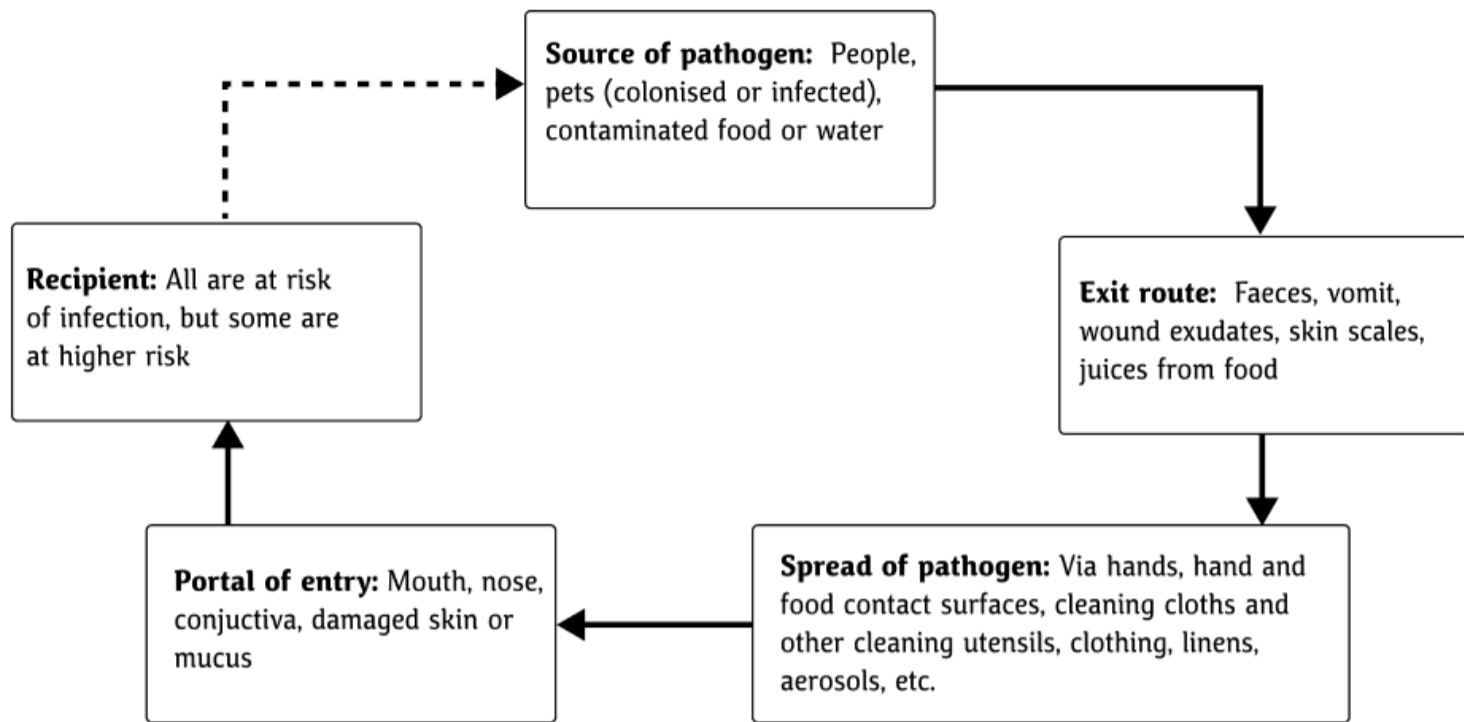


Figure 4.6a The chain of infectious transmissions at home
Adapted from Perspectives in public health, by Sally Bloomfield, (2016 p. 7)

To get from an infected source to another individual, pathogens use well defined routes. Sampling studies record the presence of non-pathogenic bacteria and band viruses of medical interest on environmental surfaces in home and community settings, and laboratory and field studies have evaluated the rates of transfer of viral and bacterial pathogens via hands and common touch surfaces. These demonstrate that the critical control points for transmission of infection are the hands, hand contact surfaces, food contact surfaces, and cleaning utensils and that these present the highest risk of transmission (Figure 4.6a).

Bloomfield (2016) also observes;

Changing hygiene behavior, however, requires changing public perceptions about hygiene”, most particularly that hygiene is different from cleanliness, that is, more than just absence of dirt. “Hygiene is what we do in the places and at the times that matter (hand, food, toilet and respiratory hygiene, healthcare, etc.) to protect against infection.”

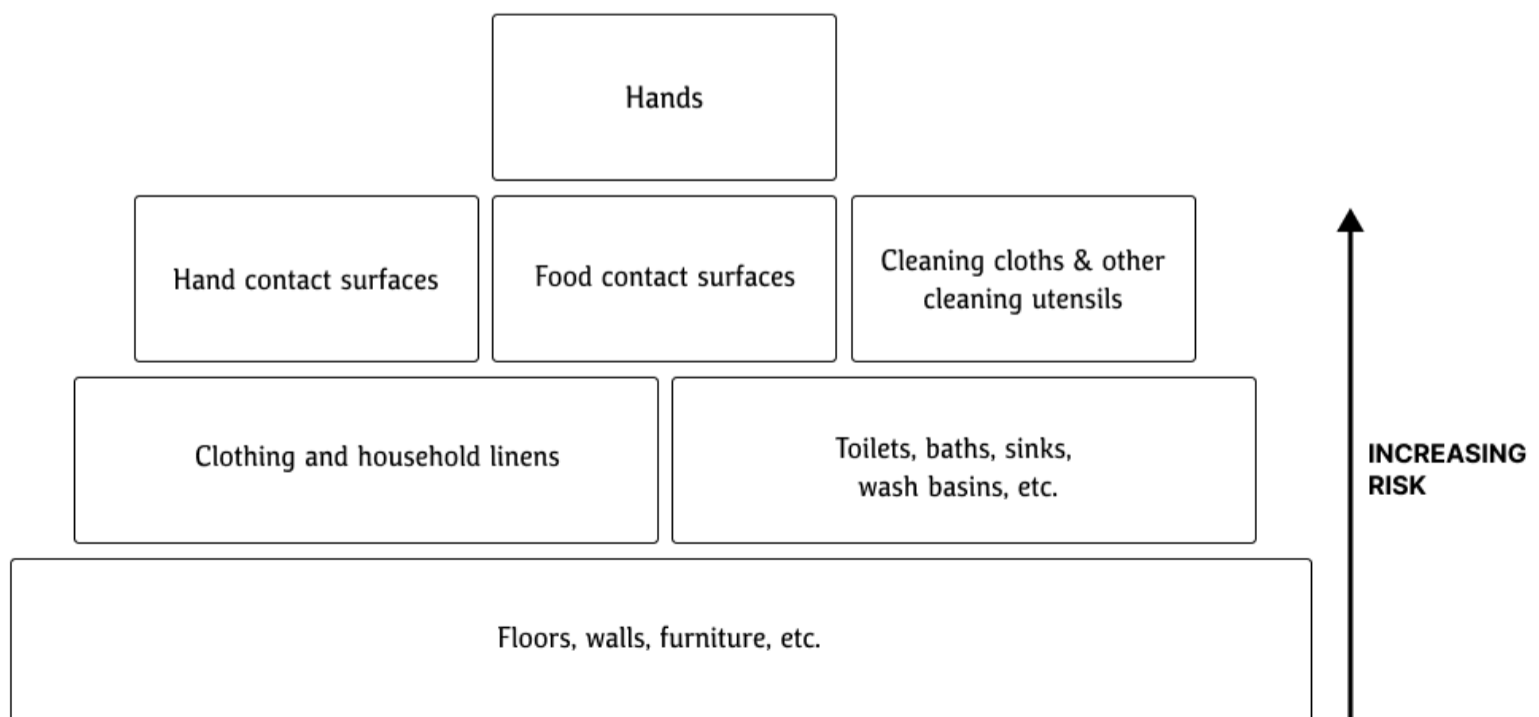


Figure 4.6b Ranking of sites and surfaces based on risk of transmission of infection
Adapted from Perspectives in public health, by Sally Bloomfield, (2016 p. 7)

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Chapter 5

Sustainability transformation for tourism activities

5.1 Sustainability transformation and radical perspectives

Recent sustainability science literature increasingly calls for a “transformation to sustainability” as a movement that calls for “radical and systemic societal shifts.” (Sackles, 2022). Nevertheless, when we talk about transformation, what are we really talking about? When can we say that something has been transformed? Transformation is an amorphous term, a broad word whose definition commonly remains superficial. For the objective of this research we clarify the term and differentiate transformation from transitions:

Transitions are defined as “radical transformations towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies” (Grin et al. 2010). Nonetheless, this definition rather converges two competing or at best complementary approaches.

In contrast with the transition approach, which potently argues for a peaceful manageable shift, transformation implies “radical, systemic shifts in deeply held values and beliefs, pattern of social behavior, and multi-level governance and management regimes”(Westley et al., 2011) Thus, a practical distinction can be made between “transitions” and “transformation” as pathways for social change (Stirling 2015).

Transitions can be seen as processes managed “under orderly control, through incumbent structures according to tightly disciplined knowledge, emphasizing technological innovation, towards some particular known end”. ‘Transformations’, in contrast, involve “more diverse, emergent and unruly political alignments, more about social innovations, challenging incumbent structures, subject to incommensurable knowledge and pursuing contending (even unknown) ends” (ibid., 15).

Transformation is understood as a “profound change which requires a fundamental shift in mindset.” (Massarella et al., 2021). Radical transformation, on the other hand, looks at the root cause of problems and gets to the core of the issue. This usually requires a shift away from the type of thinking that created the problem(s) in the first place. Changing mindsets, although challenging, is possible. The status quo cannot effectively address the environmental challenges we face. As Sackles (2022) puts it, “what is required is a radical transformation of how we envision ourselves and the world in which we live.”

According to Pelling, transformation by definition needs to reconfigure the structures of development through “changing overarching global political economy dominated by neoliberal capitalism with increasing authoritarian tendencies in our day” (Pelling et al. 2011). It includes “radical shifts, directional turns or step changes in normative and technical aspects of culture, development or risk management” (Pelling et al 2015). In this perspective, transformation deals with the deeper and obscured roots of unsustainability, laden in social, cultural, economic and political spheres.

According to (O’Brien and Sygna, 2013),

A transformation to sustainability requires a radical shift, including a shifts in society’s value-normative systems and shifting relations across the personal (i.e. beliefs, values, worldviews), political (i.e. systems and structures), and practical (i.e. behaviors and technical responses) levels simultaneously.

What the “radical” in radical transformations means. The word radical originally means “change at the root”, and requires fundamental and revolutionary change. According to Pugh (2009), “a radical transformation not only digs the roots of a problem but also engages with turning it over by creating new societal meanings and practices”. An example of radical applied in social perspective calls for “addressing social justice and power issues, as well as environmental ones in the transformation process.” (O’Brien and Sygna, 2013)

Radical transformation refers to a transformation of power structures and relations, Temper (2018) claims this process entails “challenging the sources of domination and oppression including capitalism, patriarchy, state-centrism and inequities along lines of race, caste, ethnic, gender, ableism, sexuality and others and is thus multi-dimensional and intersectional.” Which means the balance between ecological concerns with social, economic, cultural and democratic spheres. Finally, it goes from local to global, its a scalable and mindful process in opposition to dominant narratives.

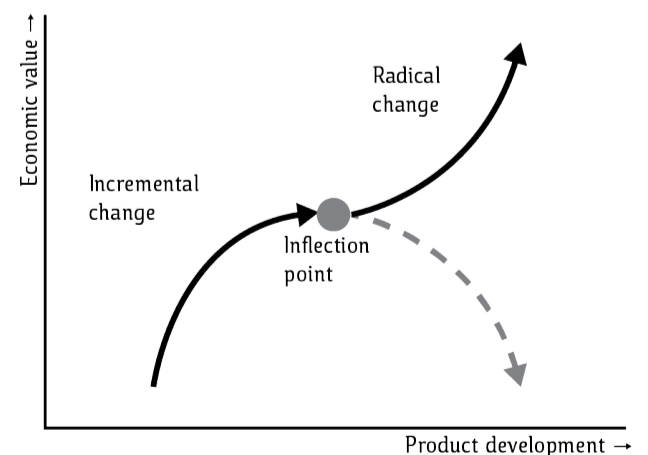
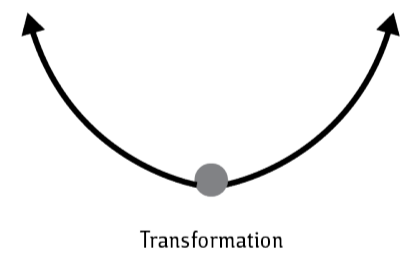
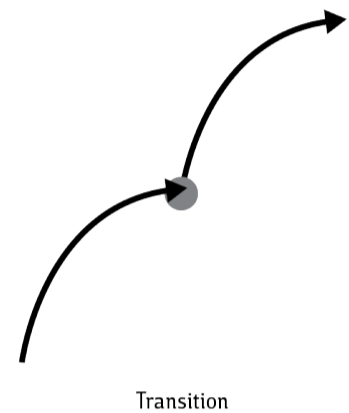


Figure 5.1 Visual dynamics between transition and transformation, Redraw chart, Source (M1.2 PDP + Growth, 2015)

5.1.1 Alternatives as strategies for radical approach

In transformation, an integral element of this resistance is the social movements engaged in practices that provide an alternative to a part or the whole of the currently dominant system, challenging one or more of the capitalist, patriarchal, religious, and other structures of power inequity.

Alternatives can be understood as practices, performances, systems, structures, policies, processes, technologies, and concepts/frameworks, practiced or proposed/propagated by any collective or individual, communities, social enterprises, etc. that usurp, challenge the capitalist mainstream and that reflect a diversity of exchange relations, social networks, forms of collective action and human experiences in different places and regions (Gibson-Graham 2006).

Alternatives can be continuations from the past, re-contextualize and modified for current times, or developing new ones; it is important to mention alternatives works by adopting and operating with values and ideologies that overtly reject current economic and political practices. While the nature of its activities remains apolitical, their attempt to create alternatives to the hegemonic system is also informed by an oppositional consciousness. This may include groups engaged in small-scale energy production: organic farming, open source software, and other forms of radical grassroots experimentation.

Furthermore, to successfully impact on people and networks transformation to sustainability should focus on understanding the strategies used by resistance movements to impact the different layers of hegemonic power, environmental justice activism remains useful as inspiration for radical movements for future interventions.

POWERTYPE	Institutional, legal, economic and political frameworks People, networks Discourse, narratives, values, world views		
AIM	To impact and change in existing frameworks in order to acknowledge human and political rights, cultural difference, etc	To impact and produce a change in peoples interactions in order to create conditions for dialogue	To unmask the apparent institutional neutrality and the historical roots of exclusion. Create social consensus over new meaning.
STRATEGIES	-Create a new modes of production/alternative technologies	-Sensitize decision-makers and business sector -Produce and disseminate new knowledge	-Construction of local views of the future

Figure 5.1.1 Strategies to impact on the personal, structural and cultural domination in environmental justice
Source Temper et al., 2018

5.2 Satisfaction unit and Systems innovation

As we previously mentioned the transition towards sustainability requires radical change in the way we produce, consume and, more in general, in the way we live.

In this case, the prospect of sustainability models converge between the improving of living conditions and at the same time, reducing the environmental footprint. In this framework the link between environmental, socio-ethical and economic dimensions of sustainability can be clearly seen, and are treated equally. According to Carlo Vezzoli, "Given the nature and the dimensions of this change, we have to see transitions towards sustainability (and, in particular, towards sustainable ways of living) as a wide-reaching social learning process in which a system discontinuity is needed." (2022)

Therefore, a system-based approach is important in order to seriously tackle such a transition, suggesting the need for so-called system innovations to take place. In this context, the two most promising models of Sustainable Product-Service Systems (S.PSS) and Distributed Economies (DE) have emerged as locally-based and eventually network structured enterprises/initiatives. These models are particularly promising when they shift the offer focus from selling products and equipment to offering "a unit of satisfaction", defined as "new solutions through which needs and wants are met" (ibid, 6). If properly designed, they result in resilient solutions that could reduce the environmental impact, while extending the access to goods and services even in the low and middle-income contexts.

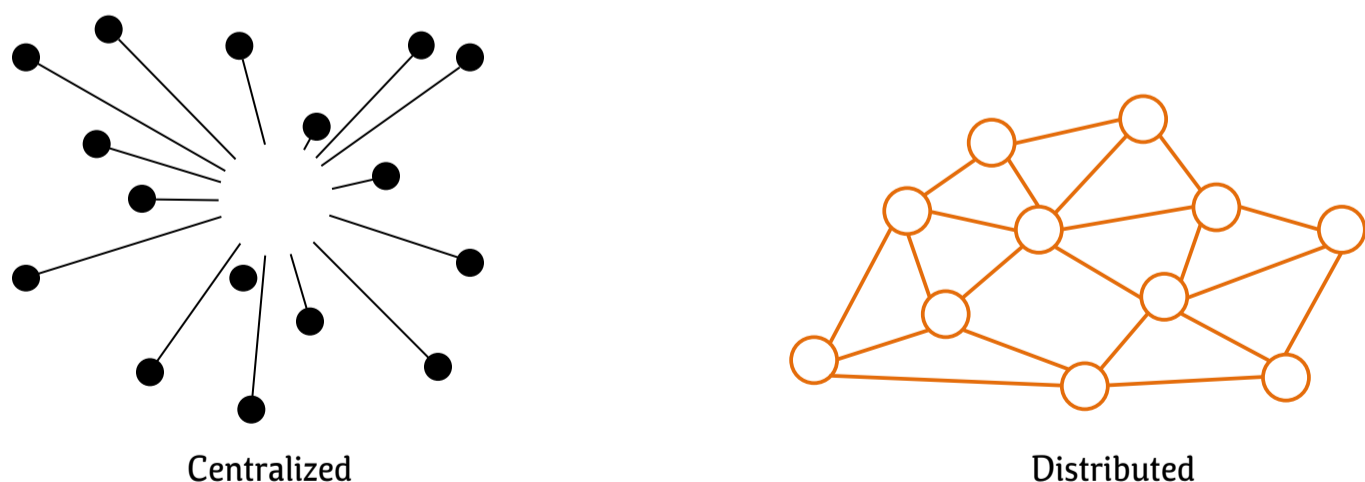


Figure 5.2 Visual dynamics of centralized and distributed economics. images obtained by 'System Design for Sustainability in practice', Source Vezzoli et al., (2022)

5.3 Water and energy consumption in tourism activities

In comparison to other economic sectors, such as agriculture, there are no specific regional or national water use statistics for tourism, and tourism-related water use is still under investigation.

The following sections discuss the range of estimates for direct (accommodation, activities) and indirect water use (fossil fuel use for transports, food, infrastructure) available in the literature.

5.3.1 Accommodation

An international review of tourism and water use suggests water consumption rates in a “range between 84 and 2000 liters per tourist per day, or up to 3423 liters per bedroom per day (Gössling et al., 2012b). A considerable share of these volumes can be staff related, with for instance “reporting use values of 250 liters per day per person in staff housing and 30 liters per day for each staff during working hours.” (Lamei et al., 2009).

Overall, there is a tendency for higher-standard accommodation to consume significantly higher water volumes, with Bohdanowicz and Martinac (2007) finding highest water use rates in hotels with spas and large or multiple swimming pools.

Water Intensive facilities typically have landscaped grounds, requiring irrigation. Higher laundry volumes per guest per day are a result of sport and health centers, as well as affected by textile quality and/or weight of laundry items, including very large towels for spa facilities or beach use.

On global average, Gössling suggested that an “international tourist consumes 222 L per day.” (2005), but evidence from the newer studies summarized in Table 1 suggests this estimate should be considered conservative.

The second dominant accommodation category are guest houses, where irrigation results for only 15 percent of the total water use (37 L per tourist per day). The major proportion of water in guesthouses was spent for direct uses including taking showers, flushing the toilet, and the use of tap water (55 per cent, 136 L per tourist per day), with a corresponding consumption of 20 per cent or 186 L per tourist per day in hotels. The higher demand of hotel guests was found to be a result of additional showers taken after swimming, and more luxurious bathroom facilities. Swimming pools represented another important factor of water use, accounting for about 15 percent of the water demand of hotels (140 L per tourist per day) (Gössling et al., 2012a).

Indirectly, swimming pools were added to laundry, for example when additional towels were handed out to guests. Guesthouses in the study did not have swimming pools, which can explain lower water use rates. According to (Gössling, 2001), “Laundry accounts for about 10 per cent (25 L per tourist per day) of the water used in guesthouses and 5 per cent (47 L per tourist per day) in hotels.”

Water use category direct	Liters per tourist per day
Tourist (direct water use)	300
At home use	160
Accommodation	84-200
Activities	10-30
Water use category - indirect	Liters per tourist per day
Infrastructure	n.a.
Fossil fuels	750 (per 100km by air/car)
Biofuels	2500 (per 1 L)
Food	2000 - 5000
Total per tourist per day	Estimated range: 2000-7500
Total per Bedroom per day	3423
Accommodation	
Water direct use (shower, flushing toilet and use of tap water)	
Guesthouse	136
Hotel room	186
Laundry guest house	25
Laundry hotels	47
Cleaning guest house	12
Cleaning hotels	47
Toilet flush	1 - 12
Shower Heads (per minute)	7 - 13
Basin	12

Figure 5.3a Water use categories and estimated use per tourist per day. Source S. Gössling et al. 2012

Energy use category	kWh per room per year
Production of domestic hot water (average hotel)	1500 - 2300
Hot water: boiler system	3800 - 4400
Room heating system	2500 - 3500
Energy	5000 - 11000k
Other appliances (domestic environment)	
Conventional water heater	4200
Hairdryer (30 min use)	290

Figure 5.3b Energy consumption water heating system. Source S. Gössling et al. 2012

Furthermore, it has been proven that tourists generally use more water for shower and bath than they would in the domestic context. Here estimated at an average of 300 L per day (direct water use), than at home (160 L per day). Tourism activities increases global water use; an argument also supported by Eurostat (2009), “water consumption by hotels is far higher than household consumption”, due largely to the collective consumption of water in hotels (watering of gardens, daily cleaning of rooms, filling of swimming pools, kitchen and above all, doing the laundry).

The previously presented data (fig 5.3a-b) highlight the current practice of overconsumption of natural sources generated by tourism-related activities compared with domestic environment use. Tourism phenomenon is fundamental for economic development in the majority of countries where the research took place; At the same time, tourism is also often related to environmental damage and social inequality. Even through the efforts for hospitality service providers to optimize resources, for the increasing demand of tourism activities in the upcoming years, it is clear that a radical and transformative approach is needed to balance the whole aspects of sustainability principles in society. The scope of the next section is to present several examples that challenge assumptions compared to everyday cleanliness practice methods.

The criteria selection of the projects are based on alternative, low-technology based solutions, some of them do not involve direct-water use, with the aim of opening perspectives, to converge different units of satisfaction in terms of cleanliness.

5.4 Case studies

5.4.1 Washing without water technologies

A small package with washcloths represents the actual bathing practice in an increasing number of European and American health care institutions for immobile patients who, “irrespective of the cause or level of immobility, need to be bathed in bed”. (Thoma-Lürken et al., 2015) The package is often called “washing without water”, which according to (Schoonhoven et al., 2015) can be described as “disposable, prepacked products for the full body wash consisting of a nonwoven carrier (washcloth) and a no-rinse cleansing fluid that allows nursing staff to bathe someone without the use of water.”

Bathing has been argued to have an effect on patient well-being (Barsevick et al., 1982) and patient comfort (Downey & Lloyd, 2008). Furthermore, preserving skin integrity and personal hygiene are proposed to be important physiological functions of bathing, which in turn prevent infections and disease. (Cowdell & Steventon, 2013)



Bathing instructions

Use one washcloth for each area of the body then discard. Package for individual use only. **Do not flush cloths in toilet.**

1. Face, Neck, Chest
2. Right Arm
3. Left Arm
4. Perineum
5. Right Leg
6. Left Leg
7. Back
8. Buttocks

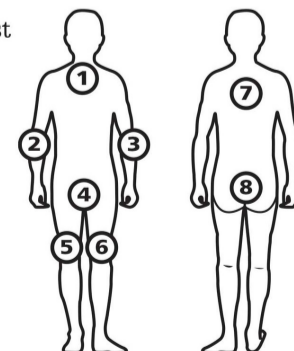


Figure 5.4.1a Sage Comfort bath washcloths, images provided by Stryker



Figure 5.4.1b Gel cleansing advertising, Source: (Mustela, n.d.)

Washing without water is claimed to offer several advantages compared to the traditional bed bath with water and soap. First of all, because water, soap, towels and wash basins are not needed, the negative effects on skin integrity and hygiene associated with these materials are eliminated (Collins, 2003). It is claimed that washing without water even has a positive influence on skin condition (Knibbe, 2006).

Critical analysis

The relevance of this case relies on the effectiveness of non-water based solutions to achieve personal hygiene, it is the most explicit example that water and soap are not critical factors when it comes to pursuing cleanliness. As several studies have shown, patient satisfaction is not being compromised during the use of washing without water technologies and also reveals skin condition improvement due to maintenance of skin integrity. Nevertheless, future research is recommended in order to expand this technology in broad scenarios like in tourism activities and hospitality services as a possible solution to manage water scarcity and water pollution, especially for destinations where natural ecosystems are fragile.

5.4.2 Mini-mister

Project's title: Water conservation and the Mist Experience, (1978)

Designer: Minimum Cost housing Group

Collaboration: School of Architecture, McGill University

Extensive research for alternative sanitations was made during the 70's that inspired several publications related to the creation of autonomous houses. In this context, atomization mechanisms were used to promote a more water-efficient means of personal cleansing. One the creation, The Mini-mister, built of standard components for less than \$2, only required a few liters of water for session.

The main component is a piece of 75mm (3") diameter tubing and closures of ABS or PVC plastics. This forms the reservoir whose capacity will depend on the length of the tube: 50cm contains about 2.3 liters of water. The ends of the pipe are closed with threaded clean-out caps. A bicycle pump valve is attached to one of the caps, while a vinyl hose is attached to the other. At the end of this hose is the hand-operated control valve and handle.

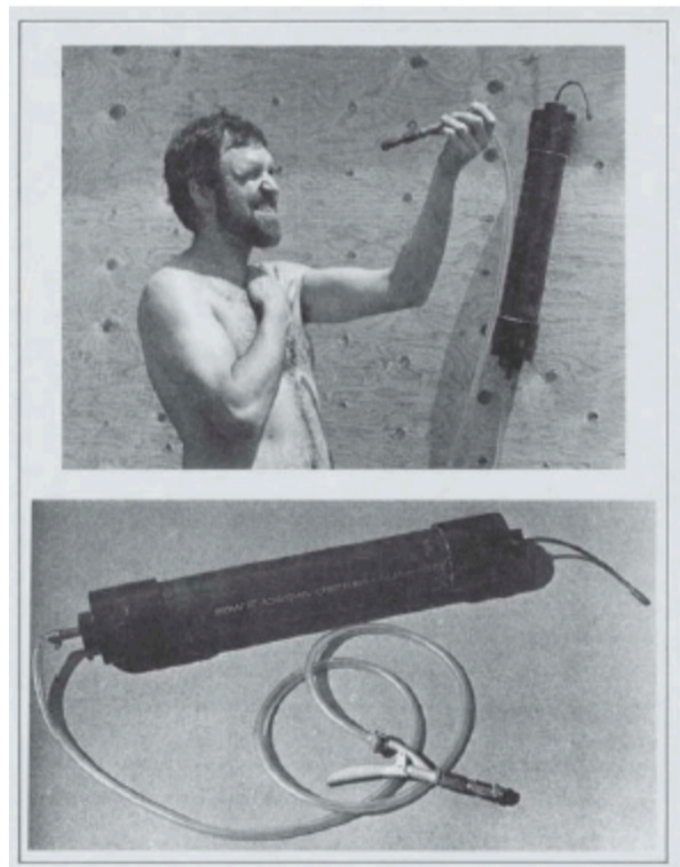
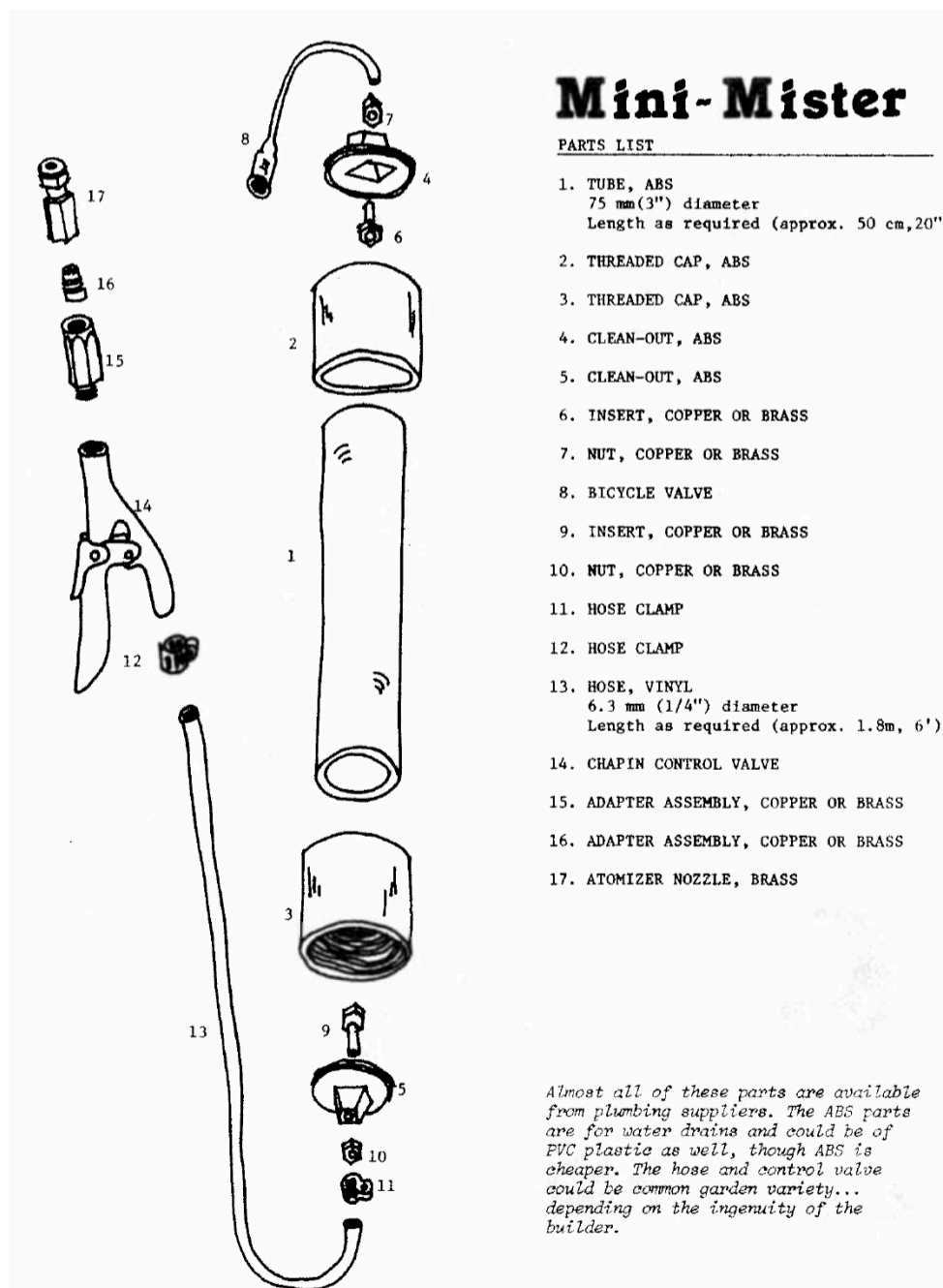
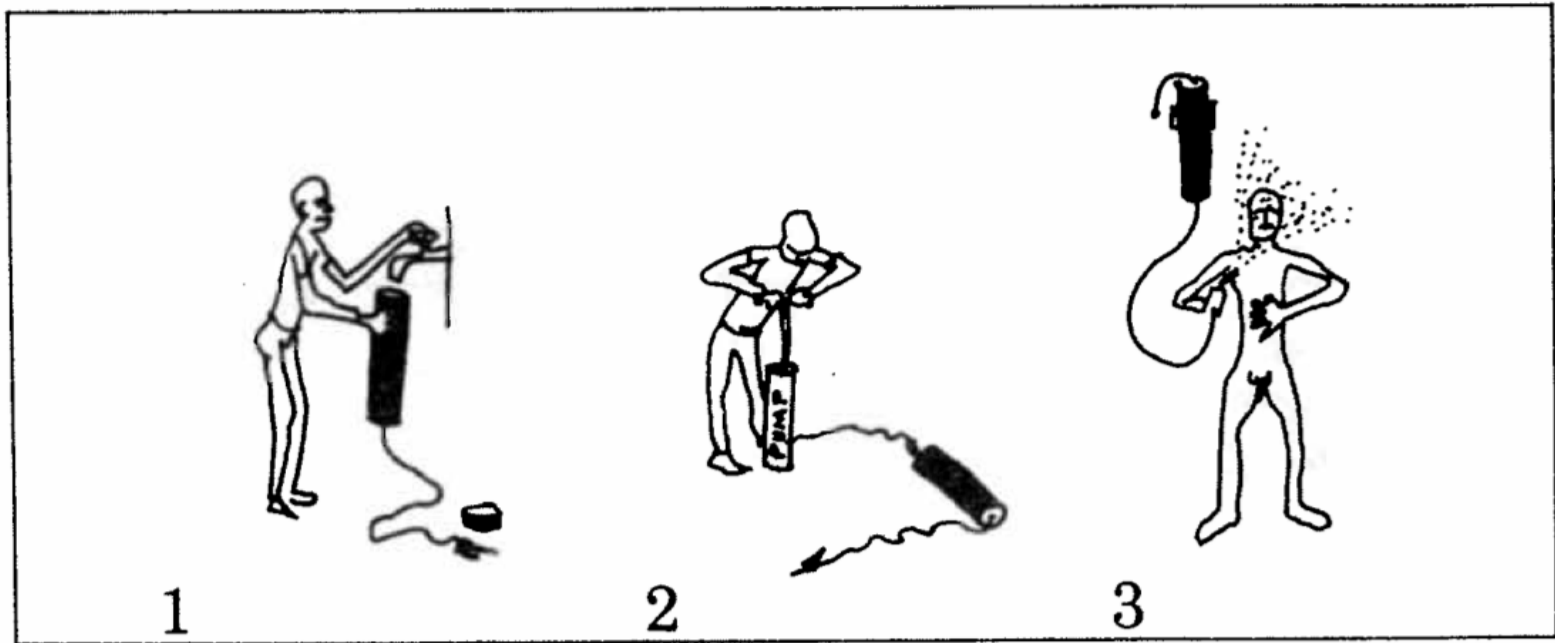


Figure 5.4.1a Testing Mini mister, created by Minimum housing group, 1978. Source: Low-tech magazine, (2020).



- Step One : Unscrew the clean-out at the bicycle valve end of the pipe and fill the reservoir with water. Replace the clean-out snugly.
- Step Two : Pressurize the reservoir; either manually with a foot-pump (less work) or a hand-operated pump, or mechanically from a garage air pump, pressurized cannister or electric pump. The pressure should be 1-2 atmospheres (15-30psi).
- Step Three : With reservoir in vertical position you are now ready to shower. A well constructed Mini-Mister should maintain its pressure for some time.

Figure 5.4.2b Mini mister mechanism instruction created by Minimun housing group, 1978. Source: Low-tech magazine, (2020).

Critical analysis

Atomization technology represents the initial efforts for water efficiency solutions, today, high-efficient showerheads are installed in the majority of hotels worldwide with the aim of optimizing water sources. Even though, what is also interesting about the mini-mister is the fact that it involves a manual action, the act of self-completion commonly lacking on traditional showers. The mini mister and its hand-operated pump changes users positions from consumers to producers, in terms of the energy self-produced to create the mist shower.

5.4.3 'Kunkun' body odor detector

Project title: KunKun body, (2019)

Designer: Konica Minolta

Collaboration: Business Innovation Center Japan

Awards: Outline of Good Design Award winners 2018

Kunkun body is a portable smell checker solution. It measures body odor, commonly difficult to recognize by individuals themselves, and it is also difficult to ask others. It is suitable for people concerned about their body odors, also engaged in the hospitality industry, since it enables them to check their own smells objectively and to take countermeasures. It consists of the checker device and a smartphone app, and measures and displays strengths of three major body odors i.e. sweaty smell, middle-aged-oily odor, and old-aged-smell. As it is handy, it is possible to check smells in the same way as to check grooming and appearance before meeting someone. The device keeps results, and also captures the trend of the same smell. With a Kunkun body, it is possible to start a new habit which makes users feel comfortable and confident.



Figure 5.4.3a Kunkun reference image provided by Konica Minolta, (2018)

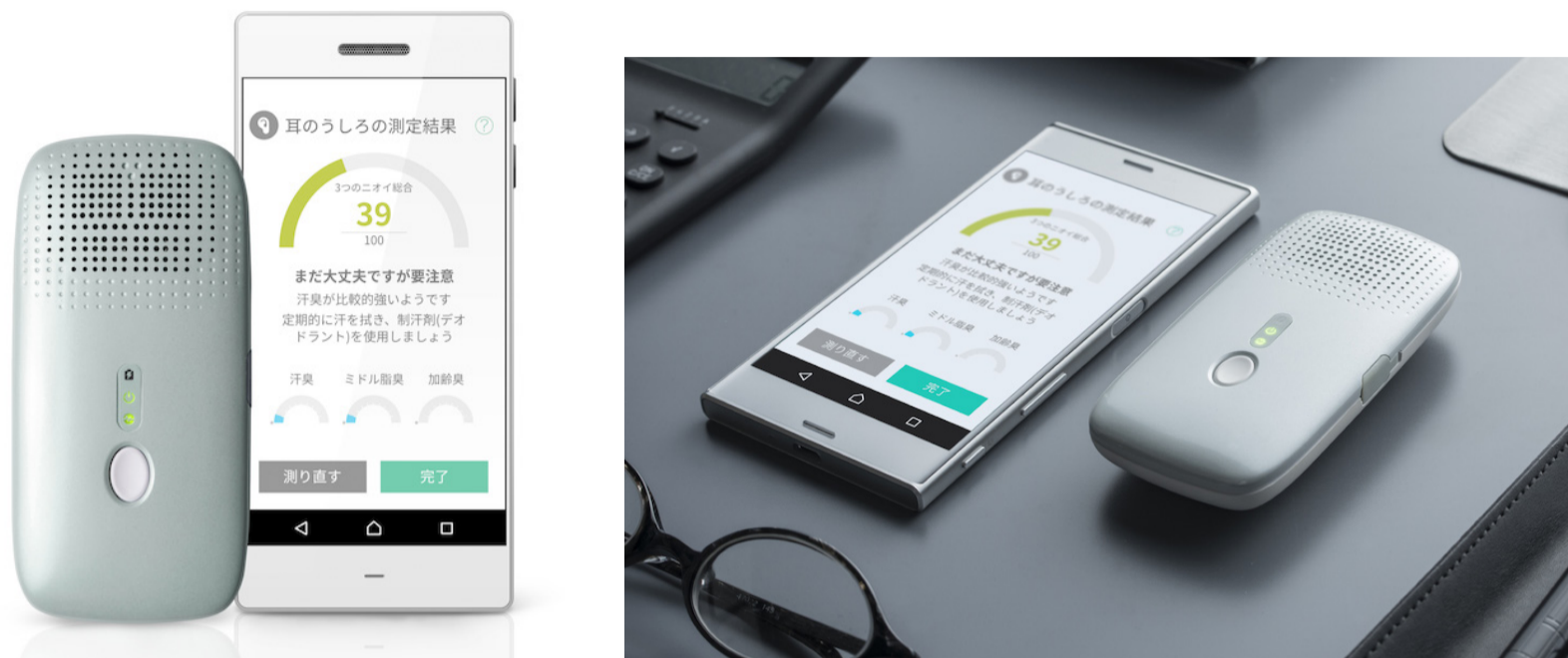


Figure 5.4.3b Kunkun reference image provided by Konica Minolta, (2018)

Critical analysis

As body odors represent a common cause for users to engage in cleanliness activities, the Kunkun device allows a novel interaction and the capacity to measure and ‘control’ human body odors in a way that wasn’t experienced before.

The Kunkun project belongs to an increasing trend referred to as ‘deep body knowledge’ which is defined as technologies that allow users to track human biological processes. Nevertheless, when it comes to cleanliness habits, these technologies can be promising to promote ‘targeted hygiene’ principles, by reassuring moral and purity order in individuals by the management of data, furthermore, by reducing the use of common cleansing agents like water and soaps when it is strictly ‘necessary’.

5.4.4 'ES-100A' Compact body smell checker

Project title: ES-100, (2018)

Designer: TANITA

The Japanese gadget Tanita ES-100 is a portable odor scanner capable of showing results in 10 seconds. The company simply adapted its technology used to produce breathalyzers to control the release of odor-producing particles in place of alcohol. It works by flipping out the sensor and pointing it to the part of the body that is concerned with exuding too much musk. It measures particulate matter and will display how intense the odor is on a 0-10 scale. Level 5 and above means stronger body odors levels. The stench scale goes both ways: sensors can also detect if too much deodorant or cologne is applied to result in a negative reading.



Figure 5.4.4a Device interaction, Images provided by Tanita, (2018)



Figure 5.4.4b Device interaction, Images provided by Tanita, (2018)

Critical analysis

Despite the similarity with the previous case, the aim of this example is to reinforce the concept of digital judgment and their future implications when these technologies became mainstream, one of the possibilities is to relieve pressure to personal hygiene, this gadget creates an domain space between what is clean and what's not, challenging our water-wired consumption habits by placing shower and baths into specific contexts. Obviously, it is one of the possibilities..

5.4.5 'Balance of being' by Layer design ft. Panasonic

Project title: 'Balance of being', (2019)

Designer: LAYER studio

Collaboration: Panasonic

LAYER has explored the intersection between home, wellbeing and technology with the launch of 'Balance of being': a collection of new product concepts bringing to life a new philosophy. The collection of six near-future design concepts sensitively combine emerging technology with sophisticated experience design and explore how we can have more meaningful engagements with products and how we take care of ourselves.

Wave is a smart massaging device for the head that can be used to relieve stress in various situations, at home or work. Mapping and evaluating the level of tension, WAVE determines the length of time, method and intensity of the experience.



Figure 5.4.5a Images provided by Layer, (2019)



Figure 5.4.5b Images provided by Layer, (2019)



Critical analysis

The transition from products to artifacts thanks, for example, to emerging IoT technologies creates a feedback (dialogue) between humans and machines, this phenomenon is allowing designers to change their perspectives by including wellness and care as part of the concept; In the case of WAVE to move from obvious functional benefits (massaging) to rather focus on user's satisfaction (customize experience to relieve stress), and this mindset allow designers to create a line of artifacts that express the same values.

5.4.6 Ruka, refillable edge styler

Project title: Ruka EdgeSlick, (2022)

Designer: BLOND

Collaboration: Ruka

Historically, hair has always been a special part of Black women's identity; it represents a source of pride, power, and creativity. Baby hairs are one of many outlets for the expression of individuality. Currently, the styling of baby hairs, otherwise known as 'edge styling', is achieved using a stiff boar brush, or more typically, a disposable toothbrush.

Ruka, a business revolutionizing the hair industry for black women, approached blond in 2021 to design a new tool that answers the needs of the user and, importantly, celebrates the creativity involved. We first conducted a deep dive into the process to understand existing pain points and identify areas for innovation, which highlighted several opportunities. Functionally, the design includes an ergonomic paddle-shaped handle that allows the user to scoop styling gel onto their wrist with one end. The other end includes both a comb and brush that clip together through an aperture within the handle. When the relatively small brush and comb reach the end of their lives they can be unclipped and disposed of, but crucially, the handle is kept. The EdgeSlick is the first refillable edge styler on the market, reducing plastic consumption by 86% compared to its competitors.



Figure 5.4.6a Images provided by (Ruka ft Blond, 2022)



Figure 5.4.6b Images provided by (Ruka ft Blond, 2022)

The reusable and refillable design allowed us to elevate the aesthetics to create a desirable object that the user would want to retain and be happy to have on display. To highlight this, we designed a stand to hold the product proudly. This stand can also be unscrewed and offers a place to store replacement heads



Critical analysis

Ruka is one example of how design works with beauty and culture to materialize identity of individuals and represent different ethnics. In this case the solution is a sustainability transition rather than transformational, including circular strategies that were applied by the selection of recyclable plastics as the main material together with the easy-to-replace brushes to extend the life of the product.

5.5 Solution Landscape

The solution landscape is made to provide an entire perspective of alternatives, the case studies were carefully chosen to represent actual practices that comprehend the results of 'pursuing cleanliness'. The projects were allocated by two assets, first by 'less and absolute pleasant experience' to determine different levels of satisfaction, and secondly by the 'demand of natural sources' to compare environmental costs. In this case showers and baths were rated based on their high levels of water and energy consumption (see point 5.3.1), compared with the rest of the projects.

The common point between all case studies is to demonstrate that cleanliness is not limited to removing physical impurities from the body, but it also moves on a mental dimension, the objective is to restore mental orders and ideals of purity. Water in this realm is a medium to connect with notions of purity, but is not fundamental. Cleanliness as a social construct is made by symbols, gestures, small and repetitive social actions where design has a big space of potential intervention. The scope of the next chapter is to construct the frame in which 're-thinking cleanliness' as a product-service level will be developed, by testing initial hypotheses, introducing the vision of targeted-clean principle, and constructing the roots for the transformation model in hospitality service.

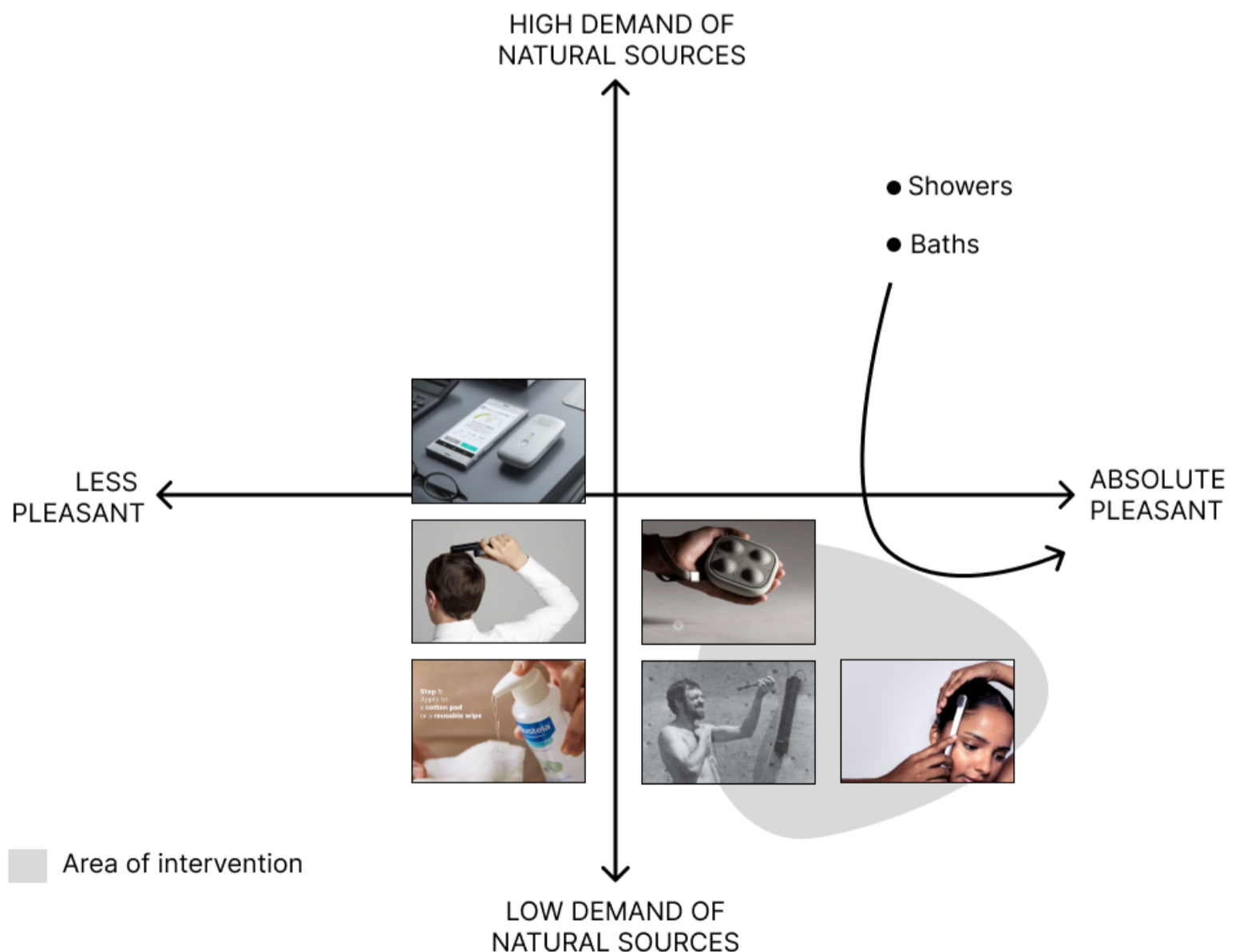


Figure 5.5 Solution Landscape diagram, Source by Author

5.6 Define several units of Satisfaction





<p>satisfaction unit</p>	<p>Restore notions of purity Alleviate moral condemnation Cultural differentiator</p>		
<p>Primary action</p>	<p>Reinforce moral order Driven by Emotions</p>	<p>Reset the structure of things, avoid disease Order/Cognitive</p>	<p>Reinforce identity, Sense of belong. Moral</p>
<p>Secondary action</p>	<p>Restore notions of purity</p>	<p>Reduce physical and moral disgust</p>	<p>Social rituals</p>
<p>Strategies</p>	<p>Mini-mister, reduce water and energy sources by mist, atomization. Non-rinse cleansing fluid</p>	<p>Technology that can measure body odor (E-nose)</p>	<p>DIY soaps and care products Wellness, Self-care, public-baths</p>
<p>Case studies</p>	  <p>Step 1: Apply to a cotton pad or a reusable wipe</p>	 	 

Figure 5.6 Competitive analysis of different units of satisfaction base on case studies, Source by Author

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Chapter 6

Envisioning future scenarios

6.1 Emergent Trends in 2022: Eco-Consumption, Regeneration and Biodiversity

6.1.1 Eco-consumption

According to the Acosta 2021 report, more than half (59 per cent) of shoppers are making it a priority to live a more environmentally conscious lifestyle, with 4 in 10 more concerned about sustainability now than they were before covid pandemics. And shoppers are willing to pay more for sustainable products (Acosta, 2021), including plant-based meat alternatives, beauty and personal care items, and dairy alternatives.

And while these findings illustrate the rise of eco-consumption, on the other hand, consumers also strongly believe that retailers have a responsibility to the environment and communities in which they belong.

Today's consumer is questioning all elements of their life – from how much carbon they use to travel, to whether their money is being invested ethically by the big banks. So, it's unsurprising to learn that shoppers are actively seeking out environmentally friendly brands and closely analyzing the eco-credentials of the products they buy. (The Grocer, 2021)



Figure 6.1.1a Hive has launched an online marketplace that only stocks products with low impact ingredients, environmentally-friendly packaging, a low-carbon footprint and a commitment to social good. Homesite website, Source Springwise, (2022)

According to the Retail Industry Leaders Association, 93 per cent of global consumers expect the brands they use to support local, social and environmental issues.

In the advent of societal change towards a more sustainable future, innovation plays a fundamental role to help educate consumers on sustainability issues and help them shop with confidence.

These trends are reflected in worldwide initiatives like in France, Zei digital platform enables companies to obtain a score measuring their environmental impact to help consumers become fully aware of the role of their lifestyle and purchases.

The app takes into account environmental, social and governance criteria through its scoring systems.

Katrina Lane explains,

The platform offers consumers eco-responsible alternatives in many areas, including food, lifestyle and wellbeing, fashion, energy, transport, and housing. Meanwhile businesses are offered a catalog of more than 800 innovations and alternatives, from green electricity suppliers to waste recycling providers, all to boost their score. (2021).

This is one example of how platforms accelerate the path to sustainability for businesses and consumers.

Eco-consumption seems to align customers and business interest in the common ground of socioethical mindset and is spread in all kinds of industries. Some of them are reflected by slow-fashion movement, simplifying supply chains, carbon accountability and activism (Hudson, 2021).



Figure 6.1.1b The Tulipshare platform allows consumers to have a voice. Springwise. Images provided by Unsplash. (2022).

6.1.2 Regeneration and Biodiversity

Regenerations as a trend refers to the increasing interest in tackling the problem of biowaste residual, when its breakdown also leads to pollution producing high levels of methane, with local water and soil at risk of becoming contaminated. From the other hand, biowaste when harnessed could transform into a valuable source. This fact has led to increasing interest for innovators to create solutions that could help businesses move from a traditional waste management system to approach more circular initiatives.

Hannah Hudson (2021) writer from Springwise illustrates with an example;

In Cote d'Ivoire, a biowaste processor turns leftovers into compost and cooking gas, enabling farmers to save time and money by producing their own supplies. Called KubeKo, the system comes in two versions. One creates compost and the other can produce cooking gas. Daily aeration is powered by either renewable energy or electricity from the grid. Every five kilogrammes of waste results in two hours of cooking gas and 50 liters of liquid compost.

Protecting biodiversity is a key part of the regeneration principle. According to Briggs, a journalist from BBC London explains, "Biodiversity is the variety of all living things on Earth and how they fit together in the web of life, bringing oxygen, water, food and countless other benefits". (2021), Prof Andy Purvis, research leader at the Natural History Museum in London also adds "biodiversity it's the foundation of our society. We've seen recently how disruptive it can be when supply chains break down. Nature is at the base of our supply chains." (2020)

Exploring some of the key trends that will emerge from regeneration and biodiversity, some initiatives came across different materials to tackle for example the high levels of plastic pollution, avoiding plastic packages to break down in landfills. To name an example, Microsoft's wireless Ocean Plastic Mouse contains 20 percent recycled plastic and comes in 100 percent recycled packaging (Khoury, 2021).



Figure 6.1.2a Danish textile company transforms recycled plastic into a variety of design fabrics, including velvet and wool. Images provided by Texstyle. (2021).



Figure 6.1.2b A German designer has created a one-piece shoe using just three natural materials, including yarn made from dog hair, Images provided by Emily Burfeind (2021).

The projects mentioned above are the evidence that sustainability principles might remain limited, as evidence in chapter 5 shows how rare complete balance between sustainability pillars is archived, sustainability principles will remain as based for transitions approach in order to become potentially transformative. Regeneration as an emerging social movement is able to disrupt supply chains, and potentially leads for a scenario of transformation.

The economic value of biowaste is changing the perspective of society, in the sense waste will acquire a positive role, waste would become a synonym for economic development and a precious resource. Surely these social changes will have a positive impact on the environment, and also will make boundaries between what is clean and dirt, more blurred and ambiguous in the future.

6.2 Vision statement: Promoting ‘targeted-clean’ concept

Recent studies show the current challenge for healthcare specialists to reconcile different perspectives in terms of the correct approach to hygiene. While public health focuses their efforts on promoting targeted-hygiene, two polar sides currently conflict in the imaginary of society.

Hygiene concepts from the last decade can be misunderstood, referring that sometimes is overdone, meaning to the excessive elimination of bacterias that leads to overprotection and disruption of natural microbiota. On the other hand, the partial abandonment of hygiene practices, which means a lack of protection against infection and the tendency to overexpose in order to increase microbial diversity.

Even though Bloomfield (2016) observes that a difference between clean and hygiene is necessary, this research suggests both concepts are complementary, claiming that it is more effective to re-think cleanliness as an extension of hygiene sharing the same theoretical principles and ethical values.

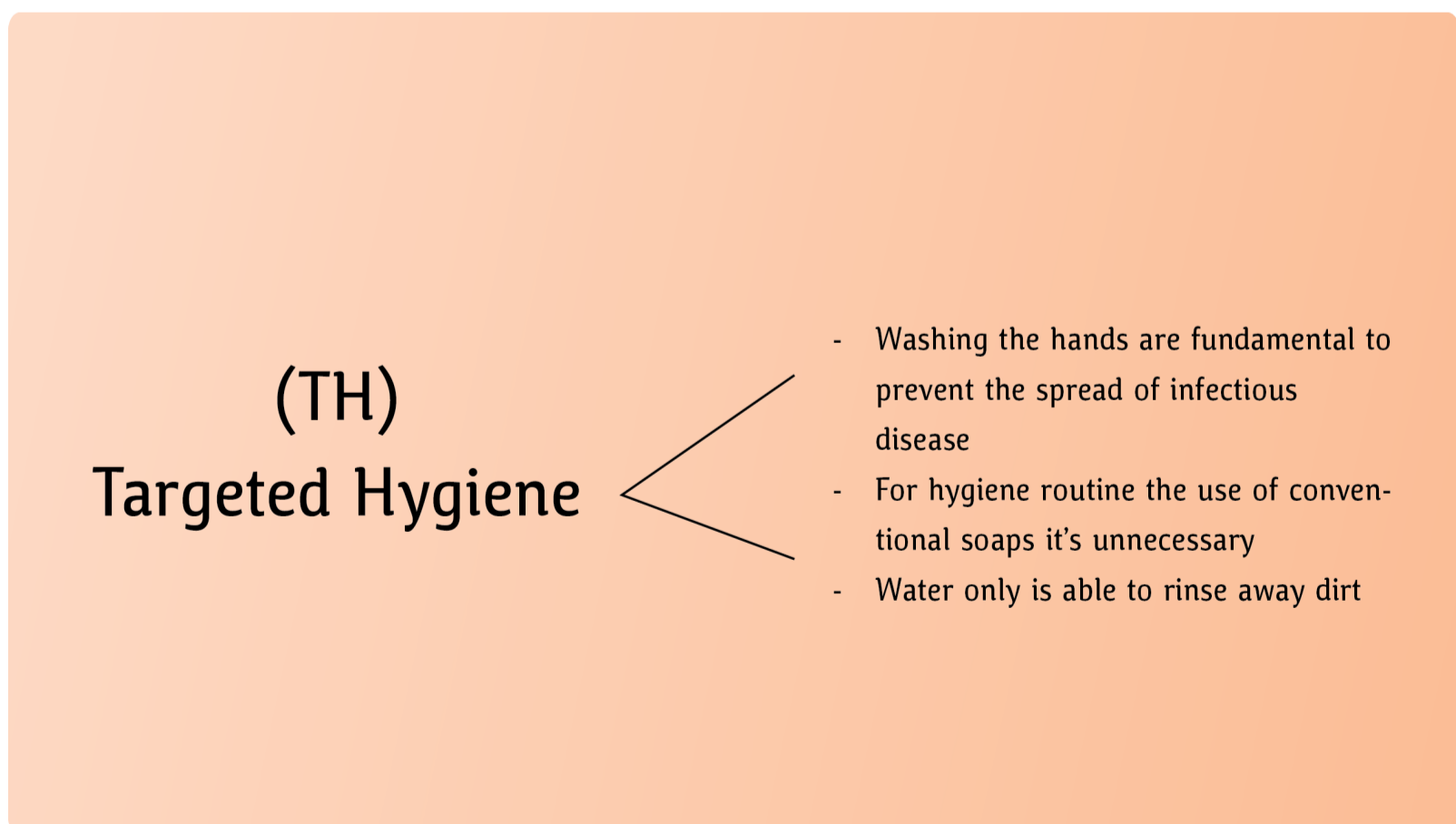


Figure 6.2a Principles of targeted hygiene, Source by Author

This research proposes the term ‘targeted-clean’ as a conceptual framework in an effort to reconcile diverse assumptions of hygiene and clean practice towards a more socio-ethical cohesion. Targeted-clean as an extension of targeted-hygiene claims for a balance of limited exposure of infectious pathogens while maximizing the contact with beneficial microbes. Basically targeted hygiene are strategies to prevent infectious disease, and targeted clean goes further into the restore notions of purity.

Targeted Hygiene principles:

- Hygiene is fundamental for the prevention of infectious diseases
- The critical control points for transmission of infection are the hands, hand contact surfaces, food contact surfaces, and cleaning utensils and that these present the highest risk of transmission.

During infancy:

- Breast versus bottle feeding has a large influence on gut microbiome
- Continuing early-life exposure from the mothers and siblings is suggested
- Pets greatly increases the microbial diversity at home
- Exposure to farm environments during the first 2-3 years of life protects against allergic disorders

Even if targeted hygiene sets the standards for healthy relation between prevention of diseases and gut microbiota diversity, targeted clean makes a further step by focusing on achieving a balance of skin microbiota with the environment. This means reconsider the use of certain products that might disrupt this balance. For example, it’s been well documented over the years that conventional soaps, which are made by mixing fat or oil with an alkali such as lye, can wreak skin by changing its pH, eradicating healthy bacteria, and wiping out vital oils. (Tarun et al., 2014)

Healthy skin pH is around 5.5, which is slightly acidic, but most conventional soaps have a much higher pH, sometimes as high as 11 (ibid, 14). The use of soaps are related to the continuous damage of the skin’s acid mantle which functions as a protective layer composed of oils, fatty acids, and amino acids. The symptoms vary according to individuals but in general presents increased dryness, itching, irritation, and inflammation. All this can also worsen skin conditions such as acne, eczema, dermatitis, and rosacea (Grice & Segre, 2011).

The natural oils removed by soaps serve an important function in keeping skin moisturized and intact. Pahr explains; “Without them, the skin becomes susceptible to cracks, tears, and other irritations that can jeopardize its function as a protective barrier” (2018).

Moreover, targeted-clean states that our current ingrained cleaning habits can actually make it harder for the skin to heal and protect itself. Nevertheless, it’s possible to get the skin back to its optimal, self-sustaining state. This requires an understanding of the dynamic relation of skin microbiota with the environment.

Targeted-clean principles:

- For daily hygiene routine the use of conventional soaps is unnecessary.
- Water only is able to rinse away dirt without stripping vital oils from the skin.
- Suggest other alternatives for conventional soaps like oil cleansing, dry brushing and DIY natural scrubs.
- Avoid products which contain: sodium lauryl sulfate, sodium laureth sulfate, phthalates, parabens, synthetic coloring agents and artificial fragrance.

Skin microbiota suggest a dynamic interaction with the environment, the mixtures of transient and permanent members tends to resemble soil microbiota. The potential health benefits are acquired through the skin and respiratory tract, and have a systemic role in immune function and maintain tissue integrity.

Skin microbiota functions:

- Skin microbiota resemble soil microbiota
- Control the barrier function of the skin
- Environmental microbiota can shape the microbial community on skin
- The skin and its microbiota have a systemic role in immune function
- Maintains tissue integrity

It is rather obvious that gut microbiota has close contact with a host, and hence has an important, systemic effect on the host's health. However, recently the interest in allergy research has shifted to the importance of the skin. The largest organ of the human body, the mediator of outer information, is more than just a passive by-stander. The main message of targeted-clean is that the contact with environmental microbes in living environment and through lifestyle jointly either support or disturb host microbiota and susceptibility to develop allergies.



Figure 6.2b Principles of targeted clean, Source by Author

6.3 Enriching smart hospitality propositions

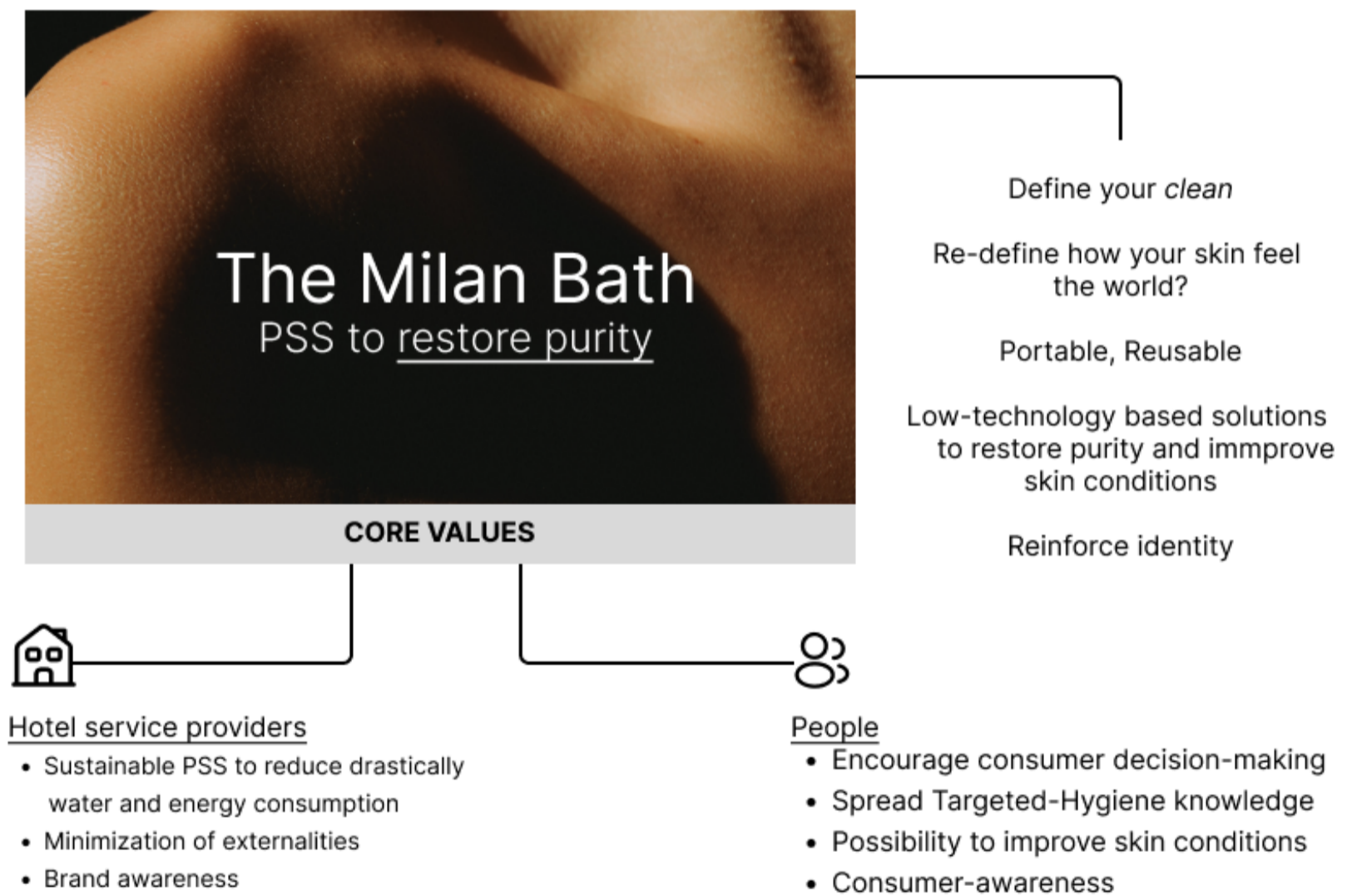


Figure 6.3 Satisfaction Offering map, Source by Author

6.4 Hypothesis generation

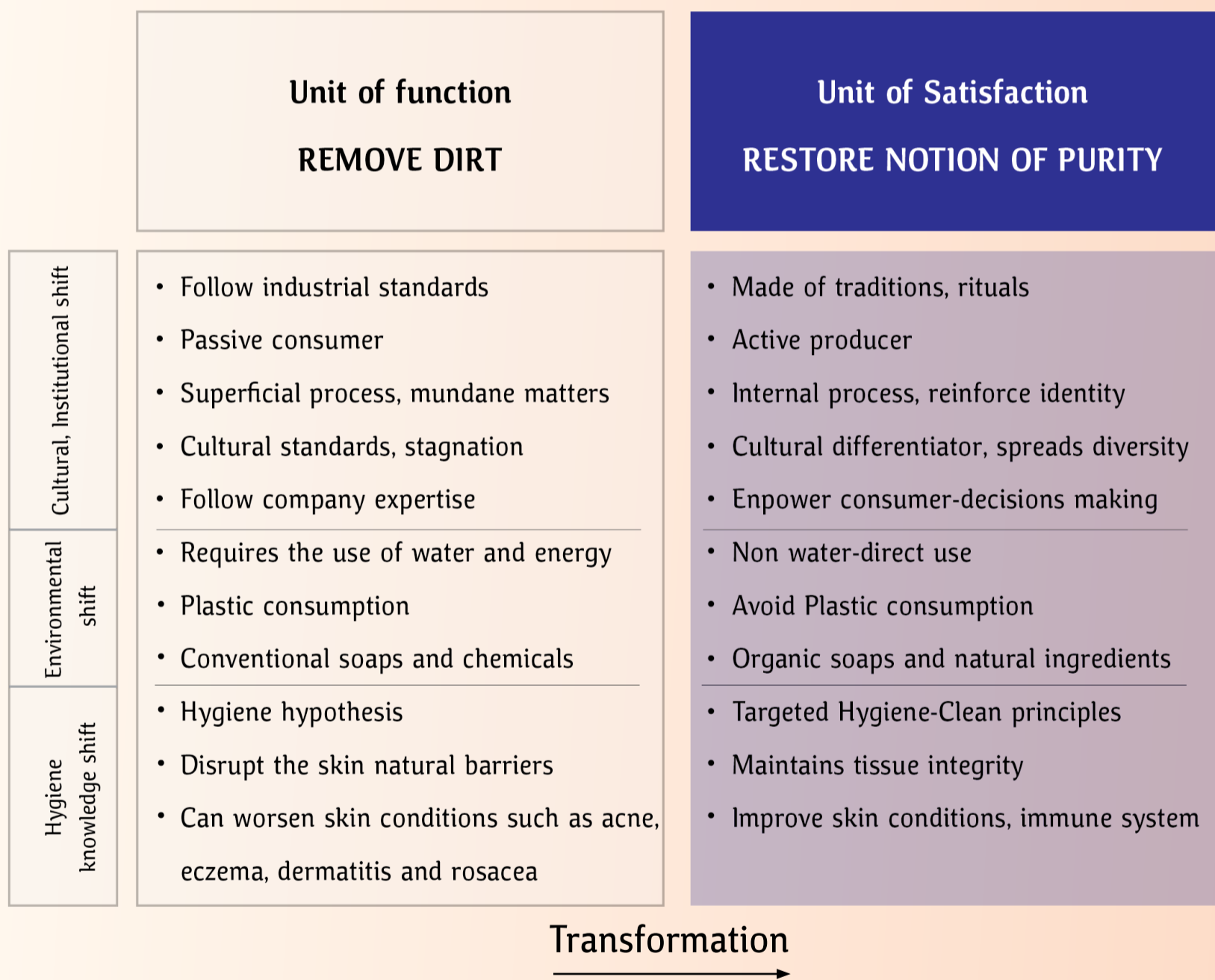


Figure 6.4 Transformation framework based on unit of satisfaction, Source by Author

6.5 User's journey mapping

Restore Notion of Purity Satisfaction system approach

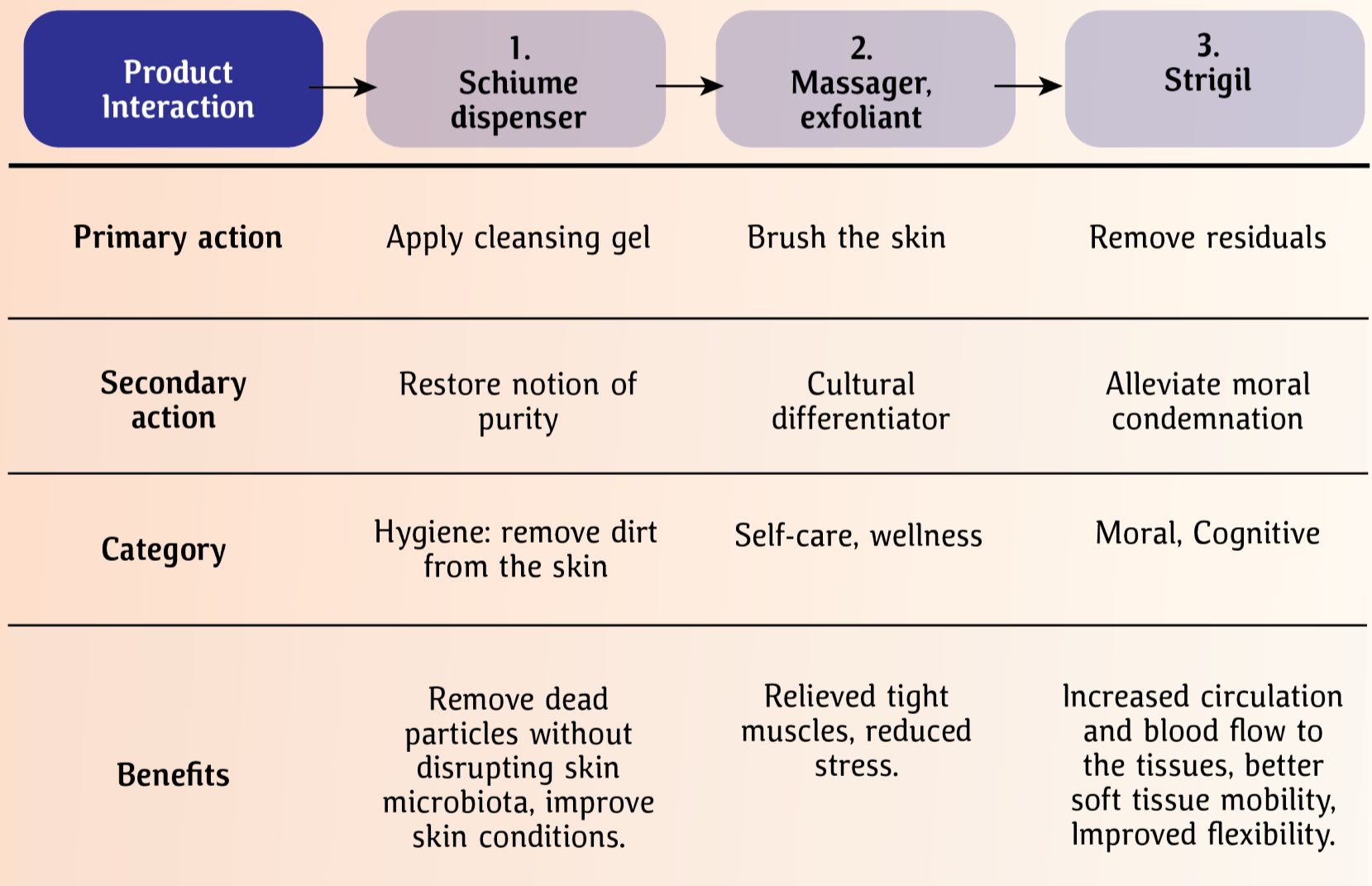


Figure 6.5 Proposed framework that encourages the 3 main actors of 'restoring notion of purity' experience. Source by Author

6.6 Comparative analysis: environmental footprint

Results: According to the research it can be possible to save more than 120 liters of water and more than 7kWh per room per use. Considering the average price for a 100 liter of tap water is \$19 and the \$0.15 per kWh the estimated total of monetary savings are 20\$ per times per room.

Components	Remove Dirt		Restore notion of purity	
	liters of water	energy kWh	liters of water	energy kWh
Showers (10min)	120	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>
Cleansing gel	0.60	<i>n.a.</i>	0.60	<i>n.a.</i>
Produce hot water w/boiler	<i>n.a.</i>	6	<i>n.a.</i>	<i>n.a.</i>
Towels	10	1.6	<i>n.a.</i>	<i>n.a.</i>
Total	130,60	7,6	0.60	<i>n.a.</i>

Figure 6.6 Comparative analysis between the proposed practice (the milan bath) and traditional cleaning habits based on environmental footprint consumption. Source by Author

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The Milan Bath

PRODUCT DESIGN

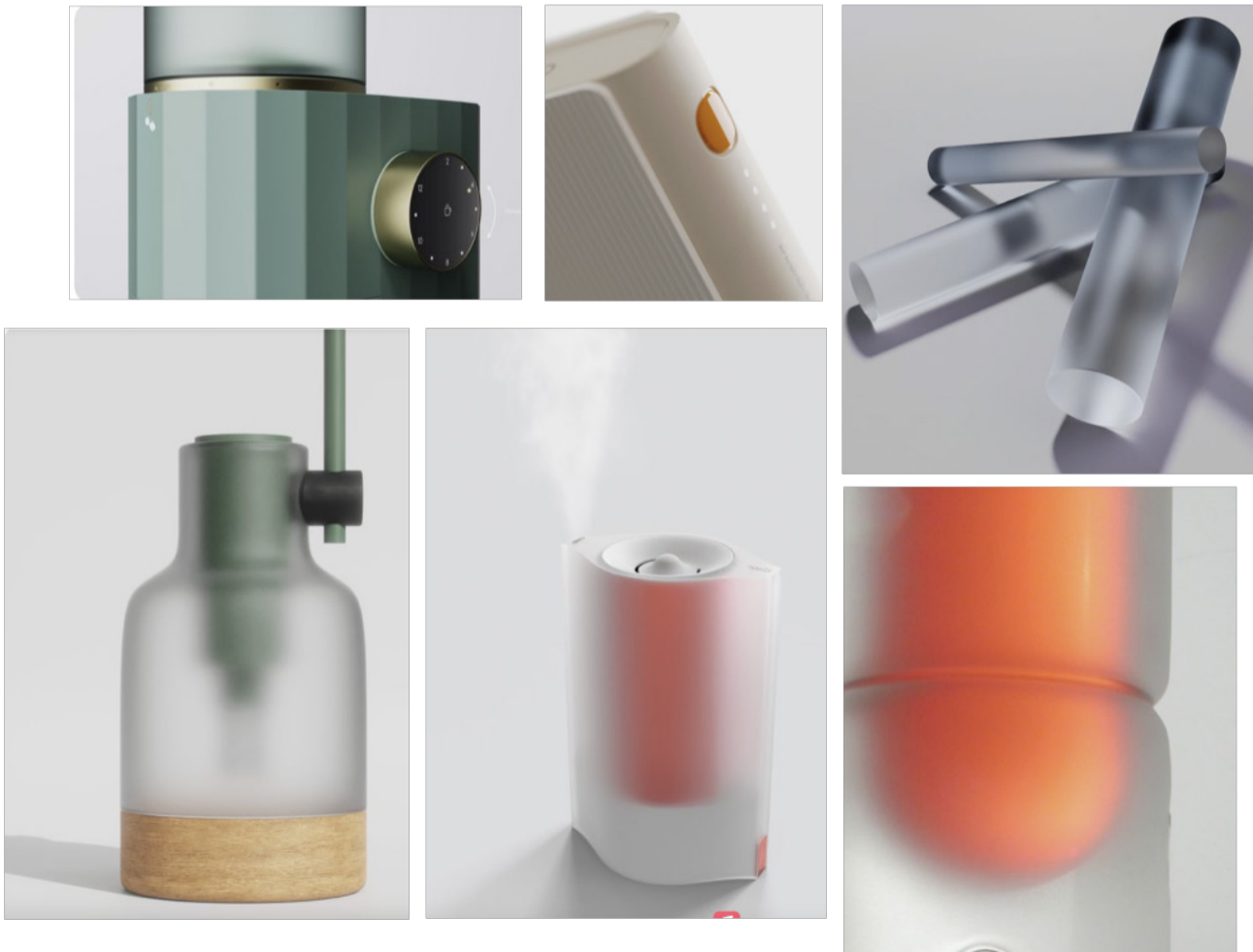


The first ammenity kit that aims to restore notion of purity as an alternative solution for tourist to choose for more eco-friendly cleanliness methods

Color Palette



Mood-board



7.1 Instructions of use

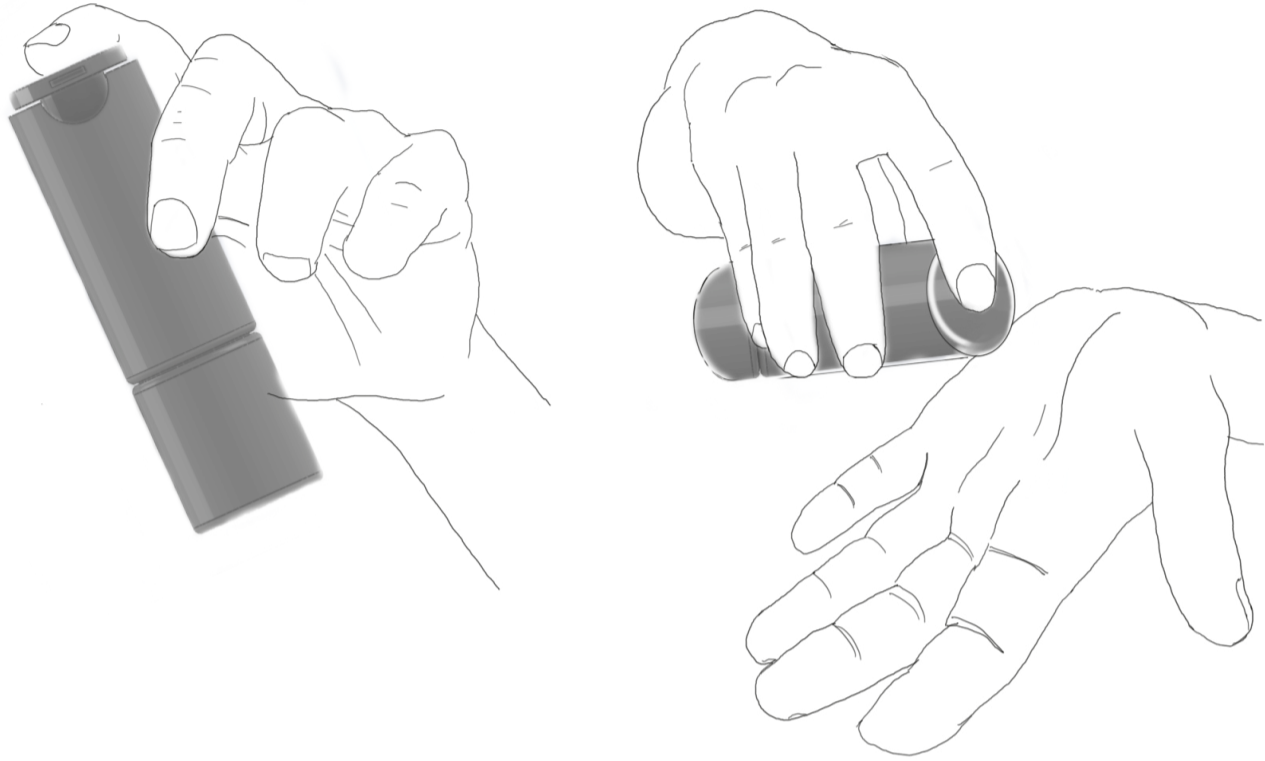
- 1. Take dispenser and make schiume on the hands*
 - 2. Wash the hands while schiume dries*
 - 3. Apply schiume on the massager*
 - 4. Massage the skin in circular motions in a clockwise direction*
- Note: You can use the sides of massager to wash easily the area between the fingers, toes and behind the ears.*
- 5. Take strigil and remove residuals of schiume, gently slide the edge of the strigil in linear motions from the outside towards the body*
- (Note: the strigil is specially designed to reach the lower body, extremities and back)*

The Schiume Dispenser

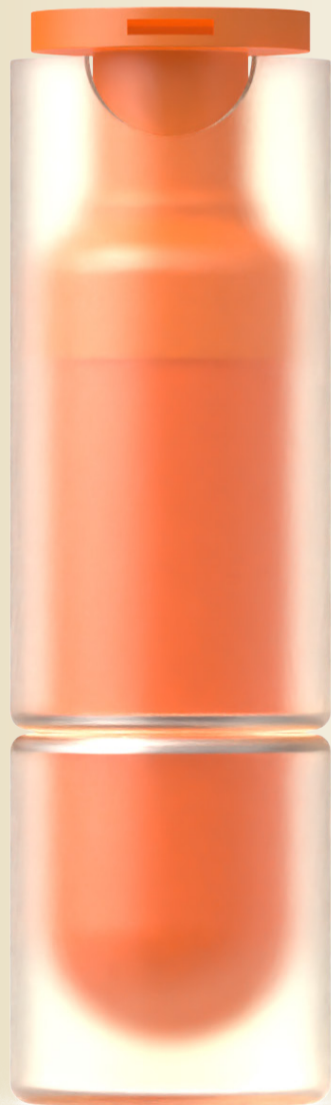
Restore notion of purity



1. Take dispenser and make schiume on the hands

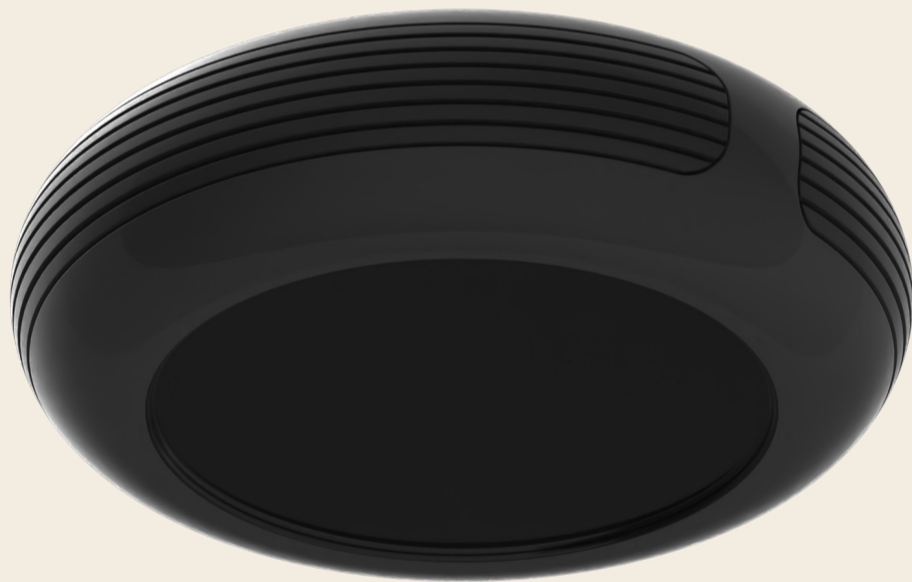


2. Wash the hands while schiume dries

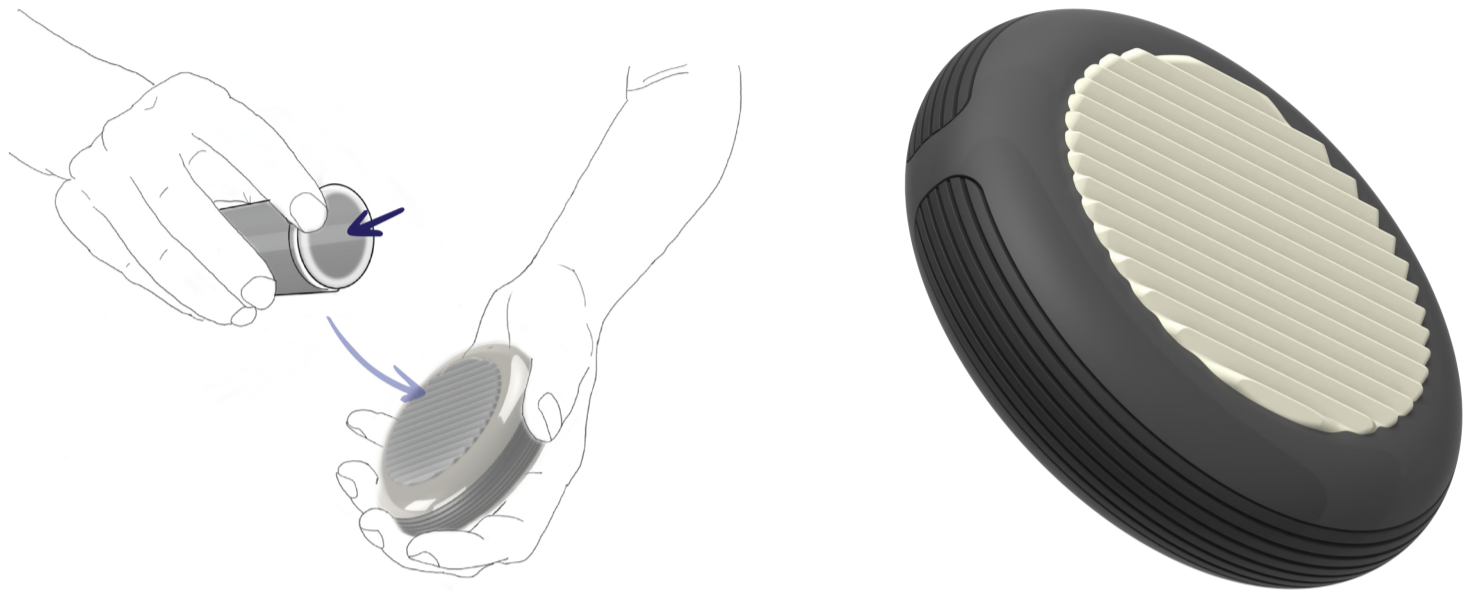


The Massager

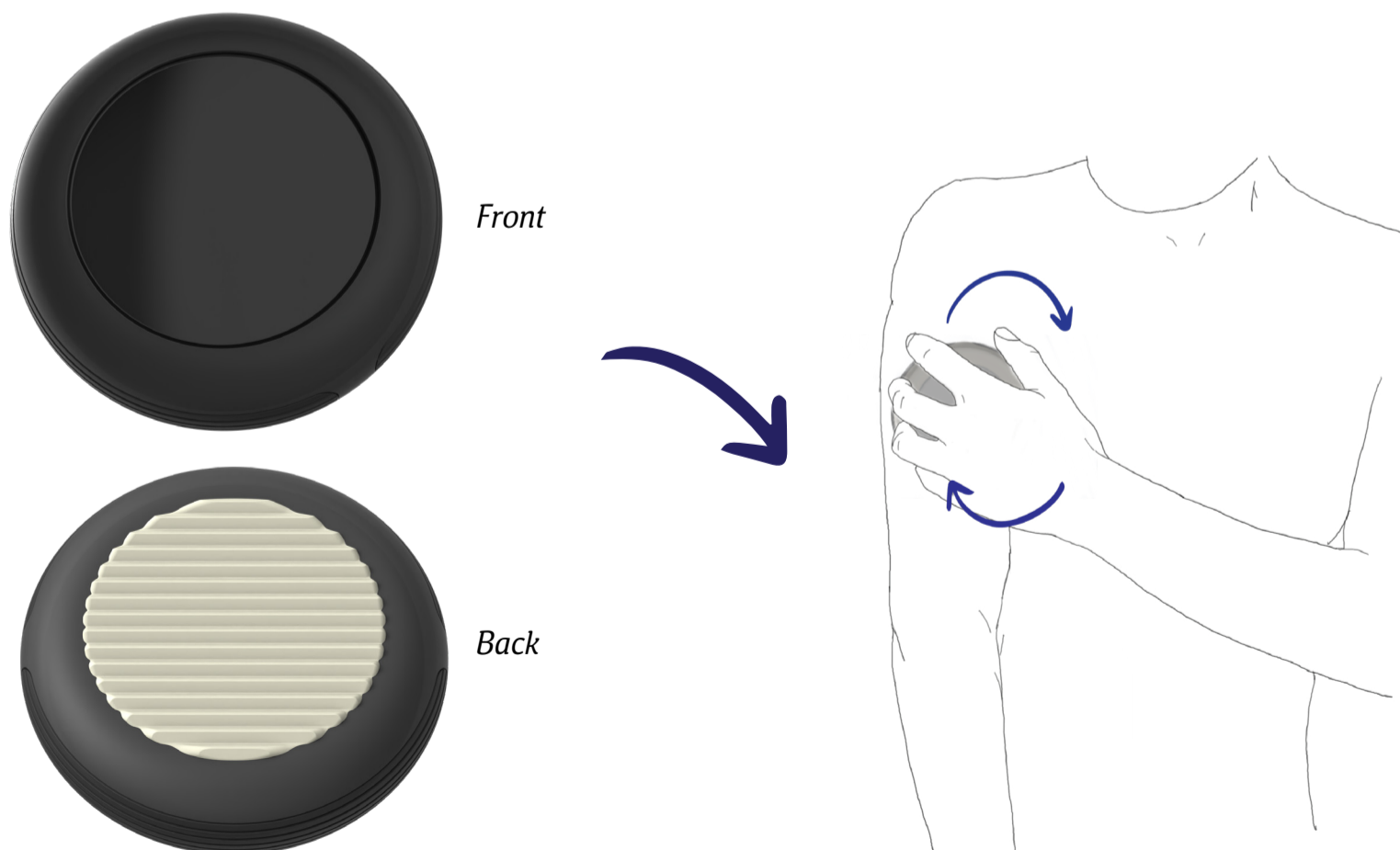
Wellness & Self-care

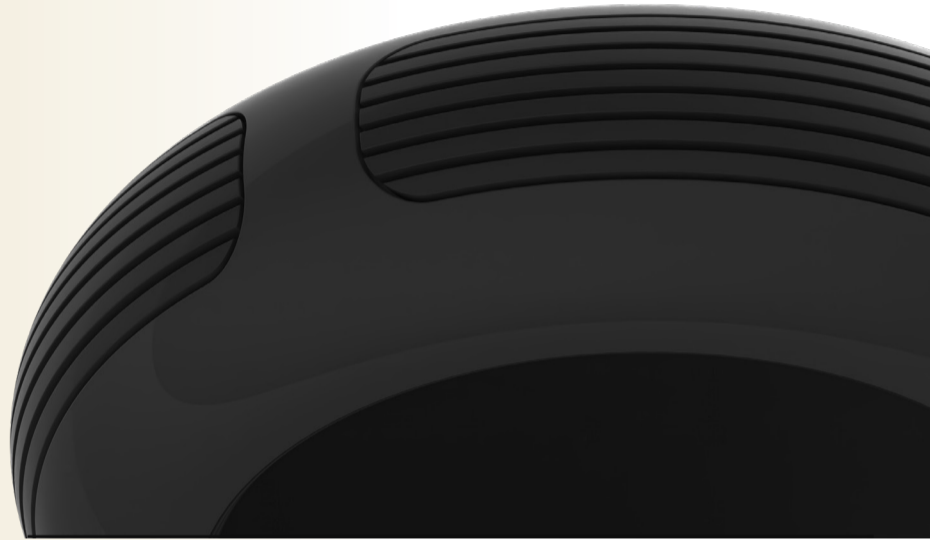
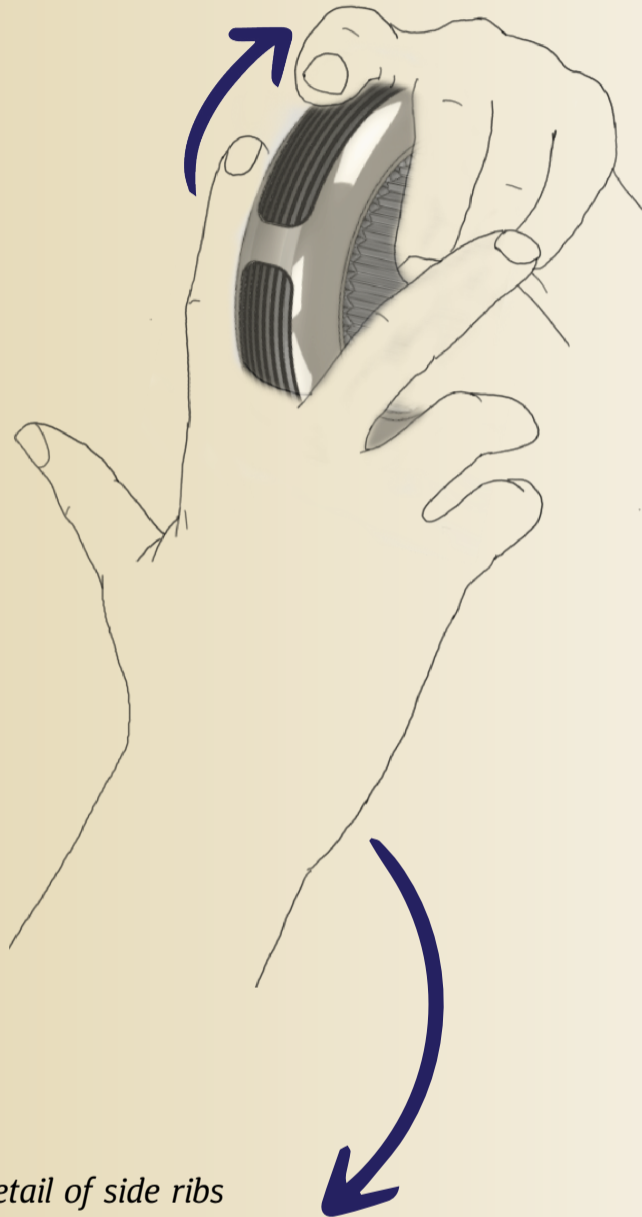
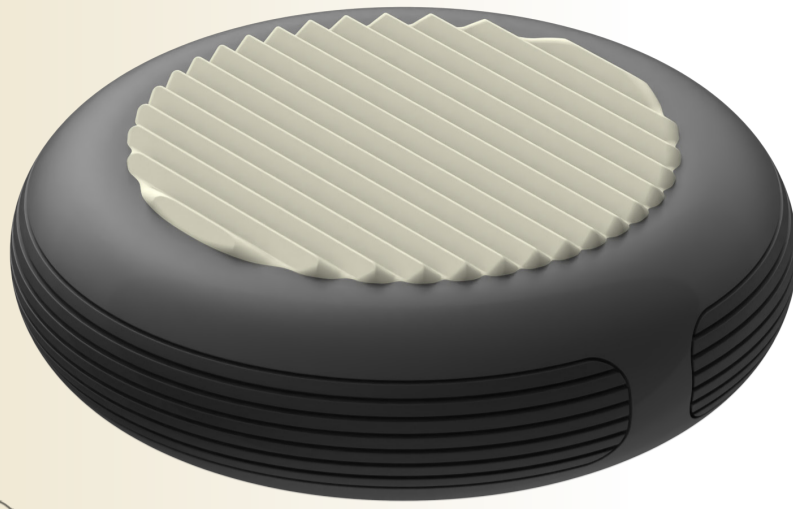


3. Apply schiume on the massager



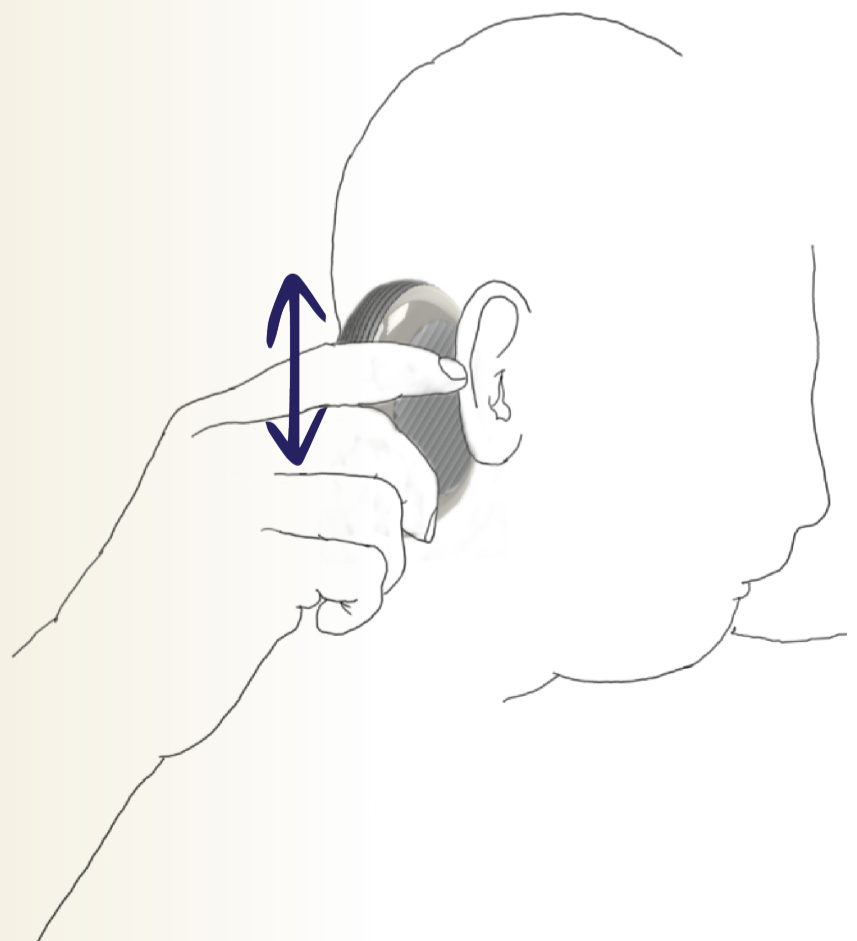
4. Massage the skin in circular motions in a clockwise direction





Note: You can use the sides of massager to wash easily the area between the fingers, toes and behind the ears.

Detail of side ribs



The Strigil

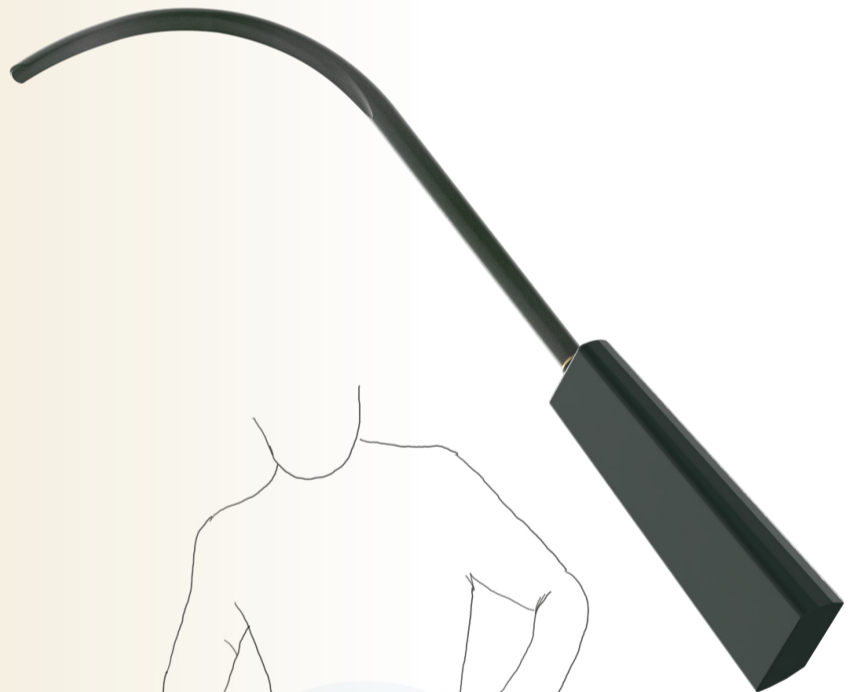
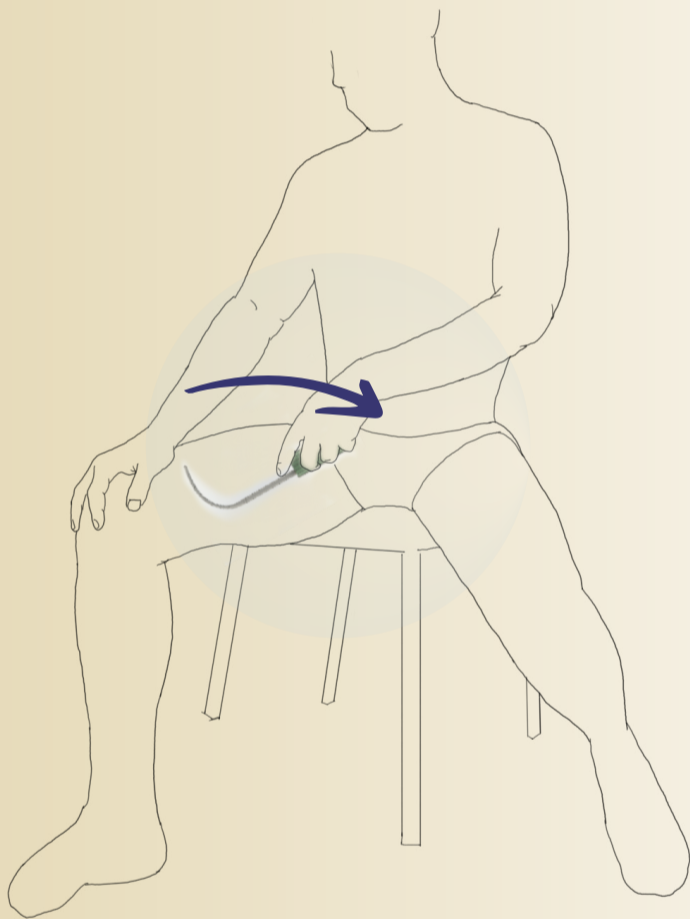
Alleviate moral condemnation



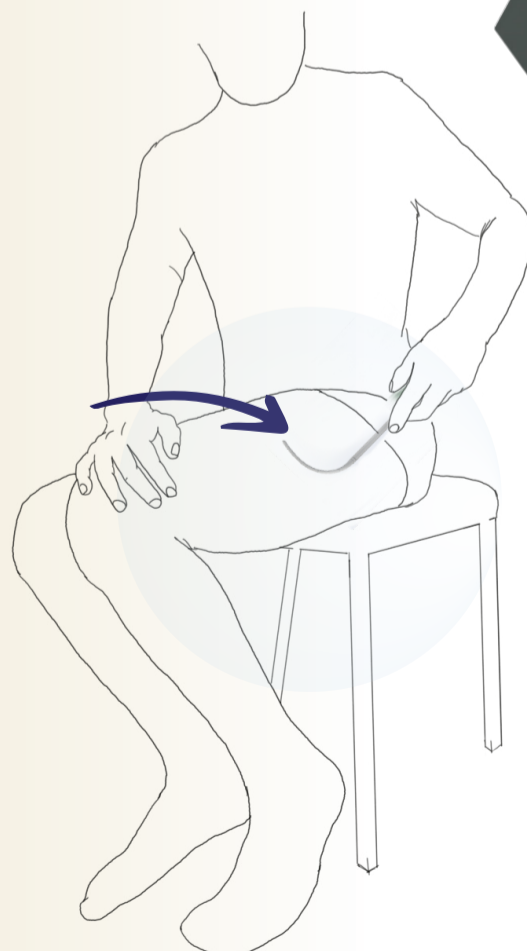
5. Take strigil and remove residuals of schiume, gently slide the edge of the strigil in linear motions from the outside towards the body

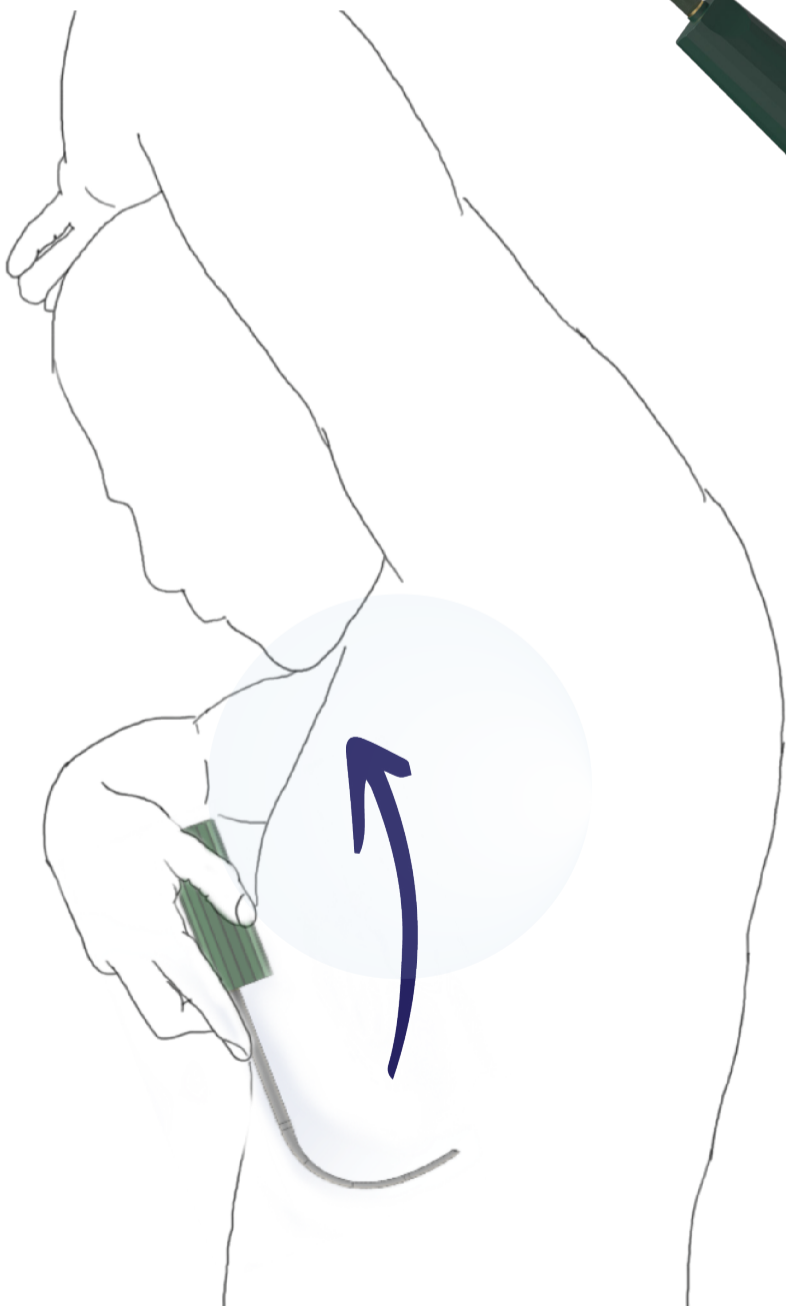
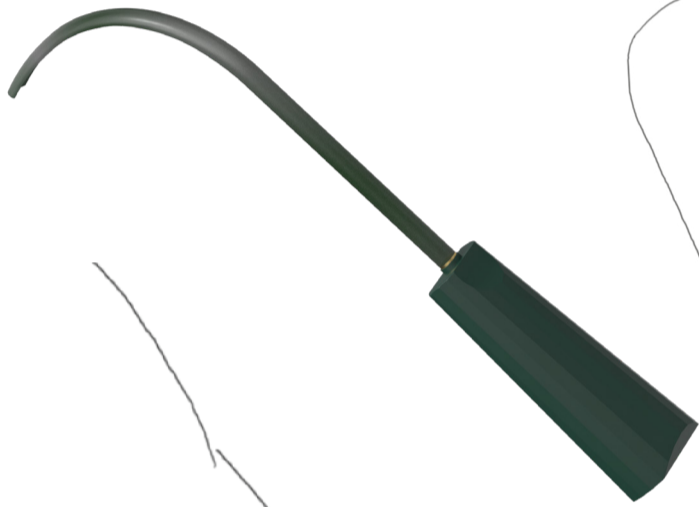


Note: the strigil is specially designed to reach the lower body, extremities and back



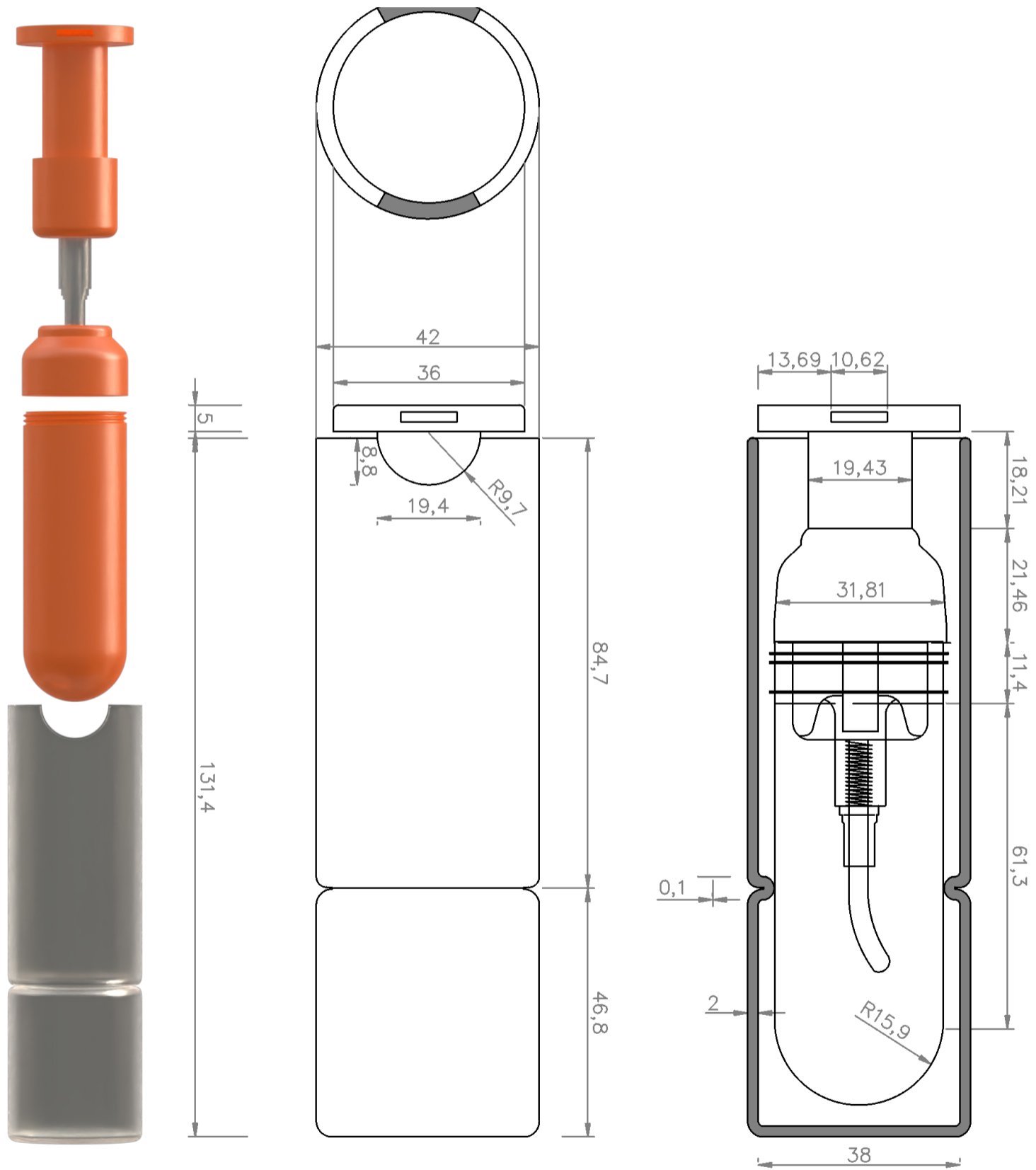
Detail view of the base

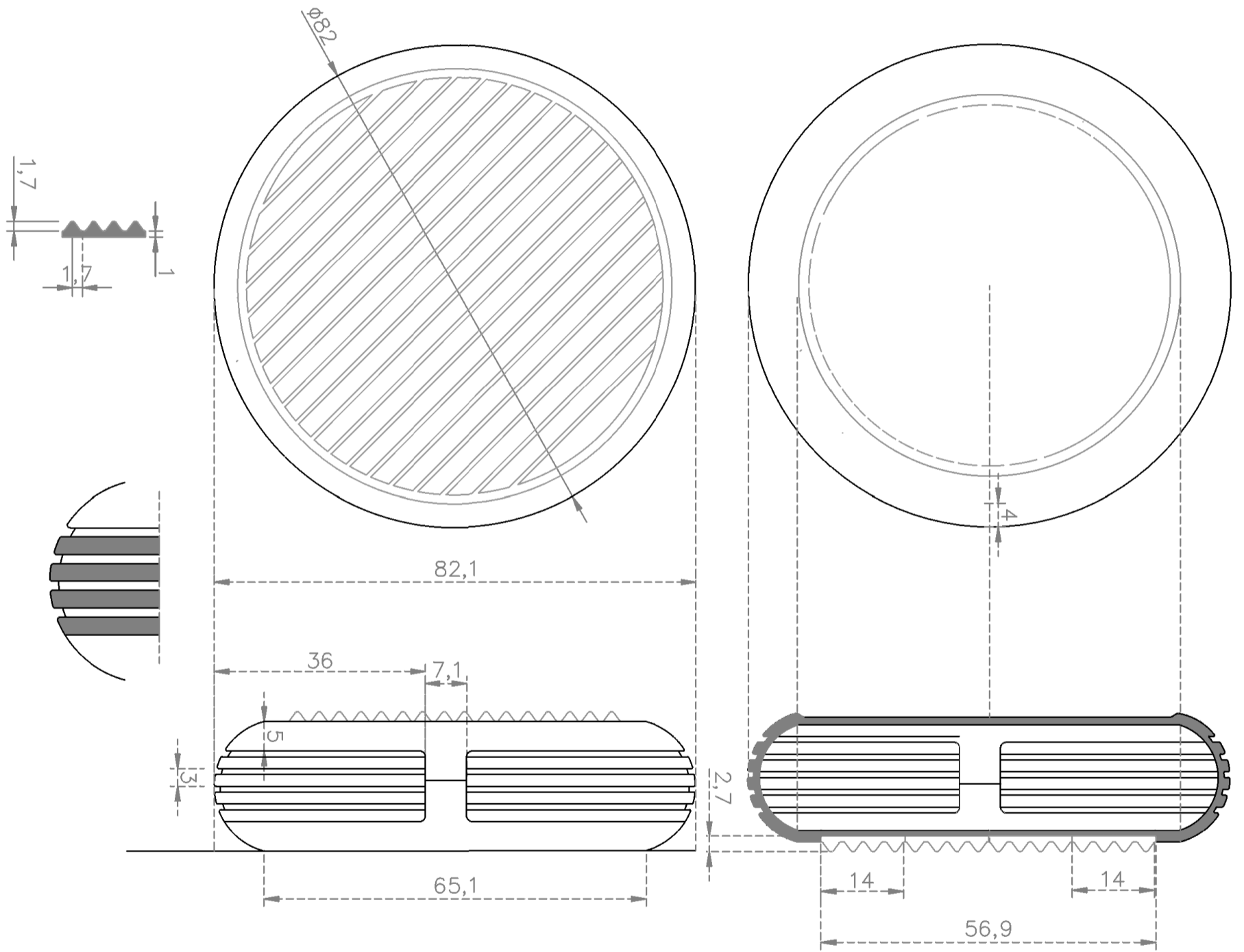


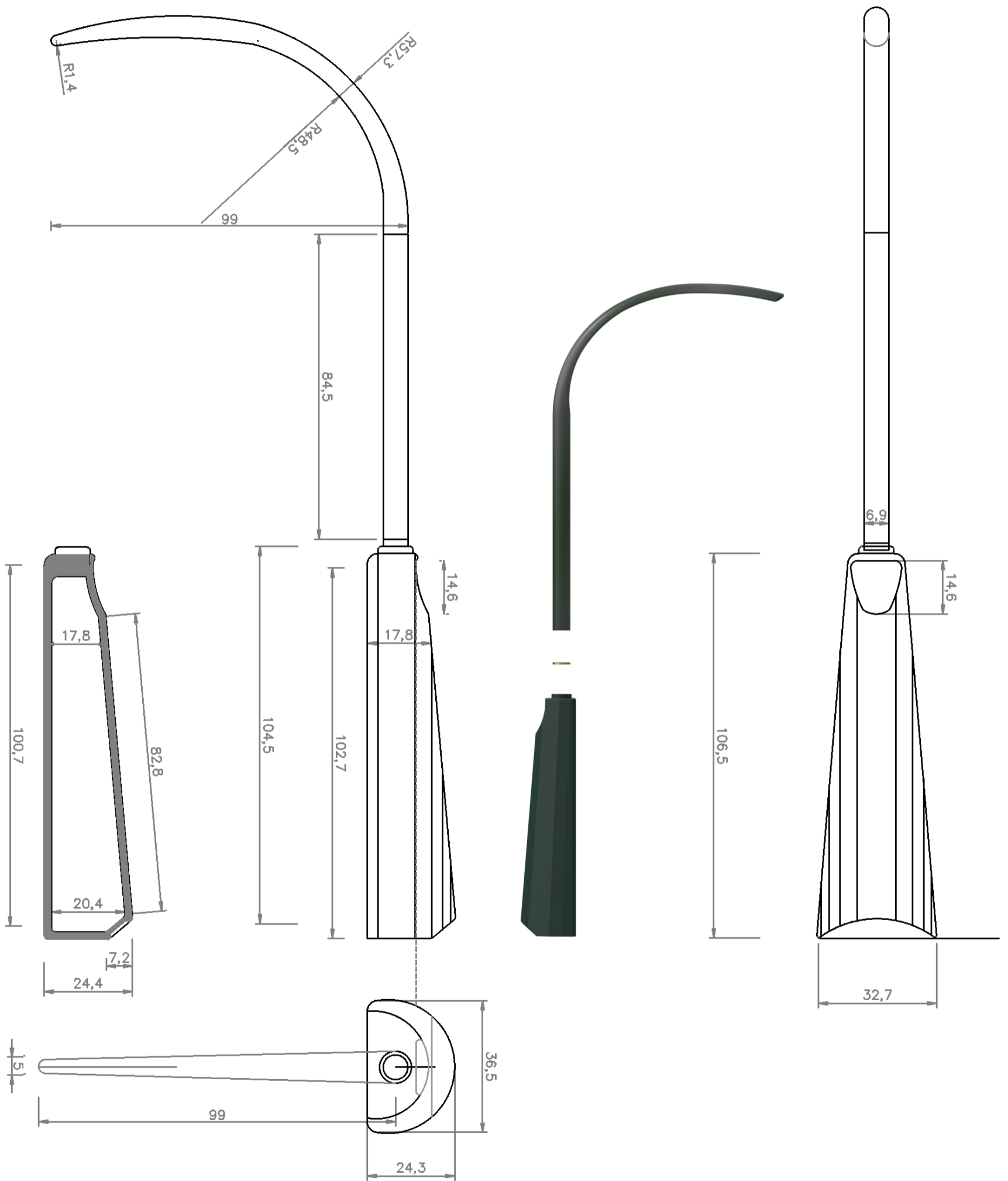


*Detail of the strigil edge
made of silicon*

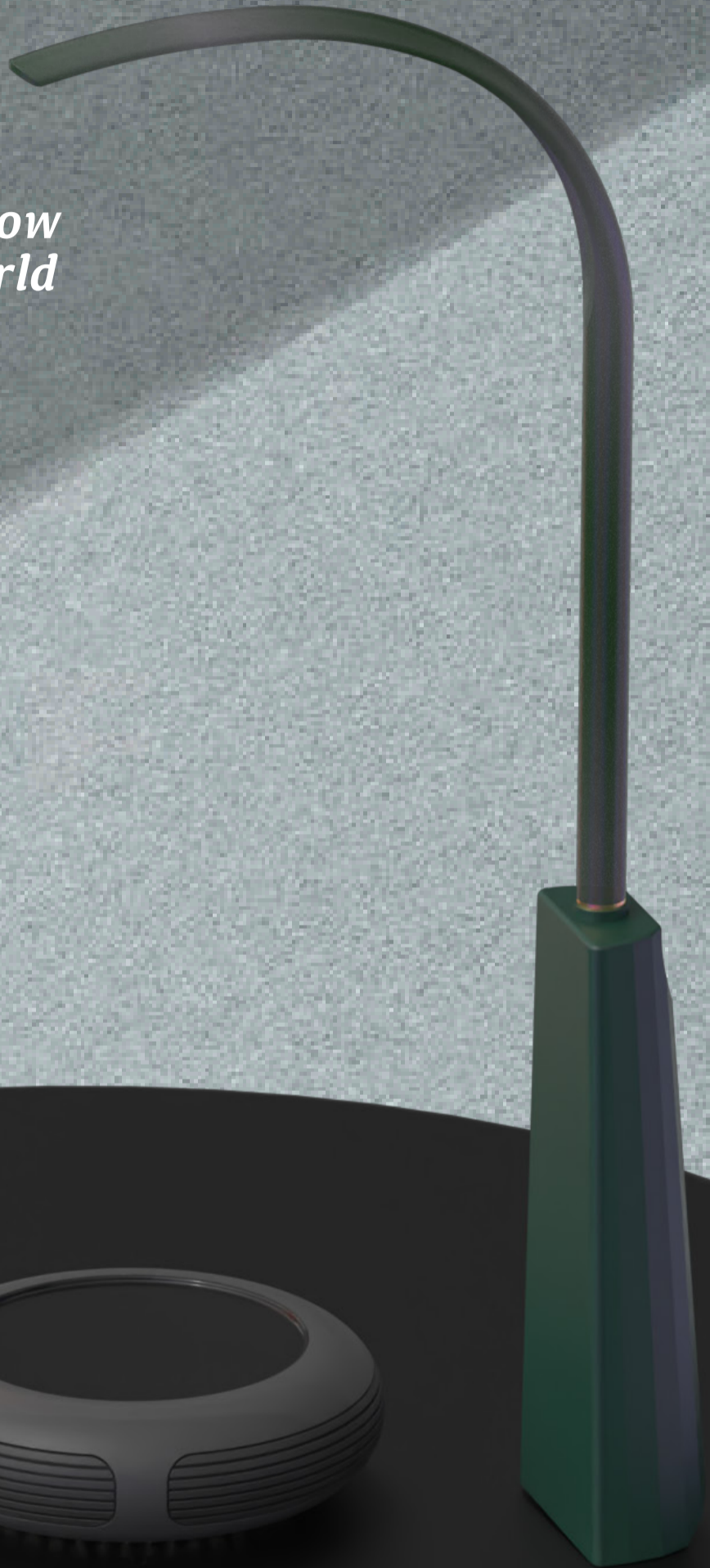








*Now you can choose how
your skin feels the world*



The Milan bath

RE-THINK CLEANLINESS

Conclusion

This research aimed to identify effective radical strategies for sustainability transformation in hospitality organizations. Based on a quantitative analysis of cultural aspects of cleanliness in response to consumer-decisions making, it can be concluded that culture plays an important role in the perception of cleanliness as a social-construct phenomenon. The results indicate that cleanliness is influenced by complex belief systems that commonly resist behavioral change, even though cleanliness is also shaped by individual appreciation, which means not static and subject to change.

This research clearly illustrates a cultural shift is ready to take place in terms of how hygiene and cleanliness is perceived in the collective imaginary, whether by understanding new perspective of human skin microbiome or the role of targeted hygiene in the domestic environment (chapter 4) but also raises the question of whether cleanliness and hygiene should be considered separate approaches (Bloomfield, 2016) or both concepts should integrate, and be thought as complementary assets towards socio-ethical cohesion.

Moreover, this study promotes the concept of targeted-clean as a novel strategy to converge the role of targeted hygiene (strategies to reduce infectious diseases) considering together also a balance of exposure to environmental microbiome (targeted-clean). From the other hand, methods and tools acquired from Sustainable PSS and circular design, specially the transition towards 'levels of the satisfaction' in this case, by 'restoring the notions of purity' were useful to build radical initiatives and arrive to a level not only of transition, but rather transformational in sustainability, challenging behavioral change and braking systems continuity.

To better understand the implications of these results, future studies could address anthropological research in terms of cleanliness perception and its relation with hygiene practices. It also encourages practitioners to explore design alternatives for consumers to play an active role in the decision-making process, especially when it comes to engaging in more sustainable services to balance environmental footprint in tourism activities.

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Images

4.6a The chain of infectious transmissions at home. Adapted from Perspectives in public health, by Sally Bloomfield, (2016 p. 7) <https://doi.org/10.1177/1757913916650225>

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