

FROM INDIGO TO INDICAN

Elaborating Social Sustainability Potentials in Relationship to a more Environmentally Sustainable Process of Indigo Dyeing with Indican

ABSTRACT

This report discusses some of the potential social effects related to introducing an alternative, more eco-friendly dyeing process that innovates denim dying by replacing indigo with its precursor indican. Indican is soluble and stable, and both indican production as well as dyeing can be achieved by employing enzymatic processes, which alleviating the environmental footprint of denim dyeing considerably.

Based on two local case studies that were selected due to the volume of denim yarn they produce, located in dyeing hubs in India and China, the report explores how communities in close proximity to dyeing facilities are affected by conventional indigo dyeing. As it is estimated that 20% of the global industrial water pollution is caused by textile dyeing (Kant, 2012), the focus of this report rests primarily with water pollution and its effects on communities. The discussions are framed through the lens of social sustainability, focusing especially on the principle of *providing a good quality of life*, in regards to socio-economic as well as health related issues.

The aim of the report is to provide a first, provisional framework to better understand and contextualize the potential advantages of indigo dyeing with indican. By framing the discussions through the lens of social sustainability, the report seeks to highlight some of the aspects that should be considered when implementing indigo dyeing with indican, which are related to yet go beyond environmental advantages.

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1. Introduction

The textile and apparel industry with its complex and globally operating supply chains has in recent years been increasingly criticized for its devastating environmental impact as well as its adverse effects on human life quality, especially within production countries (Fletcher and Tham 2019). The problems are complex, wide-reaching and interrelated in diverse ways, ranging from environmental issues relating to *e.g.* the use of pesticides that decrease biodiversity or the pollution of water through waste chemicals, and social ones such as child labour in the cotton industry and dangerous and unhealthy working conditions in production. Moreover, high amounts of overproduced garments are eventually destroyed as they cannot be sold and fast fashion items that do not last longer than one season are over-consumed and end too quickly in landfills. The problems hence span throughout the entire life-cycle of garments, thereby connecting the sourcing of raw materials, the production as well as consumption and disposal of clothes in ways that seem inherently unsustainable given the high environmental and social costs.

Efforts towards a more sustainable textile and apparel industry therefore have to be thought of and implemented in ways that address and account for this complexity of processes and relationships. Particularly, technological innovations should be understood and implemented to not only advance the environmental impacts of garments throughout their life-cycle (*e.g.* resource reduction, chemical pollution) but also advance social and cultural sustainability. Otherwise, they might end up as “techno-fixes (that) target issues in isolation” (Ceschin and Gaziulusoy 2016), not accounting for the interdependency of issues and concerns, fixing one problem while creating new ones.

Sustainability in the textile and apparel industry has thus to be addressed in more systemic ways, that pay attention to the interrelatedness of the system in its whole. Consequently, this report aims at providing a provisional framework that situates the implementation of an environmentally more sustainable indigo dye into a broader context of potentially changing relationships, explored through the lens of social sustainability.

1.1 From Indigo to Indican

Latest estimations valued the global denim jeans market at approximately USD 63.5 billion in 2020 with an expectation to rise towards USD 87.4 billion by 2027, at a CAGR of around 4.7% (Global Industry Analysts, 2021). With the overall heightened focus on increasing sustainability in the textile and apparel industry, the denim industry is also moving towards more sustainable production solutions.

It is estimated that the production of a pair of jeans consumes >10,000 L of water (cotton growing, dyeing and processing of denim), about 500 g of

chemicals (dyes, auxiliaries and finishing agents) and a vast amount of energy (irrigation of cotton, denim processes such as spinning, weaving, processing and sewing) (ACS 2012). These quantities need to be multiplied by two billions to arrive at the consumption of the world's total jeans production for a year. Hence, the question of more sustainable production arises. This report focuses on the stage of denim dyeing and the potentiality of increased social sustainability by introducing an environmentally more sustainable dyeing process.

Indigo is generally regarded as the oldest known natural dye throughout the world, with the oldest piece of dyed cloths dating back 6000 years (Li et al. 2019). Throughout its history, the colorant has been retrieved from organic materials, mostly plants from the *Indigofera* family.

With an increasing demand for indigo dye brought forward by advancing technological opportunities for the mass production of textiles, natural indigo dye couldn't fulfil the new market's demands satisfactory. After years of experimentation, in 1880 Adolf von Baeyer produced the first synthetic indigo dye, which eventually led to the industrial synthesis of indigo by the BASF AG in 1897 (Schmidt 1997). With the introduction and commercialization of synthetic indigo, the market for natural indigo dye rapidly lost in share.

Synthetic indigo paved the way for the mass production of denim yarn and was one of the key factors for the success of the iconic garment known as blue jeans. However, the denim industry is causing tremendous environmental and social hazards in its production countries, and textile dyeing is often regarded as one of the most polluting parts during the production phase. The iconic blue denim dye, indigo, is especially problematic due to its insolubility and large environmental footprint. It has proven hard to substitute with other blue pigments since the particular hue and ring colouring property of indigo cannot be obtained with any other known blue pigment.

The insoluble nature of indigo necessitates the use of harsh chemicals in the dyeing process. This has led to different innovations that tried to tackle the environmental problems caused by dyeing denim yarn and several approaches have been tested and/or implemented. One such effort is the use of biological indigo, which has been proposed but was never fully implemented, probably due to not being economically sustainable on the large scale (Berry, A., Dodge, T., Pepsin, M. et al., 2002). Right now, pre-reduced indigo, *i.e.* synthetic indigo to which reducing chemicals are already added, is the state of the art of alternative indigo dyeing. In this form, the use of alkali and additional reducing agents during the dyeing process can be reduced, yet not fully replaced.

To alleviate this, it has been suggested to use the natural indigo precursor indican instead. Indeed, indican is soluble and stable, and both indican production and indigo dyeing with indican can be achieved employing enzymatic processes. Indican therefore can be said to advance the environmental sustainability of denim dyeing by substituting the use of harsh chemicals with processes happening under mild conditions. From an environmental perspective, dyeing with indican thus would reduce the amount

of hazardous chemicals that are being used during yarn dyeing, and their concentrations in effluents.

1.2 Framing Social Sustainability

The report's aim is to emphasize social aspects related to the implementation of indican dye into the current industrial system. To do so, the report applies a social sustainability framework to discuss the cases presented here. Even though complementing economic and environmental sustainability in the three-pillar model of sustainable development, social sustainability remains the pillar least studied (Murphy 2012). This might be due to the lack of a common definition of which factors to include and address and the difficulties of applying comparable as well as quantifiable categorizations in relationship to social aspects (Littig and Griessler 2005; Boström 2012). Yet, this level of sustainability can help in detecting and highlighting stakeholders, relationships, interests, problems and consequences that often go under the radar of solely economically and environmentally framed assessments of sustainability.

According to the Western Australian Council of Social Service (WACOSS)

Social sustainability occurs when the formal and informal processes, systems, structures, and relationships actively support the capacity of current and future generations to create healthy and liveable communities. Socially sustainable communities are equitable, diverse, connected, and democratic and provide a good quality of life (in Nilipour 2020)

Drawing on this broad understanding, in this report questions of social sustainability are framed by the last overreaching principle, being *providing a good quality of life*. Here, it is foremost socio-economic as well as health concerns relating to denim dyeing and how they might get affected by the implementation of indigo dyeing with indican that will be discussed. Outlining the current state based on two cases, this report focuses on the pollution of waterways and its health related as well as socio-economical consequences for local communities. The aim thus is to provide a first, provisional framework to better understand and contextualize the potential advantages following an introduction of indigo dyeing with indican through the lens of social sustainability.

1.3 Research Question and Scope of this Report

The overreaching research question that guides the exploration of this report is the following:

What might be some of the social effects following the implementation of indican into the current system?

To explore this rather broad question, the report is divided into two parts that emphasize two different entry points into the current system, referring broadly

to the side of production and consumption. In part 1 the focus will be on the implementation of indigo dyeing with indican in the production side of the denim industry. Here, to provide a more in-depth understanding of the potential changes, the report is based on two hypothetical scenarios:

- 1. Scenario 1: Dyeing with Indican is introduced in India and China**
- 2. Scenario 2: Dyeing with Indican is introduced in Europe**

These countries/regions are chosen based on their current position within the market, with India and China producing the biggest volume of dyed denim yarn. Europe here functions as a potential go-to market for the newly developed enzymatic dyeing process.

The report will briefly outline the current state within the production countries in relationship to the involved industries and how they affect surrounding, local communities, framed through two specific, regional cases. With a focus on water pollution caused by the textile dyeing industry, the report seeks to identify how the implementation of indigo dyeing with indican might improve the livelihood of communities in close proximity to dyeing mills, while also highlighting the potentialities of moving part of the production to Europe.

The second part of the report highlights end-consumer perspectives on buying more sustainable garments, exploring the European market potential for more sustainably dyed denim and end-consumer attitudes towards sustainable denim products.

Rather than producing definite claims about the social sustainability of indigo dyeing with indican, the reports seeks to provide a provisional framework that highlights some of the contextual relationships being potentially affected by its implementation. It thus aims at highlighting some of the social aspects that often get overlooked when sustainability only gets framed through environmental advantages.

It should also be noted that the report only uses secondary resources in the discussion and therefore has to rely on the data available. However, the textile and apparel industry is notorious for its secrecy and lack of transparency in regards to suppliers and subcontractors, making it rather difficult to obtain reliable data and information on the conditions of workers within the industry in general. It seems further difficult to obtain data that specifically discusses the conditions in, and impact of, denim dyeing facilities. Therefore, the report is built on more general data on the textile industry and dyeing processes.

PART 1

2. Introducing Indican - Aspects of Social Sustainability

The denim industry operates across different continents and countries, and includes various processes, from harvesting the cotton raw material to selling finished products in retail. It is further regarded to be one of the most fragmented sub-industry within the textile and apparel market (Annapoorani 2017). This report focuses on one part of the system, namely the dyeing process of denim yarn where the introduction of indigo dyeing with indican has the potential to make a positive environmental impact.

The current Covid-19 pandemic has once again made visible the tremendous inequality that is built into the system of the textile and apparel industry, especially in the production countries, causing mass unemployment, and leaving workers with no pay for already executed work. Increasing food insecurity in the end of the supply chain of the textile industry is one of the harsh realities of the working conditions that have become even harsher under the current pandemic (Kyritsis, LeBaron, and Nova 2020). A general lack of job security the further one moves down the line within supply chains, paired with often unsafe and unhealthy working conditions, makes the industry not only one of the most polluting ones but also a particularly problematic one in regards to the conditions it provides for the work force it employs. Yet, the industry is also estimated to employ 75 million people globally, 85% of them being women, creating opportunities to move from informal to formal work (ILO 2019).

In general, the direct environmental impacts caused by the textile industry are highly localized. Foremost those communities that are in close proximity to industrial areas have to deal with the consequences of e.g. toxicity caused through production. In terms of the broader effects, the communities surrounding textile producing facilities “are significantly impacted in terms of health, quality of life and, in many cases, by associated impacts on their livelihoods from farming and fishing” (ILO 2019). This is due to the increasing pollution of waterways through wastewaters released by the textile industry. In the following, the current state of affairs in two countries, namely India and China, will be briefly outlined. The report focuses on regional examples based on case study reports.

2.1 Environmental and Social Consequences of Textile Dyeing

Dyeing is commonly regarded as one of the most polluting stages within textile production due to the use of harsh chemicals in textile dyes (Mia et al. 2019). Besides the potentially harmful consequences related to direct exposure to chemicals during textile dyeing, the process is especially damaging for surrounding communities when it comes to water. On the one hand, the high amounts of water used within the dyeing phase can cause serious problems for regions where access to clear drinking water is already under pressure. On the other hand, it is estimated that 20% of global industrial water pollution is

caused by the textile dyeing and finishing industry (Kant, 2012), entering local waterways, polluting the water supply for local communities. In the following, the report discusses some of the severe consequences that affect local communities in close proximity to textile dyeing mills when effluents are discharged in waterways without proper treatment.

2.2 Water Pollution and its Effects on Local Communities

The two cases this report will present are Pali city, India and Xintang, China. Where Pali city is a general dyeing hub, with many different dyeing processes taking place, Xintang is known as “denim capital of the world” and estimated to produce 60% of China’s denim.

2.2.1 Textile Dyeing in Pali City

Being the administrative headquarter of Pali district, Rajasthan, Pali city holds one of the biggest textile dyeing and bleaching hubs in India, with around 800 operating textile mills. Situated on the banks of Bandi River, the city was identified as one of the critically polluted areas by the Central Pollution Control Board in 1998 (Bhadra, Pathak, and Sharma 2013) and has been a case example for the hazardous pollution of the textile dyeing industry and the influences this has on the livelihood of communities in near proximity. The case also highlights some of the policy as well as governmental problems such as a lack of sufficient control and actions taken that might prevent further pollution.

The problems in the area started to intensify with increasing market demand for textile production, which resulted in ever more textile dyeing mills opening up. A case study research conducted by the Centre for Science and Environment (CSE), an Indian public interest research and advocacy organisation, found that 80% of the water samples they collected in five different areas where “not fit to be used under any class of surface water” (CSE 2014).

Further, the serious pollution of the groundwater decreased the quality of soil for agricultural uses, causing a reduction in income as well as food supply for farmers in the surrounding communities, forcing many of them into wage labour (Bhaduri 2017). Thus, the pollution of Bandi river by the textile dyeing industry has had tremendous effects on the socio-economic conditions of the nearby population, due to loss of clean water sources and agricultural land mass.

For nearly three decades farmers from 50 nearby villages have organised themselves to protest the pollution caused by the dyeing mills, which not only affects the river and the groundwater in the area, causing the agricultural fields to become infertile, but also the water in the Nehra dam 40 km downstream, which was initially built to collect rainwater (Bhaduri 2017).

Besides the scientific proof of the pollution of waterways, anecdotal evidence shows incidents of fish dying and livestock being affected by being exposed to polluted water sources. Yet, no health survey was ever conducted, hampering

evaluation and anticipation of the extent of negative effects of the textile dyeing industry on the health of its surrounding communities (Tur 2016). Another problem highlighted by activists as well as the CSE is that even though several court decisions prevent the textile mills in Pali from releasing untreated wastewater into the river, there seems to be no real legal punishment for those mills not complying and no sufficient governmental action to improve the situation in any significant way.

The case of Pali city is a good example for the hazardous, localized consequences of severe pollution by textile mills. The pollution of waterways as well as groundwater, leading to infertility of agricultural soil, changes not only the socio-economic structures of communities (Bhadra, Pathak, and Sharma 2013), but is also a health hazard through consumption of polluted water either directly or indirectly.

2.2.2 Textile Dyeing in Xintang, China

Commonly referred to as “the denim capital of the world”, Xintang is located in the northeastern part of the Pearl River Delta. Chinese authorities estimate that the region produces around 300 million denim articles per year, employing around 220,000 people; many of them migrating from other parts of China.

Although an economically successful region, Xintang suffers from severe pollution due to the high concentration of especially textile mills in the area. A report released by Greenpeace in 2009, investigating the pollution of waterways by the local industry, indicates that many factories, including textile dyeing mills, dump their wastewater into the river without sufficient treatment, causing the water to turn black-blue. Based on water samples taken from five different pipes, the report demonstrates that the water released contained excessive amounts of heavy metals, organic pollutants and chemicals.

Ever since China opened up its economy to the global market in the late 1970s, the country has held a strong position in the production of all kinds of consumer goods and textiles have historically been an important part of this economic success. Nonetheless, the Chinese environment as well as population have paid and are still paying a high price for this rapid industrialisation: By now, 70% of China's rivers and other water sources are polluted (Greenpeace 2009), some of them to such a high degree that the water cannot (or rather should not) be consumed under any circumstances. Xintang is just one of many examples for the severe consequences of industrial pollution. Local communities suffer heavily from the pollution of waterways as they depend on these nearby water sources in their daily lives. By now, the pollution of the Pearl River is so severe that it might threaten the water supply of bigger cities further downstream.

To tackle the severe problems caused by the textile industry in the area, the local government in Xintang established the new Xinzhou Environmental Industry Park and moved about 80 dyeing mills into the area. Yet, rather than

solving the pollution problem, it only got replaced to a new location and smaller textile dyeing mills continue to dump their untreated wastewater into the river. One of the problems pointed out by environmental activist is that the sheer number of industrial facilities makes it nearly impossible to comprehensively control them, creating loopholes for non-compliance.

Even though there is no scientific evidence for increased health problems in the communities in close proximity to Xintang, there are many anecdotal testimonies from community members blaming the denim industry for health problems ranging from skin rashes to infertility.

2.3 Discussion

Taking its point of departure from the two case presented, the following discussion will elaborate on some of the issues that should be considered when assessing the implementation of indigo dyeing with indican from a social sustainability perspective.

The state of the art treatment of wastewaters and effluents released from textile dyeing mills is currently centred on “end-of-pipe measures” such as wastewater treatment plants. Yet, as research suggests, these plants are not efficient enough to fully treat the effluents and many organic pollutants “will either pass through the treatment process unchanged, be converted through partial degradation into other hazardous substances, or accumulate in treatment plant ‘sludges’ that then become hazardous wastes in themselves” (Greenpeace 2009). Therefore it is suggested that “the most effective measures to address hazardous substances are those that seek alternatives to the use of such hazardous substances in manufacturing processes, progressively replacing them with less hazardous (...) alternatives in order to bring about rapid reductions” (Greenpeace, 2009). It is in this regard that indigo dyeing with indican could arguably make an impact on the wastewater that is released from dyeing mills, positively impacting the water quality of communities in close proximity to textile dying facilities.

2.3.1 Scenario 1: Indigo Dyeing with Indican is Introduced in India and China

As the two cases from India and China demonstrate, the consequences of water pollution by textile dyeing facilities are severe for surrounding communities. Given the outlined current situation, it can be anticipated that a decrease of toxins that are released during the processes of denim yarn dyeing through the implementation of indigo dyeing with indicant will lead to lesser pollution of wastewater. This would have positive outcomes for the surrounding communities affected by the pollution. Yet, it is difficult to determine how much of a difference the implementation of indican would actually make as there is no reliable data available that specifically looks at the pollution caused by solely indigo dyeing. Indeed, many dyeing hubs do not exclusively specialize in denim yarn dyeing, even though indigo is the most used garment dye. Nonetheless, every step towards more environmentally sustainable dyeing processes is a step towards decreasing the severe socio-

economic and health related consequences that communities in close proximity to textile dyeing industries are facing.

2.3.2 Scenario 2: Indigo Dyeing with Indican is Introduced in Europe

In the European context, “water is one of the most comprehensively regulated areas of EU environmental legislation” (Cattoor 2007), providing a strong legal framework for the treatment of wastewaters from e.g. the textile dyeing industry. If the implementation of indigo dyeing with indican is moved to dyeing mills in Europe it could therefore be argued that local communities in close proximity to denim dyeing mills are already well protected against the harmful consequences following water pollution. In fact, two of the most well-known and biggest denim hubs in Europe are located in Italy and Spain, and are often praised for their sustainable and innovative manufacturing processes. Both facilities have a long-standing, locally embedded and internationally recognized tradition in denim manufacturing, highlighting craftsmanship, tradition and social and environmental consciousness. Strategically, it could therefore be argued that these facilities might have an increased interest in advancing their environmentally conscious production by implementing indigo dyeing with indican into their operation and they could very well function as case study examples for the implementation.

2.3.3 Localism vs. Environmental Sourcing

The idea of localism has lately entered debates on fashion sustainability and has been praised for a potential future trajectory in creating more sustainable business operations. “Localism is defined as a business strategy where companies try to establish a supply chain in geographic proximity, while consciously taking into account local conditions in the business decisions” (Dybdahl, 2019). The introduction of the process of indigo dyeing with indican into the European context could be thought of as a move towards more localism in the denim industry by creating supply chains that are closer to their main target market. This move towards more localism in the denim industry, moving part of the production of denim yarn to regions where the finished products also will be sold, could open up for a sustainability potential that relates to heightened transparency on production level as the legal frameworks in Europe are quite regulative.

Moving a bigger part of the denim supply chain to Europe by implementing indigo dyeing with indican into European dyeing mills can also help in establishing more green jobs. In the Nordic region, the Council of Nordic Ministers has e.g. published a report, which investigates the regions potential for a continuing transition into a greener textile and apparel industry, highlighting the ambition that sees it as an opportunity for green growth (Klepp et al. 2015).

Yet, it should also be kept in mind that if the more environmentally friendly dyeing process of indican is moved to dyeing mills in Europe, the largest market share of denim dyeing would still rest in countries like India and China, thereby contributing to the continued outsourcing of environmentally harmful industrial processes while implementing greener solutions in areas where legal framework and systems of control are already better implemented. This

consideration relates to claims made by a number of authors that see environmental sourcing as a major driver when determining where to locate aspects of the supply chain that have high levels of environmental impact (Greer et al, 2009; Khan et al, 2009; Angeulov, 2016). In this argumentation, “environmental sourcing refers to multi-national corporations (MNCs) strategically locating operations in countries that are still developing their environmental regulatory systems, such as Bangladesh, China, India, Indonesia and Viet Nam, in order to exploit regulatory uncertainty” (ILO 2019).

Another aspect that might be relevant to consider in this context is job security for workers in current production countries. Would an introduction of indigo dyeing with indican in the European market move a significant amount of jobs from current production countries to Europe? As indican probably would not be implemented on a large scale immediately, it is rather difficult to anticipate what the consequences in regards to job security in current production countries would be. Yet, these questions are relevant. From a social sustainability perspective, it should therefore be considered where the biggest harm for people and their livelihood is done currently and where the biggest advances could be achieved, in regards to environmental, health-related as well as socio-economic impacts. The most important question to ask seems therefore: Who should benefit from the more environmentally sustainable dyeing process?

PART 2

3. End-User Attitudes towards Sustainable Garments

In this second part of the report, the market for more sustainably dyed denim products will briefly be investigated. The data used in this report is drawn from Fashion Revolutions latest Consumer Survey Report released in December 2020. Fashion Revolution is a non-for-profit organization, advocating for systemic change within the fashion industry by mobilising citizens, industry and policymakers through research, education and other advocacy work. The survey was conducted as part of an end line study in the 'Trade Fair, Live Fair' project 2017-2020, funded by the European Commission. Around 5000 respondents in the age group 16–75 answered the survey, coming from the five largest European markets, Germany, France, Italy, Spain and the UK. Even though the data does not specifically relate to denim products as such, its broader insights on consumer attitudes in relationship to the environmental as well as social impacts of garments and the chemical exposure caused by them is a useful starting point to explore the potential for more sustainably dyed denim products in the European market.

Denim products can generally be said to have a high sustainability potential in the use-phase, given the fabrics durability and therefore potential for extended usage. As a fabric, denim is resilient and long lasting, and even though the colour in denim garments is fading through continuous washing, garments tend to age in attractive and desirable ways. These attributes make denim a well-suited fabric to investigate sustainability potentials in the use phase of garments.

As was highlighted in the first part of this report, textile dyeing can cause tremendous environmental and socio-economic harm, when wastewater is not sufficiently treated. With a heightened awareness in the general public of the severe environmental as well as social consequences of the textile and apparel industry, in this second part of the report an overview is given that situates the potential for denim products dyed in a more sustainable way into broader discussions on Fashion Sustainability.

In the following, key findings from the Consumer Survey Report will be presented. Those findings are not ordered in the same way as in the initial report, rather the focus is on the data relevant within the scope of this report¹.

¹ A break down of the percentages per country is provided in the initial report

People's attitudes on environmental impacts of garments

78% of people agreed that it's important for brands to share detailed information about their products environmental impacts.

76% of people agreed that fashion brands should be required by law to protect the environment at every stage of making and selling their products.

75% of people agreed that fashion brands should be required by law to provide information about the environmental impacts of their business.

33% of people said it's important that the clothing (including shoes & accessories) they buy is produced in a way that is not harmful to the environment.

21% of people have tried to purchase clothing that is made in an environmentally sustainable way.

18% of people have tried not to purchase clothing where they have concerns about the environmental impact.

People's attitudes on social impacts of garments

79% of people agreed that fashion brands should be required by law to respect the human rights of everybody involved in making their products.

75% of people agreed that fashion brands should do more to improve the lives of the women making their clothes, shoes or accessories.

72% of people agreed that fashion brands should be required by law to provide information about the social impacts of their business.

22% of people said it is important that the clothing they buy is produced in safe working conditions.

19% of people have tried to purchase clothing that is made in a socially responsible way.

16% of people have tried not to purchase clothing where they have concerns about the items' impact on society.

Other relevant issues

14% of people said it is important that the clothing they buy is produced locally.

37% of people said it is important that the clothing they buy is produced without using harmful chemicals for the consumer.

69% of people would like to know how their clothes were manufactured.

69% of people are interested in learning about what fashion brands do to reduce their waste.

3.1 Discussion

These numbers suggest that there is a good strategic fundament in regards to implementing the more environmentally sustainable process of indigo dyeing with indican in general. Indeed, around 75% of consumers in the five biggest European markets utter a general concern about the environmental as well as social impacts of the garments they purchase. Further, a high amount of consumers also thinks that there should be legal frameworks in place that hold brands accountable for the social as well as environmental impacts of their businesses. To implement such accountability, a heightened transparency about the production processes is necessary and here indigo dyeing with indican could make a good case, shedding light on an often unaddressed issue in discussions of Fashion Sustainability, namely textile production and the social and environmental impacts of this part of the supply chain. The EU does regulate the amount of chemicals that are allowed in textiles and garments that are sold within its markets, and many brands have taken steps to guarantee that none of the chemicals classified as severely toxic can be found in textiles and garments sold to end-users. Yet, there has not been any comprehensive focus on the use and release of chemicals during the production phase; and with stricter regulations in the global North and higher costs connected to wastewater treatment, many brands have moved their polluting production stages to countries in the global South. The process of dyeing indigo with indican therefore tackles an issue that is often overlooked in Fashion Sustainability, where there has been much focus on garment workers, neglecting those workers and local communities even further down the supply chain.

4. Concluding Remarks

Considering that environmentally sustainable innovations should be thought of and implemented in relationship to the wider systems they will become part of, this report discussed some of the potential social effects related to introducing indigo dyeing with indican into the current system. Based on two case studies on major production sites in India and China, the report explored what the consequences of the textile dyeing industries are right now, in relationship the living conditions of surrounding communities. The discussions were framed through the lens of social sustainability, focusing especially on the principle of *providing a good quality of life*, in regards to health related issues and job security. The report focuses on water pollution caused by textile dyeing (responsible for 20% of the worldwide water pollution) and the severe consequences of this pollution for communities in close proximity to dyeing facilities. Drawing on these two cases, the report presented some of the problems faced by local communities. The discussion then centred on two

hypothetical scenarios for the implementation of the more environmentally sustainable process of indigo dyeing with indican, the first being an implementation in regions that currently hold the biggest market share of denim yarn dyeing (India and China) and a potential go-to market in Europe.

Summing up, indigo dyeing with indican has the potential to make a difference for communities in close proximity to textile dyeing facilities, especially in regions where legal frameworks are weak when it comes to holding textile producers accountable for the pollution they cause. From a social sustainability perspective, implementing indigo dyeing with indican in countries like India and China would potentially make the biggest positive impact for the people directly impacted by the pollution caused by textile dyeing mills.

1. Lack of data and transparency

To make more substantial claims about the social sustainability of indigo dyeing with indican, more research is needed on the subject matter. There is a general problem, in regards to comprehensive and reliable data when it comes to supply chains in the textile and apparel industry (Skjold 2020). To make more well-assessed statements about the impacts on social sustainability it is therefore important to conduct more research into the actual working conditions of people employed in the denim dyeing process as well as case studies analysing the actual effects, specifically of denim yarn dyeing on communities surrounding dyeing mills. Unfortunately, there is not much research done on health related issues working with chemicals in the textile dyeing phase and much evidence on health related issues comes from individual and anecdotal testimonies.

2. Best for whom?

From a social sustainability perspective, the overall question one should ask oneself in regard to the implementation of green solutions more generally speaking and specifically for the implementation of indigo dyeing with indican is: where could the biggest impact be achieved in relationship to peoples well-being (individual and community level)?

3. Good timing for more sustainable dyeing processes

There is a heightened focus on more sustainable production processes in the textile and apparel industry. The ongoing EU Textile Initiative is a good example of the importance and the momentum that more sustainable textile production and consumption currently hold. Therefore, indigo dyeing with indican could and should be implemented in accord to these initiatives.

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