



Capstone Final Report
**Environmental
Sustainability in the
Jordanian Garment
Sector**

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Executive Summary

The growth of the global fashion industry and the complexity of its supply chain has led to an unsustainable level of production and consumption, and a number of associated negative effects on the environment. These negative environmental consequences most directly impact the countries where clothing is produced, and the garment workers involved in the process.

Thanks to a preferential Free Trade Agreement (FTA) with the United States, Jordan has emerged as a player in the global garment industry. In 2006, the Jordanian garment sector was implicated in a report by the National Labor Committee (NLC) for substandard working conditions and human rights abuses. In response to these findings, the Government of Jordan (GoJ) requested that Better Work form a program to operate in the country. Better Work, a collaborative program between the United Nation's International Labour Organization (ILO) and the International Finance Corporation (IFC), a member of the World Bank Group, seeks to implement and protect the labor rights of workers and improve working conditions, while also boosting the competitiveness and profitability of the apparel industry. Better Work currently works in twelve garment producing countries around the world, and formally launched its program in Jordan (BWJ) in 2008. Since then, BWJ has made major improvements to labor conditions in the Jordanian garment sector.

One component of Better Work's upcoming global strategy focuses on the interaction between labor and environment, and this report serves as a scoping tool to explore the environmental impacts specific to the Jordanian garment sector. The report builds on existing literature and utilizes a qualitative approach by conducting focus groups with garment workers and interviews with industry stakeholders. Due to limitations in data and the use of convenience sampling, the report can be viewed as an initial exploratory study which can be used to provide insight. A number of key findings emerged from the research, which are highlighted below according to the research questions guiding the study.

Key Findings

- ◆ **Research Question 1:** What is the environmental impact of the Jordanian garment sector?

The most pertinent environmental topics in the Jordanian garment sector are water, energy, and waste. As a resource scarce country, Jordan depends almost exclusively on its regional partners for the supply of energy and water, and the increasing number of refugees in the country coupled with climate change have strained its already scarce resources. The garment industry is a reflection of this phenomena as factory managers and owners grapple with a resource crunch and rising input prices while having a significant environmental footprint. However, since the Jordanian factories fall mostly under the Tier 1 category of cut-make-trim, they do avoid the most environmentally intensive stages of garment production, such as textile dyeing and fiber production. A focus on environmental sustainability is rather new in Jordan, and this was evident both in the literature and throughout focus groups and interviews.

- ◆ **Research Question 2:** How is the environmental impact affecting the workers in the Jordanian garment sector?

As the topic of environment is in its early stages, there is a lack of consensus on environmental related issues among the workers. There are educational programs trying to fill the gap, yet such programs are not implemented consistently. Training and workshops are conducted on themes that intersect with the environment such as hygiene, water conservation, and energy. There can be further clarity on who conducts these trainings, how often, and their effectiveness. The Jordanian garment industry is dependent on migrant workers, and the diversity of cultures creates a knowledge gap between different nationalities, and also contributes to the issue of food waste.

- ◆ **Research Question 3:** What are the perceived constraints and opportunities around the environmental impact of the Jordanian garment sector for governmental and business stakeholders?

Driven by the demands of buyers, many factories have improved environmental sustainability and increased transparency in recent years through the use of reporting tools such as the Higg Index. Funding of projects is a major challenge for implementation of green practices and projects, and collaboration and public private partnerships could be further utilized. Factories are eager to implement new environmental technologies if a high up front cost leads to long-term savings, and there is consensus that a better working environment for workers is a win-win that leads to productivity gains.

There is currently a lack of collaboration between government agencies such as the Ministry of Environment (MoE) and Ministry of Labor (MoL) which could hinder further development. Regulatory barriers also exist which create challenges in forming effective partnerships, especially in regard to the ability to recycle and reuse textile waste. Additionally, factories struggle with approvals and financing for large projects such as solar energy transition, and could be offered incentives for such practices.

- ◆ **Research Question 4:** What are some recommendations to improve the environmental impact in the Jordanian garment sector?

Recommendations to improve the environmental impact in the Jordanian garment sector are described in detail at the end of the report, and center around developments such as: increased awareness and training; increased collaboration and partnerships; and the creation of a regulatory environment which allows and incentivizes stakeholders to commit to an environmentally sustainable transition.

BWJ	Better Work Jordan
CAD	Computer-aided design
CMT	Cut, Make, and Trim
EP	Environmental performance
FTA	Free Trade Agreement
GHG Emissions	Greenhouse gas emissions
GoJ	Government of Jordan
GSCM	Green supply chain management
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
KPI	Key performance indicators
MoE	Ministry of Environment
MoL	Ministry of Labour
NEPCO	National Electric Power Company
NGO	Non-governmental organization
OSH	Occupational Safety and Health
QIZ	Qualifying Industrial Zones
SAC	Sustainable Apparel Coalition
UN	United Nations
USJFTA	United States Jordan Free Trade Agreement

Key Terms

Interpretivist approach: Interpretivism is a school of thought that “maintains that knowledge of the social world can be gained through interpreting the meanings which give people reasons for acting, and that we can, in this way, understand human behavior, but we cannot explain or predict it on the basis of law-like generalizations and establishing the existence of causal relationships” (Halperin and Heath 2017).

LEED Certification: When a building is “LEED” certified it is recognized based on its sustainable building operations and the use of green initiatives in order to promote environmental friendliness and health, and cost-saving. This certification can be applied for both new and old buildings.

Tier 1, Tier 2, Tier 3: Tier 1 factories conduct business with their buyers directly and are involved with the assembly of products. Tier 1 factories obtain their supplies from Tier 2. Tier 3 is further removed, usually supplying raw materials for products. Some factories can include multiple tiers.

The Higg Index: Developed by the Sustainable Apparel Coalition, the index offers tools and streamlined measurements of sustainability.

The Golden List: Launched by the Jordan Customs programme, it gives “preferred operator status” to companies that demonstrate low-risk and comply with certain customs requirements.

The Paris Agreement: Organized by the United Nations, the Paris Agreement is a legally binding international treaty on climate change. It aims to mitigate global warming to well below 2, preferably to 1.5 degrees Celsius.

1. Introduction

1.1. Global Impact of the Fashion Industry

In 1987, the United Nations defined sustainable development as “meeting the needs of the present without compromising the ability of future generations to meet their own needs (United Nations Academic Impact Sustainability n.d).” This principle guides the UN’s 2030 Agenda and the Sustainable Development Goals (SDGs). According to the UN, “the SDGs are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice” (United Nations Sustainable Development Goals n.d). In recent years, there has been increased business and consumer awareness of the importance of sustainable development. Despite this change, many important global industries face challenges in transitioning to sustainable practices. The fashion industry is a fitting example of this concept. At present, consumer desire for “more” far exceeds consumer demand for sustainability in the fashion industry. As such, fashion production and consumption has risen to a level that is precariously unsustainable, especially with the rampant growth of fast fashion (Marques, Marques A. & Ferreira 2020).

The global garment and textile sector is one of the most polluting industries worldwide. In particular, its interplay with energy, water, and waste generates a significant environmental impact (Better Work’s Approach Environmental Sustainability and Circularity 2021). The environmental footprint of the fashion industry varies across different stages in the textile value chain. According to findings from the UN Environment Programme, the sector’s most intensive impacts occur at the raw material production stage, which includes agriculture and textile manufacturing, and at the at-home use stage, which includes garment washing and drying (United Nations Environment Programme 2020). Energy usage at the textile production stage results in over 3.3 billion metric tons of greenhouse gas emissions (GHG) per year (ibid). This accounts for about the same amount of GHG emissions as the entire economies of France, Germany, and the United Kingdom combined (McKinsey 2020). These hazardous emissions are a major contributor to climate change worldwide. Despite efforts to reduce GHG emissions, the industry is on a trajectory that will exceed its emission abatements as set by the Intergovernmental Panel on Climate Change (IPCC) and ratified in the 2015 Paris agreement (ibid).

In terms of water consumption, the fashion industry is reported to use 93 billion cubic meters of water annually—an amount equivalent to the consumption needs of five million people (How Much Do Our Wardrobes Cost to the Environment? 2019). Additionally, wastewater containing hazardous substances from fabric dyeing and treatment is released into rivers and water courses without appropriate

treatment, contributing to 20% of the world's industrial water pollution (ILO Working Paper 31 2021).

The fashion industry is also a major contributor to global waste. Of the fiber used for clothing, around 87% is either incinerated or disposed of in a landfill (How Much Do Our Wardrobes Cost to the Environment? 2019). This impact is further exacerbated by the sector's intensive use of chemicals that present a major obstacle to textile recycling by contaminating purer recyclates that could be processed into newly formed materials or products (UNIDO 2020).

Furthermore, the sector's negative environmental impact directly impacts the health, well-being, and livelihood of workers and the surrounding communities where production takes place. For example, the consumption of large quantities of water depletes water availability while production processes release hazardous, contaminated wastewater into local watersheds (Better Work's Approach Environmental Sustainability and Circularity 2021). This increased exposure to hazardous chemicals and waste is coupled with higher levels of air pollution and other factors related to climate change, such as extreme climate phenomena. These changes in climate can include increased temperatures and corresponding heat stress, rising sea levels, and extreme weather patterns.

Increased awareness of the negative footprint of the global fashion industry has driven efforts to create innovative solutions to improve sustainability and reduce negative environmental impacts. In 2015, the ILO published the "Guidelines for a just transition towards environmentally sustainable economies and societies for all." The Just Transition Guidelines call for a transition to sustainable economies which benefit society and treat all stakeholders fairly (ILO Guidelines for a just transition towards environmentally sustainable economies and societies for all 2015). These guidelines are related to the idea of the triple bottom line, meaning that global firms should commit not only to financial performance, but also to social and environmental performance. These commitments are commonly referred to as the "three P's," or profit, people, and planet (Miller 2020). The fashion industry clearly delivers on generating profit—in recent years it has generated approximately \$2.5 trillion in global annual revenue (McKinsey State of Fashion 2021). The fashion industry must, however, take actionable steps to improve its impact on people and the planet in order to secure a future that is sustainable and equitable.

1.2. Purpose of the Report

This report serves as an exploratory scoping analysis of the environmental impact of the garment sector in Jordan. Since Better Work commenced operations in Jordan in 2008, the program has been instrumental in improving labor conditions

and human rights in the Jordanian garment sector. Better Work's upcoming global strategy, in alignment with the ILO's Just Transition Guidelines, includes a specific focus on the environment and its relation to labor. In order to enhance social and environmental sustainability, Better Work seeks to drive positive outcomes at a large scale by strengthening policies and reinforcing an environment that secures both decent work and business competitiveness (Better Work Amplifying Impact 2017).

Through the analysis of relevant literature, focus groups, and interviews with garment industry workers and stakeholders, the report identifies constraints and opportunities related to environmental performance in the Jordanian garment sector, and provides recommendations to improve environmental practices.

1.3. Structure of the Report

Following the introductory sections, the report first provides an overview of the research methodology used to complete this environmental scoping study, and its limitations. The report then reviews the business and regulatory environment in Jordan as it relates to environmental sustainability in the garment sector. The next section summarizes the findings of the impact of the garment industry on the environment and garment workers by key themes: energy, water, waste, and occupational health and safety. This includes topically related elements from interviews with stakeholders and focus groups with garment workers. Following this, the report gives an overview of environmental knowledge and attitudes in the factories, including the use of training. The next section highlights constraints and opportunities in the transition to environmentally sustainable practices, as revealed by interviews with various business and regulatory stakeholders. Finally, the report lists a series of recommendations for stakeholders to implement in order to improve environmental outcomes, and provides suggestions for future research.

2. Methodology

2.1. Methodological Framework

The Better Work program has traditionally focused on labor issues and working conditions in the global garment industry. The upcoming Better Work global strategy has an explicit focus on the interaction of labor and the environment. Seeking to understand the relationship between labor and the environment in Jordan, the research follows a qualitative interpretivist approach to complete an initial exploration of the following research questions:

- **Research Question 1:** What is the environmental impact of the Jordanian garment sector?
- **Research Question 2:** How is the environmental impact affecting the workers in the Jordanian garment sector?
- **Research Question 3:** What are the perceived constraints and opportunities around the environmental impact of the Jordanian garment sector for governmental and business stakeholders?
- **Research Question 4:** What are some recommendations to improve the environmental impact in the Jordanian garment sector?

Interpretivism is a school of thought that “maintains that knowledge of the social world can be gained through interpreting the meanings which give people reasons for acting, and that we can, in this way, understand human behavior, but we cannot explain or predict it on the basis of law-like generalizations and establishing the existence of causal relationships” (Halperin and Heath 2017). Opting for an interpretivist outlook rather than a positivist one was done both based on the lack of a significant representative sample and on the recognition of our own bias as researchers. Mindful of the methodological challenges of interpretivism, as much transparency as possible will be provided to strengthen the plausibility and credibility of our findings.

Within that school of thought, qualitative research methods allow us to collect data from non-numerical sources and analyze them without converting them into data for a statistical analysis. Some examples of qualitative sources include written texts, audiovisual material, and human observations. A qualitative interpretivist approach seemed appropriate for the scope of our research as it allows for further investigation on the social outcomes ensuing from the environmental impact. More precisely, qualitative data provide the opportunity for lived experiences and perceptions to come to light, as well as giving participants more space to direct the content of the data and to express nuances.

The methods adopted were set by research questions in order to best address them respectively. Focus groups were chosen to answer our second question and to examine the effects of the environmental impact on garment workers. The reason is twofold: to speak to as many garment workers as possible within our timeframe and to gather information on social dynamics. Recognizing that the content of the qualitative data coming from union representatives would be relevant to this question, but also that they may have ideological differences, we decided to conduct individual interviews with them. As for the third question, focusing on the perceived constraints and opportunities around managing the environmental impact of the garment industry in Jordan, individual interviews were chosen. This method provides a better opportunity to extract nuances from the different nature of the stakeholders, their context and their responsibilities.

Once the research questions and the appropriate methods were defined, the starting point of this research project was to complete a literature review. The literature review included academic sources, as well as gray literature and government publications. Upon identifying emerging themes and gaps with our research questions, we developed questions for our focus groups and for the interviews, by a group of stakeholders: factory managers, government, buyers, and NGOs. Since these questions were guided by the pre-existing literature, both the interviews and the focus groups were semi-structured to allow for the literature's dominant points to be put forward, while also maintaining the exploratory nature of this research.

2.2. Data Collection and Data Analysis

To collect the data needed for the exploratory study, five members of the research team went on a field trip in Jordan in March 2022. In total, nine focus groups of five garment workers and sixteen interviews were conducted. A few of these interviews were conducted remotely. In addition, the researchers also visited factories, dormitories, and other onsite facilities from six factories in the three main industrial zones: Irbid, Dulayl, and Sahab. All factories were exporters to the United States and among the biggest in the country. Due to logistical difficulties linked to outreach and timing, convenience sampling was followed based on the contacts of Better Work Jordan for the factories and interviewees. As for focus groups, they reflected the population of workers present in the Jordanian garment sector and they had the following composition: Two groups with Jordanian women and one group with both Jordanian women and men, one group with Indian men, one group with Indian and Pakistani men, one group with Nepalese women, and three groups with Bangladeshi women. All workers were selected by the researchers on the day of the factory visits.

Overall, for both focus groups and interviews, the consent form of each focus group and interview included anonymity and permission for audio recording. The audio

recordings were then saved under coded names. The recordings were used to enable faster transcription through an automated online service called Scribie. The transcripts produced by it were then manually corrected by two members of the research team. Once the transcripts were ready, they were imported into the program NVivo for further analysis. The themes that emerged from the literature review were set up as the main pre-existing categories. These categories, organized by research question, were the following:

- *Research Question 1:* Electricity (renewables and non-renewables), waste (food waste, solid waste, textile waste), water (drinking water, water consumption, water waste), health and safety (chemicals, dust, temperature)
- *Research Question 2:* Same categories as above filled only by workers' and unions' answers
- *Research Question 3:* Business (factory managers, employer representatives, buyers, NGOs/experts), government (ministry of labor, ministry of environment, NGOs/experts)
- *Research Question 4:* No pre-existing category. They were, then, populated with specific subcategories according to the content present in the transcriptions.

2.3. Limitations

The report recognizes some research limitations. First, the research team was faced with significant limitations regarding quantitative data availability on the environmental impact in the Jordanian garment sector. An example of this data would have been the electricity and water usage and cost for factory managers. The first research question, addressing this subject, was answered primarily based on the existing literature and was complemented by anecdotes generated through data around the other research questions. The second limitation would be the broadness of the topic of overall environmental impacts, as well as the relatively unfledged concept of the intersectionality of environmental impacts and labor conditions. The third set of limitations are linked to logistical challenges: a) the bias generated from convenience sampling and the factories that accepted our visit; b) the indirect account of some actors due to translation; c) and the level of comfort of workers being interviewed at their workplace. It has to be noted that Jordanian workers spoke out significantly more than migrant workers, especially with regards to concerns and issues. Because of the above mentioned reasons, this report is an exploratory study that has no power of generalizability, but provides insight captured by all the main actors present in the context of the Jordanian garment sector.



3. Regulatory Overview

The development of Jordan's garment sector can be attributed to a number of preferential trade agreements with the United States, starting in 1996 with the introduction of the Qualifying Industrial Zones (QIZs). By 1999, the nascent Jordanian garment factories operating within the QIZs exported approximately \$50 million annually to the United States (Jordan's Textile & Apparel Industry 2020). In 2001, the United States-Jordan Free Trade Agreement (USJFTA / FTA) went into effect, creating a comparative advantage and launching the Jordanian garment sector into years of rapid growth. By 2019, the export value of the Jordanian garment sector reached nearly \$2 billion, accounting for up to 28% of total national exports. Over 94% of these exports go to the United States (ILO Skills for Trade and Economic Diversification (STED) in the Garment & Leather Manufacturing Sector in Jordan 2020).

The sector has become a key industry and an economic driver in Jordan, and currently employs over 70,000 workers who represent 2.5% of the country's total workforce (CBI Value Chain Analysis (VCA) Garments, Jordan 2019). Importantly, migrant workers make up the large majority of those working in the garment sector, accounting for at least 75% of the total. This is due to the fact that garment and apparel manufacturing has not historically been an area of experience for Jordanian nationals. Additionally, the global garment sector relies heavily on female workers, and Jordan has the second lowest female labor participation rate in the world at only 14% (Kolben 2019).

The large influx of migrant workers in response to the growing economic demand of the garment sector in Jordan led to major labor and human rights violations in the industry. In 2006, a report by the National Labor Committee detailing abusive conditions in Jordan's garment factories ignited global press coverage (ibid). Better Work launched a program in Jordan (BWJ) in 2008 and has been responsible for massive improvements in terms of labor rights. By 2016, the United States Department of Labor removed Jordan's garment sector from its forced labor list (ibid). The dependence on migrant workers demonstrates how fundamental the FTA is to the existence of Jordan's garment industry.

In many respects, Jordan faces challenges which might preclude participation in the garment sector without the existence of the preferential FTA. Many of these barriers are related to the environment. Jordan is the second most water scarce country in the world, and as such, does not have the capability to domestically produce textile fiber sources (UNICEF Water, sanitation and hygiene 2022). All textiles used in garment manufacturing are imported to Jordan, leading to high costs, long lead times, and GHG emissions along the shipping supply chain.

However, the early stages of garment production, such as textile production and dyeing, cause the most environmental harm and pollution. In comparison to many other garment manufacturing countries, Jordan does not have major issues with these particular negative externalities since its factories focus almost exclusively on the later production phases of cut, make, and trim (CMT). That being said, Jordan's overall resource scarcity also drives a reliance on imported fossil fuels which account for approximately 94% of the energy mix, leading to both higher emissions and higher costs.

According to *Jordan's updated 1st Nationally Determined Contributions (NDC) to Climate Change (2021)*, the industrial sector, which is inclusive of the garment sector, generates approximately 10% of Jordan's total GHGs. It is the second highest contributor behind the energy sector, which generates 81% of total GHGs. For the industrial sector, the report lists the mineral and cement industries as the highest GHG emitters, while the garment sector is not listed as an industry of concern. It is important to note, however, that the high emission energy sector contains the following subsections which may be pertinent to the garment industry: manufacturing industries (4% of GHGs), transport (26% of GHGs), and residential and commercial (8% of GHGs). Additionally, the waste sector, which is the third largest GHG emitter at 6%, includes the subsections of solid waste disposal, incineration, and wastewater treatment, all of which relate to the garment sector. Overall, the report on Jordan's approach to climate change acknowledges that energy and water scarcity are the main challenges facing the industrial sector, and a sustainable approach to efficient production will be necessary in order to reduce excessive resource consumption and high costs.

4. Environmental Impact of the Jordanian Garment Sector

An overview of Jordan's unique positioning with respect to environmental resources is critical to understanding its intersectionality with the garment sector. In terms of climate related development challenges, the key issue impacting Jordan is the scarcity of energy and water. At a countrywide level, Jordan also faces problems with the collection, transfer, and treatment of waste, especially due to the fact that there is no official recycling program (Jordan's updated 1st Nationally Determined Contributions (NDC) to Climate Change 2021). While energy, water, and waste are generally noted as areas of concern in the global garment industry as a whole, their impact in Jordan is substantial due to its inherent resource scarcity. In terms of its positioning in the global textile supply chain, the Jordanian garment sector operates almost exclusively at the cut-make-trim (CMT) stage of production — a less environmentally intensive stage of the industry. Nevertheless, Jordanian garment

factories generate a significant environmental impact in the community, and also affect the health and safety of workers.

In the sections below, the main environmental topics of concern are analyzed in detail. These overarching topics include energy, water, and waste, as well as environmentally related occupational health and safety. This analysis is supported by references from applicable literature, as well as by accounts from interviews with stakeholders and focus groups with garment workers.

The interviews referenced in the topical analysis include the views of various stakeholders engaged with the Jordanian garment sector. These stakeholders include: government agencies such as the Ministry of Environment (MoE) and the Ministry of Labor (MoL); union officials representing the interests of workers; employer organizations representing the interests of businesses; factory managers; a buyer for a fashion brand which sources from Jordan; and an NGO and industry expert. As for the focus groups with garment workers, anecdotes take from two groups with Jordanian women and one group with both Jordanian women and men, one group with Indian men, one group with Indian and Pakistani men, one group with Nepalese women, and three groups with Bangladeshi women.

4.1. Energy

4.1.1. Electricity

Jordan's lack of domestic energy sources has made it largely reliant on importing fossil fuels from more energy abundant neighbors such as Israel (Robins 2014). In fact, energy has been described as the "Achilles heel of the Jordanian economy" (Atzori 2013). Around 94% of Jordan's energy is imported, amounting to about 10% of its GDP (Sandri, Hussam Hussein & Alshyab 2020). The reliance on foreign energy causes high electricity costs and vulnerability to regional political instability and market fluctuations. These costs are driven even higher due to the fact that domestic electricity is exclusively provided through the government run National Electric Power Company (NEPCO). Simultaneously, energy consumption is growing at a rate of 3% each year (Energy Sector Green Growth National Action Plan 2021-2025). Notably, the government of Jordan has committed to the Paris Agreement and other global efforts to transition to renewable energy sources and combat climate change.

According to a study on the knowledge and adoption of green fashion innovation in Jordanian garment factories, the usage of energy sources such as fossil fuels in the factories produces GHG emissions, contributing to air pollution and accelerating climate change in Jordan (Ahmad et. al. 2020). Garment factories in Jordan require large amounts of electricity to operate, since powering machinery,

lighting, and energy in the factories and dorms is resource intensive. While the study conducted by Ahmad et. al. found Jordanian factories to lag behind in sustainable practices such as energy-saving bulbs and efficient machinery, onsite observations of factories demonstrated various stages of progress, with larger facilities in particular being the most advanced (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6).

Factories mentioned that high costs of energy are an issue in Jordan due to all sources being imported. Many factories have invested in technology to make their energy usage and production process more environmentally efficient. As a first step, many factories have switched to all LED lighting to achieve greater energy efficiency. Others have installed newer sewing machines and equipment, such as efficient CAD machinery for precision cutting (Interview Factory Manager 3; Interview Factory Manager 6). Factory managers emphasized that high up front costs for these types of projects were generally mitigated in the long-run due to higher efficiency (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). One factory manager shared that:

So it's basically a win-win situation: for the environment and for me. For electricity, if I save some electricity, it's also a win-win situation because the electricity charges are very high (Interview Factory Manager 6).

Improved machinery is important, as a union worker learned from a roundtable discussion that a considerable amount of energy consumption can be attributed to the fact that machinery is often outdated and not as energy efficient, rather than due to the habits of workers (Interview Union 1).

For the garment workers, energy conservation is encouraged in the dormitories and in the factories. Electronic plugs are advised to be turned off when leaving the dormitory room for work, for instance (Interview Factory Manager 6). The workers are asked by dormitory staff not to keep lights on as it may lead to short circuits and incidents of fire. Two focus groups shared that managers remind staff to turn off their machines during break (Focus Group Nepali Women 5; Focus Group Jordanian Mix 5). In regard to energy generated from commuting, most migrant workers live in the dorms near the factories, while most Jordanians live offsite and have to commute. One group explained that the factory helps organize transportation (Focus Group Jordanian Women 4).

Jordan's sunny climate makes it a good candidate for a transition to solar energy, and the government's recent environmental green growth plan targets a transition to 30% domestic renewable energy sources by 2025. (Energy Sector Green Growth

National Action Plan 2021-2025 2020). In accordance with Jordan's Energy Sector Green Growth National Action Plan 2021-2025, electricity may be generated from a variety of renewable sources, including substantial solar, wind, and biomass resources, all of which encourage economic growth and pollution reduction.

For the garment sector in Jordan, solar energy is a major opportunity that a few factories have started to implement. Ahmad et. al. (2020) reported that using solar energy in garment factories can minimize environmental pollution and substitute for fossil fuel generated electricity in intermittent use areas. The application of solar energy differed across factories. In a conversation with an NGO expert, it was shared that a lot of factories are starting to use solar systems, especially in their dormitories (Interview Expert). Researchers involved in this project noted solar panels on many of the dormitories. This practice was also confirmed during interviews with factory managers who shared that solar energy panels had been installed in their dormitories (Interview Factory Manager 2; Interview Factory Manager 6).

However, the implementation of a solar system at the factory facilities is more challenging, especially in terms of cost. Factories mentioned that the government does not generally provide funding for solar projects (Interview Factory Manager 5). Additionally, according to one factory manager, the government currently only allows 30% solar utilization while 70% of electricity must be provided by NEPCO, the government run electricity company (Interview Factory Manager 3). Additionally, the employer organizations mentioned that getting large environmental projects such as solar parks approved by the government can be difficult (Interview Employer Representative 2). One large factory that was further along in the stages to environmental sustainability mentioned that in Jordan, they are able to build ground structures for solar energy instead of relying solely on roof panels, which will allow them to reach 100% solar energy in the near future (Interview Factory Manager 5). Many of the factories had started installing solar panels for the dormitories, but lacked the necessary funding to install them for the factories (Interview Factory Manager 2; Interview Factory Manager 6). Most factories are still heavily reliant on fossil fuels including diesel and natural gas, and see solar energy as an opportunity.

4.2. Water

4.2.1. Water treatment

Jordan faces an acute water shortage and is the second most water scarce country worldwide (UNICEF Jordan n.d). In addition, its renewable water resources are less

than 100 m^3 per person annually, which is far below the 500 m^3 per person threshold used to define severe water scarcity. It is worth noting that such environmental challenges have become even more pressing with the effects of climate change. The extreme heat and reduced rainfall is a further strain on its energy and water supplies (Updated Submission of Jordan's 1st Nationally Determined Contribution 2021). This extreme climate phenomena has also been combined with a high number of refugees entering the country, adding another layer of concern for the nation's current and future water and energy resources (Combaz 2019). To meet water supply needs, the Jordanian government has mostly focused on enhancing supply through regional transboundary import agreements. More recently, there has been a focus on demand limitation and a cross-sectoral approach to water challenges (Water, Sanitation and Hygiene 2022).

In terms of water, the MoE shared that Jordan treats and reuses most domestic wastewater for agriculture, but has struggled with the reuse of industrial water waste due to hazardous chemicals. The representative mentioned research into opening an industrial waste water treatment plant, and emphasized the need for private sector or government investment (Interview MoE 2).

Since most of the factories in Jordan operate exclusively at the cut, make, and trim stage, water is not necessarily a major issue within the factories that do not have a washing section. Out of 95 factories, only around five use large amounts of water for Tier 2 production processes (Interview Expert). In the dorms, workers are instructed about how much water they should be using due to the issue of water scarcity, and domestic wastewater is sent to a government contractor to be treated for agricultural reuse (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). The factories that work with printing or washing produce industrial wastewater which is considered hazardous waste and is much more difficult to dispose of (Interview Factory Manager 3; Interview Factory Manager 6). One factory has installed a water efficiency system called an Effluent Treatment Plant (ETP) in order to reuse their industrial water many times, before disposing of it in a zone designated by the government (Interview Factory Manager 6).

4.2.2. Water Consumption

The Jordanian garment sector is dependent on migrant workers who live in dormitories near the factories where they work. The balance between saving water in a resource scarce country and providing enough water for workers to live comfortably can be difficult.

The Al-Qatarneh & Abdullah Bataineh (2021) study (N=47) found that 62% of workers lacked access to safe drinking water. This was reflected in three focus groups with workers, who brought up bringing their own water to work, and one incident of noticing the water provided in the factories was unsanitary (Focus Group Jordanian Women 6; Focus Group Jordanian Mix 5; Jordanian Women 4). One union worker echoed this sentiment, sharing that in the dorms, workers are not given enough drinking water, and available water is not always clean (Interview Union 1). As such, workers will buy water bottles from the supermarket, and use water provided by the dorm for other purposes such as cleaning. Sometimes the water provided in dorms is not clear, and will smell and taste strange. Another challenge is that the water is offered on a specific floor, and the workers must carry large, heavy bottles of roughly 15-20 liters. If they run out of water, they can go to the store and buy more. One of the biggest complaints received by the union is about a lack of water for drinking and showering (Interview Union 1). However, this could be partly due to new cultures adapting to Jordan's water scarcity issues. At the same time, some workers were aware of the issue of water scarcity, and some workers mentioned they remind their peers to save water if they notice a tap being left on (Focus Group Indian Male 1; Focus Group Bangladeshi Women 2).

In regard to water facilities, one group noted persistent water leakage in the dorms (Focus Group Jordanian Women 6). Water leakage is not only a concern because of damage such as stains and discoloration, but more critically causes environmental and health consequences. As highlighted earlier, water conservation in Jordan is a marked concern. If there is leaking, water is wasted (EPA 2022). Leaks can also lead to higher utility bills. Second, water leakage can have health ramifications, as the moisture can produce toxic mold and fungal growth, and can attract pests and insects such as mosquitoes (State of Michigan 2020). Lastly, leaks can also cause structural damage to the dormitories.

In 2020, BWJ collaborated with an engineering firm to assess factory and dormitory structures in Jordan (Better Work Jordan Annual Report 2022: An Industry and Compliance Review 2022). Many factory and dormitory structures are old, and many of the dormitories were converted from old factories. These factories were not designed for living accommodations. Improper conditions in wet areas were one of the broad concerns discovered, along with water tanks placed on rooftops which present a structural hazard due to weight concerns. The construction is likely a major factor causing the leakage, among other health and safety concerns.

4.3. Waste

4.3.1. Solid Waste

The generation of solid waste is another concerning environmental impact of the garment industry in Jordan. Regarding waste, the MoE shared that a new national waste framework law was approved in the last year (Interview MoE 1). This law hopes to reduce the problem of waste in Jordan, and seeks to invest in waste management innovations and the circular economy. At present, Jordan has no formalized government recycling program and only 5-10% of solid waste is recycled (UNDP 2014). Because of this, all municipal and industrial recycling is left mostly to informal pickers and private enterprises through voluntary efforts (Jordan Green Building Council 2016). The MoE representative acknowledged the problem of waste in Jordan, sharing that:

We have a problem of random waste. We need to enforce the law to actually reduce these practices, in addition to actually enhancing and promoting the investment in waste management. . . So in this regard, we are talking about circular economy. We must have the management line of waste being in a circle. Whatever goes from the raw materials to the production, then it should either be recycled or reused. So that we minimize the quantity of waste going into the landfill. So our intention is actually to reduce the number of landfills in Jordan and to maximize as much as possible the reuse, and the recycling, and the circular economy with regard to our waste management (Interview MoE 1).

In the factories, waste is typically thrown into bins (Focus Group Indian Male 1; Focus Group Jordanian Women 4). Three groups talked about how music, a bell, or announcement was played a few times a day to alert the workers to clean their stations (Focus Group Indian and Pakistani 3; Focus Group Jordanian Mix 5; Focus Group Bangladeshi Women 3). While there are cleaning staff who come to clean around the stations and various areas of the factory, the garment workers are responsible to clean their own stations and their own machines.

Waste bin availability in the dorms appeared from our conversations to be sufficient, including in the dormitory kitchens. The bins are cleaned out regularly; however, everything is tossed in bins without separation, likely due to the lack of widespread recycling options available in Jordan (Focus Group Nepali Women 5; Focus Group Indian and Pakistani 3). One group mentioned that the trash is picked up everyday from the dormitories (Focus Group Bangladeshi 1).

4.3.2. Textile Waste

Of the materials that comprise Jordan's Municipal Solid Waste, synthetic textile is a unique product of the garment industry that occurs from leftover fabric. The waste originates mostly from the Qualified Industrial Zones (QIZs) in which the factories operate and generally ends up in one of the 21 landfills in Jordan, 7 of which are closed sites (Saidan, Drais & Al-Manaseer 2016). The garment factories sometimes

send scraps to local companies for furniture fill. When scraps cannot be repurposed, they are sent to Al Akaideer for disposal (Solid Waste Value Chain Analysis Final Report Irbid and Mafrag 2015). However, industrial waste directly from QIZs is not accepted in Al Akaideer because QIZ inputs are exempt from import duties (ibid). As a consequence, the textile scraps are then dumped and burned just outside the site boundaries (ibid). One reason for the incineration of textile scraps is that factories are often required to pay customs fees when sending textiles for reuse.

This practice is aligned with Jordan's *Waste Management Framework Law No.16 of 2020* which states that: "Waste that cannot be reduced, reused, recycled or treated in an environmentally sound manner, shall be disposed of by being incinerated or buried, according to the set criteria and objectives." However, the practice of open waste-burning has recently been declared illegal by the GoJ, and the government is working on new solutions to deal with large amounts of textile waste (Interview MoE 2). The government is working to end textile waste incineration since it creates pollutants that damage human health and the environment (UNEP Waste n.d). An example of such harmful emissions from trash incineration includes black carbon – a key component of fine particulate matter (PM2.5) that penetrates into the lungs and bloodstreams (UNEP Waste not: the heavy toll of our trash 2020). The MoE mentioned one project in development with the UNDP to train workers to repurpose textile scraps for new items within the industrial zones. Another project of focus is to use the textiles in combinations with other forms of solid waste to generate heat for cement factories, but it is not clear if this would also cause air pollution (Interview MoE 2).

In interviews with employer representatives, textile waste was also brought up as one of the most major issues the sector is facing (Interview Employer Representative 1; Interview Employer Representative 2). The employer organization sees the reuse of textile waste as a potential area for major innovation and profit by selling to third parties who are able to use the scraps (Interview Employer Representative 1). However, the issue of customs and tariffs in regard to textile waste was emphasized (Interview Employer Representative 1; Interview Employer Representative 2). Since textile waste cannot be transported out of the industrial zones and sold for reuse without significant fees, a large majority of the waste has ended up at the landfill where it is burned or buried. However, with the practice of burning textiles recently becoming illegal, large amounts of textile waste will pile up if a new solution is not found:

They have a decision to close the allocated landfill, and not receive any new amounts of textile waste. Which means that we are talking about around 40 to 60 tonnes per day of textile waste from Irbid, and which means we have a huge amount of daily waste produced in different factories there... (Interview Employer Representative 1).

The employer organizations have been negotiating with the MoE to work on this challenge since the factories end up paying high fees for transport and disposal of textile waste (Interview Employer Representative 1). They also stated that organizations such as the ILO could help to study and implement projects in the textile waste area. In another interview with an NGO expert, the issue of textile waste and customs tariffs was also discussed:

So, for example, 100 meters of fabric that enters should leave the country as well. So if there is any remaining fabric, as compliance we are looking at the rubbish, so we are asking because of the environment, but the customs department, they ask it because it's considered as cost (Interview Expert).

Many of the factories used leftover fabric in innovative ways within the factory itself. For instance, two factories used leftover fabric to create laundry bags, and another factory used leftover fabric as rags for cleaning dyes (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 5). Some of the factories had formed partnerships with private individuals or enterprises that would reuse their leftover textiles for furniture production or other industries. They emphasized that forming these partnerships is an effort that comes at a high cost, and that many of these third party companies are not licensed (Interview Factory Manager 5). Almost all the factory managers recognized reuse of textiles as a major opportunity to work towards (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). To reuse the textile waste, the garment workers discussed how sometimes they collect leftover scraps to clean their machine, but they explained that they could not repurpose the materials for a face mask because of the chemicals (Focus Group Jordanian Mix 5; Focus Group Jordanian Women 6).

4.3.3. Food Waste

The factories have large commercial food operations to provide meals to workers, and this can result in significant food waste (Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5). It is worth noting that non-Jordanians living in the QIZs are paid a minimum of JD 125 as take home wage and JD 95 as in-kind (accommodation and food) (Better Work Jordan Annual Report 2022: An Industry and Compliance Review 2022). Food complaints surfaced throughout conversations with workers and unions, both in regard to quality and taste. The union highlighted food waste as a major issue, which is also related to the many different cultures represented. Many different nationalities result in many different food preferences, and this issue, in turn, can lead to food waste when workers do

not like the food they are provided at factories. Many factories have made an effort to alleviate this situation by offering a selection of food from all the different nationalities of their workers (Interview Union 2).

Three focus groups observed that food is often tossed out because too much is served, or it is not eaten due to taste and other aspects such as warm food being served cold (Interview Union 1; Focus Group Jordanian Women 6; Focus Group Nepali Women 5; Focus Group Jordanian Mix 5). While some workers did eat the provided food, many workers chose to not eat the food offered by the dorm, or chose to eat only the rice and prepare their own vegetables in the dorm (Focus Group Indian and Pakistan 3; Focus Group Nepali Women 5). There is not an easy way to store the food from the factory to save for later if some wished to do so (Focus Group Nepali Women 5; Focus Group Bangladeshi Women 3). Literature supports that nearly three-fourths of workers in dorms brought their own cooking facilities (i.e. small stoves in dormitories), and many eat in their rooms because the dining areas are not readily available or too small (Al-Qatarneh and Bataineh 2021). One worker advised, “everything is great, but they should improve the quality of food as it will help us work better and improve productivity (Focus Group Nepali Women 5).”

Two factories mentioned partnerships with a third party that collects food waste and gives it to a farm. The factories also mentioned training the workers about both textile and food waste (Interview Factory Manager 4; Interview Factory Manager 5).

4.4. Occupational Health & Safety

Al-Qatarneh & Abdullah Bataineh (2021) found in their study (N=47) that almost half of the garment workers interviewed highlighted humidity, dust, lighting, and ventilation as challenges. About half of workers (48%) complained about the poor working environment due to humidity, dust, crowding, darkness, and lack of hygiene (Al-Qatarneh & Bataineh 2021). BWJ’s annual report also highlighted compliance related to these areas, which are further elaborated on in the sections below (Better Work Jordan Annual Report 2022: An Industry and Compliance Review 2022). In turn, more than a quarter experienced respiratory diseases due to lack of ventilation, eye diseases due to poor lighting in the workplace, severe pain in their shoulders and back aches from sitting too long in one position, and pain in the feet due to continuous standing throughout the working hours (Al-Qatarneh & Bataineh 2021). These areas (lighting, temperature, hygiene) were also touched upon during focus groups with workers.

4.4.1. Lighting

Lighting is critical for work efficiency and health. When lighting is poor it can contribute to eye disease, for instance. An analysis of existing literature has shown strong evidence linking greater worker health outcomes and productivity gains to safe indoor working conditions and energy efficient facilities (Fisk 2000). Running two-tailed Pearson correlations from Better Work's compliance and survey data, researchers found that lower electricity costs (electricity cost per unit of output) in Vietnam garment factories were correlated with higher compliance on working conditions (except in regard to Freedom Association and Collective Bargaining) (Drejet and Rappaport, 2014). The authors believe that this could suggest that sustainability strategies may complement strategies to improve labor conditions, although establishing causation was outside the scope of this research. One example they offered is how occupational safety and health (OSH) compliance requires a lot of energy, such as providing proper heating, cooling, and ventilation, and these provisions may be more difficult to accomplish with higher energy costs.

In the focus groups conducted for this research, participants from 3 focus groups commented that lighting felt mostly comfortable (Focus Group Indian Male 1; Focus Group Jordanian Women 4; Focus Group Bangladeshi Women 2). One group discussed how lights were initially placed too close, but eventually the factory changed the lighting set up so they were placed further away, which fixed the issue. Another participant mentioned that if lights are broken, a technician can be called to fix the issue (Focus Group Bangladeshi Women 3; Focus Group Jordanian Women 4). Lights cannot be directly controlled at workstations by the workers, so the lights are often left on during work breaks (Focus Group Nepali Women 5; Focus Group Jordanian Mix 5; Focus Group Indian and Pakistan).

4.4.2. Temperature

Assessments of temperature and humidity in the factories varied (Focus Group Indian and Pakistani 3; Focus Group Indian Male 1; Focus Group Jordanian Women 4; Focus Group Jordanian Women 6; Focus Group Bangladeshi Women 3; Focus Group Bangladeshi Women 2; Focus Group Bangladeshi 1). BWJ found non-compliance around temperature improved from its previous annual report (non-compliance rate: 27%); however, the authors note that the study was conducted during summer, and complaints about temperature typically surface in winter months (Better Work Jordan Annual Report 2022: An Industry and Compliance Review 2022). Many workers commented on the factory's utilization of air conditioning and fans for warmer temperatures. One participant who works in ironing, for instance, stated that the air conditioning was sufficient (Focus Group

Indian Male 1). For others, it felt too hot in the factory all year around (Focus Group Dulayl Jordanian Women 4; Sahab Jordanian Mix 5). One union leader commented that temperature complaints used to be more common in the past, but he has resolved many of the issues addressed regarding temperature (Interview Union 2). Some workers mentioned that there is an air conditioner, but it is not always turned on during hotter months (Focus Group Jordanian Women 4). Cultural differences in attire can also play a factor into variation of assessments of perception of temperature (Focus Group Dulayl Jordanian Women 4).

Similarly, attitudes about temperature regulation in the dorms varied. Some rooms have mounted fans and heaters in the room to regulate the temperature, however, in incidents of heat, one fan is not always enough for everyone in the room (Focus Group Indian Male 1; Focus Group Nepali Women 5; Focus Group Sahab Jordanian Women 6).

4.4.3. Hygiene & Cleanliness

For garment workers interviewed in a 2021 study (N=47), cleanliness and poor hygiene surfaced as top concerns, and 84% of those interviewed noted a lack of hygiene in the dorms (Al-Qatarneh & Bataineh 2021). BWJ also found that one of the highest non-compliance areas is the issue of cleanliness, with about a 52% non-compliance rate (Better Work Jordan Annual Report 2022: An Industry and Compliance Review 2022). The lack of cleanliness causes insect and rodent infestations, which can then manifest in allergies for dorm residents (51% reported infestations).

According to some garment workers, bathrooms are suited for use, but not always hygienic (Focus Group Jordanian Women 4; Focus Group Jordanian Women 6). Sometimes the sewage water leaks (Focus Group Jordanian Women 4), and the presence of rats was noted (Focus Group Jordanian Women 4).

Cutting and production processes in particular contribute to the build up of dust in the factory (Focus Group Indian Male 1; Focus Group Jordanian Women 4; Focus Group Jordanian Women 6). Workers expressed concern about allergies and regularly breathing in the dust as they work, and stated that it also made them cough. One interview discussed how the air conditioners collect dust, and recommended more frequent cleaning of it to allow better air flow (Focus Group Jordanian Mix 5). Some of the dust from the factory is also tracked into the dormitory. When asked why matters such as dust and other health related issues are not raised to supervisors, the focus group explained the managers would not be kind, and there would not likely be a result from raising such issues (Focus Group Sahab Jordanian Mix 5).

Researchers Al-Qatarneh and Bataineh recommended increasing awareness of cleaning as a potential solution. In the focus groups conducted in this study, workers noted a lack of cleanliness in the dorms (Focus Group Jordanian Women 6). When conducting focus groups, some participants explained that room leaders often call meetings to stress the importance of keeping the rooms clean, but these meetings are not always attended by residents (Focus Group Nepali Women 5; Focus Group Bangladeshi Women 3). Staff in the dormitories will also personally address any issues, such as when they observe trash is not disposed of correctly. Some workers mentioned that they purchase their own cleaning supplies and equipment to maintain their environment (Focus Group Bangladeshi 1).

4.4.4. Skin conditions

Multiple workers mentioned that thicker, winter fabrics such as wool can cause their face and skin to itch (Focus Group Nepali Women 5; Focus Group Jordanian Mix 5). The workers talked about wearing long sleeves and masks to offset the effects of the material. They believe the quality of material used to be better in the past. It is worth further exploring the extent and level of discomfort to which these materials affect garment workers generally and to find a solution for this occurrence.

4.4.5. Chemicals

Globally, it is estimated that 43 million tons of chemicals are used in the fashion industry each year (Chen & Larsen 2019). Chemicals such as Per- and Polyfluoroalkyl Substances (PFAS), Phthalates, and Formaldehyde have been linked to health conditions including cancer, skin rashes, and pneumonia. Such chemicals can pollute water, but they also create health and safety concerns (Hagstrom et al. 2021; Bendix 2019). A study of green fashion innovation adoption across Jordan's garment industry found that companies were aware that their usage of toxic chemicals and materials contributed to water and soil pollution, yet implementation of environmentally friendly materials or cleaning products (i.e. low toxicity, organic, or locally grown and made) was low (Ahmad et. al. 2020).

While chemicals are a concern for the international textile industry, less than 1% of factories in Jordan work outside of the CMT process (Interview Expert). Some factories in Jordan have functions such as washing and printing that involve chemicals, but most fall in the tier 1 category. An NGO expert we spoke to expressed that in those instances, the chemicals are mostly well managed, explaining that factories followed protocols such as maintaining a chemical inventory, ensuring chemicals are properly stored, and supplying safety equipment (Interview Expert). In line with this, factories provide training about safety and protective gear to

workers as well as periodic health checkups for those who deal with chemicals (Interview Factory Manager 6).

Even with protocols in place and clean up, it is not always possible to fully clean the chemicals (Focus Group Jordanian Women 6), and attention is still needed. In April 2022, 60 garment workers in as-Sirhan were rushed to the hospital after inhaling chemicals that were accidentally used as cleaning products (Jordan: 60 workers in a textile factory poisoned by a chemical 2022). During the focus groups, workers also detailed some of the health and safety challenges in working with chemicals. Smell was a concern, as well as how the dyes can create persistent stains on the skin (Focus Group Jordanian Women 6). While gloves are available, some workers explained that they are not comfortable wearing gloves while working, and compared it to washing dishes with gloves. Additional participants noted negative health outcomes including eczema, allergies, and coughing (Focus Group Jordanian Women 6). Currently, BWJ collects information in its assessments about chemicals, and its recent 2022 Annual Report found a 9% non-compliance rate for 77 factories assessed (Better Work Jordan Annual Report 2022: An Industry and Compliance Review 2022).

5. Environmental Knowledge and Attitudes

Overall, the factories visited in Jordan were committed to making environmental and sustainability improvements, and there was a range in the level of progress between factories. In terms of worker training, many of the factories stated that they host sustainability orientations for new workers (Interview Factory Manager 3; Interview Factory Manager 5). Some of the factories had visual signage throughout the factories and dormitories that highlighted best environmental practices. Many of the factory managers shared that the various different cultures and languages of the migrant workers presented a challenge for alignment on environmental sustainability (Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). In one factory there could be workers from many different nationalities such as Bangladesh, Pakistan, India, Sri Lanka, Nepal, and Syria. Factories try to educate the migrant workers about the water scarcity and electricity costs in Jordan since it is much different than their countries of origin. Interestingly, one factory manager mentioned that Jordanian workers are often more reluctant to change since they have pre-existing habits and practices within their own country (Interview Factory Manager 5).

Garment workers recounted attending environmental training which included topics such as water conservation, food conservation, electricity, and personal

hygiene (Focus Group Nepali Women 5; Focus Group Jordanian Mix 5; Focus Group Bangladeshi Women 3). Union members interviewed also had organized and brought experts in to facilitate discussions on environmental topics (Interview Union 1; Interview Union 2). It was difficult to gain a sense of how often these trainings were offered, which organizations facilitated training, and who they were offered to in the factory. Some workers did not remember training on such topics or had not been trained, while other workers remember attending an environmental related training (Focus Group Bangladeshi Women 2; Focus Group Indian Male 1; Focus Group Nepali Women 5; Focus Group Jordanian Women 4; Focus Group Jordanian Mix 5; Focus Group Jordanian Women 6; Focus Group Bangladeshi Women 3). Union representatives also brought up the fact that there are multiple cultures and nationalities represented by the migrant workers, and they may not be as familiar about environmental impacts specific to Jordan (Interview Union 1; Interview Union 2). This is especially the case for the issue of water scarcity, as one union representative shared:

Their (migrant workers) countries have a high usage of water and they use it without care. So the biggest challenge is how to educate and how to inform the workers that Jordan is different from their countries. Here we only have the sea and the small beach of Aqaba, and whatever is under the ground. But they are coming from places with high resources of water, oceans, seas, rivers. And sometimes the water in their countries comes as a danger - it's rainy countries. Here in Jordan we only have one month of rain a year. And if it is raining for a whole day, we celebrate Mashallah! (Interview Union 1).

Aside from training, there are audio announcements with instructions to not waste water, to not use drinking water to wash utensils, and to keep the surrounding area clean (Focus Group Indian Male 1). Signage, particularly in English, was visible in some of the factories which promoted ideas such as conserving water and electricity. Workers also discussed how if they noticed their peers wasting water, they would address it informally (Focus Group Indian Male 1).

Factory managers also mentioned that investing in a healthy and sustainable environment for workers would lead to better outcomes. It was a general consensus amongst factories that happier and healthier workers are more productive and high up front costs to provide a good working environment would eventually translate into overall savings:

It is added-value, and absolutely - it serves the business. I will give you an example. If the workers work in a nice environment, they will be working better and they will do more work. They will work relaxed. If they have issues, they will not feel fine (Interview Factory Manager 2).

It's the best for the employees. When you give a friendly environment and good environment to any employees. They feel happy and their performance will automatically be improved (Interview Factory Manager 3).

If you're not good with the environment, maybe a worker will get too much sick in the production and they will always ask for sick leaves because they have some problem. If you have good environment, you will avoid this issue. And also when the workers come to a good environment, they will feel relaxed to work (Interview Factory Manager 4).

6. Opportunities and Constraints Identified by Business and Regulatory Stakeholders

6.1. Government

The Ministry of Environment (MoE) is the governmental body responsible for Jordan's overarching environmental strategies, which include the National Climate Change Policy and Sector Strategic Guidance Framework and the 2025 National Vision and Strategy and National Green Growth Plan. While the Jordanian government is aware of the country's unique environmental threats, actionable results have been somewhat limited. The lack of actionationable results can be attributed to the fact that many policy-makers have prioritized economic growth over environmental targets, and also to an overall fragmentation amongst government agencies (Combaz 2019). During interviews conducted with the Jordan Ministry of Environment (MoE), representatives shared that they have been working on the transition to a green economy, starting with initial assessments in 2012 and leading to the green growth action plan in 2020 (Interview MoE 1). The plan identifies six sectors with the most potential for environmental growth, three of which are highly pertinent to the garment industry: energy, water, and waste.

When asked about the intersection of environment and labor, and whether the Ministry of Environment collaborates with the Ministry of Labor (MoL) on factory inspections, the MoE was clear that the agencies are separate entities. In the current governmental organization, the different ministries have their own scope of work regarding directives and inspections on factories (Interview MoE 2). This includes issues such as factory noise pollution and dust levels, which could be relevant issues for both the ministries.

The Ministry of Labor (MoL) is Jordan's government agency which handles all concerns regarding employment, including migrant labor and vocational training. In an interview with the MoL, the environmental impact on workers was also

discussed. Similar to the effect of what was mentioned by the MoE, the MoL considered labor and environment to be separate issues (Interview MoE 2; Interview MoL). The MoL representative had heard of the 2025 vision green policy in passing, but was not familiar with any of the details since it was perceived that it would not be related to work on labor issues. The MoL mentioned that the most common issue seen in factories is non-compliance with emergency routes due to factories being crowded with packaging materials. The MoL representative also mentioned that the garment sector is organized in comparison to most other industrial industries in Jordan, mostly through the support of various partners such as BWJ, employer organizations, and unions:

It gives them... What should I say? Notices from different sides, from the governmental view, from employer organization view, from working representative view and so on. I think they are lucky, this sector, because they have the opportunity to take the comments from different sides of views (Interview MoL).

Because of this, the sector is more advanced in terms of labor rights, but environmental issues are relatively new. If there is a compliance issue in a factory, the labor inspector will give the factory a notice. If a factory is severely affecting the health of workers, the factory may be forced to close, but this is very uncommon since the sector has vastly improved over the years. The MoL representative also mentioned that if even one worker is unhealthy, productivity issues can arise since the nature of garment assembly is to work together in a line. The MoL also mentioned cost as an initial barrier to factories making improvements in occupational health and safety issues, especially if it takes a long time to see a benefit from such investment (Interview MoL).

6.2. Employer Organizations and Unions

There are two employer organizations in Jordan which engage with the garment sector. The first is an umbrella organization which works with the industrial sector as a whole. The second works specifically with exporting Jordanian garment factories. Both organizations represent the interests of garment manufacturing companies and seek to increase the competitiveness of the industry. In separate interviews with representatives from both organizations, the issue of textile waste was identified as a key issue, as mentioned in the environmental overview on waste (Interview Employer Representative 1; Interview Employer Representative 2). The representatives shared that this is currently a significant barrier that could become an opportunity if regulations were eased. Additionally, the employer organizations mentioned that getting large environmental projects such as solar parks approved by the government can be difficult (Interview Employer Representative 2). One of the representatives shared that since there are many large factories that have

advanced environmental practices, knowledge sharing with smaller factories could also be useful to improve sustainability initiatives (Interview Employer Representative 1).

On the worker side, the union supports the rights and interests of workers in the garment sector by providing education about their rights and acting as a resource to report complaints. Since 2013, the union has negotiated a sectoral Collective Bargaining Agreement as well as a unified contract for migrant, refugee, and Jordanian workers, and continues to strive for equitable and safe labor conditions for Jordanian garment workers (General Trade Union Strategic Plan 2021-2026). Due to lack of legislation, the union delivers complaints from garment workers to the MoL if any legal action is to be taken (Interview Union 1). The union representatives echoed many of the workers' sentiments about water, food waste, and hygiene, and the fact that the different cultures represented can lead to knowledge gaps. (Interview Union 1; Interview Union 2).

Another issue brought up in the union interviews is hidden subcontracting. Some of the smaller factories in Jordan are non-exporting, and therefore, not covered by BWJ. These factories do not abide by the same compliance regulations, and sometimes have poor working environments. It can be an issue if larger factories which appear to be following standards subcontract some of their work to these factories:

They are a small portion. Say 9 of our 79 factories. And the amount of workers are a very small portion of those factories. Yes, and we are trying in many cases to close some of them, move workers from those factories to better ones, but the problem is that we do not have the authority, it's the Ministry of Labor and we are still putting pressure on them to try to do this (Interview Union 2).

6.3. NGOs and Experts

In an interview with an expert in various aspects of the Jordanian garment sector, the relationship between the MoL and the MoE was once again mentioned (Interview Expert). The MoL only has the authority to inspect inside factories, and cannot even inspect inside dormitories without special permission. Alternatively, the MoE is only able to inspect environmental conditions outside the factory. This can lead to a knowledge gap when there are many similar issues between labor and environment:

But I'm not sure about the communication with the two authorized bodies. Because the labor inspectors have their authority inside the premises. However, the environment, they have the authority outside the premises and the surrounding area. So how they are working together, if there is any link... Any committees? (Interview Expert).

In the interview, the expert also mentioned that the large exporting factories face pressure from the buyers to be environmentally sustainable, and are therefore likely to follow regulations. Smaller factories generally have more issues, and the issue of subcontracting was brought up again. However, the increase in environmental sustainability, even in large factories, did not come to the forefront until around four years ago (Interview Expert).

In an interview with an environmentally focused NGO, the representative discussed connecting the public and private sector in Jordan to make progress on green development. Since environmental issues are a new topic in the country, awareness needs to be spread through multiple channels. In terms of industrial factories, the NGO is working on a study of carbon in the industry, and how carbon trading and carbon capturing could have an impact (Interview NGO). The NGO shared that cost is the biggest challenge to the advancement green initiatives:

I think the biggest challenge from my perspective would be cost wise, because initial cost you do have to have a budget for that. And as well as the material, in Jordan we have the material, re-material and the access to it is kind of limited. (Interview NGO).

6.4. Factory Managers

One commonality amongst all factories was use of the Higg Index, and most of the factories had implemented the service in very recent years (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). A previous issue in Jordan reported by BWJ has been a lack of transparency and use of public reporting as a tool to improve factory compliance, so the widespread adoption of the Higg Index demonstrates improvement in this area (Kolben 2019). The Higg Index measures relevant environmental impacts such as electricity, water, and waste and also has a separate tool to measure social and labor compliance. One large multinational factory which is particularly advanced in regards to environmental sustainability mentioned that factory managers have internal KPI's to meet on a weekly basis in regards to environmental efforts:

Every week we review our KPIs. In that, for example, we saw today that there was a lot of electricity usage compared to our budget. It was because we used more gasoline etc. because of the cold climate here in Jordan. But we try to use solar energy for heatings (Interview Factory Manager 5).

All the factories mentioned that buyers increasingly expect to work with factories using the Higg Index, and that missing environmental or social targets can lead to a disruption in the buyer relationship or canceled orders (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview

Factory Manager 5; Interview Factory Manager 6). In terms of the relationship between buyers and factories, buyers sometimes provide guidance and training to factories. However, factories generally conduct independent research and rely on the Higg Index targets to guide their environmental improvements (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). In general, factories were aware that adopting green practices is good for business when selling to multinational clothing companies that have corporate sustainability targets. This is in line with results from a study on the impact of green supply chain management (GSCM) and export performance, where research found that GSCM influences both environmental performance (EP) and export performance positively and considerably. (Al-Ghwayeen & Abdallah 2018).

Five factory managers emphasized that high up front costs for environmental projects (i.e. transitioning to more efficient technology and renewable energy sources) were generally mitigated in the long-run due to higher efficiency, especially due to high electricity costs in Jordan (Interview Factory Manager 2; Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5; Interview Factory Manager 6). One factory manager mentioned that they would need to show the cost benefit within a year after implementing new technology, but for larger projects such as solar panels this timeline could be extended (Interview Factory Manager 5).

The factories mentioned that they have noticed more government initiative on the environment in the past two to three years. Overall, many of the factories stated that increased government support in order to move environmental projects along will be beneficial and would make it easier to invest in sustainable technologies (Interview Factory Manager 3; Interview Factory Manager 4; Interview Factory Manager 5). When asked about the greatest challenge to achieving sustainability goals in the sector, one factory manager shared:

I will tell you in this way, specifically to Jordan... Sometimes it's policy. Government policy is not supporting enough. That's the main challenge right now (Interview Factory Manager 5).

6.5. Buyers

In an interview with a buyer from a large multinational fashion brand which sources from Jordan, the value of the Higg Index was prioritized again. The buyer uses the Higg Index to evaluate environmental impacts of factories. If the factory needs to make changes, they may be put on an improvement plan in order to continue working with the buyer. There is also a clear line in regards to following environmental regulations in which the buyer will no longer source from a factory:

We have what we call zero tolerance issues, that if any of even one of those zero tolerance is there, then this is just like a clear no, no, no, to sourcing regardless of any other criteria. And so those zero tolerances drive us to the choice of where to start or where to stop production. But once we already make sure that there is no zero tolerance, then it starts to become about how we can drive this for further improvements (Interview Buyer 1).

In terms of Jordan, the buyer noted that the country has been advanced in social compliance and labor rights in garment factories for a number of years. The buyer works directly with BWJ to validate the social compliance data. However, the buyer stated that environmental issues are an emerging topic for Jordan, and they are slowly taking steps and moving in the right direction. The buyer mentioned that factories in Jordan often have a dedicated social compliance officer, but it is much less common for them to have a dedicated environmental officer, and technical training may be necessary:

While most of the factories in Jordan, they have a dedicated compliance officer to look after the social aspect, most of them don't have an environmental officer to look after the environmental aspect. This is the clear distinction I think that I can see in most of the suppliers we work with in Jordan. Whereas for other countries, sometimes it's not the case. On this point, we as brands and buyers, we're trying to encourage - you cannot dictate things, and we just encourage them - to have this kind of support because they might not have the technical expertise within their own staff to fill up (Interview Buyer 1).

For sourcing decisions, the buyer considers environmental sustainability as part of a criteria of overall performance, including price, quality, and other factors. The full set of criteria adds up to an overall score for each factory and informs sourcing decisions. The buyer noted that sustainability is a KPI throughout all departments in the company, even those that are not involved in sourcing, and that sustainability can be seen as a competitive advantage to consumers (Interview Buyer 1).

7. Recommendations

7.1. Better Work Jordan

- ◆ *Increase education and awareness around unions:* Improving communication and knowledge of unions is vital for increasing participation, and it is aligned with the General Trade Union of Workers in Textile, Garment and Clothing Industries' 2021-2026 plan. Some environmental and health issues can vary from factory to factory. Some concerns may never rise to the level of being flagged during an audit or an assessment. Many workers

expressed not feeling comfortable going to supervisors, or that their issues would not be addressed. Some workers also were not familiar with unions. Who can workers turn to about environment and health related issues in the factories? Unions can be options. While unions have historically focused on wage and social issues, they have also served as an avenue for addressing environmental grievances.

- ◆ *Encourage partnership between the Ministry of Environment (MoE) and the Ministry of Labor (MoL):* While labor and the environment have noted overlaps, the ministries of labor and environment work mostly independently. BWJ can support building a bridge between the two areas of government. BWJ can encourage information sharing, or serve as an intermediary to connect initiatives and projects on the funding side. Data sharing between government agencies has proven to enhance efficiencies and reduce redundancy. For example, New York City's development of a data department under Bloomberg allowed for information sharing and alignment in work between certain government agencies, and led to a significant improvement in public safety (From Compstat to Gov 2.0 Big Data in New York City Management n.d).
- ◆ *Serve as a liaison between the public and private sector to form effective partnerships:* Business stakeholders, such as factory managers, have formed partnerships with the private sector in order to handle issues such as textile and food waste. This comes at a high cost and takes considerable effort, especially since many of these partners are not licensed by the government. BWJ could serve as a strategic guide for the government and these types of private sector partners to form partnerships which will align with the effort to transition to a green economy.
- ◆ *Become an affiliate of the Sustainable Apparel Coalition (SAC):* The sustainable apparel coalition (SAC) accepts academic, NGOs, and government members. Through SAC, members are able to share research and provide recommendations. Data collected for the Higg Index may be useful for triangulation with Better Work's existing data, however, obtaining access to this level of data needed for BWJ's purposes may currently be difficult particularly as the Higg Index is gradually rolling out transparency programs and data sharing (SAC, 2021). Since the Higg Index is a widespread tool in the industry, and factories are collecting data for this index already, perhaps participation in SAC may be fruitful for paving a path forward to influencing in roads for data sharing.

7.2. Governments

- ◆ *Create incentives to help factories transition to sustainable alternatives:* Sustainability comes at a cost to factory managers. One manager discussed how difficult it is, for instance, to export textile waste for reuse because of the government protocols. One factory manager explained that there is low reward for the factories transitioning to sustainability, and little incentive for factories with little commitment to change except from their buyers. The Jordanian government can build off of its “Golden List” to increase incentives.
- ◆ *Private sector engagement:* Explore private sector support for the government initiatives and incentives. In areas where the private sector performs well, incentivize them to invest in sustainability technologies in Jordan (an example is the water technology startup industry in Israel, which is now one of the global leaders in these developments). Textile waste is also one of the main issues addressed in the research, and this can be an appropriate area for partnership.
- ◆ *Evaluate customs requirements which create barriers in textile waste innovation:* Textile waste is currently being underutilized for reuse due to the barriers around customs and tariffs when the textile scraps leave the QIZs. The resale and reuse of textile waste is not only good for the environment, but could also serve as an economic activity that is able to produce a significant amount of new revenue. Now that incineration of textile waste is becoming illegal, this is the perfect time to come up with a solution before waste begins to accumulate.

7.3. Factories

- ◆ *Factory collaboration:* There are many examples of factories that have expedited their journey to enhanced sustainability, and can serve as leaders for other factories. Discussion forums which create space for enhanced collaboration can be created by factories, employer associations, and NGOs to facilitate sharing of best practices, lessons learned, and innovative strategies. One factory discussed sending its textile scraps for reuse at a different factory.
- ◆ *Food waste:* The garment industry in Jordan is culturally diverse, and many parties attested that the food is curated to reflect the different cultures represented. Workers spoken to were not always fans of the food, and mentioned they saw food being thrown out. Factories can consider satisfaction surveys and assessments to further understand food preferences,

at least to understand the percentage of those working who regularly partake in eating the food, or what can be improved to increase interest in food served in-house. Since factories provide JD 95 of in-kind wages through food and accommodation, it is worth reevaluating if migrants can opt out and receive the wages directly if participation in food services is low.

7.4. Buyers

- ◆ *Adding additional measures of sustainability:* Buyers are an influential driver of sustainability in the industry, and certainly influence which assessments are being used. Across the board in interviews, it was clear that buyers rely on the Higg Index to assess environmental impacts of factories, partly because it is a widely acclaimed tool. While it is an important tool, as with any measurements, there are limitations. In the past, it has been noted that the Higg Materials Sustainability Index focuses more on fiber type than other aspects such as a material's durability or potential to pollute (Wicker, 2020; Hughes, 2021). Buyers should introduce and consider additional measurements to assess environmental evaluation to complement its existing use of the Higg Index. Buyers whenever possible should go beyond what is measured in such assessments to deepen environmental change in factories.

7.5. Unions

- ◆ *Partnerships with environmentalists:* While unions historically have focused on labor rights and working conditions, the union leaders interviewed for this research demonstrated knowledge about different ways the environment affects garment workers. From issues regarding drinking water, textile waste, temperature, hygiene, cleanliness, and even energy, union leaders were able to offer insight because of how involved they are in advancing working conditions for workers. Currently, there are many grievance mechanisms for garment workers, but unions may be able to offer a voice. Calls for partnership between environmentalists and unions are not new (Byrd & Widenor, 2011; Robertson, 2014). Although labor rights can feel like distinct topics, union leaders are activists who should shift to seeing themselves as professionals who can bridge all workplace concerns.

8. Future Research

- ◆ *Training and workshop evaluation:* Explore existing training available around the environment, and assess gaps. While workers and stakeholders were able to speak to training, it is not clear how often, the breadth of topics explored, and who is trained. Behavior change and effectiveness of existing training can be assessed through means such as pre and post surveys.
- ◆ *The connection between energy efficiency and working conditions:* Drejet's and Rappaport's (2014) research of Vietnamese garment industries suggests that factories that experience lower energy costs have better rates of compliance, and encourage similar analysis for other countries with garment industries. Such findings can be helpful for making a business case to the GoJ. It is also worth expanding analysis deeper to understand why a correlation would exist between the two.
- ◆ *Data accessibility:* Gain access to existing data, such as that which is gathered on the Higg Index by the factories. This would be an incredible source for further research on sustainability topics. For instance, the Higg platform has five tools for factories and brands: the Higg Facility Environmental Module (FEM), the Higg Facility Social & Labor Module (FSLM), the Higg Brand & Retail Module (BRM), the Higg Materials Sustainability Index (MSI), and the Higg Product Module (PM). If a significant number of factories are already participating, it would allow for quantitative analysis that is more representative of the whole country. Data can be reworked by BWJ to better fit its research needs, but the data collection would greatly ease facilitation.

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