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Sustainability Issues in the Traditional Cashmere Supply Chain: Empirical Evidence from Kashmir, India

Sheikh I. Ishrat [1,*], Nigel P. Grigg [2], Carel N. Bezuidenhout [2] and Nihal P. Jayamaha [2]

[1] Department of Enterprise and Digital Innovation, Ara Institute of Canterbury, Christchurch 8011, New Zealand

[2] Department of Operations and Engineering Innovation, Massey University, Palmerston North 4474, New Zealand; N.Grigg@massey.ac.nz (N.P.G.); C.Bezuidenhout@massey.ac.nz (C.N.B.); N.P.Jayamaha@massey.ac.nz (N.P.J.)

* Correspondence: imran.ishrat@ara.ac.nz; Tel.: +64-3-940-7586

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Abstract: Considering the emerging global markets for the consumption of cashmere products, current sustainability issues prevailing in the traditional cashmere industry are explored in this study. To get a deeper understanding of the sustainability concerns in the cashmere industry, it is important to understand the cashmere supply chain operations to uncover the key sustainability issues prevalent in the present-day traditional cashmere industry. For this, a single case study was conducted in Kashmir, India using qualitative approaches. Data collection was carried out using semi-structured interviews, observations, cashmere retailer websites and documentary evidence. Due to the impact of mechanization and lack of industry standards, the research findings indicate deteriorating socio-economic conditions of the artisans; especially, women spinners and weavers. Mechanization promotes economic sustainability for the manufacturers and retailers which helps them strengthen their market base. However, with this, artisan communities are rendered jobless who are dependent on their manual skills for sustenance as they have limited alternate revenue generation options. Moreover, the lack of motivation among the artisans to use institutional support further escalates sustainability concerns in the traditional craft industry.

Keywords: cashmere industry; sustainability; supply chains; Kashmir pashmina

1. Introduction

> *The art of progress is to preserve order amid change and to preserve change amid order.*
>
> —Alfred North Whitehead (1861–1947)

Cashmere is an extremely fine specialty natural fiber [1]. In global cashmere production, the contribution of India is significantly smaller than that of China and Mongolia [2,3]. However, the products—especially shawls—handmade in the Kashmir valley (India), are arguably unmatched in sophistication, aesthetics, expertise, and artistic value [3]. Historically, the cashmere craft has been the most significant ambassador of Kashmir for centuries. The characteristics of the handmade cashmere articles produced in Kashmir are unique and much sought after in the domestic and international markets since the 18th century [4]. In fact, the term 'cashmere' was coined to represent the craft originated from Kashmir and signifies the impact of the traditional cashmere (also known as *Pashmina*) industry in the region and in the world [3]. More than 12 million inhabitants live in and around the Kashmir region; and around 7 million reside in the Kashmir valley [5]. In Kashmir, most of the population rely on manual or semi-skilled professions for their sustenance [6]. Among the employment

options in the Kashmir valley, the cashmere industry is one of the most sought-after options for the local populace which provides livelihood to more than 300,000 artisans associated in different capacities with this industry [7].

The traditional cashmere supply chain comprises of: raw cashmere fiber procurement, fiber processing (dehairing, cleaning), transformation (spinning, dyeing, weaving, washing, embroidery), and product labelling to generate value towards the final deliverable to the consumer [3]. In the traditional cashmere industry, a significant number are women spinners who are solely responsible for spinning the yarn by hand. Manual spinning is one of the most convenient jobs for the women of the region for a few reasons, such as that it can be carried out within the confines of their home [8] and is not time dependent. These aspects attract most of the women of the region, especially in the rural areas, to get involved with the traditional craft. For weaving, there are more than 500 handloom cooperative societies registered in the Kashmir region with a membership of more than 15,000 weavers in the organized sector and 20,000 weavers in the unorganized sector [9,10].

In the cashmere industry, tradition plays a significant role in evolving the pashmina craft over centuries, and capturing this aspect is critical for the present study to provide a rich and holistic view of the traditional cashmere supply chains. *Kashmiri* artisanal communities are foremost in producing a variety of cashmere articles which significantly contributes to the economy and social aspects of the region [6,8]. However, it is important to know that, among all cashmere products, shawl making through manual processes is the major source of revenue generation for hundreds of thousands of artisans in the Kashmir valley [7,8]. Based on the findings of a market survey of cashmere retailer websites conducted in the study, 3582 cashmere products under 36 unique product categories were identified (Appendix A). Among all the products, the most significant product categories found were shawl (32.10%) followed by scarf (15.16%), stole (13.12%) and sweater (12.53%). This signifies the importance of handmade shawls in the cashmere industry. Due to a range of factors explored in the present paper, the traditional cashmere manufacturing practices cannot catch up with the changing and ever evolving market trends, and as a result, the centuries-old traditional practices are affected, resulting in a paradigm shift in the cashmere supply chain operations. It is important to know that Kashmir has been involved in political turmoil for the past few decades [10] which significantly affected the infrastructural development of the region impacting socio-economic aspects of the local populace considerably. In 2014, the government of India initiated the 'Make in India' program to encourage the manufacturing sector under various categories [11,12]. In this initiative, the textile industry is considered as one of the sectors for governmental support and promotion for the sustainable development in India. For these reasons, it is a critical time to explore the impact on the artisan communities in Kashmir who have been experiencing economic and social challenges in the traditional craft industry for long. Moreover, the environmental impact of the changes the cashmere industry is going through is yet to be identified.

The present paper results from a project investigating the key themes of sustainability, product quality and value in the traditional cashmere industry operations in Kashmir, India. The research investigates and reports on the main cashmere supply chain stages, highlighting practices and trends that are of relevance to the issues surrounding economic, social and environmental sustainability. Based on this aim, the primary research question that is explored in the present paper is:

What are the key sustainability issues prevalent in the present-day traditional cashmere industry in Kashmir, India?

This can be broken into three sub-questions:

1. What is the financial impact of the industry practices on the artisan communities?
2. What are the social concerns among the artisan communities?
3. How do the cashmere industry practices affect the environment?

In this research, the impact on financial, social and environmental sustainability in the transition from using the traditional approaches to adopting the modern-day practices surrounding the cashmere

industry was explored using the case study approach. For the present research, traditional cashmere industry in Kashmir, India is selected as a single case study. Through this, economic and social impact on the artisan communities was identified and the environmental impact of the existing industry practices was also ascertained. Along with documentary evidence, the other populations of interest considered in the study included cashmere retail websites, artisans and the government officials who were involved with the cashmere industry in Kashmir, India. From the sustainability perspective, cashmere processes and the affected artisan communities formed the basis for analysis. The findings of the study suggest that, during the transitional phase, the traditional cashmere industry artisans have been significantly impacted with the paradigm shift in the industry practices. Especially, woman spinners and the weavers are subject to socio-economic challenges due to the lack of revenue generation opportunities in their traditional craft. Furthermore, the advent of mechanization in the traditional processes coupled with improper wage structures and corruption in the industry practices impacted the vulnerable artisan communities considerably. However, attempts have been made by the financial and infrastructural support through various polices by the government institutions. To the best understanding of the authors, this is a first attempt to address economic, social and environmental impact of the paradigm shift in the traditional cashmere industry. In the present research, contribution surrounding sustainable supply chain management (SSCM) regarding a traditional craft industry is made. Through this, an attempt is carried out to stretch the boundaries of the existing body of knowledge surrounding SSCM.

In the remainder of the paper, Section 2 presents the research background covering SSCM and its related aspects. This is followed by the research methods considered in the study (Section 3). The results obtained from the primary data are presented in Section 4 and prior to the conclusion in Section 6, a detailed discussion based on the research findings is covered in Section 5.

2. Research Background

Sustainability is a large and multi-faceted academic field and literature surrounding the sustainability aspects is transdisciplinary and involves multiple study domains. Of relevance to this study, the body of literature surrounding sustainable supply chain management (SSCM) and its various approaches and perspectives across different industrial contexts is considered. Mainly, the emphasis of the articles is on the textile industry since it is closely related with the scope of the present study.

In literature, the terms 'sustainability' and 'sustainable development' are frequently used interchangeably, however, there is a semantic distinction between the two [13,14]. Sustainability is a multi-dimensional and multi-scale concept [15] involving transdisciplinary areas where social and physical sciences interact [16]. The Brundtland report [17] on World Commission on Environment and Development defines sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." Whereas, sustainable development comprises of economic and social development which protect and enhance the natural environment and social equity [18]. Simplistically, sustainable development can be considered as a holistic process to achieve sustainability objectives [14,18].

For sustainable development, economic, social, and environmental concerns, also known as the Triple Bottom Line (TBL) approach is considered by the industry practitioners and academics [12–14]. For economic sustainability, the major focus of production systems is on economic growth, therefore, as a result, other sustainability dimensions such as environmental aspects or social concerns are seldom considered [14,19–21]. Hence, it is expected that economic sustainability decisions must incorporate other dimensions of sustainability [22]. Social sustainability aims to: mitigate poverty within the economic and environmental framework of the system through cultural identity, empowerment and gender equity [23,24], comply with labor laws [25], manage people's skills [26] and facilitate conducive conditions for the inhabitants to fulfil their needs [27]. Among other considerations, environmental sustainability includes the impact of operations: on ecology [28], climate change [29], which not only

impacts the environment but also has implications for economic sustainability [23], and supply chain networks [30].

Sustainability in supply chains is a major area of research. A sustainable supply chain (SSC) has been defined as the "management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development i.e., economic, environmental and social into account which are derived from customer and stakeholder requirements" [15]. In supply chain operations, TBL dimensions help organizations improve sustainable outcomes by integrating them along the chain operations [15,31–33]. In literature, significant focus has been given to sustainability studies referring to developed economies. However, in developing countries, sustainability considerations have started to gain considerable attention in the supply chain operations across a range of industrial settings [34,35]. For instance, sustainable supply chain management practices from the perspective of multi-stakeholder approach are considered to implement the inter influences of SSCM practices [36] and to identify the barriers in the remanufacturing of the automobile parts [32] in the Indian automotive industry. A multi-tier sustainable supply chain management study highlights the effect of governance in SSCM in Chinese mining and mineral industry [35]. Similarly, in a multi-tier mineral supply chain, SSCM issues link upstream and downstream operations [37]. The encouraging outcomes achieved in Malaysian manufacturing units [38] and in oil and gas industry [39] represent few instances of the broad spectrum of SSCM scenarios.

Particularly, in the context of the small and medium enterprise (SME) manufacturing sector in India, the major discourse is on pollution control and labor laws rather than on integrating overall sustainability efforts [12]. One of the reasons for the lack of motivation in the expenditure on sustainability is low or no expectation of return on the investment [40]. Based on experts' opinion, the manufacturing industry has serious implications on environment, and without adopting sustainability practices, the chances for growth of Indian manufacturing industry are minimal [12]. Therefore, based on the traditional sustainability perspective, the onus is on the focal organization to govern the supply chain as they are responsible to design the product and deliver it to the consumer [15]. For this reason, pressure needs to be exerted on the focal firm through non-regulatory stakeholders such as NGOs to push them for sustainable operations [41]. Recently, in literature, achieving sustainability considering Sustainable Development Goals (SDGs) is gaining attention as another perspective for sustainable development. In 2015, considering the TBL approach, the SDGs were developed in 17 categories by the United Nations (UN) where these goals are "integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental" [42]. To implement the 17 SDGs, the UN approved the 2030 Agenda for the betterment of the TBL globally. Among these, SDG 8, i.e., 'Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all' and SDG 9 'Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation' [43,44] resonate with the sustainable development requirements for the textile industry in India.

Sustainability aspects in the textile industry are primarily ascribed to energy consumption in yarn manufacturing, dyeing, washing and product finishing processes [45,46]. Textile supply chains are known for labor-intensive manufacturing and emitting significant environmental pollution through chemical discharge and carbon emissions [47]. Environmental sustainability considerations are significant for the textile supply chains due to the considerable use of chemicals, energy and water resources [47,48]. The role of human intervention in the textile industry, especially in the traditional craft industry such as cashmere, plays a critical role in supply chain operations. Similarly, Corporate Social Responsibility (CSR) which is closely related with social sustainability [26] is an important factor in achieving sustainability in the textile industry. There is a growing recognition among apparel product consumers regarding the visibility of CSR considerations across various supply chain aspects [49,50]. CSR reports are helpful in establishing trust with the stakeholders by giving insights into the initiative's the organizations take to achieve their sustainability goals [51] and to meet

legal and ethical expectations of the stakeholders [52]. Furthermore, regarding achieving sustainability in luxury products such as cashmere, product design, distribution strategy, country of origin and counterfeit issues are critical factors in the operations [53]. A study on the Iranian cashmere industry further indicated that price fluctuations, variable market conditions and the constraints surrounding different value addition stages are significant in the chain operations [54]. Moreover, a shift from the marketing strategies to generating consumer awareness of the cashmere processes is observed in the cashmere retail operations [55] and branding [2] aspects.

In this work, based on the sustainability domains discussed in this section, results are presented in Section 4 and a discussion based on the research findings is presented in Section 5.

3. Materials and Methods

3.1. Research Perspective

It is important to know that this research examines a traditional industry where education and literacy levels are relatively low [8]. For this reason, a constructivist ontological perspective was adopted to suit the study requirements. It was considered impractical and unreliable to examine the traditional cashmere supply chain using reductionist, objectivist methods such as surveys or quantitative approaches. Furthermore, social, financial and environmental factors significantly influence the traditional cashmere industry which are difficult to capture through objectivism [56]. Contrary to quantitative approaches, qualitative research captures a complex phenomenon, identifies the stakeholders and their relationships and articulates these aspects in the context of the phenomenon under investigation [56]. Therefore, considering the research objective of the study, interpretivism is viewed as the epistemological position to properly understand human, material and institutional aspects that play a critical role in the traditional cashmere supply chains.

3.2. Case Study

For this research, the traditional cashmere industry in Kashmir, India is selected as a single case study to identify the sustainability issues prevalent in the present-day cashmere supply chains. Single case studies provide the opportunity to explore the phenomenon from multiple perspectives within the bounds of the case [57]. Additionally, single case studies allow flexibility and opportunity for in-depth exploration through multiple data collection methods [56]. Among other reasons, a single case study can also be considered to study a unique scenario [56] which suits well in the context of the traditional cashmere industry. In empirical investigation, four criteria are important i.e., place, participants, observation of the participants and process undertaken by the participants [58]. Based on the qualitative nature of the present research, the lead author immersed in the ethnographic situation to obtain data that reflect the real-world traditional cashmere supply chain operations in the Kashmir valley. The aim of ethnographic studies is to explore and gain deep insights and perceptions of the people in the context of the study [59]. Capturing this aspect is critical for the present study to provide a rich and holistic view about the traditional cashmere industry.

3.3. Data Collection

In research, identification of appropriate population is critical. For data collection, four populations of interest were considered in the research.

- Cashmere retail websites
- Cashmere artisans in Kashmir, India
- Government officials involved with the cashmere industry in Kashmir, India
- Document related with the cashmere industry in Kashmir, India

To fully understand the richness and multitude of perspectives in traditional cashmere industry, primary data were collected through interviews, observations, photographs and documentary

evidence. Semi-structured interviews from suppliers (S), spinners (Sp), weavers (W), involved with both Traditional (THL) and advanced (AHL) looms, manufacturers (M), dyer (Dy), embroider (E), tweezer (Tw), retailers (R) and government officials (G) were conducted. Apart from conducting the interviews, different processes were observed such as dehairing (D), washing (Ws), block printing (BP). A summary of the data collected from various sources in the research is presented in Table 1.

Table 1. Data sources across cashmere supply chain processes collected from the field trip.

Data		S	D	Sp	M	W			Other Processes				R		G	
Type	**Source**					**THL**	**AHL**	**Dy**	**E**	**Tw**	**Ws**	**BP**		**1**	**2**	**3**
Primary	Interview	✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
	Photographs		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓			✓
	Observation		✓	✓		✓	✓	✓	✓	✓	✓	✓				
Secondary	Documents			✓		✓	✓									✓

The data for this research were collected from the Kashmir valley from December 2017 to February 2018 using the approach presented earlier [60]. A summary of the data collected from various sites and sources in the research is presented in Table 2.

Table 2. Data respondent categories and data collection sources.

Respondent Category		Data Sources		
		Sites Visited	**Interviews**	**Observations**
Supplier (S)		2	2	-
Dehairing (D)		1	-	1
Spinner (Sp)		5	3	3
Manufacturer (M)		3	3	-
Weaver (W)	Traditional (THL)	3	3	3
	Advanced (AHL)	3	3	2
Dyer (Dy)		1	1	1
Block Print (BP)		1	-	2
Embroider (E)		2	1	2
Tweezer (Tw)		1	1	1
Washing (Ws)		1	-	1
Retailer (R)		3	2	-
Govt. Official (G)		3	3	-
Total		29	22	16

Among the artisan categories, the two most important ones are the spinners and the weavers. The spinners selected for the research were middle aged women (36 to 60 years) who had considerable experience (16 to 30 years) of spinning the yarn manually. Whereas the weavers selected in the study were young males to older men (31 to 60+ years) who possessed a significant range of experience (6 to 35+ years) in their craft. Similarly, in other artisan categories, a wide range of age (25 to 60+) and experience (6 to 35+) in their respective crafts was observed.

Moreover, the broad range in age and experience of the artisans was helpful in critically assessing the different viewpoints these artisans have for their crafts. Furthermore, to acquire a well-rounded overview and a rich description of the traditional cashmere industry, the lead author ensured that the interviews from the same artisan category was not conducted at once, but rather spaced between the interviews with other stakeholders. Additionally, no more than two consecutive interviews were conducted with the spinners and weavers so that based on their responses, as need be, the lead author could ask questions to other relevant respondents, such as the government officials to seek their opinion on the concerns or issues raised by these stakeholders. This was helpful to capture the views

from different perspectives and to help minimize the risk of overlooking or missing any information. Therefore, the data collection process was not linear but rather iterative.

3.4. Data Analysis

After conducting the field trip, the lead author transcribed the interview data. This activity was helpful to re-familiarize with the dataset to gain an overarching view of the responses collected from the different participants in the study. After this, a range of codes were generated from the interview transcripts using NVivo 12 Pro software to conceptualize data. Finally, similar categories were placed together which evolved into sub-themes and later collapsed into different themes. A theme captures repetitive ideas containing codes with common point of reference to unify ideas of the research inquiry [61]. In this research, themes which evolved from the data are classified from the perspectives of the processes, products and stakeholders which are impacted by the practices prevalent in the present-day traditional cashmere industry in Kashmir, India. From the perspective of economic, social and environmental aspects, traditional cashmere processes and the artisanal communities impacted by the existing industry practices formed the basis for analysis in the research.

4. Results

The results are generated from the combination of all data sources as presented in Tables 1 and 2. In the context of the traditional cashmere industry, it is critical to investigate the processes and the stakeholders who are associated with these processes. The results on these aspects pertaining to the traditional cashmere industry are presented to address the research question: What are the key sustainability issues prevalent in the present-day traditional cashmere industry in Kashmir, India? For specificity, the results are presented considering the sub-questions presented in Section 1.

4.1. What Is the Financial Impact of the Existing Industry Practices on the Artisan Communities?

4.1.1. Rising Unemployment

Unemployment is an issue in almost every industrial sector. However, in the context of the traditional cashmere industry in India, this issue has further escalated due to the mechanization of the traditional processes. Due to this, artisans—especially the spinners and weavers—are severely affected as their work opportunities are snatched from them. As mentioned by a government official, "In many *Kashmiri* households, pashmina has been a source of income for centuries. For a considerable population in Srinagar, pashmina is a source of revenue generation where both women and men are involved in various pashmina activities almost throughout the year. Especially, during the harsh winter season (which lasts around four months) spinning activities are carried out by women who could do it in the comfort of their homes while taking care of the other household responsibilities." Similarly, a weaver stated that, "Manual spinning is one of the most convenient jobs for the women of the region for quite a few reasons such as it can be carried out within the confines of their home, it is not a time-bound job i.e., it can be performed at any time of the day (morning, evening, night) depending on the preference of the artisan".

However, with the advent of mechanization in the spinning process, women spinners have been deprived of the opportunity they enjoyed for centuries. Therefore, with the lack of spinning opportunities, the women spinners face financial issues since the spinners are not able to contribute monetarily towards their family. In this regard, an apt opinion was expressed by a manufacturer who stated that, "The women have been marginalized and rendered jobless by the spinning machine in the current unfortunate scenario prevailing in the *pashmina* industry. On the contrary, if machine spinning of pashmina is abolished and the entire range of existing *pashmina* spinning opportunities are provided to the women spinners of the region, then a significant amount can be generated collectively in revenue by the women spinners annually."

Like the spinners, due to mechanization, many other artisans such as the weavers have also lost their livelihood. In certain cases, especially the older generation of weavers are completely dependent on their family members for their survival. For instance, a weaver mentioned that, "My complete family including mother, sister, wife and father is involved with this traditional craft. They all do different *pashmina* related tasks according to their expertise and help each other. In this scenario, imagine the impact of mechanization on my family. If the existing scenario continues, the complete family will crumble as it is not easy for us to find an alternate source of revenue generation."

4.1.2. Downward Pressure on Wages

Apart from the unemployment challenges faced by the spinners and the weavers, insufficient wages in their respective crafts is also a significant issue that leads to the financial issues these artisans face. For instance, a spinner, who is a critical actor in the traditional cashmere supply chain, gets the same remuneration as the previous generation of spinners used to get a couple of decades earlier. As mentioned by an official, "30 years back a women spinner who used to get Indian Rupee (INR) 1 for tying a pashmina knot still gets the identical amount for the same task." In the traditional cashmere operations, weavers are no exception to the wage issues prevalent in the industry. For instance, based on the discussions with the weavers, it was observed that earlier for the shawls for which the weavers used to charge around INR 1000, now these artisans find it difficult to make INR 500 for similar articles. The reason for the downfall in wages is ascribed to the mechanization of weaving since for the manufacturer, it is beneficial to get an article made on a mechanized process for only fraction of a cost that incurs through the manual weaving process. In an instance, a weaver stated that, "Earlier we used to get as much as INR 80,000 for an exquisite shawl but in the present scenario, for the same article, we get INR 35,000–INR 30,000." Similarly, earlier for a *Kani* shawl maker, who would make as much as INR 200,000 over a period of six months, this was considered a good amount. However, at present, the wages have significantly dropped to more than half the amount the *Kani* weavers used to get a decade back.

Another reason for the low wages in traditional cashmere industry is ascribed to the emergence of individuals who consider cashmere as their alternate business activity. These new entrants have their major source of income from other avenues and explore opportunities in various cashmere related processes depending on their preferences and ability. Due to this, the wage structure is further diluted in the industry which was already bearing the brunt from cashmere products being made from mechanical processes. A weaver stated that, "For one stole, generally a manufacturer would give INR 350, however due to other options available to them now things are not the same anymore. There are instances, where artisans have made a stole for as low as INR 200 which is roughly half the price an artisan deserves for a handmade article." Like spinners and weavers, other artisans such as tweezers and embroiders are also struggling with low wages to make ends meet. As stated by a tweezer, "Mechanized processes are efficient for weaving larger volume of shawls. However, they use blended fibre which does not need manual tweezing." The tweezer further stated that, "the shawls made on the handlooms require tweezing, however, it does not help financially since the wages are lower than before." Earlier, for tweezing the shawl, the tweezer used to get INR 100. However, at present, the tweezer is offered no more than INR 20 per shawl for the same task he used to do before. Similarly, as mentioned by an embroider, "Artisan wages are the same today as they were a decade ago. For instance, if an embroider used to get INR 150 on the daily basis 10 years back then their remunerations are still the same."

4.1.3. Cashflow Issues

In supply chains, while product (or value) flows downstream, money flows upstream from the consumer and retailer, to pay the various actors. Under the financial challenges expressed by the artisans, payment of wages is another issue which also impacts the artisans considerably. In general, the cashmere artisan community is financially vulnerable and possesses limited cash

reserves. Delayed payment of the wages by the manufacturer or the retailer leads to dissatisfaction and opens a window of opportunity for the artisan to take loans, which is another vicious cycle for the artisan to get into. As stated by an embroider, "On time payment is also a significant issue in the industry where the artisan may have to wait up to a few months to get their wages paid post completing their share of the task." Additionally, at times, partial payments with a promise to provide more work in future in lieu of the remaining payment are made by the influential actors of the chain. Based on the findings, another reason leading to the payment issues surfaced, i.e., demonetization of currency. Demonetization was a one-off step taken by the government of India in 2016 in which currency denominations worth INR 500 and INR 1000 bills were made illegal tenders. The impact of demonetization was significant across various industrial sectors and its impact and ripple effects were considerable down the cashmere supply chain. As mentioned by a dyer, "Pashmina products were not being sold since the transactions were almost non-existent due to the non-availability of the cash."

4.1.4. Corruption

In traditional cashmere operations, the manufacturer and the retailer are considered as the most powerful actors of the supply chain due to their reach and influence on various industry stakeholders. In this regard, an artisan highlighted the significance of these actors in the cashmere supply chain by stating that, "Influential people such as manufacturers and retailers control the industry. People in the industry are corrupt as these powerful actors give credence to the counterfeit pashmina article since they have a mechanism and channels to legitimize the counterfeit product as genuine." An artisan stated that, "Powerful people who are industry billionaires have high level contacts in government establishments. Such people climb up the ladder and have made their life comfortable. However, for their own selfish motives they have compromised on the pashmina craft."

4.1.5. Power Imbalance in the Supply Chain

Another reason that leads to the financial struggle of the artisans in the cashmere supply chain is improper profit sharing. The manual process to produce cashmere articles is time-consuming and tedious. Unfortunately, the hard work of artisans is not reflected in their wages leading to dissatisfaction among the artisan communities. Artisans are dissatisfied with the current state of profit sharing in the industry as they are aware that the strong actors in the chain especially those who own retail outlets such as showrooms and export pashmina articles in different parts of India and overseas are the actual beneficiaries. Inappropriate sharing of the profit margins by the powerful, and at times corrupt, chain stakeholders is one of the reasons that makes the artisans switch to another vocation as they realize that the existing wage structure is not conducive to sustain themselves. For instance, according to a weaver, "Artisans are exploited by the powerful actors in the chain. If a manufacturer or retailer sells a shawl for INR 200,000 then they would give INR 40,000–INR 50,000 to the artisans as wages who may spend up to a year in making such a shawl." Another artisan mentioned that, "We would get paid in the range of INR 30,000–INR 50,000 but the manufacturer or the retailer would fetch INR 200,000 whereas the cost of the woven fabric is just INR 5000. The manufacturer is the sole beneficiary and the artisans are at a loss." A pashmina article may fetch the manufacturer or retailer more than INR 100,000. However, all the artisans combined merely get 10–20% of the selling price. A weaver who used *Kani* sticks for weaving mentioned that, "In comparison to the amount of effort, expertise and experience required to accomplish a pashmina article, the return is not worth even 5% of the inputs exhausted in the work."

4.2. What are the Social Concerns Among the Artisans?

4.2.1. Artisans Leaving Their Cultural Heritage

According to a weaver, "the art of making traditional pashmina products flourished and attained global recognition due to the guidance and blessings of our ancestors who not only developed the

craft but also took pains to keep the values intact required to make genuine pashmina articles. Sadly, these values and practices, over the period have deteriorated and gone from bad to worse in recent times." As mentioned by an official, "the elderly people used to contribute towards pashmina related processes as per their ability and expertise such as weaving, tweezing and embroidery related tasks and generate reasonable amount of revenue for the family." However, in the present scenario, many manual cashmere processes are shifted to mechanical processes. Therefore, the artisans associated with these processes are also affected. According to an embroider, "In the present scenario, daily commodities are getting expensive which makes it almost impossible for the artisans to survive and support their family needs. Due to this, many skilled and experienced artisans who were involved for generations across different pashmina processes have already left their respective crafts or contemplating on these lines." Furthermore, the embroider stated that, "in general people progress in life, but ironically for the artisans who are involved with this profession for generations, life becomes regressive."

In another instance, a tweezer stated that by carrying out 'tweezing' alone it will not help sustain the household requirements. According to the tweezer, a "similar situation is encountered with everybody else in the pashmina artisan community." For sustenance, the tweezer learnt embroidery to find other work opportunities available in the pashmina industry. The tweezer also mentioned that his children have abandoned the tweezing profession and instead chose to earn their livelihood working as laborers. A spinner reported that she has passed on this craft to her college-going daughter but does not want her to pursue this profession. Instead, she said, "*Padai likhai kar ke kuch karna behtar hai, iss kaam me ab wo baat nahi rahi. Bas ab to majboori main hi karte hain kyonki aur kuch nahi hai humko*." (It is better to study as this craft is not the same as it was. Now, I am doing it out of compulsion as there is nothing else to do except this; referring to the fact that the artisan only knows this craft).

Mechanization is fast replacing the human element from spinning and as a result, the new generation of artisans are not willing to take up the traditional craft as they do not see future in it. On the contrary, for these workers a qualification or a skill elsewhere is likely to result in a more rewarding job. A spinner stated that, "spinners, especially the younger generation is not interested in pursuing the centuries old skill set but rather seem interested getting into other jobs such as 'chain stitching' which can be carried out within the periphery of their homes." Furthermore, the spinner stated that, "if a better opportunity is available for an alternate vocation, then perhaps in the present scenario not many spinners would be interested in this skill." According to another spinner, "at present, no more than 5% of the pashmina spinning is being carried out manually in the Kashmir valley which has been the major hub of manufacturing handmade pashmina products for centuries."

4.2.2. Disempowering Women Spinners

Kashmiri artisans are foremost in producing cashmere articles which significantly contributes to the economy and social aspects of the region. Traditionally, the raw material, i.e., cashmere fiber, is spun primarily by woman spinners. According to a spinner, "Mechanization of the traditional processes has imposed a 'threat' and impacts a considerable amount of populace who are out of work and are left with few options to do anything else." Another spinner mentioned that, "there is a significant effect on the spinners since the manufacturers get the machine spun yarn and provide it to the weavers leaving no role for women spinners in the cashmere industry." Through skipping the manual spinning process, the manufacturers not only save in terms of monetary aspects but also get large volumes of spun pashmina (blended though) in a relatively shorter time frame. A weaver expressed his thoughts by saying that, "at present, the role of women spinners is almost negligible in the spinning process." In spite of the fact that there are many government policies and schemes at the regional and national level to empower women, but in the traditional cashmere industry, women face insurmountable challenges due to the emergence of mechanization in the spinning process. According to a manufacturer, "on one hand the government institutions advertise and encourages 'women empowerment' through the different schemes they launch whereas by allowing spinning on machines they are disempowering the *Kashmiri* women." As stated by a government official, "the machines have

taken over manual spinning process resulting in loss of jobs for women spinners for whom spinning was the only source of earning livelihood for their families."

An official who is involved with testing the quality of the fiber and yarn, concurred with this harsh reality stating that, "almost 90% of the present-day spinning is being carried out on mechanical processes." An artisan stated that, "even though for most of the women spinners there is no alternate vocation to switch to as they only have been involved with spinning the yarn for decades, the extent to which spinners are leaving manual spinning can be gaged from the fact that a decade back if there were 30,000 women spinners involved with the activity in the Kashmir valley then at present it is difficult to find even 400 such individuals who can pass on the skill set to the next generation of spinners." The mechanization of the spinning process has taken over manual spinning process resulting in loss of jobs for women spinners for whom spinning was the only source of earning livelihood for their families.

4.2.3. Hard-Hit Weaving Community

As a result of mechanization in the traditional cashmere industry, other than the spinners, the most hard-hit category of the artisans are the weavers. Apart from facing the livelihood challenges, respondents from the weaving community reported diminishing respect towards the artisans and the pashmina craft in the society. The weavers were proud of their traditional heritage, unique skillset, and unparalleled craftsmanship which, due to mechanization, is not in the same demand as before. Moreover, a high degree of disappointment was found among the artisan community towards the officials for not protecting the centuries-old craft. Unlike spinners, the weavers mentioned switching to other professions based on their skills or even to menial job opportunities that arise elsewhere. A manufacturer stated that "the government institutions were aware of the issues pertaining to the impact of mechanization for quite some time but have turned a blind eye resulting in the marginalization of weavers who are left with little options but to opt for other job opportunities." A weaver, whose wife is also involved with spinning, mentioned that, "there are two weaving approaches prevalent among the weaving community. In the first approach, the Traditional Handloom (THL) is used, whereas in the second one an advanced version, using a shuttle, of the handloom is used instead. The advanced handloom (AHL) is relatively faster to weave a shawl and results in a decent outcome." However, due to this, the weavers who are associated with traditional handlooms have suffered significantly since they are not able to match the product volumes generated from the advanced handlooms. For instance, using an advanced handloom if four shawls are made in a day then using a traditional loom it would take at least two to three days to come up with equal number of shawls.

Based on the present scenario in the cashmere industry, weavers are leaving the craft and opting for other sources of revenue generation since it is not feasible to sustain themselves. A weaver mentioned that, "his family has been involved in the weaving profession for four generations and based on his father's footsteps the weaver also joined the family tradition." However, for the newer generation, there is hardly any gains and they do not see much future in the craft. As a result, they do not see themselves earning their livelihood working in the traditional pashmina industry. Furthermore, another weaver mentioned that, "many of the artisans who were involved with pashmina processes in different capacities are now selling vegetables or working as laborers for their survival." A *Kani* weaver mentioned that, "the younger generation finds it difficult to adopt to the requirements of the pashmina craft. In Srinagar district, a few decades back, there used to be hundreds of *Kani* weavers, however at present no more than 50 such artisans are involved with this exquisite craft." Furthermore, the *Kani* weaver stated that, "many of his acquaintances from the weaving community are on the verge of starvation and have opted to run an auto rickshaw or sell vegetables." The *Kani* weaver himself started a business of distributing and selling blankets to the shops around the city.

4.2.4. Alternate Options for Artisans or the Lack Thereof

An official mentioned that "approximately 95% of the artisans associated with pashmina industry are not educated formally." This leaves them with not many options to look for other professions

but to opt for unskilled jobs opportunities, if they get any. The official also mentioned the role of the weather that restricts the artisans to look for other sources of revenue generation avenues. In Kashmir, winters are very harsh and long and it is difficult to venture outside and perform other jobs. Whereas, many pashmina processes such as fibre cleaning, spinning, weaving, tweezing, block printing can easily be performed with the confines and comfort of the homes. Furthermore, since for the past couple of decades, Kashmir has been under political turmoil so any event that disrupts the normal functioning of daily activities such as a call for a strike by a political party, unrest in the valley or any other similar activity have bare minimum impact on the artisan who performs their job sitting at home. An official stated that, "Tourism was another viable option for many artisans but due to the instability in the region, the tourism industry also does not guarantee a secure option to earn a livelihood". An embroider mentioned that, "an artisan would make INR150 per day which is roughly the same amount they used to get a decade ago". Furthermore, the embroider stated that, "even though the artisan community is financially fragile but there is an awareness among the people that it is likely for them to fall into the trap of making 'easy money' by getting involved into illegal activities such as drug peddling through which up to INR 3000 can be earned on the daily basis". The embroider also mentioned that, "such actions will not only result in a deplorable reaction by the family members but will have an adverse impact on the society at large." As further stated by the artisan, however, there are instances where some artisans have succumbed to the challenges of the downturn in pashmina industry and get themselves involved in illegal activities.

4.3. How Does the Industry Practices Effect the Environment?

4.3.1. Chemical Treatment

Dyeing the yarn on a finished product is an important process (Figure 1a). In this process, the yarn is exposed to a specific color in a container filled with boiling water (Figure 1b). Once the process is over the water is contaminated with chemicals and is poured on the floor to make its way to the drain (Figure 1c). As observed, the drain enters the nearby water body containing the chemicals and residuals, threating the ecology of the region.

(**a**) (**b**) (**c**)

Figure 1. Environmental concerns in the cashmere industry in the dyeing process. (**a**) Yarn being dyed; (**b**) Dyers in action; (**c**) Waste water outlet.

Traditionally, organic compounds were used to dye the yarn. A dyer mentioned that "over the years, significant difference is observed in the dyeing options. Earlier, natural dyes were used which were available in 10 to 12 different shades to dye the yarn. However, at present, synthetic dyes are being used primarily for few reasons." The dyer further elaborated that, "Firstly, the natural dyes or colours

are difficult to find these days in the market as we used to procure them from the same source as we do for the synthetic dyes. Secondly, to dye the yarns based on customers' requirements, there are as many as 450 different shades of colours that are classified in a standard shade card. Using natural dyes, it is not feasible to have as broad of a range of dyeing options as they are available with chemically processed dyes". With more than 20 years of experience in the dyeing profession, however, the dyer mentioned that "it would be helpful for the environment if the use of chemical dyes are restricted and the usage of natural dyes are encouraged." An official mentioned that, "the trend in the Western countries is to opt for natural products, for instance, the shift is towards consuming organic and eco-friendly products." Similarly, in pashmina industry, there is a realization that the only sustainable way forward is to opt for the traditional ways of dying using natural sources. However, the market share for such environment friendly products in general is very small. Now, in most instances, cashmere fiber is blended with other natural and/or synthetic fibres. However, in the cashmere industry, the blended yarn undergoes a chemical treatment process to dissolve the foreign element, i.e., the fiber such as wool, silk or nylon from the cashmere fiber. Based on the current industry practices, the chemical treatment of the blended yarn is carried out on a large scale and has a detrimental impact not only on the durability of the product but also on the environment due to the lack of waste water management mechanism in the region.

4.3.2. Impact on Ecology

Similar to dyeing, the ongoing washing practices are not sustainable and draw attention towards major environmental concerns. After washing the cashmere article, the contaminated water finds its way from the washing facility through the drain (Figure 2a) to the nearby water body which severely impacts the ecology of the area (Figure 2b). As mentioned by a spinner, "the chemicals which are used to get rid of synthetic components from blended pashmina yarn is ultimately left to flow in the nearby water bodies".

(**a**) (**b**)

Figure 2. Environmental concerns in the cashmere industry through washing practices and inappropriate outlets of waste leading to water clogging. (**a**) Washing a handmade cashmere shawl; (**b**) Water clogging near the washing facility.

A washerman shared his views on this aspect and stated that, "until 30–40 years back the riveret (flowing beside the washing facility) was crystal clear and good enough to drink the water from. However, due to negligence on the part of the community and lack of government support things have drastically changed for worse."

4.3.3. Carbon Footprint

Apart from the fact that the raw materials processed in mechanized processes are of inferior quality, such processes represent another threat to the environment. For example, it was reported by the weavers that, "weaving carried out on the power looms consumes a significant amount of energy as opposed to the traditional loom, which is a manual process, and leads to serious environmental concerns especially with infrequent power supply in the region." Because of this, the power looms

are operated through diesel-operated generators which emit toxins in the environment and leave a carbon footprint which severely effects the environment. In contrast, the handlooms promote cleaner production practices as they are manually operated and impose no adverse impact on the environment [8]. In the cashmere industry, through mechanized processes there is a considerable impact on the environment leading to air and noise pollution. In many industrial settings, initiatives are taken to address environmental concerns and to advocate for sustainable operations [62,63].

For sustainability in the traditional cashmere industry, the TBL approach should be considered in the chain operations to enhance the value for the consumer [16,31]. Regardless, the TBL model remains the backbone of sustainable development; however, over the years, new dimensions have evolved to address cultural [64], technical [65] and institutional [14,66,67] sustainability. In fact, a four-pillar sustainability model (Figure 3) capturing institutional sustainability at the core as an additional pillar is included in the existing TBL approach [14]. The role of stakeholders such as government institutions and consumers is critical in integrating the TBL approaches to create sustainable supply chains [68]. The inclusion of institutional aspect as the fourth dimension [66,67] indicates the significance of the institutional intervention for sustainable development.

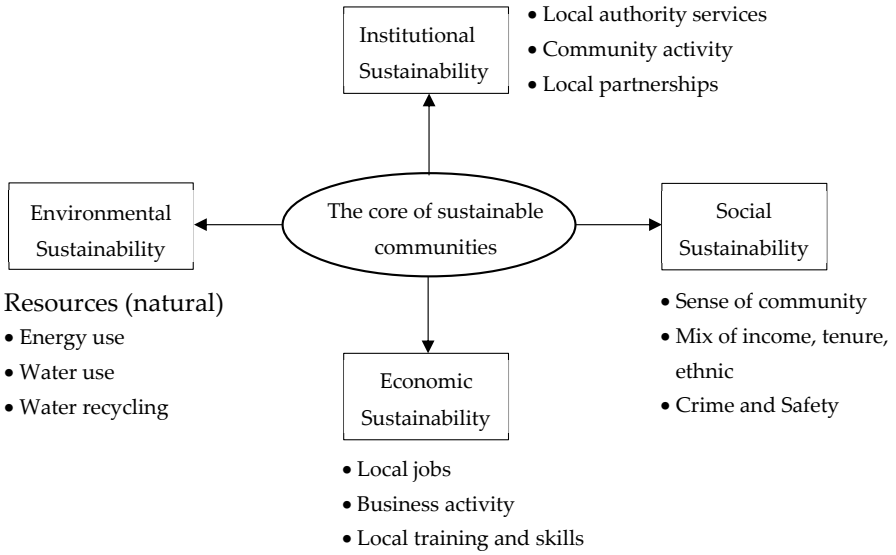

Figure 3. List of sustainability indicators adopted from the four-pillar sustainability model [68].

The results of the study maps well with the sustainability indicators [68] considered in the study. Current cashmere industry operations are changing the dynamics of the communities involved with spinning and weaving practices in the region. They are also affecting the communities involved with manual dehairing and other ancillary activities such as embroidery and tweezing in the region rendering them jobless. These aspects not only impact the economic situation of the artisanal communities but also threaten environmental sustainability.

5. Discussion

A traditional cashmere supply chain (referred as TCSC) is presented in Figure 4. Due to the significance and the impact on the chain operations, the TCSC is presented through two broad layers; cashmere processes (CP) and Institutional Support (IS). The first layer (CP) consists of major cashmere processes whereas the second layer (IS) captures the support provided by various government institutions for cashmere chain operations. The first layer in Figure 4 presents the traditional cashmere processes and captures the issues which propagate through a range of sequential processes and influence social, economic and environmental sustainability. The second layer (IS) represents the initiatives taken and the support provided by various government institutions to different stakeholders

in the chain. The two layers, i.e., cashmere processes and institutional support are connected through color-coded arrows to represent their relationships and the impact they have on the traditional cashmere supply chain operations. The arrows emanating from these processes affect the traditional cashmere operations in many ways.

The solid red arcs indicate the adverse effect of mechanization on the process itself and on the subsequent processes it is connected to in the supply chain. For instance, in the processing stage, the red arc indicates the negative impact of using mechanical processes for fiber dehairing. This will have a knock-on effect on spinning and weaving. Whereas, the dashed red arcs represent the impact of mechanization on the dehairing process depending on whether the process is carried out manually or mechanically. As shown in Figure 4, current traditional cashmere industry practices such as mechanization of processes and non-conformance of standards directly impacts fiber dehairing [69], yarn spinning [70] and fabric weaving [71,72] (Appendix B) processes.

Due to the present day practices the current state of operations not only impacts the physical and mechanical properties of cashmere yarn and products but also results in economic, social and environmental sustainability issues. Prior to the existing practices in the traditional cashmere industry, for spinners and weavers, the major source of income was from manually spinning the yarn and weaving cashmere articles on the handlooms. For instance, due to mechanization, low monetary returns to the artisans leads to issues such as insufficient wages and delayed payments from the manufactures. Manufacturers and retailers are considered as the major players in the cashmere industry and the artisans are bound to work on their conditions [8]. Based on the findings, it is observed that manufacturers who are dealing with large volumes of pashmina products get the work done outside Kashmir where they easily procure the yarn made from mechanized processes which compromises physical and mechanical properties of the yarn [Appendix C]. For manufacturers, pure cashmere fiber is expensive to procure as opposed to the blended fiber which, unlike pure fibers, can be used on the mechanized processes. As a result, in many instances, manufacturers deliberately opt for the blended fiber to cut down the operational costs, which leaves women spinners out of work ultimately affecting their livelihood. Similarly, due to mechanization, for weavers, weaving opportunities on the handlooms are diminishing. Therefore, financially, the most severely affected categories of the artisans are the spinners and weavers.

Furthermore, for these artisan categories, there is a considerable impact on revenue generation opportunities due to inconsistent wage structure prevalent in the industry. Study findings suggest that, in an industry which is growing and reaching out to the markets beyond its conventional territories, there is little reason not to redefine the wage structures to help sustain one of the most significant contributors of the cashmere supply chain—the artisans. Moreover, to make the matter worse, new entrants who have limited prior experience or expertise in the cashmere industry invest the capital as their side business. These new entrants have further diluted the wage structure for the already struggling spinners and weavers who are willing to take up any work opportunity that they come across. Another aspect leading to the financial issue is the lack of cashflow at the disposal of the artisans. Despite the efforts made by the government support, given the opportunity to choose any other vocation, it is likely that artisans would prefer to switch to other trades. However, many artisans are carrying out the traditional craft since most of them have little choice to generate revenue for sustenance. It is important to know that the majority of the women involved with spinning activities belong to the lower strata of the society and do not have formation education. Unwillingly though, these women artisans who are more vulnerable than the other affected class of artisans such as weavers, are left with barely any other option but to abandon their unique and special craft. Apart from the artisans who are already impacted by the intrusion of mechanization, there are many educated jobless youth with tertiary qualifications who are looking for work opportunities in the region and elsewhere. Traditional pashmina industry could have been a potential source of revenue generation for these youth. However, the advent of mechanization in different cashmere processes have deprived them of the option their ancestors practiced for centuries.

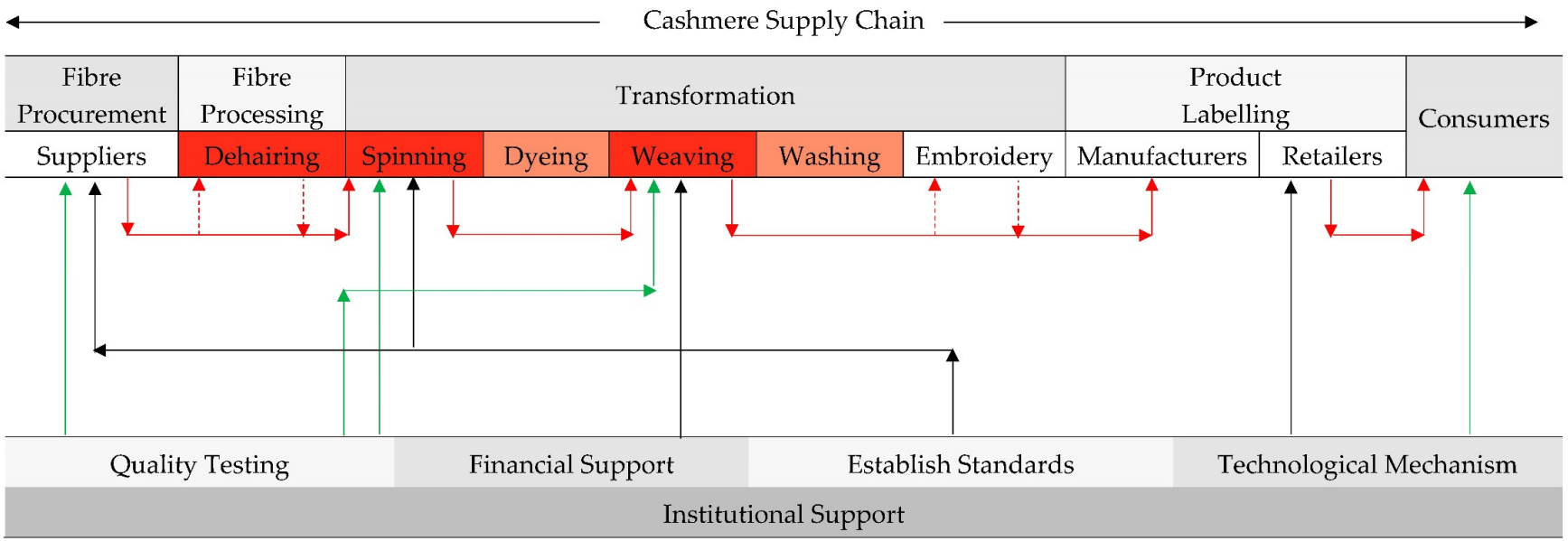

Figure 4. Sustainability issues surrounding major traditional cashmere supply chain processes.

Regarding the production practices prevalent in the traditional cashmere industry, considerable environmental degradation takes place due to the existing cashmere operations. It is critical to know that not only has the handloom industry been one of the most significant contributors for employment and revenue generation in the region, but it also has no adverse impact on the environment. Due to the surge in productivity of cashmere products (through mechanized processes) the impact of increased processing has detrimental effect on the environment. For instance, the effect of existing industry practices is observed on dyeing and washing processes [73]. The dyeing process results in the wastewater which contains more than 70 toxic chemicals that flow in the rivers and streams in the developing countries [47]. To address this, along with the investment in pollution control mechanism, environmental management systems need to be adopted [74,75] to reduce waste water [45,46] pollution and carbon emissions [76].

The green arcs indicate the encouraging influence of the institutional initiatives among the artisan communities across various chain stages. In an attempt to revive and streamline the traditional cashmere industry practices, at Crafts and Development Institute, entrepreneurial initiatives and educational programs at various levels (Diploma and Masters) are introduced to encourage the younger generation to be a part of their cultural heritage. In consultation with the experts from premier educational institutes of India, curriculum has been developed to educate the present generation of learners about the intricacies of establishing and managing a successful entrepreneurial entity. Through different qualifications, technical aspects, nuances of the craft and business insights associated across the traditional cashmere processes are covered to address the gaps existing in the industry. Trust is an integral part of the traditional cashmere operations, especially for consumers, this aspect is even more critical to have confidence in the product. Through an official website [77], a traceability mechanism is provided to ensure credibility in the manufacturing of the product. Apart from this, technological advancements also help in eco-friendly and pollution-free manufacturing practices [78].

The black arcs denote both adverse and beneficial impact of the institutional support on various supply chain aspects through quality testing, financial support, by establishing standards and through the provision of technological mechanisms across the transformation and labelling stages. For a sustainable supply chain, the social and economic status of the vulnerable sections need to be improved by providing fair, favorable and equal opportunities [79,80] and financial support [81]. The artisans are constrained with resources and are dependent to work either for the manufacturer or the middlemen. The institutions are expected to ensure fair wages and healthy working conditions for the workforce [82] to alleviate poverty and for the welfare of the workers [83]. Therefore, to mitigate the prevailing wage problems in the industry and to encourage the artisans to continue to pursue the traditional cashmere craft, the government provides a financial loan of up to INR100,000 to help establish and/or revive their practice. For instance, with the financial support, weavers are encouraged to get back on their feet and to function independently. However, the financial support is not managed well enough to keep track of the outcome from the investment, and at times, leads to a stressful situation to the weaver in repaying the loan amount with interest [8]. Artisan communities associated with spinning and weaving, manufacturers and retailers have mixed opinions on provisions provided by government institutions. For instance, the artisans are the beneficiaries from the efforts made by the government as it provides them work opportunities to carry on with the traditional practices and be able to sustain themselves economically. However, for manufacturers and retailers, on one hand the institutional support through quality testing and labelling provide credibility to their products but also lead to expensiveness and the dilution of their existing brands. Similarly, by introducing quality standards through the state-of-the art technology, government institutions have provided a mechanism to streamline quality in the spinning and weaving processes. However, this comes with a cost for the manufacturer and/or the retailer. In case the randomly selected product sample is rejected, then the entire lot is considered unfit by the quality assurance department. It is beneficial for the industry to conform to stringent quality checks but at the same time it is expensive for the manufacturer/retailer to run the risk of having a monetary loss. Therefore, for decision makers it is critical to weigh in

all the aspects surrounding economic, social and environmental dimension across cashmere supply chain operations.

Based on the data collected from the primary sources (Tables 1 and 2), a summary of the impact of traditional cashmere industry practices on various stakeholders and on the social, environmental and economic sustainability is presented in Table 3.

Table 3. A summary of the impact of traditional cashmere industry practices on the stakeholders and sustainability aspects.

Stakeholder	Impact of Cashmere Supply Chain Processes on Sustainability		
	Social	**Environmental**	**Economic**
Supplier	Changing the dynamics of the communities involved with spinning and weaving practices in the region.	Replacing manually processed yarn with mechanically processed options leading to environmental changes.	
Dehairer	Affecting the communities involved with manual dehairing in the region rendering them jobless.		
Spinner	Marginalizing the most vulnerable actor in the chain and discourage them to pass it on to the next generation.	Air pollution due to diesel operated spinning machines and post blending yarn chemical treatment.	Unemployment and no increase in the wages for decades leads to monetary loss.
Weaver	Lack of honor and respect to the community and diminishing trust between the consumer and craftsmen.	Air pollution due to diesel operated power looms results in significant carbon footprint.	Low wages and lack of work opportunities results in financial challenges.
Dyer		Water contamination due to chemical dyes and inappropriate waste outlets leads to water clogging.	
Embroider	Regressive life due to low returns leads to switching to other professions including menial jobs.		Delayed payments coupled with low wages aggravates economic concerns.
Tweezer	Abandoning the craft to pursue another profession such as laborer and other similar options.		Lack of work opportunities and extremely low wages are detrimental.
Washerman		Water contamination and inappropriate waste outlets leads to clogging in the water bodies.	
Block Printer		Chemical treatment for making the block impressions on shawls/stoles and inappropriate waste disposal mechanism.	
Retailer	Affecting the trust factor between artisans and consumers due to lack of transferability and transparency in the chain.		Low sales volume across various labelling scenarios results in less profit margins and higher inventory
Govt. Arts Emporiums	Not encouraging the artisans involved with traditional pashmina craft leading to dissatisfaction in the community.		Struggling to cater to the artisans who produce pashmina products using traditional practices.
CDI Testing Lab	Emphasizing on the significance of quality in traditional pashmina processing among different artisan communities.		Insufficient product labelling opportunities leads to unused resources and expensiveness.
CDI Institute	Attempting to revive the traditional craft by providing entrepreneurial options to the younger generation.		

6. Conclusions

For generations, a sizeable population in the Kashmir region has been involved with the traditional cashmere industry. The role and impact of human intervention on the traditional cashmere supply chain processes is vital. The key sustainability issues prevalent in the present-day traditional cashmere industry were found to be the significant shift in the socio-economic aspects of the artisans who are involved in the traditional craft industry. Under the new work environment, women spinners and weavers were hit hard due to the advent of mechanization, improper wage structures and lack of revenue generation options. Due to this, the artisan communities struggle with issues such as unemployment and insufficient wages. The unbalanced power structure in the cashmere supply chain lead to corruption and non-standardized practices significantly impacting the vulnerable communities financially and socially. The social concerns among the artisans include not being able to carry forward the legacy of the craft as they are forced to opt for other trades due to the lack of work opportunities in the traditional cashmere industry. Especially, the woman spinners are affected the most and feel disempowered. Moreover, the effect of the industry practices such as the chemical treatment of the dyes and water clogging impacts the ecology of the region considerably. However, through institutional interventions (financial) and initiatives (infrastructure), issues existing in the cashmere supply chain operations are addressed and may become influential proponent of sustainable traditional cashmere supply chains. The relationships between cashmere processes and institutional support (Figure 4) show the contextual influences, emanating from different supply chain processes and institutional support mechanisms, that impact the present-day traditional cashmere supply chain operations. Furthermore, it is observed that policy (or the lack thereof) is critical in the traditional craft industry in addressing the impact of current industry practices on various artisan communities.

The present study prompts new directions of investigation for industry practitioners, policy makers and research communities. Based on literature and, to the best understanding of the authors, this is a first attempt to address supply chain sustainability using the four-pillar sustainability model (Figure 3). Considering the themes of SDG 8 and SDG 9, a conceptual model surrounding the sustainable development of the traditional cashmere industry can be considered. Another area of investigation that needs attention is the sustainable development of the traditional cashmere industry from the perspective of geographical indications.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Classification and volume of cashmere products based on a sample 31 E-retailers and 3582 products. All prices are in New Zealand dollars.

S.No.	Product	No. of Retailers	No. of Listings	% of Products	Max Price (NZD)	Min Price (NZD)	Price Range (NZD)
1	Beanie	10	126	3.52	229.00	139.00	90.00
2	Beret	4	9	0.25	891.00	67.95	823.05
3	Blanket	9	48	1.34	3780.00	90.58	3689.42
4	Cape	1	31	0.87	2734.20	252.84	2481.36
5	Cardigan	11	102	2.85	945.00	75.00	870.00
6	Coat	2	5	0.14	694.60	314.08	380.52
7	Dress	3	12	0.34	510.38	150.00	360.38
8	Eye Mask	1	1	0.03	79.00	79.00	0.00
9	Gloves	9	44	1.23	144.00	45.28	98.72
10	Gown	1	2	0.06	169.00	159.00	10.00
11	GI Shawl	2	66	1.84	7678.35	350.00	7328.35
12	GI Stole	2	95	2.65	640.00	180.00	460.00
13	GI Scarf	2	19	0.53	443.64	150.00	293.64
14	GI Waistcoat	1	2	0.06	843.74	787.50	56.24
15	GI Muffler	1	4	0.11	255.95	179.16	76.78
16	GI Wrap	1	1	0.03	426.58	426.58	0.00
17	Hoodie	8	29	0.81	955.00	203.85	751.15
18	Jacket	2	6	0.17	537.90	295.90	242.00
19	Leggings	1	4	0.11	166.08	150.98	15.10
20	Poncho	9	39	1.09	799.00	115.00	684.00
21	Robe	1	1	0.03	759.00	759.00	0.00
22	Scarf	23	543	15.16	1222.08	45.28	1176.80
23	Shawl	16	1150	32.10	7608.81	88.20	7520.61
24	Slippers	3	5	0.14	252.84	108.90	143.94
25	Socks	8	49	1.37	135.24	47.50	87.74
26	Snood	1	4	0.11	216.00	117.00	99.00
27	Stole	11	470	13.12	1792.00	90.58	1701.42
28	Sweater	14	449	12.53	898.20	63.42	834.78
29	Sweatshirt	1	2	0.06	188.75	188.75	0.00
30	Sweatpants	1	4	0.11	508.87	398.64	110.23
31	Throw	5	29	0.81	3402.00	465.08	2936.92
32	Top	6	50	1.40	398.64	67.95	330.69
33	Track Pant	7	27	0.75	663.00	109.00	554.00
34	T-Shirt	5	25	0.70	598.00	289.00	309.00
35	Waistcoat	1	1	0.03	89.00	89.00	0.00
36	Wrap	8	128	3.57	1137.00	90.58	1046.42
	Total		3582	100			

Appendix B

Table A2. Properties of cashmere fabric made from hand-spun and machine-spun yarns [77].

Parameter	Fabric Type	
	Hand Spun	Machine Spun
Breaking strength (Kg)	4.964	4.975
Extension (%)	40.72	25.67
Alkali solubility (%)	38.00	46.00
Abrasion loss (%)	3.75	5.73
Coefficient of friction	0.70	0.75
Thermal insulation (tog)	2.00	1.95
Thickness (mm)	0.29	0.34

Appendix C

Table A3. Properties of hand-spun and machine-spun yarns [78].

Yarn Properties	Yarn Type	
	Hand-Spun (Mean ± S.E.)	Machine-Spun (Mean ± S.E.)
Yarn fiber diameter (μ)	12.25 ± 0.11	12.25 ± 0.11
No. of fiber in cross-section	39.10 ± 2.23	56.6 ± 2.61
Twist per inch	4.23 ± 0.31	4.70 ± 0.20
Actual count (Nm): Double ply yarn	56.65 ± 1.19	49.02 ± 2.22
Actual count (Nm): Single ply yarn	112.69 ± 0.47	98.04 ± 0.01
Tex (g/km)	17.75 ± 0.33	20.00 ± 1.04
Breaking strength (gwt)	60.9 ± 0.003	56.2 ± 0.002
Elongation (%)	33.13 ± 2.37	50.21 ± 4.31
Tenacity (gwt/tex)	3.41 ± 0.20	2.80 ± 0.14
Bending length (g/cm^3)	21.83 ± 1.95	29.20 ± 3.10
Coefficient of friction (μ)	0.93 ± 0.006	0.76 ± 0.004

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