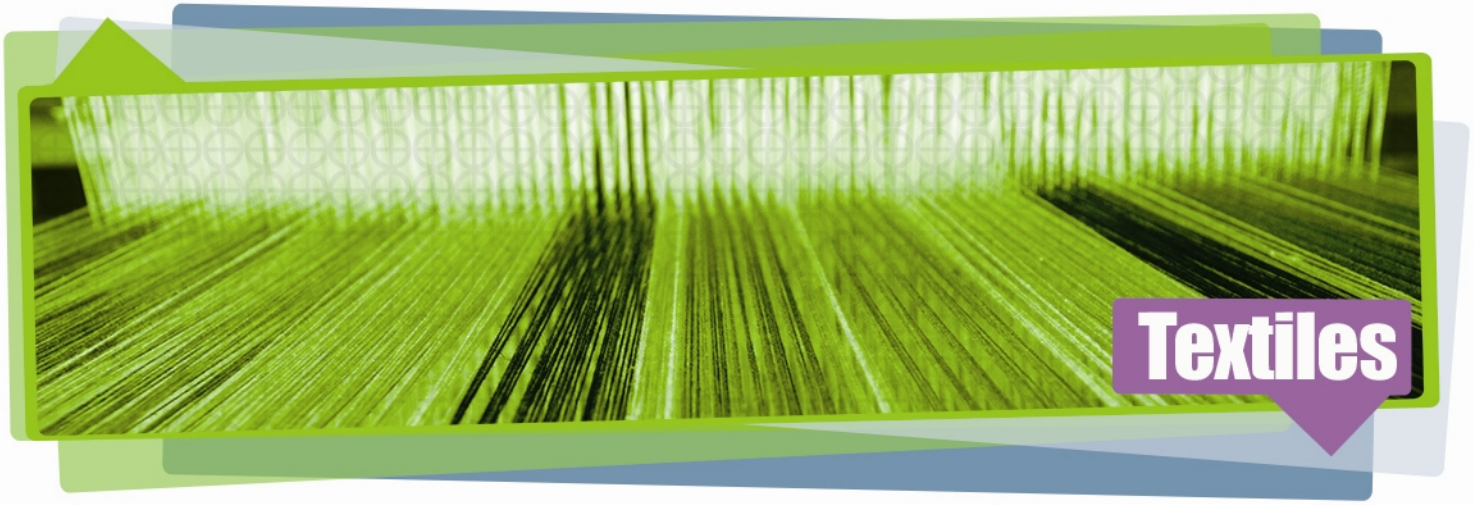
Skills for Sustainability

Manufacturing Skills Australia

Sustainability issues in textiles

This project is supported by the Australian Government
through the Clean Sustainable Skills Package



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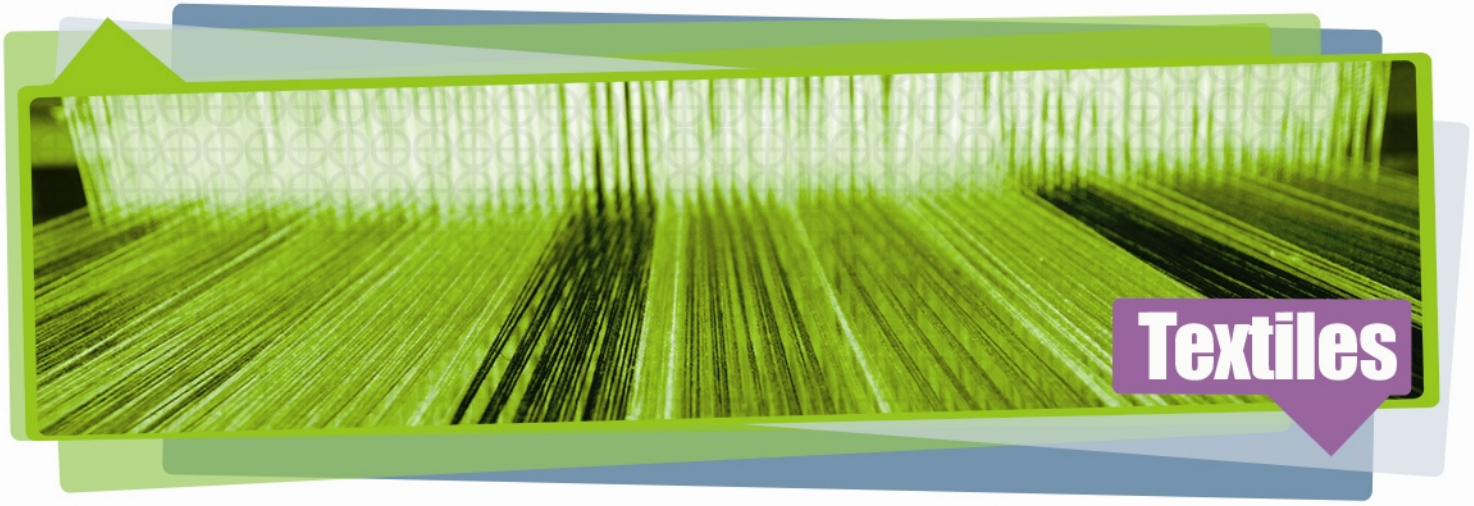


About the guide

This guide presents an outline of the social, economic and environmental sustainability issues that typically arise in the textiles sector. The guide focuses on the manufacture of domestic and industrial fabrics, manchester and carpet from natural and man-made fibres (other than glass fibres), through the processes of stripping, blending, dyeing and weaving, knitting, tufting and bonding.

Examples of products include:

- Carpets (tufted)
- Fabric for clothing, curtains, napery and upholstery (knitted or woven products)
- Felt, medical gowns and drapes, upholstery padding and carpet backing (bonded products)
- Manchester (e.g. sheets and towels)
- Shadecloth, insulation and filtration materials and drainage mats (commercial textiles).

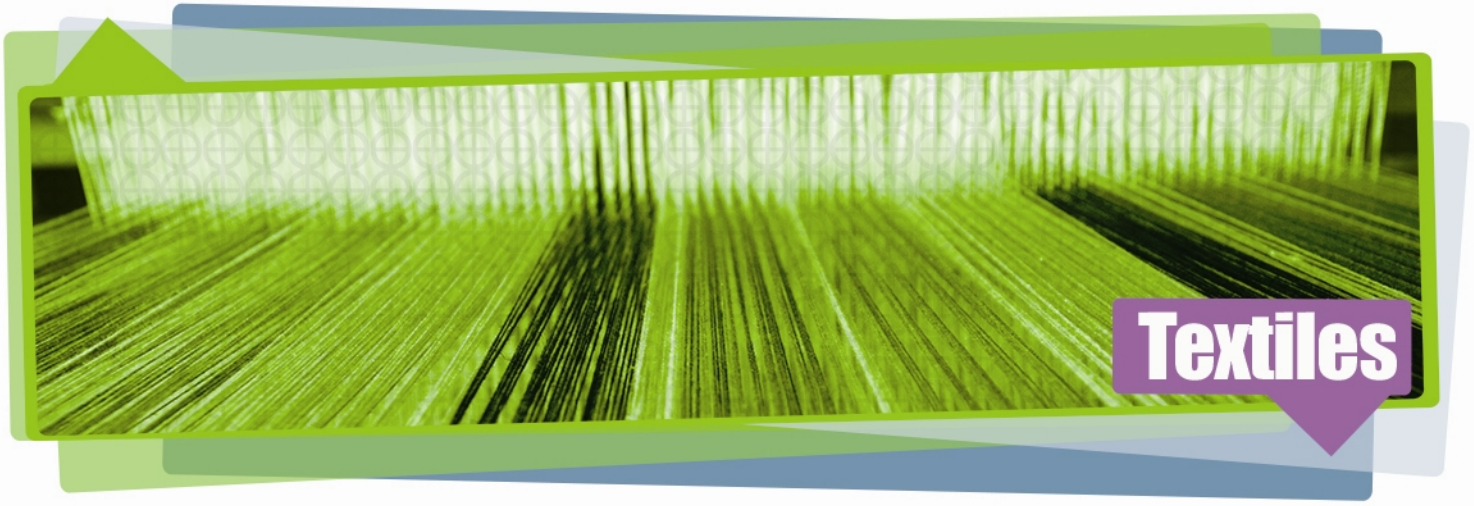
The guide shows some of the processes that are common across the sector and how sustainability issues relate to different parts of the process. These issues will vary depending on the inputs and activities in each process step.

The guide will assist Registered Training Organisations (RTOs) to identify the sustainability issues in a sector and/or business. It provides a high-level snapshot of sustainability in the sector. This can be used as a basis for the RTO to undertake its own research in order to:

- Consult with clients and understand their business and skill needs
- Develop their training and assessment strategy
- Contextualise training and assessment materials and activities.

The guide is not intended as learning material for students, however, it may be useful as part of a suite of information resources. It may also provide a model which a RTO can adapt, expand and/or contextualise for use in its own materials.

The Skills for Sustainability website provides further support for RTOs, including links to more information about this sector and guides to identifying the sustainability issues in five other manufacturing sectors. See http://www.sustainabilityskills.net.au.



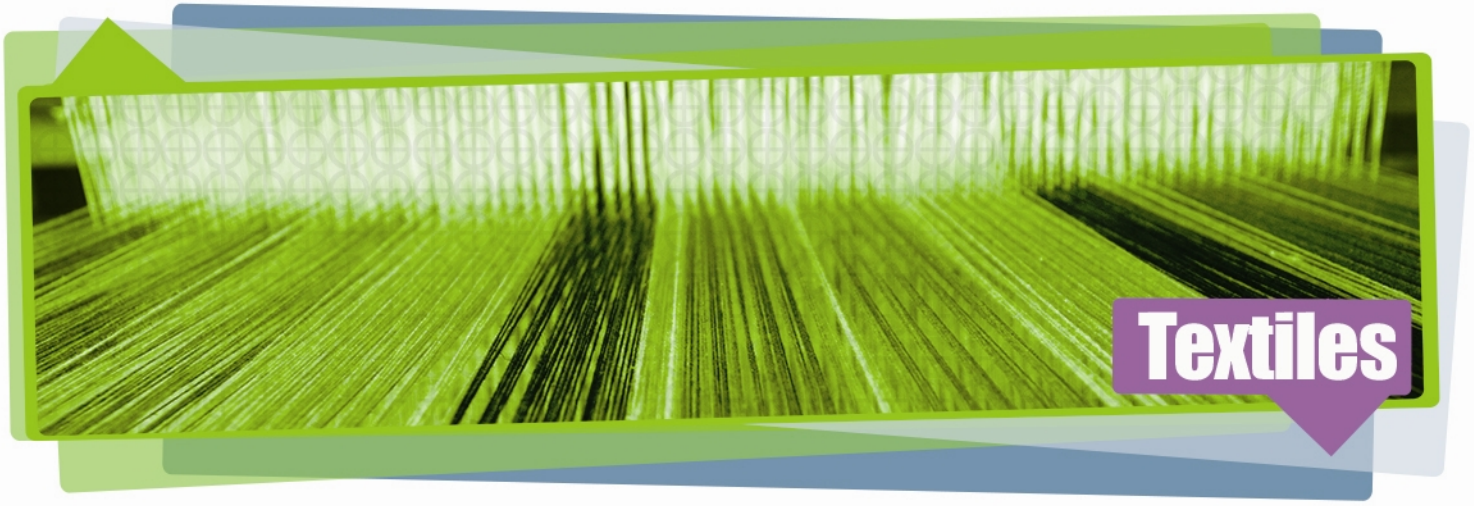
What is in the guide?

The guide includes:

- An overview of sustainability issues
- A simple process flow
- A risk rating table for sustainability issues at various points in the processes
- Examples of possible *high impact* issues and their causes.

The guide provides a 'map' of where sustainability issues are likely to arise in a particular manufacturing process, and what the impact of these issues might be. It uses a risk rating system and explains the potentially *high impact* issues in more detail. Brief and simplified examples are provided, which do not cover all of the possible sustainability issues and variables within the sector.

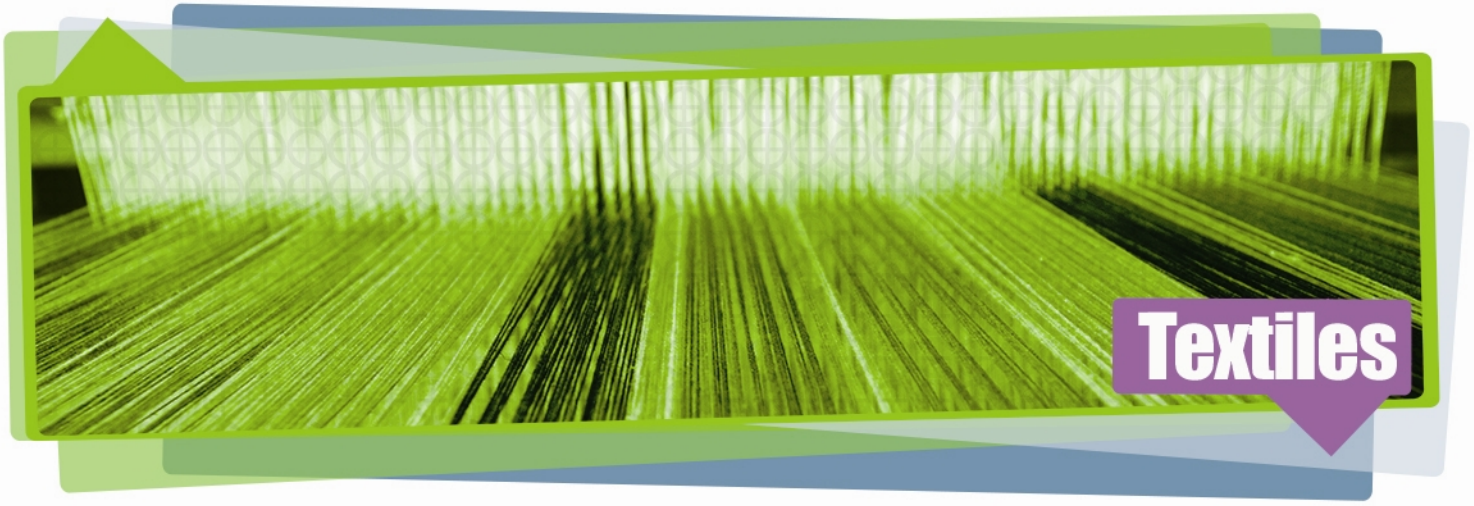
The process steps and sustainability issues in the sector have been identified through discussions with stakeholders and desktop research. Sources include IBIS World Industry Research Reports, International Finance Corporation (IFC) Environmental Health Guidelines, the MSA Environmental Scan 2012 and the National Pollutant Inventory Emission Estimation Technique (EET) Manuals.



Overview of sustainability issues

This section provides an overview of sustainability issues that are likely to affect enterprises in fabric manufacturing sector.

Sustainability issues	
Economic sustainability	• Large number of small to medium enterprises (SMEs) with limited production volumes. These businesses have limited ability to invest in innovation and sustainability, particularly when competing with developing countries. • High cost of capital – reduced ability to invest in new technology, particularly for small businesses. • High electricity usage – a high and growing cost, creating greenhouse gas (GHG) emissions and therefore exposure to the Carbon Price. • Labour intensive industry – exposure to high costs, inefficient processes and risk of industrial action. • Competition from developing countries in Asia, particularly China.
Environmental sustainability	• High electricity usage to operate dryers and presses – generates significant greenhouse gas (GHG) emissions and is currently reliant on non-renewable resources (gas and black and brown coal in Queensland, NSW, Victoria and South Australia). • High use of fuels in supply and distribution – non-renewable resources. • Emissions of GHGs and volatile organic compounds (VOCs) from chemicals and other substances used in fabric treatments and dyeing. • Use of pesticides and other chemicals in the supply chain and elements of the manufacturing process. • Environmental degradation and animal welfare issues related to farming (e.g. cotton and wool). • Effluents and air pollution during the production process (particularly laundering and treating fabrics) as chemicals are 'washed out' with water. • High use of water, largely potable (high quality, treated and drinkable) in manufacture and for the care of the product throughout its life. • Waste materials, including end-of-product life, going to landfill. • Packaging – may use renewable or non-renewable resources, and generate recyclable or non-recyclable waste.
Social sustainability	• Workplace health and safety issues are significant given the amount and type of chemicals used throughout the manufacturing process. • Competition with developing countries threatens worker conditions in Australia • Worker conditions encountered in the supply chain.



Process flow

This section provides a simple process flow showing some common steps in fabric manufacture (Figure 1). It provides a broad indication of the inputs (such as materials, energy, labour and equipment) and outputs (such as GHG emissions, particulates, waste materials and products). This defines a focus area so that specific sustainability interactions can be identified.

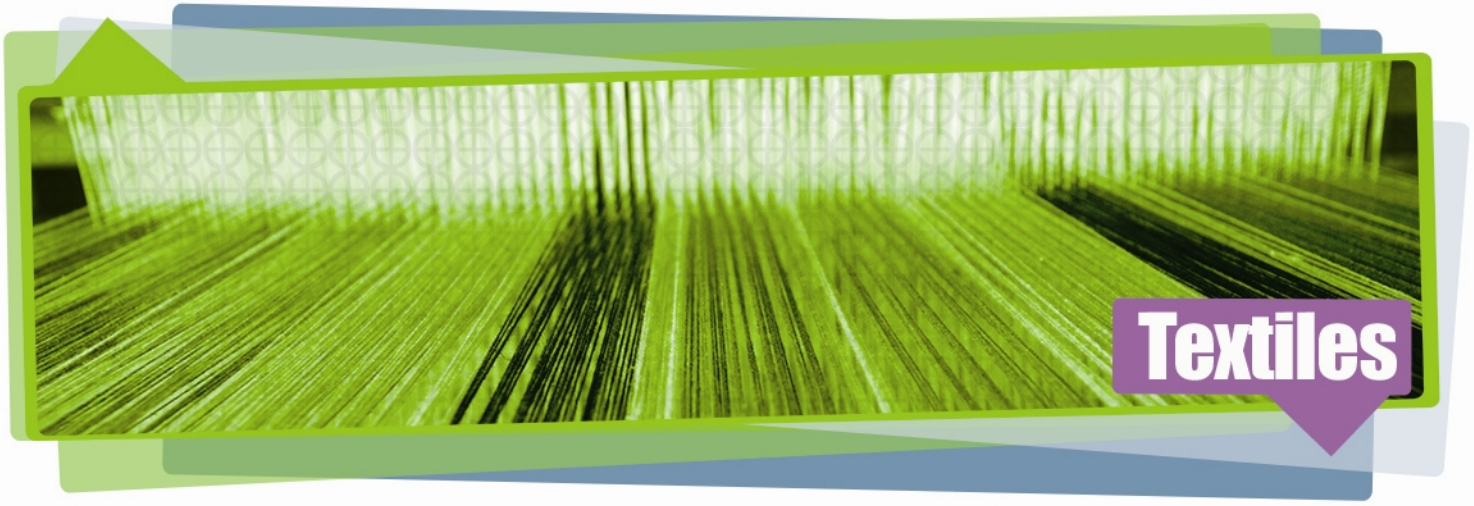
Process flows for this sector could also be developed for yarn and specialist materials manufacturing, commercial textiles and carpet manufacture.

Value chain issues

This process flows focus on a 'gate to gate' section of fabric manufacture. While they are not the focus of this process flow, the supply of raw materials and distribution of products can contribute significant sustainability impacts to the value chain and businesses can have some influence over them. For example, many enterprises include environmental and social sustainability criteria in tenders and contracts.

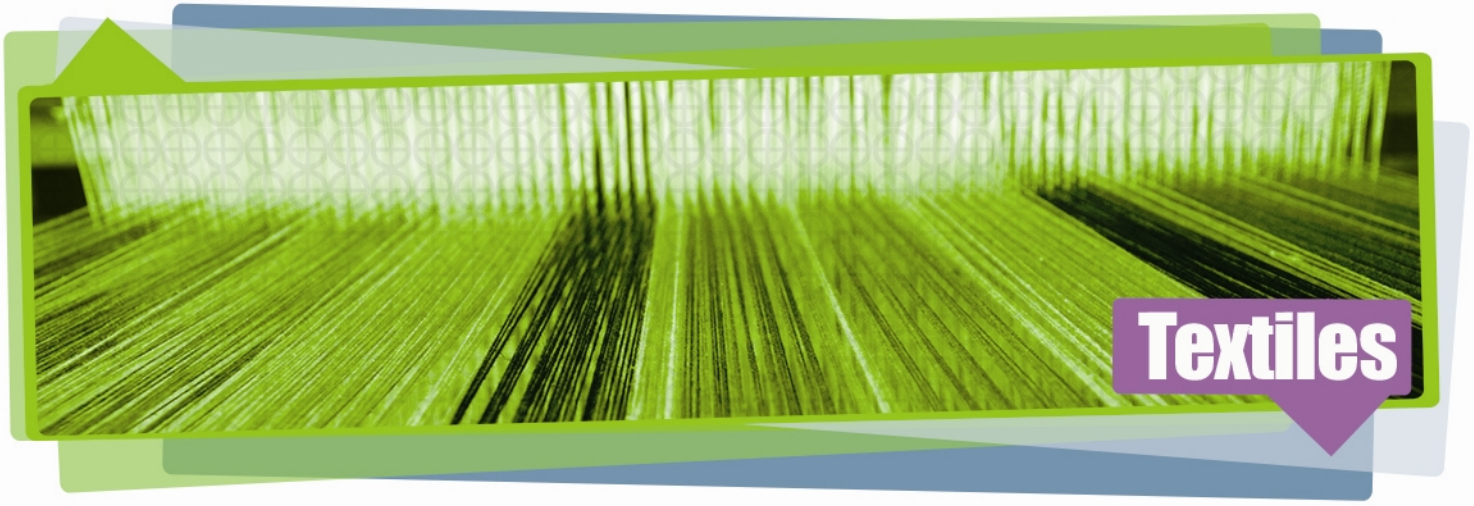
Other parts of the value chain that are excluded from this production-focused flow can influence the mix of sustainability issues that are identified. For example, the flow could include management or customer service processes. This would be likely to show more social sustainability issues in areas such as governance, ethics or customer complaints.

For more information about sustainability in practice and sustainable supply chain see http://www.sustainabilityskills.net.au.



Materials	Yarn preparation	Weaving or knitting	Finishing
INPUTS • Yarn • Dyes • Treatments (chemicals) • Transport (fuels) • Labour **OUTPUTS** • Materials stored onsite • GHG emissions • Pollution from vehicles	**INPUTS** • Yarn • Dyes (if yarn dyeing) • Water • Detergents for scouring • Sizing treatments (e.g. starches, waxes and chemicals) • Energy for heat, processing and drying • Labour **OUTPUTS** • Prepared yarn • Wastewater • Waste chemicals • Dust • Emissions to air (e.g. GHG and VOCs)	**INPUTS** • Prepared yarn • Energy for weaving or knitting machinery **OUTPUTS** • Fabric • Dust • GHG emissions	**INPUTS** • Fabric • Water • Chemicals and compounds for bleaching, desizing, mercerising, dyeing and cleaning • Energy for heat, drying and pressing • Packaging materials • Labour **OUTPUTS** • Clean, dry and pressed or rolled product • Packaged product • Dust • Emissions to air (e.g. GHG and VOCs) • Pre-consumer waste (e.g. off-cuts)

Figure 1: Fabric manufacturing process flow



Risk rating of sustainability issues in the process flow

This section looks at each step in the process flow (above). Typically, each step in a process will apply different techniques, use a range of equipment and require various inputs. These can result in very different sustainability issues at each step. This risk assessment investigates the risk of a particular sustainability issue occurring at each step and estimates the level of impact should it occur.

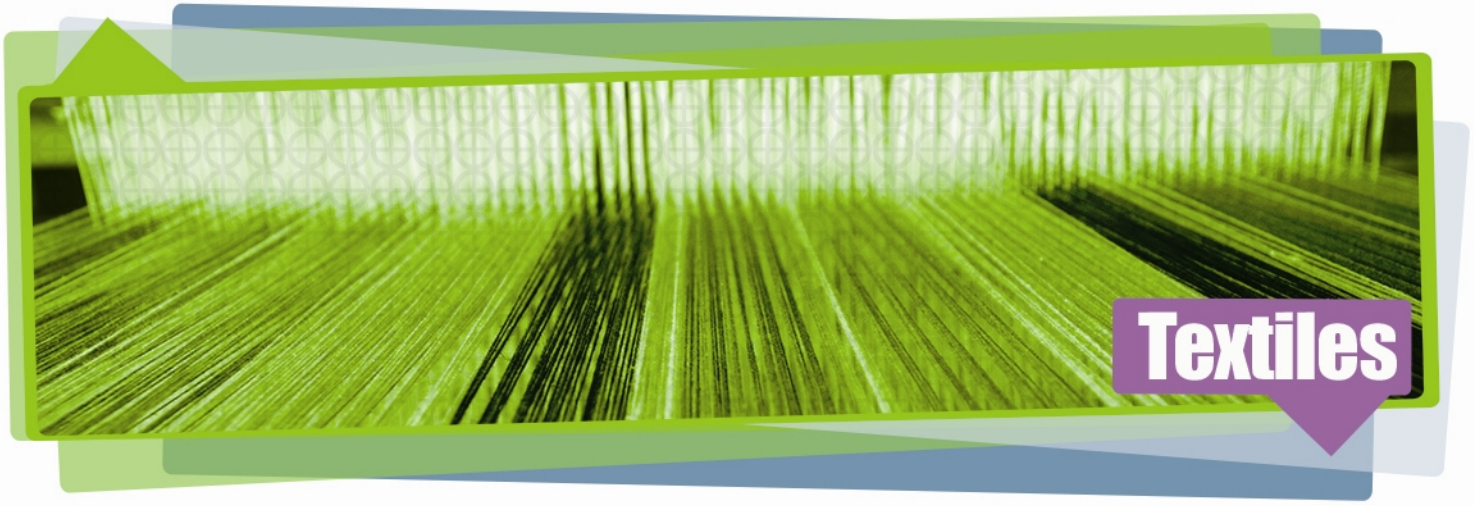
Risk assessments are subjective and require interpretation of information. In this instance the risk assessment will also depend on local and enterprise variables, for example, physical location, management systems, the economy, the skill level of the workforce, external events and available technologies.

This risk assessment is against a number of issues within economic, social and environmental sustainability. This list of issues is not exhaustive and there are many different ways that sustainability issues can be described and categorised. This list draws on a number of sources, including the Global Reporting Initiative (GRI), ISO 14001 Environmental management systems, ISO 26000 Guidance on social responsibility and the Skills for Sustainability website.

The risks have been rated using a scale for **likelihood** (probability) and **impact** (consequence).

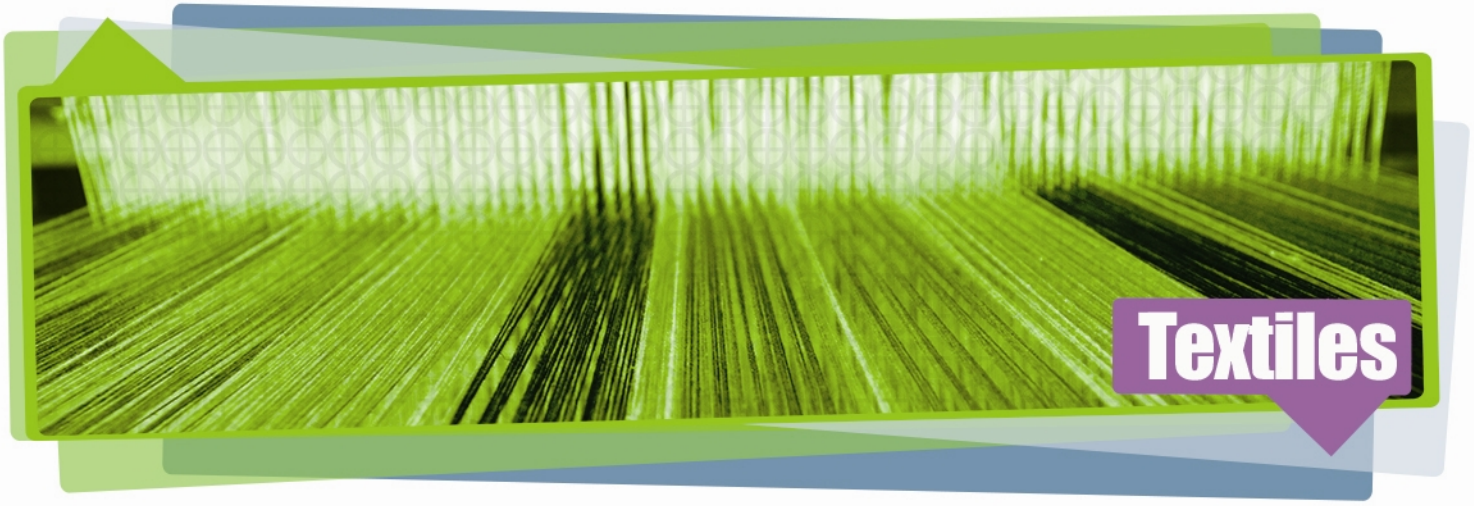
Likelihood – the probability of occurrence	Impact – the consequences of occurrence
H = highly likely	H = high impact
M= might happen	M = moderate impact
L = less likely	L = limited impact

In the following table the probability is listed first followed by the likely level of impact. So 'H/M' would be highly likely to happen and, if it did happen, would be expected to have moderate impact. *High impact* risks are discussed in further detail, as an example. However, this does not imply that other risks do not need to be considered in analysing the sector or in delivering training and assessment.



Fabric manufacture risk rating table

Sustainability issues	**Process flow elements and sustainability risks** (Textiles: fabric manufacture)			
Economic	**Materials**	**Yarn preparation**	**Weaving or knitting**	**Finishing**
Political/economic • AUD (exchange rate) • Cost of capital and taxes (including Carbon Price) • Competition with developing countries	**H/H** • High cost of energy (gas and electricity) in drying and machining processes, which is further impacted by the Carbon Price unless alternative fuels can be sourced. • Growth of developing country suppliers as competitors – with lower cost labour and fewer compliance requirements these countries compete for local and global customers. • Higher AUD increases the capacity to buy imports and increases the cost of exports, adding to the pressure on local fabric manufacturers.			
Markets • Global and local	L/L • Demand for fabric is sensitive to local market issues, such as the Global Financial Crisis (GFC) and lower sales of clothing and soft goods.			
Value • Costs and financial risks • Value add and intellectual property • Efficiency	**H/H** • High labour costs relative to developing country competitors. • High costs relative to developing country competitors reduce profit margins and the ability to invest in new technology.			



<table>
<tr><td>Sustainability issues</td><td colspan="4">Process flow elements and sustainability risks
(Textiles: fabric manufacture)</td></tr>
<tr><td>Environmental</td><td>Materials</td><td>Yarn preparation</td><td>Weaving or knitting</td><td>Finishing</td></tr>
<tr><td>Materials (and packaging)
• Consumption/reduction
• Source – recycled/renewable</td><td colspan="4">M/H
• Life cycle issues vary for different yarns (e.g. cotton is water intensive, some man-made fibres recycle waste, and imported yarn production may exploit workers and/or damage local habitats).
• Use of costly, non-reusable materials in packaging.</td></tr>
<tr><td>Energy and fuels
• Consumption/reduction
• Source – renewable/non-renewable</td><td>M/M</td><td>H/H</td><td>L/L</td><td>H/H
• Heat is required for many wet processes and for drying fabric. Typically generated by gas or electricity and results in GHG emissions.</td></tr>
<tr><td>Water
• Consumption/reduction
• Source – captured, recycled and potable
• Impact on local waterways</td><td colspan="4">H/H
• Extensive use of water in the supply chain (farming).
• Water is used in cleaning and as a delivery mechanism for chemicals used to treat textiles.
• Wastewater may contain chemicals, metals, alkalis, acids, lubricants, surfactants, mothproofing and other treatments.</td></tr>
<tr><td>Emissions, effluent and waste
• GHG and ozone depleting emissions
• Trade and solid waste
• Toxins and hazardous substances</td><td>M/M</td><td colspan="3">H/H
• Dust which might contain fibres, bacteria, fungi and pesticides.
• VOCs may be released from printing and other treatments.
• GHG emissions associated with operation of dryers.
• Non-degradable waste from production processes (e.g. chemical, off-cuts and plastic packaging) may contaminate land, water and air.</td></tr>
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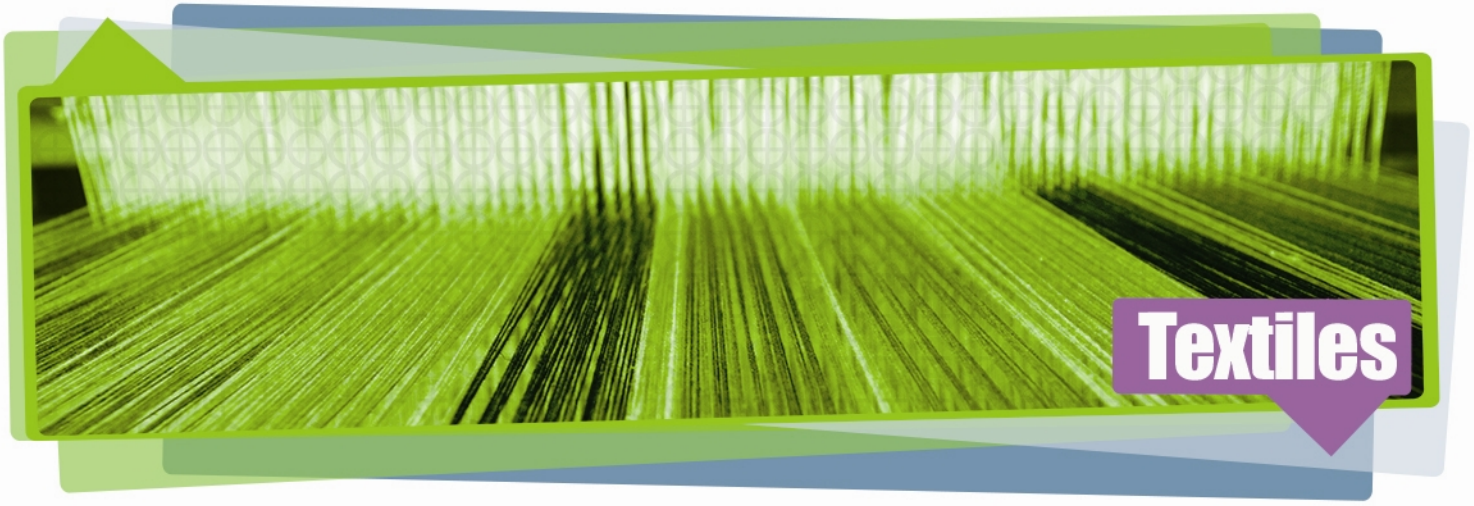
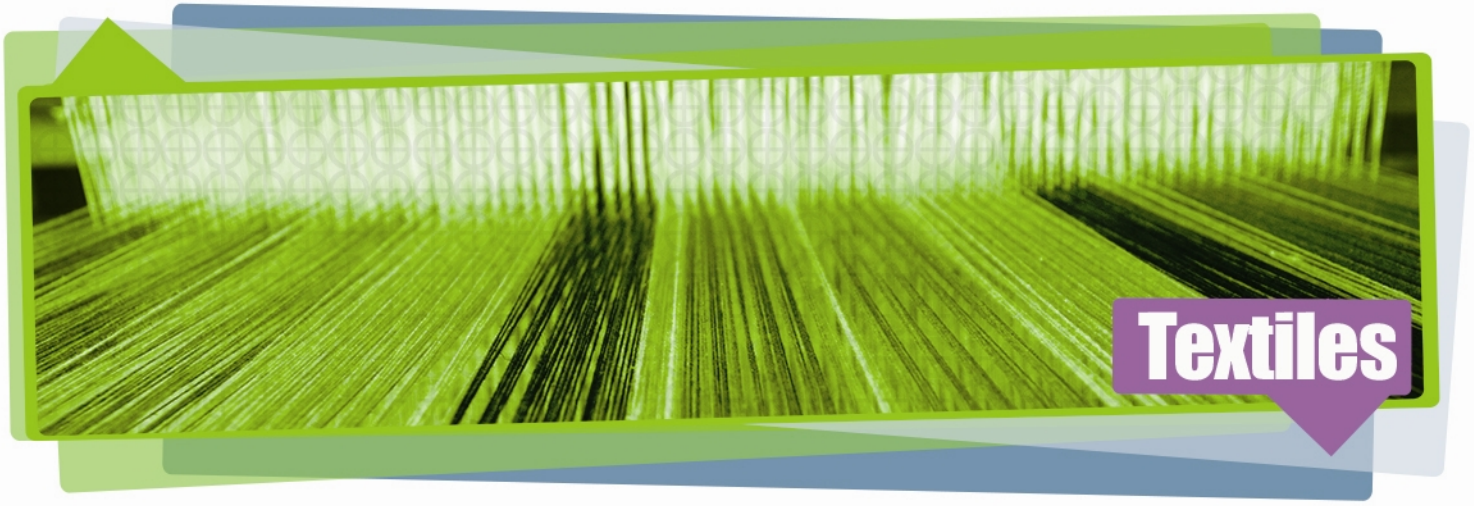


Sustainability issues	**Process flow elements and sustainability risks** (Textiles: fabric manufacture)			
Environmental	**Materials**	**Yarn preparation**	**Weaving or knitting**	**Finishing**
Habitat • Risk management and mitigation • Vulnerable area impacts	L/L			
	• Impact of issues in the supply chain, such as farming practices which impact local habitats, and use of water intensive farming in drought areas.			
Social	**Materials**	**Yarn preparation**	**Weaving or knitting**	**Finishing**
Worker health and safety • Operation of heavy machinery • Handling of heavy, hot or hazardous materials • Safety training, equipment handling and drills	M/M	**M/H**		
	• Worker exposure to heat, chemicals and treatments, dust and pollutants can cause serious health issues. • Operation of equipment requires specialised training and monitoring. • Handling of chemicals and hazardous substances used in manufacturing processes requires specialised training and monitoring.			
Workplace culture and workforce development • Worker engagement, job design and working conditions • Diversity and equal opportunity • Training and development	M/M	**H/H**		
	• Fabric production is labour intensive, currently exposed to the high costs of a large but low skilled workforce and the risk of industrial action.			
Heritage and amenity • Cultural heritage • Visual amenity, noise and pollution from plant/site • Impact on pedestrian movement and resident privacy • Traffic entering and leaving the plant (noise, pollution and hazards)	L/M			
	• The delivery of supplies or the distribution of finished product may generate traffic and associated pollution and emissions. This can have a detrimental effect on community amenity and lead to complaints and poor profile in the local community.			



Sustainability issues	**Process flow elements and sustainability risks** (Textiles: fabric manufacture)			
Social	**Materials**	**Yarn preparation**	**Weaving or knitting**	**Finishing**
Community • Engagement • Local programs • Complaints	L/M • Businesses in the sector may have a poor reputation due to complaints about noise, traffic movements or environmental risks/damage.			
Ethical practice • Governance and compliance • Management of contracts and transactions • Treatment of workers, suppliers, customers, competitors, locals and Indigenous persons	**M/H** • The risk of collusion or unethical practice in supply chain contracts, which may cost the business through fines and/or negative media coverage. • Poor practices in the supply chain may generate negative media coverage. • Effective management of these issues requires staff training and monitoring processes.			
Product responsibility • Safety and sustainability of products • Labelling, stewardship and transparency • Ethical marketing	M/M • Consumers increasingly want information about the life cycle impacts and or carbon footprint of products and materials.			