

PROCESS DESCRIPTION

Textile manufacturing is the conversion of fibres into yarn, then fabric, then textiles. There are different sources of fibre, and variable processes available at the spinning and fabric-forming stages. There are also a wide range of finishing and colouration processes that lead to production of a variety of textiles.

Overall, the manufacture of textiles involves a wide variety of physical and chemical processes, depending on the fibre type and the specification of the fabric product for use in clothing, furnishings or for industrial applications.

Therefore, the type of fibre and nature of the processing exerts a strong influence on the potential environmental and social impacts associated with textile manufacturing operations.

Textile fibres are categorized into two principal groups, as follows.

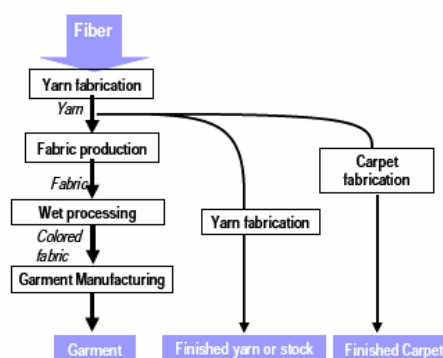
Natural fibres

Known as staple fibres when harvested, these can have either vegetable or animal origin. While cotton is the most common natural fibre, other fibres included in this category are wool, hemp, linen, jute, and silk. Raw fibres may be in staple (short fibre) or continuous filament form.

Manmade fibres

Manmade fibres include not only synthetic organic materials from the chemical industry, such as polyester and nylon, but also regenerated natural organic fibres, such as viscose. Manmade fibres are available in either staple or continuous filament forms. Staple form manmade fibres are typically used to produce blended fabrics containing combinations of manmade fibres, or manmade and natural fibres.

The main processes required to produce textiles are as follows.



Source: e-textile toolbox available at www.e-textile.org

This guidance does not include the environmental and social impacts from the cultivating and harvesting phases of natural fibres, which are covered under the Agricultural Production guidelines. Likewise, it does not cover the Garment Manufacturing phase, which is covered under the Apparel and Other textile Products (Clothes Making) guidelines.

Brief descriptions of textile manufacturing main processes are as follows.

Yarn Fabrication

Before fibres can be spun into yarn, a series of preparation phases are undertaken.

For natural fibres, this phase includes opening, cleaning, blending, carding (when fibres are separated and then assembled into a loose strand), combing (removing shorter fibres, creating a stronger yarn), and drafting (straightening the fibres). After the preparation, staple fibres are transformed into yarn through grouping and twisting operations, other fibres are processed using spinning operations.



Manmade fibres are often shipped as staple and ready for spinning, or as filament yarn, which may be used directly or following further shaping or texturing. The three main methods of fibre manufacture are: wet spinning, dry spinning, and melt spinning.

Fabric Production

The most widespread used methods of fabric production are weaving and knitting. Other fabric production methods include tufting (to make carpets), non-woven fabrics and braiding technology.

- ***Weaving:*** the interlacing of lengthwise with widthwise yarns. To prevent the warp yarns from breaking, the threads are coated with a size before weaving. Other chemicals, such as lubricants, agents, and fillers, are often added to impart additional properties to a fabric.
- ***Knitting:*** converting yarn into fabric by intermeshing loops, which are formed with the help of needles. Sophisticated, high-speed machinery is usually used in this phase.

Fabric/Wet Processing (finishing processes)

The fabric produced from the weaving or knitting, often termed 'grey' fabric, is in rough condition (rough to the touch and contains impurities). Fabric processing or wet processing is done to improve the appearance and serviceability of the fabric. The fabrics are treated with chemical and liquor baths and often require several washing, rinsing, and drying steps. Overall, the main processes include:

- ***Pre-treatment***
 - ***Desizing:*** removal of size from the fabric (with acid or enzymes etc.), so that

chemical penetration of the fabric in later stages is not inhibited.

- ***Scouring:*** removal of impurities such as wax, fatty acids, oils, etc, present in the fabric. Scouring is carried out in alkaline conditions (with sodium hydroxide) under high pressure and temperature (above 100°C).
- ***Bleaching:*** whitening of fabrics and yarns. Different chemicals such as hypochlorites and hydrogen peroxides are used as bleaching agents. Once bleaching is complete, the bleaching agent must be completely removed, either by thorough washing or through the use of enzymes.
- ***Mercerizing:*** treatment of the fabric with cold sodium hydroxide solution to increase the tensile strength. Excess sodium hydroxide is normally recovered for reuse in either the scouring or other mercerization stages.
- ***Dyeing:*** to give an all-over shade to the fabric. There are essentially two techniques available for dyeing the textile material:
 - ***Batch technique:*** the liquor and the textile are placed together in a vessel and the required amount of dye is added.
 - ***Continuous technique:*** The dye is dissolved or dispersed in the liquor. A specific quantity of dye liquor is locally applied to the textile.
- ***Printing:*** Unlike dyeing, printing is usually only carried out on prepared fabric where it is applied to specific areas to achieve a planned design. The colour is applied to the fabric and then treated with steam, heat or chemicals to fix the colour on the fabric.

Final washing of the fabric is carried out to remove excess paste and leave a uniform colour.

- **Finishing:** dependent on the properties required for the final product, finishing operations include drying, providing dimensional stability, softening, waterproofing, fireproofing, etc. Each of these operations can involve consumption of large quantities of water and chemicals.

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

The textile processing industry is characterized not only by the large volume of water required for various operations but also by the variety of chemicals used for a range of processes. There is a long sequence of wet processing that requires inputs of water, chemicals and energy. Waste is also generated at each stage.

Another feature of this industry (as the source of fashion garments) is the large variation in demand of type, pattern and colour combination of fabric resulting into significant fluctuation in waste generation volume and load. The key environmental health and safety issues are detailed as follows.

Water consumption

Although the first two stages of manufacturing (yarn manufacture and fabric production) often involve mainly dry operations (although in some processes, such as wool manufacture, large water volumes can be used), the third stage of manufacturing (fabric/wet processing) involves a significant use of water. On average, approximately 200 L of water are required to produce 1 Kg of textiles. Issues to consider include:

- Security and cost of water supply, from mains or via direct abstraction, will affect the viability of the business.
- Quality of process water used. This may require pre-treatment prior to use.

Water Discharge

Large volumes of effluent (wastewater) are generated, containing a wide variety of chemicals, used throughout the textile manufacturing process. Issues to consider include:

- A number of the pollutants originate from impurities present on the raw materials, such as insecticides, persistent organic pollutants (POPs) or other pesticides and chemicals. Raw wool, for example, may contain residues of chemicals used as veterinary medicines to protect sheep from parasites.
- Possible pollution of local water courses due to discharge of effluents or spillage of chemicals.
- Treatments to remove colour can increase the risk of pollution. Particular consideration should be given to the treatment method used. For example, treating azo-dyes results in production of amines, which could pose a greater risk to the environment than the dye itself.

Waste

Textile processing generates many waste streams, some of which may be hazardous. The nature of the waste generated depends on the type of textile facility, the processes and technologies being operated, and the types of fibres and chemicals used. Issues to consider include:

- Trials, selvedge, trimmings, cuttings of fabrics/yarns, off-specification yarn and fabric;
- Spent dyes, pigments, and printing pastes;
- Sludge from process wastewater treatment containing mainly fibres and grease.
- Packaging waste, such as cardboard reels for storing fabric and cones used to hold yarns for dyeing and knitting.

Energy Consumption

The textile industry uses considerable amounts of energy. Heat consumption is particularly significant in drying and curing operations and in activities involving wet treatments. Issues to consider include:

- Use of renewable energy sources to reduce the impacts of energy consumption in climate change.
- Energy management programmes, including measuring energy consumption, setting reduction target and implementing energy efficiency measures. The minimization of energy use also leads to a reduction of energy costs.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Occupational Health and safety

There are a number of occupational health and safety hazards during the operation phases of the textile industry. Issues to consider include:

- ***Dust:*** respiratory and dermal issues from contact with fine particulate matter, mainly associated with natural fibres and yarn

manufacturing processes. Exposure to cotton dust can generate respiratory hazards (e.g. byssinosis, chronic bronchitis, asthma, and emphysema).

- ***Volatile Organic Compounds (VOC):*** exposure to VOC emissions is related to the use of solvents in textile printing processes, fabric cleaning, and heat treatments (e.g. thermofixation, drying, and curing).
- ***Physical Hazards:*** risk of exposure to heat and high humidity (caused by the use of steam and hot fluids in these processes) are of particular concern during wet processing and dry finishing operations. Additionally, activities related to the operation and maintenance of machinery may expose workers to physical impacts, particularly with reference to hot surfaces and moving equipment.
- ***Noise:*** from machinery, particularly associated with yarn processing (e.g. texturizing and twisting and doubling) and woven fabric production.
- ***Odour:*** local nuisance might be caused by odours generated in textile manufacturing, particularly during dyeing and other finishing processes, and use of oils, solvent vapours, formaldehyde, sulphur compounds, and ammonia.

Soil and groundwater contamination

Contamination of soil and groundwater as a result of current or previous activities at the site from dyes, cleaning and finishing chemicals, wastes, oils and fuel. Issues to consider include:

- Secondary containment of tanks and working areas (bunds etc.) to prevent spills reaching the wider environment.

- Licensing of storage facilities.
- Age, construction details and testing programme of tanks.
- Labeling and environmentally secure storage of drums (including waste storage).
- Accident/fire precautions and emergency procedures.

Explosion and Fire hazard

In production areas the high temperatures generated by production machinery and the presence of flammable materials and dust, represents a fire hazard.

Atmospheric emissions

Textile manufacturing operations may generate air pollutants, issues to consider include:

- Air emissions, including particulates, arising from finishing processes (e.g. coating and dyeing operations), drying, printing, fabric preparation, and wastewater treatment residues.
- Solvent vapours may be emitted from coating / treatment finishing processes, drying ovens, and high-temperature drying and curing.
- Other potential emissions, including formaldehyde, acids (especially acetic acid), volatile compounds, and solvent vapours which may contain toxic compounds such as acetaldehyde, chlorofluorocarbons, dichlorobenzene, ethyl acetate, methylnaphthalene, chlorotoluene.
- Emissions arising from fuel combustion.

Asbestos and PCBs

Asbestos and polychlorinated biphenyls (PCBs) may need to be removed from the site which can be costly. Asbestos is found in building materials, pipework and insulation. PCBs can be found in electrical equipment such as transformers/hydraulic equipment and capacitors.

KEY SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Community Health and Safety

- ***The use of chemicals*** and their potential risk to the health of consumers who purchase garments or home textiles produced by the textile industry is of significant concern. To assure that products are safe for human use, adequate testing (e.g. for pH, pesticides, heavy metals, formaldehyde, chlorinated phenols, chloro-organic carriers, and biologically active finishes) should be conducted to assess textile characteristics according to the typical conditions of their use prior to entry into the market.
- ***Contamination of the surrounding land and water resources*** may have a negative impact on the health of the local community exposing the company to significant liability risk.
- ***Odours and noise*** might present a potential nuisance for the community if not adequately controlled
- ***Water*** – any threats to security of and access to water supply arising from intense water consumption may have a negative impact on

communities which are dependent on those water resources.

Labour standards

Labour standards are rules that govern working conditions and industrial relations. They may be formal, such as national level regulation and international agreements, or informal, expressed through norms and values.

In general, developed countries have more robust labour standards than developing countries where the associated risks are higher. The commonly accepted rights and principles enshrined in the International Labour Organization conventions are:

- The right to collective bargaining.
- Elimination of forced or compulsory labour.
- Abolition of child labour
- Elimination of all forms of discrimination.

In addition, issues to consider include:

- Fair wages.
- Fair working hours.
- Acceptable working conditions.

Violations of any of these principles could potentially cause severe reputational damage to the company.

Labour standards should apply to the company's own employees as well as to all contractors and sub-contractors engaged. In addition, labour standards should be expected to be enforced by key suppliers.

High risk of violations occur, in particular, where there is a large temporary workforce in very cyclical businesses or those with weak production planning.

OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Raw Materials

Textile manufacture requires significant amounts of raw materials that are obtained through agriculture (in the case of natural fibres) and chemical industry (in the case of manmade fibres). These agricultural and chemical activities will have their own social, labour and community issues that are discussed under EBRD's Agricultural Production and Chemical industries sub-sector guidelines.

Upstream supply chain risks

Labour standards and human rights violations in the company's supply chain can impact its ability to continue to serve discerning markets. Trade customers and retail consumers increasingly expect responsible practices from their suppliers.

There has been a marked increase in recent years of supply chain restructuring processes designed to address the above issues. This trend contributes to growing pressure on textile manufacturers to comply with customers' and consumers' expectations with regards to social/ethical standards. Leading retailers are increasingly incorporating labour and human rights considerations into their policies.

There is also increasing demand for labour and human rights standards to be applied to the producers of raw material. Therefore, textile manufacturers should be aware of the practices of their raw fibre suppliers and be prepared to cascade down the demands from their upstream

supply chain customers. This is particularly the case in the cotton industry, where high-profile, negative publicity regarding the use of child labour has been reported around the world.

Water scarcity

The impact of water scarcity on local communities might be accentuated with the use of large amounts of water by textile manufacturing industries.

FINANCIAL IMPLICATIONS

Water Supply

Textile manufacture uses significant amounts of water, a resource that is increasingly becoming scarce worldwide. The severe weather events caused by climate change may accentuate this trend. Security and cost of water supply may affect the viability of the business, depending on the water resource availability in the company's location.

Energy Supply

The textile industry involves the use of considerable amounts of energy. With the fluctuation of energy prices, weak energy management leads to higher costs to the business.

Regulatory compliance

There are costs associated with ensuring compliance with regulatory requirements. Stricter legislation will increase the costs of other environment-related expenditure such as waste disposal, water supply and water abstraction, and control of air emissions. Although environmental standards in developing countries tend to be less strict than in developed countries,

these are increasingly being tightened. Examples of environmental compliance costs include:

- Investments in air emission control equipment, for example to reduce emissions of solvents, dust or odours.
- Investments in wastewater control equipment. Even where wastewater is discharged to a wastewater treatment plant, some form of pre-treatment is likely to be necessary, including neutralisation of pH and removal of solids and organic materials.
- Investments in dewatering of the sludges produced by waste/water treatment processes may also be required. Such requirements will have implications for both capital and operating expenditure.
- Administrative costs (human resources) of training and time to complete the required paperwork.
- Investment in process to enable changes in raw materials (less polluting).
- Fines may be imposed for persistent breaches of regulation.
- It is possible that facilities (particularly those with a large energy demand) in the developing countries will be exposed to carbon abatement costs if an international agreement on limiting carbon emissions, including developing countries, is reached.

Litigation

Litigation costs may be significant depending on the degree of the damage and the number of plaintiffs. Causes for legal action could include health and safety incidents (loss of hearing, serious injuries or death, respiratory diseases

through inhalation of chemicals or dust), damage to neighbouring property through accidental fires and impacts on community well-being through air or water pollution.

Damage to property

Uncontrolled fires may cause significant damage to the site. Inflammable chemicals stored on site, dust particles and other material from a variety of fibres represent a potential risk. Safety measures and processes are therefore especially important.

Reputational risk

Damage to reputation (due to either environmental or social impacts or failures) could involve costly and long-running efforts to mitigate damage and reassure stakeholders such as investors, shareholders, customers and the public. This is in addition to associated litigation costs and compensation payments that might be incurred.

Moreover, specific products might become less desirable as a result of damaged reputation, possibly leading to a reduction of demand and fall of the product's market value, impacting the industry's financial performance.

Upstream supply chain

Low environmental, health, safety, social, labour and community standards in the supply chain might impact the industry's ability to continuously trade with key customers who are increasing their screening criteria on these issues. Loss of key customer accounts might have a significant impact on the industry's financial performance.

End-consumers' changing expectations

Over the last decades there has been a rise in the demand for "environmentally friendly" clothes (e.g. organic cotton). Retail and Consumer Companies, particularly in Europe and United States of America, have transformed this trend into business opportunity by targeting to top end-consumers, who are willing to pay a premium for such clothes.

Therefore, there are untapped opportunities to provide more "environmentally-friendly" clothes/raw material to these markets. At the moment, the risks of a considerable shrink of traditional clothes market are still small. In their business plans, textile manufactures should consider the financial implications of such opportunities and threats.

Soil and Groundwater Contamination

Where contamination has been identified on or off-site, the actions required (which may include clean up of the site) could have significant cost implications. The amount of financial and human resources required will depend upon the regulatory authorities, the local regulations and the specific site circumstances (including local geological/hydrogeological conditions).

IMPROVEMENTS

Environmental, Health and Safety Improvements

Potential environmental, health and safety improvements may include:

- Implementation of Environmental Management System, such as ISO 14001.

- Introduction of process changes that facilitate water use reduction and/or enable water re-use/recycling.
- Assessment of the source of raw materials and the harmful substances that may potentially be present in order to implement the appropriate effluent treatment.
- Avoidance of raw materials containing persistent organic pollutants (POPs).
- Improved wastewater treatment technology/processes, particularly investment in new or improved biological treatment.
- Avoidance of fugitive emissions to water and groundwater.
- Introduction of energy recovery systems.
- Efficient combination of operations, such as scouring and bleaching, to save energy and water.
- Reduction of energy consumption with the use of continuous knit bleaching ranges instead of batch preparation knitting equipment.
- Use of heat recovery from continuous dyeing / bleaching ranges to preheat incoming water and heat recovery through reuse of cooling water and by heat exchange from hot effluents discharged by batch dyeing machines.
- Effluent facilities or holding tanks, can regulate the rate of discharge of wastewater, balancing out the load on watercourses and sewage treatment works.
- Changing the class of dye used and improving the fixation efficiency of dyes may reduce the problem of removing dye from wastewater.
- Secondary containment of bulk storage chemical tanks would help prevent the spread of routine spills to the wider environment. Further contamination of land could be prevented through the provision of containment for temporary storage areas of solid wastes such as empty chemical drums.
- Regular inspection of secondary containment facilities and fitting of alarms, where not regularly inspected.
- Chemical substitution, for example, substituting dye stuffs and finishing chemicals.
- Reduction of waste generated by high volume of fabric scraps by increased fabric utilization efficiency in cutting and sewing.
- Waste recovery, particularly for wool scouring where the wool grease and fibres should be dealt with by other routes than landfill.
- Implementation of procedures for the handling and treatment of hazardous materials in the event of spillage.
- Carry out handling of VOC and dust-generating materials in enclosed areas, fitted with air extraction equipment where necessary.
- Air extraction measures, such as afterburners and absorbers, to prevent escape of VOCs and to capture emissions produced during the dewatering of sludges.

- Installation of dust extraction, recycling and ventilation systems to remove dust from work areas, especially in cotton mills.

Social, Labour and Community Improvements

Potential social, labour and community improvements may include:

- Implementation of policies and practices that support international labour standards, including the right to collective bargaining, elimination of forced or compulsory labour, abolition of child labour and elimination of all forms of discrimination.
- Ensure fair wages in line with national law and/or sector standards average (whichever is higher).
- Ensure there are fair working hours and working conditions in place in line with national law and/or sector average (whichever standard is higher).
- Develop a policy covering labour practices for contractors and sub-contractors.
- Implement a formal code of business conduct, which outlines the principles by which individual employees and the organisation must conduct themselves.
- Develop a whistleblowing policy to allow anonymous reporting of any ethical violations without fear of repercussion.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

The issues and risks associated with a site will vary depending on factors including the type and size of the operation, site location, and the

quality of management. However, due diligence visits should consist of a tour of the entire site.

When visiting the sites of potential borrowers or during loan supervision, financial intermediaries may wish to use the following suggestions to guide the initial due diligence process. However, note that this does not represent an exhaustive list of issues for consideration.

During the initial site visit, it will be important to assess the following:

Environmental, Health and Safety issues

- Identify if the site has an environmental management system and possible accreditation by an independent body (e.g. certification to a standard such as ISO14001).
- Find out whether the site has environmental policies, objectives and performance improvement targets.
- Examine if key environmental issues are being monitored (e.g. amount of water and energy used and waste disposed). Compare annual data to assess if there has been an increase or reduction of the environmental impact.
- Identify the sources of fibres used in the plant and possibility of contamination of raw fibres with pesticides.
- Look for signs of poor housekeeping, such as signs of spillages and leaks and uncontained piles of empty drums, especially in the vicinity of sensitive receptors such as water courses.
- Find out whether drainage systems lead to wastewater treatment systems or discharge directly.

- Note the extent of treatment systems for the different types of wastewater, including process water, surface water runoff and cleaning water.
- Find out about the history of the site and the area, particularly any previous industrial use, in order to assess the likelihood of soil and groundwater contamination.
- Note the colour and appearance of adjacent water courses.
- Review measures preventing the escape of volatile organic compounds (VOCs) during process operations and materials handling, for example using afterburners.
- Note odour and noise levels at and around the site, particularly if there are residential areas nearby.
- Assess the level of health and safety awareness at the works, for example the presence of safety notices, the general appearance of the site and the use of personal protective equipment.
- Note the location and integrity of oil and chemical storage areas. These should be located away from operational areas and have measures to contain spillages.
- Assess emergency response planning in the event of a fire, major spill etc.
- Identify the source of process water and site sanitary/domestic water supply. Determine the conditions of any abstraction licence for process.
- Find out what, if any, treatment is required for process water prior to use.

- Review historical and projected environmental fees and fines.
- It is also suggested that contact is made with local regulatory agencies to determine compliance record and whether complaints have been made by the public.

Social, Labour and Community issues

- Check that labour standards, contracting and remuneration are in line with national law and are consistent with the average for the sector.
- Check that hours worked, including overtime, are recorded and staff should receive written details of hours worked and payment received.
- Has the Company received inspections from the local labour inspectorate in the previous three years? Have these resulted in any penalties, fines, major recommendations or corrective action plans?
- Has the Company received inspections from major customers in the previous three years? Have these resulted in any major issues, recommendations or corrective action plans?
- Does the organisation have a grievance mechanism which allows employees to raise workplace concerns?
- Are employees free to form, or join, a worker's organisation of their choosing?
- Observe working conditions through process and document review and interview staff.
- Check if the company is subject to any customer policy and/or to any monitoring reviews (e.g. supply chain audit). If so,

analyse the policies and the results of customer's audits.

- Observe waste disposal procedures to identify potential soil, water or air contamination pathways that may affect local communities.
- Review company's history of community engagement and look for evidence of meaningful dialogue that takes into consideration the community's concerns about human health impacts of the facility.
- Is there a policy to prioritise community concerns and integrate into management decisions?
- Is there a process to communicate progress to local communities and other relevant stakeholders (such as local government authorities, NGOs etc.)?
- Development of key performance indicators (KPIs) and monitoring systems to allow for the setting of performance targets to meet regulatory standards and industry best practice. These indicators should allow, in particular, the continuous monitoring of: water use, energy use, water discharge and waste generation.
- Development of plans and procedures for managing risks including:
 - Occupational health and safety issues, such as dust related diseases, exposure to VOCs, physical hazards, noise and odour.
 - Handling and storage of hazardous materials.
 - Emergency response procedures, for example in case of explosion or fire.
 - Training for site personnel to ensure awareness of the above issues.

ACTION PLANS

Any lending or investment should take place within the context of Environmental and Social Action Plans, which should have clear timescales and roles and responsibilities established for each action point. Typically, plans include:

Environmental, Health and Safety Issues

- Provision of a financial plan and budget for management of environmental issues and performance improvement, for example:
 - Capital investments for energy efficient technology and water efficiency systems;
 - Provision for decontamination of soil and groundwater.
- Implement best-practice labour standards (in line with International Labour Organization principles), with particular attention to fair working hours and occupational health and safety measures.
- Development of plans and procedures for managing social issues, including community health impacts due to the contamination of land and water resources.
- Implementation of a process to assess labour and human rights conditions for contractors and sub-contractors.
- Design and communication of an appropriate code of business conduct that considers

Social, Labour and Community Issues



European Bank
for Reconstruction and Development

Sub-sectoral Environmental and Social Guidelines:

TEXTILE MANUFACTURE

concerns of key stakeholders (shareholders, employees, government bodies, NGOs).

ISO14000 Series: Environmental Management Systems - <http://www.iso14000-iso14001-environmental-management.com/>

REFERENCES AND ADDITIONAL SOURCES

Deeper Luxury Report, WWF - <http://www.wwf.org.uk/deeperluxury>

e-textile toolbox: a project funded by the EuropeAid Program of the European Commission, where partner organizations from Asia and Europe have joined hands to develop an on-line toolbox to help make textile production more efficient, reduce production costs, improve product quality and achieve a better environmental performance.
<http://www.e-textile.org/>

IPPC, Integrated Pollution Prevention and control, UK Environmental Agency, Guidance for textile sector, 2002 (IPPC S6.05)
<http://www.environment-agency.gov.uk>

USEPA, Best Management Practices for Pollution Prevention in the Textile Industry, 1996

WHO, Hazardous chemicals in human and environmental health
(WHO/PCS/00.1)http://www.who.int/pcs/training_material/hazardous_chemicals/section_1.htm

WHO, Information Fact Sheet N° 258 February 2001 <http://www.who.int/inf/fs/en/fact258.html>

International Finance Corporation
Environmental, Health and Safety Guidelines - <http://www.ifc.org/ifcext/sustainability.nsf/content/EnvironmentalGuidelines>

International Labour Organisation - <http://www.ilo.org/global/lang-en/index.htm>

