Environmental impact of textile production – handloom production is the answer

Environment, Ecology

D. Narasimha Reddy 1/11 Environmental Impact of Mechanised and Automated Textile Production Introduction The contribution of mechanised and automated manufacturing to various environmental impacts is enormous. Environmental impacts from manufacturing industries can be seen such areas as toxic chemicals, waste, energy, and carbon emissions. Manufacturing in developed countries is also a heavy user of water, and there have been many cases of air, water and soil contamination which have led to such actions as cleanups, class actions suits and a variety of other corporate liabilities.

Environmental impact can be seen in all phases of textile production and use, from growing or making fibres to discarding a product after its useful life has ended. The physicalenvironmentis affected by these processes, including resource depletion, pollutionand energy use; the biological environment, by considering what happens as a result of manufacture, and the social environment as it impinges on our psychological, physical and physiological comfort, as well as our financial well-being.

In recent years, textile industry in developed countries has been facing severe problems, the most serious of which are those connected with pollution. In fact, governments have been bringing up environmental laws which strictly prohibit wastewater discharge in rivers and lakes. This situation indeed burdens the textile industries and also leads to increase in production costs. Textile Industry and Process Description The textile industry includes multiple processes and activities.

The four major textile operations are: • • • • Yarn Formation: preparing and spinning raw materials (natural and synthetic); texturizing man-made filament fibers. Fabric Formation: warping and slashing yarn; performing weaving and knitting operations. Wet Processing: preparing the fabric for dyeing and finishing; dyeing, printing, and finishing operations. Product Fabrication: cutting and sewing the fabric, performing final finishing operations. In the yarn formation process, fibers are bound using spinning operations, grouping, and twisting.

Staple fibers, natural and man-made, are prepared for spinning through a combination of various processing steps such as blending, drawing, carding, opening, combing, and roving. Following drying operations, yarn may then be woven into fabric. From the spun or filament yarn, fabric is formed by knitting or weaving operations. Yarn e-mail: nreddy.com D. Narasimha Reddy 2/11 can be processed directly through knitting operations but typically requires preparation for weaving operations. Preparation for weaving includes warping and slashing (sizing).

Wet processing enhances appearance, durability, and serviceability of the fabric. Chemical Pollution Textile production involves a number of wet processes that may use solvents. Emissions of volatile organic compounds (VOCs) mainly arise from textiles finishing, drying processes, and solvent use. VOC concentrations vary from 10 milligrams of carbon per cubic meter (mg/m3) for the thermosol process to 350 mg carbon/m3 for drying and condensation process. Waste water from processes is a major source of pollutants.

It is typically alkaline and has high BOD5 (700 to 2, 000 milligrams per liter (mg/L)) and chemical oxygen demand (COD) (approximately 2 to 5 times the biochemical oxygen demand (BOD) level), solids, oil and possibly toxic organics, including phenols (from dyeing and finishing) and halogenated organics (from processes such as bleaching). Dye effluents are frequently highly colored and may contain heavy metals such as copper and chromium. Pesticides used on natural fibers are transferred to effluents during washing and scouring operations.

Pesticides are also used for moth proofing, brominated flame retardants for synthetic fabrics, and isocyanates for lamination. Effluents might include pesticides (such as DDT and PCP), and metals (such as mercury, arsenic, and copper). Air emissions include dust, oil mists, acid vapors, odors, and boiler exhausts. Cleaning and production changes result in sludges from tanks and spent process chemicals, which may contain toxic organics and metals.
Table 1: Chemicals and Chemical Categories Commonly Encountered in Textile Manufacturing Process Chemicals and Chemical Categories Dyeing/Printing Ethylene glycol, ertain glycol ethers, methanol, copper compounds, chromium compounds Desizing Certain glycol ethers Sizing Methanol Scouring Biphenyl, xylene, certain glycol ethers Chemical Finishing Certain glycol ethers, methyl ethyl ketone, formaldehyde Coating Operations Dichloromethane, methanol, methyl ethyl ketone, toluene Article/Formulation Chromium compounds, copper compounds, methanol, Components antimony compounds Manufacturing/Processing Ethylene glycol, methanol, phenol, toluene, xylene, Aids biphenyl Reactants

Diisocyanates, formaldehyde, methanol, phenol Source: Emergency Planning and Community Right- To-Know Act Section 313 Reporting Guidance for the Textile Processing Industry, US Environmental Protection Agency, May, 2000 Chemicals are used for the removal of impurities from the fiber and for machine maintenance. Man-made filament fibers may be manufactured using chemicals. e-mail: nreddy.com D. Narasimha Reddy 3/11 Processing of these fibers, known as texturizing, can result in the removal and subsequent release and other waste management activities of chemicals from the fiber.

Oils, lubricants, machine maintenance chemicals, and waste yarn and material are also released. Chemical sizing agents are added to the yarn by solution or pad/dry techniques and other chemical additives may be added to increase yarn softness and pliability. Chemicals are also used during fabric formation as fabric processing agents and equipment cleaning and maintenance chemicals. Fabric processing agents include sizing agents and performance enhancing chemicals such as certain glycol ethers, ethylene glycol, and methanol. These chemicals typically volatilize or are washed off during fabric formation. However, some may remain with the fabric throughout the fabric formation process and into the wet processing and finishing operations.

Both fugitive and point source air emissions containing chemicals typically occur during the slashing (sizing) operation or during fabric drying operations. This includes chemicals used as sizing agents or performance enhancing chemicals. Dust air emissions may also be generated during fabric formation. Effluents are generated from fabric cleaning and slashing operations; used oil, lubricants, and other machine maintenance chemicals; and equipment cleaning operations. Solid waste is also released from fabric formation. The primary source of solid waste is excess fabric material and scraps that may contain chemicals not volatilized or removed during fabric formation or chemicals brought on-site with the raw material (e. g. , antimony oxide used as a fire resistant).

Dust containing chemicals is also generated during knitting or weaving operations, which when collected byair pollutioncontrol devices or by floor sweepings is a significant solid waste. During slashing operations, residue left in sizing agent or other chemical agent containers may be a source of chemicals. Fugitive emissions are most likely to result from slashing and drying operations when chemicals, such as methanol, evaporate. In wet processing, chemical agents, such as dyes, pigments, strength agents, and flame resistors are applied through a water-intensive process. Synthetic materials may be desized and scoured prior to dyeing or printing. After preparation for wet processing, dyeing or printing can occur, followed by rinsing, drying, or heat setting. Printing operations typically do not use water.

The final wet processing step is mechanical and chemical finishing; these operations are used to improve appearance, texture, and performance of the fabric. Dye application includes various dye types and methods. Dyes can be fixed to the textile chemically and/or physically. Dyes may be bonded to the fabric or precipitated by removal of a dye solubilizing agent. Color can be affixed through the use of pigments, solvents, and resin binders. For the textile industry, wet processing operations are significant sources of chemical release. Typical chemicals include ammonia, certain glycol ethers, and methyl ethyl ketone. Alkaline or solvent solutions are used during scouring.

Solvents, although used in the past, are being replaced with aqueous chemicals. Bleaching agents and other chemical e-mail: nreddy. com D. Narasimha Reddy 4/11 additives are used during bleaching operations, however, these are usually not chemicals. Acids are used for neutralizing remaining caustic soda during mercerizing operations. During dyeing or printing operations, chemicals such as solubilizing agents, dye carriers, salts, and fixing agents may be employed to speed the process or enhance the process effects. Chemicals used during finishing operations include optical brighteners, softeners, and flame resistant chemicals. Effluents are generated from spent process baths, solutions, and rinses.

Process effluents include spent sizing solutions, scouring and dyeing baths, cleaning rinses, dyeing rinses, textile cleaning water, and mercerizing operations. Chemicals in textile effluents include dyes, pigments, and salts. Salts present in process effluents may be either raw materials (e. g. , metal compound salts) or byproducts from neutralization or other chemical reactions (e. g. , nitrate compounds). Metal compounds such as copper compounds and chromium compounds are also commonly present. Other sources include equipment cleaning wastewater, container cleaning wastewater, and used lubricants and other machine operating aids. Cleaning solvents may become part of the wastewater after scouring operations and equipment cleaning.

The US EPA has estimated that there are approximately 135 major source facilities, in US, in the printing, coating, and dyeing of fabrics and other textiles source category. The principal hazardous air pollutants emitted by these sources include toluene, methyl ethyl ketone (MEK), methanol, xylenes, methyl isobutyl ketone (MIBK), methylene chloride, trichloroethylene, n- hexane, glycol ethers (ethylene glycol), and formaldehyde. Exposure to these substances has been demonstrated to cause adversehealtheffects such as irritation of the eye, lung, and mucous membranes, effects on the central nervous system, and damage to the liver. The EPA has classified two of the hazardous air pollutants, methylene chloride and trichloroethylene, as probable or possible human carcinogens.

Dyeing The art of textile dyeing dates back thousands of years, when dyes extracted from plants or sea snails were used to color cloth. Today, most dyes are synthetically manufactured, yet only 40-90% actually resides on the cloth. The residual dye is treated and discharged into our rivers and streams. World wide, it is estimated that this accounts for over 400, 000 tons of dye per year. Colorfastness is a textile industry standard that determines how stable the color is in a garment. Good colorfastness means the garment won’t fade after one washing. Resin pretreatment is done for garments that require excellent colorfastness. Cationic fixatives could be used for outerwear garments where colorfastness to washing is moderate but colorfastness to dry cleaning is high.

Poor shade repeats are a major cause of economic loss and pollution in dyeing operations. An average dye worker makes 300 weighings per day. Sources of error are many, e-mail: nreddy.com D. Narasimha Reddy 5/11 including sorption of moisture from the atmosphere which way amout to up to a maximum of 20% error in dye weight. Other factors such as water quality, fiber variations, and the like also contribute to reworks and off quality. There needs to be a balance between improved productivity in dyeing, and the need to minimize water, energy, and effluent discharge in the textile industry. There is a need to regulate usage of dyes in improving shades on textiles while optimizing water, dye and energy utilization.

Under most circumstances, a mixture of dyes is utilised to achieve the desired shade. This means that a small number of dyes can be used to achieve an infinite number of colours, but also means that achieving the exact shade desired requires some skill and can often entail redyeing with a shading addition to correct the shade. In extreme cases, the cloth can be stripped of colour and completely redyed, but this is an environmental and commercial last resort. One of the root causes of problems in achieving the required shade is that if dyes in a mixture have different dyeing profiles the shade and depth of dyeing may change with time and the timing of the dyeing process is therefore crucial.

Thus, the difficulty associated with reliable attainment of shade and depth provides a hidden cost in production through reduced capacity and proportionately increases the environmental impact of reactive dyeing through the extra water, chemicals, energy and time needed to make a shading addition. Dyes and auxiliary chemicals used in textile mills are developed to be resistant to environmental influences. As a result, they are hard to remove from wastewater generated during the dyeing processes. In India, the detrimental nature of the synthetic dye industry has been recognised. The Central Pollution Control Board of India has included it in its " hyper-red" category reserved for the seventeen most polluting industries in the country. The true costs of synthetic dye production and application have never, to our knowledge, been assessed. According to the Tamil Nadu Pollution Control Board, an estimated 80. 70 million litres of effluent water is discharged daily into the Noyyal River from dyeing and bleaching units in Tirupur. 2 Water Consumption Water is used extensively throughout textile processing operations. Textile operations vary greatly in water consumption. Water use can vary widely between similar operations as well. Almost all dyes, specialty chemicals, and finishing chemicals are applied to textile substrates from water baths. In addition, most fabric preparation steps, including desizing, scouring, bleaching, and mercerizing, use aqueous systems. The amount of http://www. undp. org. in/Programme/Environment/natdye/dyejust. tm Zero Discharge - Treatment Options for Textile Dye Effluent: ACase Studyat Manickapurampudur Common Effluent Treatment Plant, Tirupur, Tamil Nadu, S. Eswaramoorthi, K. Dhanapal1 and J. Karpagam EPIC in India, No. 33, Anugraha Gardens, Central Studio Road, Trichy Main Road, Singanallur, Coimbatore-641005, India, 2004. 2 1 e-mail: nreddy.com D. Narasimha Reddy 6/11 water used varies widely in the industry, depending on specific processes operated at the mill, equipment used, and prevailing managementphilosophyconcerning water use. The various stages of textile production (from spinning, weaving and knitting, to dyeing and finishing) require enormous energy and water use. For example, 26. 5 gallons of water are needed to process 2. 2 pounds of textiles. Reducing water consumption in textile processing is important, due in part because excess water use dilutes pollutants and adds to the effluent load. Table 2: Water Use in Textile Processing Processing Water Use Water Use Subcategory Minimum, Median, gal/lb gal/lb of production of production Wool 13. 3 34. 1 Woven 0. 6 13. 6 Knit 2. 4 10. 0 Carpet 1. 0 5. 6 Stock/Yarn 0. 4 12. 0 Nonwoven 0. 3 4. 8 Felted Fabrics 4. 0 25. 5 Water Use Maximum, gal/ lb of production 78. 9 60. 9 45. 2 19. 5 66. 9 9. 9 111. 8 Different types of processing machinery use different amounts of water, particularly in relation to the bath ratio in dyeing processes (the ratio of the mass of water in an exhaust dyebath to the mass of fabric). Washing fabric consumes greater quantities of water than dyeing.

Water consumption of a batch processing machine depends on its bath ratio and also on mechanical factors such as agitation, mixing, bath and fabric turnover rate (called contact), turbulence and other mechanical considerations, as well as physical flow characteristics involved in washing operations. These factors all affect washing efficiency. In general, heating, wash, and dyebaths constitute the major portion of energy consumed in dyeing. Washing and rinsing operations are two of the most common operations in textile manufacturing that involve significant water consumption. Many processes involve washing and rinsing stages. To grow the fiber for one cotton diaper requires 105. 3 gallons of water, one T-shirt needs 256. 6 gallons of water, one bath towel needs 401. 4 gallons of water, a man's dress shirt requires 414. 5 gallons of water, and 987 gallons of water are required for one pair of jeans. An average integrated textile mill produces 15 tons of finished cloth per day. It uses a total of approximately 3, 840 cubic meters of water per day, including 1, 680 cubic meters for finishing and processing, another 960 cubic meters for steam generation, and an 3 Source: Sustainable Planet: Solutions for the 21st Century, " Cleaning the Closet: Toward a New Fashion Ethic," Juliet Schor, November 2002; http://www2. bc. edu 4 California Cotton Ginners and Growers Associations, Cotton Facts, http://www. ccgga. org e-mail: nreddy. com D. Narasimha Reddy 7/11 equivalent volume for serving the workers colony and other domestic uses of water.

The water used for finishing and processing results in contaminated liquid effluent of approximately 1, 500 cubic meters per day. 5 In Tirupur, annually the textile industries alone utilize around 28. 8 billion litres of ground water. 6 An estimated 70 percent of textile effluents and 20 percent of dyestuffs are still dumped into water supplies by global factories. Energy Consumption Textile manufacturers use energy as a raw material input to the manufacturing process or for some other purpose usually referred to as non-fuel use. Electricity consumption is increasing in textile mills. Textile manufacturers have to deal with rising energy supply costs. Dow Chemical Co. nd DuPont both recently announced they're raising prices on nearly everything they sell, from chemicals used in bathroom cleaners to freezer bags and kitchen counter tops, because of high raw materials costs. Testifying before Congress in October, 2005, Dow CEO Andrew Liveris said high prices for natural gas that Dow and other companies use for both fuel and raw materials have rendered " the entire U. S. chemical industry uncompetitive”. “ We simply cannot compete with the rest of the world at these prices," Liveris said, adding that Dow is shifting some work overseas. " It undermines all U. S. manufacturing, because we supply all of U. S. manufacturing. " Raw materials and energy account for 50 percent of Dow's costs today, Liveris said.

Energy costs were also a factor in layoffs at a Hanes Dye and Finishing plant in WinstonSalem and a Klaussner Furniture plant in Robbins, in Moore County in US. " China was the big reason, but energy costs make it difficult to compete in the global market," said Mike Vaughan, vice president of operations and general manager for Hanes. Vaughan said the company uses a significant amount of natural gas to operate the machinery at its facilities. In the past three years, he said, the costs have tripled. 7 In Indian textile industry, energy accounts for an estimated 12%-15% of total cost of production. It was estimated that the energy saving potential is as high as 23%. 8 The Textiles

Committee has taken up a programme to help processing units in Tirupur reduce their energy costs. Committee sources told The Hindu9 that three small-scale dyeing units, that were members of the Mannarai Common Effluent Treatment Plant (CETP), had been selected for this purpose. The project has three phases. This project Pakistan: Environmental Impact of

Cotton Production and Trade, Tariq Banuri, Copyright © 1999 International Institute for Sustainable Development, Canada 6 Ibid 2 7 http://www. newsobserver. com/102/story/374287. html, 16th March, 2006 8 http://www. renewingindia. org 9 The Hindu, 22nd January, 2004 e-mail: nreddy. com 5 D.

Narasimha Reddy 8/11 was taken up in association with the School of Energy of the PSG College ofTechnology, Coimbatore, under the cluster development programme of the committee. Sources explained that power, steam and water consumed by these units for processing one kg of fabric were estimated. During the first phase, energy auditing had been carried out in the three units. The energy consumption and the actual requirement were estimated in each of the participating units. Under the second phase, the areas that required " corrective action" were identified. Measures that had to be taken by the units and the cost implications were also recommended to them.

Growth in artificial fibre over natural fibre Fibres are transformed into yarn through spinning for natural and blended yarns or drawing and texturising for synthetic filament yarn production. Yarn is weaved into cloth. The process of fabric formation or weaving comprises preparatory activities followed by actual weaving on the loom. The preparatory process includes winding, warping, sizing, drawing-in and denting. The sheets of yarn thus prepared are then converted into fabric on the looms. This weaved cloth or fabric is stitched into garments or sold in other forms of finished textiles. These stages of manufacture have various levels of automation possible as an improvement from the basic process.

Textile fibres are predominantly of two types – natural and manmade (see figure ‘ Basic Threads’). Based on the source, natural fibres, in turn, can be those derived from animals, vegetables or minerals. On the other hand, manmade fibres are produced in the fibre form by application of mainly chemical processes on the naturally occurring substances (like hydrocarbons). The textile industry uses vegetable fibers such as cotton, animal fibers -- such as wool and silk, and a wide range of synthetic materials such as nylon, polyester, and acrylics. The production of natural fibers is approximately equal in amount to the production of synthetic fibers.

Polyester accounts for about 50% of synthetics. Manmade fibres fall in two categories – synthetics and cellulosics. Synthetic fibres are primarily made from petrochemicals whereas cellulosics are mainly regenerated wood pulp with chemical and physical treating. These fibres can be either long, highly strong yarn called filament yarn (which is oriented and fully drawn and is straight) or in staple form (much smaller in length and crimpy like natural fibres). Filament yarns are woven or knitted as they are. They are also woven into fabrics of textured yarn by combining with other types of filament yarns, twisting yarns and texturing in accordance with the aim of the product.

The filament yarns are processed into circular, triangular, oval, hollow and other cross-sections that have even better properties. The staple fibres can be easily blended with other types of fibres. They are woven into fabrics by blending with cotton, wool and linen fibres to suit the aim of the product. e-mail: nreddy.com D. Narasimha Reddy 9/11 The principal manmade fibres include polyester, nylon, acrylic and viscose. Chemically, polyester (or many esters) is primarily afamilyof polymers wherein the monomers belong to the category " esters". The most commonly used polyester is the polymer of diglycol terephthalate and is called polyethylene terephthalate (PET). Nylon is a group of polymers, which can be classified as polyamides.

Today several types of nylon are produced with properties tuned to meet customer specifications. The most commonly used ones are nylon-6 (which is manufactured from caprolactam) and nylon66 (made from adipic acid and hexamethylene diamine). The special characteristics of manmade fibres combined with availability and cost factors have seen an enormous increase in their use in the global textile industry. Fibres consumption (and consumption of related goods) has been growing at an astonishing rate. Consumption per capita of fibres has been growing steadily passing from 3. 7 kilos in 1950 to 9 kilos in 2002. The growth of manmade fibres in the textile industry has been phenomenal.

Production of artificial fibres outnumbers natural fibres since the beginning of the 1990s. In 2002, natural fibres production was at 22. 5 million tons against 33. 6 for man made fibres. Table 3: World fibre production/Consumption per capita10 Year Natural Manmade TOTAL Population Consumption * ' 000 billion** kg / capita tons 2002 22. 463 33. 657 56. 120 6, 23 9, 0 2000 21. 504 31. 147 52. 651 6, 08 8, 7 1990 21. 460

19. 380 40. 840 5, 28 7, 7 1980 15. 227 14. 301 29. 528 4, 46 6, 6 1970 13. 484 8. 394 21. 878 3, 71 5, 9 1960 11. 607 3. 367 14. 974 3, 04 4, 9 1950 7. 723 1. 681 9. 404 2, 56 3, 7 * Ramie, flax, hemp, jute, sisal and coir (fibre prepared from the husk of the coconut) not included. * World population Comparing the domestic consumption patterns of fibres in India and China, two of the largest textile players on the global market, the imbalance is evident. In India, the textile industry covers a wide range of economic activities and has a significant role in the economy of the country. In 2003, it was growing at the annual rate of 5%. In the meanwhile, the per capita consumption of textile fibre in India is one of the lowest (2. 5 kg) in the world. In China, the consumption of textiles is booming. Synthetic fibre yarns are in the top fifty import commodities. In 2003 China imported 710, 000 tons of cotton yarn and almost all Source: 2003/feb/25bud20. htm 10 www. indo-rama. net/FiberYear2002. pdf; www. rediff. com/money/ e-mail: nreddy. com D. Narasimha Reddy 10/11 luxury yarns and fibres are imported. During the same year, China's quantity per capita of processed chemical fibre reached 10 kg, much higher than the world's average. China's textile sector is predicted to achieve a 6. 0% growth to take its total fibre consumption to 14. 0 million tonnes by 2005 and its per capita fibre consumption from the 2001 level of 6. 0 kg to 8. 0 kg. In India, as yet there is no effort to quantify the overall environment impact of wet processing of man-made fibers, especially withrespectto chemical components, processing formulations and the effluent produced from the process.

It is known that pretreatment of cellulosic textiles is characterized by high consumption of chemicals, water, and energy along with great discharge of waster water. This is mainly due to carrying out pretreatment operations on separate steps with repeated washing operations after each step. Conclusion Clothes and other textiles can affect the environment to varying degrees throughout their life cycles. Before textiles reach the consumer, they have gone through many different chemical processes. They may be treated with chemicals to dye them, make them more hardwearing or wrinkle-resistant, or less flammable. Some of these chemicals are carcinogenic or may cause harm to children even before birth.

Others may trigger allergic reactions in some people. Some flame retardants that are used in certain textiles contain organic bromine compounds that are persistent (break down very slowly in the environment). The use of some dangerous chemicals in textiles is restricted such as azo dyes and formaldehyde. All textiles processes have an impact on the environment. The industry uses large amounts of natural resources such as water, while many operations use chemicals and solvents. All companies use energy, produce solid waste, discharge effluent and emit dust, fumes, etc to the atmosphere. Many textiles companies are located in rural areas where environmental protection assumes significance.

While companies in developed countries are faced with increasingly stringent legislative controls and rising water and other raw material costs, their competitors in developing countries are getting away by externalising the environmental costs. Efficient and effective use of raw materials and improved process operations are vital for Western companies to remain competitive. Pressure is also being exerted by suppliers and customers on such companies to reduce their environmental impact. Environmental aspects in the textile industry are typically addressed at the corporate level, and the environmental costs are viewed as corporate overhead, but in general not discussed at the national level.

A more efficient compliance with proper environmental guidelines is required for significant cost reduction on environment. e-mail: nreddy. com D. Narasimha Reddy 11/11 Environmental issues can no longer be ignored by the textiles industry and the government. Indian textile industry should realize that to remain competitive operating costs have to be reduced and environmental compliance has to be increased. Government should also integrate environmentalgoalsinto the national textile policy, and cannot have independent growth strategies, as environmental costs are proving to be a drag on growth and development. The textile industry in Tirupur was expected to grow to achieve the targetted textile product export of US$ 50 Billion by the year 2010.

But, such growth is now greatly hampered due to immense environmental damage caused to the Noyyal river, ground water system, and agricultural production, by the textile wet processing industries in Tirupur. 11 All these factors mean that environmental issues should be an essential part of textile growth policies. For Indian textile sector, the main drivers for environmentally benign growth can be: • Growth of handloom sector • Competition • Pressure exerted down the supply chain by the consumer •

Reducing production costs • Meeting current and anticipated legislative requirements • Concern for the global and local environment In India, a comprehensive approach has not been undertaken before on environmental impacts of textile manufacturing and has never previously been associated with textile production and use.

A comprehensive analysis of the environmental impact of textile manufacturing activity should be done, which includes an analysis of the degradation by air pollution, wind, water and other agents. A complete survey of how developments in the textile industry and consumers of its products have affected the environment in the past needs to be taken up. This should also cover the most recent solutions adopted by the industry to alleviate the problems. This is important given the high textile production targets post 2005, and the ways in which the industry is responding to the environmental challenge. It will help the national textile policy and the growth of textile industry as well. 11 Ibid 2 e-mail: nreddy.
com