SUMMARY

Over exploitation of natural resources can severely impact sustainability of industrial production systems. Collateral damage emerges in the form of environmental damage and decline in socio-economic growth. As production dwindles due to unavailability of resource inputs, jobs dry. This briefing note summarises three promising case studies of improved resource use efficiency from India that will inform a process of cross-learning with other South Asia countries. However, it will be for developing countries to assess their utility and appropriateness in their own context.

Small and medium enterprises (SMEs) are engines for economic growth in many South Asian countries. SMEs play a crucial role as these supply raw materials, sub-assemblies and finished products to larger industries. Unfortunately, the environmental and energy performance of these enterprises are poor. But this trend can be reversed by greening the supply chain through the introduction of sustainable practices that reduce resource use, pollution and waste; encourage waste reuse; and, mitigate CO2 emissions.

Resource efficiency and waste minimisation directly impacts the profitability and competitiveness of SMEs through reduced costs of energy and raw material. Co-benefits include: Improved environment and safety at the workplace, reduced health impacts, stable employment of workers and significant GHG mitigation. In India, Bangladesh and Pakistan, similar SME operations tend to cluster, facilitating mainstreaming of interventions.

The textile, brick and steel re-rolling industries in India have demonstrated opportunities for clean growth by significantly bringing down water and energy use, resulting in resource saving and a reduction of carbon emissions.

Employment numbers:
- Textile: 55 million direct employment, 90 million indirect in South Asia
- Brick: 10 million direct in India; a million each in Bangladesh and Pakistan
- Steel re-rolling: 68,000 people in India, direct 30,000 and indirect between 100,000-200,000 in Bangladesh

Case studies from these three sectors in India demonstrate resource efficiency in the supply chain that are relevant because of (a) High resource consumption and environmental impacts; (b) Relevance to local economy; and, (c) Replication potential.

Reducing resource footprint across industrial sectors

Textiles
- Reduction in water and pesticide use in cotton cultivation
- Increased resource efficiency through financially viable conservation efforts.

Brick industry
- Reduction in use of fertile agricultural soil
- Use of fly ash waste for brick making (Fal-G technology)
- No use of coal for brick making.

Steel re-rolling
- Coal saving
- Steel saving.

Outcomes
- Savings of water, energy, raw materials & GHG reduction
- Improved working conditions
- Improved bottom line of vendors
- Improved regulatory compliance and job security

Replication potential of Indian good practices

Textile
- Significant scope for other South Asian countries as cultivation and production processes, technologies and operational practices are similar.

Bricks (Adopting Fal-G technology)
- Opportunities due to (a) Increase in fly ash generation from power plants, and (b) Decline in agricultural soil availability for conventional bricks.
- Applicability/adaptation of Government of India policies to promote fly ash use in the brick industry.
- Bangladesh has more than 6,000 brick kilns and is embarking on a major coal based power plant drive: Fly ash will be the waste generated and available.
- In Pakistan, with over 16,000 operational kilns, part substitution by Fal-G offers potential.

Steel re-rolling
- Small steel re-rolling units have mushroomed in clusters, allowing the possibility of developing standard solutions which enhances the chances of replication/scale up.
- The Bhavnagar example where the raw material is being sourced from Alang ship breaking yard is of direct relevance to steel re-rolling mills in Bangladesh and Pakistan, where the raw material is sourced from ship breaking yards in Chittagong and Gidani respectively.

Call for action
- Experience sharing for knowledge transfer
- Demonstration of financially viable and resource efficient practices and resources saved
- Engaging with sector stakeholders for their buy in
- Linkages to financial institutions
- Favorable policy environment.

*This report draws its analysis from a Knowledge Partnership Programme funded study ‘Promoting Resource Efficiency across the Vendor Base of Large Private Sector Entities in South Asia’ authored by Institute for Industrial Productivity. The study was supported by DFID, UK.
BACKGROUND

Rapid development coupled with high population growth in South Asia has resulted in unsustainable use of natural resources, leading to serious environmental and social problems, which could limit growth in the production and manufacturing industry, critical for the development of the region’s economy, especially for feeding its growing population and for pulling millions out of poverty.

SMEs offer employment opportunities in South Asia, but face major challenges such as technological obsolescence, poor product quality, information deficiency, non-availability of credits and inadequate management systems. The competitiveness of most of these enterprises is based only on the low cost of labour and not because products, technologies or skills are better. The energy, resource and environment performance of these units are extremely poor with high saving potential for saving. Some of the benefits of bringing in green technology and resource efficiency are given in Figure 1.

South Asia’s brick industry makes up for a major share in the global brick production: India, Pakistan, Bangladesh, Nepal China and Vietnam are among the top six brick producing countries of the world. The brick industry in South Asian countries provides an important source of livelihood for large number of rural poor during the dry summer months. The sector provides livelihood to around ten million people in India and about a million each in Pakistan and Bangladesh.

Steel re-rolling in this region is largely dominated by small and medium enterprises, employing a huge workforce. Currently, there are around 2,500 steel re-rolling mills operating in the region providing livelihoods to millions of people both directly and indirectly along its supply chain. In Bangladesh, it caters to 80 per cent of the country’s steel needs and provides direct employment to 30,000 and indirect employment between 100,000 and 200,000 people. In Pakistan steel re-rolling industry accounts for up to 15 per cent of Pakistan’s steel production.

This paper highlights interventions made in the textile, brick making and steel re-rolling sectors in India, which has resulted in resource saving, improved bottom lines and working conditions. Given the similarities of production practices, these offer significant replication potential for robust and sustainable SME development in the region.

Figure 1: Co-benefits associated with resource efficiency and cleaner production options
TEXTILE INDUSTRY: REDUCING ECOLOGICAL FOOTPRINTS

This case study focuses on how resource efficiency has been achieved in the textile sector along the supply chain of IKEA in India, a leading multinational brand. Starting from the farm level, resource conservation measures have led to reduced use of water and pesticide for cotton production on one end to increase in resource efficiency and productivity for textile manufacture. While these measures resulted in improving the bottom line for farmers and SME entrepreneur, it also impacted the larger sustainability issues.

- The sector has a complex value chain, including agricultural products. Resource use is intensive, with high use of energy, chemicals and water, all with environmental implications
- Potential for resource efficiency is high through the use of a range of technological interventions to reduce energy and water use, minimise wastage and enhance operational efficiency
- Large potential for replication and knowledge sharing.

Resource inefficiency and environmental challenges
Excessive water use, water pollution, energy, air pollution, chemicals and solid waste

Interventions
- Linking the farmers in the Better Cotton Initiative (BCI www.bettercotton.org)
- Bringing in resource-cutting (water, energy) technological interventions at various stages of textile production.

Highlights
- Linking of 6,000 farmers in Aurangabad to the Better Cotton Initiative or BCI, who benefitted through (a) 38% decline in pesticide use, (b) 24 per cent less water use and (c) 29 per cent less fertiliser use (Figure 2).
- All this led to a 45 percent increase in gross profit margins compared to conventional farmers.

- Focus on social issues of child labor, health and safety and employment conditions for farm workers. Better earnings increased the farmers’ ability to send their children to school, access to better health care facilities and provide a better quality of life to their families.
- Reduced water pollution and associated damage to the nearby turmeric agricultural fields of farmers.
- Improvement of bottom line of around 65 small vendors involved in spinning, weaving, cutting, sewing operations through financially viable resource conservation efforts.
- Saving of save 51 million liters of water and 13,015 Gcal energy, equivalent to annual monetary savings of Rs. 308 million (USD 5 million) and a 3,800 tCO₂ reduction of greenhouse gas (GHG) by vendor.
- Lower emission of harmful gases and fumes, better ventilation, enhanced natural lighting through use of acrylic sheets in factories and worker’s quarter and clean drinking water has helped in improving the living and working conditions of the workforce.
- Improved compliance of environmental guidelines and regulations has helped in providing stable livelihoods to the workers by avoiding shutdown threats.

Replication potential
- Significant scope for other South Asian countries as cultivation and production processes, technologies and operational practices are similar.
- With an estimated 5,500 textile units in Bangladesh accounting for 45 per cent total industrial workforce and in Pakistan with textile contributing to 11 per cent of GDP and 40 per cent of total industrial workforce, the India experience holds enormous potential for scale up through effective regional collaborations around knowledge transfer, which can help in enhancing the competitiveness of this sector and in increasing their market share in the world.

Figure 2: Impact of BCI Initiative
GREEN BRICKS FOR INFRASTRUCTURE DEVELOPMENT

This case study highlights a climate-friendly fly ash brick (FaL-G) technology that produces bricks without using top soil and coal and completely eliminates carbon emissions. The technology patented in India also holds the promise of gainfully utilising certain industrial hazardous wastes.

Resources inefficiency and environmental challenges

- Highly resource intensive and inefficient resource utilisation: Energy accounts for 35 to 45 per cent of the total brick production cost
- Massive use of top soil from fertile agricultural belt (annually, around 1,145 million tonnes of soil is used for making of bricks in South Asia) which threatens food security
- Air pollution
- Occupational hazards and subsequent health impacts
- Poor working and living conditions, drudgery,
- Seasonal employment
- Children and gender issues.

Intervention

- Producing fly-ash bricks using FaL technology. Fly ash is a waste product.

FLY ASH

The use of fly ash in brick making is not new, but FaL-G of Fly ash Limestone-Gypsum technology has the potential to completely eliminate carbon emissions from India’s large brick-making industry (picture 3). It does not use topsoil, but fly ash an unwanted residue from coal-fired power plants. Bricks can be produced in a variety of strengths and sizes and for various types of infrastructure projects. To encourage its widespread adoption, the inventors of FaL-G are providing their technology without invoking the patent. Entrepreneurs who choose this technology are provided assistance with production techniques, training for workers, and advice on the marketing of bricks.

The production process of FaL-G does not require any burning of coal and subsequent carbon emissions.

Government of India directives also supports the manufacture and use of fly ash bricks.

Fly-ash brick

Highlights

- As of March 2012, over 16,000 FaL-G brick plants in operation, up from a mere 100 enterprises in 2000, producing bricks and blocks equivalent to over 48 billion standard bricks, generating a turnover of over Rs. 12,000 crore annually (USD 1,970 million).
- Savings of about 67 million cum of agriculture soil, equivalent to 7,200 ha of fertile agriculture land.
- Coal saving of 9.6 million tonnes and gainful use of over 20 million tonnes of fly ash which would otherwise have created serious health and pollution problem and got dumped as hazardous ash mounds and ponds.
- Abatement of over 11,520,000 tonnes of CO2.
- Stable year-round employment for over 200,000 workers nearer their homes, allowing their children to attend regular school (instead of seasonal, migratory employment in clay brick units).
- Women entrepreneurs are setting up FaL-G brick manufacturing plants (with low investment between Rs 3.0-3.5 lakh or USD 5,500).
- Around 12 per cent revenue allocation for improving life and working conditions, as per an assessment of 108 FaL-G brick plants reveals. Workers are covered by health and accident insurance, provided with protective gear for use at the workplace. They were also provided with toilets, showers, and drinking water facilities in the residential area along with awareness campaigns on HIV.

Replication potential

- Clay bricks manufacture is becoming increasingly unviable in South Asia given the spiralling costs of the clay (land) and fuel.
- Opportunities for the growth of FaL-G brick technology exist: The generation of fly ash will only go up because of the operation coal-fired power plants and those planned in the near future. Raw material for FaL-G bricks is thus assured.
- FaL-G can help in dealing with the threat of fly ash pollution while protecting agricultural land from getting converted in to barren un-fertile land. Policies of the Government of India for promoting fly ash use in the brick industry can find applicability in South Asia.
- Bangladesh with more than 6,000 brick kilns is expanding its coal based power plants base and so timing of introducing this technology is right.
- In Pakistan, with over 16,000 kilns in operation, part substitution by FaL-G offers tremendous potential.
BRINGING IN EFFICIENCY IN STEEL RE-ROLLING

The case study is based on a scrap-based re-rolling industry cluster sourcing its raw material from ship breaking yard and can find direct application for similar clusters in neighbouring countries.

Resources inefficiency and environmental challenges

- Ship breaking is highly polluting
- High and inefficient energy use
- Raw material wastage
- Poor environment performance
- Lack of technical manpower
- Hazardous working conditions

Interventions

The intervention focused on effective disposal of hazardous waste generated through ship dismantling by using it as a fuel in place of coal in cement production, leading to resource saving as well as avoiding potential health and social impacts for the workers and the nearby community. At the level of the steel re-rolling unit (Figure 4), the intervention focused on demonstrating an energy efficient reheating furnace that saves coal and steel through improvement in thermal efficiency and reduction in scale losses, respectively.

- Engagement with the local steel re-rolling association
- Design and demonstration of reheating furnace that (i) aids uniform heating (ii) saves on coal (iii) increases production rate and (iv) reduces air pollution
- Training of plant operators and supervisors
- Monitoring
- Financing need and identification of financing partner

Highlights

- Safe handling and disposal potential for 3,285 tonnes per annum of hazardous wastes produced from ship breaking activity, by blending it along with municipal solid waste generated in Bhavnagar municipal area.
- The participating small steel re-rolling mill benefitted from coal saving of 22 kg per tonne of steel produced, which is equivalent to 330 tonnes of coal annually. Along with this, the oxidation loss reduction of 1.6 per cent resulted in savings of 240 tonnes of steel annually.
- Training of workers on safe handling of hazardous waste helped in reducing the number of accidental deaths.

Figure 4: Typical production process in steel re-rolling sector

Replication potential

The small steel re-rolling units have mostly mushroomed in clusters in the South Asia region with a great deal of similarity between the units within a cluster in terms of the level of technology, operating practices and even trade practices. This allows the possibility of developing standard solutions which enhances the chances of replication/scale up. The Bhavnagar example where the raw material is being sourced from Alang ship breaking yard is of direct relevance to large number of small and medium sized steel re-rolling mills in Bangladesh and Pakistan, where the raw material is sourced from ship breaking yards in Chittagong and Gidani respectively.
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KPP is a South-South cooperation programme promoting knowledge sharing in the areas of Food Security, Resource Scarcity and Climate Change; Health and Disease Control; Trade and Investment; and Women and Girls. KPP is Funded by the Government of UK's Department for International Development (DFID) and managed by a consortium led by IPE Global Private Limited under its Knowledge Initiative. The main objective of KPP is 'Gathering and uptake of evidence on issues central to India’s national development that have potential for replication in LICS and impact on global poverty'.

Contact Us: Dr Indira Khurana
Policy Lead – (Resource scarcity, food security and climate change)
IPE Global Pvt. Ltd. B – 84, Defence Colony, 110 024, New Delhi, India
Phone Main: 0091 11 4075 5974; Direct: 0091 11 4075 5984
E-mail: ikhurana@ipeglobal.com
Website: www.ipekpp.com

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