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Cleaner Production in Kenyan Small and Medium Enterprises: Prerequisites for Successful Technology Adoption¹

Evans Kituyi & Martin Marani

1.0 Introduction

Results of cleaner production initiatives taken so far in Africa amply justify the benefits of cleaner production (CP). The joint UNIDO-UNEP initiative of establishing National Cleaner Production Centres (NCPCs) in developing countries have been successful in establishing such centres in Kenya, Tanzania, Zimbabwe, Tunisia and Morocco. In most of these countries, initial activities have involved demonstration projects such as those funded by DANIDA and NORAD in Zimbabwe and Tanzania. However, experiences in Asian countries such as Thailand and Malaysia have shown that such demonstration projects may not necessarily rise to the original expectation of the multiplication effects of the CP concept in SME sub-sectors, despite clear demonstration of the technical and financial viability of these projects. This has been attributed to the distinct characteristics of SMEs in Asian countries, most of which reflect the situation in Africa. These include lack of resources and skilled manpower, and the fear of taking high risks.

In this document, we argue that the initial step to the successful introduction and diffusion of CP technologies in developing countries such as Kenya should be the formulation of relevant policies and legislation, and institutions to oversee their implementation. The paper also recognises the need for a different approach to the introduction of CP concepts in SMEs as compared to larger industries, owing to the typical characteristics of Kenyan SMEs. Building upon the major focal areas specific to Asian SMEs identified by , this paper analyses the overall pre-requisites for successful CP adoption in Kenya and proposes an iterative mechanism for their implementation. These consider the current growth and proliferation of small industries in Kenya that make the adoption of CP techniques in SMEs become highly relevant and timely for combating pollution and reducing energy use.

2.0 The SME Sector in Developing Countries

The term small and medium enterprise (SME) in both advanced and developing countries is used to describe heterogeneous groups of production units of diverse size, organization, managerial capacity and technological level and sophistication. The EU definition of SME is a firm employing less than 500 employees, although a study by Nielsen *et al.* finds this definition inappropriate. In Hong Kong, more than 95% of the factories are SMEs employing fewer than 50 workers, while in mainland China, SMEs constitute more than 98% of the total number of industrial enterprises. In

¹ Paper presented at the World Expo 2000, Hanover, Germany

Asia, about 85% of total number of manufacturing establishments are SMEs . No official definition for SME exists in Kenya though some studies have defined small-scale enterprises (SSE) as those with fewer than 20 employees . According to the Kenya Association of Manufacturers (KAM), almost all industrial establishments in the country are SMEs.

2.1 Role in Economic Development

SMEs are important in job creation and employ millions of people in Africa. By 1990, the sector was contributing significantly to the GDPs in Liberia (34.6%), Nigeria (24.5%), Kenya (19.5%), and Benin (17.7%) . In Kenya, the sector employs about 70% of the country's workforce . SMEs have characteristics that justify promoting them in development strategies. They create employment at low levels of investment per job, lead to increased participation of indigenous people in the economy, use mainly local resources, promote the creation and use of local technologies and provide skills training at low cost to society .

SMEs in Kenya face certain unique problems which affect their growth and profitability, hence diminish their ability to contribute effectively to sustainable development. Many of these problems have implications for technology choice. These include lack of access to credit, inadequate managerial and technical skills, low levels of education, poor market information, inhibitive regulatory environments, and lack of access to technology . In its pursuit towards achieving Newly Industrialised Country (NIC) status, the government appreciates the need to promote industrialisation without compromising the ability of the resource base to meet needs of future generations, can be deduced from the action plan developed to ensure sustainable industry/environment relationship.

As with Asian SMEs, many Kenyan establishments are owned and managed by family units, and usually limited to confined activities (due to lack of resources and skilled manpower). They also adopt a simple management structure and few administrative activities, do not undertake high risk jobs and are usually involved in the sub-contracting market requiring short gestation periods. Kenya's SMEs are also characterised by a low level of energy efficiency and a high level of pollution due to:

- Employment of old and inefficient technologies and lack of information on new energy-efficient and environmentally sound technologies (ESTs).
- Poor or absence of waste disposal and treatment systems, and more profit-oriented than environmentally conscious.
- Poor industrial infra-structures

- Existence of technical, economic, informational, social, and institutional barriers to the adoption and implementation of ESTs.

3.0 Cleaner Production and SMEs

Cleaner Production (CP), according to the United Nations Environmental Programme, is the continuous application of an integrated preventative environmental and business strategy to procure resources, process and produce products or provide services at a higher efficiency, increased profitability, and at reduced risks to the environment. CP can be applied to the processes in any industry and to industrial products themselves. For processes, CP results from one or a combination of the following measures:

- conserving raw materials, water and energy;
- eliminating toxic and dangerous raw materials;
- reducing the quantity and toxicity of all emissions and wastes before they leave a process.

For products, CP aims at reducing the environmental, health and safety impact of products over their entire life cycles, from raw material extraction through manufacturing and use, to ultimate disposal of the product.

3.1 Why Cleaner Production?

The costs of the traditional, end-of-pipe treatment strategy of wastes and emissions are well known. In the United States, for example, industry and government spend an estimated \$115 billion each year, according to a US government report called "Environmental Investments: The Cost of a Clean Environment". Worldwide, it is estimated that over \$300 billion is being spend each year, mainly to purchase and maintain end-of-pipe technologies. This figure could be higher than the total development aid given to Africa annually (if not cumulatively over the past few years!). The developing countries are spending so much to clean up the environmental damage created by recent rapid industrialisation and population growth. These costs, to industry, are unproductive because they do not add to the value of the products at all. The disposal costs of wastes and emissions, in addition to their environmental and health impacts, can be avoided by applying the cleaner production concept from the beginning. When CP is applied, efficiency is gained, fewer raw materials are used and less waste is generated.

High costs of production, diminishing natural resources, consumer demands and a growing environmental awareness are some of the factors driving the adoption of cleaner production technologies in developing countries. Apart from changing the technology, CP also requires a

change of attitudes which means finding a new approach to the relationship between industry and the environment. Simply rethinking an industrial process or product in terms of cleaner production may produce required results without introducing a new technology. It is also important to emphasise that the preferred cleaner production option will always be reduction of waste at the source.

3.2 Benefits of Cleaner Production

CP has many benefits, not only to the industry but to other stakeholders and the environment. Once successfully introduced, CP:

- leads to product and process improvements;
- saves raw materials and energy, and thus reduces production costs;
- increases competitiveness through the use of new and improved technologies;
- reduces need for more restrictions and prohibitions;
- reduces risks from treatment, storage and disposal of toxic wastes;
- improves the health and safety of employees;
- improves a company's public and peer image; and
- reduces the cost of increasingly expensive end-of-pipe solutions.

3.3 Current CP Practices

A study of the literature reveals the conventional way of CP introduction in developing countries as being that shown in Figure 1. A national body to co-ordinate demonstration activities is initially established, followed by active demonstration activities in selected industries. The recently formed Kenya NCPC is currently undertaking a series of foundational activities towards CP introduction and diffusion. This follows the signing of the CP Declaration at the recent First Cleaner Production Roundtable for Africa (CPRA) in August 2000 in Nairobi, Kenya.

Figure 1. Current CP introduction and diffusion practice in developing countries

This mode of CP introduction and practice tends to disregard certain basic elements typical of local SMEs that need to be understood and remedied before any tangible success may be achieved. These have been studied widely in other countries, particularly for SMEs in Asia and South America, most of whose characteristics resemble those in Africa. Typical general barriers are discussed in the next section.

4.0 Barriers to CP Adoption

Various impediments deter the speedy adoption of CP in developing countries. CP adoption is primarily hindered by perception of its benefits, which is influenced by both internal factors such as management perception and willingness to take risks, and external factors, mainly environmental legislation and enforcement. Chandak categorised the various barriers to CP adoption into organisational, systemic, attitudinal, economic, technical and governmental. According to his study, the small mills studied in India are mainly family-run and lacking in professional management set-up and good house-keeping culture. From the chief executive officer to workers, lapses in housekeeping are taken as part of industrial operations instead of being considered as an indicator of poor efficiency and mismanagement. There is general resistance to change by personnel, and the knowledge of the operators is mostly experience based without formal training. Any deviation from existing operating practices is resisted making CP implementation difficult. These conditions compare well with those reported for Kenyan SMEs.

As most mills are generally run by families, the owners/decision-makers are seldom qualified managers and fail to provide the required corporate guidance. The vision and thinking of employees is also limited to day-to-day working without any long-term targets. There's general lack of supervision as supervisors are not trained persons but those promoted from amongst "good-performing" workers. Job insecurity in SMEs is also high, with people worrying more about how to retain their jobs by doing what pleases their employers, other than take the risk of failure in a new activity. Since the owners are the sole decision-makers, production staff do not participate in environmental management activity unless ordered to do so. Ownership is therefore not engendered in the staff, leading to low motivation and lack of initiative of taking up new and challenging assignments. Coupled with poor remuneration, these aspects result in high turn-over of staff. There exist various systemic barriers to CP adoption too. There are poor or no records at all kept of water, energy, materials consumption and chemical use among others. The environmental auditing process is therefore tedious, often having to begin from baseline data. Environmental records e.g quantity and quality of liquids, solid and air emissions, are also maintained. There is lack of systematic training of employees to improve their skills. The workers are therefore unable to comprehend new subjects such as CP.

A number of technical barriers are experienced by SMEs too. For instance, lack of in-house infra-structural facilities required for on-site monitoring, makes SMEs to depend on the few, expensive, distant-located external agencies. Basic data collecting for CP implementation is therefore a problem. Trained personnel to handle such tasks or interpret results are also in short supply in this

sector. Generally, the SMEs have limited access to important information such as that on success stories on CP within the country and region. The information available from abroad is neither directly relevant nor tailored to suit SMEs in developing countries. Technology barriers include the lack of records of any technology developments in African SMEs. Mostly the old technologies have been modified, and problems encountered are solved by trial-and-error without analysing the basic chemistry and engineering involved in the process. Such activities are also never documented to provide benchmarks for others in the sector.

Financing institutions in Kenya have so far not had any interest in financing new cost-intensive technologies, especially those with long pay-back periods. In cases where finances have been available, interest rates are high making technology change measures not viable. Frequently, there is inadequate investment planning that may result in partial implementation. The most attractive technology options, but requiring higher investment do not get the priority. Instead, least capital-intensive options are chosen with the risk of poor performance leading to loss of interest and confidence.

The governments could also present certain barriers to CP implementation. There have been no standards and environmental legislation in many African countries for a long time. Where some exist, regulatory authorities are ill-equipped and still emphasise on achieving a stipulated environmental discharge standard. SMEs therefore prefer the conventional end-of-pipe (EOP) control to satisfy the authorities rather than adopt CP and still face regulatory problems. Although it is the government's policy intention to provide economic incentives such as tax exemptions for environmental management tools, these important policy provisions are never implemented.

5.0 Proposed CP Adoption Cycle For Kenya

Successful adoption of CP requires a well designed introduction and diffusion plan incorporating remedial steps to the issues previously identified. The scheme shown in Figure 2 outlines a proposed approach to achieving such an aim. It advocates for a systematic (phase-wise) elimination of barriers. Before CP is introduced, there is the need for the government to recognise the entire philosophy within official national development policies, emphasising clear action plans. Provisions should be clear on who may take part in the initialisation process and what capacities these players need to have. It is such provisions that should establish the NCPCs, NGOs and other interest groups. These groups should be able to develop and oversee, in defined collaborative formulae, the rest of the implementation plan as suggested by Figure 2.

Figure 2. Proposed CP introduction and Diffusion cycle for Kenya: An Iterative Process

5.1 Policy and Legislative Frameworks

Until January 2000, Kenya like many other developing countries, never had a framework environmental law. It only had pieces of legislation scattered within the statute books. But after a long struggle with a process often marred by political interference, the Environmental Management and Co-ordination Act of 1999 was adopted. It is however, yet to be effected as the entire institutional framework is not yet in place. A study of these laws finds them lacking in various aspects. Much emphasis dwells on enforcement of pollution levels and standards that are yet to be developed. It also outlines the punitive measures to be taken against polluters. There is therefore the tendency by the Act to lean towards end-of-pipe pollution control enforcement. The CP concept of anticipatory pollution prevention is not directly recognised in the new law. However, many Kenyan strongly agree that the new law is a landmark in the country's sphere of environmental governance. The last few years have witnessed rapid expansion of the SME sector in Kenya, mainly those involved in small-scale manufacturing. These have been favoured partly by the generous licensing system in place supportive of the government policy to achieve Newly Industrialised Country (NIC) status by 2020 described in the Sessional Paper No. 2 of 1996. However, the plan of action towards this goal is not accompanied by environmental management provisions that fit within the broad description of CP. Some of the reported strategies to achieve successful environmental management during the plan period, that tend towards CP, include the intention by the Finance Ministry to examine ways to provide tax relief and other benefits to encourage business and industry to use environmentally friendly technologies....and identify and remove or reduce those subsidies/incentives that work against sustainable development objectives . Sessional paper No. 6 of 1999 stipulates government policy on Environment and Development but lacks clarity on CP. Being a technology, new policies need to be formulated taking into consideration information needs, technology access and transfer. As it stands now, the main environmental management and industrial development policy documents for Kenya do not address the cleaner production concept. A clear CP technology policy is therefore needed.

5.2 Institutional Requirements

Successful adoption of CP calls for the establishment of certain institutions to oversee implementation of the defined policies. Some of these include:

Capacity building There is so far no capacity building program specific to CP in Kenya and many other countries in the region. In order that real impact of CP be felt in SMEs, capacity building efforts need to reach out to various stakeholders within and without industry eg banks, utility suppliers, regulatory bodies, industry associations, NGOs, mass media, among others. SMEs are known to serve as training grounds for developing skills of industrial workers and entrepreneurs and the skills acquired enables them to branch out to other fields . However, this informal on-the-job training is usually not well organised. There is need for planning new CP training activities that cater for not only specialists, but also reaching out to the various cross sections of future technicians, and planners.

Standards and benchmarks Both energy and environmental issues for the SMEs in developing countries lack the benchmarks for identifying and defining the reduction goals and information available are often those based on industrialised country technologies. There is need to develop industry or technology-based energy and environment benchmarks specially suited for SMEs. Such an undertaking calls for close collaboration between policy makers, industry associations, and equipment manufacturers.

Information dissemination and awareness raising Urgent dissemination of information and publicity about cleaner production and its benefits is necessary. Such efforts should target various groups that are often overlooked or neglected while developing industrial environmental management programs. Some of these groups have been identified by studies in Asia and include general public, financial institutions, regulating bodies, industry and trade associations, etc. Increased information access is bound to enlarge the base upon which entrepreneurs may make informed technology choices. Some studies have demonstrated that industrial pollution can be reduced significantly by public pressure even in an extremely poor economy with little formal regulation with better public information.

Financial mechanisms Financing is a major barrier to CP technology uptake and various examples exist justifying the viability of implementing pollution prevention and energy efficiency programs in SME sectors. Mechanisms or agencies with a clear mandate for the promotion of CP related issues at the national level will boost the confidence of SMEs and help in the adoption of CP technologies at a faster pace. Small national credit institutions could be established or existing ones supported to expand their mandates to include financing CP activities. The economic tools employed by governments such as tax exemption on environmental management equipment are a

feasible policy whose implementation in Kenya need strengthening. This could supplement efforts already in place by the newly introduced KNCPC.

Technology Development and Transfer Whereas large industries can easily adopt western technologies, the high cost and operational nature of SMEs makes it difficult to adopt such technologies. Therefore CP technology promotion need to focus more on indiginisation of western technologies to suit local energy, raw material resources and local sustainable development policies. The recently established Industrial Ecology Institute (IEI) in Nairobi is proposing the establishment of a technology transfer agency to lead the process by an increased Africa-Asia interaction for technical collaboration, information sharing and capacity building. The choice of Asian countries (mainly those in ASEAN) began their CP adoption activities earlier, about a decade ago, having SME structures similar to those in most African countries. During initial CP inception, these countries had economies similar to those prevailing in Africa. Furthermore, many cheap, cleaner energy technologies have emerged from countries such as India and Thailand, which could easily be transferred to other places. Similarly, a lot of experience has also been acquired by entrepreneurs through the numerous training and sensitisation programs. But perhaps of much significance are the developed networks and agencies for technology enquiry and transfer to which African institutions could be linked. To support any gains made from such links, local research and development could be co-ordinated by organisational groups of individual SMEs for their own benefit. Industry-academia links could also be strengthened.

6.0 Conclusion

Cleaner production in Kenya is at its infancy stage and there is high potential for its adoption by SMEs in the country. However, there is the risk of its adoption being slowed down by the lack of clear supportive policies. There is therefore the need for a CP technology policy to guide the technology development, assessment, transfer, information generation and dissemination. Further to the emphasis on the use of demonstration projects to promote CP technology diffusion in industry in Kenya, clear legal and institutional arrangements will need to be installed. These will be instrumental in not only breaking the prohibitive corporate cultures established within the SME sector, but will also initiate links and networks supportive of technology transfer and capacity building programs. CP is clearly the springboard to sustainable industrial growth in the technologically inferior Africa.

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