

An Integrated Policy Framework for minimizing industrial wastes at-source Enabling Cleaner Solutions*

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Abstract

Waste minimization is one of the most important interventions that can help sustain industrial production without compounding onslaughts due to pollution on environmental sinks. The importance of this intervention cannot be overemphasized. This has been proved by several instances across different sectors clearly highlighting economic benefits of resource conservation and avoidance of waste. Several rules and regulations have tended to curb firms from generating excessively large quantities of wastes especially in conjunction with the diversity and intensity of impacts they generate. However the build up of wastes in the environment has continued unabated. The present paper suggests a policy framework integrating certain command and control interventions with such hybrid approaches as reality checks and capacity building to overcome barriers in waste minimization. The policy framework suggested in this paper argues that it is possible to stimulate waste minimization through a mix of appropriately designed incentives to adopt cleaner production and disincentives to counter generation of wastes. Additionally, value addition to wastes apart from comprehensive waste treatment, is expected to augment waste minimization.

These approaches are intertwined and have very important roles, as part of a preventive environmental management framework. This integrated policy framework has been substantiated with sector-specific examples from several parts of the world and is proposed as a viable mechanism for synergizing industrial production and environmental pollution. Capacity building measures, as a sequel to information servicing are highlighted in conjunction with UNESCO's initiative on education for sustainable development. Targetted interventions aimed at improving preparedness of stakeholders to effectively participate in minimisation and abatement tasks become relevant in this context.

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Introduction

The significance of an integrated approach including an analysis of the limitations of technologies / practices in use, appropriateness of regulatory and fiscal measures and improving preparedness of stakeholders to respond to the imperatives of environmental protection, cannot be overemphasized. It is however critical to evolve an appropriate mix of interventions depending on the intensity of externalities. The process of evolution of such a mix of interventions is characterized by a preponderance of one or more of such instruments under different scenarios, creating the need for an appropriate integration of determinants. These instruments impact variations in the responses of the systems at different levels including the firm level, sectoral and economy-wide contexts (Markandya et.al 2002).

The dynamics of the interrelatedness of such instruments have been highlighted by several policy analysts periodically. (Huber & Liberatore 2001; Haas & McCabe 2001; Paavola 2002; Bromley & Paavola 2002; Gale & Barg 1995; Repetto 2004; Coglianese & Nash 2002 and UNEP 2004a) Some of the most recent trends in the trade, technology and environment interface also call for a careful analysis of the implications of becoming environmentally more efficient; thereby help attain higher levels of environmental performance (Moore 2003).

The most recent framework of action to improve preparedness of stakeholders to effectively participate in environmental action and sustainable development has been proposed by the UNESCO (2004), creating an excellent opportunity for strengthening information support and capacity building initiatives. The need for such a concerted effort is probably most felt in the context of pollution prevention involving the small, medium and large scale industries, not only in the developing world, but also in countries with economies in transition and the developed world. This is also reflected in initiatives on international cooperation to manage chemical risks, highlighting a preventive environmental approach (UNEP 2004b). It is in this context that the present paper focuses on a policy framework (a statement of goals to be achieved and some probable options for action) with special reference to strengthening pollution prevention initiatives. IAELP-Workshop CEE Centre for Environment Education It is important to recognize that dialogues on pollution prevention have moved far beyond rhetoric. Very clear instances of pollution prevention have been documented. Importantly, public outcry against unabated pollution has also been gaining momentum. Demonstration projects and capacity building interventions have been reported, indicating efforts towards strengthening pollution prevention measures. Some of these have been included for easy reference as footnotes in this paper (1 to 17). It will be evident from the information presented, that the role of civil society is gaining in strength particularly with the increasing implications of understanding environmental information, as part of reporting processes.

Examples of cleaner production initiatives the world over and some important routes for accessing relevant information have been presented. The specific framework of integrated management of chemicals, as a means of triggering cleaner options (proposed by UNEP) provides insights into the relevance of measures, not only of domestic origin but also their interrelatedness with other countries.

This paper does not present an analysis of policies with the type of rigor that can be expected from specialists in the development of policy frameworks. On the other hand, this paper only presents some basic information on the need to develop policy interventions that can adequately complement end-of-pipe treatment systems and demonstrate the need for becoming cleaner. In this context, the emphasis is on waste minimization.

We also propose using the option of comprehensive treatment of wastes as an incentive / inspiration for triggering larger scale integration of cleaner production / waste minimization, than what is seen today. It is with this specific intention, that the paper presents a compilation of some important information and sources that could be made use of by the reader, in order to build on the learnings indicated therein.

Based on the above, we wish to briefly state that it is possible to capture opportunities provided by links with financial institutions, regulatory authorities and the civil society, more effectively and implement an enabling framework with the objective of strengthening waste minimization / cleaner production interventions. We argue that existing laws on pollution prevention and environmental compliance do reflect a policy embedded in a preventive environmental approach. However, it is important to strengthen its implementation by creating an appropriate milieu, wherein firms are motivated to participate in waste minimization efforts.

One of the most important opportunities for enabling transitions to higher levels of environmental performance pertains to providing appropriate information in a timely manner to the stakeholders. We argue that it is important to compile information on the limitations of existing production systems (which are implicated in the generation of wastes) and design capacity building programmes on aspects of cleaner production / waste minimization. While existing programme need to be significantly up-scaled, the relevance of providing such information on technological improvement opportunities to financial institutions becomes significant.

We have presented some information on the quantity of wastes generated (in India) implying opportunities in waste minimization. Reference to some significant initiatives in waste minimization from a few parts of the world, to indicate some of the most important emerging trends in pollution prevention / waste minimization has been made. An action plan has been briefly outlined to suggest a possible means of implementing an integrated policy option that argues for rapid and comprehensive waste treatment as a means to demonstrate the benefits of becoming cleaner and seek a more emphatic and a positive response from firms in terms of the scale and diversity of waste minimization interventions.

Problem statement

Pollution continues unabated in spite of the existence of several regulations developed over the last couple of decades in particular. This will be evident from several reports, for instance that land degradation and contamination of river systems due to industrial run-offs has increased significantly. Existing clean up technologies have not adequately matched the requirements of control and abatement, thereby calling for concerted efforts to significantly enhance treatment and better disposal. Some solutions beyond command and control regimes are also emerging. These include public participation demanding environmental remediation, settlement for grievances, and environmentally responsible action by the industry. Cleaner Production (CP) assessment and implementation has also been evident in some cases but they are few and far between.

Several such reasons as

- resource and energy intensive production technologies
- inadequate capacities to establish qualitative and quantitative linkages
- material and energy intensities
- inadequate and incompatible end-of-pipe treatment systems, and
- very poor enforcement have been cited for the prevailing situation

Imperatives

It is critical to

- (1) proactively reduce wastes through treatment systems that are up-scaled and adapted to adequately treat and dispose, in order to prevent further build up,
- (2) strengthen systems of community participation and action to ensure uncompromising enforcement of compliance,
- (3) community action should be guided to evolve far beyond acrimonious relationships towards a supportive role in the form of documenting, monitoring and reporting environmental perturbations in order to motivate appropriate preventive measures and
- (4) device mechanisms by which voluntary action towards significant improvement in environmental performance by industry is promoted and suitably rewarded.

It is important to take note of the fact that firms, investors, and public can suffer substantial losses through lack of transparency on environmental risks and exposures. The requirement that all material information must be promptly disclosed is wide-spread in countries with developed financial markets. Mandatory disclosure has become a more effective policy instrument in Canada, UK and the EU (Repetto 2004).

These losses add significantly to the burden on inefficient environmental performance, resulting in high pollution control costs. The International Chemical Manufacturers Association also emphasizes transition to sustainable development through improving competitiveness. Such firms as Dow Chemical, Du Pont, BASF and Bayer have been cited as examples (Watkins 2002) of the Responsible Care framework. Reducing environmental footprints, committing to corporate social responsibility, serving the triple bottom-line adding value in economic, social and environmental terms are some of the features of such a transition.

Applying principles of green chemistry is also increasingly evident in the process of deriving environmental and economic benefits. Rouhi (2002) cites the case of Pfizer, where several steps were telescoped thereby helping to eliminate 440 metric tonnes of titanium chloride and a host of organics in addition to improving yield through improved production systems. A 10-fold reduction in solvents, 150 tonnes of hydrochloric acid and 100 metric tonnes of NaOH, saving hundreds of thousands of dollars was achieved. At Bristol – Myers Squibb, fewer unit operations yielded 68% increase, simultaneously reducing solvents significantly. (The foot notes provide additional information on accessing examples in different sectors across the globe).

Important questions

Abatement of pollution and a reduction in pollution load has to be achieved in significant measure similar to those cited above, with a much larger number of firms being enabled to integrate cleaner production calling for large scale integration of waste reduction and avoidance measures. In this context it is relevant to raise the following questions. If comprehensive pollution prevention is to be achieved on the basis of a suitably devised policy framework, what interventions have to be evolved to support existing regulatory processes in addition to fostering voluntary approaches? Are existing structures of governance including command and control, market-based instruments and capacity building approaches adequate to achieve the goals of pollution prevention?

With reference to the question raised “what if” scenarios have to be constructed to highlight the relative significance of such modulators as (1) efficiency and adequacy of end – of - pipe interventions as they exist, (2) improved treatment and disposal to demonstrate the value of at – source reduction; and (3) implications of unconstrained accumulation of contaminants, in order to exhibit the value of the

IAELP-Workshop and CEE (Centre for Environment Education) proposed policy framework. Empirical evidences on rudiments of positive action and constraints have to be documented to substantiate the “policy – based” prescription for preventive action, supported by an action plan to guide implementation of tasks to achieve the goals set forth by the policy.

The rationale of the proposed framework is that it is possible to retard build up of pollutants by adopting a proactive approach (across sectors), embodying the following action elements.

- (1) Up-scale comprehensive waste treatment initiatives with suitable adaptations to adequately treat and appropriately dispose them.
- (2) Stimulate waste reduction at-source through capacity building for cleaner production assessment, value addition for wastes and incentives for becoming cleaner.
- (3) Enable understanding of limitations of technologies and practices, for the benefit of financial institutions to devise mechanisms for technology screening and support.

Sectoral analyses become important in this context.

- (4) Establish mechanisms to build capacities of communities to help, document, monitor, report and communicate on environmental perturbations. Learnings from the process of interpreting opportunities for technology augmentation, infusing cleaner production, value addition to wastes, identifying cleaner technology interventions, assessing

prevailing levels of awareness and preparedness of communities to participate environmental action will help develop an appropriate framework of action, emphasizing a multi – pronged approach.

Information on (1) systemic barriers in environmental compliance including aspects of greener processes and products, value-addition options, alternatives, (2) implications of inadequate information and documentation systems, (3) access to substitutes, (4) inadequate diagnostic frameworks for waste streams, (5) assessment of performance of collective initiatives in waste treatment and (6) prevailing levels of awareness and preparedness of communities to initiative remedial action on a participatory basis, will emerge. Gaps in the process of collection and consolidation of relevant information in the hands of regulatory agencies, select financial institutions and policy development will also come to light.

Information for the benefit of the government agencies on (1) the levels of preparedness and capabilities of industries, communities and financial institutions to respond to emerging trends in environmental protection will help define appropriate capacity building interventions. (2) Approaches and opportunities for strengthening compliance, waste treatment and disposal for defining mechanisms that support innovations and help transition to efficient voluntary initiatives will also emerge. (3) Information for the benefit of industries on the imperatives of integrating cleaner production practices, proactively reducing wastes, reporting on environmental compliance for evolving participatory processes will also be generated. (4) Information on technology limitations, innovations and scope for IAELP-Workshop CEE Centre for Environment Education evolving adaptations to handle heterogeneous wastes typical of several systems of production in India will help financial institutions develop suitable technology assessments and support. (5) Information for the benefit of communities will centre on the process of documenting perturbations, monitoring and reporting systems to proactively enable preventive environmental management interventions.

The long term benefits of such a process will relate to (1) information on opportunities to strengthen framework of policies through an analyses of barriers and education and communication interventions to overcome them. (2) It will also help the various target groups gain access to frameworks of sustainable action through integrated preventive environmental management approaches. (3) A participatory method will evolve on the basis of understanding prevailing levels of preparedness to act.

The proposed policy response

We argue that, while the existing rules and regulations represent a preventive approach, it is important to integrate ‘adaptive mechanisms’ as part of the policy framework to strengthen implementation. These adaptive mechanisms should respond to increasing entropy by enabling the evolution of appropriate technology based interventions, augmented by capacity building initiatives.

For instance, a policy focusing on preventing the build up of contaminants is needed. This policy is expected to trigger proactive interventions in at least three major areas of environmental action.

The areas are:

1. Improved waste treatment and disposal, post – end – of - pipe treatment
2. Technology adaptations through an integration of cleaner production approaches with implications in developing trade advantages
3. The evolution of technology forecasting systems that will help leapfrog into significantly higher levels of environmental performance.

Additionally, the proposed policy framework will provide opportunities to integrate appropriate incentives for becoming cleaner, develop hybrid approaches based on the command and control system, market-based instruments and voluntary initiatives. The equally significant roles of the policy maker, industry and community will get highlighted in the framework of the proposed policy. Mechanisms of capacity building will be an integral part of the policy response. Plans, programmes and projects embodying the policy will also emerge as part of the output proposed. Accordingly the aim of the proposed policy intervention is to enable a multi – pronged implementation framework for comprehensive pollution control.

An approach

A logical framework matrix has to be employed in defining the goals, approaches, tools and techniques and indicators of progress of investigation. In this context it is important to compile information on the extent of externalities generated. A framework of policy interventions that can highlight concerted efforts to intensify appropriate treatment and safe disposal of accumulated wastes, will generate the necessary impetus for regulatory authorities to ask industries for significant reduction of wastes at source.

This creates an opportunity for industry to look for and respond to capacity building interventions to reduce wastes at source through cleaner production assessment and preventive approaches. This approach of analysis will help define capacity building interventions and other systemic measures in response to prevailing levels of preparedness of the various target groups.

The policy model can also be tested for its adaptability through an integration of characteristic system-specific constraints. Analysis of these constraints has to be carried out through participatory processes in the industrial estates, regulatory agencies and communities. The learnings so generated should be shared across the target groups and refine interpretations of determinants.

One of the best examples of facilitating adoption of alternatives (for instance in India) is the case of responding to the phaseout requirements of the Montreal Protocol. Adequate information support followed by training on use of alternatives has characterized the success of the implementation of phaseout tasks. A national policy that wanted to minimize economic dislocation and obsolescence costs was supported by a thorough analysis of the technological preparedness of the production and consumption sectors to comply with the phaseout requirements.

The mechanics of awareness raising as a concerted effort in response to specific system requirements center around 6 critical steps. These include

- (1) setting environmental communication objectives,
- (2) identifying the target groups and the key intermediaries,
- (3) formulating effective messages,
- (4) defining means of transferring messages,

(5) creating and implementation schedule,
(6) evaluation and monitoring (Mehers 1998). These have also been substantiated in an earlier and a comprehensive framework (UNEP 1996) on the process of raising awareness on ozone depletion. The India country effort, coordinated by UNEP, GTZ and INFRAS (2001) also reemphasizes the need for a multi-pronged strategy for the servicing sector through an emphatic integration

IAELP-Workshop CEE Centre for Environment Education of inputs from the stakeholders, as a process initiative and not centered on just a few events.

A comprehensive strategy planning initiative to help define the mechanics of implementation of capacity building programmes as part of a larger process, rather than a project, will be a very useful starting point for this need-based intervention. It will be very useful to contribute to the process of strategy planning which has already been initiated by UNEP (UNEP 2001), on the basis of some indicative empirical evidences regarding the suitability of tools for information dissemination. Providing instructive information in a timely and appropriate way is the key to ensuring satisfactory outcome of the initiative. In this context, it will be useful to take note of the dynamics of capacity building through environmental education and communication, characterized by at least four important stages (Mehers1998). While awareness pertains to gaining basic information about the new idea, it also entails the triggering of a tendency in the target group to learn more about how others use the information.

Preliminary attempts to use the innovation or value added know how is also fraught with the possibility of the user exercising the choice to decline further involvement. This pertains to the trial aspect, before getting in phase with the proposed change. It is in this context that incentives / certification-driven servicing become important. Adoption occurs in final stage with commitment to employ the altered path of action in a sustained manner. The relevance of this framework of capacity building to the presently discussed context of enabling technicians to transition to 'good practices' will be quite obvious. Carew - Reid et. al. (1994) indicate that it is important to build on existing participatory structures, methods and projects for successful harmonization of natural strategies and local participatory efforts. Some of the tools proposed by them include a clearing house mechanism for communication, organizing workshops and briefings for the specific target group, publishing newsletters of strategy based activities, reporting on progress to different groups, issuing press releases and regular briefings for the media. They further argue that the success of the strategy depends not only on changing some attitudes and types of behavior but on strengthening a few others. Formal and informal on education and training on aspects on targeted through the awareness exercises and access to incentives may trigger better levels of active participation. The choice of the medium of communication however varies across countries and contexts.

Awareness campaigns have also been used to complement environmental action (Scriabine R. 1996). The Worldwide Fund for Nature mounted campaigns to protect tropical rain forests and wetlands through coordinated national action, using mass media, advertising special events, exhibitions, conferences, seminars and workshops and

merchandizing. Canada's Green Plan was taken to the people through a consultation process involving more than 40 information sessions to explain the document and seek feedback. Coalitions are also known to consolidate local action, for evaluating and redesigning programmes and more importantly repositioning for new markets in response to demands for safer and cleaner environment. Scriabine (op.cited) further argues that it is possible for IAELP-Workshop CEE Centre for Environment Education business to look at environmental education and communication strategies as viable options to involve stakeholders and in this process also build capacities that will enable integration of newer skills. Developing skills to enable people take action and become involved in solving problems is an integral part of education and communication strategies to attain targets of action focused on environment and development (Mehers 1998; Smith 1995).

Footnotes:

Pollution control imperatives - India

- The State of the Environment 2001 report on India prepared by UNEP (2001) indicates the following: 7.2 million tonnes of hazardous waste is generated in India, of which nearly 20 per cent is recycled. The rest are fit only for disposal either through incineration or at a secured landfill. The report also cites the pressure-state-impact-response framework employed by the Government of India to identify important environmental issues that need to be addressed on a priority basis through action-based programmes.
- Nearly 270 industrial estates function in Gujarat; an equal number is seen in Maharashtra. (CSE 2000a,b,c; Tiwari & Mahapatra 2000).
- Effluents from tanneries, textile dyeing units and other industrial operations severely reduced productivity of soils and contaminated river basins (Sivanappan 2000; CSE 2001).
- Six major hazardous industrial locations were identified by the Inspectorate of Factories in Tamil Nadu. Contingency plans were to be developed to prevent impacts of accidents on account of these industries. (Hindu 1998).
- State pollution control boards of 17 states have prepared an inventory of just about 2523 highly polluting units in India. Quantitative information base has to be further strengthened.(DTE 2001)
- Public and judicial actions against perturbations by industries has been quite emphatic (Yadav 2000,Dhara 2000)
- Mercury in effluents is found in significantly high quantities. Paper and pulp sector consumes three to six folds higher levels of water per tonne of produce, compares to normal operations (Kashyap S 2001).
- Activists and civil society protest against dumping of toxic mercury wastes from production of thermometer in Kodaikanal and force the companies to clean up the mess (DTE 2001a, b, c).
- CPCB in 1995 published that 22 places in 16 states of India were critically polluted sites in terms of groundwater contamination. Industrial effluents contributed to high levels of heavy metals seen therein. State authorities have even announced in local newspapers that informants of wanton dumping wastes will be suitably rewarded (Tiwari & Mahapatra 1999).

- At least 11 major river stretches across the country are polluted due to pollutants of industrial origin. Nearly 7.2 million tones of hazardous wastes have been generated in

the country of which about 20% appears to be recyclable (UNEP 2001).

References from India Today 1999. The Poisoning of India: 53p.

- “Thanks to callous corporations and uncaring governments, parts of India have turned into wastelands, home to an unregulated amoeba –like spread of industries. Despite a growing awareness about pollution and efforts by courts to shut down factories and enforce green law, progress is excruciatingly slow”. (p3)
- The river Noyyal in Tamil Nadu has become a lifeless water-body on account of human wastes and toxic industrial effluents from dyeing units in textile factories (p16)
- Ganga receives toxic effluents in Kanpur and Calcutta from tanneries and other industrial effluents along the Patna stretch (p 18)
- The Damodar river is polluted by coal-dust, wastes from distilleries, explosives factories, fertilizer and other chemical plants. The river Betwa is contaminated by effluents from liquor manufacturing processes and other industrial effluents. Patalganga is heavily polluted due to effluents from large scale industries (p 20)
- Coastal pollution is also quite severe (p 28-29)
- 22 critically poisoned areas have been identified in India; nearly 100 million tones of wastes including sludges have been implicated in this catastrophe (p 37)
- Some of the aspects of an agenda for change include the development of comprehensive policies, inventories of wastes, creating safe dumping grounds and awareness for all (p54)

1. Overview of Cleaner Production in India

Details regarding the policy statement for the abatement, the various regulatory and fiscal interventions to prevent and abate pollution and initiatives to promote cleaner technologies have been discussed. Some of the most interesting examples relate to the life cycle assessment study in the steel sector, carrying capacity based planning, the assistance received from the Asian Development Bank to develop projects on cleaner production, eco-park programmes, waste re-use and recycling programmes in several small scale industrial sectors, the establishment of waste minimization circles based on which more than 300 waste minimization options were identified from nearly 180 firms, the introduction of environmental statement as part of environmental audit, assessment of pollution control activities in highly polluting industries, recognition of environmental laboratories, zoning atlas, training education and awareness activities including the Clean Technology Initiatives with support from USAID, the role of the Confederation of Indian Industry, the Federation of Indian Chamber of Commerce and Industry and the Associated Chambers of Commerce and Industry have been discussed.

Work on environmentally sound technologies has also suggested the importance of focused sensitization programmes for managements, tackling indifference of public to environmental degradation and the need to highlight the challenges that we arise on account of liberalization. The need for a comprehensive database on cleaner technologies and the development of appropriate measures to promote cleaner technologies has also been highlighted.

The Gujarat Cleaner Production Centre, the Confederation of Indian Industry and the Federation of Indian Chambers of Commerce and Industry provide very useful information on examples of cleaner production and cleaner technology options in their respective web sites.

1. The Indian Experience: Overview of the Progress of Cleaner Production in India
<http://www.aprcp.org/cphelp/Country/India.htm> as viewed on 10/28/2004

2. The call for improved management of hazardous wastes

India generates approximately 6-7 million tones of hazardous wastes per year. A comprehensive qualitative and quantitative profile of the wastes is required to arrive at the precise quantities. Obsolete technologies are implicated in the generation of hazardous wastes. Preventive approaches are by and large not evident. Enforcement of laws does not seem to be adequate. Negligence on the part of officials has been cited as one of the most important cause. While environmentally friendly hazardous wastes management systems are needed, the government agencies, private sectors and the civil society have to participate in collective action to mitigate impacts. The media could play the role of investigators and publicize information to the public and strengthen policy advocacy initiatives. It is therefore very important to rethink on the existing approaches to pollution control and end-of-pipe approaches. Emphasis should be on pollution prevention, waste minimization, cleaner production and reduction in the use of toxics.

2. The dangers of hazardous waste

<http://www.toxicslink.org/art-view.php?id=2> as viewed on 10/28/2004

3. Successful Practice at of waste management at Asian Paints India Ltd (APIL).

Considering the stringent legal requirements regarding hazardous wastes management, APIL worked diligently to improve its environmental performance and in this process minimized generation of wastes apart from eliminating a few waste streams. All the six manufacturing facilities are ISO 9001 and ISO 14001 certified. 78 types of wastes were identified from paint manufacturing facilities of which 18 were found to be hazardous in nature. Some of the waste minimization project carried out in two of its manufacturing facilities including recovery of solvents and reuse of wash water. Waste minimization audit are carried out to identify pollution prevention opportunities.

3. Hazardous Waste Management- Successful Practices at Asian Paints, Hyderabad

http://www.cleantechindia.com/eicimage/21010102_38/HWM.htm as viewed on 10/28/2004

4. Status of Hazardous waste management in India

The Centre Pollution Control Board started an inventory on hazardous waste in 1993. With reference to the rules on waste management and the guidelines developed by the Government of India, nearly 116 hazardous waste incinerators and several engineered landfills are currently operational. Improper storage, handling, treatment, transport and disposal of the wastes, by the firms compounds the problems in the management of hazardous wastes. Notwithstanding these rules and guidelines, which also include a detailed reporting system on the movement of hazardous wastes, the extend of management leaves enormous scope for input. The National Environmental Tribunal Act 1995 provides for remedies to damages experiences on account of environmental misdeeds. The Community's Right to Know 1996 intervention has also been adopted,

strengthening the role of the civil society. The Central Pollution Control Board has prepared a ready reckoner on the sources, characteristics and methods for recycling and disposal of hazardous wastes. Several bilateral initiatives are in operation in areas of improving infrastructure for the management of hazardous wastes. Most importantly, there are no incentives for waste reduction or minimization efforts in India. Standards for clean up of contaminated sites has also not been formulated, because of which the firms continue to contaminate waters and soils unless they are forced to clean up through judicial intervention. It is important to target waste minimization / reduction activities, supported by training and capacity building of firms and of the regulatory authorities. www.teriin.org/seminar/waste.pdf , as viewed on 10/28/2004

India's National Environmental Policy 2004

- Objectives

Ensure efficient use of environmental resources to minimize adverse environmental impacts through improved transparency, rationality, accountability, reduction in time and costs, and participation. Some of the principles which will guide implementation include payments by the polluter, legal liability including fault based and strict liability and preventive action. Some of the barriers to the adoption of clean technologies include absence of competitive substitutes and lack of adequate capacity in financial institutions for appraisal of proposals for changeover to cleaner technologies, lack of coordination in R&D efforts in India aimed at developing a shelf of commercially viable clean technologies.

India proposes to encourage capacity building in the financial sector for appraising proposals on adopting alternatives, network technology research institutions in the country for cooperation in the development of cleaner technologies and strengthen environmental awareness, education, and information support. Partnership and stakeholder involvement are equally important in this context.

5. Waste minimization circles in India (References are cited alongside)

5. Waste minimization circles in India

1. Global initiatives supporting waste minimization

Details regarding international action on toxic chemicals and management of hazardous have been presented with reference to Agenda 21. Chapter 19 and 20 highlight the need for comprehensive assessments of pollutants and contaminants reinforcement of national capacities to detect and halt introduction of toxic and dangerous substances and providing assistance to all countries to obtain information on illegal traffic of toxic chemicals and dangerous products. The need to promote cleaner production, recycling of materials, promotion of appropriate national measures and programmes, development of human resources and dissemination of information, harmonizing procedures to identify and control wastes has also been emphasized. The Intergovernmental Forum on Chemical Safety (IFCS) and the Inter-Organization Programme for the Sound Management of Chemicals (IOPC) has also been formed.

Some other important references include Chapter 4 highlights consumption patterns, Chapter 6 focuses on protecting and promoting human health conditions and Chapter 9 on protection of the atmosphere.

6. International Action on Toxic Chemicals and Hazardous Wastes

<http://www.un.org/ecosocdev/geninfo/sustdev/toxic.htm> as viewed on 10/28/2004

Other complementing Interventions

The Basel Action Network (BAN) and the International POPs Elimination Network (IPEN) along with several representatives of the civil society across the world are working assiduously to ensure that management of wastes is done comprehensively. These frameworks include Basel Convention on the trans-boundary movement of hazardous wastes (1989), Basel Ban Amendment (1995) The London Convention Protocol (1996) and the Rotterdam Convention (1998) in addition to the Stockholm Convention. Some of the most important source of information in this context includes the following: Secretariat of the Basel Convention www.basel.int Interim Secretariat of the Rotterdam Convention www.pic.int Interim Secretariat of the Stockholm Convention www.chem.unep.ch/sc

7. International Toxics Progress Report Card

http://www.ban.org/country_status/report_card.html as viewed on 10/26/2004

8 & 13 The United Nations support system: an example

The United Nations Institute for Training and Research – Chemicals and Waste Management Programme provides information on integrated programmes for management of chemicals in wastes, their profiles, and information exchange initiatives, implementation of the Globally Harmonized System of Classification and Labeling of Chemicals and the development of a Public Involvement Plan. An information network titled ‘Information Exchange Network on Capacity Building for the Sound Management of Chemicals (INFOCAP) has also been presented.

The Stockholm Convention on Persistent Organic Pollutants (POPs), which entered into force in May, seeks to protect human health and the environment from toxic chemicals that remain intact in the environment for long periods and are widely distributed geographically. Another treaty, the Rotterdam Convention on prior informed consent (PIC), which entered into force in February, will help protect people in chemical-importing countries.

Since UNEP’s proposal for a Strategic Approach to International Chemicals Management (SAICM) was endorsed by the World Summit on Sustainable Development in 2002, efforts have been ongoing to further develop this strategy. SAICM will advance the sound management of chemicals worldwide, building on progress already made in the last 20 to 30 years. Three international conventions, developed in the last two decades, provide an international framework for environmentally sound management of hazardous chemicals throughout their life cycles: the Rotterdam Convention on Prior Informed Consent (PIC) (adopted 1998, entered into force 2004), the Stockholm Convention on Persistent Organic Pollutants (POPs) (adopted 2001, entered into force 2004) and the 1989 Basel Convention.

At the regional level, this year is the 25th anniversary of the Geneva Convention on Long range Trans boundary Air Pollution of the UN Economic Council of Europe (UNECE). The UNECE’s more recent Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (adopted 1998, entered into force 2001) establishes links between human rights and “environmental rights”.

8 UNEP's proposal for a new Strategic Approach to International Chemicals Management, currently being developed in cooperation with other international organizations, builds on this international cooperative work. The World Summit on Sustainable Development in 2002 supported the development of SAICM as a next step towards effective worldwide chemicals management. (Industry and Environment. 27 (2-3) April – September 2004). United Nations Environment Programme recently joined with institutional investors throughout the world (e.g. Citigroup, BNP Paribas) to develop a set of corporate social responsibility investment standards.

8. United Nations Institute of Training and Research – Chemicals and Waste Management Programme

<http://www.unitar.org/cwm/> as viewed on 10/28/2004

13. Information Exchange Network on Capacity Building for the Sound Management of Chemicals (INFOCAP)

<http://www.unitar.org/cwm/c/cbn/index.htm> as viewed on 10/28/2004

9. Highlights of some policies on integrated management – European Union (EU)

An integrated environmental assessment is proposed for the development of comprehensive policies on wastes. There is a strong link between GDP and volume of wastes generated implying the need to decouple resource use and waste generation from economic growth. Four principles which guide the EU framework include reduction of waste at source, producer responsibility and polluter pays, the precautionary principle and the proximity principle. Recently the emphasis has been on maximizing recovery in addition to prevention of pollution through promotion of cleaner technologies and the use of economic instruments, eco-audits and eco-labeling schemes to

IAELP-Workshop CEE Centre for Environment Education support prevention without distorting competition. Better resource efficiency, focusing on sustainable production, in conjunction with carrying capacity estimates are the principal foci at the present. Integrated product policy considering lifecycle assessment, strengthened by the development of comprehensive reliable and comparable data systems is also highlighted.

9. Applying Integrated Environmental Assessment to EU Waste Policy

www.ieep.org.uk/PDFfiles/PUBLICATIONS/EFIEA%20Waste-%20final%20report.pdf as viewed on 11/03/2004

10. Policies for Cleaner Production

The UNEP presents information on regulatory instruments, market-based instruments and information-based instruments in addition to defining the nature of interactions between the government and the industry. Specified compliance, negotiated compliance, co-regulation and self-regulation add to the diversity of mechanisms.

10. Governmental Strategies & Policies for Cleaner Production

http://www.uneptie.org/pc/cp/understanding_cp/cp_policies.htm as viewed on 10/27/2004

11. Integrated programmes for sound management of chemicals

This document prepared by UNITAR et. al provides an overview of the importance of sound chemicals management, the right-to-know principle, the importance of stakeholder involvement, scientific evidence, regional and global initiatives, the Johannesburg

Declaration on Sustainable Development, the Strategic Approach to International Chemicals Management and the move towards a Globally harmonized System of Classification and Labeling of Chemicals, emerging legislation, the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, signifying the role of civil society and opportunities for integrated capacity development. In addition to policy issues which form the basis, institutional and other coordination aspects also gain significance.

The need for locale – specific interventions have also been emphasized (Shende UNEP TIE 2004).

11. Developing and Sustaining an Integrated National Programme for Sound Chemicals Management [http://www.unitar.org/cwm/publications/current/inp/inp_bro\(04-05\).pdf](http://www.unitar.org/cwm/publications/current/inp/inp_bro(04-05).pdf) as viewed on 27/10/2004

12. Dimensions of technology transfer

Reference is drawn to the Seventh Millennium Development Goal that highlights the need to address unsustainable patterns of production and consumption. The UNIDO Corporate Strategy has attempted to address this challenge and in the process developed the methodology for responding to the demands of the transfer of environmentally sound technologies in order to help reduce environmental risks and increase competitiveness of firms.

12. Increasing Productivity and Environmental Performance: an Integrated Approach http://www.unido.org/file-storage/download?file_id=2641, as viewed on 25/10/2004

14 & 15 Useful references for inspectors dealing with hazardous wastes and on waste reduction with reference to assessment of pollution prevention

14. Waste Minimization for Hazardous Materials Inspectors: Module I. <http://p2.utep.edu/publications/manual1.cfm> as viewed on 10/28/2004

15. Waste Reduction and Pollution Prevention Assessment www.srl.gatech.edu/education/ME4171/PPA-no2.ppt as viewed on 10/25/2004

16. Some useful examples from the European Union on waste minimization
Waste prevention and recycling have been examined in several cases.

16. Case studies on waste minimization practices in Europe http://reports.eea.eu.int/topic_report_2002_2/en/tab_content_RLR as viewed on 10/27/2004

17. A global overview of cleaner production

Reference to the UNEP's definition of cleaner production, several related concepts in preventive environmental management, the range of policy instruments, their relevance, the International Declaration on Cleaner Production, the European Union's Sixth Environment Action Programme, the Strategy for Sustainable Development, Waste Management Hierarchy, Integrated Pollution Prevention and Control Directive, CP Financing, the Role of UNIDO, OECD, World Business Council for Sustainable Development, Institute for Prospective Technological Studies, examples of US EPA's Enviro\$en\$e programme and case examples from several other countries have been referred. Integration of cleaner production, environment management systems to complement compliance efforts, has been suggested. Some of the most important barriers in the implementation of a preventive strategy include in adequate regulatory pressure, lack of measures for direct promotion of cleaner production, poor integration of cleaner

production with other relevant policies, low levels of awareness among decision-makers, limited capacities and resources and slow dissemination of information.

17. Preventing Pollution

<http://waste.eionet.eu.int/prevention> as viewed on 10/25/2004

Reporting needs are more stringent; access to information is however difficult. Repetto Companies' stock prices have been affected by disclosure of information regarding emissions (even if legal), violations of environmental regulations, or potential liability to environmental remediation. During the 1980s, the discovery of many contaminated industrial sites requiring remediation, and the rapid escalation of cleanup costs led to an elaboration of disclosure requirements. However, the availability of information on environmental issues is a major issue. Even databases in the public domain, are hard to access and inconsistent. Environmental reports of firms tend to be selective and not related to financial statements.

In Europe as well, the European Commission issued stricter non-binding guidelines in 2001 for disclosure of environmental costs and liabilities, in response to a finding that unreliable and inadequate information about environmental performance "makes it difficult for investors ... to form a clear and accurate picture of the impact of environmental factors on a company's performance or to make comparisons between companies." The recommendation stated that "environmental issues should be disclosed to the extent that they are material to the financial performance or the financial position of the reporting entity."

In the United Kingdom, beginning in 2005 listed companies will have to provide shareholders with an Operating and Financial Review, similar to the MD&A, that indicates the companies' key performance drivers and future prospects, including environmental matters whenever significant.

Similarly, in Canada, the Canadian Institute of Chartered Accountants has issued new guidelines on the preparation and content of the MD&A portion of the financial reports. The guidelines reiterate that the purpose of the MD&A is to enable investors to understand the company's business and prospects through the eyes of management and should state clearly the factors that drive performance as well as the risks that may affect results. These factors and risks may include environmental matters.

Some interesting trends worldwide in integration of CP

Enhancement of cooperation among all stakeholders is needed in order to bridge the gap in chemicals management between developed and developing countries, as one of the key goals of

IAELP-Workshop CEE Centre for Environment Education the strategy. It is important in this context to note that the UNEP GC/GMEF recently decided that there is a need to prepare an intergovernmental strategic plan for technology support and capacity building. This strategy, which will be embedded in the overall issue of sustainable consumption and production, will contribute to sustainable development.

Development of the strategy will clearly be influenced by national/regional chemical policies, trade and economic aspects, environmental and health policies, agriculture and industry policy, and (in principle) countries' general public policy. From the chemical industry perspective, it is key that the strategy provides the means to bridge the gap in

chemicals management between developed and developing countries. It is a prerequisite that chemicals policy will become a building block of a more general public policy. Capacity building (in the sense of building infrastructure, and promoting and supporting education and training for using cleaner technologies and handling chemicals safely) should therefore be a key element of this strategy.

The strategy should encourage the development of efficient and transparent mechanisms and a policy framework for sharing best practices among companies in the global product chain, as well as among governments (Koch UNEP IE 2004).

Industrial pollution is decreasing in the UK Improved regulation and more stringent fines have helped curb industrial pollution in the United Kingdom. The UK's Environment Agency reports that 613 cases of serious pollution were caused by industry in 2003, a 12% drop compared with the previous year. The farming and waste management sectors were singled out for the progress they have made. "Our risk-based approach to regulation, developed with business, is working," says chief executive Barbara Young, in the agency's annual Spotlight on Business report (www.environmentagency.gov.uk/spotlight). "But fines for environmental offences are still far too low." Average fines were little changed at around £8400 (US\$ 15,068), although the heaviest was £232,000 (US\$ 416,000), the largest-ever fine for illegal waste management in the UK.

However, the waste management sector reduced cases of serious pollution by about 25%. Personal liability for environmental pollution has increased; 11 company directors were fined in 2003. The main repeat offenders were utility companies, which were prosecuted for letting sewage pollute lakes or streams. Water industry pollution incidents rose by around 25% compared with 2002. The construction industry was responsible for 3% of pollution incidents or 80,000 tonnes of waste annually. This amount is increasing with regeneration works, the Agency reported. Greenhouse gas and nitrogen oxide emissions both increased, by 5 and 9%, due to increased burning of coal for power generation. There was less oil-based pollution than in previous years. For more information, see www.environmentagency.gov.uk.

European chemical industry launches technology platform on sustainable chemistry
The European Union's chemical and biotechnology industries have joined forces to promote "sustainable and competitive chemistry". Its purpose is to increase investment in research and innovation and to boost European competitiveness and include environment, health and safety, education and skills, research infrastructures and access to risk capital.

Global principles for responsible investment to be developed

UNEP will work with major institutional investors to develop a set of globally recognized principles for responsible investment. The new principles, which will come into force from September 2005, will integrate environmental, social and governance concerns into investor and capital market considerations. The launching of the Responsible Investment Initiative follows a recent meeting of more than 40 investors and fund managers in Paris, organized by the UNEP Finance Initiative (UNEP FI).

Policy instruments

Voluntary mechanisms including promotion, persuasion, moral appeals; information, education and training, empowerment of non-government organizations and voluntary standards-setting processes for industry

Government regulations and taxation including empowerment of standards-setting bodies
Public expenditure including government programs and delivery, public infrastructure
development and financial incentives (subsidies, grants and tax allowance)

Some important references:

OCED (1993) Environmental Policies and Industrial Competitiveness, OCED, Paris

Sonnen, Carl (1990) Speaking Notes for Session on Environment, Canadian Centre for
Management Development, December

Savoie, Donald (1988) The Politics of Public Spending in Canada University of Toronto
Free Press, Toronto

Wildavsky, Aron (1986) Budgeting: A Comparative Theory of Budgetary Process,
revised edition, Transaction Books, New York.

Sr. No.	Sector & Location	Dominant waste stream	Waste reduction technique	Benefits	References
1	Hosiery, Kanpur	1. Waste kier liquor & coal ash from furnace	1. Modification in kiering furnace 2. Optimization of chemicals usages in kiering, blending and finishing operation 3. Better disposal 4. Elimination of acid wash 5. Material substitution 6. Reusing kier liquor bleached liquor and finishing liquor with appropriate make-up chemicals	1. Coal consumption reduced by 35% saving Rs. 10,000 / month 2. Improved fabric quality. Rs. 3,00,000 / year 3. Market this product as a commercial product for utensil washing powder 4. Improved quality and reduce water consumption 5. Reuse of chemicals	WMC Vol. 1 No. 1, April 1996 WMC Vol. 2 No 6, 2-3, December 2001
2	Pulp and Paper, Muzaffar nagar	1. Wastewater from pulp washing 2. Fibre waste	1. Identify 25 waste minimization option 2. Development of a screw press for extraction of black liquor from digested pulp 3. Installation of Hailey's screw 4. Modification in Rosin system 5. Modification in paper machine felting system 6. Modification in paper machine drying section (Installation in high velocity hood)	1. Expected reduction in water consumption for pulp washing by 90% 2. Fibre recovery of 5% 3. Reduction in rosin consumption by 80%, Rs. 2,00,000 / month 4. Increase in paper machine capacity by 15-20% 5. Production increases by 10% & reduction in energy consumption	

3	Electroplating sector Industrial area, Ludhiana	Wastewater	1. A number of house keeping improvement measures have been identified and implemented by this circle 2. Installation of drag-out trays for collection and recycling of both solution drippings 3. Recovery of plating chemicals 4. Circle is interested in setting up a small CETP, cum-metal recovery system	1. Reduction in chemical consumption by 10% 2. Reduced nickel solution requirement (1 lit / day), Rs. 1500 / month	
4	Cotton dying sector, Ludhiana	1. Scouring: Alkalies: caustic soda, soda ash, detergent, sodium silicate, wax, grease (knitting oil)	1. Combustion optimization of boilers 2. WM options related to input material substitution process optimization under discussion 3. Chemical and dyestuff reduction	2. Reduction in fuel consumption. Saving of Rs. 30,000 / month 3. saving of Rs. 1000 – 4000 / ton by reducing chemical and dyestuff 4. Saving of Rs. 25 – 50 / ton by	

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	2. Bleaching: Chlorine compounds, hyd. Peroxide, acids, AOX etc. 3. Mercerizing: Caustic soda 4. Dyeing: Dyestuffs, salts, acids, alkalies, soaps, dye fixing agents, sodium sulfides 5. printing: dyes, pigments, starch, gum, solvents, urea, acids and	4. Reduction in water consumption 5. Optimization of fuel / coal consumption 6. Electrical energy conservation	reducing water consumption 5. Optimization of fuel / coal consumption save Rs. 400 – 1600 / ton 6. Saving of Rs. 100 – 200 / ton by electrical energy conservation	
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		metallic salts 6. Finishing: Formaldehyde, starch, foams, surfactants, finishing agents, lamitex etc.		
5	Electroplating sector focal point, Ludhiana	Identify reduction of electricity and chemical consumption in pretreatment section as the first thrust area		
6	Textile weaving Sector, Erode		Option • Segregation of waste streams • Re-use of residual dye through R.O. system • Centralized tertiary treatment system for reducing wastewater are under study	
7	Tannery sector, Pammal, Madras	• Water consumption • Yield improvement • Electrical and energy consumption • Reduction in dyes and chemical consumption		

8	Textile and Printing sector, Surat	Identify 15 areas	<ul style="list-style-type: none"> • Recycling of water • Modifications in packing input dyes • Conversion of steam stenters to gas fired stenters • Rationalization of hardness of bangle rolls and trials on improved print, paste formulation 		
9	Khandsari Industry, Vidur Khandsari, Khari, Bijnor Moradabad road		<ul style="list-style-type: none"> • Raw material substitution 	Finished product recovery at 5.7% overall	WMC Vol. 2 No 1, August 2000
10	Rice Mills, Nizamabad, Hyderabad	<ul style="list-style-type: none"> • Dust in the paddy unloading area • Waste husk due to improper handling of husk from sheller cum husker (500 MT husk is wasted per annum) • Inefficient boiler operation generates co, ash & pollutants • Rise husk ash • Wastewater effluent is generated only 	<ul style="list-style-type: none"> • The unloading area is isolated & sufficient housekeeping measures are taken up • Isolation of paddy milling area • Installed a heat exchanger to preheat water • Use as a fertilizer in turmeric • Soaking tanks will be marked to indicate water level and to avoid overfilling • Single blower of 30 HP as against 2 blowers of 20 HP 	<ul style="list-style-type: none"> • Dust level reduced by 60% • The temp can be increased to 7075%. The annual fuel savings after the system is perfectly insulated is expected to be 200 MT of husk • About 6 to 7 MT of rise husk ash is sold at Rs 400 – 600 • Reduce the water consumption and consequently effluent generation will decrease by 1.1 KL / MT of paddy (4000 Ltr / day, 120 KL / annum) • Save 30000 KWH. Saving of Rs. 1,20,000/- 	

		<p>from the par boiler rise mill</p> <ul style="list-style-type: none"> • Electrical system of dryer 			
11	Distillery industry, S.S.K. Ltd., Akluj	<ul style="list-style-type: none"> • Disposal of distillery spent wash 	<ul style="list-style-type: none"> • Composting technology 	<ul style="list-style-type: none"> • Reduce spent wash quantity by almost 40% 	
12	Stone Crushing unit, India	Fine dust	<ul style="list-style-type: none"> • Dust suppression system 	<ul style="list-style-type: none"> • Significant reduction of fugitive emission levels observed 	WMC Vol. 2 No 5, 8-9, September 2001

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13	Sago industry, Tamil Nadu	<ul style="list-style-type: none"> • Water (Initial wash) • Crushing • Filtration (Screen) • Washing (4 washer) (Rasping) • Sedimentation • Pulversing (Powdering) • Boiling • Housekeeping & maintenance • Electricity usage 	<ul style="list-style-type: none"> • Use conveyor for unloading –fitted with nozzle sprinklers • Use crusher guard • Use titled platform and use screen guard • Use screw press to separate tippy from milk (investment: Rs. 2 lacs) • Reuse water and Se enzyme • Use additional filtration stage • Regulated by better process control • Use high power jet nozzle operated by electric motor (2-3 HP) instead of manual process • Use tile floor instead of cement floor and use vinyl sheet cover by cloth of spiked roller and use horizontal belt instead of vertical • Better process control to reduce time from 60 min to 45 min • Avoid open house, leaky water taps, better supervision • Use only ISI grade condenser / capacitor bank to improve P.F. from 0.75 to 0.95 	<ul style="list-style-type: none"> • Save water 25 TPD • Save water 20 TOD, starch 250 kg / day • Save starch 50 kg / d • Save starch 200 kg • Save water 50 TPD • Save starch 200 kg / d • Save water 30 TPD • Hygienic for worker & save water 50 TPD • Save starch 40 kg/d • Save fuel 25% • Save water 10 TPD • Save power kwh (200 kwh/d) 	WMC Vol. 2 No 6, 8, December 2001
14	Aluminium utensil manufacturing units, Haryana	<ul style="list-style-type: none"> • Iron particles in aluminium scrap • Chocking of burner by furnace oil (FO) • Reduction in fuel consumption 	<ul style="list-style-type: none"> • Screening of aluminium scrap manually with the help of magnets to remove iron particles and stones etc. • Filtration of FO used for melting regularly • Modification of existing annealing furnace to maintain optimum temp range through technological change / equipment modification process 	<ul style="list-style-type: none"> • Reducing 20 kg impurities per day in aluminium scrap yielding better quality products • Reduce time of repairing the burners which also reducing heat transfer efficiency leading to reduction in the life of the crucible • Reduction in fuel (wood) consumption around 30% • Reduction in GHG emission 	WMC Vol. 3 No 1, 310, March 2002

15	Dye & dye intermediate manufacturing, Dintex, Vatva,	<ul style="list-style-type: none"> • Heat losses through poor steam distribution • Mother liquor losses • Gaseous emission 	<ul style="list-style-type: none"> • Enhanced housekeeping, maintenance and monitoring. For example, the steam distribution system was insulated and better process controls, such as temp 	<ul style="list-style-type: none"> • Acid mother liquor is use in alum production in paper industry • It improve HCl secondary stage recovery • Reduce amount of wash water 	
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	ahmedabad	and wash water	monitoring devices installed	needed	
			<ul style="list-style-type: none"> • Recovered sulfanilic acid, salt from mother liquor • Modify HCl scrubber design by packed bed type • The cake washing method was also improved 		
16	M/s Rasma Phosphate Limited (RPL), Oil Division, Indore, M.P.	<ul style="list-style-type: none"> • Oil loss in DOC (High residual oil content in DOC) • Oil loss in Refinery • Hexane loss in solvent extraction plant • Waste water generation from refinery & its treatment • Energy loss • Inadequate steam generation leading to high oil & hexane loss • Inadequate air pollution control device 	<ul style="list-style-type: none"> • Replace worn-out roller of the Cracker • Increase the heating surface area in the cooker by adding more steam pipes (limpets) • Repair worn-out roller of the Flaker • Replace irreparable roller of the Flaker • Improve the hexane spray system • Recalibrate Water Flow Meter in short mix plant • Increase mineral oil flow rate in THF • Increase heating surface area of PHE • Increase chilled water flow rate in vent condenser • Install separate condenser with steam ejector in stripper to increase vacuum • Reuse seal cooling water generated by short mix plant • Replace aluminium impellers of cooling tower fans by FRP impeller • Replace diesel fuel by coal in THF • Replace 7 kg/cm² pressure steam nozzle by 	<ul style="list-style-type: none"> • Saving of Rs. 38.54 lakhs per annum as a result of 20% reduction in oil loss in DOC (1.18% to 0.97%) • Saving of Rs. 0.48 lakhs per annum as a result of water conservation upto 14m³/day • Saving of Rs. 12.7 lakhs per annum as a result of reduction of hexane loss from 4.39 to 4.3 lit/ton of seed processed • Saving of 1.87 lakhs per annum as a result of water saving of 25m³/day • Saving of 24.22 lakhs per annum • A gain of Rs. 2.64 lakhs as a result of 128 ton coal saving per annum • Reduction in GHG emission of 192 ton/annum • A gross gain of Rs. 216 lakh per annum • Reduction in 	WMC Vol. 3 No 3, 4-7, September 2002

			10 kg/cm ² pressure nozzle in De-odoriser • Install waste heat recovery system in existing boiler • Install FBC boiler of requisite capacity • Improve dust extraction capacity & efficiency of existing cyclone	GHG emission upto 2000 tons/annum • Improve work environment • Increased labour productivity	
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References

- Bromley DW & Paavola J 2002. Economics, Ethics and Environmental Policy. Pp 261-276. In: Economics, ethics and environmental policy. Contested choices. Eds. DW Bromley and J Paavola 286 p. Blackwell Publishing. Oxford
- Carew – Reod J, Prescott- Allen R. Bass S & Dolat-Clayton B 1994. Strategies for National Sustainable Development: & Handbook for the planning and implementation. 23 p. Earthscan Publications in association with IUCN & IIED.
- Coglianesi C& Nash J 2002. Policy options for environmental management in the Private sector. Environment. 44(9): 12-23
- CSE 2000 a Close, or elseDTE September 30:4
- CSE 2000 b Shut down. DTE. January 31: 13
- CSE 2000 c Western tragedy. DTE April 15: 36
- CSE 2001 Sewer river. DTE. May 15:7
- Dhara S 2000. In a spot. DTE Jan 15: 54-56
- DTE 2001 a The trail of ash DTE Feb 15:9
- DTE 2001 b Defining moment DTE Feb 15 9-10
- DTE 2001c Toxicity sealed. DTE. July 15:8-9

DTE 2001c The road ahead DTE July 31: 43-46(UNEP 2001 State of Environment. India 2001. 159 p.)

Gale RJP & Barg SR 1995. The Greening of Budgets: The choice of governing instrument pp. 1 27 In: Green Budget Reform. And International casebook of leading practices. R. Gale, S. Barg and A Gillies. 368 p. IISD. Earthscan Publications Ltd., London

Haas PM & McCabe D 2001; Amplifiers or dampeners : International institutions and Social learning in the Management of global environmental risks. Pp 323-348 In: Learning to manage global environmental risks. Vol. I A comparative history of social response to climate change, ozone depletion and acid rain. The social learning group MIT The Hindu. 1998. Six major hazardous industries identified . The Hindu. 16.5.1998

Huber M & Liberatore.2001. A regional approach to the management of global Environmental risks: the case of the European Community. Pp 295-322. In: Learning to manage global environmental risks. Vol. I A comparative history of social response to climate change, ozone depletion and acid rain. The social learning group MIT.

Kashyap S 2001 A toxic cover DTE April 30:7 Markandya A., Haron P., Bellu LG., and Cistulli V., 2002 . Environmental Economics for Sustainable Growth. A handbook for practitioners 567 p. Edward Elgar. Cheltenham. UK.

Mehers M.G. 1998. Environmental Communication, Planning handbook for the Mediterranean region. International Academy of Environment. Switzerland.

Moore M 2003. A World without Walls. Freedom, Development, Free trade and Global Governments Cambridge University Press, Cambridge. 292 p

Paavola J 2002. Rethinking the choice and performance of environmental policies pp.82-102 In: Economics, ethics and environmental policy. Contested choices. Eds. DW Bromley and J Paavola 286 p. Blackwell Publishing. Oxford

Repetto R 2004. Are Companies coming cleaning? The Environmental Forum Sept-October: 19-27.

Rouhi MA 2002. Green chemistry for pharma C& EN April 22: 30-33

Scriabine R 1996. Putting people into policy: The role of environmental education and communication. 39 p. GreenCom Discussion Paper GreenCOM-USAID, Washington

Sivanappan RK 2000. Foul waters. DTE. March 31:56

Smith W.A 1995. Behaviour, social marketing and environment. Pp 9-20. In planning education to care for earth. 168 p. (ed) Joy Palmer, Wendy Goldstein, Anthony Curnow. IUCN. Gland.

Tiwari M & Mahapatra R 1999. Analysis. What goes down must come up.

Tiwari M. Mahapatra R. 2000. Industrial devil-ution. DTE April 15: 27

UNEP 2004a. Balancing the Benefits of Chemicals with their Health and Environmental Risks. Industry and Environment 27 (2-3):3

UNESCO 2004. United Nations Decade of Education for Sustainable Development 2005-2014.

Draft International Implementation Scheme. October 2004 50 p.

UNEP 2004 b. The Chemical Industry and International Cooperation to manage chemical risks: Facts and figures. Industry and Environment 27 (2-3): 4-6)

UNEP 1996. Five steps for easing awareness on ozone depletion. A handbook for national ozone units. 29 p. UNEP OzonAction Programme. Paris

INFRAS 2000. Ecofrig Project phase II . Report on project achievement by 12/99. 50 p
INFRAS

UNEP 2001. Stakeholders workshop on strategy development for the servicing sector in India. January 2001. Organized by UNEP in cooperation with the governments of India, Germany and Switzerland.

UNEP 2001. India: State of the Environment 2001. UNEP Watkins KJ 2002.

Sustainability takes Centre stage. C&EN April 22: 15-19 Yadav KPS 2000 Sealed fate. DTE. April: 22-23

Bibliography

Audinet P 1995 A note on public policy and innovation in the biomass based industrial sector: lessons

from the sugarcane industry in Brazil and India. UNEP IE (Jan- March) : 61.

Bakken P 2001 Using cleaner production to achieve implementation of MEAs. UNEP IE (Jan – June):

60- 64.

Barber J 1998 Responsible action or public relation? NGO perspective on voluntary initiatives. UNEP

IE (Jan- June):19 – 22.

Bell R G & Russell C 2002. Environmental policy for developing countries. Issues in Science and

Technology. (Spring): 63 – 70.

Buengsung S 1994. Cleaner production initiatives in Thailand. UNEP IE (Oct- Dec) : 58- 61.

Chandak SP “DESIRE”, Demonstration in Small Industries for Reducing Waste. UNEP IE October –

December 1994: 41 – 45

Droll P 1998 Environmental agreements: the European Commission policy and programme UNEP IE

(Jan- June):10 – 15.

Dunn L L 1998. The power of partnership in Canada: how industry and government work together for

economic growth and a cleaner environment. UNEP IE (Jan- June):31 – 33.

Erkman S & Ramaswamy R 2001 Industrial ecology: a new cleaner production strategy UNEP IE (Jan –

June): 64-67.

Evans W, Stevenson R 2001 Policy and planning: a holistic approach to promoting cleaner production.

UNEP IE (Jan – June): 46- 47.

Fussler C 1994. The development of eco – efficiency in industry, UNEP IE (Oct- Dec) : 71- 74.

Gaiser K 2001. Cleaner Production Perspectives 2: integrating CP into sustainable strategies. UNEP IE

(Jan- June): 33 – 36.

Hanks J 1998 Sharing responsibility: Co – regulatory policy instruments as a means of achieving

industrial sustainable development in South Africa and other developing countries.

UNEP IE (Jan-
June):36-41.

Hileman B 2002. Precautionary principle debate. C & EN (April 22): 24 – 26

Hileman L 1994 Policy initiatives to promote cleaner production in Latin America and the Caribbean.

UNEP IE (Oct- Dec): 35.

Johnson I & Martin C 2002 a tool for future – oriented decision making: combined monetary and

biophysical indicators. UNEP IE (April – June): 25 - 28.

Katuhria V 2001. Pollution: Prévention vs Control. Is EOP treatment the solution?

Economic and

Political Weekly. July 21: 2745 – 2748.

Kennedy N 1998 The ICC Business Charter for sustainable development and other voluntary

initiatives: more relevant than ever in a globalizing world. UNEP IE (Jan- June):23 – 26.

Lever H 1998 Responsible Care (R) in action. UNEP IE (Jan- June):49 – 53.

Lindqvist T 2001 Cleaner production: Government policies and strategies UNEP IE (Jan – June): 41- 45

Long B L 1994. Cleaner production in OECD countries UNEP IE Oct- Dec: 23- 26

Loprieno M 1997 The European Union Eco – Label scheme: an environmental policy marketing tool.

UNEP IE (Jan- June): 35-38

Mohanty B, Viswanathan C & Senomayake G 1998 Energy efficient and environmentally sound

technologies in Asia. UNEP IE (Jan- June):70 – 73.

Moody – Stuart 2002 What can business bring to the World Summit on Sustainable Development.

UNEP IE (April – June): 12-15

Nielsen B B, Christiansen K, Doelman P & Schelleman F 1994 Waste management: clean technologies –

update on the situation in EU member states. UNEP IE (Oct- Dec) : 29- 35.

Nowak Z 1994 Cleaner production in Poland: aiming at a joint industrial and environmental policy.

UNEP IE (Oct- Dec) : 36-38.

Paramentier R 2002 Sustainability for all. UNEP IE (April – June): 18-21.

Peck & Associates 1998 Eco – industrial Network Development Opportunities for Progress in Canada

14 p

Stigson B 1998 Business makes case for voluntary initiatives. UNEP IE (Jan- June):16 – 18.

UNEP IE 1995 Canadian Environmental Technology Advancement Centers. UNEP IE (Jan- March): 61.

UNEP IE 1995 Canadian province point recycling programme. UNEP IE (Jan- March): 61.

UNEP IE 2001 Summary Report UNEP IE (Jan- June):14 – 15

UNEP IE 2002 State of the world's environment and progress towards sustainability. UNEP IE (April – June): 6.

Van Berkel R Cleaner production Perspectives 1: CP and industrial development UNEP IE (Jan – June): 28 – 32.

Van Berkel, Kryger J & Luken R 1994. Preliminary experiences with the cleaner production in China and India. UNEP IE (Oct- Dec): 46-50.

Watkins K J 2002. Sustainability takes the centre stage. C & EN (April 22): 15– 22.

Wettstad J 2002. Clearing the air. Europe tackles transboundary pollution. Environment. 44(2): 32- 40.

CEIN 2001. The Eco – industrial advantage 1 (I):2001.

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