Final Technical Report

ON

WASTE MINIMISATION IN SMALL SCALE INDUSTRIES (WMC – Project Phase III)

Prepared for

Ministry of Environment and Forests (MoEF), New Delhi

Submitted by

National Productivity Council

(Under Ministry of Commerce and Industry, Govt. of India)

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Title of the Project	:	Waste Minimisation in Small Scale Industries (Waste Minimisation Circle Project)
Location of the Project	:	New Delhi with establishment of WMCs in various parts of India
Funding Agencies	:	Ministry of Environment and Forests, Govt. of India
Salient Details of the R&D	:	This is not an R&D project The project as a vehicle has focused on promoting Waste Minimisation in Indian MSME sector via green Public Private Partnership Mechanism addressing SMEs
Implementing and Technical Agency / Contractor	:	National Productivity Council, under Ministry of Commerce and Industry

FINAL TECHNICAL REPORT ON WASTE MINIMISATION CIRCLE PROJECT (Phase III)

1. BACKGROUND OF THE PROJECT

Environmental problems pertaining to SMEs in India and the emergence and application of the Waste Minimisation concept and its propagation perspectives

It has been reasoned for Indian scenario as well that growth in the rate of material extraction and waste generation is owing to limitations of process efficiencies [that happen to be particularly magnified in small scale industries (SSIs)] owing to their traditional technology constraints in adequately transforming inputs into final products (Nyati, 1988). Thus, pollution (as undesirable contamination and consequent hazard etc) is viewed as an inescapable consequence of all kinds of industrial activities – low tech or hi-tech. This scenario has been seen to have emerged as a wide spread phenomenon vis a vis Small Scale Industries (SSI) as they have been particularly encouraged and sought to serve as tools for enabling balanced growth scenarios across regions (urban and rural) through inducement of their dispersal on geographic terrain. As paradoxes take shape, the much needed and heralded engines of economic dynamism in India enjoyed many promotional measures and policy incentives (such as concessional credits, tax incentives, product reservations, public procurements and supportive developments in industrial zones etc) such that they collectively (both registered and unregistered firms by 1988) accounted for about 90% of total industrial units and substantial production and GDP, besides accounting by then for over 22% of exports and had the privilege of employing over estimated 11 million of the workforce, yet they brought forth as a flip side an estimated contribution in aggregate of over 60% of industrial pollution (Nyati, 1988).

An overview of the then Indian Environmental legislation (Mathew and Bakshi, 1987) indicates emphasis on both prevention and control initiatives. However, it did not help that the variety of industrial waste discharges were seemingly uneconomical to treat within small scale factory premises (corresponding to regulatory standards notified), and also for long remained as non viable wastes to commercially collate, treat, manage and scientifically dispose especially owing to wide dispersion of the firms and owing to a lack of awareness and pressures for initiatives (Nyati, 1988). And where firms were clustered and concentrated the intensity of pollution only multiplied with technical and financial issues

plaguing management of the few common facilities such as common effluent treatment plants that were being set up on experimental basis then and indeed continue to reveal a complex set of problems even today (Rahman, 2008; Sengupta, 2008).

As further highlighted the peculiarities and problems concerning Environmental considerations amongst manufacturing SMEs were myriad (Nyati, 1988).

(a) Entrepreneurs had little specific guidance imparted on pollution matters by promotional agencies and had limited time and manpower to allocate for a perceived cost incurring activity such as pollution management and neither did SSIs possess requisite technical, financial and legal capabilities to sort pollution problems.

(b) Soft loans being made available by financial institutions towards addressing pollution control issues in the prevailing high interest rate regime were usually at rates unacceptable to SSIs.

(c) Policy approaches towards addressing pollution from SSIs were not tailor made but were generic and mostly suited to medium / larger units, and additionally enabling institutional mechanisms were also not in place (be it techno-managerial support for impact assessments, laboratories to conduct tests, knotty issues with consent / NOC applications etc).

(d) Also shortage of staff amongst regulators made administrative reach and pollution control philosophy mostly unviable. Further widespread variance in enforcement processes across states / regions potentially affected respective regional competitiveness factors and therefore were mostly desisted etc.

The assessments further highlighted by World Bank (2006) regarding environmental issues concerning manufacturing SMEs in India (revised numbers to about 4.5 million units as of year 2006) has been indicative of the rise in estimates pertaining to total industrial pollution generated by SMEs to 70%, i.e. up from 55-60% estimates in late 1980s and mid 1990s. this is indicated below in the Figure 1.1 as a bar chart (World Bank, 2006).

The problem of industrial pollution in general and emanating from SMEs in particular has been sought to be addressed in India by various approaches including (a) Regulatory and command and control perspectives, (b) Application of Market Based Instruments (MBIs) where feasible including tax incentives and subsidies and such concessions for aspects such as technological modernization and pollution control equipment installation etc. and (c) Facilitative approach whereby efforts to provide hand holding support to SMEs by various institutions and other partners to enable addressing environmental problems by various measures and means has been sought to be provided etc. It is indicated that the WMC project is essentially one of facilitative approach with a moderate linkage to MBIs in the backdrop and operating within the larger regulatory environment under the aegis of the Ministry of Environment and Forests, Government of India.

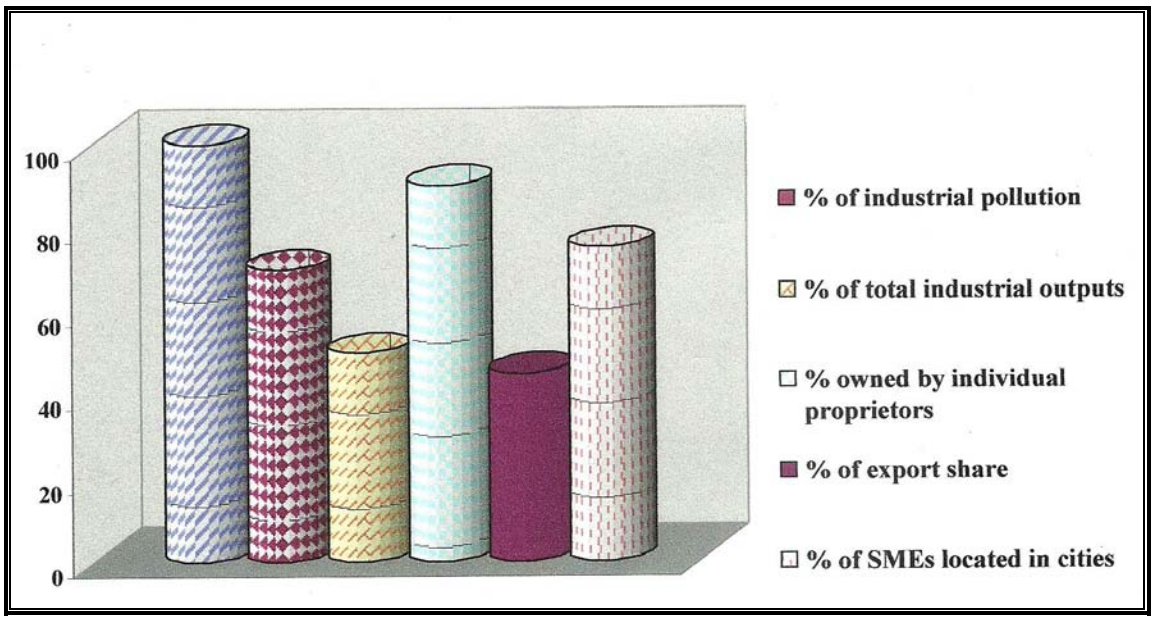

Figure 1.1 : The significance of SMEs in India and the related environmental problems as observed (Source : World Bank, 2006)

Waste Minimisation concept and the Demonstration imperative for SMEs – emergence of primary partnership arrangements in the process within manufacturing extension services ideology (as viewed retrospectively)

The prevalent Indian scenario of late 1980s as described above indicated limited scope for success through the regulatory command and control mechanisms. The command and control approach faced resistance especially as major emphasis was made on the futile end-of-pipe approach which essentially led to economically inefficient pollutant transfers from one media to another. This had been occurring despite prevalent laws that had outlined combinatorial options for pollution prevention and control (Mathew and Bakshi, 1987). Thus in view of difficulties faced towards implementing pollution control strategies particularly with respect to SMEs, the operative word 'pollution prevention' (P2) had started to gain greater credence in India. In the late 1980s and early 1990s pollution prevention related practices that were being undertaken especially in USA were being made available to India by the US Environmental Protection Agency (US EPA).

The realization further, that there were few Indian waste minimization case studies and benchmarks to serve as national and local examples to relate to and emulate, amongst the larger range of Indian Small and Medium Enterprises had also dawned by early 1990s

(Chandak et. al. 1994, 1995). This was especially observable in view of information trickling in on pollution prevention studies of USA through cases obtained from USEPA being not found amenable for as-is or direct adoption but requiring significant trials and adaptations (Chandak et al., 1994; 1995). Accordingly necessary proactive initiatives to popularize shifts in Indian SMEs towards environmentally conscious preventative measures through waste minimization / cleaner production took shape The case in point is the UNIDO sponsored 'DESIRE' project (Demonstration in Small Industries to Reduce Wastes) executed by National Productivity Council that led to development of technical manuals in agro based pulp and paper industry; synthetic textile dyeing and printing industry and pesticide formulation sector (Chandak et al., 1995; UNIDO, 1996, 'Video on DESIRE project').

A key feature of the DESIRE project was that it enabled the development of a 6 step – 18 task based structured Waste Minimisation Methodology for application in Indian SME context. This was related to the classical PDCA (Plan-Do-Check-Act) cycle, but was more attuned to Indian SME scenario, wherein for example was incorporated a key step towards 'construction of actual and suitable process data through real time measurements' (usually found missing or not readily available in many Indian SMEs). This was also emphasized as essential for enabling detailed flow-charting and undertaking necessary cause analysis related to prioritized waste streams and subsequent generation and selection of waste minimization options for further programmatic implementation. The DESIRE project thus happened to be one of the path setting Waste Minimisation and Cleaner Production focused manufacturing extension initiative (internationally supported) for SMEs and was designed to showcase Waste Minimisation potential in SMEs of India. This project can be especially viewed retrospectively from a PPP lens as a green Public Private Partnership initiative, wherein public leverage and finance was applied for jointly undertaking waste minimization efforts with collaborating and cooperating SMEs from manufacturing sector.

In due course it however became evident that while demand for additional WM demonstration projects was growing, where several other firms that learnt of such initiatives also sought such subsidized ventures for implementation in their respective units, yet the desired automatic and endogenous multiplier effects mimetic of achievements of the WM demonstrations were apparently few and far between. The reasons as learnt through discussions with NPC colleagues included non-tipping cost-benefit calculus as then felt by the firms, coupled with various causes for their inertia either due to restraining factors enumerated earlier (Nyati, 1988) or on account of the broader scenario of availability of entrenched, assured and established domestic markets and certain levels of profitability that continued to be gained through business as usual practices.

The Waste Minimisation Demonstration projects however provided opportunities for exploring and bringing out in structured format various perspectives related to WM concept which were thereby ready to be further propagated vide suitable program / project designs. A brief overview of the key features that buttresses the WM concept (and as collated from

multi-country insights) is presented below (ref. Waste to profit Manual and WMC Facilitator Training Manual and presentation modules of the WMC project including http://wmc.nic.in).

1.1 Waste Minimization Circle Project : Phase - I

A Waste Minimisation Circle has been defined as "**A small group of entrepreneurs in the small scale sector whose units manufacture similar products and employ the same processes meeting periodically and regularly in the premises of each member unit one after another, to analyse the operation of the host unit, to identify sources of waste generation and implement Waste Minimisation Options leading to an increase in individual profitability and reduction in pollution load from the units**" (WMC News Vol 1 No. 1, April 1996). This has been further outlined and depicted in Figure 1.2 below.

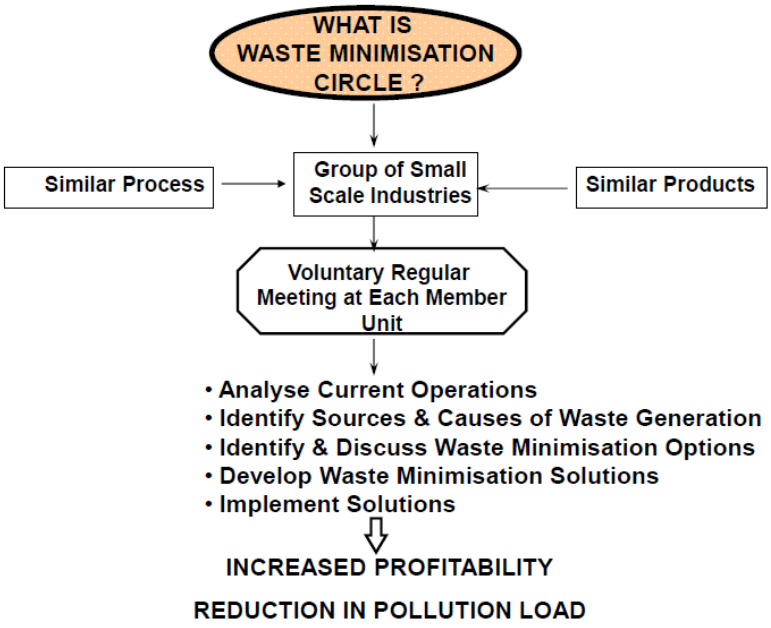

Figure 1.2 : Schematic outline of Waste Minimisation Circle concept

The key aspect of the project has been attaining of productivity gains and accordingly positive environmental outcomes, individually and when aggregated collectively, in the volunteering group of SMEs located in clusters, through inducement of resource conservation initiatives and by means of forging collaborative group efforts and group dynamics. The project comprises systematic and deliberative application of waste minimisaton techniques through a suitably designed structured methodology. And the program frame incorporates a multi-layered linkage between public and private agencies including nested public private partnership (PPP) compositions (as viewed retrospectively). The case thus presents a working model of a 'Green PPP' project framework that has

evolved and has been inducing WM culture in SMEs and facilitating other integral reforms oriented initiatives in India.

It is indicative that the WMC concept has been essentially built -though incorporating substantial variation in structure and framework on the platform of the internationally acclaimed and much debated model of Quality Circles introduced first in Japanese firms (Goldstein, 1985; Mohrman and Novelli, 1985; WMC Facilitator Training Manual). The major features and elements of the WMC programme structure as distinguished from Quality Circles is presented in Table 1.1 below.

Table 1.1 : Comparison and distinctions : Quality Circles and Waste Minimisation Circles

Quality Circles	**Waste Minimisation Circles**
Established within one unit	Established amongst 5-6 different SMEs to function as a group
Functions at shop floor level	Functions at Industrial Cluster level amongst units with similar products and processes
Formed amongst workers who perform tasks together	Formed amongst Entrepreneurs from different units to engage in WM circle project activities, and may establish WM teams in respective units to facilitate implementation of WM options etc
Same familiar surroundings	Unfamiliar observations available from member units
QC teams face bounds as they interact with same people available within their firms / operational units	The different entrepreneurs observe varying versions of similar enterprises and interact with different personnel in the WMC member units
Activity within a private enterprise	Framework facilitating PPP compositions to strengthen mechanism

(Source : WMC project website : http://wmc.nic.in Last accessed 15th November 2012)

The pilot testing phase of the WMC program (Phase – I) revealed salient aspects in respect of the working of an ideal Waste Minimisation Circle, and led to initial identification and development of project focused benchmarks, risks related issues, incentive components needed and regulation aspects vis a vis operational needs of a WMC and the protocols that would be involved.

Insights that emerged in Phase – I regarding an ideal set of features in a Working WMC :-

- Ideal Size -- 5 Or 6 Members
- Group Leader Not Elected But Emerges
- Formation Of Unit Level WM Team & Identification Of a

- Representative Of The Team In WMC
- Operational staff and Workers' Participation to be ensured
- Issues pertaining to Meeting Frequency
- Conduction aspects Of WMC related Meetings including issues as follows :-
    - Ensure Participation Of All Members
    - Well Defined Agenda
    - Recording Minutes Of The Meeting
    - Implementation Plan For Commitments Made
    - Meeting To Be Need Based
    - Date And Venue For Next Meeting
    - Review Of Previous Meeting etc.

The deliberations regarding the WMC operational aspects also led to identifying Do's and Don't's that would make or break a WMC as a generic set of guidelines which also emerged in phase – I.

Table 1.2 : The identification of Do's and Don't's pertaining to WMC operations

Do's	**Don'ts**
✓ Create A Free & Informal Atmosphere ✓ Harmony & Respect For Each Other ✓ Proper Documentation ✓ Follow The Methodology ✓ Encourage Experimentation / Trials ✓ Generate And Own Ideas ✓ Give Credit Liberally ✓ Appreciate Profusely	o Do Not Look For Ready Made Technical Solutions o Do Not Impose Your Ideas On The Group o Do Not Be The Principal Speaker o Don't Jump To Conclusions o Do Not Allow Snubbing o Do Not Demotivate By Pointing Mistakes

The WMC project, initially considered idealistic and utopian in conception, proved workable in Indian SME clusters as tested through the pilot phase of the project undertaken during 1995-96 (WMC News Vol. 1 No. 1, April 1996 to Vol. 1 No. 4, April 1997 on web : http://wmc.nic.in Last accessed 30th April 2008). Apparently, the PPP based WMC project incorporated various ingredients that served as drivers for deliberative lateral thinking, innovation sharing and insightful revelations through benchmarking processes. It also enabled intense competitive reasoning alongside camaraderie building as supported by a manufacturing extension service agency such as NPC [an autonomous management and technical advisory and consultancy services agency, under Ministry of Commerce and Industry, Government of India]. NPC with a strong industrial engineering background had established since 1958 had built desired credibility in Indian SME sector (web : http://www.npcindia.org Last accessed 15th November 2012)] and had developed the Environment Division in due course and was now persuasively managing the project by itself, by serving as WMC Facilitator sponsored by MoEF in the pilot phase i.e. Phase I. A photograph / plate from the project archives indicative of the early phase of the launch of the WMC program is presented below where the project designers and developers from MoEF and NPC, especially Shri. George Joseph, then Jt. Secretary MoEF, Dr. G. V. Subrahmanyam currently Adviser (Research) MoEF and Shri S.P. Chandak, former Director Environment Group NPC and NCPC India (currently at UNEP, Osaka) are deliberating with Industry association members at Ludhiana.

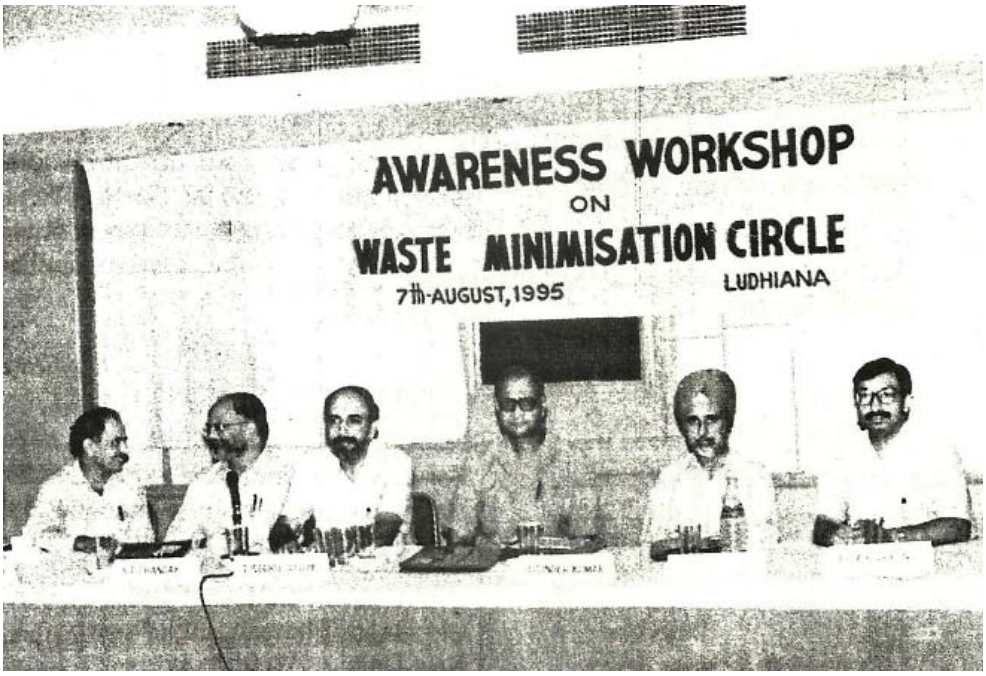

Plate 1.1 : A photograph of Awareness Workshop organization in Phase – I with MoEF / NPC and Electroplating Industry association officials at Ludhiana highlighting project design and features

It is indicative here that the WMC project phase – I (pilot project) which started with very humble beginnings in 1995-96 as a pilot scale experiment to test the concept and its workability and potential, eventually led to setting a new trend in Environmental Consulting domain.

The facilitation of the participating firms' initiatives on knowledge sharing towards enabling process improvements in member units of the respective WMCs, had begun to showcase dynamics of 'competitive cooperation' within WMCs and amongst member units. Further, potential of 'cooperative competition' across WMCs of similar as well as from amongst dissimilar sectors being located within or across different regions had become a popular refrain. The programmatic efforts towards overcoming initial 'resistance to participate' and various other 'barriers to change' etc, leading towards SME acceptance and readiness for transformation has revealed pursuit of apparently idealistic perspectives towards cooperative gains behind the general façade of pragmatic or practical considerations that tends to favour secrecy / non-cooperation etc. It is also indicative that the idea of collaborative advantage (Huxham) too becomes visible in a Public-- Private Partnership context amongst participating or stakeholder public institutions and private sector organizations such as SMEs in manufacturing sector (as level – 1 PPP) and later involving private sector consulting units as well whereby nested PPP framework arose as WMC project framework evolved.

Table 1.3 : Some highlights of WMCs in Project Phase - I

WMC Ref.	WMC sector / location	Key WM measure	Benefits	Savings
1	Hosiery (Kanpur)	Manufacture of liquid detergent from spent kier liquor	Reduction in pollution load	Rs. 5 Lakh per annum
	-Do-	Recycling of Kier liquor	Reduction in waste generation and reduced fuels and chemicals consumption	Rs. 2 Lakh per annum
2	Pulp and paper (Muzaffarnagar)	Increase in wire mesh size in depither	Increase in pith recovery and decrease in chemicals consumption	Rs. 375/- per Ton of paper produced
	-Do-	Captive power generation	Elimination of process disruption and reduced paper breakages due to power cuts etc	Rs. 6 Lakhs per annum
3	Electroplating (Ludhiana)	Introduction of reactive rinsing	Reduction in water consumption and of waste water quantity	Reduced costs in ETP operations envisaged
	-Do-	Modifications in drag out arrangements	Improved recovery of drag out chemicals	Reduced chemical consumption by 12%

4	Cotton Dyeing (Ludhiana)	Substitution of soda ash by caustic soda in dyeing process	Reduced chemical consumption	Rs. 3 Lakhs per annum
	-Do-	Suitable covering for winches	Improved process conditions for improved quality	Reduced fuel consumption by 12%
5	Electroplating (Ludhiana)	Segregation of waste streams	Improved management of hazardous waste streams for ETP	Improved work environment
	-Do -	Installing drag out and rinse tanks after zinc cyanide process	Reduction in toxic waste quantity	Water consumption reduced by 20% and Chemical consumption by 10%
6	Textile Hosiery (Tiruppur)	Equipment modifications	Increase in winch speed from 47 to 55 rpm	Increased production rate with same quantity of effluent volumes
	-Do-	Installation of new boiler and repairs of insulation	Better process / steam management	Reduced fuel consumption by 10-15%
7	Textile weaving (Erode)	Equipment modifications	Splitting machine for knitted fabrics for operational efficiency in printing process	Increased production capacity by over 20% and reduced print wastes by about 50%
	-Do-	Computerised matching of colours	Improved recipe preparation for dyeing operations	Optimising dye consumption
8	Metal finishing (Madras)	Installation of temperature controllers in pre-treatment tanks	Improved quality of pre-treatment	Reduction in operation time by 3 hours per batch and direct savings of Rs. 32,000/- p.a.
	-Do-	Installation of timers in Electric Oven	Reduced rejection rates in shades / gloss differences etc and oven operation time optimised	Direct savings of Rs. 52,000/- p.a.
9	Tannery (Pammal)	Use of liming enzymes	Improved quality in pelts	Increase in area yield resulting in gain of Rs. 708/-per ton, and reduction in sodium sulphide consumption by 40%
	-Do-	Use of soft water in dyeing operations	Dye and Syntan consumptions reduced by 7% and 5% respectively	Savings of Rs. 1185/- per ton
10	Man-made textiles (Surat)	Loop ager by flue gas and steam distribution	Utilisation of heat from flue gas	Reduction in fuel consumption by 3-5%
	-Do-	Rain water collection and reuse	Municipal water use and consumption optimised	Savings in water bills
11	Metal Finishing (Mumbai)	WM activity information gaps and apparently insignificant	WMC project non operational	WMC project not operational

12	Hotels (Mumbai)	WM activity information gaps and apparently insignificant	WMC project non operational	WMC project non operational
13	Tannery (Vaniyambadi)	Use of fleshings as fuel after sun drying	Economical source of energy	Provided solution to waste disposal as well
14	Tannery (Vaniyambadi)	Scraping of salts from hides at raw stage for use in pickling stage	Reduction in salt consumption	Reduction in TDS concentration in effluents
	-do-	Rain water harvesting and segregation from waste streams	Optimising piped water consumption	Reduced effluent volumes and ETP costs
15	Tannery (Vaniyambadi)	Change in chemicals measurement to weight and mass basis from volume basis	Improved process control	Optimising and reducing chemical consumption by 5-10%
	-Do-	Benzidine based dye stuff substitution	Trials and application of non-benzidine based dye stuff	Toxicity in waste streams due to residual dye stuffs being reduced

Table 1.4: WMC Project Phase I (1995-96) : Key Results / Outcomes

Sl	**Sector**	**Location(s)**	**No. of WMCs**
1	Textile sector : Hosiery; Cotton Dyeing; Weaving; man-made / synthetic textiles Hosiery	Kanpur, Tiruppur, Ludhiana, Erode, Surat	5
2	Pulp and Paper	Muzaffarnagar	1
3	Electroplating / Metal finishing	Ludhiana, Chennai, Mumbai	4
4	Tannery	Chennai, Vaniyambadi	4
5	Hotels	Mumbai	1
			15

No. of SME Units facilitated : 75+

No. of WM Options generated : 170+

No. of WM options implemented : 80+

No. of Awareness / Training / Final Workshops : 25+

The WMC project phase – I related project Economics :

Gross Investments by SME units (> Rs. 50 Lakhs) and Savings (> Rs. 30 Lakhs p.a.)

Environmental gains (in SME Units) in respect of Energy and Water savings focus :

Substantial material resources conserved through reuse / recycling and savings in utilities such as Energy (10-30% savings) ; Water (5% - 20%) etc.

The project in view of the results and features and in view of prospects and feasibilities towards overcoming of barriers that were being envisaged and observed was accordingly considered for scaling up into a phase II and expanded in reach and relevance in several contexts and later has been further pursued as phase – III which is currently operational.

1.2 Waste Minimization Circle Project Phase – II : A retrospective observation of the multiplier effect and outsourcing features of structure and mechanism including of project communications strategy and key achievements

The successes of the pilot phase led to extension of the project into Phase II, where the project design was modified to a new format (Figure 1.2). In this structure involvement of private consultancy services (i.e. Environmental / Energy Auditing and Management Consulting firms etc.) as WMC Facilitator organisations was envisaged. In addition sectoral / research institutions (such as CSIR labs and other academic institutions) could be invited and also chose to participate. The WMC Facilitators would essentially function as NPCs extended arm as was conceptualized for Phase II. Personnel from these interested organizations and institutions and governmental agencies were to be suitably trained on the project concept and were to establish and run the WMCs in industrial clusters proximate to their respective operational regions.

It is indicative that the WMC program structure in its modified form (as adopted for Phase II and also now for Phase III) has multilevel organizational and framework components as depicted in Figure 1.3 (http://wmc.nic.in accessed 5th November 2012; WMC Facilitator Training Manual, 2007). The overall project framework and broad lines of communication reveal different types of roles and activities inherent in the model amongst the organizations involved.

On the one hand are differentiable outsourcing components (public to private) especially visible at two different levels i.e.

(a) Between a public entity (NPC the nodal project management agency) and private entities (WMC Facilitators i.e. private consultancy firms) and designed in a contracting out format, and

(b) Between contracted out public entities (such as Sectoral / Research institutions and other autonomous public institutions including NPC regional offices functioning as

WMC facilitators) and private entities (i.e. SME member units voluntarily participating in the project), and designed in a strategic relationship and service delivery frame to ultimate beneficiaries through provision of support for business process improvement and towards enabling knowledge sharing, technology development and technology transfer processes.

The other equally critical inter-organisational relationship and activity components involved have been :-

(a) public-public organization interactions and outsourcing and contracting structures (between MoEF and NPC and between NPC and Sectoral / Research institutions), and also the phase where the World Bank had been involved for about 50% of financing for Phase II where the relationship between the World Bank (an international public organization) with the MoEF came into operation. The public – public role of the World Bank was also channelized through an independent assessment of the project that had led to strengthening of the project tasks and deliverables and execution structure and components.

(b) private – private relationships between consulting firms serving as WMC Facilitators as extended arms of NPC and the SME units of their WMCs engaged as primary project and programme beneficiaries etc. Besides the public – private relationships amongst institutional and government agencies engaging as WMC Facilitator organizations with the SME units identified to be WMC members in respective WMCs established and facilitated.

It is emphasized that the inherent sources of strength of all the types of inter-organisational relationship elements involved has had an impact in the achievement of the WMC concept's success in the different sectors and regions where WMCs have been established.

In view of the nature of the structure of WMC project phase – II that emerged during NPC and MoEF deliberations and for key reasons indicated above, the need for identifying and selecting Waste Minimisation Circle Facilitators and WMC Facilitating partner organizations was sought to be addressed by drawing up a Criteria Set for the process. This is indicated and presented below in Table 1.5. In addition what emerged as key roles and responsibilities of the core project stakeholders is presented in Table 1.6 which is indicative also of inter and intra – organizational communication features that would influence and have a bearing on the nested PPPs and also public-public linkages involved.

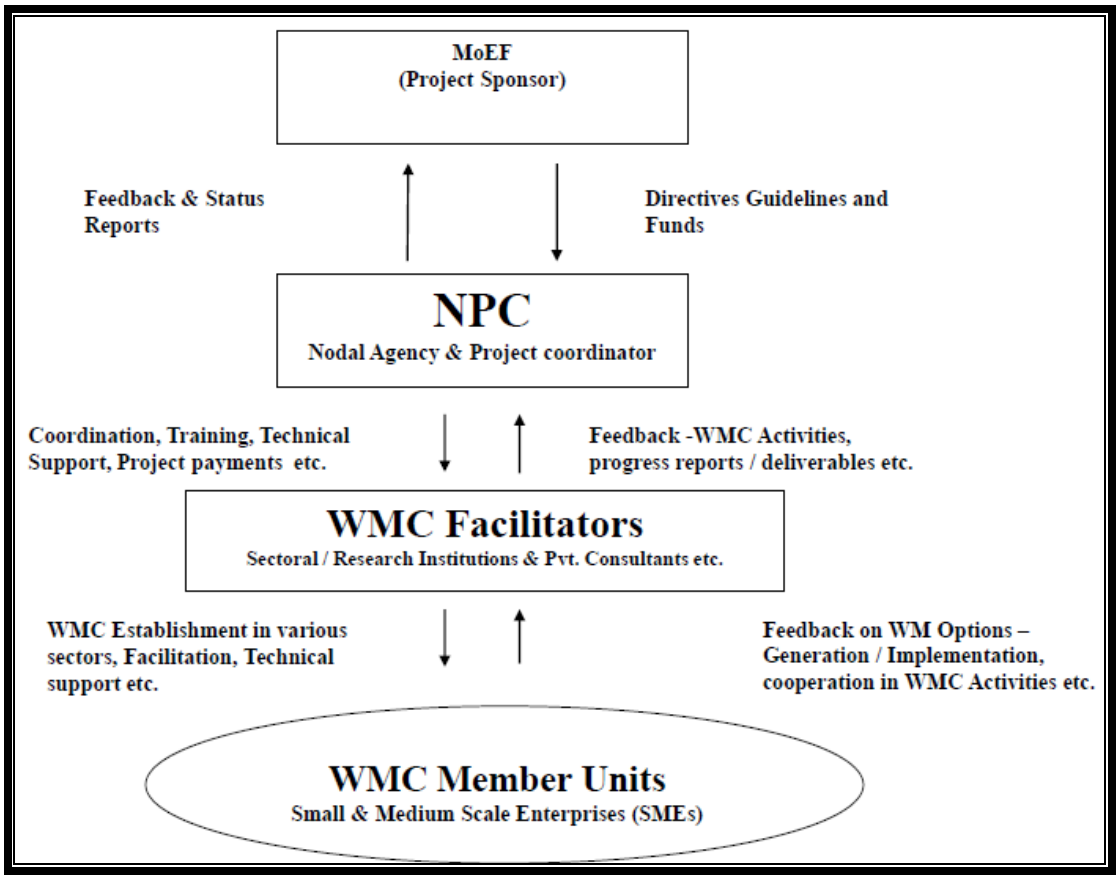

Figure 1.3 : WMC – project structure (Phase II) also adapted later in Phase III

Table 1.5 : Criteria for Selection of WMC Facilitators

Sl	Criteria	Weightage (%)
1	Type of Organisation / Institution (Research / Academic / Consultancy)	10
2	Management's Commitment	15
3	Experience in Environmental Management / Waste Minimisation	15
4	Linkage with Industries	15
5	Available Manpower and Qualifications / Expertise	20
6	Focal Area of Activity	10
7	Infrastructure	15
	Total	100

Table 1.6 : The roles of key project stakeholders / participants in the nested PPP visualized in Phase II

NPC	WMC Facilitators
❑ Identification, Selection and Training of WMC Facilitators ❑ Assisting WMC Facilitators in ▪ Identification of potential industrial sectors / clusters for WMC establishment etc. ▪ Organising Awareness workshop / Training Workshop and in reviewing progress & disseminating results at the Review / Final Workshops etc. ❑ Providing Technical Assistance to WMCs as per requirement ❑ Monitoring progress of WMCs ❑ Facilitating WMC networking ❑ Developing awareness material (Quarterly Newsletter, WMC website, Posters / Audio Visuals and manuals) ❑ Conduction of workshops for multiplier effect ❑ Developing WMC sustenance strategy ❑ Addressing various project requirements and deliverables to MoEF	❑ Signing of MOU towards establishment and operation of WMCs as per project guidelines and schedules ❑ Establishment and Running of WMCs (Key Activities) • Identification of Industrial Clusters having WM / WMC potential • Conduction of Awareness Workshop • Identification and selection of WMC member units (and Group leader etc) • Conduction of Training Workshop ❑ Running of WMCs (Key Activities) • Providing assistance to WMCs in Formulating action plan • Organising WMC Meetings • Generation of baseline data & WM options • Adapting WM to SME needs • Conduction of Review Workshop / Meetings and Final Workshop • Addressing WMC requirements – monitoring and reporting WMC progress and deliverables – and • Seeking NPC inputs and administrative support through the feedback mechanism etc.

The project activities and task structure in Phase II, especially after the World Bank review was undertaken in year 2000-01 led to focus on strengthening project features and development of Output and outcomes based indicators which are indicated in Table 1.7.

Table 1.7 : Output and Outcome indicators and progress monitoring as developed in Phase II

Output Indicators	Outcome Indicators
• Sectors/Cluster Profile • Details of Awareness Workshop/Training Program/Review Workshop/Final Workshop (venue, schedule, participant list, press releases, photographs, highlights) • Commitment letters from WMC Member Units • Details of unit level WM Teams • Process Flow Diagrams • Comparison chart of processes / activities of Member units • Material & Energy Balance Diagrams/Worksheets • List of quantities of wastes generated along with the areas of generation and their cause analysis. • Details of WMC meetings and Agenda/Deliberations • Analysis reports of waste streams (before and after WM Option(s) implementation) • List of WM Options generated • Techno-Economic Feasibility Analysis of WM Options • Details of implemented WM options and the "Cost Benefit Analysis"(CBA) • Linkages established with Sectoral / Research Institutions / Model industries in the region • Final report (Project achievements/ highlights etc)	➢ Waste Minimisation Options • Number of WM options identified • Number of WM options implemented ➢ Investments and Savings (per WM Option) & Gross Economic Benefits • Total investments made for implementing WMOs • Net savings accrued per annum (Rs.) • Payback period ➢ Development of Unit Specific / WMC Data (Before and After Implementation of WM Options) and assessing performance [Quantitative / Percent improvement per WMO and Gross achievements.] • Specific Raw Materials and Utilities Consumption • Specific Water Consumption and Waste Water Discharged / Treated • Specific pollution Load etc. • Specific Fuel (LDO / Diesel / Furnace Oil) Consumption • Specific Electrical Energy Consumption • Yield improvements / Losses reduction and Other achievements

1.2.1 WMC project (Phase II) : Independent review (2000-01) and Strategic Consultations regarding project strengthening perspectives (2002) related insights

The WMC program was an MoEF initiative operated through National Productivity Council (NPC), under financial support of IPPP, from 1997 to closure of the World Bank engagement in 2002 while the project further was to continue with MoEF support and internal resources. In 1999 the World Bank had requested through MoEF an evaluation of the WMC program by an independent expert. The task was undertaken by Dr. Ranganthan former Chairman Central Pollution Control Board in financial year 2000-2001. The lessons learned at the time and recommendations from the evaluation had led to the revised terms of reference for the NPC, including a request to develop outcome based performance indicators for each of the WMCs. These performance indicators have provided an excellent framework for monitoring the effectiveness of the WMC program.

The key Strengths of WMC project / framework as were identified by Dr. Ranganathan were as follows :-

- Adoption, acceptance and implementation of WM Options (WMOs) can be ensured when WMOs are identified by entrepreneurs / employees
- To cover the length and breadth of the country relying on consultants located at different places is a logical approach
- WMC can generate a spirit of co-operation among its members even beyond WM
- Members of WMCs after achieving success could generate the desired multiplier effect
- The WMC approach focusing on self help catalysed by the facilitator is a movement independent of regulatory pressures

Accordingly, NPC had proceeded and prepared a comprehensive database on the WMCs, identifying the economic and environmental benefits of various WM options. It was indicated that "***The WMC program has accordingly gained attention as a means to promote pollution prevention in small and medium industries and the model is being sought to be replicated in countries including Vietnam, Nepal, Sri Lanka, South Africa and***

Thailand and is also being integrated into in the operation of UNIDO/UNEP National Cleaner Production Centres".

In addition to the above assessment, a second review had been undertaken in August 2002 for WMC project (Phase II) towards exploring opportunities and mechanisms for strengthening the project / program under the Chairmanship of Shri Beliappa, former Chairman, Tamil Nadu Pollution Control Board under the aegis and advise of Ministry of Environment and Forests, Govt. of India. The thematic issues deliberated by the delegates / entrepreneurs from industry (especially WMC member units) / WMC facilitating organizations / MoEF / NPC and other consulting firms (who had not established WMCs etc) are broadly indicated below:-

The key questions that were sought to be addressed included :-

- Was there need for further capacity building through training of more facilitators ?
- Were 100+ WMC's adequate for meeting the vision of the WMC project and whether a critical mass had been reached for sustenance of the WMC concept ?
- Were the achievements made till then sufficient to propagate a WM movement ?
- Should there be modifications in the then strategy of WMC project ? If so, what and how ?
- Was there a need for a new product or a new package ? etc.

The views expressed by the participants in the said workshop have been gleaned from the archives and a brief summary of the collective opinion on some of the key issues are enumerated below :-.

More capacity building efforts were considered to be required for propagating WM / WMC, i.e. more facilitators were needed to be trained (168 trained through 10 training programmes were felt to be not enough). Further, retraining and expanding knowledge base and exposure of existing facilitators to a wider stream of expertise was also to be addressed (example energy auditing, plant and safety engineering, TQM and benchmarking, project management and IT interface, HRD aspects, financial & cost engineering, emerging technologies etc.).

Further, 100+ additional WMC's that may be considered to be established were also viewed as insufficient in number (the seeding needed to be more, maybe 500 – 1000 WMCs needed to be established for creating widespread interest) and to make the desired impact towards engendering a multiplier effect on the lines of the Quality Circles concept which had spread like wild fire in the 1980's in Indian industry after the immense success observed in Japan. The participants emphasized that the Quality Circle concept took off after sustained efforts were made by the government, by multinationals, by industry associations, academic community etc, in popularising it for over 15 years and that WMC was as yet a fledgling concept and needed more effort and time to mature and spread in Indian industry. It was indicative that reference was made to Petrochemicals Research Institute which had taken over 25 years to achieve reasonable visibility on energy auditing services. Therefore, a phased approach was felt needed to be adopted for WMC programme over a 10-15 year period.

The participants expressed the opinion that the success rate of the WMC project by any yardstick had been very good. For example, 36 Facilitator organisation out of 112 whose representatives trained as WMC facilitators having established WMCs was roughly 1/3 ratio which was felt acceptable. The economic and environmental benefits that were being realised by WMC member units (approximately 500 units), and in aggregate terms was an excellent reflection of the impact the project had already made in a short span and with minimal government investment. Further the projects core theme on developing a self help mechanism for the SME's and a voluntary nature sans regulatory pressures built trust in the project mechanism and provided ideal situation for developing interest in entrepreneurs to engage in the programme.

Regarding building awareness on WM / WMC much more work was felt needed. Besides distribution of WMC Newsletter, Generic and Technical Manuals, launch of WMC website, Organisation of Awareness Workshops etc., it was indicated that the national and local media (Television channels and Newspapers) could be purposefully engaged through projection of audio-visuals and case studies / success stories etc. Further, greater involvement of industrial development corporations and associations could be sought in promoting WM / WMC in their respective regions. In effect all the participants and stakeholders in the project MoEF, NPC, WMC facilitators, WMC Member Units etc., were expected to contribute more towards popularising the WMC concept. The WMC philosophy was sought to be made to percolate down from National to Regional to State to District to Industrial Estates etc.

The scenario emerging under the project was multiple sectors – multiple Facilitators. The situation was thus ideal for WMC facilitators to be better networked as they could share experiences and knowledge, both through organisation of annual meets and through mediums such as WMC website, email linkages etc. Further they could be invited as experts to other regions for sharing experiences and helping establish new WMCs in these regions.

This was expected would further ensure effective utilisation of the capacity being developed.

Awareness Workshops on WM / WMC were felt to be inadequate at the time and many more regional workshops were sought to be organised where WMC facilitators could contribute meaningfully the experiences gained under the programme. It was indicated that the facilitators may be provided necessary technical and financial support to hold regional level workshops on a periodic basis. Further, use of local language and development of awareness / dissemination material in local languages should be undertaken on priority.

In respect of the then budgetary aspects for the WMC facilitators (@ Rs. 1.725 Lakhs per WMC), the view was that budgetary provisions were not commensurate with the amount of work that was needed to be undertaken in each WMC as detailed in the progress linked payment schedule. Moreover the burden of service tax that had been also introduced by Govt. of India further depleted the professional fees payable to the Facilitators. It was suggested that a revision in the budgetary provisions would be an appropriate incentive for establishment of more WMC's in future.

The participants also indicated that there was a need for greater sensitisation of the banking sector and financial institutions on WM and WMC concept and its relevance to Indian industry. This could lead (in the financial sector) towards development of specific (WM / CP / WMC) credit lines and financial mechanisms to promote investment in application of WM and WMC approach by industry leading to eventual improvement in technology and productivity in the SME's. The efforts towards sensitisation of regulatory bodies on WM / WMC concepts was sought to be scaled up whereby industries undertaking WM / WMC initiatives receive due encouragement and support from the SPCB's as well.

There was felt a growing need to synergise efforts that were being undertaken by NPC and other institutions such as SISI (later MSME) and NSIC with development banks such as SIDBI for encouraging SME's to upgrade technology and improve processes for becoming more competitive in the globalising economy.

The WMC facilitators had also expressed an opinion that due to the prevalent organisational structure of SME's where the manager – entrepreneur engages himself to undertake all the major functional aspects of the enterprise from developing business to managing the production process and attending to production and client requirements, there was usually very little time he could to spare for WMC meetings. Further, since the WMC entails no financial contribution from the member units in the project structure the WMC activities on many occasions tended to lose priority as well. It was therefore felt that a nominal contribution / fee could be levied for the WMC members to participate in the programme, such as to ensure that it gets higher priority on the entrepreneur's agenda.

The utility of waste minimization circle concept, the project success and the need to take this project / concept further was amply appreciated by the World Bank in its final report (2002-03) with respect to then project credit line to MOEF wherein WMC project was partly funded from 2001-2003 which read as follows :-

"***WMCs were more intellectual investment that were expected to lead to ideas that would reduce pollution at source and at the same time improve profitability of the units. In addition, the WMC program included building capabilities of professionals in the country and catalyzing a market for pollution prevention"***.

Further, it was indicative that the MoEF had decided to continue the financing of the WMCs under its own budget with a target of atleast 500 WMCs, and was exploring linkages with financial institutions such as SIDBI. Although the WMC activities helped identify many pollution prevention options in Small and medium Scale industries, the associated potential investments were not eligible for financing under IDBI and ICICI credit lines. Financing of such investments through the SIDBI could have helped considerably in this regard. "***WMCs could accordingly prove to be a very useful project identification mechanism for cost effective abatement of pollution in India, especially for SMEs".***

The WMC project phase – II accordingly was in operation from 1997 to 2005 and various developments occurred including establishment of 118 WMCs during the 2nd phase of the project. Some of the highlights including case examples of the nested green PPP addressing SMEs based are presented here.

1.2.2 Outputs and outcomes of the nested PPP based WMC project Phase II

A total of 12 WMC Facilitator Training Programmes have been organized during Phase II and 112 organisations participated (through 168 nominees)as part of capacity building focus . The project has been further instrumental in generating awareness in industrial clusters through the organisation of Awareness, Training, Review and Final Workshops for the WMCs whereby the establishment, review and progress assessment and dissemination of results from the WMCs under the project have been undertaken leading to an outreach to over 6000+ additional SME units (ref. progress reports).

It is indicative that of the organizations selected and invited to establish WMCs a total of 39 WMC Facilitator organizations (besides some of the NPC regional offices) came forward to establish 118 WMCs under Phase II across 41 sectors and reaching 59 clusters spread in 17 states (WMC News Vol 3 No. 3, June 2003) and as depicted in Table 1.8. Amongst organizations that established WMCs in Phase II a set of 11 institutions are included which combinedly established 40 WMCs and these were of the type :- Academic/Research, Sectoral/Research, private academic institutions, autonomous bodies, scientific institutions and local productivity councils. It is indicative that in phase II over 70% of the established WMCs met objectives set out in the program.

1.2.2.1 The aggregate estimated economic and environmental outcomes of the PPP based WMC Project Phase II (as of year 2005)

Estimated Gross investments and financial benefits (Economic gains) from Phase II of the WMC Project :- (based on estimates of investments made by WMCs in implementation of key WM options and the estimates on savings being accrued to the WMC member units as of year 2005)

(i) Number of WM options identified	: 600+
(ii) Number of WM options implemented	: 250+
(iii) Investment made by member units	: > Rs. 8 Crores
(iv) Annual savings to member units	: > Rs. 4.5 Crores

Estimated Range of Aggregate Environmental Benefits from the Project :- (based on estimates of results indicated in WMC reports regarding changes in consumption of various input utilities / raw materials etc as obtained for various WMCs that met project objectives as of year 2005)

Reduction in water consumption	: 10-35%
Reduction in electricity consumption	: 15-20%
Reduction in fossil fuel consumption	: 10-20%
Reduction in raw material use	: 10-20%
Reduction in waste water generation	: 10-30%
Reduction in Air Emissions (GHG)	: 5-10%
Reduction in solid waste generation	: 5-20%
Yield improvement	: 2-5%

The project phase II had another key additional set of features that presented a communications strategy that involved developing project communication tools and also exploring e-Governance oriented engagements. In this respect it can be added that WMC project newsletters were improved upon in due course and quality of content enhanced (a total of 17 issues produced during this phase i.e. Vol 1 No. 5 to Vol. 4 No. 3) and the range of

readership expanded significantly to over 1750 personnel. Further a project video was developed to highlight several WMC cases across regions / clusters and sectors. This especially helped phase III of the project communications and its buildup. In addition was developed the project specific website which has been helpful in essentially one way dissemination of information (in view of primarily field work oriented activity focus), though project case studies dissemination to a wide spectrum of visitors and stakeholders from middle of Phase II was achieved through the website. The email based communications strengthened and speeded up interactions and problems and solutions handling processes. These also helped maintain a high degree of transparency amongst project team members and ensured that all team members remained updated and in operational readiness to meet project objectives and address differentiated responsibilities to the best extent as per project needs. The WMC project website maintenance and support has been facilitated by National Informatics Centre for which NPC has been extremely grateful. A glimpse of the WMC website where additional content from phase III is to be uploaded and which is undergoing security audit is presented below in figure 1.4.

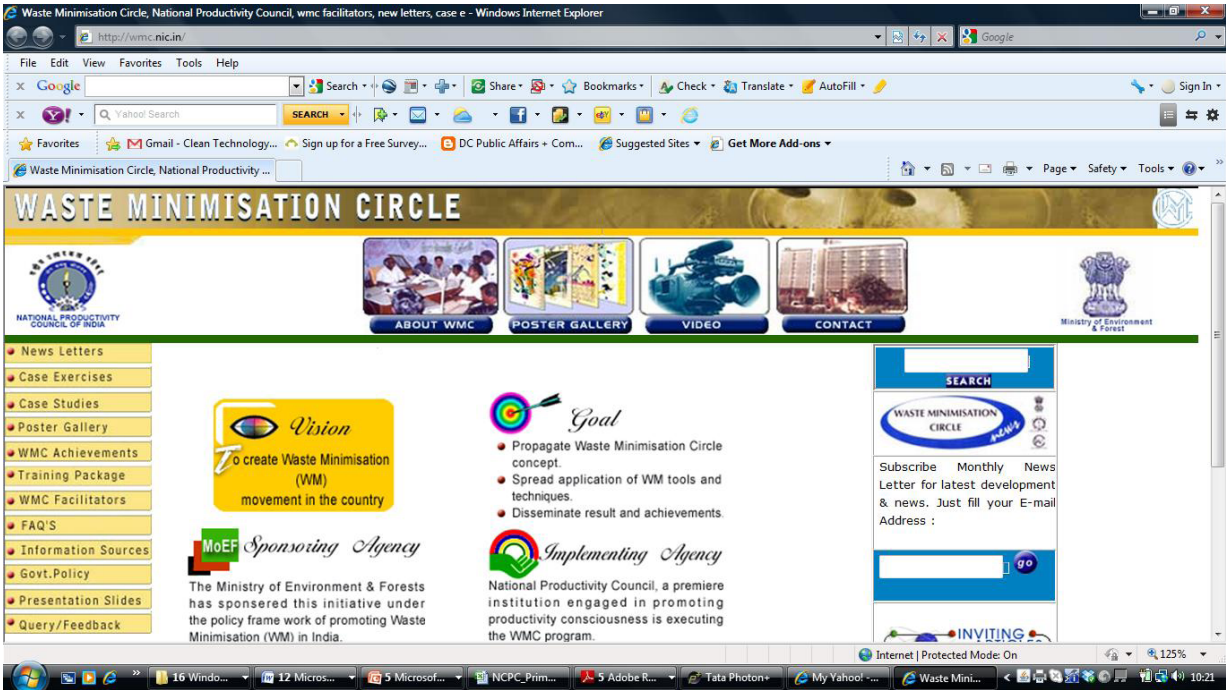

Figure 1.4 : The WMC project Website highlighting Vision and Goals of the program (http://wmc.nic.in as accessed on 5th November 2012)

Table 1.8 : WMC Phase – II : Industrial Sectors covered and Clusters reached

Industrial Sectors and No. Of WMCs			Clusters and States
Sl	Sector	No. of WMCs	
1	Khandsari	2	1 Ahmedabad (Gujarat)
2	Pulp & Paper	4	2 Ambernath (Maharashtra)
3	Refractories	3	3 Bangalore (Karnataka)
4	Dye & Dye Intermediates	7	4 Belgaum (Karnataka)
5	Foundry	12	5 Bhilai (Madhya Pradesh)
6	Electroplating	14	6 Bhopal (Madhya Pradesh)
7	Hotels	5	7 Bhubaneswar (Orissa)
8	Forging	1	8 Bijnore (Uttar Pradesh)
9	Distillery	1	9 Chandigarh (Punjab)
10	Textiles Processing	8	10 Chennai (Tamil Nadu)
11	Dairy	3	11 Chitradurga (Karnataka)
12	Paints	1	12 Coimbatore (Tamil Nadu)
13	Resins	2	13 Cuttack (Orissa)
14	Bulk Drug / Pharma	3	14 Dehradun (Uttaranchal)
15	Marble & Slurry	1	15 Delhi (Delhi)
16	Rice Mill	3	16 Erode (Tamil Nadu)
17	Rubber Processing	2	17 Faridabad (Haryana)
18	Steel Rolling Mills	2	18 Hosur (Karnataka)
19	Pesticide Formulation	1	19 Hyderabad (Andhra Pradesh)
20	Printed Circuit Board	3	20 Ichalkaranji (Maharashtra)
21	Battery Manufacturing	1	21 Indore (Madhya Pradesh)
22	Edible Oil	2	22 Jagadhari (Haryana)
23	Ply Board	1	23 Jamnagar (Gujarat)
24	Engineering Sector	1	24 Jullunder (Punjab)
25	Utensil Manufacturing	3	25 Khurja (Uttar Pradesh)
26	Sago / Tapioca Processing	3	26 Kolhapur (Maharashtra)
27	Brick Kilns/Roofing Tiles	2	27 Kolkata (West Bengal)
28	Textile Spinning	1	28 Ludhiana (Punjab)
29	Coir Defibring	1	29 Madurai (Tamil Nadu)
30	Sanitary Fittings	1	30 Malur (Karnataka)
31	Packaging Materials	1	31 Mettur (Tamil Nadu)
32	Tannery	5	32 Modinagar (Uttar Pradesh)
33	Hosiery Processing	5	33 Mohali (Punjab)
34	Ceramics	5	34 Morbi (Gujarat)
35	Fertilizer	1	35 Mumbai (Maharashtra)
36	Safety Match Box	1	36 Muzaffarnagar (Uttar Pradesh)
37	Flour Mills	2	37 Nizamabad (Andhra Pradesh)
38	Screen Printing	1	38 Palakkad (Kerala)
39	Sugar	1	39 Panchkula (Haryana)
40	Plastic Components	1	40 Pune (Maharashtra)
41	Academic Institutions	1	41 Rajahmundry (Andhra Pradesh)
		118	42 Rajapalayam (Tamil Nadu)
			43 Rajkot (Gujarat)
			44 Ramgarh (Bihar)
			45 Ranipet (Tamil Nadu)
			46 Salem (Tamil Nadu)
			47 Samarlkot (Andhra Pradesh)
			48 Sangli (Maharashtra)
			49 Shimla (Himachal Pradesh)
			50 Shimoga (Karnataka)
			51 Surat (Gujarat)
			52 Thangadh (Gujarat)
			53 Thiruvananthapuram (Kerala)
			54 Thuthipet (Tamil Nadu)
			55 Tiruppur (Tamil Nadu)
			56 Udaipur (Rajasthan)
			57 Vadodara (Gujarat)
			58 Vaniyambadi (Tamil Nadu)
			59 Virudhunagar (Tamil Nadu)

2.0 Salient Components of the Project – WMC Phase III

The phase III of the project could be initiated in July - August 2007 and was sought to be built on phase II template(s). The observance of the nested Public – Private Partnership had however been not specified in the previous implementation phases of the WMC project in the project discourse, which could be now attended to by propagating this perspective in phase III related activities and developments. It was possible to undertake such a process from the early stage of organizing two WMC Facilitator Training programs to develop a fresh impetus for the project phase III. An outline of the operational structure for public and private entities and participants in Phase III is presented in Figure 2.1 below.

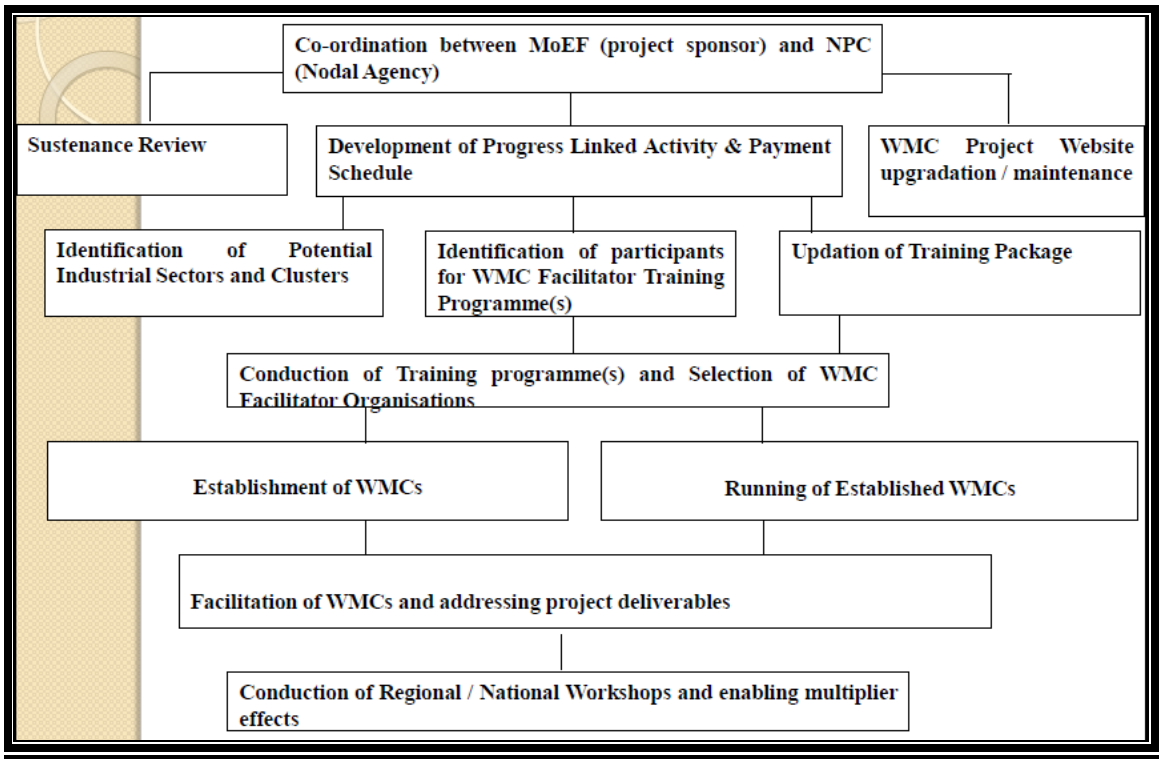

Figure 2.1 : A schematic of Key project activities and stakeholder interactions structure

2.1 Towards focused WMC Phase III action : Priority sectors and Regions

The Ministry of Environment and Forests had indicated at the start of Phase III a few priority sectors that may be especially focused upon for WMC initiatives which are indicated below along with indications that the eastern and north eastern region of India should be reached to the best extent possible.

(1). Foundry and Forging,

(2). Electroplating,

(3). Textile Dyeing and Processing,

(4). Bulk Drug / Pharma,

(5). Steel Rolling Mills,

(6). Brick Kilns / Roof Tiling,

(7). Tannery,

(8). Activated Carbon – Charcoal sectors.

The efforts to achieve the desirable sectors and regions related coverage were undertaken in Phase III. This included developing and / or seeking sectoral profiles for above sectors from Phase II facilitators. In respect of addressing activated carbon charcoal sector which had not got addressed even in phase II, a parallel proposal was also submitted to Central Pollution Control Board for undertaking Comprehensive Document development in the COINDS series being developed by CPCB. Further invitations were sent to potential WMC facilitators from amongst consulting units, Local Productivity councils and other organizations and institutions of eastern region to participate in the two WMC facilitator Training programs envisaged for phase III to build additional capacity for the program.

2.2 The Task Wise progress and achievements scenario (Phase III)

The progress on the project titled "Waste Minimisation in Small Scale Industries – WMC Extension Phase III" as sponsored by the Ministry of Environment and Forests, Govt. of India to the nodal agency i.e. National Productivity Council (Environment Group), under Ministry of Commerce and Industry, Govt. of India, is submitted herewith outlining the task wise progress and achievements vis a vis the project activities envisaged as proposed besides highlighting of key insights obtained from the field work.

2.2.1 Task No. 1 : Undertaking Sustainability Review of the earlier established 118 WMCs of phase II

As part of the activities under **Task 1** it had been envisaged that Sustainability Review be undertaken for WMCs established under Phase II of the project. In this regard the first steps undertaken were towards seeking inputs from WMC Facilitator organisations of Phase II towards obtaining perspectives from the project partners who established the WMCs in various industrial sectors and clusters with MoEF and NPC support, and who managed and facilitated these WMCs on the ground for periods ranging between 1 to 2 years as per the project framework and as per schedule of activities and deliverables envisaged. Accordingly a suitable questionnaire was developed and sent to all 45 WMC facilitator organizations that had established WMCs in Phase II (Annexure AT1.A). The key reasoning being that the respective WMC Facilitating organizations could be expected to continue to be linked in formal or informal ways with their respective WMC members, and that the WMC facilitators might be aware of the activities the WMC member units may have been undertaking after formal closure or completion of respective WMCs beyond ceasing of programmatic support that had been provided to the WMCs through the WMC facilitating organizations (which had

received structured financial support from MOEF for 4 stages of activities for a period of 1 year as per format of the activities / deliverables schedule).

It may be noted though that several WMCs in Phase II actually operated for periods ranging from 1.5 to 2 years as it took almost all WMC Facilitators necessary additional time (beyond 1 year structured plan for each WMC) to grasp the group consulting approach and mechanism developed for WMCs, and also for the WMC member units themselves to gather momentum for cooperative action as per WMC concept during phase II. The case to case scenarios for each WMC for the respective sector and in view of specific issues in each industrial region / cluster also tended to affect the schedules for the WMC activities. It may be mentioned that keeping in view such circumstances the Nodal agency allowed (with understanding of MoEF) any reasonable flexibility in the time frames for WMC activity implementations for the respective WMCs (considering the larger program of establishing 100 WMCs in Phase II), but these were however limited to be undertaken within allocated budgetary provisions. The support from Ministry of Environment and Forests towards such basic minimal flexibility in time frames while guiding NPC and WMC facilitators on various occasions such as during launch of a WMC when Awareness Workshops were attended, or during review and Final workshops when MoEF officials appreciated WMC member units for achievements made have been gratefully acknowledged by NPC and WMC Facilitators and Member units.

As a key step towards building fresh momentum on the WMC program it was important to explore sustenance scenario and features with respect to Phase II that had closed in year 2005. It may be noted that the Survey Questionnaire was designed keeping the PPP related perspectives that were being sought to be explored for analysis. These included exploring issues such as institutionalization of WMC program in general in the industrial domain, any benchmarks that could be set by the efforts made vide the project, whether the WMC program had carved a niche etc. Also seeking indications that could be obtained in respect of WMC facilitator's enthusiasm and any special efforts made in the project. Further, whether inter – circle industry visits would be useful and if the Facilitator would be in a

position to enable and coordinate visits by other circle members to units that had been facilitated at their end for technology and knowledge sharing across regions of India. Also seeking information whether indications existed regarding financing mechanism adopted by firms towards implementing WM options, such as to identify need for building financial synergies for the program during phase III etc.

Some encouraging responses that arrived indicated that the overall rating for the project in phase II could be placed at 7 on a 10 point scale. The institutionalization of WM movement was being observed in industrial domain by most of the respondents which also included entrepreneurs rewarding / recognizing innovative ideas from the workers and operational staff. The niche aspect of the WMC project was indicated to be the 'group consulting' feature for SME manufacturing units that WMC program spread in phase II, which was a newer format to work with and had substantive challenges and contained scope for building newer capabilities and strategic business partnerships vis a vis the traditional approach of one to one consulting projects that used to be undertaken for large sector companies or for SMEs on behalf of large consulting firms. Enthusiasm for inter circle visits across WMCs was especially desirable as indicated by the respondents. Interest in participating towards facilitating major technology upgradation initiatives for SMEs was also indicated.

As regards suggestions for undertaking sustainability Review for Phase II WMCs which had met objectives as per project structure in phase II between 2001 and 2005 also responses were obtained. For example, M/s Maruti Consultants indicated as part of the survey response

"As a consultant / facilitator no special efforts have been made by us for sustaining this/ any other project. Probably after the final workshop, some review visits to evaluate sustainability (say once a quarter) can be thought of. The project needs to allocate funds for this. Some fund allocation can be made for instrument bank in each cluster and for reading material. This way we make our visibility felt. Soft funding of technological innovations in demo projects can be facilitated."

In response to special gains from the project M/s Ecofriends Consulting unit indicated :-

“The WMC members gained confidence to look positively towards Waste minimization options as preventive control rather than fully depend on End-of-Pipe (EOP) solutions. This confidence got them to believe in Environmental Management System”.

It is indicative that in further interactions M/s Ecofriends consulting had begun to provide EMS consulting services to SME units and had developed further capacities.

One of the manufacturing units M/s Palakkad Dairy that responded indicated :-

“NPC representative / facilitator to be retained to establish coordination and continuity beyond project period”

In view of such encouraging perspectives from Phase II stage participants, the WMC project phase III was initiated afresh with enthusiasm at NPC despite the budgetary concerns and manpower constraints that had to be overcome in due course.

In taking up the Sustenance Review explorations involving WMC Facilitators at the start of phase III of the project, it was also reasoned that a few of the WMC Facilitators of Phase II project may intimate willingness to participate in the project in Phase III as well. It was envisaged that such a response would especially enable momentum to rebuild the WMC program / project in Phase III (after a relatively long dormant intervening time period for initiating phase III of the WMC program considering phase II was officially concluded by April 2005 and Phase III actually initiated in July 2007 due to various reasons), while fresh efforts towards capacity building and developing newer WMC facilitators in Phase III could also be carried out. It was envisaged that WMC facilitators of Phase II could add substantive value through sharing of experiences when some of Phase II Facilitators continue involvement in the WMC program into Phase III as this could serve as another factor that also could play a role in sustenance of the project itself considering scope of transmission of experiences amongst WMC facilitators and for mutual learnings as part of an expanding network of such consulting partners of the program. It was further observed that by enabling continuity of the involvement of the willing WMC Facilitators of Phase II that may opt to participate in

Phase III of the program (as well), could strengthen phase III initiatives, where scope would exist not only for transmitting insights and sharing perspectives to newer stakeholders in Phase III operations but also enabling continuity of access to the Phase II WMCs that were sought to be reached in exploring respective self sustenance scenarios and / or need and prospects for any further programmatic interventions that may serve the desirable sustenance objectives for WMCs that functioned as part of the program.

The list of WMC Facilitators of phase II who responded to the questionnaire for this purpose is enumerated in table below. It is further submitted that some of the WMC Facilitators of Phase II who responded chose to participate in the program in Phase III as well as anticipated earlier. It was also useful that these Facilitator organizations also chose to provide insights from the experiences of establishing WMCs in Phase III as well considering the questionnaire responses essentially arrived during year 2009 in particular.

Table 2.1 : WMC Facilitators (Phase II / III) who responded to Sustenance Review questionnaire

Sl. No.	WMC Facilitator Organization and Phases when WMCs established	Type of Organization
1	Maruti Consultants, Hyderabad (II / III)	SME Consulting (Major capabilities : Energy Auditing, Resource Conservation)
2	Essen Energy Technologies Pvt. Ltd, Indore (II/III)	SME Consulting (Major capabilities : Energy Auditing, Resource Conservation)
3	Central Glass and Ceramic Research Institute (Naroda Centre), Ahmedabad (II)	CSIR Laboratory / Institution (Major capabilities : Ceramics sector Technology development, and Technology upgradation support including all Resource Management Services)
4	Kadam Environmental Consultants, Vadodara (II)	SME Consulting (Major capabilities : Environmental Management Services, Resource Conservation studies)

5	Central Glass and Ceramic Research Institute (Khurja Centre), Uttar Pradesh (II)	CSIR Laboratory / Institution (Major capabilities : Ceramics sector Technology development, and Technology upgradation support including all Resource Management Services)
6	Industrial Operations Research Group, Palakkad, Kerala (II/III)	SME Consulting (Major capabilities : Operations research, Technology Management Services, Resource Conservation studies)
7	EcoFriends Consulting, Ichalkaranji, Maharashtra (II)	SME Consulting (Major capabilities : Environmental Management Services, Resource Conservation studies)
8	EHS Consultants, Dewas, Madhya Pradesh (III)	SME Consulting (Major capabilities : Environmental Management Services, Resource Conservation studies)

Note : more responses further awaited and being sought through further follow up efforts

It is further submitted that the idea of seeking responses from WMC Facilitators regarding sustenance of WMCs was also extended to newer WMC Facilitators of Phase III as well, as the project progressed, and an example of response received from amongst new Facilitators who joined the program namely M/s EHS consultants (Dewas) also being included in the report.

As part of the exercise it was learnt however that some of the WMC facilitator organizations of Phase II had shifted addresses considering a few letters were received back at NPC as undelivered on account of changed addresses regarding some WMC Facilitator organisations. It is also important to submit here that action towards seeking inputs from WMC member manufacturing units as well, regarding sustenance aspects for their respective WMCs was also initiated (for a start in a semi-structured interview format). This was attempted vide interactions to begin with, with Phase II member units and as undertaken at Indore (for pharmaceutical and packaging sector WMCs which had been

facilitated by M/s Essen Energy Technologies P. Ltd.) and for WMC in rice milling sector of Nizamabad (Andhra Pradesh) as facilitated by M/s Maruti consultants located at Hyderabad. These interactions could be undertaken in conjunction with visits towards establishment of Phase III WMCs in Indore and Hyderabad regions for other newer sectors, and has provided some useful pointers on the issues pertaining to sustenance aspects of Phase II WMCs and to the strength and weaknesses involved in limited duration oriented programmatic interventions etc.

Plates 2.1 : Photographs depicting Sustenance Review related visits

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<tr><td colspan="2">Pictures of Sustenance review efforts in Pharma sector Indore WMC (phase II) and Dairy sector WMC member unit Palghat WMC (phase II)undertaken by NPC (EN Group) officials along with WMC facilitating partner organization, in addition to that undertaken for packaging sector and resin sectors Indore (phase II) and for Rice Milling sector at Nizamabad (A.P.) phase II.</td></tr>
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Sustenance Review in Foundry Sector (phase III), Indore and Steel Rolling Nagpur. The WMC Units making progress technologically and laboratory upgrades. The Indore unit especially displaying WMC project participation Certificate amongst awards/certificates	
	
Sustenance Review – Foundry Sector (phase III) Indore, along with visit by UNIDO India official (Ms. Tonilyn Lim) towards an independent review and exploration of industry problems and scope for green industry facilitative engagements	

	
	
	

Sustenance Review – Engineering Sector (phase III) Dewas and Steel rolling sector Indore

(phase II), along with visit by UNIDO India official (Ms. Tonilyn Lim) towards an independent review and exploration of industry problems and scope for green industry facilitative engagements

Field visit to Chemicals sector and Ceramic sector WMCs in Dewas / Pithampur and Khurja respectively, and sustenance review explorations by Dr. M. Salahuddin, Director (CT) MOEF along with Mr. Pervez, Group Head (EN) & D(NCPC) from NPC India

	
Field visit and Sustenance Review by NPC/NCPC official along with CGCRI officials at Crockery and Insulator sectors at Khurja, Uttar Pradesh	

It is indicative that the key sub-themes of sustenance and independent review undertaken by NPC / NCPC India officials along with MoEF and UNIDO officials included the following aspects :-

[1] New project designs and infrastructure needs across industrial tiers for enabling advanced resource conservation initiatives and prospective financial structures / financial flow approaches and investment mechanisms for technology transfer / upgradation and development facilitation that could arise through market mechanism or be promoted, facilitated and undertaken by national and international institutions along with deliberations regarding features of NCPC / RECP network in context

[2] The need and facilitation towards employment of middle management professionals for small & medium enterprises and the possible development and facilitation mechanisms of the said professionals with desired / needed skill sets as part of arrangements for addressing

industrial competitiveness issues / aspects and in obtaining positive results regarding purported demographic dividend expectations

[3] Deliberations on Eco-innovation initiatives and the existing and evolving participation in green procurement processes in the region and in furthering development of green supply chains in the backdrop of emergence of Sustainable Business Leadership forum and potential engagement in Parivartan awards 2012 as being organised by M/s cKinetics and M/s India Carbon outlook with NCPC India as Industry partner facilitating the initiative. In addition deliberations on progress on Indian Eco-Products Directory / catalogue Development as per Asian productivity organisation Template and its engaging role concerning desired harmonisation of eco-products databases.

[4] The strengthening of strategic management consultancy support for enabling international collaborations and prospects for exercising 'technologies for markets' ideology and scope for enabling suitable arrangements to be undertaken in two way formats across regions / countries (within the framework of the 47 country network of NCPCs under the aegis of UNIDO and UNEP)

[5] The toolkits for Cleaner Production and Safer production facilitation for eco- industrial development from UNIDO / UNEP and need for new toolkits that may be developed / provisioned from NCPC India for enabling green growth and fostering green economy

[6] Issues regarding industrial infrastructure scenario and key existing limitations and bottlenecks and exploration of green infrastructure development needs / prospects, and such priorities for policy advocacy and facilitative program design and implementation mechanisms under the aegis of new manufacturing policy

It is however indicative that the problems in delayed exploration of sustenance aspects for WMCs that had been operated for periods ranging 1 - 2 years during 1997 to 2005 appeared to be an issue, and provided indications that it may be useful to undertake sustenance review for WMCs of Phase III to add to further exploration of sustenance aspects regarding Phase II WMCs as envisaged.

A collation of the responses received from WMC facilitators as received and indicated above is further enumerated below.

It is submitted that as many WMCs of Phase II happen to have concluded 8 to 12 years ago, and the WMC facilitators tended to be engaged with newer projects etc, the links to those WMCs have been found to be tenuous. It was also learnt that some of the phase II WMCs did continue WM related interactions after formal support to WMC Facilitators for the WMCs was withdrawn / concluded once stage wise activities concluded over 1.5 to 2 year periods, yet some of the sample WMCs reached happen to have discontinued WMC activities, though at industry association level the entrepreneurs would have continued to interact in respect of common business / association matters and carried on interacting since Phase II WMC activities concluded. It has been also learnt that some of the WMC member units sold their units to newer entrepreneurs and / or changed interests into newer initiatives, and in some cases in response to economic environment and downturns and viability aspects some plants shut operations for shorter or longer periods. It therefore appeared more feasible to undertake WMC Sustenance Reviews especially for Phase III WMCs (as was deliberated in Steering Committee meeting in September 2010) within the existing budget provisions itself for the process, considering these were more recent and were also in the process of concluding WMC operations since year 2009. A decision by the Steering Committee members to advise and allow us to explore WMC Sustenance prospects and aspects and such needs from WMC member units of Phase III has been helpful to obtain better response and enabled understanding of current industry perspectives regarding WMC program and approach to making these sustain for longer periods say upto or beyond 3 years and also to seek inputs on nature of improvisations that could be incorporated in future WMC initiatives if felt appropriate. The above effort could be undertaken through development of a fresh questionnaire and administering the schedule during field visits or seeking responses vide email / post etc during October to December 2010.

Some of the suggestions given by the facilitators to make the WMCs sustain beyond the project period of one year are given below.

- Regular / periodic meetings among WMC members and enabling sustenance (including engaging in newer initiatives etc) can be coordinated by the WMC Facilitators especially in case suitable financial support could be provided to the Facilitator organizations for such sustenance efforts as part of the program structure if considered by MoEF / NPC. This may be further deliberated upon during national / regional workshops or during future WMC initaitives.
- Certificates and Awards from MoEF or NPC could be given to those WMCs which are functional and operational for more than 3 years (especially after conclusion of programmatic structured 4 stage progress format being undertaken (which runs for 1 – 2 years on the ground).
- Some encouragement / incentive may be provided from concerned State Pollution Control Boards for the longer term operational WMCs.
- Enhancing publication of case studies in the WMC newsletter and possibly enhancing circulation to the relevant WMCs / industries / institutions.
- NPC officials and WMC Facilitators may be retained beyond the project period to enable further coordination of sustenance related activities among the WMC members and with WMC Facilitators.

It is submitted here that questionnaire responses have included indicators regarding budgetary support needed for sustenance related activities as per intimation and requests from some of the WMC Facilitators of Phase II (as well as of those participating in Phase III training programs). Some of the indications were that quarterly review efforts could be undertaken for concluded WMCs and that a cost of Rs. 10,000 per such meeting / review and assessment by WMC Facilitator could be considered for a suitable additional period (say upto 3 years after WMCs complete the 4-stage structured program ideally expected to be completed within 1-1.5 years).

A view in this regard was sought by the project management unit as to how may the WMC sustenance activities be structured beyond 4-stage WMC activities completions and what may be suitable budgetary provisions for Phase III WMCs being concluded and possibly for a design for more WMCs that may be undertaken in future. Advise was also sought within NPC and also indicated to MOEF towards permission to appoint project associates on contract basis for enabling WMC Sustenance review related tasks such that funds allocated for Sustenance review work could be suitably utilized (the activity could be easily learnt as survey action by passing out college students from science and management backgrounds etc and where the costs of monthly support and basic travel related expenditures could be accounted for as well).

The said process of seeking and appointing project associates could not be embarked upon however, as the process of reorganization of budgetary provision would have taken much time, even though an employment creation scope had existed (even if on short term basis) and which would have had long term gains for the project. It has been accordingly decided by the project unit that in future project extension (if it occurs) necessary provisions for engaging project associates or project volunteers shall be sought as an appropriate scaling up mechanism and project success support approach in terms of checking cost and time overruns in particular. The exploration of the need for middle management for SMEs as has also been undertaken further buttresses the need for structuring as future project plans the scope for appointing volunteers at various locations who can be paid for jointly by the program and by firms and industry availing the volunteer support and facility as part of project implementation and success strategy.

2.2.2 Task No. 2 Identification of potential industrial sectors and clusters for the WMC program with priority on inadequately covered industrial sectors and clusters:

The undertaking of **Task 2** involved the process of identification of potential industrial sectors and clusters for the WMC program Phase III, which included perspectives received from MoEF during proposal development phase regarding 8 priority sectors in particular, and through the two way process of explorations carried out by NPC as nodal agency and also by WMC Facilitators as per prospects envisaged in industrial clusters in the respective regions where the Facilitating firm was located. These also included industrial zones as felt at reasonable vicinity of the firm that could be reached within budgetary provisions for a WMC especially with respect to travel related provisions etc. For example Maruti Consultants located in Hyderabad established a WMC in Earthen Tiles sector at Nuzwid near Vijayawada and successfully completed the WMC with desirable results being achieved. Similarly Essen Energy Technologies located in Indore ventured to establish a progressively operational WMC in Nagpur (Maharashtra) as the firm expanded its operational locations and consulting activities.

The priority sectors identified by MoEF for WMC project phase III have been indicated in section 2.1. It is to be mentioned here that this list includes two sectors wherein WMCs were not established under Phase II (i.e. Roof Tiling and Activated Carbon – Charcoal sectors)

It would be appropriate to indicate here that during phase II of the project there were 41 sectors in which WMCs could be established and which happen to be located in 59 industrial townships / clusters across 17 states of India. Most of these regions were in central or southern or western states, and accordingly eastern region of India seemed to have been displaying lesser number of WMC establishments. It was notable that eastern regions including Orissa, Bihar, West Bengal, and north eastern states had an approximately 5% of WMCs established in Phase II amongst 118 WMCs that were operationalised during 1997 to 2004.

It is indicated that this problem has tended to persist even in phase III of the project despite attempts to invite and involve consulting firms and institutions from eastern region.

Towards the development of sectoral and industrial profiles amongst priority sectors indicated by MoEF and as felt feasible by WMC member units an outline of features that could be addressed in shaping these profiles were indicated to WMC facilitators for submission along with the Expression of Interest towards seeking approval for establishing WMCs. NPC also explored prospects for Waste Minimisation potential amongst these and other industrial sectors and communicated such inputs to potential WMC Facilitators in such regions and also urged the Facilitating organizations to attempt making WMCs in the identified sectors. These included for example Activated Carbon manufacturing and Roof Tiling units etc. It is indicative that amongst 8 priority sectors sought to be particularly addressed amongst WMCs in Phase III, six of the sectors had been already addressed in a few industrial clusters in Phase II. However, as per the project directives with implicit scope and discretion of provisions for exploring newer sectors as well, project efforts were continued though lesser number of newer sectors could be attempted or got addressed in Phase III for establishing the 25 nos WMCs eventually.

The newer sectors explored by WMC facilitators have included cotton seed oil processing at Dhule, sponge iron in Andhra Pradesh, Ayurvedic Pharma in Kerala and e-waste processing and recycling at Bangalore. Some of these WMCs however have tended to not progress substantively as expectations of WMC members here or of WMC Facilitators were identified to be in divergence to program provisions (or problems arose after initiating the activities) as learnt after launch of the WMCs (the launching of these WMCs were undertaken with enthusiasm though).

For example, in Dhule (Maharashtra) the expectations of cotton seed oil sector was felt to be more towards primarily receiving potential grants under the project for technology upgradation activities as per key need in the region at the time in year 2008, in addition to

programmatic technical support from a WMC Facilitating organisation. In respect of Sponge Iron sector in Andhra Pradesh, the limited budgetary provision and other institutional constraints became a concern at ASCI, considering the limited prospects of establishing say larger number of WMCs in a given specialized sector for spillover effect and budgetary balance that was feasible in tannery sector and ceramic sectors during Phase II as undertaken by CSIR labs such as CLRI and CGCRI. Considering that upto 20 WMCs only had been sanctioned initially and 25 nos as per mid term revision of the project (additional 5 nos only) the scope for more WMCs in bulk at the start in year 2007 - 2008 as may have been suitable for an institution was however limited. However, as project progressed and enthusiastic demand for WMCs got received from amongst the actively focused WMC facilitators, the go aheads were granted to the WMC Facilitators in establishing the WMCs in Phase III where more than one WMC in particular was considered acceptable to establish by the most interested WMC facilitators which was allowed in view of potential interest amongst units and scope of resource conservation indicated.

Further a set of sample sectoral / cluster profiles developed as part of the WMC project phase III through two way inputs and explorations amongst NPC and WMC Facilitators evolved. These include Cluster profile for Krishna District Tile Manufacturer's (Andhra Pradesh), explorations of Indian Foundry and Forging sector profile, Cotton seed oil manufacturing at Dhule (Maharashtra), Paints and resins sector at Hyderabad (Andhra Pradesh), Brass Foundry sector at Jamnagar (Gujarat), Ayurveda Pharma sector (for a WMC in Kerala), activated carbon sector in India etc. The industry sector profiles and cluster profiles prepared by NPC (example activated carbon, foundry and sponge iron sectors and sharing of perspectives on advancements in foundry sector (including brass foundry) added to the collation of industry sector profiles. A sample set of Industry sector profiles is presented at Annexure AT2.A.

2.2.3 Task No. 3 : Identification of institutions / consultants to be trained as WMC Facilitators who will be invited to participate in

further training programmes (priority efforts to be accorded towards eastern states)

As part of **Task 3** attempts were especially made towards inviting potential WMC facilitators from eastern region of India (example from Assam, West Bengal, Orissa etc) to the two training programs organized for WMC Facilitators in October 2007 and January 2008. It was however noted that though a few representatives did participate in these training programs from these regions, the process of establishing WMCs in eastern region had not necessarily been forthcoming due to specific issues that seem to have been encountered by consulting firms / institutions in these regions. These included the constraints on seeking voluntary participation of firms. It was however felt inappropriate that any firm be coerced into responding to the project expectations by seeking involvement of state pollution control boards. The problem of budgetary constraints per WMC though remained an issue to contend with. An instance also arose about whether to include medium to large sponge iron units in Orissa state amongst potential sector for WMC establishment at an early stage of phase III etc (which was approved for going ahead a few months later but by then the potential WMC facilitating organization happen to have been committed to other projects during 2008-2009). It is accordingly feasible to suggest that this sector and region may be possible to reach for a WMC in future in case the project gets further consideration for expansion in view of evolving industrial scenario.

It may be noted that towards identifying institutions and consultants to be trained for the WMC facilitator training programs, efforts had been initiated and pursued through the year 2007 as also indicated in reports submitted earlier regarding invitations sent for both training programs i.e. those held in October 2007 and January 2008.

It is further indicated here that for inviting consultants and institutions to participate as WMC facilitators in the project explorations were made from various databases and sources

/ lists of such agencies. These included for example list of consulting organizations and institutions available with NPC from past efforts on the project related invitations, exploring of prospective options from Consultancy Development Centre (CDC), List of research institutions (example CSIR labs) and academic institutions focusing on Engineering / technology areas. A communication with CDC on the matter of identifying consultants to invite is enclosed at Annexure AT3.A. Further involvement was sought from Local Productivity Councils and suggestions of potential organizations that may be keen on the project were sought from NPC Regional Offices as well as from selected industry associations.

It may be mentioned that an expansion of the potential participants and list of consultants sent invitations was particularly enabled by exploring professionals who had cleared Bureau of Energy Efficiency run exams for Energy Auditors as these were available from BEE website and as NPC was also engaged in assisting BEE in developing course content for the subjects related to energy Auditing and Assessments and also in assisting BEE in conduction of the examinations for Energy Auditors. A list of such sources for identifying consulting organizations / sectoral / research institutions that could be invited for participation in WMC Facilitator Training programs was accordingly developed.

2.2.4 Task No. 4 : Updating of the training package :

The process of updation of the training package as **Task 4** was being especially undertaken towards the conduction of the training programs for WMC facilitators as held in October 2007 and January 2008. This included adding newer case studies on WM / CP theme from sources within NPC Environment group activities, as well as from websites of international and national agencies. Further inputs from books and journals on environmental domain also have been added.

The inclusion of WMC newsletters as these got published has been a regular feature. Further content has been included as obtained from participation of NPC consultants in various conferences / seminars and also from training of trainer programs that were found suitable for inclusion. This process of updation of training package is being continued for future potential application and in case there is scope for expansion of the WMC project as well. The earlier updations until January 2008 were especially printed and file folders prepared for distribution to WMC Facilitator Training program participants and organizations seeking insights on the training activities on the theme. The later improvements are primarily being undertaken by adding content to DVDs being prepared pertaining to enhancing content for such a project as part of the Training Package.

These DVDs besides containing soft copies of various documents (the text chapters and power point slides in pdf format, WMC newsletters in pdf format etc) and the WMC project video developed under Phase II etc, had been further being enriched with additional case studies and WM / CP tools related inputs for practicing consultants and environmental managers (particularly the insights obtained from UNEP sponsored Promotion of Resource Efficiency for SMEs program held in October 2009 at Hanoi). In addition Energy Management Manual and Energy Auditing related approaches and such contents and case studies being added (say from UNEP sponsored project). A DVD as prepared for distribution in the WMC Final Workshops in year 2012 is presented as a sample at Annexure AT4.A.

Further newer inputs on eco-products related theme and eco-industrial parks being included for wider dissemination amongst SME units and consulting organizations and sectoral / research institutions. An outline of the contents of the Training package and a DVD with latest contents for an updated training package is being included as part of the report.

It is further indicative that additional content for future Training Package upgrades is regularly collated from the developments in the environmental management filed. These

would include content received from Centre for Environment Education on Low Carbon Lifestyles related perspectives and also the presentations and achievements being made on technological innovations / resource innovations as reflected especially in India for example during Parivartan awards 2012 and about significant resource conservation efforts being undertaken by firms across various sectors in recent years from India in particular.

2.2.5 Task No. 5 : Conduction of 2 intensive training programs for identifying and selecting WMC facilitators:

The undertaking of Task 5 activities, especially the process of capacity building activities regarding WM / CP and WMC initiatives has been through structured training programs for consultants and representatives from sectoral / research institutions, as well as through the on the project or on the job activities and hand holding processes undertaken for WMC Facilitators who may specially further venture to establish WMCs.

It is appropriate to mention that many new and young environmental engineers have been recipients of the training and skills upgradation process in particular, and gained orientation and inculcation of WM / CP / WMC ideology through above processes. This has occurred by involvement of engineers and science students from colleges (example DCE, BHU, Universities in Madhya Pradesh etc) who have been keen on learning from live projects and industry experiences as part of their curriculum, or by the process of internal training of younger engineers who joined NPC or WMC Facilitating organizations.

It is submitted that as part of the WMC Facilitator Training program in Phase III a total of 36 registered participants received training on WM / CP / WMC concepts and implementation frameworks. Accordingly in the WMC program through phases II and III a total of 204 participants obtained comprehensive training on above themes through a total of 12 training programs (of 4 -5 days duration each). From amongst the trained personnel several

enthusiastic participants went on to establish 143 WMCs as part of initiatives of their respective consulting organizations or sectoral / research institutions. It may be noted that in Phase I i.e. the pilot phase when 15 nos WMCs were established only by NPC and its regional offices, the training for external consultants on WM / WMC had not been required or undertaken, but the idea for involvement of partner organizations as WMC facilitators did take root at the time and got implemented as part of phases II and III. The training program related schedules and structures and lists of participants and their profiles etc., have been submitted in earlier reports on the project. A sample reference to the training structure and program features enclosed at annexures pertaining to Task 5..

The two training programmes as conducted during October 2007 and January 2008 had a breakup of 10 participants in 1st Training program held during 1-5 October 2007 and 26 participants in the 2nd Training program held during 21-25 January 2008. The participants included nominees and representatives from sectoral, research and academic institutions, and private consulting firms from different parts of the country (focusing on Environmental / Energy and Management consultancy domains), besides some engineers and officers drawn from NPC headquarters and regional office(s). The list of participants of the two training programs of Phase III has been submitted in earlier reports. The structure of the training program as developed for the second Training Program and the Inaugural Address by the then Director General NPC Shri Pradeep Singh are presented at Annexures AT5.B and AT5.A respectively.

It may be indicated here that amongst the participants 9 out of 36 (i.e. 25%) arrived from the eastern region of India including eastern part of UP (i.e. from states such as Assam (Guwahati and Tinsukia), West Bengal (Kolkata) and Orissa (Bhubaneswar, Sunabeda) and the cities of Lucknow and Allahabad from eastern part of UP). A sizeable number of the participants i.e 10 nos arrived from the central and western region of India from states such as Madhya Pradesh (Bhopal, Indore and Dewas), Maharashtra (Nasik, Thane, Deopur/Dhule and Raigad) and Rajasthan (Udaipur, Jaipur). Further, 5 nos participants came from South India i.e. Andhra Pradesh (Vizag, Hyderabad) and Kerala (Chengannur). And 12 participants

(33%) were from Delhi and NCR region (Ghaziabad, Faridabad), and areas close to Delhi (e.g. Mathura in UP). The two Training Programs have been conducted at Delhi in NPC's conference hall and a few photographs taken during these training programs are presented below. It is also indicated here that in keeping with requests from WMC Facilitator Training programme participants (past and present), participation certificates from NPC were awarded.

Plates 2.2 : Photographs from WMC Facilitator Training Programs (1 and 2)

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WMC Facilitator Training Program 1 (phase III) during 1-5 October 2007. The Faculty drawn from various Departments of NPC and from amongst WMC Facilitating Organisations besides from Environment Group. Participants going through lectures, theoretical and practice sessions and case studies and case exercises & role plays and quiz / selection process in final session.	

	


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WMC Facilitator Training Program 2 (phase III) during 21-25 January 2008. The Faculty drawn from various Departments of NPC and from amongst WMC Facilitating Organisations besides from Environment Group. Participants going through lectures, theoretical and practice sessions and case studies and case exercises & role plays that were followed by presentations by participants and selection process.

An insight into some of the contents of the training programs is presented at Annexure AT5.C to AT5.E where are placed a few presentations and case exercises. These include cases on sago processing industry and edible oil sector and content on energy auditing and energy conservation tips, besides case exercises and example references of factsheets and WMC progress and achievements as observed in phase II. In the training programs the WMC project video of phase II and DESIRE project audio visual also presented and deliberated upon in appropriate sessions. As regards training program evaluation a feedback format utilized for the same is placed at Annexure AT5.F.

It is further notable that willingness to engage with the project had been frequently received and indicated by firms and industry personnel. This can be reflected also from the observable response and successes being achieved in the lean manufacturing program that is being undertaken on an improved format vis a vis the WMC project and in view of the inherent and latent industry demand for seeking, expecting and participating in institutions led structured manufacturing extension services oriented projects. About the time of concluding 2nd WMC facilitator's training program, letters of interest from about 15 additional potential participants for further WMC Facilitator Training programs were received and could have been considered for the Facilitator Training Programs in case additional Training Programs were needed to be undertaken and envisaged for the project

It was observed that amongst the participants in two training programs organized as start up for Phase III, there were 9 out of 36 (i.e. 25%) participants who had arrived from the eastern region of India including eastern part of UP (i.e. from states such as Assam (Guwahati and Tinsukia), West Bengal (Kolkata) and Orissa (Bhubaneswar, Sunabeda) and the cities of Lucknow and Allahabad from eastern part of UP). A sizeable number of the participants i.e 10 nos arrived from the central and western region of India from states such as Madhya Pradesh (Bhopal, Indore and Dewas), Maharashtra (Nasik, Thane, Deopur/Dhule and Raigad) and Rajasthan (Udaipur, Jaipur). Further, 5 nos participants came from South India i.e. Andhra Pradesh (Vizag, Hyderabad) and Kerala (Chengannur). And 12 participants (33%) were from Delhi and NCR region (Ghaziabad, Faridabad), and areas close to Delhi (e.g. Mathura in UP). The two Training Programs were conducted at Delhi.

2.2.6 Task No. 6 : Selection of trained institutions / consultants as WMC Facilitators by Nodal agency / consultant (NPC) & MoEF

The process of selecting potential WMC Facilitators (**Task 6**) from amongst participants and organizations whose representatives receive training in the training programs, is essentially a process involving application of a 'criteria for selection' (amongst participants and organizations invited to the program), while taking into cognizance the deliberations, performance and interest displayed by the participants and representatives as observed and identified during the course of the training programs. The pictures below from Training program 2 reflects upon presentations made by participants to highlight nature of work undertaken by the said personnel and consulting organizations as one of the components to enable selection of consulting firms and representatives for undertaking the WMC project in partnership with NPC and to serve accordingly as WMC Facilitating organisations.

The efforts for selection of WMC Facilitators is strengthened by the assessments undertaken by the steering committee members during interactive deliberations undertaken on the concluding day when suitable structured feedback regarding the project / program and prospects for establishing WMCs by respective participants / organizations and significance

of sector / cluster and region suggested etc is obtained. A quiz on WM / CP aspects is also administered to participants of the training program to facilitate recall in respect of environmental issues deliberated during the training program and also is indicative in respect of concentration paid and seriousness displayed by participants towards absorbing concepts and issues deliberated on the subject.

Plates 2.3 : Photographs of WMC Facilitator Training Program 2 during selection process of WMC Facilitators

	
Participants and representatives from various organizations in the 2nd Training program making presentations and / or discussing areas of focus and reasons for looking forward to establishing WMCs etc, and also taking the quiz / exam and going through the selection criteria based assessment process	

It must be indicated here that it has been preferably sought to provide opportunities to most participants and respective organizations towards obtaining go ahead for establishing WMCs. However on specific occasions, especially if any participant chooses to absent himself / herself during the training program then a candidate or organization would not be considered for going ahead towards establishing WMCs. In some other circumstances and occasions if a candidate emphatically communicates many constraints and inabilities that may prevent establishment of WMC during the course of the training or as per feedback received etc, the discretion of the committee evaluating candidates for selection as WMC Facilitators is exercised. The candidates are in essence ranked on the performance in the training program and observed over the entire program towards identifying capabilities/capacities and suitability for being considered to join the project as the esteemed project partners and WMC facilitators. A sample of the evaluation / ranking sheet as per criteria structure for selecting from amongst participants the potential WMC facilitating organizations is presented at Annexure AT6.A.

2.2.7 Task No. 7 : Development of WMC progress assessment indicators, MOU and guidelines towards contracting partnerships with WMC Facilitators:

The development of WMC progress assessment indicators in respect of **Task 7** has been undertaken towards outlining and structuring or shaping formats of data collation activities as part of WMC activities in view of the deliverables organized in four stages. For example are a few Data collation formats and output and outcome based indicators (Annexure AT7.A). In respect of facilitating above efforts a reference to data formats / worksheets for WM / CP assessments as indicated in DESIRE project reports, Green Productivity Manual and Energy management manual developed by NPC EM group (in Phase II) was made besides highlighting types of metrics that have appeared or may be suitable to adopt / adapt from other technical case studies on WM / CP demonstration for consideration. The efforts to draw attention to such formats is especially undertaken or encouraged during combined Awareness Workshop / Training Workshop stages in particular, which included broad based material / water conservation and energy auditing related efforts and categorization of WM techniques during the WMC project activities.

The above however have been indicative only and respective WMC Facilitators have been provided with flexibilities to be applied in obtaining and collating information from WMC Units who may voluntarily share and disclose broader range of information on industry process which may enable further progress vis a vis the sector in which WMC established and as per case specific availability of data or monitoring efforts for generating useful data that would enable the Waste Minimisation / Cleaner Production efforts in the WMC across the member units. Accordingly WMC Facilitators have made efforts to develop comparative charts or tables regarding basic operational features amongst WMC Units, which have included firm ownership features, annual turnovers, manpower availability, consumption of key raw materials and utilities (including water and energy), in addition to examples of nature of energy sources and quantum of consumption as per unit operations addressed

etc. A few examples of Data collation formats developed by WMC Facilitators are being enclosed for reference in the report (Annexure AT7.B).

In addition to above some of the WMC Facilitators developed suitable data collation structures where undertaking of monitoring and analysis of wastes (example waste waters, air pollution characteristics, solid waste or product defects were to be assessed) or towards analyzing equipment and / or their components that may have defects to be corrected for improving industrial operations as per the case specificities.. The WMC facilitators who tended to focus on a wider range of industrial engineering and operations management aspects also addressed material handling issues, equipment / shop floor layout features and other areas, and accordingly developed applicable formats for respective cases and focus areas as per WM / CP approaches undertaken.

In addition to the data collation formats the anticipated key Outcome and Output Indicators from the WMCs as communicated (which had been especially undertaken in consultation with MoEF during Phase II of the project) were sought to be presented in the form of factsheets where feasible (as per phase II achievement factsheets for WMCs to reflect on the results obtained per WMC). It may be noted however, that the WMC Facilitators have been submitting documents and progress reports with data components structured as per situational need and circumstances of the cases which have tended to vary in some of the instances vis a vis NPC provided outlines towards collating outputs and outcomes. Though the data structuring towards cost / benefit analysis by the member units or WMC facilitators vis a vis WM options generated and those implemented have been case specific, the WMC Facilitators have tended to focus on and arrive at simple payback periods (instead of calculating rates of return such as IRRs etc) on the basis of proposed WM options and actual implementations of solutions and these have been reflected on time frames especially in months or years against the options generated / explored and implemented. A few WMC facilitators chose to identify specific options generation and implementation efforts as sub-projects within the WMC context and where such demonstrations of mechanisms of testing equipment or towards auditing undertaken. These were sought to be undertaken as

distributed amongst units such that suitable replication of efforts could be undertaken by other members.

The format for the Memorandum of Understanding between NPC and WMC Facilitators has been essentially structured as developed upon that outlined in Phase II of the project. The MoU has been developed towards providing encouragement especially to emerging consultancy organizations, as well as for established firms, with a purpose towards enabling and inviting earnestness and positive orientation amongst WMC facilitators towards focusing on the project tasks while avoiding detailed legalistic structuring. This has resulted in shaping a simpler contract and partnership based obligation. The MoU is accompanied by guidelines on the documentation process that ideally be addressed for various stages and in respect of nature of acceptable documents / bills that would be needed to be submitted for obtaining necessary approvals for reimbursements for professional fees and variable expenditures across subheads at each stage and milestone of activities undertaken.

It may be added that the format for processing of bills at NPC's end also needed structuring on note-sheets and this evolved and were modified as per changes in terms of budgetary revision that occurred in terms of variable cost for organizing workshop / contingency etc that initial 14 WMCs received, and also for reworking of such formats for WMCs that were being established after receipt of revised sanction order in March 2009. These also reflected changes in service tax charges that have occurred as per GOI notifications.

2.2.8 Task No. 8 : Development of payment schedule to WMC Facilitators and sectoral institutions involved

The process of development of WMC payment schedule i.e. **Task 8** was undertaken in cognizance of stage wise progress sought for the WMCs and corresponding to the progress assessment indicators laid out as indicated in Task 7 above. This combinatorial structure

including distribution of time allocations per stage and of budget provisions, especially in respect of professional fees is being included in this report (Annexure AT8.A). The nodal agency as part of the bills processing framework urged and indicated to WMC Facilitators that variable expenses may be suitably distributed over the four stage schedules. This perspective was adopted in bills processing stages and payments made on pro-rata basis vis a vis nature of tasks and deliverables per stage. However there was element of varied distribution of intensity of efforts made by WMC Facilitators across stages and reimbursements made in cognizance of the same as well.

It is submitted that the framework of the project activities was deliberated in detail in the Training Program by NPC consultants as part of final day sessions pertaining to WMC Facilitator Action Plan. The various aspects of the progress assessment indicators and deliverables were further sought to be outlined during Training Workshops in particular at the time of launch of WMCs in respective clusters/regions. This was undertaken such that the participating WMC member units were adequately apprised of the expectations that MoEF and NPC had of the member units' cooperation in the project activities, along with WMC Facilitators' efforts anticipated on the project across the time frames vis a vis four stages delineated.

It can be suggested that apparently the efforts to focus on enhancing transparency amongst stakeholders regarding the project features and especially regarding the structuring of activities and deliverables at the early stages of the WMC initiations has tended to help member units in respective WMCs to understand and appreciate nature of commitments involved from the Facilitators and amongst member units (while no direct cost implications made of the units in addition to ensuring clarity that no grants existed or were being committed to towards the WMC member units). This apparently helped as indicated by some of the Facilitators and WMC member units in enabling seriousness amongst units in involving suitable operations staff, and shaping such team formations in respective units who could undertake WM / CP activities and cooperate with WMC facilitators in the process

in addition to the entrepreneurs engaging in WMC deliberations as per stages and agendas that evolved.

It is submitted here that the prospects for shaping a variant of the payment schedule to enable economies from numbers (such that overheads could be distributed amongst the WMCs) vis a vis tasks for the WMCs in respect of institutions was found constrained in Phase III. It is further submitted that the possibility of granting advance for establishing WMCs was also found to be limited in this phase. This is because the optimal numbers for establishing or contracting WMCs (say considered as 5 nos for an institution as a suitable quantum to work on as felt appropriate in Phase II), did not appear feasible now considering a total cap of 20 to later 25 nos WMCs that the Phase III of the project entailed.

Considering also that the project sought to involve expanding capacity building efforts that would occur during implementation of WMC activities and during operations as well (on the job action), it was felt appropriate to especially focus on involving more WMC Facilitators who may seek to be engaged with the project. Also for reference we had the Phase II scenario having set a precedent of a broader geographic spread considering distribution of industrial clusters amongst states for similar / common and / or varied sectors of industry. Accordingly it was felt indicative that to reach key identified sectors as priority sectors, the potential for granting maxiumum upto two WMCs at a given point of time was more appropriate. The response by ASCI for taking up the WMC assignment for two WMCs initially was encouraging, so also interest received from CGCRI Khurja. However, the nature of payment schedule did appear as deterrent for institutions later (as especially indicated by ASCI) in view of the restrictions to the allowed initial outline of two WMCs to be established to begin with, However, ASCI attempted to establish two WMCs though but the budgetary limits being one factor and industry response aspects another were found constraining in the case of ASCI, and these impacted the venture on WMCs launched by ASCI.

The additional issues such as variations amongst project structure developed within NPC proposal to MoEF and as part of sanction order to identify service charges provisions with professional fees only (and not including variable expenditures in the ambit) was also found to be constraining. This matter was deliberated upon with CGCRI as the said institution practiced service charges payable on entire budgetary amount that was allocated for a WMC (i.e. on both professional fees and variable expenses). Since provisions for the above in the budget structure per WMC were not contained (as this was restricted in relation to professional fees per stage only), the matter tended to hold the initiation of WMCs by CGCRI in Phase III. The commitments of personnel and scientists at CGCRI meanwhile on other pressing projects further held the matter for additional time. However, interest of CGCRI did remain and communications were also received telephonically at a later stage when commitments for upto 22 WMCs to other Facilitators had been already made in view of EOIs and earnest interests that arrived and in view of successes being achieved on WMCs being facilitated on the ground. It is submitted that once the project was advised to expand by additional 5 nos WMCs within given budget itself, the nodal agency accorded priority to seek involvement of CGCRI as an institution for taking up 2 nos WMCs related establishment such that the project could benefit from institutional engagement where potential transfer of technology to firms in ceramic clusters could be undertaken.

2.2.9 to 2.2.11 Tasks No. 9 to 11 :

Task 9 - Providing / arranging technical assistance to WMC Facilitators ;

Task 10 – Reviewing the WMC progress and facilitator bills processing Activities ;

Task 11 – Assistance in information dissemination through Final workshops for individual WMCs etc.

In respect of provisioning assistance to the partner WMC Facilitators as per initiation of activities under **Task 9, 10 and 11** we have been undertaking various sub-tasks. These include for example :-

Addressing information flow on sectoral and industrial developments by searching for and identification of sector based information and possibly technology trends and perspectives, as obtainable from case studies that are developed by NPC or explored / obtained from institutions and the internet for dissemination efforts amongst WMC Facilitators and member units. Identifying useful information and collating the same for deliberations during WMC workshops and review visits and for dissemination amongst WMC Facilitators and units in respect of environmental management themes and evolving approaches from within India and as arising in international domain (on a broader framework as well as linked with industrial development aspects including pertaining to green infrastructure issues and regional development aspects). Information arising and insights obtainable from various fora (example seminars, conferences, workshops etc) and different formats (example presentations and research based inputs pertaining to environmental issues and industry initiatives, audio-visuals on case studies example DESIRE project, Green Productivity Demonstrations, WMC project Phase II video and others including photographs and video clippings, various reports and information obtainable from websites of national / international institutions, regarding features pertaining to new projects / programs being undertaken by institutions including NPC such as lean manufacturing, Cluster based energy audits by BEE, UNIDO / UNEP newsletters / reports on SCP etc, technical / academic and other literature on various environmental themes (pollution prevention and control aspects including air pollution control devices, water / waste water treatment aspects etc). Additional information in respect of evolving trends in regional and industrial competitiveness issues, industrial ecology, aspects pertaining to eco-labeling issues and eco-friendly products, eco- materials, and eco-components and regarding green supply chains. Perspectives regarding international trade and phyto-sanitary barriers and such themes which may interest WMC Facilitators and member units. In addition WMC member units in particular have been provided insights from UNIDO/UNEP toolkits such as Promoting Resource Efficiency in SMEs, Cleaner Production toolkit, Safer Production toolkit insights

etc. Further, are perspectives shared on public and private goods and sustainable development frameworks including international environmental governance themes. A few samples of presentations by NPC personnel made are being submitted in the report (Annexure AT9.A (i.e. Content from above mentioned toolkits)).

The nodal agency (NPC Environment Group with NCPC India joining the effort since April 2009) also offered assistance by requesting for the testing of material, equipment components, or insights on improved equipment for addressing waste management aspects etc that could be undertaken for some of the needed cases (such as broken flanges in steel rolling, environmental and energy management related parameter analysis related insights, issues concerning metal recovery from waste slag etc) with support of other WMC member units across industrial sectors or from research institutions as well. A letter in this regard as forwarded to CGCRI Naroda is referred to. In this respect facilitating interactions amongst WMC Facilitators for inter-circle cooperation further made on various occasions. Also exploring of the scope for industrial visits amongst units across industrial sectors and urging and encouraging the same for WM / CP related techniques as being applied in different sectors to enable exploring technology migration potential were undertaken.

There were efforts made towards seeking inputs from WMC member units for exploring and deliberating technological solutions that may be possibly enabled at cluster level, or amongst groups of units etc. The process involved exploring expressed need and demand for potential technological solutions and infrastructure related interventions (including identifying and deliberating aspects of advanced technologies and equipment installations at cluster level and suitable mechanisms that may appeal discussants from the firms. The idea of eco-products testing laboratories and significance / priority for the firms in this regard, exploring usefulness of possible arrangements towards technology maintenance hubs, identifying manpower related issues and needs that may be arising in the industrial units etc and seeking insights for potential solutions undertaken or desired). A questionnaire in this respect (as part of developing an eco-products directory for India) as sent to WMC member units and WMC Facilitators is enclosed for reference (Annexure AT9.B).

The process of provisioning support to partner WMC facilitating organizations also included editing of articles received from WMC Facilitators and Industrial units for publication in WMC newsletters for wider dissemination amongst industrial units, central / state government departments, financial and other development institutions, academic institutions and sectoral research organizations. The efforts made in respect of WMC Newsletters is reflected in the submission of phase III related newsletter publications as presented as Supplement I.

Further support has included information dissemination in respect of environmental action related awards from institutions and in respect of corporate social responsibility perspectives. In this respect efforts made to highlight Parivartan awards 2012 program of M/s cKinetics and India Carbon Outlook can be cited besides also the Maharashtra Pollution Control Board awards which was being managed by M/s Environment Management Centre, Mumbai that focused on informing WMC member units of Phase II and Phase III from Maharashtra in particular. The nodal agency has also made efforts towards enabling encouragement and inspiration for the firms (WMC members) and WMC Facilitators by inviting senior officials from Ministry of Environment and Forests, senior consultants from NPC regional offices, from MSME departments at districts and regional levels, from UNIDO etc towards participation in WMC project related workshops and meetings. A few sample pictures pertaining to WMC awareness workshops, review visits by senior officials from Ministry of Environment and Forests and from UNIDO, Field perspectives and observations in WMC member units and of Final workshops are presented here.

Plates 2.4 Sample photographs from WMC (Phase III) workshops and some field visits to manufacturing WMC member units

Awareness Workshop in Paint Sector (Hyderabad)	
	
Awareness Workshop for Cotton seed Oil Sector at Dhule (Maharashtra)	
	
Industry Training Programme at Dhule (Maharashtra)	**Awareness workshop - Hotel sector (Mumbai)**

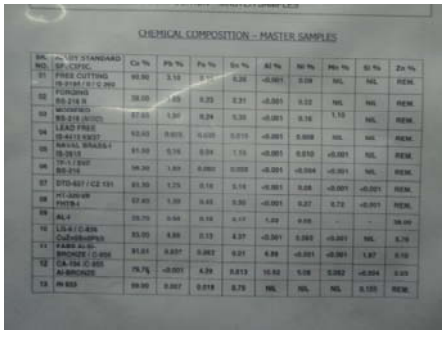
Awareness workshop – e-Waste sector (Bangalore)

Awareness program and Training deliberations – Steel rolling (Indore)

Review Visit – Foundry (Indore / Pithampur- MP)	Field visit in Engineering Sector unit at Dewas

	
Review visit – Brass foundry (Jamnagar) Gujarat	**Runners and risers removal – Foundry unit (Pithampur)**
	
WMC meeting in progress (Chemical sector – Dewas / Pithampur) MP	
	

Review of Dewas WMCs	**Review visit – Tile manufacturing sector (Trichur / Palakkad) Kerala**
	

Brass Foundry – improved management and recycling system (Jamnagar)	**Quality parameters for steel foundry materials (Steel Foundry, Pithampur)**
	

Raw material for secondary steel re-rolling – Secondary Steel Rolling unit (Tiruchur - Kerala)	**Raw material for rolling –Steel Rolling unit (Indore)**
	
Hot ingots for rolling – Steel Rolling unit (Indore)	**Production process in Electroplating unit at Dewas, Madhya Pradesh**
	

Tile manufacturing unit at Trichur, kerala	Melt pouring at Brass foundry, Jamnagar
	

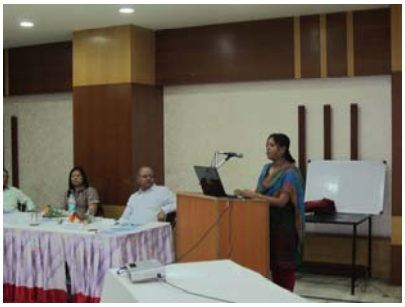
Wastage of oil (Engineering unit, Dewas)	Awareness Creation poster (Engineering unit, Dewas)
	

NRV foot valve installation (Rolling Sector-Indore)	**Installation of conveyor system for material handling (Rolling Sector – Indore)**
	
Installation of Timer (ElectroPlating unit, Dewas)	**Handling of Finished Product (Brass foundry Unit, Jamnagar)**
	
Change in pump (Chemical unit, Dye Intermediate mfg, Pithampur)	**Metal recovery (Brass Foundry, Jamnagar)**
	

Flange breakages (Steel rolling, Indore)	**Storage, testing and reworking and recycling of defective parts (shock absorber components) Engg. Units, Dewas**
	

Plates 2.5: Photographs from WMC Final Workshops

WMC unit members sharing their experience during the Final workshop in Foundry sector (Indore)	
	

Final Workshop – Chemical sector (Dewas/Pithampur)	
	
Final workshop (chemical ector) Dewas / pithampur	**Final workshop – WMCs in Ceramic sector (Khurja – UP)**
	
	

Final workshop – WMCs in Ceramic sector (Khurja – UP)	
	

The nodal agency has been further seeking participation from technical and development institutions and sectoral research organizations besides academic institutions in Awareness / Final workshops etc., and during review of WMC activities for sharing insights with units towards undertaking WM / CP efforts. A few Awareness / Review and Final Workshop related Schedules as per advise of NPC consultants and / or structured by WMC Facilitators are being enclosed for reference in the report (Annexure AT9.C). It may be noted that as part of the initiatives Press release and press interactions have also been undertaken for obtaining greater publicity regarding the program. A few press releases / translations as well from published releases in local press etc being enclosed for reference (Annexure AT9.D). A sample of WMC participation certificates for WMC member units and for WMC Facilitators towards appreciating the efforts undertaken in the program also being enclosed as annexure in the report (Annexure AT9.E).

Towards WMC Facilitator bills processing activities etc., suitable formats in Excel have been developed at the Environment Group end such that a quick status is available for reference regarding bills processed besides those in Notesheet format. Further, communications

towards release of cheques, despatches of TDS certificates etc to WMC Facilitators undertaken by the WMC project team members periodically after bills have been assessed and processed by Finance Division.

2.2.12 Task 12 : Bring out quarterly WMC Newsletters

The publication of the WMC newsletters (**Task 12**) has enabled wider dissemination of project related information and technical case studies to the project participants and various institutions. This has also helped build a brand image for the WMC program and is seen as a useful contribution to positive environmental journalism pertaining to industrial and institutional initiatives towards facilitating environmental consciousness and actions amongst SMEs.

A total of 32 issues of WMC newsletter have been so far printed / published in the project during Phases I to III (where 11 nos in Phase III). As part of this series the Newsletters published in Phase III as of date are (Vol 4 No.4 April 2009 to Vol 6 No. 3 July 2012) and the entire set published so far are included as supplement I. It may be noted that the content and coverage of issues has been evolving over time in these newsletters, besides enhancing of quality of case studies being published. The coverage of issues is expanding into wider themes of industrial ecology, regional development, strategic management and innovation arenas as well including themes of eco-products and green supply chains as emerging actions in environmental domain. A view of the Ministry and Steering / Review Committee members was sought if it may be felt useful to also include brief interviews with luminaries in environmental management activities and of industrialists and entrepreneurs from Small / Medium / large units etc on environmental and social responsibility domains, as well as from research institutions and key governmental departments to be included amongst publishable content for such newsletters to add to the variety of the perspectives and trends evolving on SCP domains. This had essentially received a positive response. However, with priority having been given to case studies, such content could be taken up in future

expansion works. It is submitted that a few case studies from the WMCs in phase III have not been published as yet and hopefully by the closure of the project additional 3 nos WMC newsletters could be published to complete the Volume 6 series and do justice to the case studies pending printing. It may be indicated here that 2000 copies of the WMC newsletter issues are being printed and over 1500 are usually dispatched / distributed by post or released in workshops to a wide range of firms, institutions and departments. Interested readers seeking subscription to the newsletter being distributed free of cost are provided with printed or soft copies (pdf formats) as part of the awareness building and results dissemination mechanism for the project. A fair number of newsletter dispatches being undertaken electronically vide the email route by sending these as pdf documents, and also by making these downloadable from the WMC project website for which newer content had been emerging. It is submitted however that due to focus on dispatches and emails based communications and non introduction of multiple way forum oriented connectivity provisions on wmc website, much of the new content from WMC project was essentially conveyed by emails.

An indicative list of recipient organizations / categories of institutions to whom WMC newsletters are dispatched as printed versions is enumerated in the report (AT12.A). It would also be appropriate to mention here that a number of appreciation letters were received in the past and also being received from readers of the Newsletter (and a collection of appreciation/feedback aspects has been reflected in a few issues earlier as a Encouragements Column. Recent responses from readers in respect of WMC newsletters, the content, presentations, relevance etc are also indicatively reflected within Newsletters submitted as supplement I.

2.2.13 Task No. 13 : Organisation of National and Regional Workshops

The WMC project Phase III has led to the organization of 4 nos Regional workshops. These have provided avenues towards obtaining feedback from the firms (both WMC member

units and other firms as yet not participated in WMC program) and from WMC Facilitators who established WMCs and from those participants / representatives who were trained in WMC Facilitator training programs and may be looking forward to potentially establishing WMCs in the near future, including those who have participated in the program since Phase I. Towards the organization of the Regional Workshops the Environment Group sought engagement of some of its regional offices such as Gandhinagar, Chennai, Hyderabad and Bangalore, where Environment Group consultants have been located. A sample set of IOMs enclosed for reference (AT13.A).

It has been indicative that the possibility of organizing regional workshops also existed with engagement of interested WMC Facilitator organizations as well. Infact such an interest had been received earlier in year 2009 when firms and units in foundry and steel rolling sectors had evinced keenness on exploring and deliberating on developments pertaining to technologies that relate to their sectors and of common themes as well including insulation aspects for furnaces and other energy efficiency and renewable energy applications. Interest was also indicated by WMC facilitators to obtain opportunities for greater interaction amongst each other across regions. A view remained to be taken whether within available budgets NPC could have invited interested WMC facilitating organizations to undertake the process of organizing a Regional workshop and such possibilities being left to be explored in a future project phase.

It is reflected here that a national workshop could possibly be organized before final closure of phase III. This may be undertaken in a format alongside or contiguous to any similar initiatives arising from other institutions / organizations in case feasible as an option possibly. Accordingly, the national workshop could potentially contain inter-related themes pertaining to WM/CP, to enable broader range of participation and also cover widening range of emerging action domains (including for example interest being generated amongst firms regarding green purchasing aspects and in respect of carbon / water footprint related concerns and other manufacturing and operational safety related themes). The scope for addressing green supply chains and eco-innovations related perspectives exists besides also

with respect to identifying financial synergies of WMC type projects with other institutions. It is indicated here that as part of the regional workshops organized, broader explorations were parallelly being also undertaken regarding whether participating firms / delegates were manufacturing eco-products and about possibilities of the units' participation in Indian Eco-Products Directory project. A set of schedules of Regional workshops is presented for reference at Annexure AT13.B.

2.2.14 Task No. 14 : Develop Awareness material on Waste Minimisation and facilitator networking

As regards the components of **Task 14** efforts have been made in various ways to develop awareness materials on Waste Minimisation and Facilitator networking activities. A key step in this direction has been as stated earlier the publication of the WMC newsletter. Further to the above publication, there has been ongoing action and work undertaken towards developing reading materials and collation of audio-visuals for sharing insights on industrial environmental management and sustainable development themes. These have also included material highlighting national and international WM/CP related experiences, insights and perspectives that were added to the literature and reference material over the third phase of the project as well. These have included research articles and UNIDO/UNEP and APO programs and toolkits related content etc. It must be emphasized that content enhancement on thematic areas concerning related subjects has been an ongoing and continuous process.

It is indicative that in phase II the WM training package related material and WM methodology aspects had been published in local languages as well, for example in Tamil / Malayalam etc., by dynamic WMC Facilitators (example Madurai Productivity Council). Similar efforts towards translating contents say of WMC newsletters or WM related presentations into Hindi have been made by WMC facilitators at Indore and Dewas (M/s

EHS Consultants and M/s Essen Energy Technologies Pvt. Ltd.). A reference to such an effort is being made in the report (Annexure AT14.A). It is also to be noted that some of the industrial units and firms have also displayed content derived from the Training Package in the shop floors as posters. As part of efforts to build awareness with published materials the posters developed at NPC by various departments including as part of WMC project have been put up and displayed at Awareness / Final Workshops.

The efforts to obtain attention of the academic community have also been a part of the project's awareness building activity. In this regard presentations pertaining to WMC project have been made in various universities and colleges by NPC consultants such as in Indian Institute of Management Bangalore, Colleges in Punjab and Palakkad, deliberations at IIM Calcutta etc. These institutions have found the project of immense significance. Various students undertaking research work including those in management studies related projects have evinced interest in the project and sought to understand the project origins and evolution and results which included undertaking interviews with project team members and referring to WMC newsletters etc.

Further, non governmental organizations such as Centre for Science and Environment, The Energy Research Institute and others found the WMC project as a useful initiative for Indian industry. Moreover, newer programs have emerged that obtained insights from the WMC project such as Lean Manufacturing project being sponsored by Ministry of Micro Small and Medium Enterprises. It may be also noted that The WMC project case study presented at IIM Bangalore also received attention from the Indian arm of 'Knowledge at Wharton' related coverage of business related initiatives.

The prospects of developing an audio-visual film may however need to be considered in case the project is considered for further expansion as the potential does exist for the same. It may be mentioned that digital camera based amateur video clippings of production processes could be taken during field visits but a professional audio-visual filming and script

development activity as undertaken in phase II was not initiated in phase III in view of a smaller number of WMCs established for several of which case studies with graphical / pictorial content being published in the WMC newsletters itself.

The efforts towards updation and maintenance of WMC project website (a key sub-task under **Task 14**), have been also undertaken. There could be more done in this regard however in case a fourth phase of the project is considered. It is indicative that National Informatics Centre (NIC) has kindly continued to host and supported the maintenance of the website from phase II to phase III as well. The structure of the homepage of this website is being presented in the report (Annexure AT14.B). It may be submitted that during Phase II year 2003-2005 a separate dial up connection and phone line was made available towards uploading content on the website, which however was later disconnected once WMC project phase II had concluded in year 2005. However, in phase III as per discussions with NIC personnel, it was indicated that it was feasible to undertake uploading of content on the WMC website without having to obtain such dedicated telephone lines, by the usage Virtual Private Networks (vpn) for the same. The uploading of content on the website accordingly could be undertaken from say NPC Lan based internet connectivity as well. NIC provided the team with necessary application format for applying to NIC for provision of VPN service and also sought MoEF recommendation in this regard. In this respect necessary assistance from IT deptt. of NPC was also sought. The team however focused on maintaining the website as supported by NIC and towards which as per NIC advise necessary web security related concerns were addressed. A view can be taken towards possibly developing the website into an interactive website in future which may however depend on the nature and quantum of newer content that could be uploaded. Periodic inputs of content appear to be only feasible under the WMC project if considered towards an extension into phase IV.

2.2.15 Task No.15 : Energizing Synergies with financial Institutions, and other agencies for promoting investment in waste minimization implementation and technology up-gradation:

The initiatives towards energizing synergies with financial institutions and other agencies for promoting waste minimization and technology upgradation had been an ongoing exercise. The efforts were undertaken at various levels such as by NPC and WMC Facilitators as well as by MoEF and in different ways. At NPC one of the subtle mechanisms being adopted is the distribution of WMC newsletters for kind information and reference of Financial and Development institutions including multilateral agencies. These include for example SIDBI, UNIDO, UNDP, UNEP, USAID, World Bank, APO, gtz/GIZ etc. The appreciation letters from several institutions regarding the project as responses to these publications have been further received. The explorations on financial synergies could be undertaken during interactions with representatives of these institutions in various fora such as in Seminars / conferences and workshops / meetings when such opportunities helped outline the project features for generating interest.

In respect of exploring linkages with Financial and development institutions at the WMC Facilitator's end, efforts have been essentially made to invite senior officials from banks and other financial institutions to Awareness Workshops and Final Workshops for the WMCs being facilitated. On such occasions representatives of financial institutions, including representatives from MSME regional offices have highlighted the nature of financial products and projects towards technology upgradation being enabled by such institutions, including schemes for supporting environment related initiatives during deliberations in such workshops. The insights and guidance from MoEF in this regard have been very helpful for us to explore the financial assistance aspects that may be available for SMEs for example the inter-institutional interactions that could be undertaken as an instance between MoEF officials, NPC participants and MSME officials in respect of schemes that may be available for example towards subsidies for pollution control equipment related installations by SMEs etc.

The exploring of possibilities of supporting seminars and conferences on the WM / CP themes by WMC Facilitators have also been occurring on the initiatives by the Facilitators such as in Gujarat, Indore, Hyderabad, Palakkad etc., and some seminars have been undertaken and as organized by WMC Facilitators as key agencies involved in organizing process. Explorations have also been made during WMC review visits and meetings with MSME officials in Districts and local offices on the nature of programs being supported for SMEs which may be useful for WMC members as well.

There is however much scope in systematically exploring newer projects that may be supported by development and financial institutions that would take forward WM / CP initiatives and program structures on the theme. It may however be interesting to note that amongst SME units (and especially family businesses) the tendency has been generally to employ own and internal resources and funds for process improvement related investments, though for major technology collaborations and technology upgradation efforts the firms do explore financial resources that may be available as grants and/or subsidies or as soft loans etc and indications have been received that rates of interest say for commercial borrowings by SMEs may be preferably provided in the 6 - 8 % rates from an annual cost of capital aspects. However, the lending rates being of a larger variety being offered by financial institutions and banks, the negotiations and market rate features and discounts among industrial units and representatives of such institutions have been a feature to be explored in detail by NPC or WMC facilitators as yet and which could be addressed in a national workshop that could be organized ahead where future program / project frameworks could also be deliberated for further initiatives on resource conservation facilitation in Indian industry.

3.0 Application of Techniques

The primary focus of the WM concept has been to treat and view wastes as resources that happen to have been found located in a wrong place etc., and that these have intrinsic economic value which can be identified for recovery and further action. At NPC a definition emerged for Waste Minimisation which is indicative of the need for innovative thinking to address the waste generation problem. Accordingly, Waste Minimisation has been sought to be defined as " A new and creative way of thinking about products and processes that make them, and that Waste Minimisation could be achieved by the continuous application of strategies to minimize generation of wastes and emissions".

The significance for undertaking Waste Minimisation initiatives has been couched in the language of being a business imperative whereby profits were waiting to be obtained in various ways and especially by obtaining productivity gains vide resource conservation efforts indicative of :-

- Cost Reduction (during manufacturing process and for end – of - pipe treatment, environmental clean-up and general health care aspects etc.)
- Chemical And Auxiliaries Conservation
- Water Conservation
- Market Requirement (ISO 14000 etc)
- Better Working Conditions and shop floor environment and ergonomics
- Improved product quality
- Improved Image
- New Market Opportunities etc.

It has also been emphasized that Waste Minimisation practices led to lowered risks for Workers / operational staff, the community, consumers of products, and future generations. In addition has been a continuing emphasis on pre-requisites that are essential for WM to be attempted and to succeed which includes (1) Willingness from various levels of management and especially top management (2) Commitment to the process and project (3) An open mind to ideas and experimentation etc (4) The development and facilitation of Team work and (5) application of a structured methodology.

The WM concept also included deliberations pertaining to application of WM Techniques and addressing and overcoming a wide range of barriers and highlighting the enablers for the same. A brief insight on these is presented below from the project files and presentations.

WM Techniques

- Source Reduction[Good Housekeeping] and [Process Change (Input Material Change; Better Process Control; Equipment Modifications; Technology Change)]
- Recycling [On site recovery and reuse] and [off site recovery and recycling]
- Product Re-formulation [by-products developments] and / or [New product design] etc.

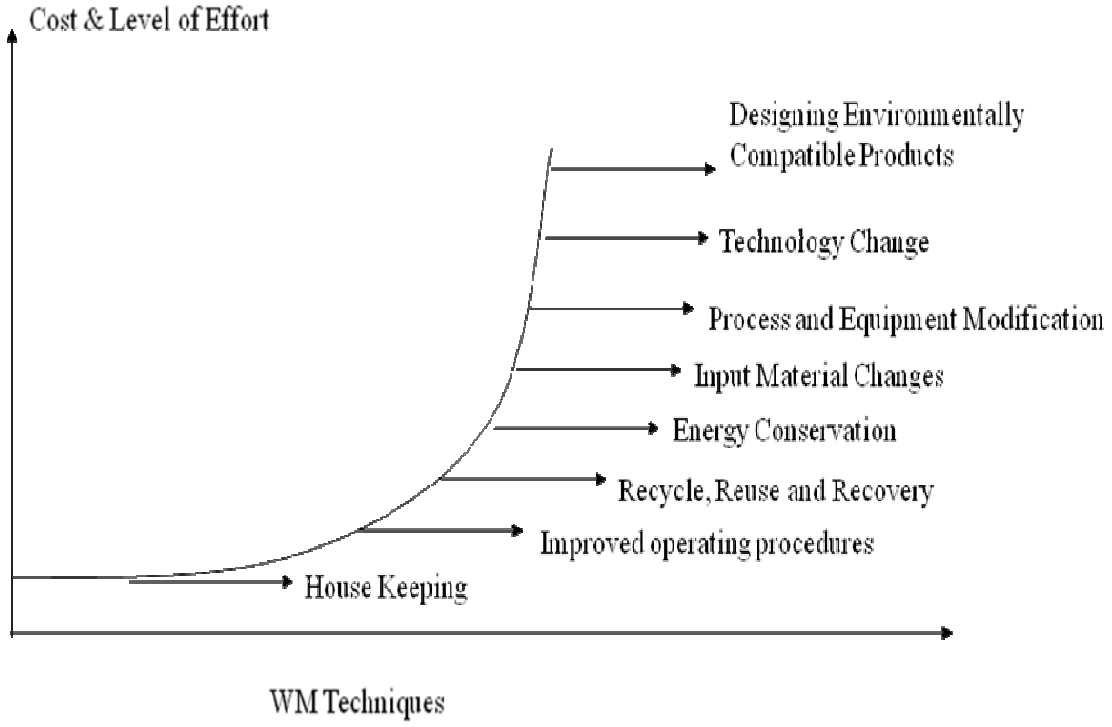


Figure 3.1 : Cost and Level of Effort vis a vis WM Technique applied (a generic perspective)

Towards implementing the various WM techniques a structured methodology was applied and adopted as reflected here. This contained six steps and 18 tasks (Fig. 3.2)

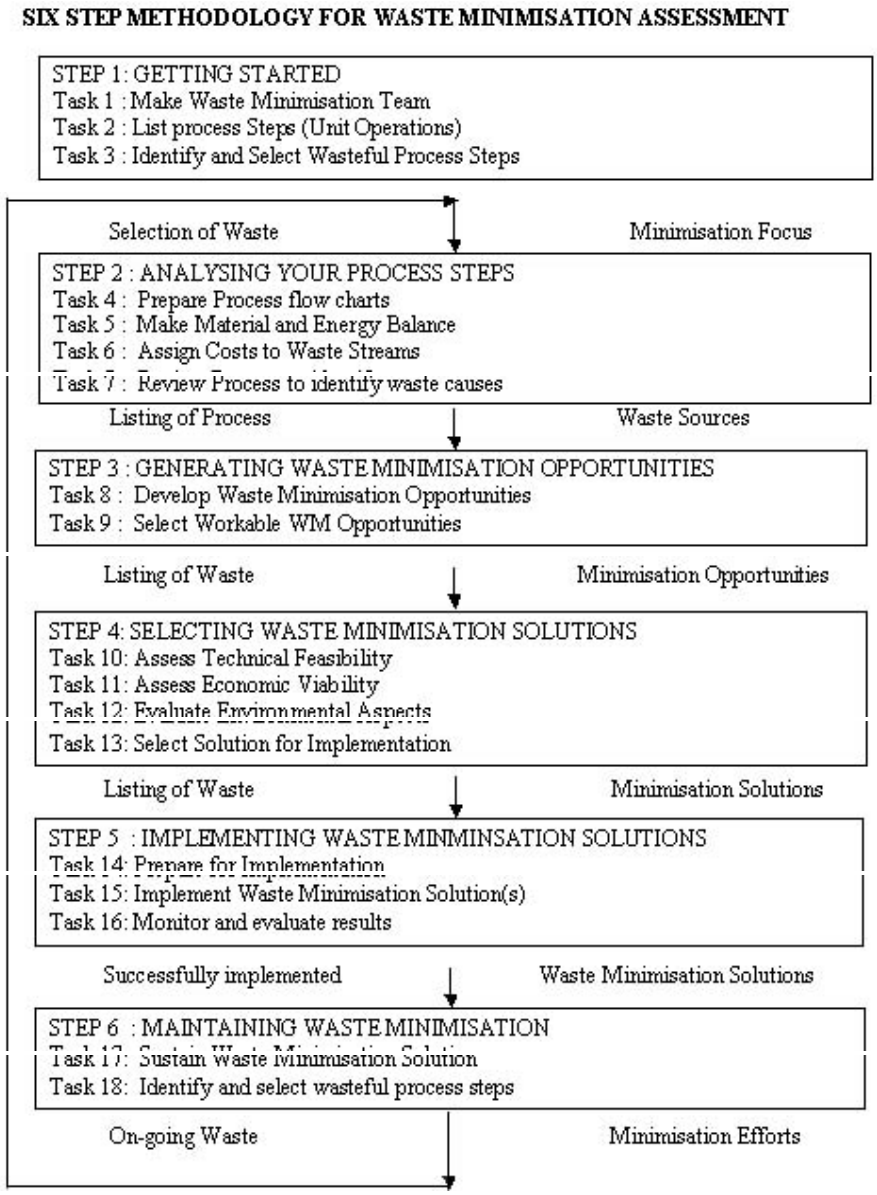


Figure 3.2 : The delineation of the Six Step WM Methodology

Further, WM initiatives led to discovering hurdles such as various Myths, Mental Blocks and Idea killers that had to be addressed and tackled and as these emerged in almost all sectors where WM demonstrations were attempted or WMC project was propagated. A wide variety of barriers, catalysts and enabling measures were also identified. A brief outline of these is presented in Tables 3.1 and 3.2 below. It is also indicative that such barriers/enablers/myths/idea killers affect and get reflected in public – private partnerships development and operation scenarios.

Table 3.1 : Waste Minimisation Concept Application related hurdles such as Myths / Mental Blocks and Idea Killers

(Source : http://wmc.nic.in and WMC Facilitator Training Manual)

WM Myths	WM Mental Blocks	WM Idea Killers
▪ Good Only For Large Companies / MNCs ▪ Requires Large Funds ▪ Requires Modern Technology ▪ Requires Qualified Professionals ▪ Automation Must ▪ One Time Activity ▪ Limited Potential	▪ Fear Of Making Mistakes ▪ Fear Of Being Seen As A simpleton ▪ Fear Of Being Criticised ▪ Fear Of Disturbing Tradition ▪ Fear Of Being Alone ▪ Fear Of Data Being Misused ▪ Fear Of Losing The Security Of Habit ▪ Fear Of Losing The Group's Respect ▪ Fear Of Change / Resistance To Change ▪ Fear Of Being A Guinea Pig / Experimented with	▪ Let's Think About It Later ▪ We Have Already Tried It ▪ It Is Not The Right Time ▪ You Don't Understand The Problem ▪ Talk To John, This Is Not My Field ▪ It Sounds Nice In Theory, But It Will Not Work In Practice ▪ We Are Too Small / Big For It ▪ Has It Been Tried Elsewhere

		▪ It Doesn't Fit In Our Planning

Table 3.2 : Waste Minimisation Application related Barriers / Catalysts and Enabling Measures

(Source : http://wmc.nic.in and WMC Facilitator Training Manual)

Constraints / Barriers	Catalysts	Enabling Measures
1. Attitudinal		
▪ Lack Of Good Housekeeping Culture ▪ Resistance To Change ▪ Lack Of Leadership ▪ Lack Of Effective Supervision ▪ Job Insecurity ▪ Fear Of Failure	▪ First Time Team Members ▪ Early Success	▪ Involvement Of Employees ▪ Manage The Changes ▪ Provide Effective Supervision ▪ Training Of Owners for Effective Leadership
2. Systemic		
▪ Lack Of Professional Management Skills ▪ Poor Production Records ▪ Inadequate & Ineffective Management Systems	▪ Proper Documentation And Planned Layout ▪ Proper House Keeping And Maintenance Provisions	▪ Training Of Plant Level Waste Minimisation Team ▪ Development Of Simple Management Indicators ▪ Top Down Housekeeping

		Drive ▪ Dissemination Of Success Stories
3. **Organisational**		
▪ Non-Involvement Of Employees ▪ Decision Making Powers ▪ Emphasis On Production Maximisation ▪ High Turnover Of Technical Staff ▪ Lack Of Recognition	▪ Family Supervision ▪ Direct Involvement Of Owners ▪ Information Sharing	▪ Involving Employees In Waste Minimisation Program ▪ Delegate Decision Making Powers ▪ Reward The Achievers ▪ Increase Emphasis On Non-Production Issues
4. Technical		
▪ Lack Of Infrastructural Facilities ▪ Limited Or Non-Availability Of Trained Manpower ▪ Limited Access To Technical Information ▪ Technology Limitations ▪ Technology Gap ▪ Limited In-House Maintenance Facilities	▪ In-House Maintenance Workshops ▪ Planned Layout ▪ Trained And Qualified Personnel	▪ Develop Infrastructure Facilities ▪ Information Dissemination
5. **Economic**		
▪ Resource Pricing And Availability ▪ Availability And Cost Of Funds ▪ Exclusion Analysis Of Wm Measures ▪ Inadequate Investment	▪ Economically Attractive Waste Minimisation Measures ▪ Financially Sound Units	▪ Include Environmental Costs In Economic Analysis ▪ Plan The Investment

Planning ▪ Prevalence Of Production Related Fiscal Incentives		
6. **Governmental**		
▪ Pricing Policy Of Water and other resources etc. ▪ Emphasis On EOP Approach ▪ Lack Of Enforcement Of Environmental Regulations ▪ Lack Of Incentives For Waste Minimisation Efforts	▪ Scarcity / Non Availability Of Water and other resources ▪ Regulatory Pressure	▪ Natural Resource Accounting ▪ Focus On WM / CP / PP / GP Etc. - Providing Incentives ▪ Improvement In Enforcement Of Regulations Etc.
7. **Other Barriers**		
▪ Lack Of Institutional Support ▪ Lack Of Public Pressure For Controlling Pollution ▪ Seasonal Variations ▪ Space Limitations	▪ Issues Of Institutional Capacity ▪ State Of Public Awareness And Status Of Information Disclosure ▪ Planning Aspects regarding seasonal response / space management	▪ Develop suitable partnerships / collaborative programs ▪ Public participation approaches for awareness building and planning themes

4.0 Status of the Project

The project has been completed with 25 WMCs having been established. In phase III it is indicated that 60% of WMCs met the project objectives and completed the tasks as per activity schedule. An outline in this regard is presented below as Table 4.1. It is further submitted that the project has led to establishment of WMCs by 10 nos WMC facilitator organizations including institutions besides including one WMC by an NPC regional office. There has been an attempt to have wider coverage of sectors / sub-sectors and accordingly 17 sectors / sub-sectors were sought to be covered under the project. These WMCs have been spread across 13 industrial clusters or industrial townships which are located across 7 states. It may however be noted that several WMCs were required to be terminated during the course of the project on account of reasons such as indications that WMC facilitator budget was inadequate especially indicated by institutions, further the expectations of WMC member units were more for technology upgradation related funding support as part of the project beyond advise for undertaking waste minimization initiatives etc.

Table 4.1 : List and Status of WMCs established in Phase III

Sl	Sector	Location	WMC Facilitator Organisation	Status
1	Earthen Tile	Nuzwid (Andhra Pradesh)	M/s Maruti Consultants, Hyderabad	Completed
2	Foundry	Pithampur (Madhya Pradesh)	M/s Essen Energy Technologies Pvt. Ltd., Indore	Completed
3	Steel Rolling	Indore (Madhya Pradesh)	M/s Essen Energy Technologies Pvt. Ltd., Indore	Completed
4	Electroplating	Dewas (Madhya Pradesh)	M/s EHS Consultants, Dewas	Completed

5	Engineering	Dewas (Madhya Pradesh)	M/s EHS Consultants, Dewas	Completed
6	Cotton Seed Oil	Dhule (Maharashtra)	M/s Eternal Solutions Pvt. Ltd., Dhule	Stage II Terminated
7	Brass Foundry	Jamnagar (Gujarat)	M/s Nansey and Associates, Jamnagar	Completed
8	Steel Rolling	Nagpur (Maharashtra)	M/s Essen Energy Technologies Pvt. Ltd., Indore through office at Nagpur	Completed
9	Steel Rolling	Trichur – Palakkad belt	M/s Industrial Operations Research Group, Palakkad, Kerala	Completed
10	Ceramic Tiles	Trichur – Palakkad belt	M/s Industrial Operations Research Group, Palakkad, Kerala	Completed
11	Sponge Iron	Hyderabad (Andhra Pradesh)	M/s Administrative staff college of India , Hyderabad, Andhra Pradesh	Stage I Terminated
12	Steel Rolling	Hyderabad (Andhra Pradesh)	M/s Administrative staff college of India , Hyderabad, Andhra Pradesh	Stage I Terminated
13	Textile Processing	Ujjain (Madhya Pradesh)	M/s Essen Energy Technologies P Ltd , Indore, Madhya Pradesh	Stage I Terminated)
14	Steel Rolling - 2	Indore (Madhya Pradesh)	M/s Essen Energy Technologies P Ltd , Indore, Madhya Pradesh	Completed
15	Foundry - 2	Indore (Madhya Pradesh)	M/s Essen Energy Technologies P Ltd , Indore, Madhya Pradesh	Stage II Terminated
16	Paints	Hyderabad (Andhra Pradesh)	M/s Maruti Consultants, Hyderabad	Completed
17	Resins	Hyderabad (Andhra Pradesh)	M/s Maruti Consultants, Hyderabad	Completed
18	Pharmaceuticals	Trichur – Palakkad belt	M/s Industrial Operations Research Group, Palakkad, Kerala	Completed

19	Foundry	Trichur – Palakkad belt	M/s Industrial Operations Research Group, Palakkad, Kerala	Completed
20	Hotel	Mumbai (Maharashtra)	M/s Tawde Associates, Thane, Maharashtra	Stage I Terminated
21	Chemicals	Dewas (Madhya Pradesh)	M/s EHS Consultants, Dewas	Completed
22	Brass Foundry	Jamnagar (Gujarat)	M/s Nansey and Associates, Jamnagar	Stage II Terminated
23	Ceramic – Pottery	Khurja (Uttar Pradesh)	Central Glass and Ceramic Research institute, Khurja	Completed
24	Ceramic - insulators	Khurja (Uttar Pradesh)	Central Glass and Ceramic Research Institute, Khurja	Completed
25	WMC in E-Waste Recycling launch on 21st March 2011	Bangalore (Karnataka)	NPC Regional Office, Bangalore	Stage I Terminated

5.0 Treatment Units installed and commissioned under the project

This project was not focused on design and installation of any treatment units for air pollution control or waste water treatment etc. However, one of the brass foundry units in Jamnagar had installed a cyclone cum bag filter for controlling air pollution from the furnace.

Further, a Steel Rolling unit at Indore also installed a air pollution control equipment to check emissions from their furnace as per advise of the state pollution control board. These were however not explicit activities of the WMC project.

6.0 Details of equipment

It is to be emphasized here that as the project has been regarding promotion of waste minimization adoption and adaptation in industry and that it has not been a research and development oriented project, specific procurement and installation of equipment need to be viewed as part of project design.

However, the industrial units that participated in the project did take initiatives in undertaking equipment modification for process improvements at their own end with technical facilitation efforts by WNMC facilitators. There were occasions also of new small devices / equipment that were being installed to improve production process and some of these have been highlighted in the WMC Newsletters as part of case studies. A few photographs of such small equipment installations at their own behest are also presented in earlier section 2.0.

7.0 Performance of the system

It may be once again reiterated here that the project has not been one of research and development or a major clean technology demonstration oriented project. There have been however process improvements and accordingly improvement in performance of industrial processes in MSMEs that participated and especially those who took initiatives in applying the WM methodology and WM techniques in their units.

As regards performance of the project related analytics it may be indicated here that the investments made on the project did lead to multiplier effects in terms of crowding in some additional investments and leading to financial savings etc. This perspective is

presented here as a measure of financial productivity of the project. As a reference to this is indicated here financial productivity aspects in simpler terms for a set of six WMCs.

The following charts depict private sector investments induced for average public investments made (or allocated) per WMC set being analysed and also in respect of private sector savings vis a vis public sector investments, whereby indicating the financial investment productivity from the project as obtained for different WMCs. These are also indicative of the mantra of Waste to Profits ideology that the program has been professing since inception and conceptualization.

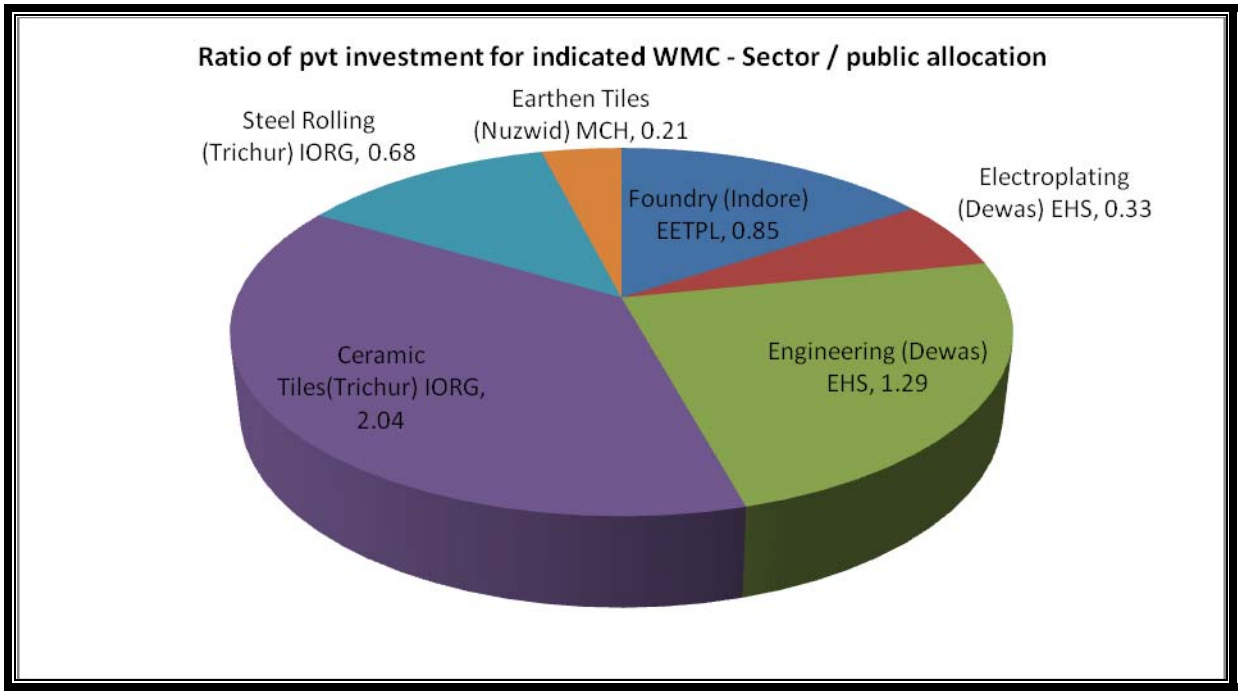


Figure 7.1 : Investment Multiplier for selected WMCs for given Sector and region

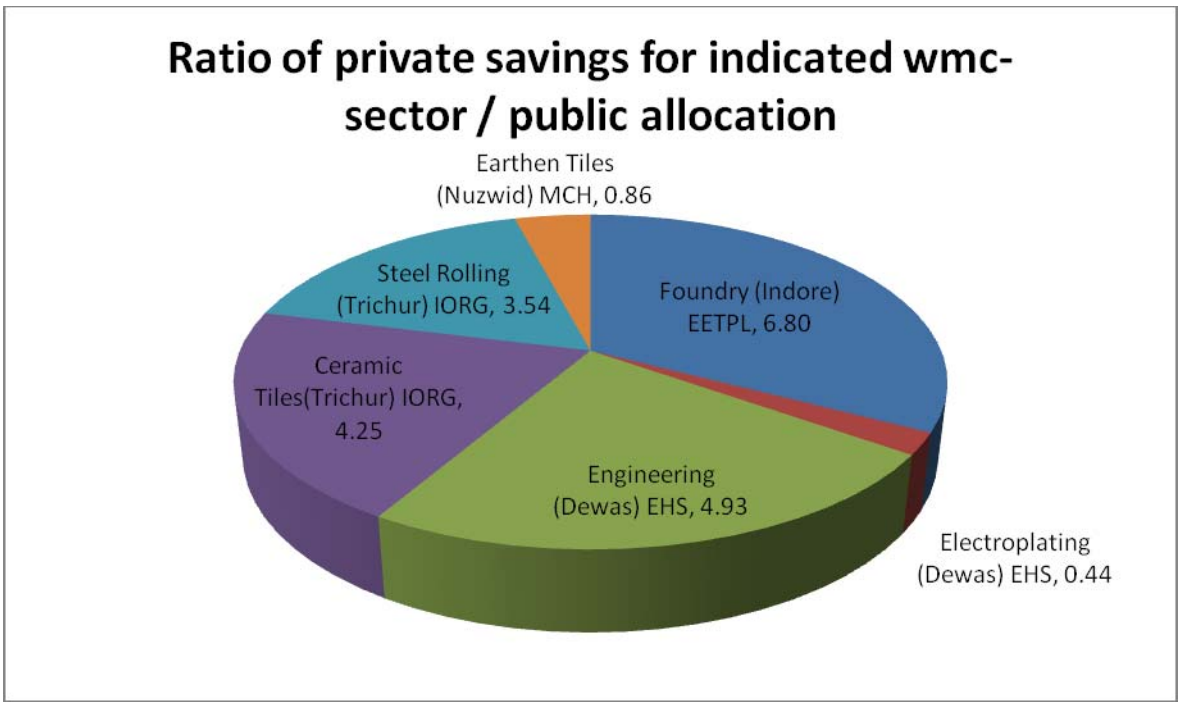


Figure 7.2 : Savings Returns Ratio Vis a Vis Public Investments per WMC for Given Sector and region

It is indicative that the levels of private sector investments vis a vis public investment or allocation of funds per WMC in Phase II are generally higher and also that of savings levels obtained vis a vis public investment per WMC on gross basis within WMC project phases. It is indicative that in phase II the project which was being scaled up had gained due recognition for enabling firms to systematically identify several invisible or hidden losses in their operations vis a vis the average revenues and profits of participating firms and accordingly invoking much investments. In phase – III the relative degree of savings could be viewed in the larger context of a generally growing focus on process improvements that were being undertaken by SMEs in manufacturing sector of own accord and in-house and which the next generation entrepreneurs in the family business had begun to especially address. Also rising availability of SME consultants could be accessed more easily for support either on paid basis or by availing opportunities arising through programmatic frameworks that facilitated the process (including frameworks such as WMC, Lean manufacturing, Energy Efficiency for Clusters by BEE etc).

8.0 Observations and Outcome of the Project (Phase III)

In respect of the WMC project there have been some observations that can be collated and reflected upon. These have been grouped and presented below in the context of strength and soundness of the project, pertaining to institutionalization and scripting of the concept amongst public and private entities and in respect of governance properties. Accordingly some of the key observations are as follows.

8.1.1 In respect of strength and soundness of the WMC phase III as green PPP-SME project the following are observations through field engagement.

The richness of the concept has been high with the pioneering group consulting dynamic a hallmark of the program since phase I stating in 1995-96 and carried forward in partnership format with SME consultants involvement. The degree of balance between public-public and public – private engagements in technical aspects and contributions over time diminished as program management and coordination roles reduced direct technical engagements in SME manufacturing units for NPC and Ministry personnel. This had a bearing in some instances on technical data flows from the field and thus crosschecking prospects over time were also tending to be constrained considering that each WMC demanded extensive coordination roles and a very small team of 2 or 3 personnel at NPC were coordinating the project. The alignment of incentives was found to be average considering budgetary constraints in general and related outdated benchmarks problem with gaps in fuller appreciation of quantum of work involved for both NPC and WMC facilitator organizations taking time to be visible to all stakeholders. These were improved upon to some extent after long deliberations over a year or more during course of the project with moderate revisions in budget made at a later stage and consideration of additional mandays for NPC. As regards alignment of risk sharing and risk management the shared reputational risk has been a primary concern amongst the

entities. The degree of completeness of contract could be indicated to be partially complete, considering it was based on MOU that had non binding and flexible informal features, where time overruns on WMC activities were possible to accommodate in the interest of completion of all activity and tasks components in response to ground conditions in the facilitation process. In this respect WMC activity related innovations were allowed beyond designed tasks schedule.

The project entailed production of quasi public goods and of provisioning WM advise via SME consultants to SME manufacturers towards environmental cause at the next stage. The fairness of regulation in terms of quantum and quality was medium to low as very few steering committee meetings occurred. The project budgets were at a relatively lower spectrum from sponsoring Ministry amongst various their other projects and the attention to the program was lower in phase III. This was indicative vis a vis the comparisons with newly emergent lean manufacturing program that built on WMC concept of group consulting related experiences, but had a better design with special purpose vehicle (SPV) formation structure, where SME units had been willing to also pay partly for the services which had a reforms perspective in the green PPP-SME arena. The WMC project personnel did have previous experience in the project and which helped the gathering of momentum in the project and significant contributions in early to middle stages, but later with multiple project engagements and extension of WMC numbers to be established slowed the arrival of results as the project stretched. However, in phase III WMC program enabled opportunities to identify gaps in program design varieties and scope for new initiatives leading to building newer green PPP-SME project ideas that may be implemented in future. The WMC project facilitated implementation of other projects such as Eco-Products International Fair and NCPC revitalization efforts that found support through WMC program platforms. The degree of transparency for the project was maintained very high to build stronger norms on this score and to enable propagation of ethics, trust and other norms in the sub-project chains and amongst other partnership node. This also led to strong ethical orientations on projects and personal front amongst newly inducted WMC project personnel learning the project activity for the first time, such that the sharing of project loads could be balanced amongst personnel and better

legacy elements in project management be developed. The quality of civil society monitoring was fair to weak as in Phase III compared to Phase II, as the number of NGOs sending queries or wanting to discuss the project outputs, outcomes and features were lesser. However there were significant highs as Knowledge at Wharton personnel had shown excitement and interest regarding the project and so also UNIDO / UNEP personnel keen on engaging the WMC project team in the NCPC revitalization efforts in due course in view of feedbacks from field on project legitimacy and goodwill building initiatives. These attributes were amongst other technical skills being sought for developing a new team for NCPC revitalization process. As regards nature of demand for the public good, it has been high from both demand side and supply side and that the key actors in phase III were sought to be middle management from NPC and top management and operational staff in SMEs. The market condition for such services have over time become competitive as various agencies have emerged and undertaking projects for manufacturing sector support.

The WMC project has been able to sustain its relevance and appeal for about 16+ years now, having developed a brand through the project results and such pursuits from NPC including use of project communication tools such as WMC newsletter. The social benefits from the project have been significant for SME manufacturing settings as inter-industry dynamics have been increasingly made positive and within the units the social systems and industrial relations have evolved in positive ways considering unit level project championing efforts were often sought and good WM ideas and options gained appreciation and support for implementation and innovations focused experimentation got encouragement in industry. The project in phase III was a purely domestic initiative with MoEF financing the program. The zone of influence of the WMC program through three phases has been large, though by phase III it had begun to get constrained owing to supply side issues from MoEF that was seeking to retest the concept and also exploring new project models for implementation. In essence the product life of the WMC program in existing format has begun to taper especially since there is a need for newer range of services to be integrated in future program design. Thus a revised and revitalized model shall be needed in case the WMC project is sought to be extended to phase IV (which

however is indicatively needed from the realization that the Lean manufacturing program is largely found to be successful and a better SPV based format and that further underlying demand for such services is being identified). In the context of green economy and green growth emphasis being made in India, and the potential for India to be a leader in sustainability domain and green industry initiatives (considering insights obtained by NPC / NCPC from being industry partners in Parivartan Awards 2012 where there has been further learning about Indian industry eco-innovations that have been showcased being also found to have obtained international acclaim and adaptations), the need for revised and revitalized and strengthened WMC program Phase IV could be considered for about 500 additional WMCs. In case it is considered it may need to integrate various sub-components such as Concentric Circles action (differentiable from purely cluster development approach), and inter-value chain collaborations across industrial sectors / clusters and tiers, scope for green initiative focused incubators to raise and engender born global green enterprises, and also components of exclusive green funds and / or their applications with enhanced focus on eco-industrial tourism and attention to newer formats of green disclosures as per National Voluntary Guidelines etc., where the model of program design could be based on consortium structures of inter-institutional and innovative public-private partnership models.

8.1.2 Observations pertaining to process of institutionalization and scripting and legitimization amongst public and private stakeholders.

The introduction of WM culture in SME manufacturing units by NPC in the past through demonstration projects and hand holding of SMEs with institutional support over time with the build up on strategic partnership with SME consulting organisations in phase II of WMC project enabled continuing legitimacy into phase III. The multiplier effect and group consulting novelty remained as drivers. As regards quality of protocols for the partnerships the MOUs were similar to phase II, however steering activities could have been enhanced. In the project success factors and capacity building activities along with strong project communications etc continued to maintain project legitimacy. The articulation of the project ownership was made as per the arrangement being public sector

driven and deliverance of services with strategic private sector partners. The tenure of personnel was observed to be two persons at all stages and a flux of 5 to 6 members over time at the nodal agency. The previous experience amongst some of the personnel was high and that natural and nurtured project champions were beginning to evolve into institutional champions oriented mode and quest as new thematic green PPPs-SMEs were being designed for larger scale of implementation and involving broader range of inter-institutional and inter-organisational activities. The strong training features and learning by experience scope were indicators of approach to capacity building. The responsibility aspects involved public sector based concept design and private sector concept adaptation and implementation related initiatives in cooperative formats. The reinforcements for the project involved development and articulation and dissemination of results based on output and outcome indicators, with project branding focus and readiness to and processes of independent assessments as enablers. The extensive coverage of the project in various workshops by media (local print and audio visuals too) in various industrial regions and national and international references of the websites and process of case studies dissemination and newsletter readership build up were some of the avenues by which media attention was obtained for the project.

8.1.3 Observations regarding governance properties, how PPP governed and how regulatory system related and evolved.

The features of self governance included periodic monitoring and evaluation of progress and course corrections whenever needed with the inter-institutional coordination process being involved. The progress linked payment schedule and steering committee based periodic guidance indicated other formal features of regulatory arrangements, which enabled norms setting and the structured process of financial assessments adding to the features. The WMC project partner activities and deliverables schedule is presented in Annexures. The alternative programs such as emergence of lean manufacturing project and from agencies such as gtz / giz and UNDP / UNIDO sponsored projects and other cluster development activities such as of IL&FS are the indicators of nature of

competition for the WMC program in Phase III. The other benchmarks for itself vis a vis previous phases and with other projects in respect of geographic reach, sectoral coverage and tech upgradation support achievements and regarding quality and quantum of SME participation and multiplier effects etc have emerged to serve as competitiveness related benchmarks and indicators. However, a deeper engagement of financial institutions was a key missing factor that remained a problematic in phase III despite seeking and exploring financial synergies in the broader eco-finance arena (considering that the project had limited functional framework to do so). The WM options and implementation benchmarks and focus on WM movement creation / sustenance were some of the conditionalities in the project to check and curb production of any public bads. The quality of accounts aspects included allocation of WMC establishment based on rationing of total number of WMCs being allowed per WMC facilitators and also in cognizance of past achievements in such programs. However, in accelerating project implementation at different phases, the preparedness or expectations of potential industrial units were inadequately assessed in a few instances by the partner WMC facilitator organizations, and such gaps in understanding did lead to some of the WMCs being prematurely terminated or being unable to achieve respective WMC objectives.

As regards funds release in respect of established WMC and its activities the
progress linked payment schedule has been the main reference. The project itself having a separate independent account enabled the process. Further, the bills processing was highly structured, which however reduced technical engagements on engineering support for WMCs from the institutional side that was heavily engaged with project coordination work.

As regards the nature of funding it is indicatively public leverage based, with budget structure developed on number of WMCs planned for establishment and financing support in view of previous project phase per WMC basis etc. The project valuation in phase III was found to be essentially weak and lower compared to other programs and projects of similar varieties. The need for alternative perspectives such as evolving private sector comparators as an idea offered by the project team which could be used for better project valuation processes and in design stage as an appropriate mechanism has to

be developed in consultation with the Ministry in future and to be subject to seeking opinions on the feasibility and approach to be taken on the same (as differentiated from public sector comparator logics used in private finance initiatives based projects and those involving build-operate – transfer and other such designs in infrastructure development arena).

The arrival of the contract was on single source basis with NPC being given the project for implementation by MoEF in cognizance of being the joint developers and implementers of the project through phase I and II already in association with the Ministry of Environment and Forests. The demand for capacity building and for supporting alternative thematic toolkits developments and implementation support were amongst other demand characteristics for the project. The accountability pressures for the project have been from MOEF, DIPP, UNIDO, industry, other ministries and also NGOs etc. The project related accountability expectations were primarily loaded on middle management personnel who strove to achieve project results within the manpower constraints that happen to exist at NPC (EN/NCPC), and at SME consultants and SME manufacturers' end, which have been reflective of need for volunteering support for institutions and middle management professional development needs for SMEs that may be a factor to consider including in future program design / project implementation action. Further, regarding e-governance oriented arrangements the continuation of WMC project website was ensured and further information flows heavily relied on email based communications.

8.1.4 Observations regarding the reforms perspective being introduced into and from green PPPs addressing SMEs as being identified and propagated in pursuit of WMC program

The WMC project with its spread and need for reaching across industrial sectors and clusters in India and with opportunities to enable deliberations with multiple institutions has been a fertile deliberative plank. It has led to shaping of interactive debates and

forums whereby the project participants, stakeholders, project team members etc., have been able to interactively explore gaps in industrial organization systems. In addition these occasions provided avenues to think deeper regarding program designs and project implementation constraints and also identification of potential reforms that may be needed in functioning of systems and projects so as to ensure or structure them to overcome constraining circumstances such that project objectives are eventually met even if constraints are encountered. To address such themes the WMC Newsletter has been applied for larger change management oriented perspectives propagation. A reference can be made to WMC Newsletter Reflections column of Vol 5 No. 6 May 2011 as below.

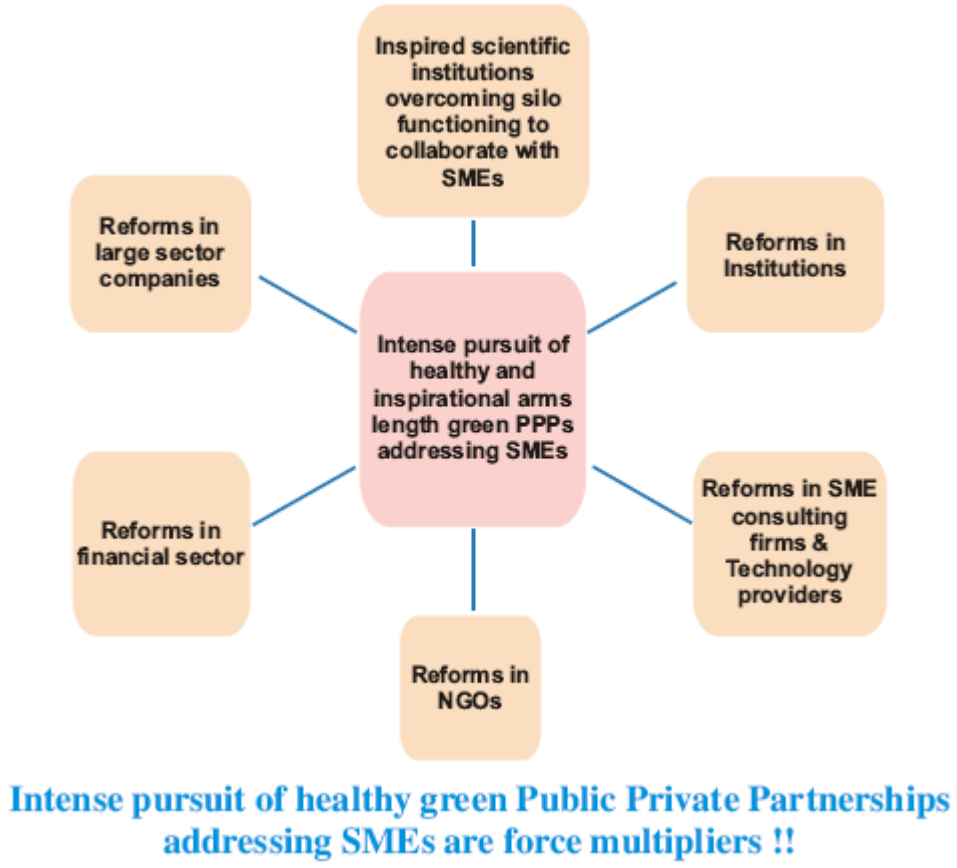


Figure 8.1 : A perspective on reforms propagation from green PPPs addressing SMEs in the context of WMC project

8.2 Indicative Outputs and Outcomes in WMC project phase III

The Waste Minimisation Circle project has led to various outputs as reflected in sections above such as in the status of the project and as reflected in the task wise achievements regarding which details are placed in annexures accompanying the report. The physical effects on the ground in industrial units have been substantive as well. The overall achievements can be reflected in a range of percentage changes as indicated below with further insights on a sample set of six WMCs as well that are compiled from related factsheets.

8.2.1 Environmental benefits

The estimated range of aggregated environmental benefits from the WMC project phase III based on estimates of results indicated in WMC reports regarding changes in consumption of various input utilities / raw materials etc.

Reduction in water consumption	: 5-10%
Reduction in electricity consumption	: 5-15%
Reduction in fossil fuel consumption	: 3-5%
Reduction in raw material use	: 2-5%
Reduction in waste water generation	: 5-10%
Yield improvement	: 1-3%

In respect of the completed circles which had met project objectives, the dynamics had been observed in multiple stages and during field visits and can be here also reflected upon regarding the public – private and private – private partnership features. Regarding those that were terminated it is clear that the last mile partnerships reaching SME manufacturing happen to on occasions also fail. As regards project reports received and factsheets prepared by the project team for some of the completed circles a sample set of representative data regarding outputs and outcomes is presented as factsheets in Table 8.1 below. The factsheets here reflect upon the circle code, sector, cluster / location, facilitating partner organizations, No. of Waste Minimisation Options generated and implemented, Environmental indicators and Economic indicators.

Table 8.1 : Sample Factsheets for three WMCs of different sectors indicating nature of data collated for analysis

Circle No	**C-III/01/MCH/01/NUZ**	**C-III/03/EET/02/IND**	**C-III/04/EHS/01/DWS**
Sector	Earthen tiles	Steel Re Rolling	Electroplating
Location	Nuzwid	Indore	Dewas
Facilitator partner organisations	Maruti consultants	Essen Energy Technologies (P) Ltd	EHS Consultant
No. of WM options etc.	No. of WM options Identified = 9 No of WM options implemented = 5	No. of WM options Identified = 41 No of WM options implemented = 7	No. of WM options Identified = 56 No of WM options implemented = 36
Environmental indicators	1. Reduced fuel consumption (rice husk) by 1296 tons per annum 2. Reduced solid waste(tiles waste) by 450 tons per annum 3. Reduced fuel wastage (rice husk) by 179 tons per annum	1. Reduced electricity consumption by 39840 kWh per annum 2. Reduced fuel consumption (furnace oil) by 7 tons per annum	1. Reduced water consumption by 136 m^3/month. 2. Reduced waste water generation by 112 m^3/month. 3. Reduced solid waste generation by 1.5 tons/month 4. Reduced lime consumption by 670 kgs/month. 5. Reduced Hydrochloric acid consumption by 180 litres/month. 6. Reduced hexavalent chromium and other metallic salts consumption by 0.5 tons per month.
Major Options Implemented:	1. Improved storage and handling of rice husk. 2. Installation of thermocouple for monitoring kiln temperature. 3. Use of ground rejects to partially offset use of rice husk ash. 4. Control of Air fuel ratio by blocking	1. Replaced bulk coal firing with pulverized coal firing in the furnace. 2. Belt alignment for drives with vee belts viz swing grinders, compressors, fans etc. 3. Replaced foot valve with Normex	1. Replaced leaking and broken equipment for water transportation. 2. Changed the practice of water rinse with pipe. 3. Developed operational control procedure for regular maintenance of rectifiers and heaters. 4. Setting up of chemical solution discards

	part of the inlet air inlet. 5. Monitored and reduced moisture content in green tiles.	make foot valves for better operations of pumps. 4. Replaced rolling scrap raw material with plates from ship breaking industry to avoid bearing failure. 5. Adopting lower stack of raw material in the furnace reducing burning loss.	criteria. 5. Conducted competency and awareness training for workers involved in the job. 6. Prepared standard operation procedure (SOP), operational Control Procedure (OCP) to various equipment. 7. Modified shop floor by civil construction to reduce water consumption and recovery of spilled chemicals. 8. Installed buzzer to prevent over plating. 9. Substitution of chemicals in plating and waste water treatment area.
Economic indicators	Investment made = Rs 1,26,000 Savings achieved = Rs 5,04,000 per annum Payback period = 3 months	Investment made = Rs 5,00,000 Savings achieved = Rs 40,00,000 per annum Payback period = 2 months	Investment made= Rs 1,93,000/ Savings achieved = Rs 2,57,196 / per annum Payback period = 9 months

Further the data aspects regarding economic and environmental indicators from a sample set of six of the completed WMCs in Phase III have been collated and presented here. These are from six circles representing efforts made in sectors such as Earthen Tiles, steel rolling, ceramic tiles, engineering, electroplating and foundry sectors.

8.2.2 Economic indicators from WMCs meeting project objectives :-

- Investments made by SMEs during project Phase III > Rs. 30 Lakhs
- Savings achieved per annum > Rs. 60 lakhs
- Simple / Average payback period of 0.5 years

8.2.3 A few indicators from a set of six WMCs as obtained :-

The compiled information for the selected set of six WMCs in six sectors is depicted in charts below in Figures 8.2 and 8.3.

The environmental gains for different sector wise collations are also indicative of nature of material savings in mass or volume terms that have been obtained as of date and reflects on process inefficiency features that were being addressed and areas of prospects in material savings and waste reduction pertaining to the sector related processes and resource use features. A chart regarding percentage values on resources conserved in mass or volume terms regarding mix of various solid or liquid materials and regarding units of electricity from these sample WMC member units from indicated sectors is also indicative of the waste media related aspects that Waste Minimisation options addressed in the specific sectors.

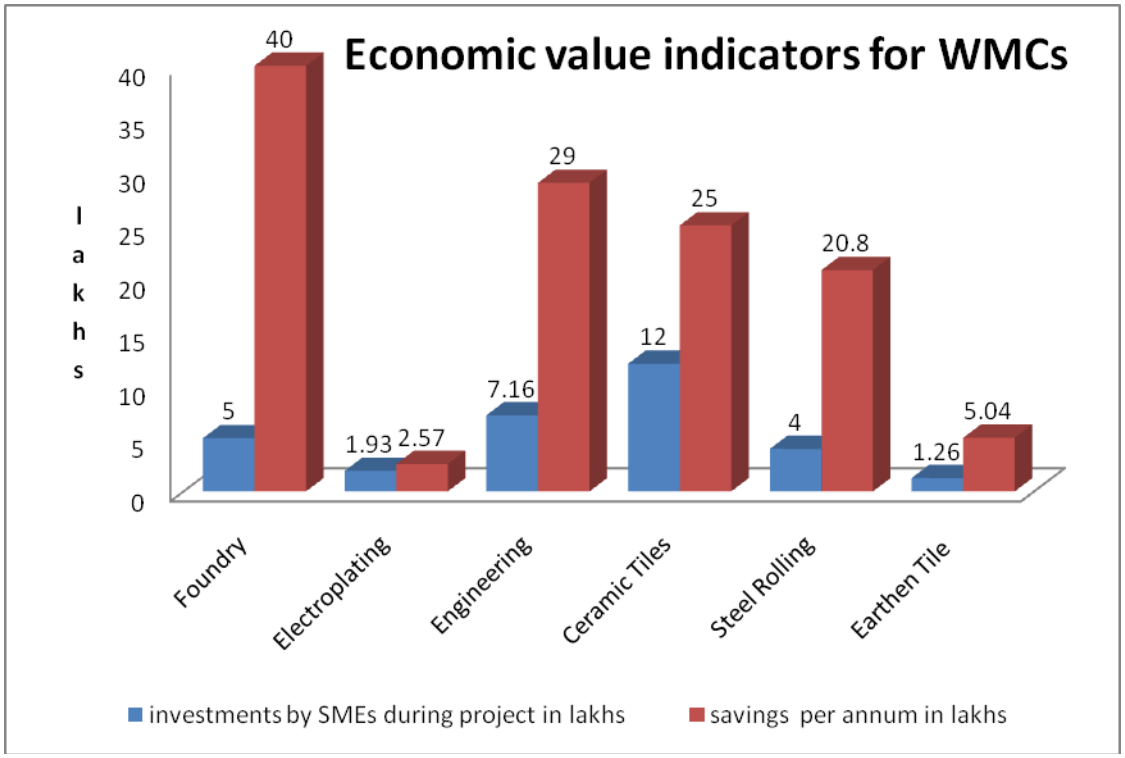


Figure 8.2 : Economic indicators for different sectors / WMCs obtained in Phase III

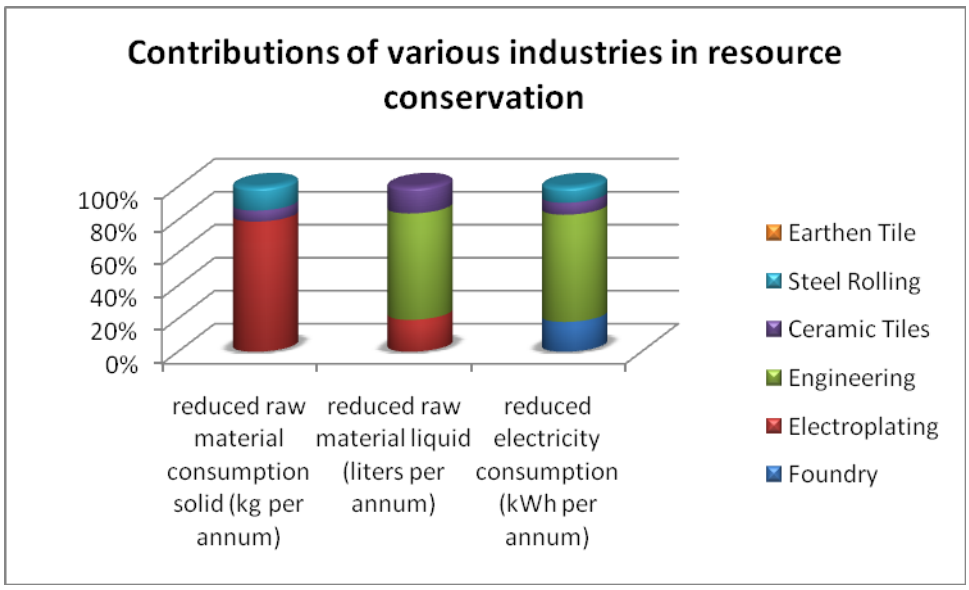


Figure 8.3 : Compiled indicators in % terms regarding resources conserved as solids, liquids and in respect of electricity showcasing comparative resource type savings obtained in different sectors in Phase III

It could be identifiable that the WMC projects in Phase I and II had played a pioneering role at the time (amongst a few other cluster development projects including of UNIDO) in inducing a waste minimization culture in industry, which had spread and had built a brand value too across industrial sectors. This was observed to be acknowledged by SME units in general. It must be indicated here that WMC member units in the program during phase III had looked forward to facilitative help now to not only focus on process operations improvements and maintenance features, but wished to embark on major equipment modifications and technology upgradation efforts to start moving forward on the productivity gaining and sustainability achieving pathways. These were indicative of need for evolving newer range of projects as well that would have supply chain impacts and value chain productivity enhancement features while seeking sustainability focused contributions in the simultaneous needs for rebalancing the value chains in the process.

8.3 Various other aspects with respect to WMC Phase III

- 11 Nos WMC Newsletters developed and printed and potential readership expanded to over 2000 personnel from industry / institutions (national /

international) etc especially as pdf documents being actively and substantively emailed

- A range of newer initiatives such as Inter sectoral partnerships and towards achieving developments / facilitation of Technology migration across sectors being explored. An initiative in this direction includes Management Representatives implementing ISO 9000 or ISO 14000 or OHSAS 18000 standards in different types of firms from different industrial sectors amongst SMEs have been enabled to be brought together especially by M/s EHS Consultants (an esteemed partner WMC Facilitating organization) to undertake new initiatives. They have also initiated partnering under WMC project with WMC Facilitator support for undertaking inter-firm audits for WM / CP implementation

- In respect of undertaking WM / CP assessments where needed, inter-sector co-operations amongst firms, such as analysis of material and or testing equipment etc being undertaken. This is made feasible by engaging advanced laboratories that some foundry WMC member units have for cause identification of technology issues in steel rolling sector being enabled by same WMC Facilitator organization involved for both sector WMCs. In this way laboratory infrastructure in a region with latent capacity could find utility across industrial sectors. Also joint advanced training workshops were being explored for Steel Rolling and Foundry sectors such that common areas of concern such as furnace efficiencies, insulation materials etc could be addressed.

- Eco-friendly product promotion aspects were being undertaken through WMC project and various awareness, review and final workshops have led to detailed discussions regarding Eco-products Directory developments.

- The Regional Workshops under WMC project have served parallelly as effective platforms for deliberations towards new models of WM / CP and Cleaner Technology support desired by industrial units and also a forum for exploring advanced training needs for SMEs and State Pollution Control Boards.

- The WMC project related workshops also served as a forum for deliberations regarding other NPC projects such as lean manufacturing project and enabling development of industry interest in these initiatives

- The WMC project also finding substantive international interest and serving as significant case study from India for UNIDO / UNEP initiatives on Promoting

Resource Efficiency in SMEs and for reference in other UNEP projects that are being developed or forthcoming.

- The WMC project and newsletters being much appreciated by national and international institutions and industrial units including UNEP / APO and various NPOs / USAID / Local Productivity Councils and small, medium and large companies. The demand for producing WMC newsletter in various other regional languages especially being received for dissemination to companies and for reference for operational staff in Shop floors across industrial units.

8.4 The pan India reach of WMC program through three phases

The Waste Minimisation Circle program and projects in three phases has made a pan India footprint as regards reach and presence. A map of India depicting the states where the WMCs have been established in these phases is presented in Figure 8.4 below.

Figure 8.4 : The spread of Waste Minimisation Circles in India (Phases I, II and III)

The project has thus reached about 64 industrial clusters and enabled a Waste Minimisation movement in its wake, while touching resource conservation potential in about 40+ industrial sectors. It is indicative that capacity building process was a core feature of the project as achieved through training and practice modes. A significant contribution to the environmental consulting arena was achieved through the twelve WMC Facilitator Training programs organized wherein 204 consulting industry and institutional representatives participated from different regions. The imbibition of group consulting capacities through the avenues made available in the WMC program for the interested SME consultants and some of the interested institutions has been acknowledged profusely by the WMC Facilitating partner organizations and the consulting industry in general. The gains to the environmental management field from such an initiative has begun to make further contributions as new programs and projects seeking to address greening of industry and manufacturing competitiveness are also co-opting partnerships with the firms who have associated with the program.

8.5 Building of Project Visibility - Vehicles for propagating green PPP theme addressing SMEs

The already established momentum that had emerged for Phase III was especially helpful to re-position the project format as a green PPP addressing SMEs, which happen to be readily acceptable in cognizance of the general re-scripting scenarios taking place in the institutional domain and programmatic initiatives occurring in India. This was comprehensively possible and accomplished during field visits to industrial areas when Awareness Workshops and Training Programs were being organized for launch of WMCs across India. The local media coverage such as newspapers, local channels etc., helped in this regard.

The additional communication tools that were available to the project such as WMC Newsletter, WMC project Video developed in Phase II, the WMC website developed in Phase II etc were also useful in furthering the Phase III momentum and reconnecting

NPC – Environment Group with the industrial eco-system. The project team could disseminate newer learnings and re-conceptualization of phase II perspectives into phase III to a larger audience through the Awareness workshops and industry interactions towards locating industrial environmental management responses in the broader regional development domain. This also contributed to constructing a new vision and outlook for the project and green PPPs addressing ideology, while building fresh linkages for NPC to enable shaping of new programs and initiatives at the regional scale subsequently.

Apart from industry interactions the WMC project enabled highlighting the green PPP features in academic institutes such as IIM Bangalore Public Policy and management conference in August 2008, and at international platforms. These included the Eco-labeling seminar in Hanoi, Vietnam, facilitated by Asian Productivity organization in 2008 and in Promoting Resource Efficiency for SMEs toolkit development also at Hanoi, Vietnam, in 2009 as organized by UNEP. Further, the WMC project was a key discussion topic in the Eco-Industrial Parks development related deliberations at the regional interaction meet held at Jakarta, Indonesia in 2011. Further, Knowledge at Wharton related coverage of business related initiatives interviewed the project team member in respect of the paper on the above theme as presented for the project Phase II at IIM Bangalore.

The nested green PPP component of the WMC project structure, within public leverage framework but having strategic linkages with private sector be it SME consultants or SME manufacturing units, was also being reflected upon in reports being submitted to Ministry of Environment and Forests. The indication and acknowledgment of WMC project as a Public – Private Partnership happens to be projected also by the Indian Government website as presented in Figure 8.5 below.

Further, the nested green PPP – SME perspective of WMC project has been shared in questionnaire responses as well. For example in the survey on various business models focusing on promoting sustainability issues in SMEs, that had arrived from Wuppertal Institute a premier international research centre.

Infact offshoots of the application of the above perspective of nested green PPPs addressing SMEs as projected by project team in the recent five years, has also found

resonance in structuring of other projects such as Lean manufacturing Program in a more formalized structure. The Lean Manufacturing program incorporating cost sharing features by SMEs towards engaging Lean manufacturing Consultants in Mini Clusters is a significant new model that emerged and as developed by Ministry of Micro Small and Medium Enterprises and NPC – Process Management Group.

This project structure of the Lean manufacturing program, which is another variety in project design, reflects the experiences and lessons learnt at NPC in the WMC program as shared amongst Environment Group and Process Management group. It is indicative that Group head, Environment management, NPC was also involved in the deliberations that had taken place in shaping Lean Manufacturing Program in 2008-09.

http://www.india.gov.in/citizen/green_corner/green_corner_public.php accessed 27th July 2011

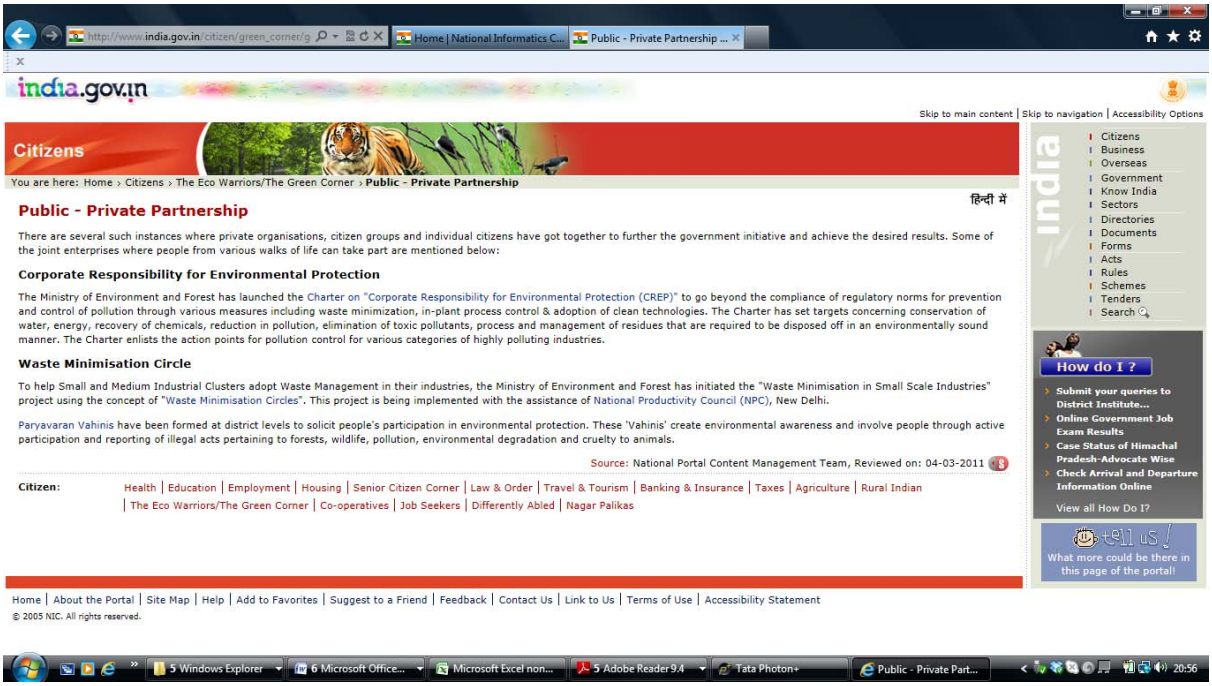


Figure 8.5 : The india.gov.in website indicating WMC project amongst Public - Private Partnership models for Environment management area

It is also relevant to indicate that the WMC program Phase III has also served as a significant vehicle for propagating the parallel projects such as eco-products directory development and the regional workshops organized on WM / CP and Resource Efficiency themes financed under WMC program provided opportunities for highlighting and marketing the Eco-Products International Fair 2011 and deliberations with industry regarding RECP and NCPC network developments and revitalization initiatives at Environment Group, NPC.

9.0 Conclusions

The WMC programme implemented across three phases (with intermittent breaks amongst the phases) has fostered attention to waste minimization prospects in Indian industry (especially SMEs) and led to broad basing the concept of 'group consulting' that is increasingly found acceptable to SME manufacturers who have become willing to be guided on WM / CP and lean manufacturing themes by institutional and independent consulting organizations.

9.1 The overall outcome of the WMC programme

On the whole, it can be indicative that WMC programme led to following estimated environmental and economic benefits to WMC member units who participated in the project.

(a) Environmental Benefits to WMC members units from WMC programme (phases I to III)

- Reduction in water consumption : 5-35%
- Reduction in electricity consumption : 5-20%
- Reduction in fossil fuel consumption : 3-15%
- Reduction in raw material use : 2-20%
- Reduction in waste water generation : 5-30%
- Reduction in Air Emissions (GHG) : 5-10%

- Reduction in solid waste generation : 5-20%
- Yield improvement : 1-5%

(b) <u>Overall economic aspects (investments and gains by WMC member units as part of WMC programme through three phases)</u>

(i) Number of WM options identified : 850+

(ii) Number of WM options implemented : 350+

(iii) Investment made by SME WMC member units (since programme Inception in 1996) : > Rs. 8.5 Crores

(iv) Annual savings to member units (since project inception) : > Rs. 5 Crores p.a.

It is indicative that the multiplier effects to the above results could be considered to be accordingly higher in view of the spread of the WM / CP ideas amongst industrial units who did not directly participate but adopted the WM options generated in WMC units. This multiplier effect could be considered to be between 2 to 3 times above values over the period since the programme has been under implementation.

The task wise exposition of the WMC project phase III (and the larger WMC programme across three phases brought into context) in the backdrop of the SME-Environmental behaviour scenarios in national and international arenas, and the observations made of the project process and outputs and outcomes lead us to further reflect on deeper features and learnings about such program designs, and indeed regarding the paradigms concerning manufacturing extension services, outsourcing and partnership features beyond the innovations such as group consulting dynamics and prospects for new programmatic ventures. This section addresses some of the above perspectives and highlights the significance of the ongoing intervention efforts and the WMC project approach towards further leading to future plans.

9.2 Revisiting the WMC project and situating it in the broader Green PPPs-SMEs realm and within the broader typological domain

The WMC project as a green PPP – SME case can be categorised within a wider realm of thematic varieties, albeit with inherent inter-linkages amongst the identifiable range and dimensions as further depicted in Figure 9.1. Clearly, the case is essentially of the advisory/consulting variety where institutional partners are key players. These have displayed linkages in various ways to other gPPP-SME varieties that also bring reference to the typologies emerging in the gPPP-SMEs realm.

The inter-linking gPPP-SMEs can be further sub-categorised such as to include the following components:-

(a) Capacity building and green infrastructure: Capacity building towards green entrepreneurship amongst both SME(Cs) and SME(Ms); facilitation of vendor development and tech providers; green collar workforce creation; participation in development of environmental and other laboratories and testing facilities and such environmental infrastructure creation.

(b) Industrial organisation and green competitiveness: Themes of industrial ecology and clustering processes and issues of positive/negative externalities besides eco-industrial parks creation; engagement in assessing value chain productivities and facilitating green supply chain expansion.

(c) Technology upgradation and diffusion: The facilitation of domestic technology upgradation process in firms involving in-house R&D efforts, technology convergence and collaborations with research institutions and others, and also addressing diffusion of environmentally safe technologies as part of green economy facilitation.

(d) Green Finance: Engagements in facilitating eco-finance instruments developments by enabling the correlation of such needs and services; and also assisting venture capital initiatives.

(e) Awareness building and network creation: The campaigns for confidence building and acceptance of pollution prevention, waste minimisation and cleaner production ideologies and their benefits; undertaking project based initiatives as grounded and last mile service providers (individualised or group consulting formats); engaging in case studies development and results dissemination besides promoting environmental disclosures and reporting; researching technology trends and facilitating clearing houses and also enabling development of networks.

(f) Eco-products and green chemistry promotion: The engagement in eco-labeling processes and eco-product databases creation; organisation of trade fairs and promotion of green procurement practices including facilitation of domestic/export/import markets for eco-friendly goods.

(g) Technology exchange and migration: Participation in national and international technology transfers within and across sectoral boundaries and also enabling technology exchange mechanics amongst stakeholders

(i) Environmental governance and norms : Participation in national and international environmental governance processes and providing feedback to the architectures; engaging in concepts development and scaling up and mainstreaming pathways and in program and project designs, and implementation works; sharing insights for toolkits development and application; engaging in environmental standards development and norms setting; participating in transmission of reforms.

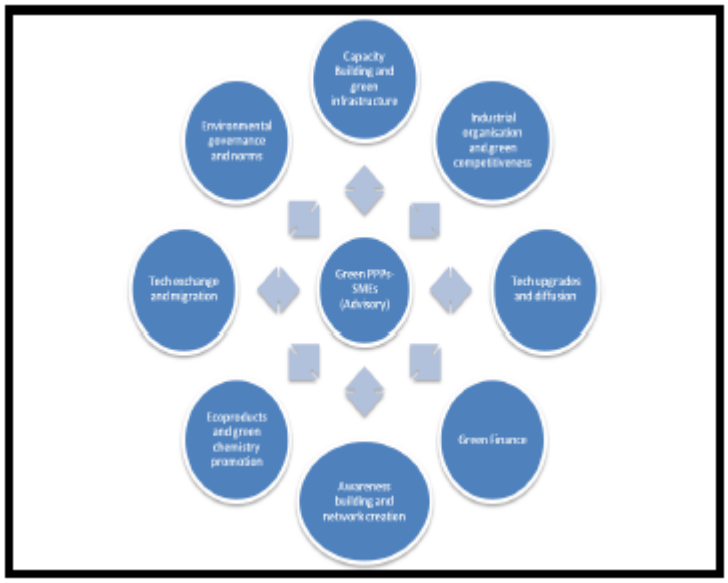


Figure 9.1 : The significance and role dimensions of the advisory green PPPs-SMEs

Accordingly, we can conclude that the WMC project or programme as a whole presents a scenario of high institutionalization as well.

9.3 The environmental problem and related concerns regarding SMEs in India – a revisit and emerging trends

It has been noted that environmental problems (air pollution, water pollution, land degradation, deforestation, climate change issues and disasters etc.) have many contributors and sources such as industry, agriculture, domestic and service sectors (UNEP, 2009; Mathew and Bakshi, 1987; MOEF 2001). A major part of the contribution

to the problem of pollution and emissions from within industrial sources in India (flue gas emissions, waste waters, solid and hazardous wastes and toxics emissions) had been especially attributed to Small Scale Industry i.e. upto 60% (Nyati 1988). The limitations of process efficiencies happen to be magnified in small firms which used traditional technology and were not found to be continually modernizing. This had led to many inadequacies in transforming inputs into final products. It had been generating considerable amount of waste and pollution in aggregate terms. (Nyati, 1988; Chandak et al, 1994 & 1995; COINDS series CPCB website; *Parivesh Newsletter of CPCB - Highlights*, 2003 and 2008)

Morris et al (2001) explore the range of mechanisms towards innovative efforts or sourcing of technologies through formal and informal means and/or technology spill-overs, and the deeper constraints towards modernization of small firms. On technology strategies in small firms, it has been found that small firms tend to primarily focus on domestic markets. They compete with other small firms, and seem to be technologically inactive *vis-a-vis* those competing with imports, multinational corporations and large firms (Morris et.al. 2001). Thus, in a scenario of a vast domestic market for goods, considering India's population and urban and rural spread, the possibility of addressing local market niches and customers with various kinds of linkages with other media and large firms continue to coexist with modernized and modernizing firms across Indian landscape (Nyati 1988; Vepa, 1987).

India has made significant improvements in environmental legislation since enacting pollution prevention and control Acts in 1970's and early 1980's addressing water pollution, water cess issues, air pollution issues. Amendments and newer legislation have followed. (MOEF 2001; Mathew and Bakshi, 1987; *Parivesh – Highlights*, 2008) But emissions, pollution and waste from SMEs remain a vexing issue, as they generally fail to comply with environmental standards (Sengupta, 2008; Pargal et al 1997). From their wide dispersal across geographic terrain, we observe complex sets of problems concerning environmental management in the SME context continuing even today. (Rahman, 2008; Sengupta, 2008)

Thus, the dimensions and basis of environmental issues and problems concerning SMEs in India have been observed to be vast and it presents challenging tasks for Green PPPs. Several aspects in India are common to what SMEs reflect in other countries. Unique complexities in the Indian context are also identifiable and visible, as national and international efforts to address sustainability issues are building up (Nyati, 1988; Van Berkel, 2007-08; Mehra, 2011). Indeed, the need for scaling up and mainstreaming existing Green PPPs and evolving newer models focussed on supply chains/value chains besides clusters approach, including broader role for finance, has been emerging in India. There is a need for including more industrial sectors in the ambit of achieving leaner manufacturing and sustainable development outputs and outcomes (Regional RECP meeting at Indonesia, 2011; Bhavnani, 2011; Malhotra and Agarwalla, 2011; Mandal and Bawri, 2011; Thukral, 2008; www.npcindia.org accessed 15 April 2011; Bharat Jain, GCPC 2011). Mehra et.al. (2011, Fig 9.2 and 9.3) provides a reflection on the exploration of sustainability concerns from amongst a sample of responding firms, especially in Textile sector consisting small, medium and large firms. This effort shows some existing problems, such as the geographic spread of textile sector units that thin out and constrain environmental intervention efforts for this sector. It also indicates complex problems that supply chain management issues would entail amongst the large variety of units within the textile sector itself.

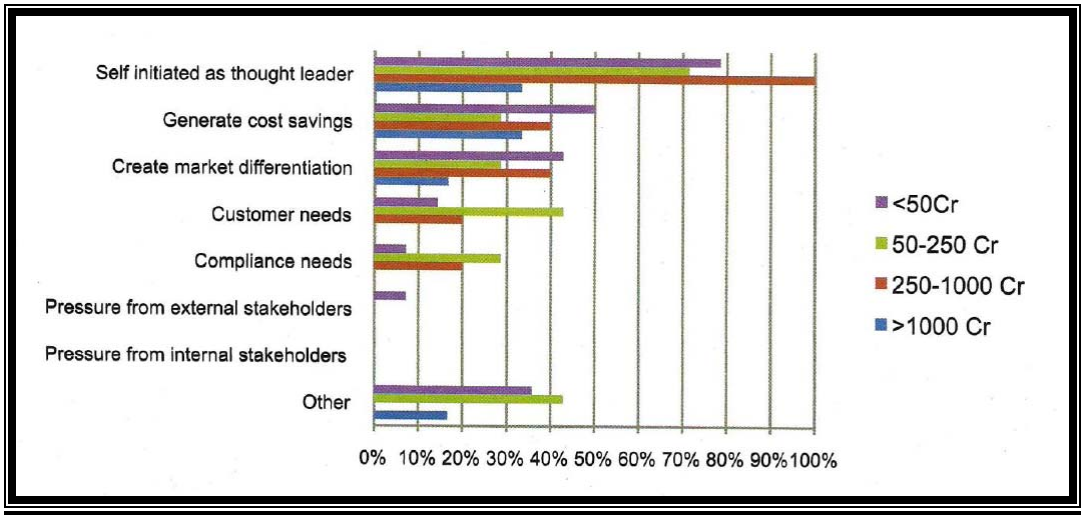


Figure 9.2: A reflection on the nature of emerging sustainability drivers and environmental considerations within the textile sector of India (Mehra 2011)

It would be important to indicate here that over two decades ago the drivers of environmental response as per SME view point were primarily as responses to regulatory duress and compliance focused. This was noticed when WMC project had been initiated as well in 1995-96. It is interesting that SMEs are now indicating sustainability drivers such as self initiated thought leadership, and that indicative SME behavioural response has certainly come a long way. This would reflect on the positive impact of enabling green PPPs addressing SMEs (such as WMC project) which has been one of the leading contributors that has played a pioneering role in building Waste Minimisation momentum in a voluntary framework)

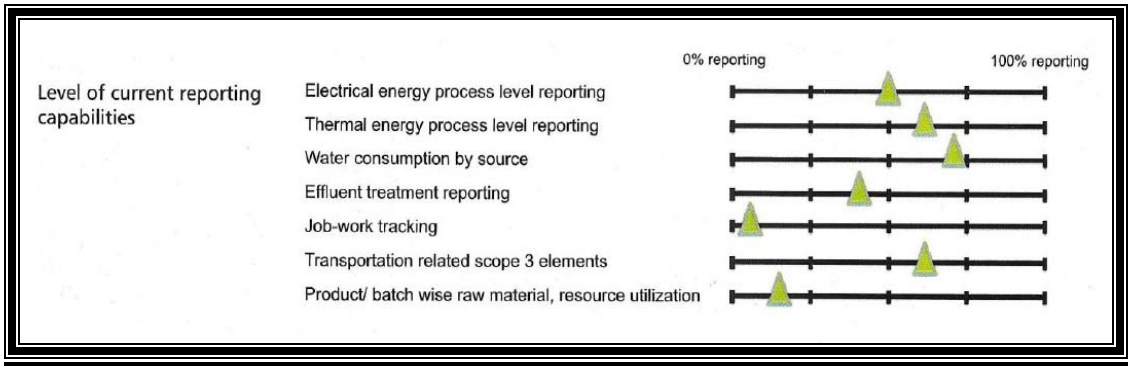


Figure 9.3: Indications on reporting capabilities amongst sample textile sector units on various environmental/sustainability parameters (Mehra et al, 2011)

However, amongst the recent explorations vide survey of the textile sector by Mehra (2011), the traditional inadequacy of data gaps for environmental analysis are appearing to be a continuing problem of the SME sector. Similar gaps regarding SME scenario and behaviour and capabilities had been identified in various other projects and studies including Waste Minimisation Circle (WMC) project undertaken by National Productivity Council (NPC) as sponsored by MoEF (http://wmc.nic.in; WMC Newsletters etc.). The scope for engaging SMEs in undertaking programmatic initiatives for obtaining sustainable development prospects and scenarios is also reflected in the literature on Eco-Industrial Parks (EIPs) related initiatives across countries (Fujita Tsuyoshi, 2009; Rene Van Berkel et. al., 2009; Yong Geng et. al, 2008). The developments regarding Eco-Industrial Parks is also reflected in ongoing efforts in India

as being undertaken currently in Gujarat, Tamil Nadu and Karnataka, especially in conjunction with eco-cities and eco-towns related developments going beyond Industrial zoning processes (Zoning Atlas of India, CPCB; Bharat Jain, GCPC, 2011). An indication of efforts on Eco-Industrial Parks related developments in various Asia Pacific countries is presented in Table 9.1 (RECP Network meeting, 2011; Bharat Jain, GCPC, 2011; Prof. Chiu, 2011). The deliberations regarding primary concerns in EIP development has been pointed out to be the development of acceptable and possibly uniform criteria to identify and classify EIPs, and this is appearing to be a fuzzy area across countries (ref. Discussions with Prof. Chiu in January 2011, Jakarta, Indonesia). Interactions on EIP explorations and potential research prospects have also been undertaken with Prof. Park of Ulsan University, South Korea in May-June 2011, and apparently this area is likely to prove a very rich area for explorations in the near future.

Table 9.1: Eco-Industrial Parks related developments outlining comparative efforts in Asia-Pacific countries including India (Bharat Jain, GCPC, 2011)

Country	**Eco Industrial Park**
China	Dalian, Tianjin, Luzhou, Yantai, Guigang, Nanhai, Shanghai Chemical Industrial Park (SCIP), Rizhao Economic Development Area (REDA)
Philippines	Laguna International Industrial Park, Light Industry & Science Park, Carmelray Industrial Park, LIMA, Laguna Technopark, Philippine National Oil Company Petrochem Industrial Park, Clean City Centre Project (USAID)
Indonesia	Lingkungan (LIK), Tangerang, Semarang, Industri Sona Maris
India	Naroda, Tirupur Textile sector, Tamil Nadu tanneries, Calcutta foundries, Tamil Nadu Paper/Sugar, Bangalore Water Project, Ankleshwar, Nandesari, Thane Belapur
Malaysia	LHT Resources Linkage
Japan	12 ecotowns (eg Kitakyushu, Itabashi), Fujisawa, Toyota city
Taiwan	Tainan Technology & Industrial Park, Changhua Coastal Industrial Park, Corporate Synergy System (CSS II) projects
Vietnam	Amata (env mgmt), Hanoi Sai Dong

Thailand	Industrial Estate Authority of Thailand plans (Map Ta Phut, Northern region, Amata Nakorn, Eastern Sea Board, Bang Poo), Samut Prakarn Province CPIE project (ADB funded), Bangkok (Panapanaan)
Sri Lanka	Ministry of Economic and Industrial Development plans

The developments of various industrial environmental management related efforts in India indicate that action on obtaining industrial sustainability related outputs and outcomes are pursued by various means. These include Green PPPs that arise from government initiated intervention programs in particular.

9.4 SMEs and attendant environmental concerns: insights on international situation regarding green behaviour for India's reference

Brio and Junquera (2003) provide a comprehensive overview of the exposition on the SME – environment activity and behavior scenario. They collate and present perspectives from significant studies across different countries under thematic components. These include : (1) SMEs' environmental strategy alternatives; (2) Determining factors of the environmental strategy in SMEs (a) Financial resources, (b) Organisational structure, (c) Management style, (d) Human resources, (e) Environmental management status, (f) Manufacturing activity, (g) Technological approach, (h) Innovative capacity, (i) External cooperation and (3) SMEs' specific environmental regulation needs.

In an overarching observation by Brio and Junquera (2003) it is indicated that SMEs are reactive when it comes to environmental response, and indeed that their determinants are external, including types of regulations of various kinds and not just to environmental regulations, such as with regard to social consciousness, to clients, suppliers and competitors etc. (citing : Azzone et.al., 1997; Azzone and Noci, 1998; Noci and Vergranti, 1999). They indicate that SMEs tend to react to external stimuli such as

green movements, governments, regulators and other companies. It is also indicated that with regard to environmental regulation they tend to adopt an escapist strategy and may enter new markets if under high environmental pressure as well (as per Brockhoff et.al. (1999)). Alternatively, they can be fatalistic and may be prepared to close shop or may be willing to face challenges when resources are made available as indicated by Berends et.al. (2000). The perspectives that SMEs ignore environmental effects of their activity, that they at best hold a compliance with legislation attitude, and have short term orientation (citing : Sroufe et.al., 2000; Azzone et.al. 1997; Remmen, 2001; Bianchi and Noci, 1998).

The focus on the limitations that SMEs face to be a cause for inadequate environmental response is especially indicated. These include suggestions that they have limited financial resources, and low level of awareness (Azzone et.al. 1997), they have a limited development situation (Remmen, 2001), have limited resources compared to large firms (Morino, 1984), have lower business profitability affecting environmental performance (Russo and Fouts, 1997), that they perceive less environmental management advantages (King and Lennox, 2000), are lacking information and management capacities (Azzone and Noci, 1998), that there is little training for environmental management amongst personnel (Bianchi and Noci, 1998). Further, they are indicated to have low intensity R&D if at all, and lack centralization of information concerning research effort that affects the performance of the firm in multiple ways (Sanchez, 1997), and that large companies who respond to environmental pressure and generate suitable innovations in this effect force SMEs to leave the market (Birnbaum, 1984; Bartel and Thomas, 1987). Other limitations highlighted regarding SMEs by Brio and Junquera while citing the literature and researchers is that SMEs have been indicated by Noci and Verganti (1999) to be having limited capacity to activate new relations with public administrations and other companies such as those providing logistics services, research laboratories, and other external organizations, and all of these issues become an obstacle to their environmental action development. It is also indicated by Pashigian (1984) that stricter regulation scenarios prevent SMEs to choose the environmental equipment most adequate to their operations.

It can be indicated that above said range of problems are also visible amongst SMEs in India and more. However, there are several strengths that SMEs behold and a reflection of these is further indicative. Brio and Junquera (2003) in reference to respective researchers collate the following positive perspectives as well regarding SME-environment responses. Noci and Verganti (1999) have suggested that an SME with high innovation capacity could successfully develop a very advanced environmental strategy. King and Lennox (2000) indicate that voluntary agreements amongst SMEs lead to environmental improvements in such companies. Greener (1997) indicate that environmental regulations also bring favorable effects as preferential treatment is received from public administrations. It is also indicated that SMEs have more capacity than large companies to adopt to changes in the environment (Sroufe et.al., 2000).

It is suggested that problems of technological complexity and issues of experience effects (Porter, 1980 and Scherer and Ross, 1990 respectively) can be overcome if SMEs are provided with resources and support and if they obtain suitable environmental consulting for example (Greener et.al. 1997), and that if a suitable post for an environmental manager is created etc leading to higher environmental response (Elkington et.al. 1991; Sadgrove, 1991).

There have been studies undertaken to understand SME behavior vis a vis environmental management pressures, related advisories and inherent strategic considerations within the connect to sustainable development ideology. Malmborg (2003; 2004) reflects on the idea that sustainable development efforts require collaborative action of several actors from various social spheres. Malmborg (2003) addresses the significance of inter-organisational networks, considerations of ecological modernization, and engagement of SMEs, in the sustainable development process, while referring to the works of various studies by Clarke and Roome (1999), Hartman et. al (1999), de Bruijn and Tukker (2002), Shearlock et al (2000), Rowe and Enticott (2000). He has provided interviews with representatives of public and private actors engaged in PPPs for sustainable development. Malmborg (2003) identifies four main conditions for regional

public/private partnerships to succeed: (1) organisational capability to participate, (2) bottom-up perspective and realistic objectives, (3) project competence and (4) mutual trust.

In another study focused on supply chain environmental management intervention, Howarth and Fredericks (2011) show that the general arrangements to seek improved environmental responses from SMEs worldwide have been from an organisational change and outside-inside intervention perspective. They indicate that it was important that SME behaviour towards responding to various environmental concerns, be analysed in an inside-outside approach (Howarth and Fredericks, 2011).

Howarth and Frederick (2011) take note of Fays's (2009) emphasis that SMEs "also account for their share of pollution, waste and other unsustainable practices". It is indicated by Netregs (2003) that SMEs have had a 'head in the sand' attitude and approach when it comes to engaging and addressing their environmental impacts. Accordingly it is suggested that the need to demand a change in SME behaviours towards seeking SME attention to environmental impacts has arisen, and that their impacts may be of particular concern to customers (Howarth and Fredericks, 2011). Howarth and Fredericks (2011) highlight the factors affecting attitude and behaviours in SMEs. This is based on the issue of sustainability and the background of how interpretations of SMEs environmental responses have been viewed. Their study primarily deals with how an interventionist approach towards SMEs gains precedence. (Revell and Blackburn, 2004; Taylor et al, 2001; Williamson and Lynch-Wood, 2001; Worthington and Patton, 2005)

The explorations by Howarth and Fredericks (2011) regarding external factors, mediating and moderating and influencing decision making amongst SME towards environmental strategies, are developed further, while reflecting on Berger et al (2001), Henningson et. al (2004) and Tilley (1999) who seek focus on supply-chain aspects that affect SME-Environment behaviour. They also acknowledge Fanshawe (2000) and Tunnessen (2000) who emphasise the mentorship role of larger enterprises to enable desirable changes amongst SMEs. The authors make an admirable effort to deeply

understand, from an inside-outside perspective, SME behaviour across various identified dimensions and over time. They develop a wider landscape for understanding SME-environment behaviour, by exploring key SME concerns for financial returns and the psychological risks involved in behaviour change. They deal with scenarios of sole responsibility, or individual accountability and the theme of shared commitment, especially, in three definable and differentiable phases. They discuss circumstances and perceptions where a reactionary and controlling situation is responded and reacted to by SMEs. They also look at an adaptive profile situation as perceived by SME managers where 'external signals for change' are understood and responded to. A third observation is the phase of proactive action by SME managers. In this phase, a new vision of their business model within the ecological realm is identified and sustainable business performance efforts are undertaken. The formulation on the above explorations by Howarth and Frederick's (2011) has been a key reference for explorations in project designs and implementation that have green public – private partnership characteristics inherent in the frameworks as well.

It is to be noted that in most studies regarding SME – Environmental activity and behavior and indeed of linkages amongst SMEs and government in socio-economic arena, the SMEs are viewed as weak entities needing support of various kinds to respond to disadvantages attributed to them. There are possibilities however to view SME and government and public administration and institutional linkages in partnership terminology that holds cooperative and collaborative action potential in strategic contexts. Such a perspective is especially explored in the context of the WMC programme as well that highlights the features and significance of green PPPs addressing SMEs. It can be especially observed that the focus on resource efficiency in industrial production has been driving the institutional responses to facilitate greening of industry, while putting in sustainable development efforts as various forms of Green PPPs through direct/indirect and nested partnership arrangements. These can be seen, for example, as focused on encouraging uptake and adoption by industry of various Environmentally Sound Technologies (ESTs), or application of various resource efficiency toolkits such as Promoting Resource Efficiency in SMEs (PRE-SME) toolkit, Cleaner Production (CP)

Toolkit, safer production toolkits, or promotion of chemical leasing programs etc. (Luken and Rompaey, 2007; PRE SME Toolkit by UNEP and UNIDO, 2009; CP Toolkit by UNIDO and UNEP, 2010; Safer Production Toolkit by UNEP, 2009; www.chemicalleasing.com accessed 3 March 2011). The efforts to enable a global spread of resource efficiency and cleaner production programs, or strategies for chemical management and safety measures in industrial production that lead to shaping varieties of Green PPPs, are especially identifiable by the concerted effort of international institutions and organizations such as UNIDO, UNEP, ILO, gtz/GIZ.. An example of one such major effort is the spread of the development of National Cleaner Production Centres (NCPC) in various countries including the NCPC established in India (CP Toolkit, UNIDO 2010). Indeed there are a larger variety of institutional and public sector linkages with SMEs that tend to facilitate improved environmental response and behaviour and these can be viewed in partnership frameworks and suitable typologies accordingly delineated as well.

It can be added here that the study by the Central Pollution Control Board and IIT Delhi (year 2009), identifying highly-polluted industrial zones of India and listing over 60 such areas that may need substantive corrective initiatives, highlights the continuing problem of industrial pollution and industrial environmental management. The studies by various organizations and institutions, by officials, scientists, NGOs and consultants-- with their focus on cluster-oriented or regional pollution issues, industrial sector problems, and unacceptable contamination of air, water and land-- have been adding to the urgency for corrective actions. Consequently, local and national initiatives are being adopted. Projects and program designs involve public institutions and agencies. Several of these initiatives have essentially taken the form of ‘Green PPPs addressing SMEs’. These efforts have also presented a variety of Green PPP for SME-related models within a larger framework of public service delivery.

10.0 Future Plan / Activities

The future plan and activities beyond phase III of the project is being informed by the observations that have been made and emerged from the WMC programme implemented so far and from the emerging global scenario of pro-activity in industry (Small / Medium / Large) towards environmental and corporate responsibility, and from the perspectives on how clusters have evolved and need to be addressed in future.

10.1 The internationally acclaimed cluster development ideology and mechanics – and the need to go beyond

SME cluster development aspects have been insightfully presented in the context of Italy and Latin America and other advanced and developing countries by Parilli (2007). He provides a dynamic view of the field and highlights the themes such as inclusion versus fragmentation scenarios, and different theoretical approaches to SME cluster development. He presents the underlying precepts and features of (a) spontaneous approach to SME development, (b) policy inducement approach, (c) the social approach and its sub-component elements in highlighting the strengths and weaknesses involved. A very significant insight is provided regarding the stages model and eclectic approach to industrial district development. He highlights that the stages model may not be applicable to all cluster development processes but is a useful reference to have for planners to compare with regarding clusters in their respective regional/country contexts. The stages highlighted regarding Italian industrial districts are : (1) The passage from rural life to artisanal clusters (1920s – early 1950s), (2) the passage from craft production to industrial concentration (1950s – 1960s), (c) the passage from industrial concentration to industrial districts (1960s – 1980s) and (d) The passage from traditional IDs to new competitive IDs and describes the internal dynamics ad features within them. He also indicates two policy keys (i) the importance of upgrading through stages – leading to capacity building on multiple frontiers and the assimilation for next phase action etc (ii)

and the relevance of an eclectic approach depending on specific contexts and special dynamics in any industrial region. The empirical explorations of survival clusters and other insightful deliberations provides an in-depth understanding of strengths and weaknesses in policy blending for SME advancement and regarding issues of collective efficiency, social embeddedness and policy inducement issues and their appropriate management such as to ensure cluster potentials are realized through their progress via desirable trajectories.

The insights provided by Haar and Meyer-Stamer (2008) regarding daunting tasks faced by SMEs in the new global economy adds to the overview of SME scenarios. They highlight the lessons in the collation of articles presented in the book as (a) local economic development matters greatly, (b) Financial access remains a major challenge for SMEs, especially in developing countries, (c) SMEs can facilitate but cannot solve the development problems of low income sectors, (d) Innovativeness and entrepreneurial orientation are necessary for success, (e) The lack of policy clarity and SME's lack of knowledge of government assistance programmes remain impediments, (f) As clusters are becoming more diversified, medium size firms are increasing their competitiveness, (g) SMEs are increasingly globalizing but it is unclear that government assistance agencies are effective, (h) Public support of SMEs is not only helpful but often indispensable, especially in poorer economies, (i) addressing infrastructure needs is a pre-requisite for success.

10.2 The acknowledgment of Indian MSME pro-activity and envisioning MSME leadership in the green economy space – Scoping policy and programmatic action ahead

It can be further indicative and reasoned that SMEs of own accord and particularly in partnership with government and institutions tend to create a variety of pro-active initiatives as well as create reforms oriented impulses in different directions as has been observed, perceived and being explored during field work during the WMC project

undertaken. The visible features have included those differentiable from Large firms affecting small firm behaviour ideology but rather in reversible contexts. The theme of public leverage based aid and handouts and supportive features aside, the reversal of roles where SMEs strengthen institutions and their legitimacies and of the governments hand for their undertaking advancing of developmental activities and international engagements have also been found and deliberated further as an interesting feature of dynamic partnerships amongst public and private enterprises. The impacts spreading across institutional system and large enterprises promises new initiatives and exploratory research work as well. There is also visible a genuine shortage of strategic management consultants who could cater to SME needs and contribute to their internationalisation and globalisation efforts, and such gaps amongst various gaps identified as per literature on the subject which could be addressed by public – private partnerships amongst institutions and SMEs, and these ideas are key thematic elements underlying the project work undertaken and potential future programmatic action and research prospects.

Indeed the insights obtained from the project work on MSME pro-activity as visible in broader context can be taken forward as key underlying themes that could inform a future phase of the WMC project / programme.

10.2.1 The emergent Pro-Activity Principles for MSMEs towards Sustainable Development

In respect of India a recent article as a chapter by Keshab Das (2008) in Haar and Meyer-Stamer (2008) presents the scenario of Indian small firms under globalization with insights on whether policy initiatives helped the sector. It is indicated in no uncertain terms that many policy initiatives have failed or failing to address real problems of SSIs

and MSMEs in India. Whether provision of credit and finance, infrastructure, labour productivity enhancement measures, or others. He has lamented the tendency to present clearly erroneous and inflated data as well by the concerned departments looking into the statistics regarding this sector for policy making, and the perpetuation of errors on various fronts including in terms of assessment of growth, contribution to GDP and exports and to employment generation has been a constraint in taking corrective actions. The changing definitions of SSIs since 1980 is reflected upon and how it privileged finance and credit to go to larger units is highlighted. Even the performance of export oriented units have been found to be inadequate besides other exports clubbed in from SSIs, considering the year on year fluctuations including negative annual growth rates since 1991 as well. Also that product group in exports has also remained the same except a minor addition of electronic and computer software products. The persisting sickness and reservation of goods to be manufactured having been amiss as well, and problems of the sector have festered. Keshab Das (2008) indicates even the cluster development programs initiated with UNIDO support since 1998 have been unable to understand and address the functional dynamics of Indian clusters and the socio-economic and legal contexts, and informs that amongst the over 2400 clusters (including 2000 rural and artisan based) technological dynamism has been constrained as these have been rooted in regional constraints. He indicates the spatiality and regional development perspective have to be addressed in developing SSIs in India.

In the above backdrop it behooves upon the MSME sector, institutions and organizations engaged with the Micro Small and Medium Enterprises (MSMEs) framework to also highlight not only the vast range of principled initiatives that were taken by the sector, but also to help codify the range and nature of principles and responsibilities that are futuristic in thought and action. These for highlighting the nature of guided deeds and action to follow with greater vigour and purpose, especially as the inclusive growth and green economy ideology deepens and sustainable development perspectives acknowledge green transformations and their mainstreaming

and scaling up as arriving from stakeholders which need to be construed in the multidimensional evolving scenario at large.

Accordingly NCPC India and NPC India (Environment Group) proposes based on the vast experience of working with the MSME sector (manufacturing and consulting domains), in advisory and consulting and partnership capacities, some of the deeper observations made on principles of action that evolved (and those emerging and evolving) in the MSME sector. In this regard taking cognizance of the trends and indeed of the prospective future framework actions that are likely to arise and which can be further highlighted as potential range of pro-activity principles arising from the MSME-institutional partnerships with guidelines to develop for the consideration of the socio-economic system and human organizational progress in inclusive and fundamentally grass roots driven developmental pathways as deliberated here. It is indicative that the National Voluntary Guidelines that have been codified largely for the corporate sector in India serves as a good reference point as enumerated below before reflecting on MSME pro-activity principles that would especially inform future WMC project and resource conservation initiatives for MSME sector.

10.2.2 The principles and core elements enshrined in the National Voluntary Guidelines on Social, Environmental & Economic Responsibilities of Business (2011) for reference:-

Principle 1 : Businesses should conduct and govern themselves with Ethics, Transparency and Accountability

Principle 2 : Businesses should provide goods and services that are safe and contribute to sustainability throughout their life cycle

Principle 3 : Business should promote the well being of all employees

Principle 4 : Businesses should respect the interests of, and be responsive towards all stakeholders, especially those who are disadvantaged, vulnerable and marginalized

Principle 5 : Business should respect and promote human rights

Principle 6 : Business should respect, protect, and make efforts to restore the environment

Principle 7 : Businesses, when engaged in influencing public and regulatory policy, should do so in a responsible manner

Principle 8 : Business should support inclusive growth and equitable development

Principle 9 : Business should engage with and provide value to their customers and consumers in a responsible manner

10.2.3 The MSME Pro-Activity principles towards sustainable development that may be viewed as a proposition to complement the NVGs outlined for Businesses as enumerated above

A set of 20 MSME pro-activity principles being propositioned for informing future WMC programme / policy action are :-

Principle (a) : MSMEs shall engage in piloting of technology convergence action

MSMEs shall pro-actively invite research institutions to contribute to grounded research action and convergent initiatives for technology commercialization and upgradation,

and ecological modernization initiatives via technology fertilization through technology convergence and technology migration action.

Principle (b) : The MSME sector shall commit to the development of middle management to strengthen growth dynamics

MSMEs shall pro-actively develop middle management for the sub-sectors to enable mass employment generation while facilitating demographic dividends in the country and accordingly strengthening professionalism and capacity to modernize the said sectors that would help expand the base and shape newer foundations for marching towards transformational frontiers

Principle (c) : The MSMEs (manufacturing and consulting) shall participate actively in consortiums towards improved natural resources management

The MSME sector shall display willingness to participate in all natural resource management initiatives (as part of consortiums and in association with institutions where needed) such as to strengthen the economic basis of the country alongside the reworking of productive and distributive efficiencies in the economy

Principle (d) : The Micro Small and Medium Enterprises shall shape entrepreneurial vision beyond national boundaries

MSMEs shall seek to reshape and improve entrepreneurial vision and capabilities by focused outward internationalization initiatives (beyond the export markets and access ideologies) and be willing to setup manufacturing and consulting bases in new shores and further take action beyond collaborations to potentially re-energise and revitalize

and transform foreign firms as well in various countries that may be needing such support and intervention from Indian Micro, Small and Medium enterprises

Principle (e) : The said sectoral leaderships and associations shall address and overcome inclusion – exclusion difficulties in programmatic action designed and developed for and by MSMEs

MSMEs shall take collective action to higher levels of benchmarks and enable proactive inclusiveness in firm by firm participation in national initiatives amongst the members which would include engaging in institutionalized programs that would highlight the equitable formats

Principle (f) : MSMEs shall steer multi-stakeholder policy action by innovatively and comprehensively engaging with larger corporations and civil society

It would be the added responsibility of MSMEs to be willing to acquire stakes in larger corporates in India and abroad (in individual and collective capacities), such as to ensure reformist voices from all regions and stakeholders and glocal communities are made to be heard and adhered to in apex forums (national, bilateral, and multilateral), such that suitable outcomes are realized from the policy actionables so developed here and agreed upon and accordingly for the quality of national and international entrepreneurship to achieve higher benchmarks in the eyes of national and international communities and stakeholders.

Principle (g) : The sector shall contribute to industrial policy development related legislative action

MSMEs shall seek to collectively contribute to or participate in the development of suitable legislations and legislative activity via the agency of policy entrepreneurship and policy intrapreneuship facilitated by private and public institutions and related departmental entities and systems

Principle (h) : The MSME sector shall strive to facilitate overcoming various market failures and promote fair trade practices

The responsibility of taking forward and enabling newer positive frontiers in the discipline of business services is another major arena for MSME action to emerge. In this regard MSMEs shall endeavour to facilitate overcoming of market failures such as in respect of services rendered by Chartered Accountancy and various financial services, legal services provisioning and also of technology provisioning agencies etc., such that ethical and transparent business services delivery is ensured and financially productive outcomes achieved amongst participants to the services and beyond.

Principle (i) : The MSMEs shall be highly active in facilitation of employee actualization and achievement of advancements and realization of aspirations of its teams and personnel

MSMEs owe it to their employees and society that they take appropriate risks and grow larger via active response to socio-economic change (and thus not stagnate), such as to provide best growth for their employees and further meet aspirational expectations of all stakeholders via suitably redesigned redistributive value sharing practices that are acknowledged by all businesses and institutional entities

Principle (j) : MSMEs shall strive to go beyond existing green industry norms and set higher standards towards sustainable development focus and lead the inter-generational equity movement ahead

MSMEs to not only adopt advanced green practices and green factories' norms (such as multi-storeyed factory investments) but also to contribute to additional ways in advancing industrial land productivity via pro-active employment creation for any residually displaced communities that may be affected by larger scale land acquisitions for industrial development activities. In this respect MSMEs to actively partner with large scale industry sector and national and international institutions in setting higher standards, norms and practices that internalize and lead to practice of larger public interest.

Principle (k) : MSMEs shall strive for factor reduction in resource use and application

MSMEs to strive for factor reductions as per Weizsacker (2009-10) individually and collectively and include the achievements as part of environmental disclosures

Principle (l) : Contribute to and adopt IT applications for MSMEs

MSMEs to develop IT infrastructure collectively or in consultation with large scale units and IT firms and institutions engaged in IT services such as to develop applicable and effective MSME Enterprise Resource Management software and application for improved firm management processes that may enable reflections on resource productivity assessments in aggregate basis from the sample reference structures so developed.

Principle (m) : Professionalise and contribute to development finance and Tobin funds

MSMEs to encourage application of Tobin Tax or Tobin type Tax on financial transactions that occur on stock exchanges which reflect capitalization and performance metrics of key economic

entities in countries, such that there is continuous stream of development finance support including for social, economic and environmental responsibilities achievement support and also for building sovereign funds that may enable outward internationalization of India and its economic entities.

Principle (n) : Focus on enhancing entrepreneurial performance

MSMEs to continuously strive for enhancing and improving entrepreneurship quality in India in multi-dimensional ways as may be a dynamic feature to strengthen the basis of regional and national economic growth and development, including in the domain of shaping advanced initiatives in social entrepreneurship, besides also in the arena of venture capital productivity enhancement frameworks

Principle (o) : Demand improved public and private systems

MSMEs may be amongst front runners in demand creation for higher quality of services from public system and in value chains across enterprises. This shall become a reflection of improving indices regarding Indian governance architecture and socio-economic parameters vis a vis the world statistics and measurements being undertaken and those that may evolve further ahead as economies modernise

Principle (p) : Strengthen institutional services

MSMEs may actively extend institutional capacities to educate and apprise consumers of consumer rights such as to ensure demand creation for sustainability initiatives, including towards seeking eco-friendly products development and production and provisioning, addressing of life cycle costing and promoting life cycle thinking for strengthening green procurement practices

Principle (q) : Engage in, support / adapt and lead fair trade practices

MSMEs may take the lead in the process of enabling fair trade practices and balance the import and export processes with cognizance of the principles of comparative advantage amongst nations and economies. In this respect exploration of trade relationships with economies that have been traditionally marginal trade partners so as to strengthen the trade balances in evolving goods and services markets context, and also in achieving a greater balance between indigenisation vis a vis import content in products

Principle (r) : Usher green growth and green economy

MSMEs to strive to lead the ushering of the green economy in India and in facilitating the large scale units as well in such initiatives and processes in this regard. In such an evolving effort the MSMEs may offer respective firms and units for evaluation and monitoring such as to enable identification of strengths in MSME domain, and improving prospects of practices also in the large scale sector through collectively addressing gaps in achieving closed loop systems and balance in public-private goods cycles that are embedded in the institutional matrix.

Principle (s) Engage in knowledge creation

MSMEs to engage with the process of creation of new knowledge proactively and strive to be born global enterprises and potentially transformable into green global corporations that lead green technology applications into other countries and economies and be harbingers of highly responsible corporations of the future that could also turn around stagnating and ailing companies in other countries and be amongst the employment generators and life long learning organizations and accordingly bringing global acclaim to Indian enterprise

Principle (t) : Strengthen civil society initiatives

MSMEs shall proactively engage with civil society to facilitate effective quasi public and quasi private actions and activities that seek to effectively bridge citizen gaps in economic activity that

may be found and need to be overcome with community action and deliberative democratic principles in practice such that a balance in regional development is achieved and active balanced citizen participation across all sections of society so enabled. In the process also foster improved MSME institutional responsibility and reversible Institutional MSME responsibility in newer dimensions as well via the agency of entrepreneurship and intrapreneurship of higher quality across domains.

10.3 Scope for additional WMCs with new program structure and content with new paradigm and framework

In addressing above principles and more and in essence the vision being presented for the SME world towards transformation into green global corporations as Indian SMEs are better embedded in the international context, a new programmatic paradigm is needed to be developed and implemented. This paradigm ought to transcend the intensive and extensive and long term focus that has occurred so far in terms of cluster development paradigm of SME development based on the theories of agglomeration / specialization / concentration and externalities and economies that were defining shifts in clusters. It can be referred here that the Italian construction of how clusters arise and develop and evolve, and how such constructs have been a focal theme of industrial development in developing countries as well have to be revisited and reviewed. These perspectives can be complemented with a new range of programmatic initiatives that also reflect the new realities becoming visible pertaining to MSME pro-activity and take cognizance of alternative pathways of industrial development processes in substance.

In this context what the above principles and vision elements are indicative of needs the construction of alternative paradigm structures of development, one of which can be considered to be the scope for shaping value chain development frameworks via value chain development programmes as differentiable from and in addition to and in

conjunction with cluster development programmes. There is thus scope for reaching out to more clusters and value chains including focusing on multi-sector linkages via tier wise and concentric circle oriented resource conservation initiatives. It is indicative, in view of the large mass of active clusters in India that we need to reach more sectoral arrangements via projects such as WMC (in addition to the Lean manufacturing project underway as being spearheaded by Ministry of Micro, Small and Medium Enterprises). Thus, WMC project could be considered for extension to a new phase by establishing 350 more WMCs which could be designed with keeping in mind MSME pro-activity principles enumerated above, and with structures including more institutional partners and stakeholders and also engagement of productivity volunteers in the framework for micro-level interventions.

As an indicative set, a few sectors that may be further included in the ambit of a new phase of the WMC project could be the following.

1. Plaster of Paris manufacturing
2. Cashew nut processing / manufacture (eastern and southern India)
3. Mini steel plants (medium scale units) (eastern region – Jharkhand / Bihar etc)
3. Gums and resins processing / manufacture
4. Construction / Infrastructure sector hardware units (e.g. plumbing items manufacture; pipes and steel tubes production etc)
5. Ginning and pressing units
6. Construction material Grinding units (e.g. for soapstone; china clay processing etc)
7. Groups of Small / Medium scale Hospitals and clinics
8. Small Husk based and other electricity power generation units (thermal power and Non-Conventional / Renewable energy based)
9. Corrugated box manufacturing units
10. Fish processing sector
12. Tyre retreading units

13. Automobile workshops / service stations etc.

14. Auto / Machine components manufacturing / finishing units (e.g. ancillaries to large scale units; PSUs etc)

15. Coffee processing

16. Rubber footwear manufacturing

17. Edible flour making (e.g. Dal mills)

18. Fertilizer – for example single super phosphate

19. Medium scale cement manufacturing units

20. Sugar manufacturing

21. Light / incandescent / other - bulb manufacturing

22. Plastics – HDPE woven sacks manufacturing and other engineered plastics etc.

23. Wire drawing industries (e.g. Copper wire drawing units)

24. Composite materials manufacturing units

25. Hot mix plants

26. Waste oil recycling units etc.

It must be emphasized here that for an extension and new phase (possibly for establishing 350 more WMCs) the WMC project framework would need to enhance the role of the WMC facilitating partners as well those of institutions and public system. The WMC facilitators may need to build the information base regarding WMC units' operations and cut down on time utilizable for stages of activities that would be developed accordingly for implementation of various WM / CP techniques and priority solutions for productivity gains. This, as part of improved methodology that would be conceived for performance based activity and related payment schedules for desired outputs and outcomes. The need for encouraging Enterprise Resource Planning (and linking to larger national resource productivity goals) in MSME sector and IT applications

for the same, and for various technology upgradation activities that would be identified will further require separate funding mechanisms as well.

The futuristic WMC programme must therefore meet the emergent new realities as MSMEs seek to take lead in ushering green economy and be especially further facilitated and strengthened in that resolve with a focus on geographically balanced sustainable development action. The Ministry of Environment and Forests and the Ministry of Micro Small and Medium Enterprises and the Ministry of Commerce and Industry (Deptt. of Industrial Policy and Promotion) along with National Productivity Council and National Cleaner Production Centre with Environment Group of NPC India have thus significant roles ahead to give shape to new industrial development paradigms. This, in association with the range of stakeholders that have their tasks cut out for enabling India to be on a firmer footing on the green growth pathway amongst the comity of nations.

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