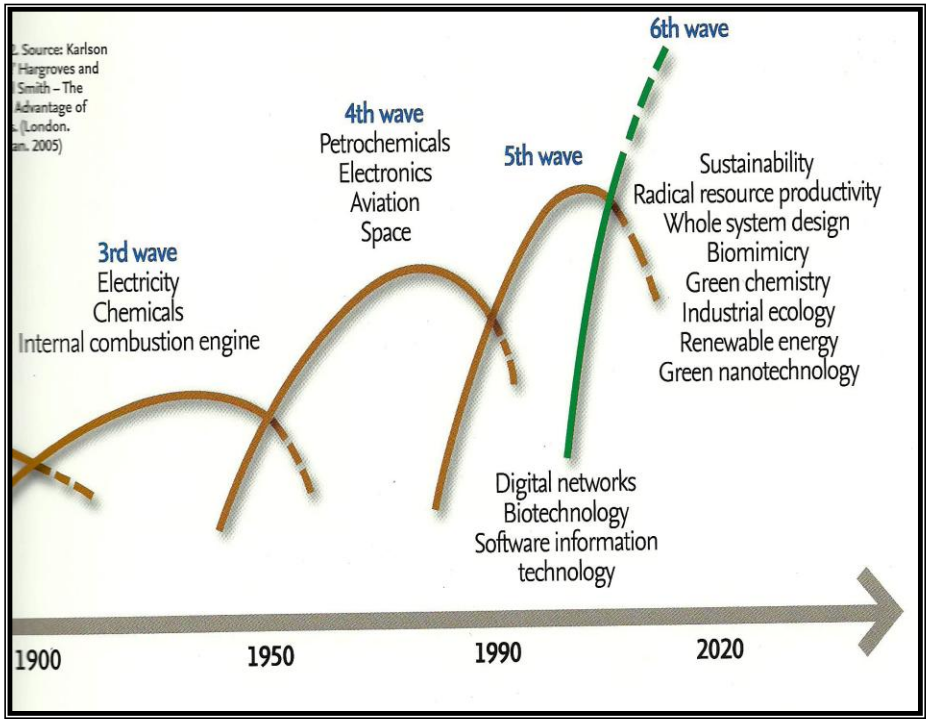
Towards Closing the Loop via Sustainable Industrial Development : A visit to mechanics, features and institutional stewardship



Environmental Focus : The Kondratiev Cycles and emergence of the 6th wave – The eco-innovation wave (ref. Von Weizsacker, 2009)

Harsh Thukral, NCPC / NPC : 11 Oct 2012

Industrial Symbiosis initiatives (A. Agarwal and P. Strachan (2006))

(a) **Green Twinning** *(single material and/or energy exchange); (b)* **Greenfield Eco-industrial Development** *(geographically confined space) ; (c)* **Brownfield Eco-industrial Development** *(geographically confined space) ; (d)* **Eco-industrial Network** *(no strict requirement of geographical proximity) ; (e)* **Virtual Eco-industrial Network** *(networks spread in large areas e.g. regional network) ; (f)* **Networked Eco-industrial System** *(macro level developments with links across regions)*

Eco-Industrial Development [Research Triangle Institute (2001)]

(1) ***a single by-product exchange pattern or network of exchanges;*** *(2)* ***a recycling business cluster (****e.g., resource recovery, recycling companies); (3)* ***a collection of environmental technology companies;*** *(4)* ***a collection of companies making "green" products;*** *(5)* ***an industrial park designed around a single environmental theme*** *(i.e., a solar energy-driven park); (6)* ***a park with environmentally friendly infrastructure or construction;*** *and (7)* ***a mixed use development*** *(i.e., industrial, commercial, and residential)*

Industry as the front runner and benchmark setter : A core expectation !!

Global and Asian Used Resource Extraction (1985 – 2005) [Biomass + Minerals + Fossil Fuels + Metal ores] Source : Dittrich 2010

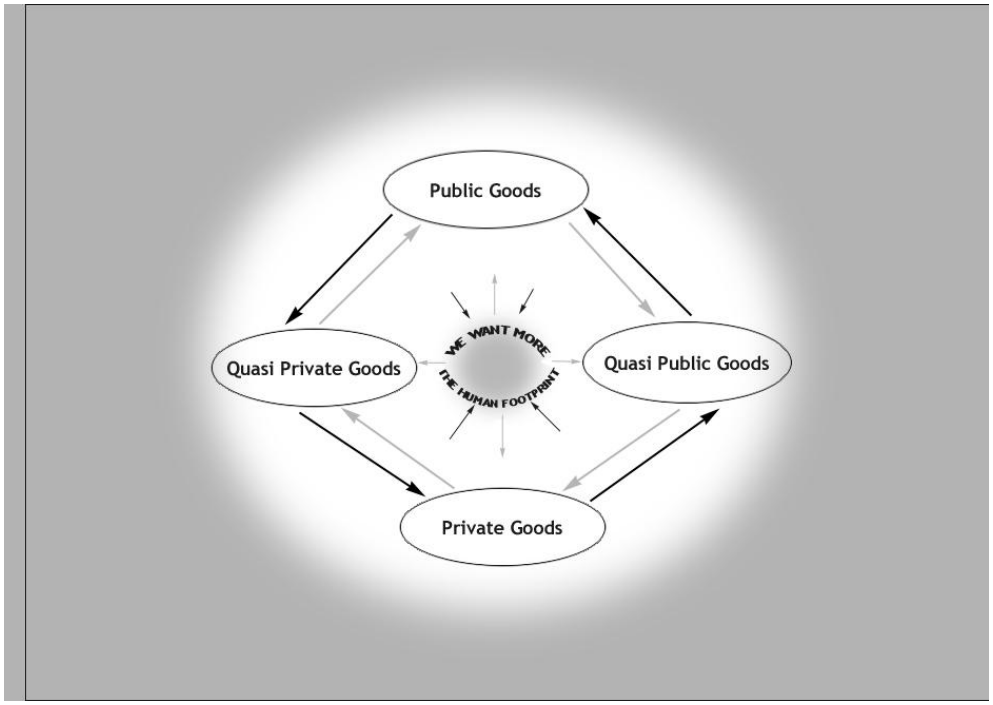
	Global extraction Billion tons	**Global extraction 1985=100**	**Asian extraction (19 countries) Billion tons**	**Asian Extraction (19 countries) 1985=100**	**Share of 19 countries in Global extraction**
1985	40.9	100	9.0	100	22.1%
1995	46.7	114	13.0	144	27.8%
2005	57.5	140	17.8	197	31.0%

Shares of countries in Asian material consumption in % [1985-2005] (Balance % by other 16 countries)

	China	**Japan**	**India**
1985	33	19	20
1995	39	15	19
2005	44	11	17

An intuitive Generalised Public – Private Goods Cycle : The other inherently underlying loop at work

The institutional matrix – moderating externalities (+/-)



Signifying institutional participation towards facilitating green economy and green growth. Invocations of CIR / ICR / IIR towards green values generation, transmission and response.

Closed Loop Systems seek to address and rework

(a) Mass / Material / Heat / Energy / Value / Information etc., transfers and stocks and flows management

(b) Instrumentalisation and Calibration (including market based instruments, metric designs & norms, disclosure benchmarks and self regulation achievements cognition

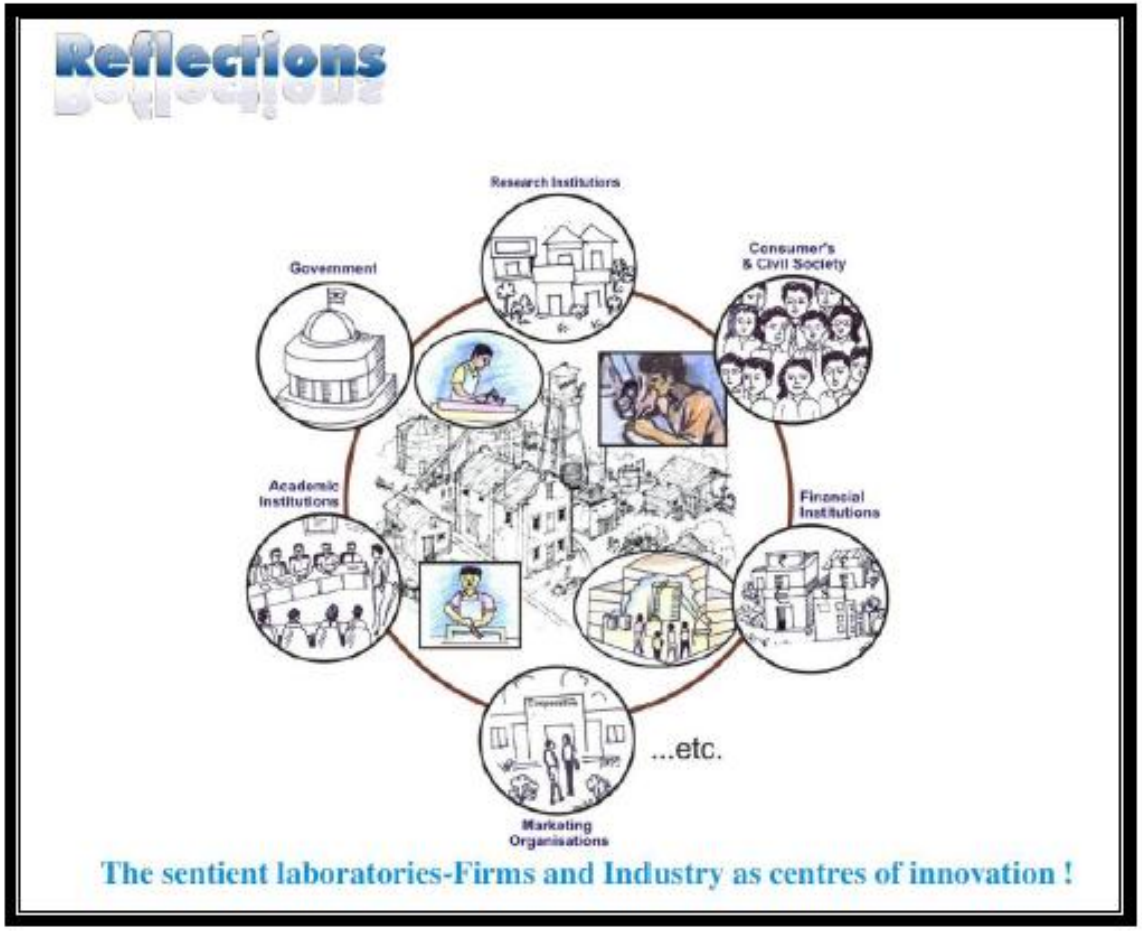
(c) Structuring of integration (forward / backward and supply and demand balance) including filling gaps such as regarding green procurement and initiatives for ecological response

(d) Accounting +ve / -ve Externalities (including waste management, waste recoveries, recycling and ecological restoration initiatives) etc.

In essence revisiting and redesigning the 'Responsibility Terrain' towards stakeholders, social issues, environmental perspectives and more …

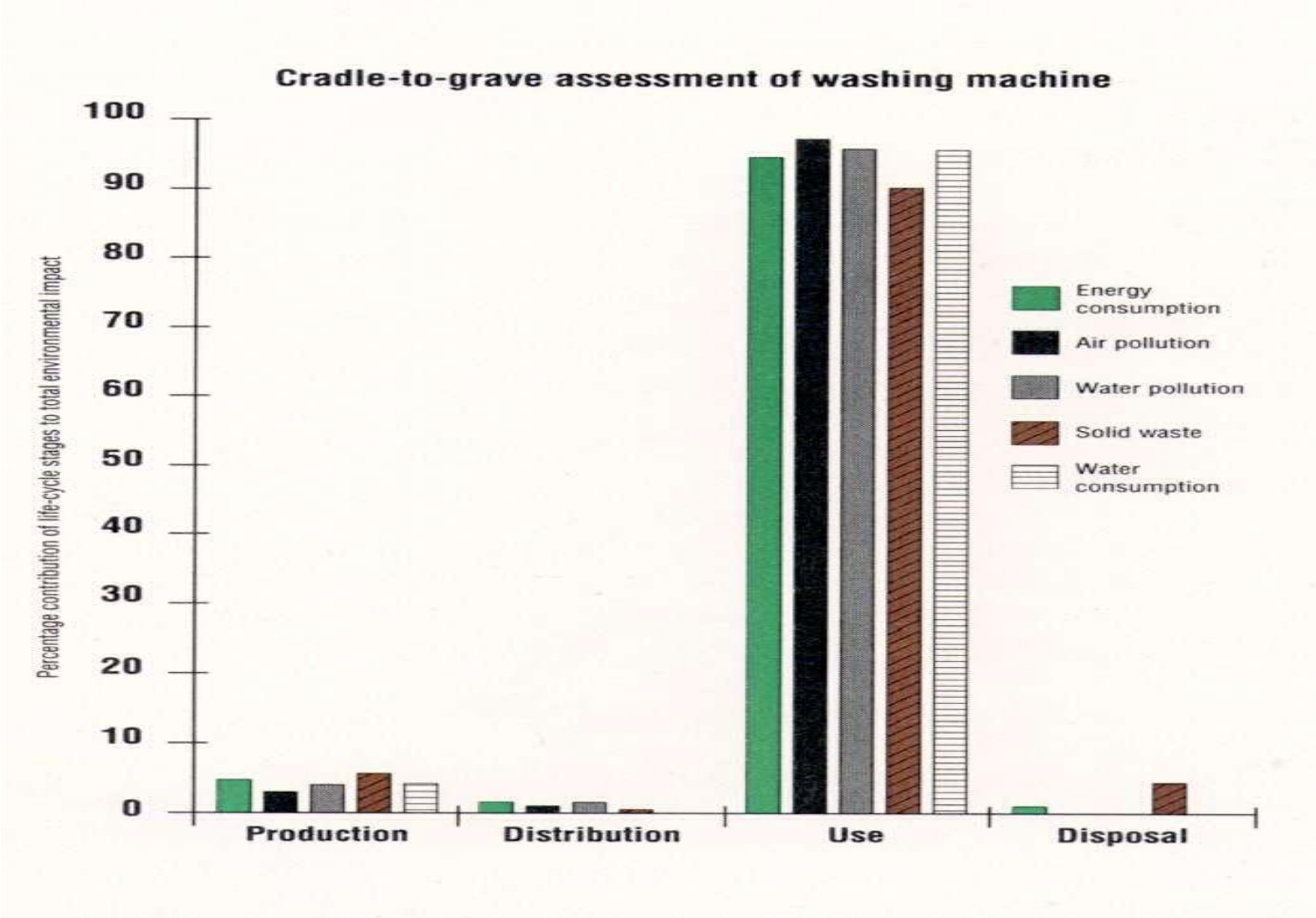
An institutional engagement with industry perspective

(Star / hexagonal loop elements)

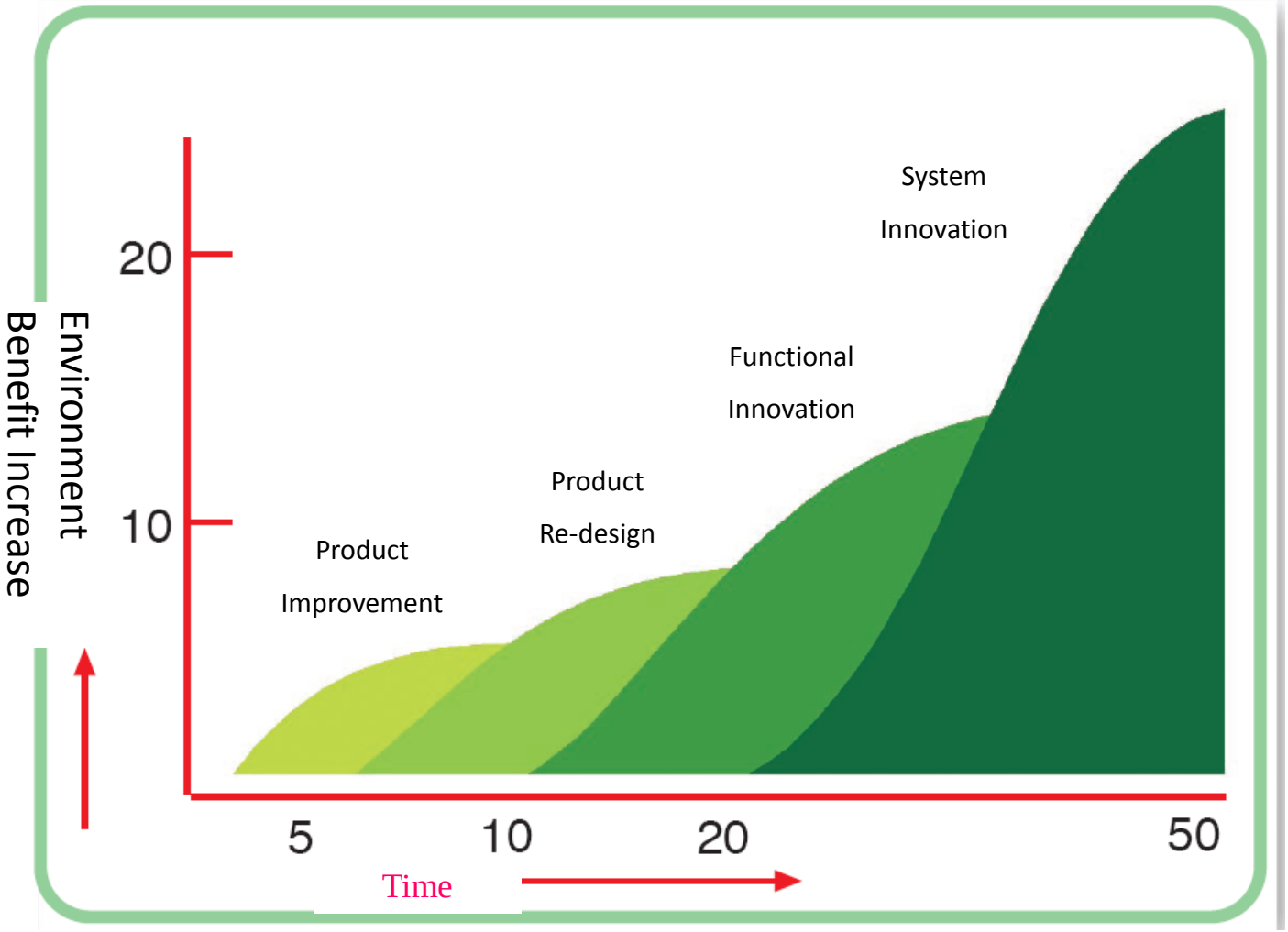


Leading further to the focus / encouragement of Life Cycle Thinking / Design and factor frameworks !

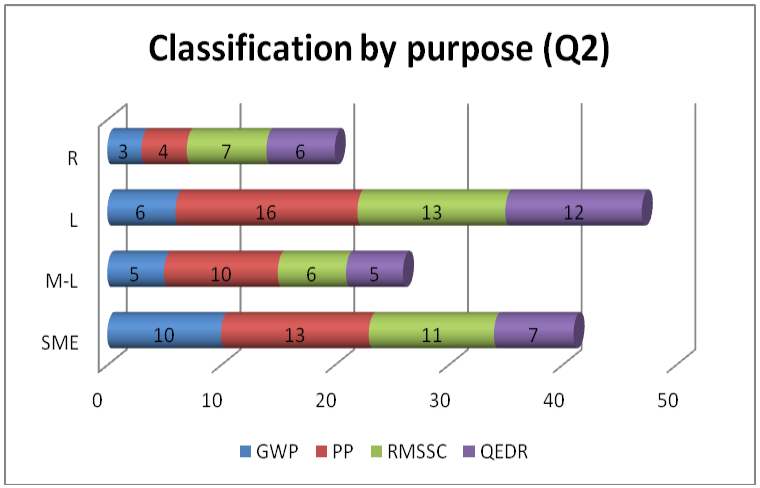
Life Cycle Analysis – An Example Scenario

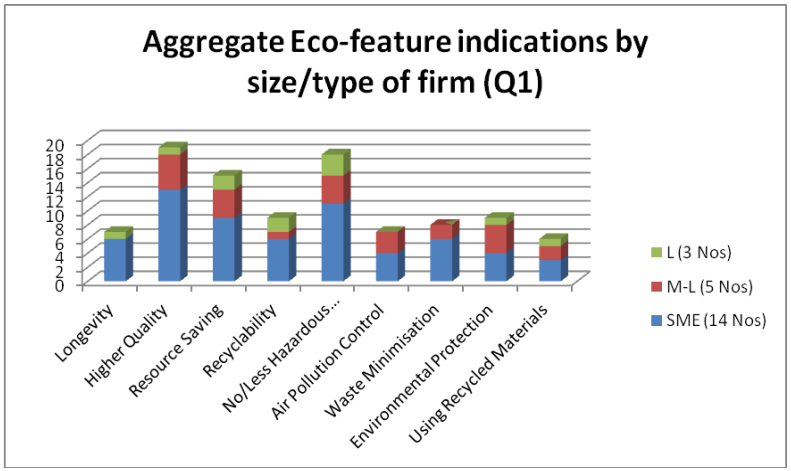


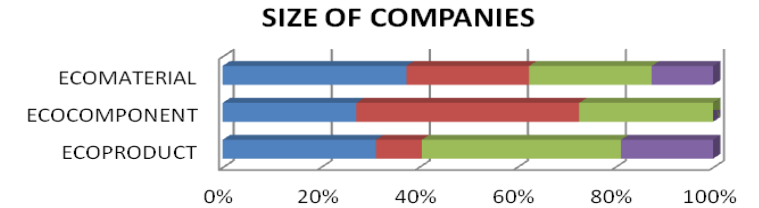
Improvement in Eco-efficiency



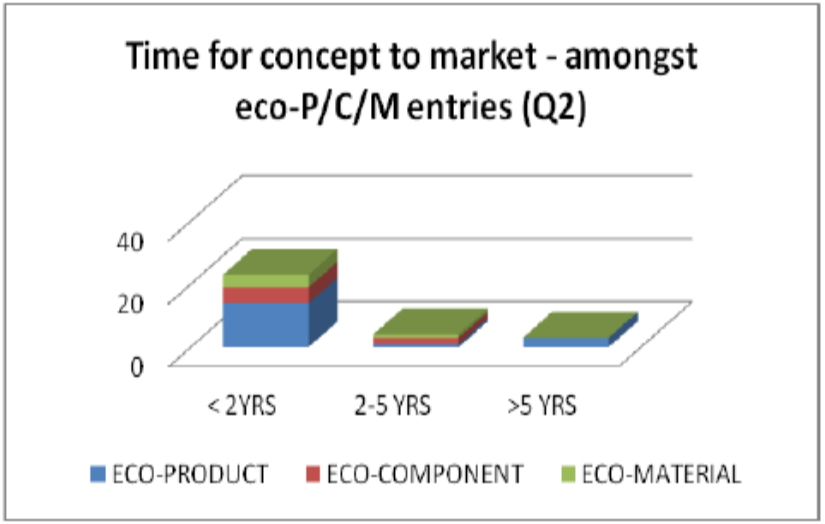
Indicative nature of Eco-P/C/M variety and firm sizes for Indian EPD (evolving) from Questionnaire-1 and Questionnaire - 2 responses





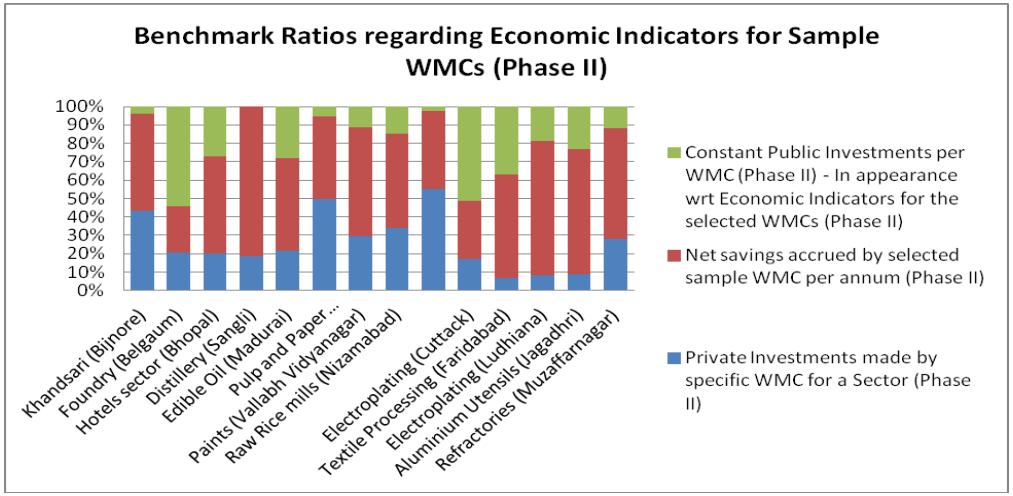


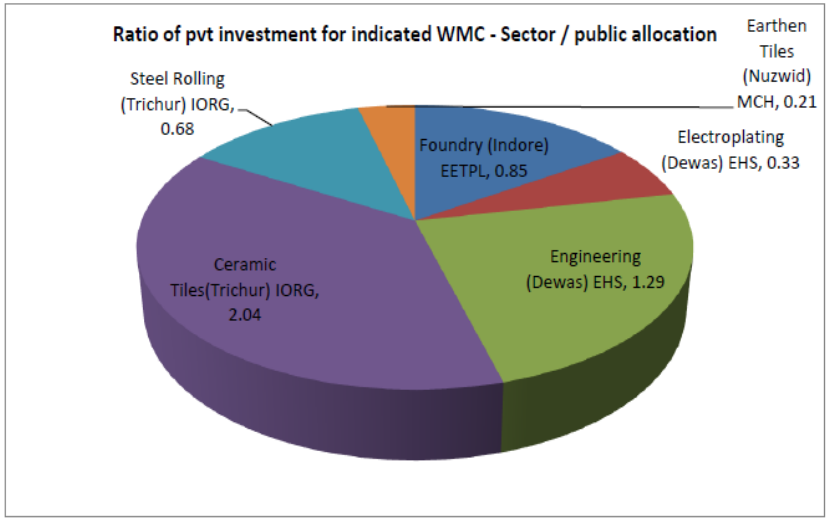
	ECOPRODUCT	ECOCOMPONENT	ECOMATERIAL
SME	10	3	3
M-L	3	5	2
L	13	3	2
R	6	0	1

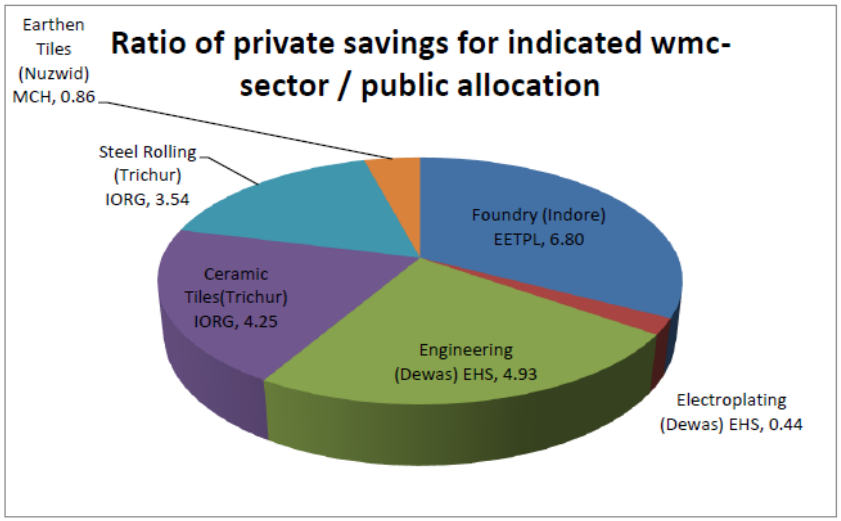


An indicative perspective on financial productivity features regarding public funds application per WMC in Phases II and III

(Sample set of WMCs)







Questions the institutions do ask of themselves while seeking insights on action from front runners (the industry) on the stewardship trail !

(a) What institutional innovations ? What roles and partnerships to engage in / enjoin ? What contributions to make ?

(b) What eco-metrics to facilitate and evaluations to set, for example identifying EIPs and setting evolutionary metrics ?

(c) What responsibilities to obtain and what to deliver ?

(d) What challenges, especially towards realising effective closed loop systems to address ?

(e) What technological / ecological modernisation trajectories to facilitate and to sustain ?

(f) How / When / Where etc … on above and more issues …. to enable achievement of balance in the multi-dimensional expectations framework amongst stakeholders (within and beyond closed loop boundaries) ?

Conclusions

- The benefits that eco-industrial development provides can serve as driving forces for companies to improve environmental performance in terms of management of materials, energy and waste and encourage communities to invest in concepts incorporating this approach to industrial development.

- An integrated approach containing key elements, such as policies & regulations, economic instruments, information system and capacity building, and choice of mechanisms enable closing of the loop and achieving sustainable industrial development.
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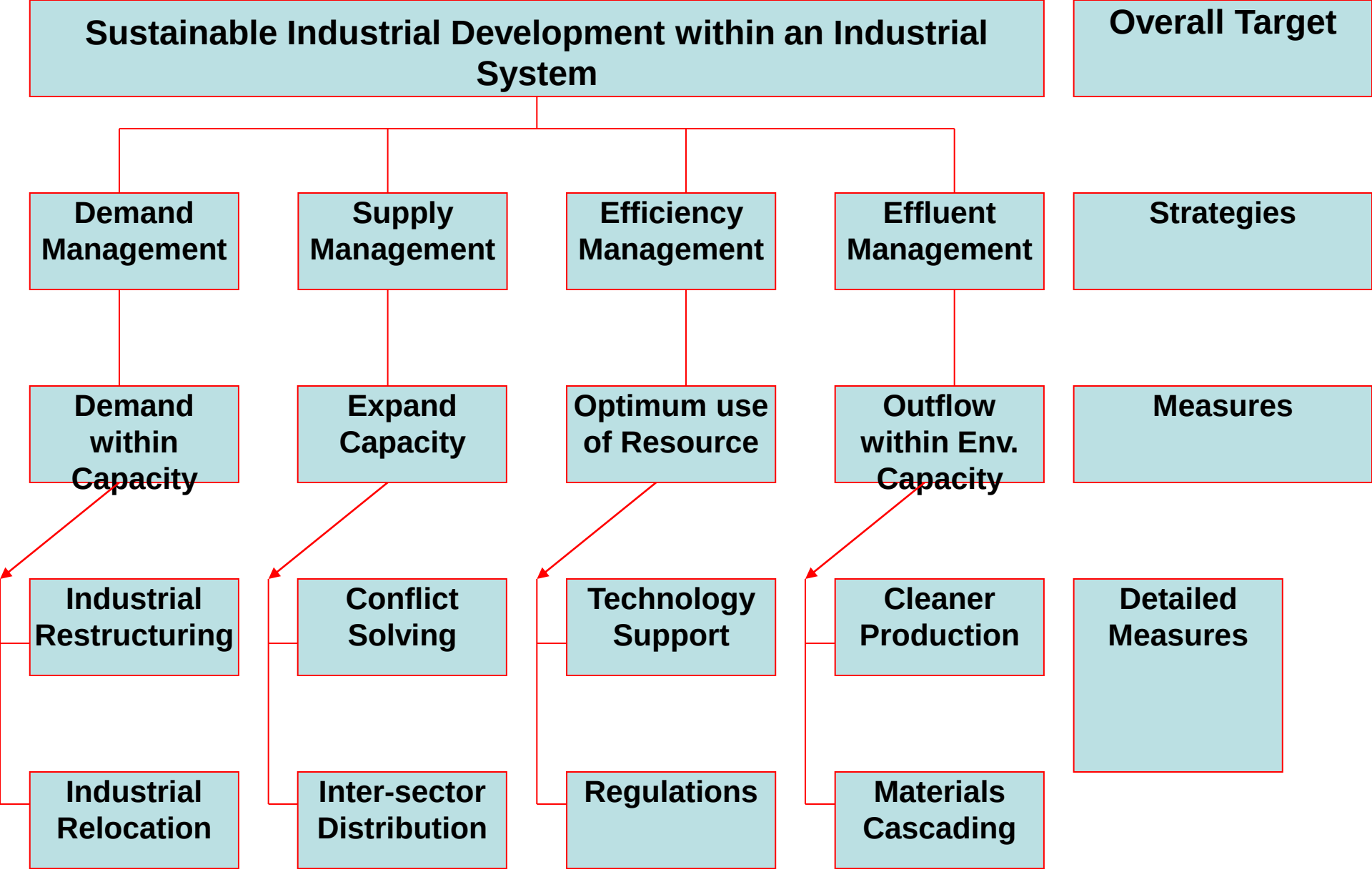
- *The significant problems we face today cannot be solved at the same level of thinking we were at when we created them*

- Albert Einstein

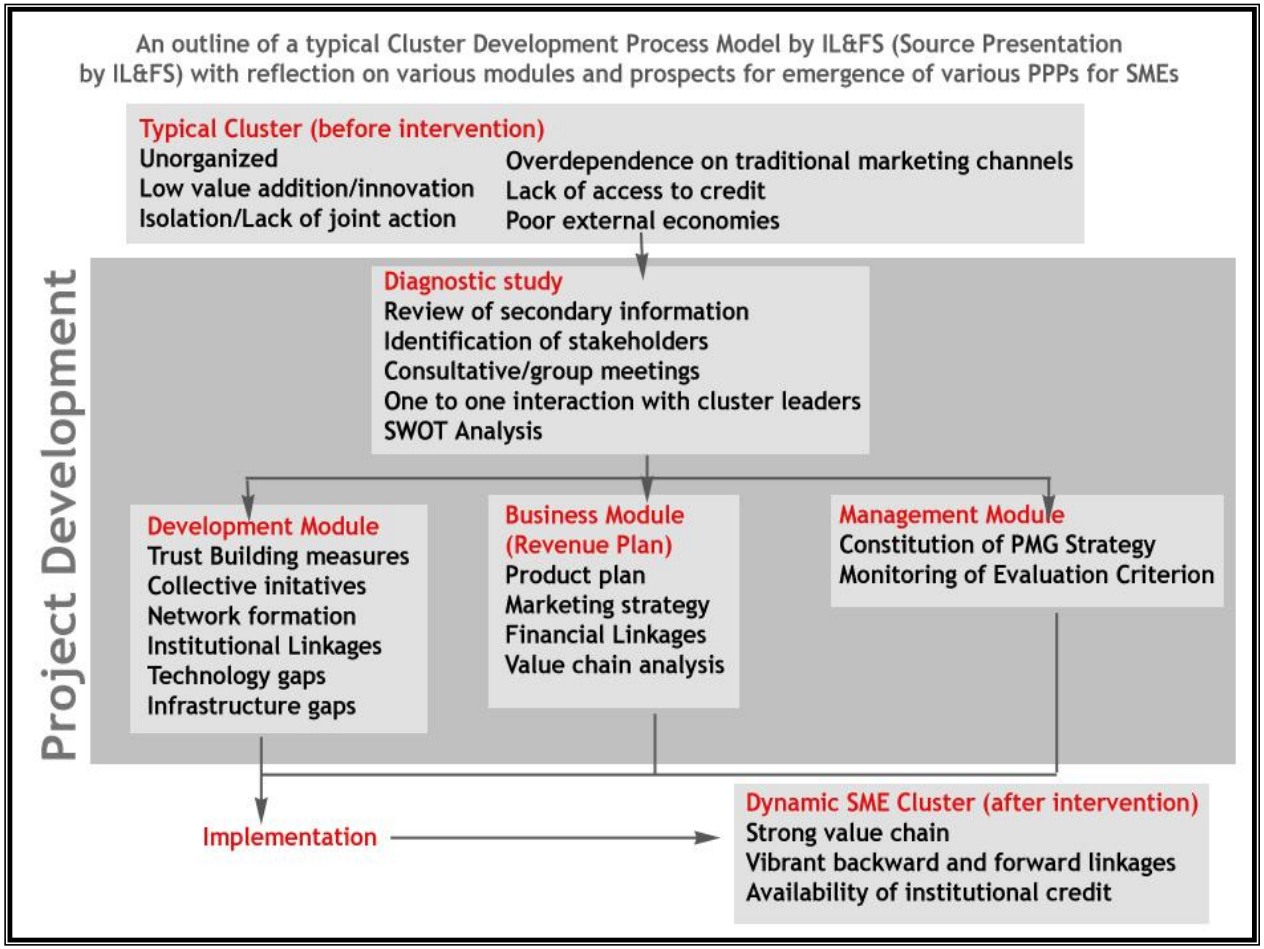
The significance of advisory green PPPs – SMEs services

(a nucleus driving green growth)

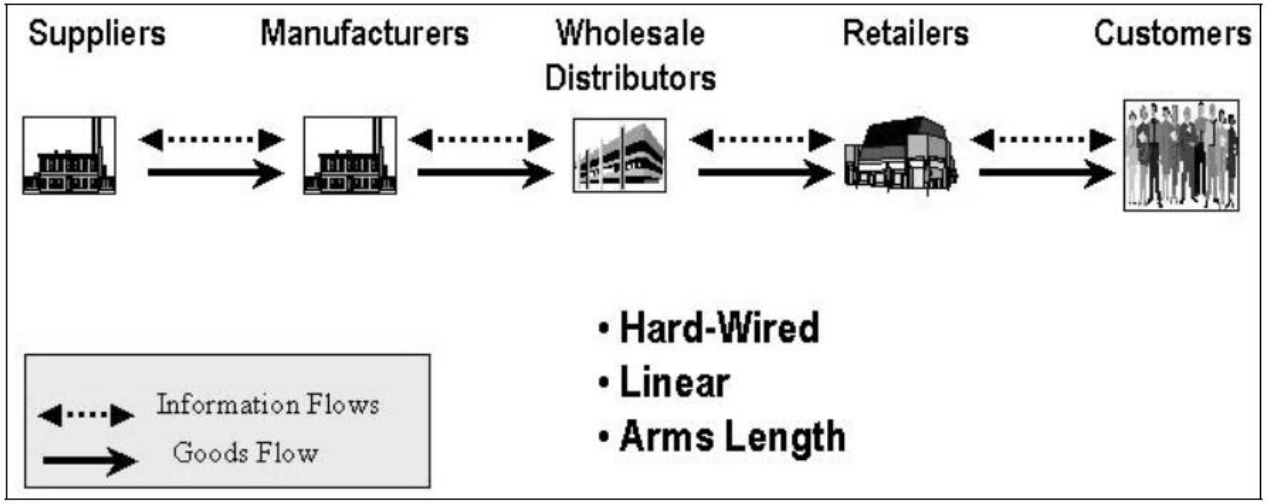


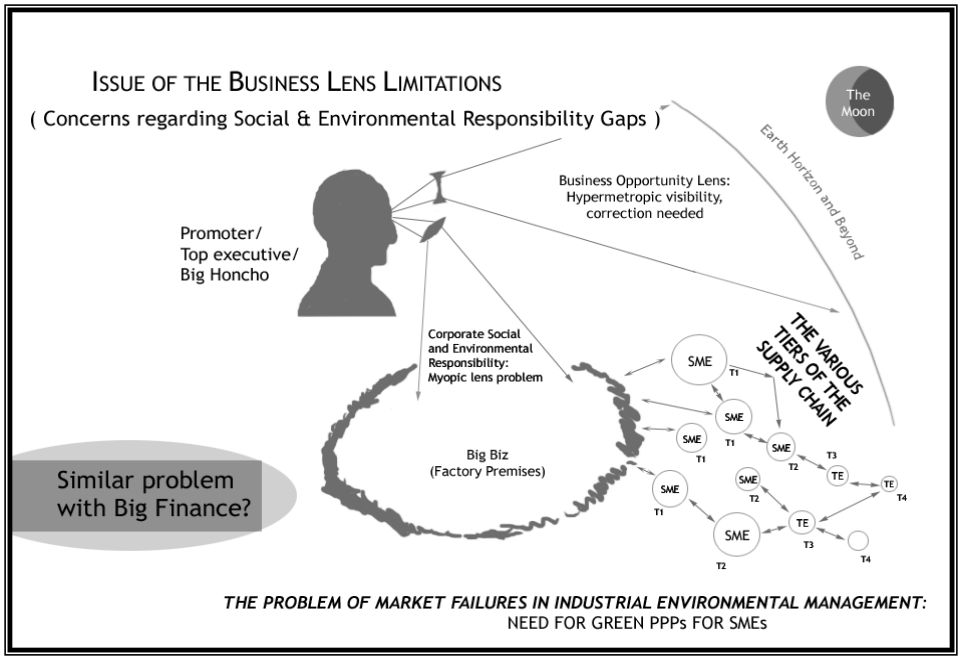
Outline of Integrated Policies Framework for Eco-industrial Development in China

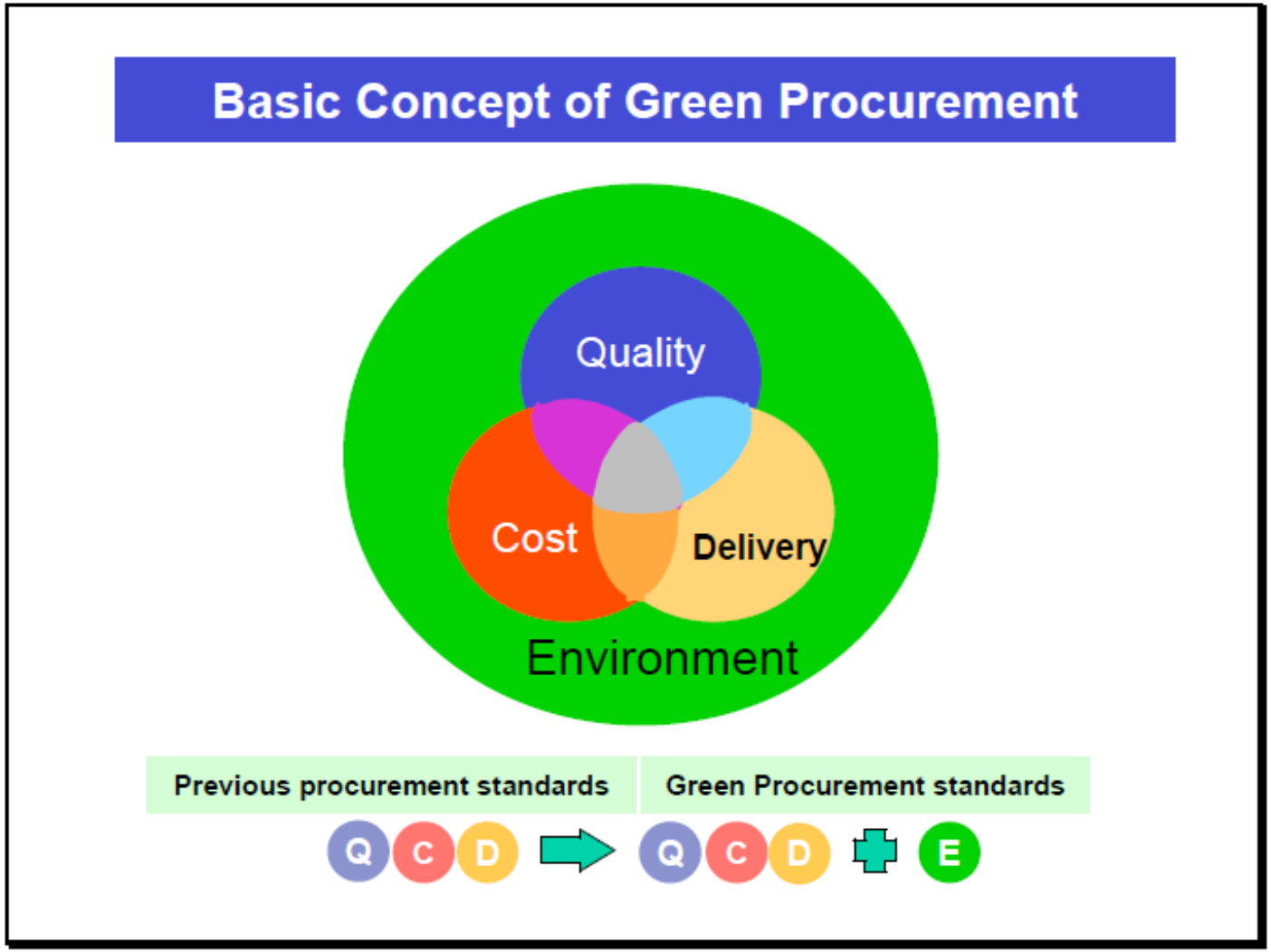
Typical Cluster Development Scenario (adapted from IL&FS)



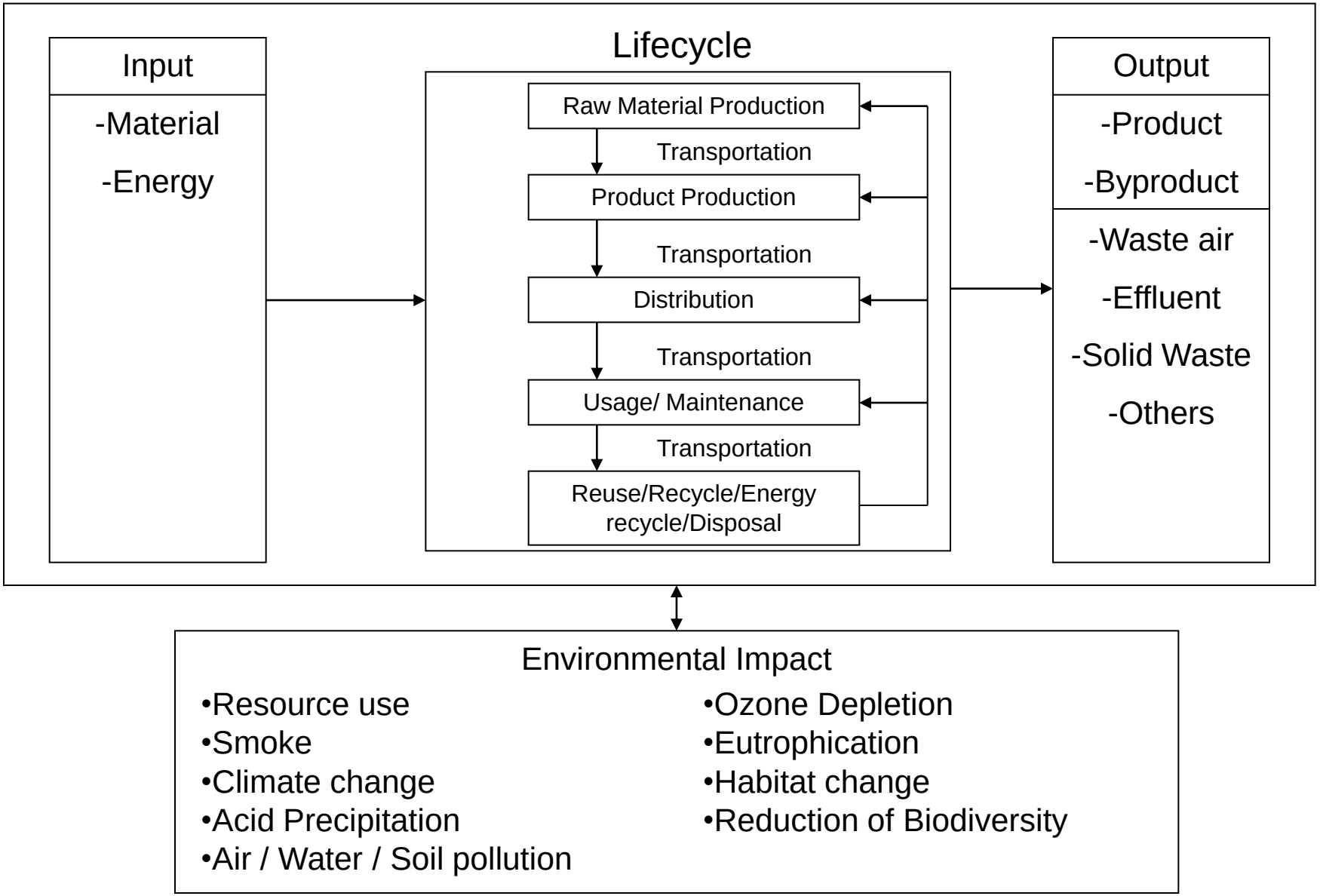
The traditional limiting Supply Chains and Environmental Response perspectives (Signifying Attention to the Problem)







The essence of **Green Procurement**



The Attention to Life Cycles and Eco-Design

Different Types of Eco-labelling (Chen 2007)

- mandatory or voluntary

- single or multiple issue (Life Cycle based)

- single or multiple sector

- inform, compare or leadership

- self-declared or 3rd-party verified

Water-based paints (Firm in Taiwan)

The content of volatile organic compounds (VOCs, boiling points shall be less than 250°C) in the product shall meet the following requirements:

Type of Paint	VOCs
Latex	< 50 g/L
Others	< 100 g/L

.

Indian companies / India based manufactured product reflections in APO – EPD 2011

EP-8-114 **Machines and equipment**

solar concentrators

Solar Concentrators

Environmental performance

We have developed solar concentrators which uses solar energy for generation of process steam. Rather then burning coal, oil or biomass, solar energy can be used to generate steam which can be used for process application or power generation. Our products are used by industries and commercial establishments.

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E-mail vishal.mehra@thermaxindia.com
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Available in: Worldwide

EC-4-010 **Machine parts**

manufacturing products

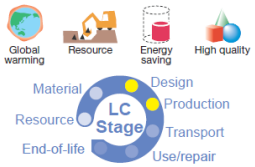
Low voltage Electric Motors

Environmental performance

a.Siemens motors helps customer's minimize their energy consumption & increase the productivity, thus reducing their cost of ownership and proliferating savings.
b.The superior design and higher quality of materials used in energy efficient motors result in lower heat generation. This leads to increased insulation life, longer uptime, reduced maintenance costs and enhanced reliability. This means a higher productivity for customer.
c.With the energy demand from the system being reduced by use of high efficiency motors, the utility companies need to generate lesser energy and therefore burn lesser fossil fuels. Reduced combustion of fossil fuels ensures lesser CO_2 emission in the atmosphere. Thus use of energy efficient

Product performance

Energy efficient motors are designed and manufactured with very high level of precision. The material content used is also of very high grade. The processes followed for manufacturing the product are very advance and quality standards are also very stringent to achieve the higher and consistence performance. Finally the energy saving results into reducing users foot prints on the environment and reduce global warming.



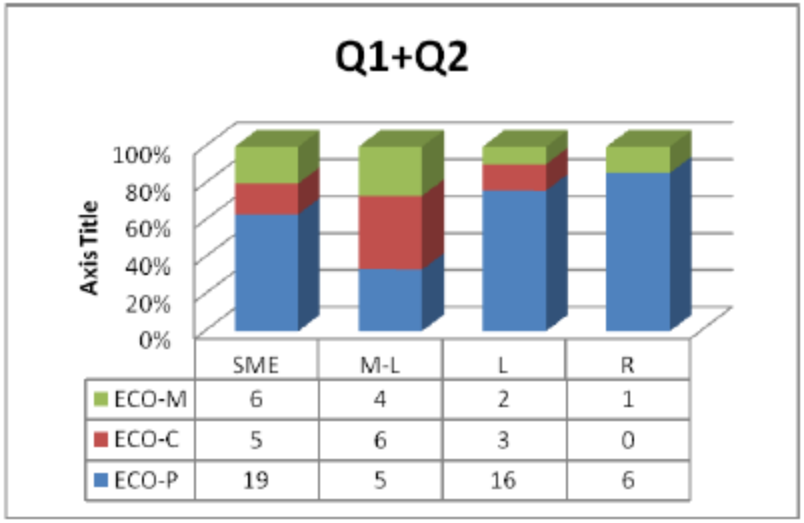
Siemens Limited

'Corporate Offie - 130, Pandurang Budhkar Marg, Worli, 400 018, India
Tel + 91 22 27645902 Fax + 91 22 27645504
E-mail motors.in@siemens.com
URL www.siemens.com

Setting the benchmark in energy-efficiency and reliability

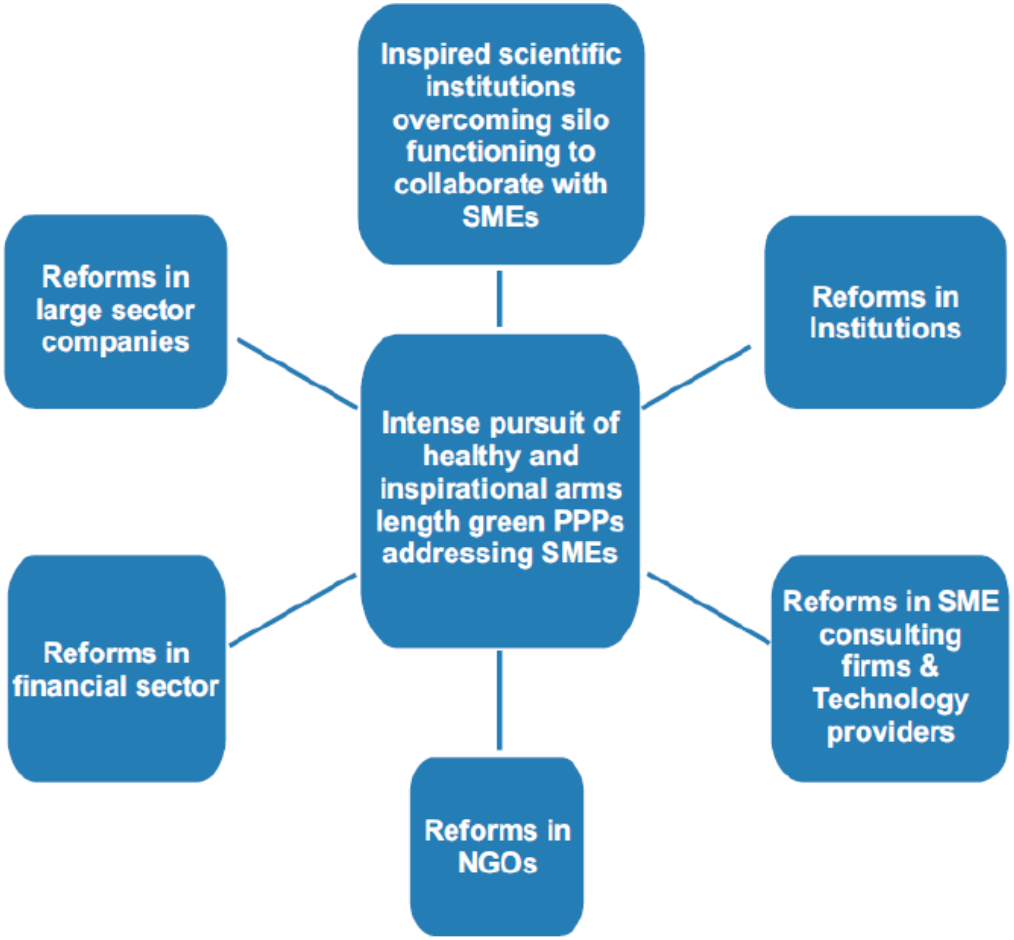
The APO EPD and Indian EPD development scenario

	APO Eco-Product Directories		Indian EPD (Q1+Q2)
Year	2010	2011	(under development)
Eco-Materials	11.58%	13.24%	17.81%
Eco-Components	14.46%	13.76%	19.18%
Eco-Products	73.95%	73%	63.01%



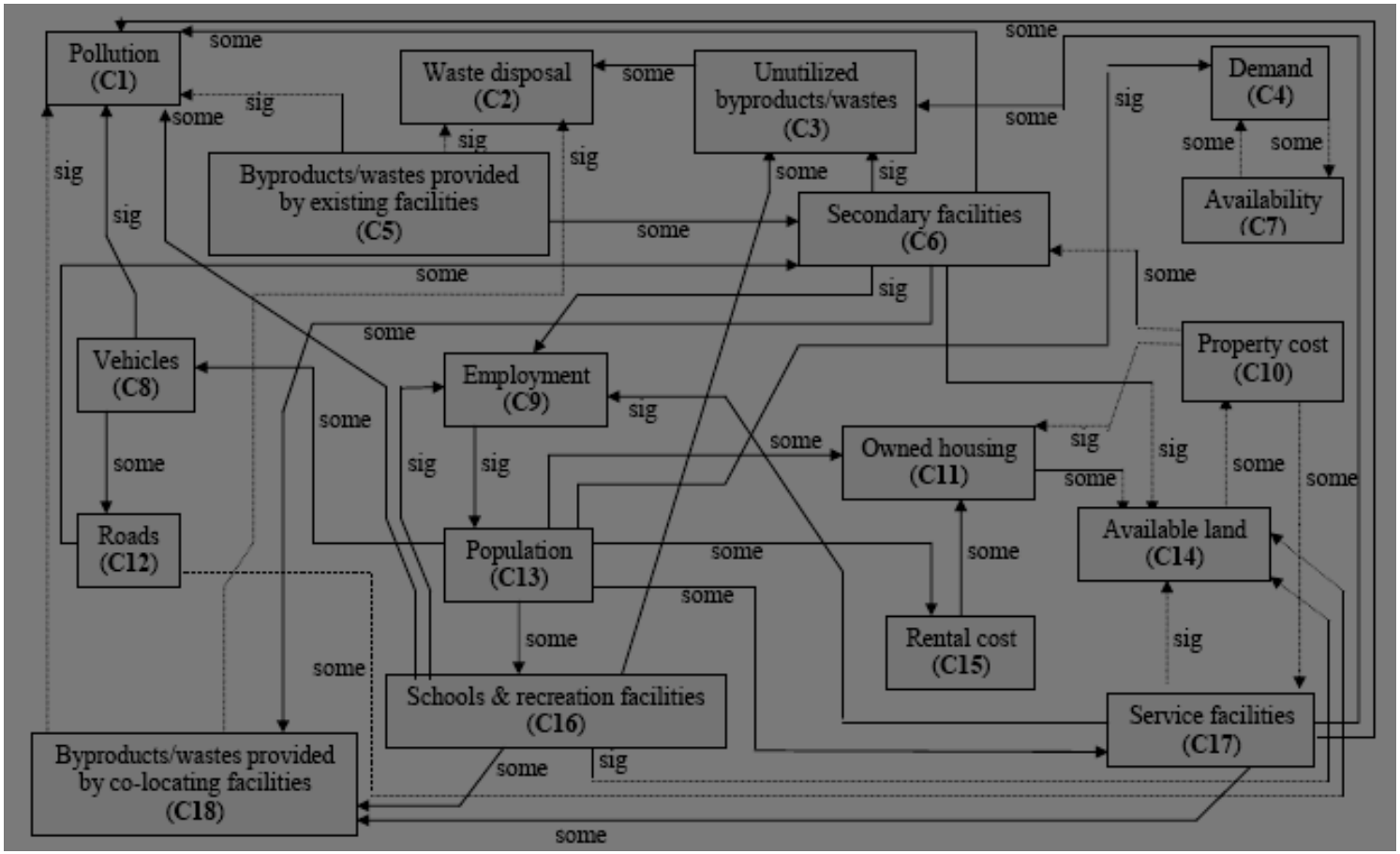
Categorisation applied for Indian firms :- SME : Small and Medium Enterprises (Turn Over < Rs. 100 Crores); M-L : Medium to Large firms (TO Rs. 100 – 500 Crores); Large Firms (TO > Rs. 500 Crores); R : Research organisations such as CSIR labs.

gPPP-SMEs & the Reforms Impetus



Green PPPs-SMEs as force multipliers

Fuzzy cognitive map of the impacts of an eco-industrial park [Fons et al. (2004)]



C- cause and effect variables, sig- significant, some-somewhat, solid arrow: +ve causal relationship, dashed arrow: -ve causal relationship

Thank you for kind attention ☺

Towards Closing the Loop : Sustainable Industrial Development via green PPPs – SMEs and Industry Environmental Stewardship approaches

Harsh Thukral
National Cleaner Production Centre (NCPC)
National Productivity Council (NPC), New Delhi
harsht.ncpcindia@gmail.com

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