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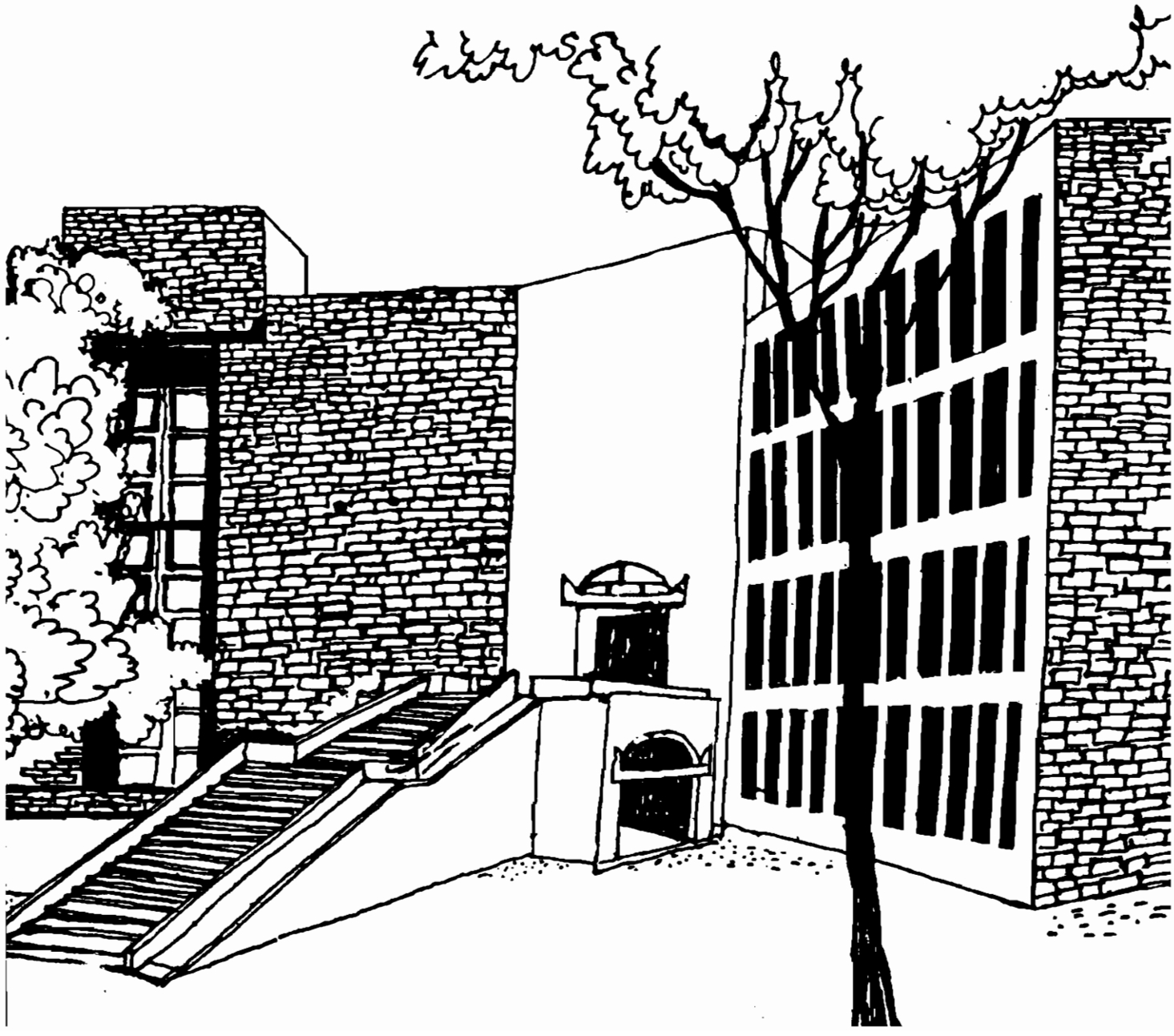

Choosing The Right Mix :
Market, State, and Institutions
for
Environmentally Sustainable Industrial Growth

By

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Abstract

Efficiency, Growth, and *Exports* are the main items on nation's economic agenda. There is some concern (perhaps not adequate) for developing *Safety Nets* for people hurt/ left out by growth. Unfortunately environmental implications of industrial restructuring have not been given adequate attention. We present a framework to identify the appropriate policy response to make growth environmentally sustainable.

We see no contradiction between growth and environment sustainability. There is a broad degree of consensus that the size of the cake needs to be expanded. The issue therefore is not to have growth or not. The issue is what kind of growth and what pace of growth. Environmental implications are contingent on the pace and kind of growth. Since environment sustainability and economic growth reinforce each other, we need to make environment as an explicit decision variable in the macro economic policy.

Three policy measures i.e. market mechanism, state intervention, and institutional innovations can be used to enable firms to internalize externalities. We need to identify various mix of three options to deal with various kinds of externalities.

The best policy response is one that internalizes externalities at lowest transaction cost.In Section one we present a typology of externalities. In Section two we relate the type of externality with the stage and causes of industrial growth. Externalities can arise not only at the firm stage (input and transformation) but also at the consumer stage (consumption and disposal).Growth at production can be due to increase in scale of operation, new technology , and increase in number of firms. Growth in consumption can be due to increase in per capita consumption, introduction of new products and new consumers entering the market.In Section Three we speculate upon the feasible policy choice given a mix of externalities, associated uncertainties and the measurability of the impact of the uncertainties.

"The practical men have led us to the edge of an abyss, and the intellectuals in whom acceptance of political power has first killed the moral sense and then the sense of reality, are urging us to march rapidly forward without changing directions".

- George Orwell in
"Catastrophic Gradualism"

Introduction

Industrial Restructuring in India reflects the redefinition of the role of state in economic sphere. Planned development through public sector led industrialization, licensing and control regime for regulating direction and volume of investment and a deliberate decoupling from international trade have clearly not delivered on the goals of growth, poverty alleviation, equity, price and balance of payments (BOP) stability. There exists today a broad degree of consensus on relying increasingly on market mechanism for guiding economic activity, though there is disagreement on pace and extent of the change. The main items today on nation's economic agenda are `growth', `efficiency' , `integration with world trade, and what should be the 'safety- nets' for the people for whom the 'trickle down 'is too little (if at all) or too late.

To fight poverty, size of the cake needs to be expanded[1]. Otherwise, we merely redistribute poverty[2]. Industrial Restructuring is therefore aimed at expanding the size of the economic cake on a sustainable basis . New policy regime has two components- Stabilization Policies and Growth Policies.

'Stabilization Policies' aim at achieving Fiscal and BOP stability. Fiscal stability will be achieved through reduction in government expenditure and decreasing dependence of public sector on government for funds. BOP stability is to be achieved by accelerated exports and direct foreign investment. Since, import elasticity of country's growth is high (in the 'take off' stage, growth is energy intensive and energy is the main component of country's import bill), reduction/deceleration in imports is a non-option.

Growth Policies' involve allocation of resources in an 'efficient' manner, accelerated pace of private investment, and creation of an atmosphere conducive for private initiative through minimal government control.

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1. During the period, the size of the cake grows enough to impact the poor, poverty alleviation programs are necessary. Given poor performance of most state sponsored anti poverty programs ,role of non-bureaucratic independent initiatives assumes importance.

2. Environmental degradation can be accentuated by capital rationing ,reduction of subsidies, shrinkage of markets and shift in the technology at the level of marginal producers like pastoralists and artisans. For instance, when the price of the fodder (weight/volume ratio is low) increases due to increased transportation costs, the pastoralists may shift from cattle to sheep and goat. Soil erosion will be accentuated by withdrawal of dry matter from more marginal regions and more intensive grazing in the existing regions.

Environmental impact of growth is not a leading item on the agenda though environment sustainability and long term sustainable growth reinforce each other. There has been an inadequate level of debate as to what extent country has to cut (environmental) corners to achieve industrialization.

There are two scenarios (constituting the two ends of the continuum) of growth and environmental interaction.

Scenario I : High growth rates ; High degree of environmental damage; High surplus to rectify environmental damage and to fight poverty (Poverty is believed to be a major cause of environmental damage). (World Development Report, 1992:30-31; Ascher & Healy ,1990 : 17-18).

This assumes high rates of growth are based on generation of high level of externalities and hence high level of pollution. High surplus arises because many costs have been externalized.

The option of high growth-low environmental externality may be the ideal option but at the current stage of Indian economy, it may not be available.

Scenario II : Low growth rate; Low environmental damage; Low level of surplus to fight poverty.

Low growth rates can also be associated with high environment damage where the economy is caught in the self perpetuating circle of poverty and environment degradation (Ascher & Healy, 1990). [3] In such situations industrialization as an option of growth is not feasible due to both demand and supply constraints. Conditions in Sudan, Ethiopia and some other parts of Africa are an example of this scenario. We are however, talking of the conscious option of low industrial growth to minimize environment degradation. Hence we shall discuss low growth only in the context of low environmental damage.[4]

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3. Affluence may lead to over consumption of resources. Also high income elastic goods may have higher production and consumption externalities *vis-a-vis* wage goods. Thus affluence could as well result in environmental degradation.

4. There are two dimensions to environment sustainability -degree of equilibrium (weak versus strong) and extent (low versus high) .Weak sustainability implies fragile ecological systems i.e. situation of an unstable equilibrium. Low sustainability refers to accelerated environmental degradation.

Environment Sustainability

	Weak	Strong
Low		
High		

Both growth and environmental sustainability are necessary (and neither of them by itself is sufficient) conditions for India to achieve its goals. The issue therefore, is not `whether to have growth or not'. The issue, we believe, is `what kind of growth (in terms of technology, sectors, industries), and `at what pace.

Generation of externality is inevitable in the process of growth. Internalizing them requires evolution of various mechanisms such as market, legislation, state regulation, self regulation or institutional development. It is possible that no one set of instrument may be appropriate for different kinds of externalities . We will therefore propose a framework to identify the appropriate instruments for various types of externalities.[5]

Our framework will attempt to understand the following issues:

1. What are the environmental implications of industrial growth i.e.how does a manufactured good generate externalities in the various stages of its life cycle (Input Stage, Transformation Stage, Consumption Stage and Disposal Stage)? We shall analyze the generation of externalities both at firm level (Input and Transformation stages) and at the consumer level (Consumption and Disposal stages).

2. What kind of response (market,state or institutions) internalizes externalities at minimum transaction costs ? At what level of aggregation (country, region, industry or firm) should this be initiated ? What kind of organisational forms (networks, co-operatives or communal) are appropriate for institutional response ?

What Is Environmental Sustainability ?

> The first thing I realized was the intimate relationship of man , his well being and progress with soil, sunshine, river system , forests, and the natural surroundings .... They are one whole; their richness and strength are one. If this equilibrium is disturbed, man dies (Munshi, 1951).

Concept of sustainability is not new. Many religions have stressed the essential unity between man and nature. In recent times due to changes in technology this unity is under stress and the issue of sustainability has acquired urgency.[6]

Brundtland Commission has defined sustainable development as "meeting the needs of the present generation without compromising the needs of future generations" (World Commission on Environment & Development ,1987). Viderman has defined a sustainable society as " one that ensures health and vitality of human life and culture and of nature's capital, for the present and future generations. Such a society acts to stop the activities that serve to destroy human life and culture and nature's capital and to encourage those activities that serve to conserve what exists, restore what has been damaged, and prevent future harm" (Viderman, 1992).

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5. We recommend that instrument which minimizes total transaction costs.
Matthews (1986:903-910) has defined transaction costs as " cost of arranging a contract ex ante, and monitoring, and enforcing it ex post ".

6. The public trust doctrine derived from Roman law provided "that certain natural amenities associated with environmental benefits are in effect unalienable to the common good, and so cannot totally be usurped by private landowner" (Sax,1970:167-9).

Sustainability has also been interpreted as "total stock of resources - Human capital, physical reproducible capital, environmental resources, and exhaustible resources - does not decrease over time".[7] This viewpoint highlights the notion of substitutability between resources. Exploitation of oil reserves (exhaustible resource) may therefore be a part of sustainable development if investment in alternative energy sources is made such that welfare of future generations is not threatened by exhaustion of the reserve. (Boja et al ,1990 :13-14 ; Pearce et al, 1991:1-2)

Sustainability is set in an institutional and ethical context. The values shared by different stakeholders are reflected in the preferences for different kinds of institutional solutions for containing negative externalities and enhancing conservation ethic. Sustainable development implies reliance on such feedback systems that give early warning signals about possible damage, help generate consensus around desirable action, and provide motivation to the actors to regulate their behaviour accordingly.

Sustainability need not be assessed only at the level of the resource transforming technology but also at the level of the institutional processes(Gupta, 1992). The trust inducing environment among stakeholders is necessary if self regulation has to become a widespread practice of controlling externalities. The trust in turn may be created more easily through the accountable and open institutional processes rather than through legislation or administrative fiats.

Why do we need Environmental Sustainability ?

Sound Environmental policies reinforces long term economic growth. World Development Report (1992:38) gives the example of Aral Sea (erstwhile U.S.S.R.) where excess diversion of river water (which drains into Aral Sea) for irrigation has made Aral Sea and the surrounding aquifer saline and therefore threatening the livelihood of 50 million people living in the basin. Another study " indicates that U.S. crop harvest is down by at least five percent, perhaps as much as ten percent, because of air pollution" (Brown L ,1991 :354).

Environmental sustainability and economic growth reinforce each other. Both are necessary conditions for LDCs (including India) to achieve their developmental objectives. However, neither of them by itself is a sufficient condition for meeting

7. There are three kinds of resources:
1) Natural Capital consisting of renewable resources, non renewable resources and environmental services such as maintenance of quality of atmosphere, climate, operation of the hydrological cycle etc.
2) Human made capital.
3) Cultural capital which provides human societies with the means to deal with natural environment and to modify it. This includes tradition, philosophy, institutions etc. (Berkes & Folke :1992:2).

national objectives (World Development Report ,1992 : 2-4).[8]

Divergence between environmental stability and economic growth often results in social conflicts. This is increasingly being witnessed in resource rich but economically poor regions where economy is dependent on exploitation of resources in an unsustainable manner. e.g. Limestone mining in Doon Valley, Tehri Dam project, Prawn farming in Chilka Lake. Thus imperatives of political and social stability (a pre condition for sustainable growth) demand growth in an environmentally sustainable way.

However, as Panayotou (1991 :356) has argued " sustainable development is meant to benefit both current and future generations. If sustainability means Spartan living by current generation of the poor so that next generation of poor will have better standard of living, where is inter-generation equity ? .[9]

Industrial Restructuring and Environmental Sustainability :

Current Industrial Restructuring is emphasizing growth, efficiency, and exports. Though environmental awareness is higher than ever before (major projects require environmental clearance from the Ministry of Environment), some environment issues need to be given more thought. These issues are :

1) What kind of industries should we encourage - ones which generate low negative externalities or ones which generate high negative externalities ? To what extent should the decision of choice of industries and their location be left to the market mechanism? What is the role of public policy ?

2) Is it better to grow and generate negative externalities in short run and subsequently depollute or is it desirable to compromise on growth in short run by limiting/ banning certain highly polluting industries (e.g. dyestuff) which cause irreversi-

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8. Often pollution is cited as the necessary price for growth. Any attempt to evaluate different methods to reach the same goals are stonewalled. " The great obstacle", Berry (1991:154) feels, "is simply this - the conviction that we cannot change because we are dependent upon what is wrong. But this is the addict's excuse.. ".

   Popular media has also attacked environmentalism on economic grounds."Green zeal tends to outstrip reason because true size of the bill is often hidden from those who insist it be paid"(The Economist : 1992).

9. National Income Accounts need to incorporate the cost of environment damage caused by economic growth. This can be done by treating natural capital similar to man made capital. Thus adjusted NNP would equal original NNP less cost of degraded environment. Adjusted NNP indicates the value of total consumption that can be maintained forever. It can be also be interpreted as return on total stock of assets - human, manmade, and natural. (Bojo et al, 1990 : 52 ; Chopra K, 1992:3).

   Cruz & Repetto's work (1992) reveals that Philippines' balance sheet during 1970-87 deteriorated more from depreciation of natural capital than from foreign borrowings. Depreciation in just three sectors - forests, soils, and coastal fisheries - averaged more than 4 percent of GDP p.a. versus 3.2 percent of GDP for external debt.

ble damage to environment ?[10]

3) If we want to grow in short run and pollute, what is the time horizon for this short run operation? Would the victims of pollution be compensated ?

4) If we want to discourage polluting industries how do we propose to implement this objective - through price mechanism, legislations or institutional innovations or a mix of all the three ?

5) To what extent should the externalities be internalized ?
Over what time period ?

6) If government privatises public sector undertakings do the buyers bear liability for accumulated externalities ?[11]

7) What kind of industries should be encouraged for exports - non renewable resource intensive (e.g. iron ore) which have significant negative production externalities or industries in which India has 'man made comparative advantage', and low negative externalities. e.g. Software. It has been argued that LDCs relying primarily on exports of non renewable resource intensive goods accelerate environment degradation in order to hike export earnings. Since terms of trade for these goods are declining (due to decreasing resource intensity of growth in developed countries),to hike export earnings , LDCs have to constantly increase physical exports of these goods (Marmora and Messner,1992).[12]

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10. There is a fear that relatively low environmental standards in developing countries compared to industrialized countries will lead to migration of 'dirty' industries to developing countries (industry flight hypothesis). Also developing countries may deliberately have lax environmental standards in order to attract investment (pollution haven hypothesis) (Dean,1992:17).

    Low & Yeats'(1992) empirical study reveals that 'dirty' industries account for a growing share of exports in developing countries against a background of a reduction in the share of 'dirty' industry exports in total exports of industrialized countries, and an overall reduction of such exports in world trade. However trade flows as an indicator of locational changes may be misleading if production and consumption of such products are growing at different rates across countries.

    Another empirical study of Lucas et al (1992) also suggests 'dirty' industries have certainly moved into developing countries. However it cannot be conclusively shown whether this is a reflection of dispersion / expansion or of displacement of such industries.

11. Privatization of state enterprise in Eastern Europe is bedeviled by the issue of who bears the liability for accumulated externalities (Sorsa P ,1992:118).

12. Expansion of non traditional agricultural exports (shrimps,cattle) has caused significant environmental degradation in Honduras (Stonich S :1992)

8) If export industry is made to internalize externalities how would international competitiveness be affected.[13]

Options for Environment Friendly Policies :

There are three kinds of options.

1. Incentives
2. Legislations
3. Institutional innovations.

Incentive based policies operate through the market mechanism by changing price (tax on petrol) or cost (emission tax on firms). These policies will be effective only if polluters respond to them. Response depends on ownership (public sector may not respond to emission tax if it is not accountable for profit), competition (in an uncompetitive market, firms would find it easier to pass on tax to consumers), and differences in cost structure amongst polluters (if all entities have same technology and cost structure, pollution tax would have uniform level of adverse effect on profitability. Thus, no one would be motivated to tackle pollution (World Development Report ,1992 :159).

Legislation prohibit certain activities (DDT is banned in many countries), set minimum standards for pollution control, enable undertaking of certain activities (consumer forums can approach court without any locus standii), clarify/define status on property rights (nationalization of forests took away customary property rights from the forest dwellers), explicate obligations of stake holders in a common property regime, make information sharing mandatory (products to display information on ingredients), educate the public ('breast milk is best for babies') etc.[14]

Institutional innovations can be of the following kind :

A).Industry Initiative

- Self Regulation by the industry e.g. Worlds largest chemical companies have adopted 'Responsible Care' code of operation ethics to ensure minimum environment damage(Leighton, 1992).

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13. It may not be possible , as Summers has observed (1992: iii-iv),for governments to harmonize their environmental standards because
a)Damage caused by pollution differs across regions due to differences in atmospheric, topographic and demographic conditions.
b)Difficulty in securing agreements on issues like should emission standards regulate flow or stock of pollutants.
c)Differences in resources which nation can devote to environment.
Also
d)Differences in social preferences regarding environment conservation (Low , 1992b :2).

A number of studies indicate that even in the most polluting industries, pollution abatement costs constitute only 1-3% of total cost. Hence (price) competitive advantage is not compromised with due to pollution abatement technology (Subramaniam A :1992 :140).

14. Unimaginative legislations can backfire. Forests are often under threat because responsibility of their management has been taken away from local people i.e. nationalization of forests has taken away ownership from people residing in the forests. Thus local people cease to be stewards and become poachers (Redclift M, 1992:256).

- Industrial units pooling-in resources to tackle environmental problems at an aggregated level e.g. small scale units in NOIDA have installed a common effluent treatment plant which is unaffordable at firm level.

B). Government Policy

- Developing new markets through legislations e.g. Clean-Air Policy in U.S.A. has created a market for sulphur-di-oxide emission quotas. These quotas are freely traded in stock exchanges.

- Granting environment friendly certification through ECO MARK.

C). Consumer Pressure

- Consumer networking or movements to force firms and industries to adopt environment friendly policies.(the case against Baby Milk Food, Asbestos, Toxic Pesticides etc., illustrates the dynamics and strength of this process).[15]

Looking Beyond Neo Classical Theory

Neo Classical Theory originated in the backdrop of industrial revolution. Since time immemorial human beings have used technology to tap nature's endowments. However Industrial Revolution constituted a discontinuity in the scale and pace of exploitation. Nature became a mere input to be used for human gratification. Man was no longer an integral part of nature but a superior being entitled to exploit it.

Neo Classical Theory has been accused of being 'utilitarian '(things count to the extent people want them) 'anthropocentric ' (human beings are assigning values) and 'instrumentalist' (biota is regarded as an instrument of human satisfaction) (Randall A , 1986 :217-218)[16]

In the Neo Classical paradigm environmental issues are viewed as problems of "externalities" i.e. cost are external to the firms. However, in reality, these costs are picked up by other members of the society - current or future generation. What is external to the firm is still internal to the society. Thus, the private cost to a firm and the social cost diverge. This results in a socially sub-optimal equilibrium as firms make decisions based on their private costs only. Pigovian remedy is a government imposed tax on the polluter equal to the difference between social and private costs[17].This would harmonize private and social

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15. We thank Prof. Sandesara for emphasizing this point.

16. Economists often don't acknowledge the intrinsic value of nature i.e. non human life has value in itself. Yet well being of non human life must be considered along with welfare of human beings. Thus nature should not be viewed merely as a means to achieve human ends. (Craig Paul et al :1992:5)

17. Public Choice school views externalities to be 'reciprocal'. Government intervention is opposed as it denies the affected parties the option to negotiate and arrive at a mutually agreeable solution. Government imposed solution invariably generates transaction costs in excess of the potential benefits.

equilibrium [18].In this study we shall build upon the concept of externality. Choice of the instrument to internalize externalities will depend on the nature of externality.

Some Limitations of Market Mechanism

Market mechanism alone cannot handle the environmental issues because of the following:

1. There exists `**Information gap**' amongst consumers and industry on implication of certain policies. Full cost accounting is not done and decisions are made on the basis of cost curves which understate costs e.g. In 1960s, consumers and industry did not cost for the effect of CFCs (used in aerosols, refrigeration etc.) on Ozone layer and the implication of Ozone hole. This led to over production and over consumption of CFCs.

2. Monetization of **non-monetisable resources** e.g. clean city/rural setting, bio-diversity. This may not be possible either due to information gap or the resource inherently defies monetization e.g. esthetics of a city.[19]

3. Consumers may **undervalue costs** for the following reasons: Pollutants may not look damaging since they may be below threshold; pollutants may have delayed action (effect of radiation exposure show up some times through genetic changes), or individually pollutants may not be damaging, but the combined effect of many pollutants may be damaging (`Synergy' amongst pollutants) (Common and Perring , 1992).

4. Difficulty in costing the preferences of the **"non-voting public"** i.e. sections of society which cannot articulate through the market mechanism or the future generations (problem of **inter-generation equity**) which don't have spokesmen in current generation.[20]

Pursuit of inter-temporal efficiency on the basis of sovereignty of existing consumer may be ecologically unsustainable(Common and Perring , 1986). If current generation shows 'Altruism', then the issue of inter generation equity may be handled. `Altruism' is said to exist when utility function of the current generation is also influenced by the utility function of future generation. Even with `altruism', issue arises whether current generation decides what future generation should want (Selfish Altruism) or current generation should engage in resource use so as to leave maximum options for future generations (Disinterested Altruism) (Markandaya & Pearce, 1991 :145).

5. Difficulty in estimating **cross country externalities** e.g. Acid rain which is destroying the forests of Germany is primarily due to Sulphur-di-Oxide and Nitrogen-di-Oxide emission in UK, Italy and Spain (World Development Report, 1992 :83).

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18. Imposition of Pigovian tax on a monopolist could reduce social welfare. A monopolist restricts output below socially optimal levels and a Pigovian tax could yet further contract output. Welfare effect is therefore not clear (Buchanan ,1969 :174-177).

19. Brennan warns against the tendency to set up a single order of values or preferences as some values will for ever elude quantification (Brennan A ,1991 :20-21).

20. Non voting public should also include non human living beings. Daly remarks " The intrinsic value of other species, their own capacity to enjoy life, is not admitted at all in economics, and their instrumental value as providers of ecological life support services to human is only dimly perceived " (Daly ,1991 :236, also see Norton, 1986 and Ehrenfeld, 1986).

6. Markets work through price signals. In Neo Classical texts " individuals and business companies are seen as agents that react like machines to price signals ... there are also non monetary incentives and disincentives ... Exxon Valdez oil spill ... has direct environmental and financial implications but there is certainly also an impact on goodwill position of the company" (Soderbaum, 1992).

However companies do respond to non market signals e.g. Corporate philanthropy creates goodwill which may not impact profitability but serves the social motives of the managers.(Galbraith ,1972)[21]

7. Markets for many of the environmental resources do not exist leading to the inability of price mechanism to allocate resources efficiently. e.g.no market exists for the soil protection function of forests (Dasgupta and Maler, 1991 :111).

8. Market mechanism would result in efficient allocation of resources only if decision makers maximize their objective functions. Prisoners' Dilemma construct shows that in absence of information sharing, individual rationality leads to collective irrationality. If the assumption of "selfishness" is dropped and individual's objective function redefined (Assurance Game and Other-Regarding preference), prisoners can reach a ' Pareto Superior' position versus Prisoner Dilemma equilibrium (Sen ,1982 :76-80).

9. Use of environmental resources has multi period implications. Hence 'efficient ' allocation of such resources requires a well functioning **'futures market.** Unfortunately 'futures markets' don't work for environmental resources as property rights on such goods in future are not well defined or the transaction costs for making financial projections are very high (Bojo et al ,1990 : 27-28).

10. The benefits of environmental goods are apparent in future and are diffused over people/ places. However costs are borne in present. Thus environmental goods require a well functioning ' **risk market'** where the individual can insure himself (e.g. a farmer investing in soil protection technology for increasing yield in future could insure himself by paying a part of future surplus as premium). Such markets do not exist (Bojo et al ,1990 :26-27).

Even if above constraints can be tackled, governments seldom take policy measures based on economic rationality alone due to presence of pressure groups - vested interests of polluters (Dietz & Straaten, 1992; Kasperkovitz & Straaten ,1992). Thus public policy responds to `dramatic rather than chronic' problems (World Development Report, 1992:83). Therefore, incentive based policies which operate through market mechanism (may be necessary) are not alone sufficient for ensuring environment friendly growth.

<u>Regulations/Legislations</u> :

Physical controls have been suggested for tackling the problem of externalities. Kapp (1963 :193) has suggested **"social minimas"** for defining state of environment. Dietz and Straaten (1992) have argued that "ecologically bounded possibilities of using natural resources" be taken as the starting point for developing economic theory.

Dasgupta (1982 :70) advocates treating issues of environmental protection (especially of

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21. Tomer has developed a socio-economic model of a firm which provides an alternative explanation of the firm's environment behaviour by incorporating environmental variables in the decision making process. This model suggests that firms need not succumb to negative externalities and under certain conditions firms can pursue behaviour that is both profitable and environment friendly (Tomer JF ,1992).

public health) like 'merit goods'. Government should base its policies on only the most informed opinions and not on the preferences of the majority.

Public Choice school however argues against government intervention as it leads to attenuation of property rights [22]. Attenuation generates unwarranted transaction costs and results in inefficient allocation of resources. A government imposed solution will therefore foreclose the possibility of bargaining where individuals can realise mutually advantageous trades(Coase ,1960 ;Dragon & Jakobsson, 1992: 10).

Experience not only in India but throughout the world points at the limitations of government policy both to legislate and to implement. The problem is of course more serious in `soft' states. Thus environmental friendly growth through state fiat alone is clearly not the best solution.

Institutional Response

Elsner (1987: 5-14) has defined Institutions as "set up of rules for decision making on part of individuals in repetitive decision making situations involving more than one person which has acquired general recognition to the extent that the individuals concerned have reciprocal expectations with regard to their respective behaviour" .

Institutional intervention acknowledges both the economic and the non economic character of human beings (Neo Classical framework views man solely as an economic entity) (Myrdal, 1977: 3-4 ; Wolozin, 1977: 33). It therefore uses both economic and non economic processes to bring harmony between individual rationality and collective rationality. Further institutional innovations don't assume decision makers behaviour/taste /preferences to be given. Compatibility between environment and growth may be initiated not only through appealing to individual selfishness but also through changing the thinking of people (Green movement, Responsible care code amongst chemical companies in U.S.A.) or through redefining/ creating new markets (e.g. market for Sulphur Di Oxide quotas in U.S.A.).

Ostrom (1990:53-54) argues that three kind of rules influence the institutional evolution viz: Constitutional (boundary, legitimacy related), Collective choice (prescribing policies for resource management), and Operational (allocation, monitoring and enforcement). She further adds that the operational rules are easier to change, the collective choice are more difficult, and the constitutional the most difficult.

One could also suggest that we could have basically two kind of rules: the boundary and the resource allocation. The conflict resolution rules evolve in the context of these two (Gupta, 1985). The boundary related rules determine the jurisdiction - who is in and who is out, what makes people accept these boundaries (customary rules, traditions, culture, historical experience, and nature of governance) etc. The Resource Allocation rules deter-

22. Property Rights are relationships between individuals which establish social pattern of rights & duties, benefits & costs, and gains & losses (Dragun, 1989: 3).

mine who gets what when, how will some people be compensated [23] if some others gain or do not lose; or what goals [24] to be pursued(not taking the societal goals as given).

The Conflict Resolution Principles deal with the process through which conflicts are resolved, for example, arbitration, adjudication, various bargaining models, voting, consensuses through general body meetings or through delegations (elected, non elected), etc. The principles provided in the Boundary Rules and Conflict Resolution Rules are operationalized through Conflict Resolution Rules (relating to processes), so that institutional environment for sustainable resource management can be generated and maintained.

Choosing the Right Mix of Interventions

The framework for identifying the appropriate policy response to deal with various kinds of externalities is discussed next. In section one, typology of externalities is given. In section two, we have tried to relate the type of externality with the stage and causes of industrial growth. In section three, given a mix of various externalities and associated uncertainties, we speculate upon the feasible policy choices.

Section I

1. Reversible / Irreversible

Reversibility could be through process of nature (forests acting as sinks for carbon -dioxide) or by human intervention (effluent plant to treat industrial waste). Reversibility may be in *short run* (leaving land fallow) or in *long term* (top soil loss takes centuries to

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23. There can be three ways to compensate for externalities: Damages For Suffering (DFS), Polluter Pays Principle (PPP), and Maximum Social Gain (MSG).
DFS compensates on the basis of who suffers; it requires inter personal valuation of suffering which may prove difficult.e.g. how do we compensate children in Bangkok who have lost four I.Q. points by the age of seven due to elevated exposure to lead(World Development Report, 1992:5).
PPP makes the polluter correct the error. It assumes the causation is unavoidable, the only issue is correction. PPP cannot be applied in case of irreversible damages. Business Council of Sustainable Development also concedes that implementation of PPP has remained inadequate and adhoc (Schmidheiny ,1992).
MSG is applicable when more than one agency causes comparable environmental damage. e.g. a chemical factory and a tannery pollute same volume of water which costs Rs. 10 to society..Chemical factory generates higher value addition (say Rs. 30) than tannery (say Rs. 20). MSG would require tannery pays not only Rs. 10 as damage (akin to PPP) but also pays an additional Rs. 10 (Rs.30 minus Rs. 20)) for being less efficient than the chemical factory. The quotas for pollution entitlement in this scheme will be discounted by the inefficiency index i.e. higher the inefficiency smaller is the quota.

24. The current model of economic growth aims to deliver the Western life styles to the millions of third world people. Studies have shown the impossibility of ensuring Western life styles for the people on this planet(only those who exist today, not taking the future growth into account) (Marmora and Messner, 1992).

Enzensberger (1984 :67) observes, "3bn.cars, 400 m.tons of meat, 40 m. gigawatt hours of electricity, 12 bn.tons of oil per year: - the planet on which we live simply cannot provide all that."

Boulding puts it even more graphically. He says, "to believe in unlimited growth on a limited planet you have to be either an idiot or an economist" (Boulding, in Adler - Karlsson, 1977: 88). Environmental imperatives have caused rethinking amongst economists leading to emergence of ecological economics and revival of interest in institutional economics.

regenerate). Human intervention to reverse the externality may require *individual effort or collective effort*.

2. Insulable / Non Insulable

The generator of externality may be able to insulate himself/herself (generator of industrial externality installs water filters at home though general public drinks contaminated water) or may not be able to insulate (CFC causing Ozone hole which affects everyone).

3.Identifiable / Non Identifiable Source

Source of externality is identifiable (thermal plant in a non industrialized region causing air pollution) or not identifiable (there are innumerable sources of air pollution in a metropolitan city).

4. Single / Multiple Source

Externality is from a single source or from (identifiable) multiple sources.

5. Preventable / Non Preventable

Externality can/cannot be prevented from occurring by modification of production or consumption process.

6. Localized / Non Localized

The effect of the externality can be localized (by dumping industrial waste a plot of land becomes barren and assuming no seepage to water table) or cannot be localized (emission of greenhouse gases).

Section II

We shall now present a framework to highlight the relationship between externalities and the life cycle of a manufactured good. To internalize these externalities transaction costs would emerge and the optimal arrangement would be one which would minimize the sum of such transaction costs.

Externalities for a manufactured good emerge not only at firm stage but also at consumer stage. We shall therefore identify externalities in the Input, Transformation (firm stage) and Consumption , Disposal (consumer stage).

1.Growth Factors : Firm Stage

Growth in Industrial production can be due to various factors i.e. same firms may have expanded capacity, new firms may have emerged or new technology may have been developed which has enabled firms to increase production without enhancing total capital stock. Externalities associated with all these options differ. e.g. if the existing firms have expanded capacity then externalities will be spatially concentrated and of the same kind. If growth is due to new technology, character of externalities changes depending whether the new technology is polluting or non polluting. Thus the policy response to internalize externalities would be determined by the source of growth.

Analytical scheme:

Fig. 1

Growth Factors : Firm Stage

Stages in Product cycle	Scale	Technology	Number of firms
Input			
Transformation			

2. Growth Factors : Consumer Stage

Growth in production is sustained through growth in consumption. We therefore need to identify the factors which make consumption grow. These are growth in average per capita consumption, increase in number of consumers or emergence of new products which expand the consumption basket for existing consumers or new consumers.

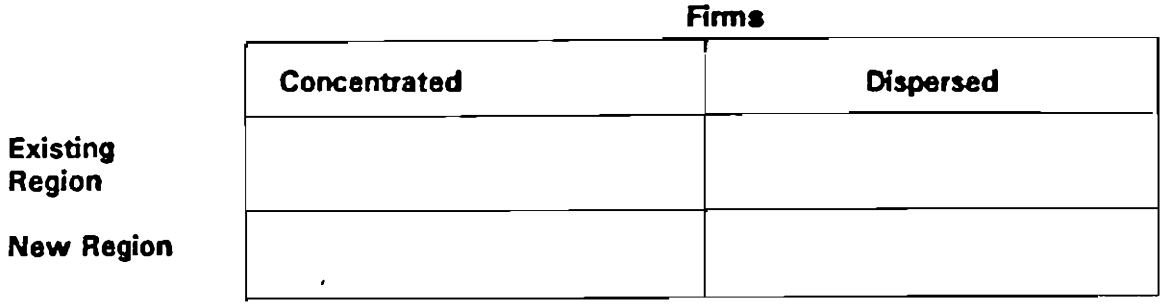
Fig. 2

Growth Factors : Consumer Stage

Stages in Product cycle	Per capita consumption	New product	New consumers
Consumption			
Disposal			

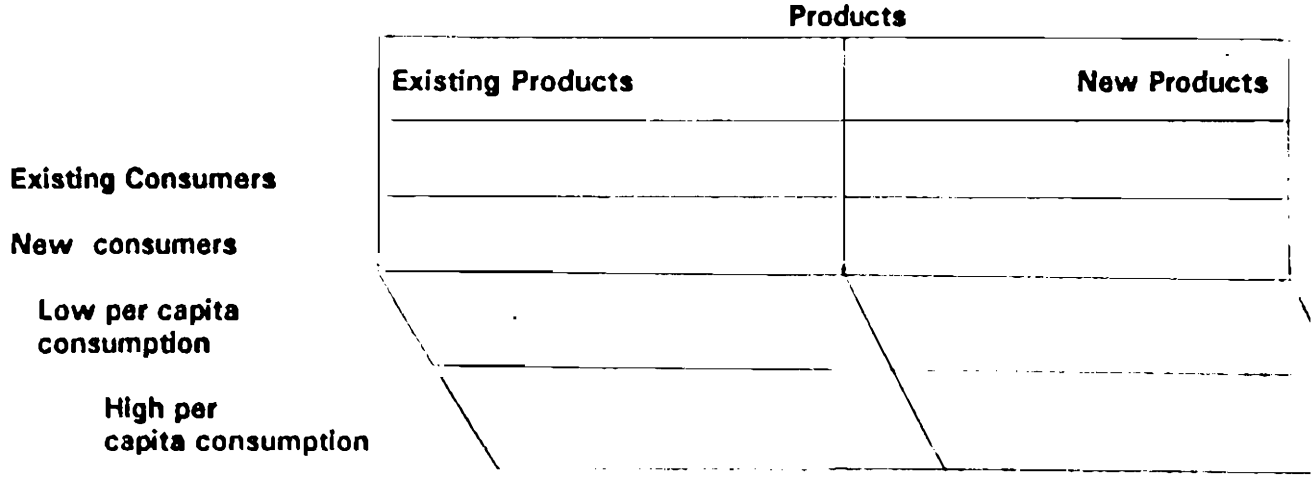
We could further classify the externalities due of increase in number of firms (Growth Factors :Firm Stage). These would depend on whether new firms are in new regions/existing regions, spatially dispersed / concentrated. e.g. if growth is due to emergence of new firms in new regions, externalities would be dispersed and may be within the capacity of natural environment to absorb them. If , for example, treatment of pollutants requires a 'critical mass' of pollutants , it may be desirable for the new firms to emerge in existing area so that firms may pool in their pollutants to establish treatment facility.

Fig 3



The externalities due to increase in per capita consumption and emergence of new consumers (Growth Factors: Consumer Stage, Fig 2) would depend on whether new or existing products are used. If per capita consumption has increased due to use of existing products and the new consumers also use new products ,waste (e.g. packaging material) would be of a similar kind. Thus waste collection and disposal (disposal externalities) would be facilitated. (low transaction costs to internalize externalities).

Fig 4



Given the state of technology and available tools of measurement, policy makers have to contend with the uncertainty involved in dealing with externalities. Table one relates the uncertainty and measurability to different kinds of externalities.

Table I

	Uncertainty			
	Low		High	
	Measurability		Measurability	
Externality	Low	High	Low	High
1A. Reversible				
1B. Irreversible				
2A. Insulable				
2B. Non-insulable				
3A. Source Identifiable				
3B. Source Non-identifiable				
4A. Single source				
4B. Multiple source				
5A. Preventable				
5B. Non-Preventable				
6A. Localized				
6B. Non localized				

To illustrate the interaction between externality and uncertainty, we may take a few sub sets of the above table. In case of high uncertainty, low measurability and irreversible externality as in case of radiation leak of a nuclear reactor, the appropriate policy measure could be a legislative intervention. Society cannot afford to rely entirely on self regulation by the producers or by the markets. Similarly, in the case of the loss of biodiversity, one may use legislative as well as institutional innovations like watch dog committees, consumer forums, citizens councils, expert groups, etc. In contrast, for low uncertainty, high measurability and with multiple source of externality, for example, water pollution by an industrial estate, the effluent tax - a market instrument may perhaps work.

We have outlined framework for identifying the policy actions, given the nature and extent of externality and associated uncertainty and measurability. The policy action which aims at minimizing total transaction costs of all stake holders may be considered desirable[25].[26]

Epilogue

Given a dim prospect of increase in exports, availability of domestic savings, and sluggish foreign investments, the investible surpluses for correcting past environmental externalities is limited. Should then a case for environmentally sustainable growth in future rest ?

Should India continue to defer major environmental policy reforms merely because the developed Western nations have not yet agreed(despite Agenda 21) to transfer environmental technologies and aid to the third world ? If taken to logical conclusion, no stakeholder in India or any other third world country should take any precaution or voluntary action aimed at restoration of ecological balance and sound environmental health of a country ?

There is a conflict between priorities of North and South. North is concerned about biodiversity, green house effect, heritage sites etc. while South emphasizes sanitation, health and education . Further North has material wealth but lacks natural wealth and South has natural wealth but lacks material wealth .Also conventional notions of 'development' (for which South is aspiring) entail conversion of natural wealth into material wealth. (Pearce D, 1992).

The case for indigenous initiatives rests entirely on the need for generating our own thinking on the subject. Aid induced environmental reforms will inevitably reflect the priorities of the aid givers. Should not there be our own agenda on the subject? This project is a modest attempt to answer this question.

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25. This assumes that the transaction costs of different stakeholders have the same numeraire and can be added linearly.

26. Schmidheiny (1992: 29-30) has identified a few parameters which influence choice of policy action.

1. Efficiency
2. Flexibility of response, i.e industry to minimize change over costs by deciding on technology, pace of change.
3. Confidence in regulatory environment.
4. Level playing field. Regulations should affect all comparable enterprises equally.
5. Transparency of compliance.

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