Chapter 7

CONCLUSION

We initiated our study by pointing out that though industrialisation is nowadays taken as the main instrument of development and improved living standard of people, both at local and global level, it has certain negative impacts as well. One of the unwanted fallouts of industrial expansion is the damages caused to the environment. Apart from the often discussed ozone layer depletion, greenhouse effect, global warming, and related problems, there are some impacts that are limited to the regional level, affecting the population living in the immediate vicinity of industrial units. We contended that the negative environmental impacts have to be taken into account while planning for industrialisation and for that purpose it is essential to arrive at a valuation of such damages. This dissertation has attempted to act as a pointer in that direction by outlining the environmental impact of recent industrialisation drive in an industrial city – Durgapur of West Bengal in India – and estimating the value of environmental damages caused by such industrialisation over the last decade. In this chapter we summarise the basic issues raised by this study, briefly describe some of the steps that can be taken to limit such negative impacts, and associated problems.
MAIN FINDINGS

In the first chapter we discussed that industrialization process in any developing country cannot be viewed as only benefits. While significant economic progress occurs due to industrialisation, there are substantial accounted and unaccounted costs too. Employment generation and production of output are the direct benefits while linkages with agricultural sector and human capital formation are the indirect benefits. On the other hand environmental cost of industrialization is environmental pollution and associated costs to human beings. Pollution from industries directly damages human and animal health, degrades drinking water, indirectly reduces productivity from agriculture and animal husbandry. The cost of industrial pollution is borne by the people in the form of health loss and natural resources degradation. Industrial effluents, agricultural chemical runoff and leaching are also causing serious water pollution and degradation of soil quality. We therefore postulated that the costs of industrialisation process should be estimated before going full throttle on further industrialisation in a specific location.

In the second chapter we have discussed few studies in the context of impact of industrialization on environment. It was noted that only a few studies have dealt with environmental problems due to industrial pollution, especially in the developing countries context where industrialization is still seen as the panacea for underdevelopment. Most of the studies contend that costs of environmental damages due to industrial pollution are higher in developing countries than in developed countries. There are few studies in the context of large developing countries also. However, most of these studies are in the context of water pollution from industry / agriculture or vehicular air pollution. In Indian
context only a handful of studies analyses the impact of industrialization on environment and tries to value the incidental damages. It was noted that the present work seeks to bridge that gap in existing literature.

In the third chapter we have described the profile of the region, specific objectives of the study and the methodologies that are to be adopted. It was proposed that WTA and WTP were to be used to arrive at estimates of environmental costs of the recent industrialisation drive in the region. Both primary and secondary data was to be used. The sample design was aimed at reducing errors and ensuring the validity of the study. Therefore Stratified Random Sampling method was used to acquire precise and representative information from the population. Personal interview method of survey was used with a structured questionnaire.

In the fourth chapter we discussed how the industrial scenario in Durgapur region has evolved over the last 50 years – rising and falling over time before skyrocketing in the last decade. Major trends over the three phases – Period of Growth up to 1991, the Recession Period of 1991-2001, and the Neo-Industrialisation period from 2001 onwards – were discussed. The nature of the new industrial units, the product and technology mix, and its close link with 'dirty' industrialisation was discussed. It was also noted that during the 2001-08 period as many as 24 industrial units in the study region were cautioned by the West Bengal Pollution Control Board for serious environmental damages, and most of these were new units set up in post-2001 period.

In the fifth chapter we explored the air pollution situation in Durgapur in detail, focussing on the technical aspect of air pollution levels. Various basic issues related to air pollution in general were discussed in the beginning to provide a backdrop to the pollution scenario in the city. Air
quality data and annual average concentration of major air pollutants like SPM, RSPM, SOx, and NOx in various locations within Durgapur were reported. It was observed that the average pollution level for residential locations in 2004-05 was higher than that in 1999, indicating greater level of pollution in spite of technological improvements like imposition of BS-III norms for vehicles. This was the first indication that the industrialisation drive of post-2000 period was also associated with rising environmental damages in the locality. The impact of new industrial units on the air pollution level in Durgapur was highlighted by the level of pollutants in 2009-10 period as obtained from the Ambient Air Quality Monitoring stations of WBPCB located at four locations of the city – Angadpur, Bhiringi-Benachiti, Bidhannagar, and PCBL More. It is evident that for most of the pollutants, the peak levels were reached in the winter months of 2009. The results, when averaged for the city as a whole, also provide similar trends. We also reported that Central Pollution Control Board, in its Annual Report of 2008-09 had commented that the ambient air quality of Durgapur city was *Highly Critical* in terms of SPM, *Moderately Critical* in terms of NOx and RSPM, and *Low Critical* (non-critical) for SOx. It is thus amply clear that the industrialisation process during the post-2000 period has been associated with increasing air pollution levels in the city of Durgapur. It was therefore inferred that the air pollution level in Durgapur has been increasing in the past decade – the period matching with the growth of new industrial units in the locality.

In the sixth chapter we attempted a valuation of environmental damages caused by industrial air pollution of the last decade based on primary survey. One of the foremost impacts of increased pollution level is on the
health of the residents. It is observed that most of them spend ₹ 500-1000 per month as medical expenses. To evaluate the Environmental Cost we used both WTA and WTP methods, with separate samples. For the WTP sample, respondents were provided two scenarios – maintaining environmental standard of the current year, and reverting back to the environmental situation of the year 2000. It is observed that the monthly WTA values for most of the respondents fall within the ₹ 500-1000 band, the average being ₹ 207 per month. Locational differences were observed which may be a reflection of higher pollution levels in some areas, or may be determined by the characteristics of the respondents therein.

In contrast to WTA, when we use the WTP method, we find that respondents are willing to shell out not more than ₹ 300 per year, or about ₹ 25 per month for minor changes in environment situation that would maintain the current standard, the average being ₹ 171 per year. For major changes that would have reverted back to the pre-2001 standards respondents are willing to pay ₹ 495 per year on an average. It was again observed that residents of some locations are willing to pay significantly higher amount relative to others for major improvements in environment. This confirms our earlier notion that either pollution level is worst in these locations or residents herein value the environment more than others. It was also noted that few respondents are not willing to pay for improvement in environment because they don't believe that the situation will change and feel that the environment will go from bad to worse. We also observed that respondents engaged in service or as casual workers have the highest WTA and WTP, indicating that they value the environment more than others. WTP is lowest for the Businessmen. This may be associated with the profile of the occupational groups – whether
they are Risk-lovers or Risk-averse. Family size and educational status were found to be closely and positively related to WTA. More educated persons and respondents from large family have higher WTA. Large family size also leads to higher WTP, indicating that valuation of environment is higher for these families, perhaps because of concern for their children. On the contrary, WTP is not affected by educational status, indicating perhaps a perception among educated respondents that once the environment is polluted there are no real chances of improving it irrespective of how much they are ready to pay. This cynicism among the educated is a major cause of worry for the local civil society. On the other hand, income does affect WTP for major changes, and respondents with higher PCI are willing to pay more for substantial improvement in the environment.

We also estimated the gross environmental cost due to recent industrialization in Durgapur region from the WTA and WTP figures using population multipliers. If we consider the WTA figures the valuation of the environmental impact of the current industrialisation process comes out to be a staggering ₹1366 million per year – more than 10 per cent of the total monetary benefits (salaries due to employment generated and profits accrued) that is generated in the local economy from industries. Using WTP method, two estimates were arrived at – one as a value of the current environmental situation and the other the value of the pre-2001 environmental situation. Estimated value of current environmental situation comes to be ₹94 million whereas the pre-2001 situation is valued at ₹272 million. Compared to the monetary benefit generated by the industries annually, this is not a large sum – about 2 per cent of the total benefits (salaries due to employment generated and
profits accrued) from the industrialisation process. The actual value of environmental cost of the post-2000 industrialisation in the study region lies between the value obtained from WTP method and that obtained from the WTA method. Thus, though precise estimates cannot be obtained, this study is a pointer to the fact that we must look at environmental damages and their costs before embarking on further industrialisation process in the region to protect environmental balance and keep the system sustainable.

Against this backdrop we may suggest certain steps for mitigating the environmental damages in the region due to the recent industrialisation drive.

**POLICY SUGGESTIONS**

The suggestions can be grouped under two heads – technical methods to control air pollution; and economic policies. Let us explore them in brief.

*Technical Methods to Control Air Pollution*

Control of air pollution is largely a matter of (a) preventing pollutants from escaping from their source, (b) eliminating the source, or (c) shifting the location of the source or of the recipient. Air pollution from fixed sources as experienced during the course of this study is localised and accordingly, remedies, though costly, are much more clearly related to benefits within comparatively localised political jurisdictions.

Technologically, Mechanical Collectors (dust cyclones, multicyclones) and Electrostatic precipitators are commonly used as pollution control devices by industry or transportation devices. They can either destroy contaminants or remove them from an exhaust stream before it is emitted into the atmosphere. In the industries that are operative in Durgapur, electrostatic precipitators (ESPs) should be used as they are
highly efficient filtration devices that do not obstruct the flow of air through the device but yet removes fine particulate matters like SPM and RSPM from the composite gaseous output. Baghouses, Particulate scrubbers, Wet scrubbers may also be used. Installation of Waste Heat Recovery Boilers for reusing flue gases from the Rotary Kiln can act as an energy efficient process as also facilitate emission control.

It was learned during field survey that most of the new industries do not take adequate pollution control measures or do not operate the devices installed to save electricity and money. Such practices should be immediately stopped and appropriate technological steps must be taken by the units for preventing emissions.

Particulate inputs and outputs [coal char, coal fines etc] should not be stored in open space. The dust collection system in the ESP should be provided with pneumatic control system along with silo and pug mill. Concrete / paved roads must be provided within the factory premises to prevent dust particles blowing up due to vehicle and human movement. In addition the industrial units must ensure continuous water spraying within and outside the factory premises for prevention of SPM and RSPM blowing up in wind. All units must develop green buffer zone along the inside periphery of factory premises, covering at least one-third of the total area.

While these are technical details, to be thrashed out in more detail by environmentalists, the implementation of any such step needs bold and pro-active administrative stance coupled with economic sanctions against defaulters.
Economic and Administrative Steps

Globally, the environmental regulation-avoiding attitude of producers often leads to concentration of polluting industries in locations characterized by lax environmental norms (Pollution Haven Hypothesis). Usually it is argued that the developed country producers relocate their polluting units in newly industrializing developing countries (Eskeland and Harrison, 2003). Similarly within a country, relocation along that line from 'cleaner' States to the 'dirtier' States, and from metropole to the suburbs may be noticed. To prevent proliferation of polluting industries and their concentration in specific locations, two main pollution control statutes in India are existent – the Water Control Act of 1974, and, the Air (Prevention and Control of Pollution) Act of 1981. Although the scope of these legislations is broad, they have not been very effective in controlling air pollution and preventing environmental damage in Durgapur. One of the main reasons for this poor implementation is that there is basic division of power between the centre and the state in India, reflecting the federal nature of the constitution. While the Central Pollution Control Board (CPCE) is responsible for setting environmental standards for plants and ambient air pollution levels, the implementation of environmental standards and their enforcement are decentralized and are the responsibility of the SPCB (State Pollution Control Board), the West Bengal Pollution Control Board in this case. The WBPCB have an important role to play in making the plants use an environmental friendly plant operation through command and control policies. This is what WBPCB has been doing though the approach has been mostly a comprehensive one rather that sector and location specific. If WBPCB inspection finds that emissions from a certain industrial unit have gone
above the specified limit then a notification is served which asks for the reason behind the increased level of emission. An inspection by WBPCB is repeated after some period of time and if the industrial unit is still not meeting the standards then penal steps are initiated. In most cases the unit is asked to deposit a bank guarantee of some specified amount as guarantee against above-limit emission in future, which is forfeited if emission still remains higher. This forfeited amount is used by the WBPCB for the improvement of the environmental quality in the industrial area as well as the nearby residential area. This forfeited amount is used by the WBPCB for the improvement of the environmental quality in the industrial area as well as the nearby residential area.

However, several drawbacks plague this system. First, the process is so long drawn out and so much time is given to the units to bring emission under specified limit that they very often can operate without pollution control devices for close to one year and start using the device only weeks before the impending third visit by WBPCB. Second, question arises regarding the amount of bank guarantee too. There is no economic rationale behind fixation of the amount; rather it is fixed arbitrarily, raising questions of non-transparency and collusion with offending units. Under such circumstances, administrative steps should include doing away with serving of notices and warning the industrial units. Strict vigil for ensuring continuous and efficient functioning of emission control system has to be adopted to detect wilful defaulters who are to be dealt with very sternly. Inspections must be periodic and without prior information. Heavy fines must be imposed even on first time offenders as it is a crime to pollute the environment after consenting to operate under strict guidelines. Since Sponge Iron units are the worst offenders in the
locality, special steps must be taken for them. Further clustering of sponge iron units is to be discouraged. Existing units must be encouraged to become integrated with downstream facilities when renewal of their Consent to Operate comes up.

Monitoring committees should be set up for each industrial unit comprising of WBPCB nominees, local residents, and technical personnel from academic institutes of the region. These committees should have authority to inspect and submit legally binding reports periodically, based on which penalties should be imposed on defaulters. A scheme for providing incentives to 'green' units may also be initiated to encourage adoption of environment friendly operational procedures.

It must also be accepted that a major reason for such environmental mess in Durgapur is administrative short-sightedness that allowed changes in the land use pattern to attract new industries to a recession hit region. Such changes, incremental at a time, have cumulated to major changes over time and now there are polluting industrial units in every nook and corner of the city. The green buffer zones have been depleted in a bid to industrialise and urbanise, compounding matters further. Existing regulations like considering the ambient air quality of the whole city during Environment Impact Assessment of intending industrial units whereas pollution is spatially concentrated has also lead to setting up of more units compared to carrying capacity of the region. In addition, the nature of the new units - their product mix & technology - was also questionable. It is good that it has been decided by the WBPCB not to allow any more Sponge Iron industries in the region.

The problem also has potential to initiate policy formulation from a broader and long run perspective that may be replicated across similar
regions in the country. For example, it could be addressed in terms of regional airsheds (analogous to water-sheds) and therefore plan about the quality of air and act in a fashion similar to considering river-basins as units in the planning and conservation of water resources. The city of Durgapur and contagious localities may form an air-shed, and demarcated based on the prevailing wind pattern, habitation, land-use and terrain. After that an Air-shed Authority for the area can be set up who would look after maintaining and improving the environmental standards of the region, keeping the divergent pressures of industrialisation and sustainability in balance.

POSSIBLE EXTENSIONS

This study looked at the costs of further industrialisation in a location which is already predominantly industrial in nature. The costs that have been estimated in this study are only indicative of the magnitude of the problem. The study can be extended to undertake a techno-economic study of the industrial units to understand the economics of pollution from the producers' side so that appropriate economic policies may be framed to discourage pollution. In addition, more intensive studies to explore the actual health damages resulting from increased air pollution in the region may also be undertaken. A full-fledged Cost-Benefit Analysis of the neo-industrialisation drive in the region may also be undertaken in future, based on the preliminary findings of this study. Comparative studies on other locations – both that have similar history of increased pollution and those that have been successful in keeping pollution under control may be undertaken to prepare a blue-print for sustainable industrialisation of the region.
To summarise, the problem that we have discussed is a classic case of trade off between regional economic growth and regional environmental damages where the authorities have failed to maintain balance between the two, spurred no doubt by the recessionary trends during the 1990s and the increasing pressure to sell the region as an attractive industrial hot spot to potential investors. It is now imperative to correct the imbalance and ensure sustainability of the region’s environment. It is hoped that this study is the first step towards a long and arduous journey.