POVERTY, ENVIRONMENT AND DEVELOPMENT

Studies of Four Countries in the Asia Pacific Region

Edited by

ADRIAN HAYES AND M.V. NADKARNI

Sponsored by

ASSOCIATION OF ASIAN SOCIAL SCIENCE RESEARCH COUNCILS (AASSREC)

and supported by

UNESCO

UNESCO Principal Regional Office for Asia and the Pacific. Regional Unit for Social and Human Sciences in Asia and the Pacific.
Poverty, environment and development: studies of four countries in the Asia Pacific Region/edited by Adrian Hayes and M.V. Nadkarni.
Bangkok: UNESCO PROAP, 2001.
279 p.

Sponsored by Association of Asian Social Science Research Councils (AASSREC) and supported by UNESCO.

1. POVERTY. 2. ENVIRONMENT. 3. ECONOMIC AND SOCIAL DEVELOPMENT. 4. CASE STUDIES. 5. INDIA. 6. CHINA. 7. KOREA R. 8. AUSTRALIA. I. Hayes, Adrian. II. Nadkarni, M.V. III. Title.

363.7

Published by the
UNESCO Principal Regional Office for Asia and the Pacific
P.O. Box 967, Prakanong Post Office
Bangkok 10110, Thailand

Printed in Thailand

CONTENTS

CONTENTS *(continued)*

CONTENTS *(continued)*

CONTENTS *(continued)*

PREFACE

The completion of this volume is a substantive accomplishment of the Association of Asian Social Science Research Councils (AASSREC). Conceived in 1996, the study on poverty and the environment on which it is based was planned as an AASSREC activity to help monitor, within the Asia-Pacific region, government commitments to the goals of the 1995 World Summit for Social Development (WSSD). As is well known, the goals of the WSSD centered chiefly on reducing poverty through direct interventions and the adoption of synergistic development policies and measures, the end-goals of which were directed likewise at alleviating poverty while ensuring social and environmental sustainability. This plan received encouragement from Dr. Yogesh Atal, then Director of the Coordinating Unit for the World Summit for Social Development, UNESCO, Paris. Dr. Atal also helped AASSREC obtain some funding support for the planned project.

As related by Professor M.V. Nadkarni in his introduction to the volume, the design for the study was formulated and further refined during AASSREC's regular Biennial General Conference in Beijing in 1997 and at a special project meeting convened in Bangkok in 1998. The case studies contained here are the final project outputs presented during AASSREC's latest Biennial General Conference in Seoul in 1999.

The work and case studies that went into making this volume illustrate how social scientists use their expertise to analyze ongoing phenomena and examine commonly-held views from some critical distance, thereby, enhancing greatly our understanding of given events and social processes. The AASSREC study itself evolved from a simpler concern with examining the empirical basis for the hypothesized "downward spiral" or "vicious circle" relationship between increasing poverty and environmental degradation to ferreting out, with the use of country case studies, the important factors

impinging on this assumed relationship. It concludes by showing that the relationship between poverty and environment is not only of one kind. In fact, this spans several possibilities ranging from vicious to virtuous circles and including situations in-between. The study then attempts a clearer specification of the conditions under which the poverty-environment linkage can lead to positive or negative outcomes, and the implications of these for development policy and programs. All these are neatly presented in the introductory and concluding sections of the volume and well illustrated by the country case studies.

This volume would not have been possible without the generous contribution of time and effort by scholars and researchers who assumed the responsibility of undertaking the necessary case studies in their respective countries: Adrian C. Hayes of the Research School of Social Studies, The Australian National University, Canberra; M.V. Nadkarni, Vice Chancellor of Gulbarga University, Karnataka; Young-Pyoung Kim, Professor of Public Administration, Korea University, Seoul; and Zheng Yuxin, Deputy Director of the Institute of Quantitative and Technical Economics, Chinese Academy of Social Sciences (CASS), and his colleagues Wang Songpei, Qian Yihong and Yan Lin at CASS. Drs. Hayes and Nadkarni also graciously volunteered to serve as editors of this volume.

Throughout the project, as in fact since the establishment of AASSREC, the Regional Unit on Social and Human Sciences in Asia and the Pacific (RUSHSAP) of the UNESCO Regional Office in Bangkok, has lent constant support to AASSREC's activities. We gratefully acknowledge this support. In particular, we wish to thank Dr. Malama S. Meleisea, Regional Adviser for the Social and Human Sciences, for his interest in the publication of this volume and its distribution in the region.

VIRGINIA A. MIRALAO
Secretary-General
AASSREC
September 2000

Chapter 1

INTRODUCTION

M.V. NADKARNI
Vice-Chancellor, Gulbarga University, Karnataka

BACKGROUND TO THE STUDIES

With the publication of the Report of the World Commission on Environment and Development in 1987, popularly known as the Bruntland Report, we have arrived at a surprisingly good consensus on the necessity of sustainable development. Surprising, because different countries are at different levels of development with differing perspectives on environment and its degradation. And yet, no government of any country could dare say openly that they prefer to have development even if it is at the cost of environment. This is an important achievement for the world community.

The Report saw, however, an important challenge to the goal of sustainable development from the side of poverty which development should have helped to alleviate. On the other hand, the Report observed that "many present development trends leave increasing numbers of people poor and vulnerable, while at the same time degrading environment" (WCED 1987: 4). This is not the first time this observation had been made, but the Report went further and showed links between increasing poverty and environmental degradation, which the development trends did not succeed in stopping. It observed: "Many parts of the world are caught in a vicious downward spiral: Poor people are forced to overuse environmental resources to survive from day to day, and the impoverishment of their environment

further impoverishes them, making their survival even more difficult and uncertain" (WCED 1987: 27).

This stimulated a lot of debate and the thesis of vicious downward spiral (also referred to as circle or cycle) was widely questioned.[1] More than the poor, it was the rich countries and the rich within the developing countries who were pointed out to be the main agents of environment degradation, and to blame the poor for environment degradation seemed like adding insult to injury. It was evident that not all poverty was due to environment degradation, nor was all environment degradation due to poverty. And yet, there did exist a triangular nexus between poverty, environment and development, influencing each other in complex ways. What made it complex is that this influence was not in one direction only and could depend on prevailing circumstances.

What is more, as Reardon and Vosti (1995) argue, the concept of poverty itself needs to be better understood. Poverty cannot be understood merely in terms of a deprivation of a certain measure of welfare (consumption or income or commodities) but more in terms of capacity to invest in resource conservation. Even earlier, Sen (1987) had questioned the emphasis on "opulence" as in real income estimates, or on utility as in traditional welfare economics. Sen, instead, focussed on what a person can do or can be, shifting from commodities to capabilities. It was this shift which led to the emergence of the Human Development Index as a measure. However, the traditional concept of poverty in terms of head count ratios, defined through certain consumption or income levels, has still persisted. This notion of absolute poverty is still relevant in countries like India as they are yet to eliminate it. With higher levels of development, relative poverty becomes more important. Whether it is absolute poverty or relative poverty, we get a more balanced perspective of poverty when seen against other parameters of human development. This is because even with relatively low incomes, countries like Sri Lanka and states like Kerala within India have attained higher level of human development.

In view of the need to better understand the nexus between poverty (or low level of human development), environment degradation and development so as to formulate better and more effective policies, it was thought that the specific experience of

countries could be analysed and studied. The question was discussed in a Sub-Meeting of the Poverty and Environment Group at the 12th Biennial Conference of the Association of Asian Social Science Resource Councils (AASSREC) at Beijing in October 1997, involving six countries (Bangladesh, China, India, Indonesia, South Korea and Australia). A general proposal for the country studies was first prepared by Adrian Hayes, to be sponsored by AASSREC and supported by UNESCO. At the Second Meeting of the Group in Bangkok in September 1998, proposals of country studies were discussed and a tentative analytical frame and format for the studies was decided upon. At the 13th Biennial Conference at Seoul in October 1999, the draft studies of five countries were presented at the Group Meeting. Four of these studies were further revised and refined for publication, which are presented in this volume. The volume owes its success not only to the authors of the studies but also to the unwavering encouragement and support from Virginia A. Miralao of AASSREC and Malama S. Meleisea of UNESCO.

Each country study was to present a profile of the problems of poverty and environment degradation in an analytical framework or perspective suited to the concerned country along with a critical assessment of measures initiated to tackle the problems. This was to be done in the context of the process of economic development and industrialisation taking place in the respective countries, analysing at the same time the triangular nexus between poverty, environment and development in the light of the specific experience of the respective countries. Policy implications were also to be spelt out with such an analysis. While the experience of the different patterns of the triangular nexus could be illustrated with several examples, it was planned to present two separate case studies for each selected country, one in a rural/forest environment and the second in an urban/industrial setting. The purpose of the case studies was to concretely illustrate the kind of dilemmas facing the countries concerned and to bring out the linkages between poverty, environment and development. The selection of the countries was confined to the Asia-Pacific Region, including the developing countries like India and China, a newly industrialised country like the Republic of Korea, and a developed country like Australia. This made it possible to reflect on the triangular nexus as prevailing in different types of countries within the Region.

The perspective in terms of which the three dimensional nexus between poverty, environment and development can be viewed and analysed is presented in Part II of the paper on India by Nadkarni. It asserts that there are so many patterns and situations of the nexus that it would be naive to conceptualise it in terms of single thesis of the "vicious circle." The thesis explains neither poverty nor environmental degradation. At best, it could be one of the several situations prevailing *within* a country, and can not even be a dominant one. Moreover, the thesis is a misleading guide to understanding differences *between* countries. There are also situations other than the vicious circle, which are: the affluent degrading the environment more than the poor; trade-off between poverty alleviation (through development) and environment; environment conservation conflicting with interests of the poor; destructive development that aggravates both poverty and environment degradation; environment helped by continuing poverty – a situation inconsistent with human dignity, and the "virtuous circle" which helps both poverty alleviation (through development) and also environment. While the vulnerability of the poor to environment degradation is emphasised, women are shown to be especially vulnerable, and hence having the special potential to stimulate "virtuous circles." All these patterns are illustrated with Indian experience, but the experience of other countries also fits into such an analytical frame. For example, the virtuous circle as illustrated by watershed development programs is common to both China and India.

A COMPARATIVE PROFILE OF THE SELECTED COUNTRIES

Four countries are selected here for the studies – India, China, the Republic of Korea (South Korea) and Australia. They are presented here in an ascending order of their level of human and economic development, or in descending order of the level of poverty. Thus in terms of the Human Development Index, India ranks 132nd, China 98th, the Republic of Korea 30th and Australia 7th, with their respective HDV Index being 0.545, 0.701, 0.852 and 0.922 respectively in 1997. The absolute poverty in terms of a uniform international poverty line of U$ 1 a day per capita, was 52.5 per cent in India and 29.4 per cent in China in 1994, while both the Republic of Korea and Australia had no such absolute poverty.

Four tables at the end of this Chapter present a comparative picture of these countries – the first of them on the levels of human development including GNP per capita, the second on demographic features, the third on selected environment parameters, and the last specifically on the levels of air pollution in major cities of the four countries.

Australia appears as an outlier with a density of population of only 2.4 per sq. km. in 1998, in contrast with South Korea's 470, India's 330 and China's 133. However, in terms of the rate of growth of population per annum between 1975-97, China (1.3 per cent), South Korea (1.2 per cent) and Australia (1.3 per cent) are close to each other. India's population growth which was 2.0 per cent per annum in this period, is expected to fall to 1.3 per cent per annum during 1997-2015. But this growth rate is expected to decline in the other three countries as well. Total Fertility Rate is highest in India and lowest in Australia, but it is declining in all the four countries significantly. Both Australia and South Korea are highly urbanised, respectively with 85 and 84 per cent urban population in 1997, compared with China's 32 per cent and India's 27 per cent. The latter two most populous countries are predominantly rural and are expected to be so even by 2015. However, both India and China have quite a few enormously large cities which are bursting at the seams especially in India. There are as many as 24 "million plus" cities in China, and 11 in India (as in 1995), compared with only 3 each in South Korea and Australia. The population of Mumbai alone in India (15.1 million in 1995) is only slightly less than the entire population of Australia (18.3 million in 1997). Even while the population is dominantly urban in South Korea and Australia, it is more evenly spread there than in India and China.

There is a tremendous diversity in the countries selected in terms of their economic position and human development. As compared to India, which is at the bottom, GNP per capita in 1997 was 1.87 times higher in China, 8.14 times higher in South Korea and 12.10 times higher in Australia. While China has succeeded in reducing its absolute poverty substantially, India has been much slower in this regard in spite of the fact that it started poverty alleviation programs on a large scale during the 1970s. The relative success of China seems to be mainly due to effective land reforms followed by early Economic

Reforms which stimulated a significantly high rate of economic growth in the 1980s and 1990s. In contrast, land reforms in India were half hearted, and serious economic reforms were started only from the early 1990s, a decade later than China. Rapid rural industrialisation in China also helped absorb surplus labour in agriculture. Now China is worried more about relative poverty, especially in urban areas, created by displacement of labour due to closing down inefficient industries. These displaced workers have not joined the ranks of the absolute poor since they receive compensatory payments and are only relatively poor compared to the employed workers. South Korea and Australia have only relative poverty. This relative poverty in Australia, however, has an ethnic character as the poverty rate among Aborigines is much higher than among the white population.

India is poor, not only in terms of income, but also in terms of adult literacy rates, especially female literacy rates, school enrolment, infant mortality and maternal mortality rates, though the position is now much better than it was some thirty years back. Life expectancy at birth has considerably improved in India, though it is still lower than in China. Even at the reduced level, the infant mortality rate in India is over 14 times higher than in Australia, and maternal mortality 63 times higher! This is not surprising, because the number of doctors per 100,000 people in 1993 was only 48 in India, in contrast to 88 in China, 232 in South Korea and 299 in Australia.

When we come to environment, the picture is different (see tables III & IV). It is the poor countries which degrade the environment much less! In Australia, the forest area declined from 1067 thousand sq. km. in 1980 to 409 thousand sq. km. in 1995. South Korea managed to increase this area from 49 thousand sq. km. to 76 thousand sq. km. during the same period, a substantial increase in relative terms. Both the poorer countries, India and China, also actually increased forest area – India from 640 thousand sq. km. to 650 thousand sq. km. and China from 1150 thousand sq. km. to 1333 thousand sq. km. between the same years. Australia is not alone among the rich countries to have reduced forest area. Forest area in Canada declined from 4364 thousand sq. km. to 2446 thousand sq. km. and in USA from 2960 thousand sq. km. to 2125 thousand sq. km. – during the period.[2]

It is not the quantity of forest area alone. Most of the forest area in rich countries is devoted to growing commercial species, while forest area in poorer countries harbours a rich bio-diversity. Alas! it is valued more by environmentalists than business persons! It is hardly realised that the poorer countries too have the same commercial interests in forests and forest area as the rich. While rich countries like USA have evolved market mechanisms to protect privately owned forests by paying compensation for retaining them under wilderness use, similar mechanisms are yet to evolve to protect tropical forests which are even richer in biodiversity and wilderness.

Forests are now valued also as a carbon sink. The bulk of CO_2 emissions occurs in rich countries because of their much higher per capita figures there. Among the four selected countries also, there is a perfect and positive rank correlation between per capita income and per capita CO_2 emissions. Though GNP per capita (1997) in Australia was 12.1 times higher than in India, its per capita CO_2 emissions (1996) were 15.5 times higher! The commercial energy use per capita also has a similar correlation with GNP per capita. Interestingly, however, the GDP output per kg of energy also is much higher both in South Korea and Australia (3.0 and 3.7 US$ respectively) compared to India and China (0.8 and 0.7 US$ respectively). The efficiency of energy use, however, has improved between 1980 and 1996 in these countries except in South Korea where it has slightly declined.

Sustainable use of fresh water is going to be a serious issue in the years to come. Per capita water withdrawals are lower than the world average both in India and China, but higher in South Korea and Australia. However, Australia has huge internal renewable water resources, and its annual rate of withdrawal is only 4.3 per cent, compared to world average of 7.3 per cent. This rate is higher in the other countries selected here: 41.7 per cent in South Korea, 20.5 per cent in India and 16.4 per cent in China. Water pollution, in terms of emissions of organic pollutants, is higher in per capita terms in India, than in the other three countries. However, it has shown a declining trend including in India per capita, though not in total pollutants.

Urban environment and congestion is a serious issue in India, China and South Korea. The number of people injured or killed per 1000 vehicles was intolerably high in South Korea in 1980, but they managed to reduce it to 34 in 1997. In 1997, India had the dubious distinction of having the highest position in this regard.

In terms of air pollution in major cities (with a population of 3 million or above), China shows the most dismal picture. In terms of all the three parameters, total suspended particulates (TSP), sulfur dioxide and nitrogen oxide, the simple averages of these cities in China are much higher than in the other three countries, whereas Australia shows the cleanest picture (see Table 1d). As observed earlier, urbanisation is more evenly scattered in Australia. It has no city with more than 4 million population. South Korea has only 2 cities with more than 4 million in spite of its high level of urbanisation within a small size of the country, while China has 7 and India has 6 of them (as in 1995). This metropolitanisation draws heavy resources for infrastructure development, housing, supply of water and waste removal; urban slums and crime are also serious problems closely related with this phenomenon.

To the question of who degrades the environment more – the poor or the rich, there can be no straight answer. The general feeling that the poor countries are diverting forest areas for other purposes due to poverty and demographic pressures, is not borne out by hard facts pointed here. But they do not have enough resources to manage their problems of urbanisation and industrialisation with the same ease with which rich countries are managing them at present. Though the poor are also catching up with the rich countries, the level of per capita CO_2 emissions is several times higher in the latter than in the former. It is heartening, however, that the efficiency of energy use is improving even in the poor countries.

COUNTRY STUDIES IN A NUTSHELL[3]

India

India is yet to solve the problem of absolute poverty on a scale which is much larger than in the other three countries. This is in spite of the fact that absolute poverty is declining steadily. What is

worrying is that Economic Reforms seem to have slowed down this decline, unlike in China where they seem to have accelerated the decline in poverty. Pressures to hold down fiscal deficits as a part of the Economic Reforms have led to relatively reduced allocations to education and health, which could be one of the factors behind this, though in the process the rate of inflation is pushed below 5 per cent during the 1990s. It is significant, however, that decline in poverty speeded up in India when agricultural growth picked up, and declined when the latter decelerated. Poverty in India is still mainly rural in character, both because the bulk of the population continues to be rural and also because the proportion of poverty in rural areas is higher. Speeding up agricultural development, agro-industries and rural industrialisation holds the key to reducing India's poverty. Developing infrastructure also would help here.

India is a very diverse country with significant variations both in the level of poverty and human development. These variations, however, have little to do with natural resource endowments. In general, though not strictly, the populous northern states are lagging behind the southern states both in demographic transition and human development. Both modern education and industrialisation had an earlier start in the south as in West Bengal and Maharashtra too. Land Reforms were also a better success in the south and West Bengal than in the northern states.

Both poverty alleviation and population control programs were started in India on a large scale in the early 1950s. Poverty alleviation was first sought through Community Development programs in rural areas, and direct programs were started in 1970s on a wide scale. However, these programs did not have many resources, which could have been generated only through high growth rates. The GNP growth rate, which was around 3 per cent till 1980s, picked up in 1990s going above 6 per cent. The slowdown in poverty decline in the 1990s may well be temporary. Though population control programs were initiated simultaneously or even earlier than poverty programs, they lacked teeth. They were based only on publicity and persuasion, and not on compulsion. Positive incentives like an extra increment in salary for adopting terminal methods like (vasectomy or tubal ligation) are confined to employees of government and semi government institutions, who represent only a small fraction of the total population.

In spite of the rhetoric about poverty being the worst form of population, India went ahead with the required legislation and established institutions to take proper care of environment. Since 1980s, environment legislation has been made comprehensive and tighter, making agencies of control more proactive. However, the Pollution Control Boards do not have enough resources and staff to monitor the implementation of pollution standards by industries effectively. Industries, however, are progressively adopting pollution control measures. There is a problem with small scale industries, but it is tried to be tackled through collective treatment plants. However, urban pollution in the form of sewerage and solid waste has become a more severe problem than industrial pollution.

Since the majority of people are still dependent on natural resources for livelihood, as for example in agriculture, they are vulnerable to environmental degradation. Reversing land degradation and soil erosion and improving moisture conservation can lead to sustainable development of agriculture, and reduction in poverty. Though the paper on India makes a comprehensive critique of the "vicious circle" thesis, it does not deny its existence altogether and cites instances where the vicious circle, to the extent it operated, was turned into a virtuous one, as for example in Ralegaon Siddi. This village went beyond watershed development to cover entire rural development in a holistic way. But the dilemma of choice between sometimes conflicting goals of conservation and development, continues both in rural and urban areas, as illustrated in the paper. It is emphasised that care has to be taken to particularly avoid destructive development which aggravates poverty and also degrades environment, instances of which are cited. One thing is clear, environment cannot be sustainably protected by continuation of poverty and at the cost of human dignity.

Of the two separate case studies on India, one is on the dilemma faced in a National Park in Karnataka intended to conserve bio-diversity and wild life, but human settlements within the park are feared to be going against the goal of the Park. The second case study is on tanneries in Tamil Nadu, where a shift to a modern chrome tanning process caused widespread environmental problems, adversely affecting both land and water, and thereby aggravated human misery.

India is no less culturally rich and talented than China. Its intellectuals, writers, artists and musicians have made a mark all over the world. It has a unique diversity in culture, language and religion. Its greatest achievement is that it has maintained and even nurtured this diversity in spite of all odds, and has zealously protected freedom of expression and its democratic institutions. But it is yet to succeed in eliminating even absolute poverty. This should not, however, hide its achievements in getting into the mainstream millions of socially and culturally deprived castes and tribes, though even this process is not yet complete (see Nadkarni 1997). The spurt in the rates of economic growth in the 1990s has given room for optimism, and the slowing down process in poverty alleviation experienced during the period may, hopefully, be only a temporary phase.

China

The paper by Zheng Yuxin and others points out that during the last twenty years since the policy of opening up and Economic Reforms was initiated, China recorded dramatic achievements both in stepping up its rate of growth and in reducing poverty. Farmers' incomes and quality of life improved and the gap between income levels in rural and urban areas was considerably reduced. Apart from Economic Reforms and rapid agricultural development and rural industrialisation, the effectiveness of family planning also contributed to this. The process of poverty alleviation, however, had started much earlier with land reforms.

In addition to the indirect way of reducing poverty through growth, China also adopted direct measures. Programs were taken up on a large scale to provide drinking water, roads, electricity, education and health services to rural areas. Special attention was given to develop skills for jobs outside agriculture too. These efforts were made in India too.

Of particular significance are the programs to integrate poverty alleviation and ecological improvements. Here again, we can see similarities between India and China, though the scale appears to be larger in China. These programs relate to controlling soil erosion and desertification, which seem to be more severe in China. Desertification, particularly, is still serious, since about 34 per cent of

land area is affected by it. Reclaiming areas degraded due to desertification and converting them into farmlands is high priority for China. Watershed development programs are also taken up on a large scale, both for soil and water conservation.

Even while tackling rural poverty, China had to face aggravating urban poverty problems. With the deepening of Economic Reforms, many inefficient State-owned enterprises were closed down, resulting in unemployment. The problem became significant by early 1990s, but since then the proportion of urban population who are poor has declined in part because of systematic attempts to give the unemployed new skills and absorb them elsewhere. Unemployed urban poor are not in absolute poverty, since the laid-off workers are provided with a basic living security made possible by rapid economic growth.

Though absolute poverty has dramatically declined, relative poverty worries China. With the Economic Reforms and greater freedom of enterprise, income gaps have increased particularly in urban areas. Much of the absolute poverty which remains is confined to Western and mountainous regions, attributed mainly to harsh natural environment.

With urbanisation and industrial development, both urban and industrial pollution became significant. Waste water discharges, smoke, dust, industrial emissions, solid wastes, and SO_2 have sharply increased during the 1990s. However, of the estimated total environmental cost valued at 330 billion yuan (amounting to 10 per cent of GDP), the greater part of 230 billion yuan is attributed to ecological costs like desertification, grassland destruction, degradation of farm lands, depletion of water resources and other human induced disasters. The costs on account of air and water pollution and solid waste are estimated at 100 billion yuan (3 per cent of GDP).

China has taken bold steps to meet this challenge. For example, in 1997 September, some 60,000 polluting enterprises were closed down. Enterprises started earlier in townships were specially liable to pollute.

Special attempts are made to convert vicious circles to virtuous circles or sound circles, especially in rural areas. People in harsh and arid environment conditions are being shifted to newly irrigated

areas. Preservation zones to protect endangered species are developed, creating new job opportunities to rural people. "After training and organising a peasant environment protection team, the peasants who destroy environment become protectors of the environment" (Yuxin et al. section IV.4).

The China paper has two case studies. The first relates to a poor mountainous area. The destruction of the ecology of the region was the main reason for poverty here. An ambitious program was initiated to revegetate the mountains. The poverty-ridden people were taken care of in three phases: the first was "blood transfusion" (relief and direct assistance); the second was "blood making" (projects initiated to generate income); and the third was continuation of the second phase but with new projects which generated more incomes and also improved the ecology of the area through watershed development, developing grasslands, and animal husbandry. Micro credit program were also organised for the poor on the Bangladeshi model.

The second case study relates to the people displaced by the exhaustion of mines, involving an ecological disaster too in addition to the human. With the closing of the mines, the displaced people had to be rehabilitated or given a basic living allowance to avoid absolute poverty. At the same time, land surfaces stripped and devastated by the mines had to be corrected.

Overall, the Chinese policy in poverty alleviation is to transcend from "blood transfusion" to "blood making" and to integrate poverty alleviation with ecological improvement.

The Republic of Korea

Republic of Korea is a newly industrialised country and recorded even more dramatic achievements than China both in achieving high levels of income and abolishing poverty. Four decades ago it was a typical agrarian society, and today it is a modern, highly industrialised and urbanised country. Its average density of 470 persons per sq. km. in 1998 is one of the highest in the world. Taking into account the fact that the bulk of its land area is under forests, actual density in other areas is enormously high.

Behind this economic success lies the importance given to education, health, and development of technical skills. Backed with

open, export-oriented, market friendly economic policies, these industrious and hard working people made a big success of themselves in a short time. It is also interesting that in spite of the economic boom, inequality did not increase nor did unemployment.

The vulnerability to world market forces with a high export orientation produced its own problems. The country faced a shocking economic crisis in 1997-98 and led to closing down many enterprises and retrenchment of over a million workers. The government rose to the occasion and provided a safety net in the form of unemployment benefits. It could, however, overcome the crisis by 1999 itself.

It comes out clearly from the paper on South Korea by Young-Pyoung Kim that the country does not have the kind of "vicious circle" situation which may prevail in rural societies pressing on land and forests. On the contrary, Korea managed to significantly increase the area under forests in spite of its extremely high population density. Its environment problems, however, are mainly urban and industrial, typical of an affluent country. Coupled with purely environment problems, there are human problems like lack of adequate number of houses and small size of houses. Its relatively poor are mainly urban based.

Attempts are made to meet these environmental problems, and the air quality of its cities actually improved during the 1990s. However, water quality continued to worsen. The problems of solid waste and littering in cities are under control by requiring households to place such waste in trash bags which they must purchase, and put them in designated places. Industrial waste has been more difficult to control. A new relationship between environment and the relatively poor has emerged in the cities. The relatively poor stay near more degraded areas and face the brunt of environment deterioration, since they cannot afford houses in a better environment. This can affect their health too and capacity to work. So here is an urban vicious circle!

The government has taken several steps to improve the situation, by enacting anti-pollution laws and starting institutions to implement and maintain the law. The first antipollution law dates back to 1963. The budget allocation for the environment sector is 1 per cent of GNP,

which is higher than in several countries including the developed. The government has also conservation zones to protect endangered species and wild life. Attempts are made to encourage shift to cleaner fuels. As in India, Republic of Korea also has people's environment movements and NGOs are active in spreading environment awareness and influencing trade and industry to adopt the required measures. As in India again, the NGOs are emphatically pro-poor, even while advocating the cause of environment and ensure that measures to improve environment do not hit the poor hard.

Of the two case studies on Korea, the first relates to an industrial park at Ulsan started in 1962. Initially, it was surrounded by farmlands, but later residential areas of others too developed. Most of the factories were heavily polluting and there was no buffer zone between them and residential areas. The original inhabitants of farmlands suffered most. The pollutants affected agricultural production, and even the health of residents. Being a coastal city, the area polluted the sea too, and fishermen complained of diminished fish-catch. In 1982 the government declared immediate coastal areas as off-limits to fishing. The government also evolved plans to relocate environmental victims, but many of them resisted relocation. A new program was then introduced to relocate the victims in a more satisfactory way and giving compensation for the loss of assets (though not directly to the victims). Though relocation freed them from the damaging environment, the people had to find jobs or occupations in a new setting. Ultimately, they bore the cost of industrialisation while benefits went to others.

The second case study is about a gigantic land fill to take the solid waste of the Capital Metropolitan Region which includes Seoul and surrounding area and accounts for 60 per cent of the country's waste generation. It is intended to contain 281 million cubic meters of solid waste, covering 19.6 million square meters of area. It is planned to operate for 30 years beginning from 1991. The plan, however, soon met the resistance of local people who asserted NIMBY ("not in my back yard")! It took years of struggle and negotiations between local residents and CMR officials. The paper describes this arduous journey and concludes that eventually some compromise was reached. The details of the compromise are not available.

Australia

Unlike Republic of Korea which is a newly industrialised country, Australia is an established developed and rich country. There is no absolute poverty here, but the relative poverty has ethnic and geographical dimensions. Adrian Hayes points out in his paper on Australia that where one lives in the vast landscape determines the access to natural environment. The first landmark study of poverty in Australia was by the Henderson Commission in 1975. Subsequent studies show that the incidence of poverty increased from 10.7 per cent in 1981-82 to 16.7 per cent in 1989-90. It is guessed that since unemployment increased from around 2 per cent in 1974 to 9 per cent in 1996, there must have been an increase in the poverty levels during the 1990s too. Overall poverty among Aborigines is estimated to be 43.2 per cent in 1986, three times higher than in the non-indigenous population. Subsequent studies also show a much higher incidence of poverty among the indigenous population, mainly on account of joblessness. There is no adequate information to suggest whether the incidence of poverty is higher in rural (farm) families or the urban. Since, however, Australia is highly urbanised, the bulk of the relatively poor may be in urban areas.

Being a vast country with a very low density of population, stress on environment may not be expected. Yet, human intervention particularly by the European settlers did create a few problems for the environment, according to Hayes. His paper presents an interesting history of the environment in relation to people. The Aborigines simply did not roam about, but *managed* the land – reshaping it within the limits of their technology. Through a constant regime of fire, burning down the trees, they tried to make the landscape mere productive, but in the process, also made it more erosion prone and reduced genetic diversity. Nevertheless, over the millennia, the Aborigines "lived more or less in a balanced and sustainable relationship with the environment." Aboriginal customs also kept their population down, e.g., marrying teenage daughters to the eldest members of the clan. The arrival of Europeans changed the life of Aborigines. They were no longer able to practice their migratory movements and live off vast areas of land. Instead many now rely on government welfare payments, but still prefer to live in small and dispersed remote communities. Hayes observes: "they now make less

demands on natural resources than before the white settlement. Their livelihood today is often dependent on the state, and severely constrained by lack of access to employment opportunities, health and social services, and by lack of relevant skills".

Hayes further observes that "it is the white settlers of the last 200 years who made a more dramatic impact on the environment. ... They introduced land practices which led unwittingly for the most part, to widespread environment degradation." They also introduced exotic animal species as well as plant species, some of which became threatening pests and weeds. Many of the remaining forests were destroyed through fire to make room for grasslands for sheep and cattle.

The dispersed nature of urbanisation in Australia created its own problems. More and more suburbs were built, requiring provision of roads, transport and other urban services. The developers assumed that the residents would have their own cars. This pattern affected the urban poor adversely, and put them at locational disadvantages and constraints in access to job opportunities. Moreover, dispersed low-density housing also meant encroachments into surrounding eco-systems. A Better Cities Program was introduced aimed at providing better social justice and more sustainable urban development, but it had only limited impact.

In conclusion, Hayes points to a growing awareness among OECD countries about the inappropriateness of their current development model which makes insufficient use of labour resources and excessive use of natural resources. There is a lesson here for developing countries too.

There is a thesis that just as in the case of demographic transition, the developing countries tend to degrade environment in the initial stages of development and then as they reach more advanced levels of development, both environment awareness and ability to deal with environment degradation improves. Known as the environmental inverted-U curve or Kuznet environmental curve, the relationship was first observed by Shafik and Bandyapadhyoy (1992) and then by Selden and Song (1994),[4] by relating per capita income of several countries to air pollutants. The theory of demographic transition had to be modified because even before reaching high

levels of development or income, developing countries have shown a decline in TFR, birth rates and in population growth rates. The States like Kerala and Tamil Nadu in India are examples of this (Rayappa and Lingaraju 1996). This is happening on the environment front too. Even before reaching higher levels of income and development, developing countries have shown both environment awareness and capacity to deal with environment degradation. It is only when problems overwhelm them, that they are helpless.

Table 1. A Comparative Profile of the Selected Countries

1a. Demographic Profile

	India	China	Republic of Korea	Australia
Population (millions)				
1997	966	1 244	45.7	18.3
2015	1 212	1 418	51.1	21.5
Surface area ('000 sq. km.)	3 288	9 597	99	7 741
Density of population 1998 (persons per sq. km.)	330	133	470	2.4
Annual population growth rate (%)				
1975-1997	20	1.3	1.2	1.3
1997-2015	1.3	0.7	0.6	0.9
Urban Population (%)				
1975	21.3	17.3	48.0	85.9
1997	27.4	31.9	83.5	84.6
2015	35.9	45.9	92.2	86.0
Total Fertility Rate				
1975	5.1	4.3	3.4	2.3
1997	3.1	2.3	1.7	1.8
Contraceptive prevalence rate				
1990-98	41	–	79	76

Source: UNDP, *Human Development Report 1999*; World Bank, *World Development Report 1999* and *World Development Report 2000*.

Table 1. *(continued)*

1b. Human Development Profile

	India	China	Republic of Korea	Australia
Real GDP per capita (PPP $) 1997	1 670	3 130	13 590	20 210
GNP annual growth rate, %				
1985-95	3.2	8.3	7.7	1.4
Population below poverty line, %, 1994 International Poverty Line (at $1 a day PPP 1989-95)	52.5	29.4	Nil	Nil
National Line	35.0	11.0	Not available	7.8*
Life expectancy at birth, years, 1997				
Female	62.9	72.0	76.0	81.1
Total	62.9	69.8	72.4	78.2
Adult literary, %, 1997				
Female	39.4	74.5	95.5	99.0
Total	53.5	82.9	97.2	99.0
Combined first, second and third level gross enrolment, %, 1997				
Female	47	67	84	100
Male	62	71	94	100
Infant mortality rate per 1,000 live births				
1970	130	85	43	17
1997	71	38	6	5
Maternal mortality rate per 100,000 live births				
1990	570	95	130	9
Number of doctors per 10,000 people				
1993	48	88	232	299
HD Index value				
1997	0.545	0.701	0.852	0.922
HDI Rank among countries	174			
1997	132	98	30	7

Source: UNDP, *Human Development Report 1999*.

* This is at poverty line of $ 14.4 a day PPP (1985), for the years 1989-95. The figure is 12.9 per cent if poverty line is set at 50 per cent of median income.

Table 1. *(continued)*

1c. Profile of the Environment

	India	China	Republic of Korea	Australia	World
Commercial energy use (oil equivalent):					
Per capita (kg)					
1980	352	604	1 148	4 790	1 625
1996	476	902	3 576	5 494	1 681
GDP output per kg (US $)					
1980	0.6	0.3	3.1	3.3	2.0
1996	0.8	0.7	3.0	3.7	2.2
Internal renewable water resources per capita: (cubic meters per year)					
1998	1 896	2 231	1 434	18 596	6 918
Annual fresh water withdrawals: As per cent of water resources					
1987-95	20.5	16.4	41.7	4.3	7.3
Per capita (cubic meters)					
1987-95	612	461	632	933	626
CO_2 emissions, 1996:					
Total emissions (million of metric tons)	999	3 369	408.7	307.1	22 443
Share of world total (%)	4.2	14.1	1.7	1.3	93.8*
Forest area in 1995:					
Forested area (thousand sq. km.)	650	1 333	76	409	32 712
As per cent of total land area	21.9	14.3	76.8	5.3	25.1
Arable land as per cent of land area:					
1980	54.8	10.4	20.9	5.7	10.1
1996	54.7	13.3	17.7	6.5	10.6
Emissions of organic water pollution:					
Per day (thousand kg)					
1980	1 457	3 377	282	204	na**
1996	1 694	8 863	353	na	na
Kilograms per worker					
1980	0.21	0.14	0.14	0.18	na
1996	0.19	0.13	0.12	na	na

Table 1. *(continued)*

1c. Profile of the Environment *(continued)*

	India	China	Republic of Korea	Australia	World
Traffic accidents:					
People killed or injured per 1,000 vehicles					
1980	na	12	212	5	na
1997	61	22	34	–	na

Source: UNDP, *Human Development Report 1999*; World Bank, *World Development Report 1999*.

* The world total is less than 100 per cent because of nonreporting of data from some countries, and also because the global total includes emissions not included in national totals.

** na – Not available.

1d. Levels of Air Pollution in Major Cities* (1995) (micrograms per cubic metre)

	Total suspended particulets	Sulfur dioxide	Nitrogen oxide	Population in millions
India				
Mumbai (Bombay)	240	33	39	15.1
Calcutta	375	49	34	11.9
Delhi	415	24	41	9.9
Chennai (Madras)	130	15	17	6.0
Hyderabad	152	12	17	5.5
Bangalore	123	na	na	4.8
Ahmedabad	299	30	21	3.7
SIMPLE AVERAGE	248	27	28	8.1
China				
Shanghai	246	53	73	13.6
Beijing	377	90	122	11.3
Tianjin	306	82	50	9.4
Shenyang	374	99	73	5.1
Chengdu	366	77	74	4.3
Wuhan	211	40	43	4.2
Guangzhu	295	57	136	4.1
Zibu	453	198	43	3.8
Liupanshui	408	102	na	3.6
Chongquing	320	340	70	3.5
Harbin	359	23	30	3.3
Quing dao	na	190	64	3.1
Dalian	185	61	100	3.1
Jinan	472	132	45	3.0
SIMPLE AVERAGE	336	110	71	5.4

Table 1. *(continued)*

1d. Levels of Air Pollution in Major Cities* (1995) (micrograms per cubic metre) *(continued)*

	Total suspended particulets	Sulfur dioxide	Nitrogen oxide	Population in millions
Republic of Korea				
Seoul	84	44	60	11.6
Pusan	94	60	51	4.1
SIMPLE AVERAGE	89	52	56	7.8
Australia				
Sydney	54	28	na	3.6
Melbourne	35	0	56	3.1
SIMPLE AVERAGE	45	14	30	3.3

Source: World Bank (1999: 168-169).

* With a population of 3 million and above, in descending order of population for each country.

NOTES

[1] For a critical review of the literature on poverty environment links and debate thereon, see Reardon and Vosti (1995), Duraiappah (1996) and Prakash (1997).

[2] The figures for forest area for 1980 are taken here from World Bank (1992) and for 1995 from the World Bank's World Development Indicators 1999.

[3] The following account is based on Chapters 2 to 5 of this volume.

[4] Also see World Bank (1992: 40-41).

REFERENCES

Duraiappah, A. 1996. "Poverty and Environmental Protection: A Literature Review and Analysis," CREED Working Paper Series No. 8, International Institute for Environment and Development, London.

Nadkarni, M.V. 1997. "Broad Basing Process in India and Dalits," *Economic and Political Weekly* 32 (33 & 34): 2160-2171.

Prakash, S. 1997. "Poverty and Environment Linkages in Mountains and Uplands: Reflection on the Poverty Trap," CREED Working Paper Series No. 12, International Institute for Environment and Development, London.

Rayappa, P.H. and M. Lingaraju. 1996. "Demographic Transition in the South: A Regional Perspective," *Demography India* 25(2): 155-176.

Reardon, T. and S.A. Vosti. 1993. "Links Between Rural Poverty and Environment in Developing Countries," *World Development* 23(9): 1495-1506.

Selden, T.M. and D.S. Song. 1994. "Environmental Quality and Development: Is There a Kuznets Curve for Air Pollution Emissions?," *Journal of Environmental Economics and Management* 27: 147-162.

Sen, Amartya. 1987. *Commodities and Capabilities*. Oxford University Press, Oxford.

Shafik, N. and S. Bandyopadhyay 1992. "Economic Growth and Environment Quality: Time Series and Cross Country Evidence," World Bank Working Papers, WPS 904, Washington.

World Bank. 1992. *World Development Report 1992: Development and Environment*. Oxford University Press, New York.

World Bank. 1999. *World Development Indicators 1999*. The World Bank, Washington, DC.

World Commission on Environment and Development (WCED). 1987. *Our Common Future*. Oxford University Press, Oxford and New York.

Chapter 2

POVERTY, ENVIRONMENT AND DEVELOPMENT IN INDIA

M.V. NADKARNI
Vice-Chancellor, Gulbarga University, Karnataka

I. A PROFILE OF THE COUNTRY

I.1 Population and Poverty in the Context of Economic Development in India

India presents one of the most interesting examples of the three dimensional interaction between poverty, environment and development. It is a prominent developing country, which launched a strategy of planned development since 1950 allowing also a market economy. It has, in the 1990s, stepped up its average rates of growth above 6 per cent per annum from the earlier average of less than 3 per cent per annum. Yet, it still has mass poverty and faces serious threats to its rich and diverse natural resource environment.

India's population has reached one billion in May 2000. Its rate of growth has already started steadily declining from 2.2 per cent between 1950-70 to 2.1 per cent between 1970-90, and further to 1.8 per cent during the 1990s (estimated, World Bank 1999: 194). But it is still a long way for it to taper off and is well set to surpass China's population by 2050. This massive growth in population keeps down the growth in per capita income, slows down the impact of poverty alleviation strategies and programs, and is even feared to accelerate environmental degradation. To set the picture in a more balanced perspective, it should also be pointed out that the density

of population in India which was 330 per sq. km. in 1998, is still lower than in South Korea (470) and Netherlands (463) (c.f. World Bank 2000a: 230-1). Reaching such densities, however, would present monumental problems for India both on the poverty and environment fronts. India started its population control program on a large scale early in the 1950s, but it relies only on publicity and persuasion except for a brief interlude in 1975-77 during Emergency. The compulsive measures adopted during the Emergency brought down the government in the very next General Election.

The changes in a few demographic features both that have taken place and that have not taken place are interesting. The proportion of rural population has not declined very much in spite of the spurt in the growth of cities and industries after Independence in 1947. It fell from 82.7 per cent in 1951 to only 74.3 per cent in 1991 (the last census at the time of writing). The share of agricultural workers (both farmers and labourers together) fell from 69.5 per cent in 1961 to only 64.9 per cent in 1991. In contrast, the share of agriculture in total Gross Domestic Product at constant prices in 1980-81, fell more sharply from 45.8 per cent in 1960-61 to 29.5 per cent in 1990-91. This means that the income of agricultural workers has declined over the years relative to nonagricultural workers, due to faster growth in the non-agricultural sectors. The bulk of the poor are in agriculture in the rural sector, both due to higher proportion of poverty and higher proportion of the population in the sector. Due to demographic pressure on agriculture and also due to inadequate expansion of job opportunities in the nonfarm sector, agricultural holdings are declining in size. The average size of operational holdings declined from 2.30 hectares in 1970-71 to 1.84 hectares in 1980-81 and further to 1.57 hectares in 1990-91. The rural poor comprise mainly small and marginal cultivators with 2 hectares or less (who together accounted for 32 per cent of cultivated area and 78 per cent of all operational holdings in 1990-91), and labourers and rural artisans. The latter two categories are poorer than cultivators as a whole (Dev et al. 1991: 58). Since poverty is mainly in rural character and growth of agriculture is particularly effective in alleviating poverty, agricultural production has been tried to be raised both through extension of irrigation and improvement in farming practices. Thus, the proportion of net sown area under irrigation increased from 22.2 per cent in 1970-71 to 37.6 per cent in 1995-96. However, poverty, especially rural poverty has still persisted.

Defined in terms of expenditure needed to obtain 2400 calories per day per capita in the rural areas and 2250 calories per day per capita in the urban areas, its own national poverty line in India is much lower than the uniform international poverty line of $ 1 per day per capita. Thus, in terms of the national poverty line, 35 per cent of the population was poor in 1994, while it was 47 per cent in the same year as per the uniform international criterion (World Development Indicators 1999: 67). Indian economists and statisticians gave considerable attention to developing poverty measures and to studying trends in poverty separately for urban and rural areas and also for each state.[2] The first landmark was the study by Dandekar and Rath (1971) who not only estimated poverty levels for the first time in India both for rural and urban areas, but also suggested ways of alleviating it which greatly influenced subsequent policy. Table 1 below shows trends in poverty (in terms of head count ratios) over the years from 1951-52 to 1997 at the national level.

Table 1. Poverty in India, 1951-97 (head count %)

Survey period	Rural	Urban	National
Aug. 51-Nov. 52	47.32	35.46	45.31
July 60-Aug. 61	45.40	44.65	45.27
July 65-June 66*	57.60	52.90	56.71
July 70-June 71	54.84	44.98	52.88
July 77-June 78	50.60	40.50	48.36
July 86-June 87	38.81	34.29	37.69
July 90-June 91	36.43	32.76	35.49
July 93-June 94	36.66	30.51	35.04
Jan. 97-Dec. 97	35.69	29.99	34.40

Source: World Bank 2000b: 149.

* This was a year of severe drought.

The table shows that both urban and rural poverty increased first up to mid-sixties then declined sharply up to 1986-87, after which the decline slowed down. The Head Count Ratios (HCR) are criticised on the ground that they do not indicate the intensity of poverty. However, the Intensity Index of Poverty has also been declining steadily in India both in rural and urban areas (Tendulkar and Jain 1996; Dev and Ranade 1997: 74). Yet, the fact remains that about one out of three

Indians do not have the income to buy enough food to meet the caloric norms.

An interesting feature of human development and poverty levels in India is the variation within the country in this regard. Table 2 illustrates a North-South divide that characterises these variations. The northern states in general are somewhat lagging behind the southern states, though some of the northern states like Himachal Pradesh are also making good progress now as in the South. Only the most populous of the northern states and all the four southern states are included in the table. Maharashtra though populous is not included because of its special characteristics of greater industrialisation and it

Table 2. Variations in the Levels of Human Development, Poverty and Total Fertility Rate within India

	Populous Northern States				Southern States			
	Uttar Pradesh	Madhya Pradesh	Rajasthan	Bihar	Andhra Pradesh	Karnataka	Tamil Nadu	Kerala
1. Infant Mortality Rates per thousand 1998-99	86.7	86.1	80.4	73.4	65.0	51.5	48.2	16.3
2. Illiteracy Rates(%) for +6 age groups 1998-99								
Female	57.3	55.6	62.8	65.4	54.4	44.6	42.0	15.1
Male	28.1	28.2	27.8	36.7	33.3	25.9	20.3	7.2
3. Total Fertility Rate (TFR) per woman (15-49 age group)								
1990-92	4.82	3.90	3.63	4.00	2.59	2.85	2.48	2.00
1996-98	3.99	3.31	3.78	3.48	2.25	2.13	2.18	1.96
4. Rural Poverty (head count, per cent)								
Late 1950s	47.4	56.7	46.4	64.5	65.1	54.1	69.7	69.2
Early 1990s	41.7	49.8	45.8	63.2	35.9	46.9	41.8	33.0
5. Urban Poverty (head count, per cent)								
Late 1950s	59.4	47.6	45.2	60.3	48.0	53.2	46.6	54.2
Early 1990s	39.4	38.2	29.5	42.4	30.6	34.1	31.9	30.6

Source: Bose 2000: 1699; Parikh 1999: 49.

is not strictly a northern state. Among all the states, Kerala is outstanding in its achievements in higher levels of human development and also in controlling TFR though it is yet to alleviate poverty totally. It is necessary to clarify here that these differences are not so much on account of differences in natural resource endowment as on account of historical, cultural and institutional factors.

Another interesting aspect of poverty alleviation in India is that it has not led to any conspicuous increase in inequality. The Gini ratios for consumption expenditure have shown no upward trend at least up to 1993-94, for which the data were available at the time of writing. Thus the Gini ratio for rural areas which was 0.288 in 1970-71, increased to 0.302 in 1987-88, but declined again to 0.285 in 1993-94. Inequality is higher in urban than in rural areas. The Gini ratio for urban areas also increased from 0.346 in 1970-71 to 0.356 in 1987-88, but declined again to 0.345 in 1993-94 (Tendulkar 1998). The impact of the new Economic Reforms initiated in the early 1990s is yet to be properly assessed, and we can not say that the decline in inequality may have continued during the 1990s.

The steady decline in poverty – even to the extent it has taken place – could not have been brought about without the broad-based distributional impact of agricultural growth (Tendulkar and Jain 1996: 126).

The success of the Green Revolution combined also with the competence with which India handled its droughts has been the single most important factor in reducing poverty. Though the Green Revolution (through the adoption of HYVs on a widespread basis together with fertilisers) was initially confined to irrigated areas and to wheat and rice, it spread to rainfed areas and other crops before the end of 1970s. At a time when the growth of agriculture could no longer be based on extending cultivated land, the Green Revolution, based on a strategy of boosting the yields, opened a more promising growth front. It is noteworthy that agricultural growth in India has been consistently higher than the growth of population since the 1970s. From a net importer of food grains, India has emerged as a net exporter of food. Table 1 shows that the decline in poverty started with the success of the Green Revolution and consequent spurt in food grains production, and the slowdown in the decline of poverty also coincides with a slowdown in the growth of agriculture.

Direct efforts at poverty alleviation, quite apart from the indirect factor of agricultural growth, also have had their positive impact, though it is debatable whether they have been as effective as growth. A serious implementation of Land Reforms had the potential of being an important factor in significantly reducing poverty and landlessness of the poor. However, attempts in this direction were half-hearted. The exercise of imposing ceilings on the size of agricultural holdings and transferring the surplus land to the landless poor and petty holders was a dismal failure. The proportion of area under large holdings (of 10 ha and above) has steadily declined over the years from 30.9 per cent in 1970-71 to 17.4 per cent in 1990-91, and the average size of these large holdings has declined from 18 hectares to 17 hectares between the same years due to demographic pressures. The average size of holdings in India (1.57 hectare in 1990-91) is much smaller than in other large countries and this has also been steadily declining, thanks to the pressure of increasing population on land. There was not much potential for a large surplus of land resulting from imposition of ceilings to solve the problem of the landless and petty holders. However, the legislation to transfer ownership of agricultural lands to tenants was a mixed success. While the land owned by absentee landlords was transferred to the tenants, this did not necessarily benefit the actual tillers of the soil since tenants often sublet to petty tenants or "tenants at will" or cultivated with hired labourers.

Other direct measures on poverty, however, had greater measure of success. Since Land Reforms could not succeed in giving lands to the landless, the government either encouraged the landless to encroach on the forests (other than Reserve Forests) to make a living by cultivating cleared lands, or even openly gave away scrub jungles and other government-owned lands to the poor. Extension of area for cultivation was the most important factor behind the decline in forest areas. The extension of cultivation is no longer encouraged now, at least officially. Encroachers into forests have now to wait for years before getting their title deeds, which they may, sometimes, not get at all.

India has since long realised that there is a strong social dimension to poverty. The economically poor very often belong to deprived caste groups and tribal societies, who were kept out of the mainstream. They belong to Scheduled Castes (SCs) and Scheduled

Tribes (STs) and also Other Backward Classes (OBCs). India introduced reservations (positive discrimination) for them in jobs offered in government and semi-government institutions and Universities, and also in admissions to educational courses in Colleges and Universities. The reservations to SCs and STs together amounts to 18 per cent, while reservations for all categories together including the OBCs amount to 50 per cent. These reservations are monitored closely by State Assemblies and the Parliament, and have contributed to getting the deprived castes and classes into the mainstream of politics and economy. Such a policy of positive discrimination has been practiced in no other country as widely as in India and also since so long. The principle of adult franchise, irrespective of the level of education and wealth of voters also contributed to the broad-basing of the India's polity and society and to drawing the deprived classes into the mainstream (Nadkarni 1997).

To provide an example of how compulsions of democratic politics helped to develop programs of poverty alleviation, we can take the case of nationalisation of leading commercial banks in 1969. Adopting the slogan of *Garibi Hatao* (Eliminate Poverty), the then Prime Minister Mrs. Indira Gandhi defeated her political adversaries. In a major move, she nationalised 14 big banks in the country, mainly to provide credit to the poor on easy terms. The efficiency of the bank managers was henceforth to be judged on the basis of how many loans they provided to the poor, whom conventional banking based on security cover had bypassed. This move resulted in a larger flow of credit to agriculture and animal husbandry. However, soon democratic politics led to populist politics. Politicians encouraged borrowers not to repay loans to banks and cooperative societies and there were agitations to write off loans to cultivators on the plea that terms of trade were moving against agriculture. This resulted in slowing down credit flows to rural areas. Initiatives are taken now whereby loans are given by banks to self-help groups at the grass roots level who are responsible for repaying loans. These initiatives were inspired by the Grameen Bank model in Bangladesh.

More direct programs targeted at the poor have also been in operation in India particularly, since the 1970s. They started with programs of employment on wage labour in relief works during droughts, but became a regular feature in normal years too. The principle is that any one in need of at least unskilled wage

employment should have it as close as possible to his/her native place. These programs are offered both by State Governments and the Central Government, the latter being named after India's first Prime Minister as *Jawahar Rozgar Yojana*. Other programs (like Integrated Rural Development or IRDP) were also introduced to enable the poor to own assets and generate self-employment. Besides, there are programs to impart technical and even entrepreneurial skills to youth, like TRYSEM program. The Public Distribution System has a wide net work of Fair Price Shops both in rural and urban areas which sell selected subsidised foodgrains (mainly, wheat and rice), sugar and also kerosene. The Integrated Child Development Services (ICDS) Program provides additional nutrition and health care to the children of the poor in *Anganwadis* which also serve as creches to keep the children of working mothers. This is supported by UNICEF.

To have a better implementation of these programs, people's representatives are involved in carrying them out. Thus the decentralised local government machinery is fully involved in them. The earlier bureaucratic approach of the 1970s has yielded place to democratic and decentralised approaches. NGOs have also gone into this task, starting self help groups to organise credit for the needy. NGOs have played an important role in a few distant areas to promote tribal development, providing primary education, health care and productive skills. NGOs, however, are more conspicuous in organising resistance of people against development projects feared to lead to displacement and environmental degradation.

A major difference between government sponsored programs and NGO programs is that while the former are too thinly scattered to show conspicuous results in a given area, the latter tend to concentrate in a few regions for a visible and effective implementation. In spite of a democratic decentralised set up, government programs are still dependent on the flow of money from government and the leadership quality of district and grass root level government functionaries. These persons tend to be transferred often in unpredictable ways, which has a destabilising or at least a disturbing effect on poverty alleviation programs. The NGO programs are relatively free from this problem. But they too have a turnover of functionaries, as they tend to move from one NGO to another or start their own NGO for improving their own career prospects. Moreover, government programs are more transparent and accountable and are closely

watched by people's representatives in the local and state government. The problem of accountability of NGOs and their work is still an unresolved issue. As such it is difficult to judge which agency is more successful, or more prone to leakages.

On the whole, economic growth, especially agricultural growth, has been a more important factor in reducing poverty, even if it has been an indirect one. But direct efforts targeted at the poor have still a major role to play, because they have to reach people whom the larger forces of economic growth have bypassed. It is feared however, that the compulsions of fiscal policy to reduce fiscal deficits under economic reforms, have reduced the role of direct programs (evidenced from declining proportion of national income going to such programs), and increased the importance of economic growth as the major factor in poverty alleviation. The success of economic growth in this task depends on its nature particularly on its capacity to generate employment for the poor and to meet their basic needs.

I.2 Environment in the Context of Development Before Independence

Considering the state of our environment today, it may look surprising but true that environment protection in India had an early start. Kautilya's *Artha Sastra* (fourth century B.C.) enjoined the kings to protect forests and wildlife, particularly elephants. The cultural values in favour of protection of environment were strong enough to give rise to the institution of the sacred groves or *Devara kadu* (literally, forests reserved for God), where exploitation of forest produce including wildlife was severely restricted or prohibited. Some of these groves have survived even today. Several ancient hymns in Sanskrit were in praise of nature and specially prayed God to bless the Earth with regular rainfall and greenery. Indian religions are not anthropocentric and have emphasised nonviolence (Ahimsa) and rights of animals to life and compassionate treatment.

Scholars like Madhav Gadgil have contended that there did exist institutionalised patterns of sustainable use of common property land resources like forests at the grass roots level before the British entry into India (Gadgil and Iyer 1987; Gadgil and Guha 1995). The village forests were managed by community councils, which either limited the quality of wood extracted by each household in a

season or permitted people to remove only dead and fallen wood. Some of these practices continued even after independence, until they were swamped by the dominant and all-pervading forces of commercialisation and industrialisation and also population pressure.

Thanks to high death rates caused by frequent famines and epidemics, population growth in British India was hardly significant. It was only after Independence in 1947 that control over death rates was more effective due to better management of droughts and preventive measures to fight epidemics. It was this factor – a decline in death rates but a lag in birth rates recording such a decline – which caused a spurt in population growth after Independence. Population pressure as a factor behind ecological degradation was not, therefore a pertinent issue before Independence.

The British Government however, went about systematically to establish control over forests and isolate local people from forests and their control over forests as far as possible. This was meant to serve two purposes. Having depleted their oak resources in its own country, the British Government had covetous eyes on the rich timber resources of India to meet the needs of ship building and railway expansion. Teak, black wood, sandal wood and other such trees were promptly declared as government property to prevent local people from using them. The second purpose was conservation of forests and protect the forests from such practices like slash-and-burn cultivation and also to reduce the pressure of grazing on forests both of which were considered as destructive practices. As early as 1807, a proclamation was issued in Bombay Presidency "asserting the Company's (East India Company's) right of sovereignty over the forests and forbidding the fetching of timber by private individuals" (Brandis 1897: 9).

The Forest Department was formerly created at the Centre in 1864 with Dietrich Brandis, a German, as the first Inspector General of Forests. The Government Forest Act, 1865, empowered the Government to declare any forest as government property. There was a tradition of state ownership of forests and the Act formalised this fact. The forest legislation was made more comprehensive and stringent through the Indian Forest Act of 1878, classifying the Forests into Reserved, Protected and Village Forests. The Government held absolute rights of ownership in the Reserved Forests, and their

products were not to be used by local people unless specifically permitted as a privilege and not as a matter of right of locals. Protected Forests were those which were yet to be surveyed and settled, but the local peoples' access and privilege were permitted for the time being except in those cases where they were specifically prohibited (e.g. cutting valuable timber). It was in the case of Village Forests that the rights of locals were conceded in respect of grazing. The extension of cultivation was possible only when permitted and such permission was not available in Reserved Forests (for details see Nadkarni et al. 1989).

The Indian Forest Act of 1927 continued the earlier classification of forests, and gave more powers to the Government in the Reserved Forests, increased the number of listed offenses and enhanced the punishment for some of the offenses. In the case of "Protected Forests," rights and privileges of "persons" was recorded which the Government had no powers to reduce. The emphasis in the Act was more on the rights and privileges of individuals rather than local communities. This Act has continued to be in force, and so has the classification of forests.

Though local people had full access to Village Forests and limited access to Protected Forests, the area under both was very limited. The bulk of forest area was placed under the Reserved category. This meant extreme pressure on Village Forests and alienation of local people from forests. The alienation of the locals led to serious discontent and protest movements as it adversely affected the local economy (see Nadkarni et al. 1989; Guha 1989). They did not have any responsibility in the management of forests, especially the Reserve Forests. The expansion of railways took a big toll of timber resources, even before the Second World War. The Second World War further accelerated the exhaustion of forest resources. As already explained earlier, population increase was not significant during the British period and was hardly a factor in forest degradation.

The British Government took initial legislative steps in controlling industrial pollution as well. The first formal legislation to protect environment, viz. the Shore Nuisance (Bombay and Kolaba) Act was passed as early as in 1853. The Indian Penal Code Act of 1860 was a more comprehensive legislation containing several provisions for pollution control. Fines and even imprisonment were instituted for

"fouling of water of public springs and reservoir" or for "making atmosphere noxious to health" and for negligent conduct with respect to poisonous, combustible and explosive substances. The Police Act of 1861 dealt with noise pollution in public places. The Indian Easement Act 1882 protected riparians against "unreasonable" pollution of water by upstream users. The Indian Fisheries Act of 1887 penalised killing of fish by poisoning or by explosives. The Motor Vehicles Act of 1939 empowered State Governments to regulate emissions of smoke (for details see Rosencranz et al. 1991: 37-38).

The approach to environment regulation was however, piecemeal and was based on the tort law. The action against the polluters was taken only by the courts on the basis of proper representations by the affected people. When the affected people happened to be poor with no resources to approach the courts, the polluters went scot free. Even the penalty provided in law was not deterrent enough and the course of legal action took a long time. Environment related legislation was not accorded priority in implementation, and no special institutions were created to prevent adverse impact on the environment. For industrial pollution, this situation continued even after Independence up to at least 1974.

After Independence: Rural ecology – forests, land and water

The post-Independence scene can be said to consist of two phases, one up to the middle of 1970s and the next thereafter. The first phase was marked by emphasis on industrialisation to usher India into the modern age and help her catch up with the rest of the world. This led both to deforestation and massive problems of industrial pollution. Huge irrigation and hydro-electric projects were planned to speed up agricultural development. While this helped India's Green Revolution under which the country achieved self-reliance in food production, it also led to other problems like the displacement of people, water logging and salinity due to careless water management in quite a few places. Excessive use of fertilisers and pesticides in a few places contaminated water bodies including underground aquifers.

The phase since the middle of 1970s, however, marked a more enlightened and active period from the point of environment awareness and the resolve to end poverty at the same time. New legislation and new institutions were created to meet both objectives.

India also played a responsible role in the world bodies on environmental issues, by participating in international conferences actively and also by signing conventions designed to protect the ozone layer and bio-diversity and similar agreements. It would be worthwhile to describe the environmental situation and major events during these two phases.

The use of forest produce for the development of the economy had started even during the British regime mainly for the expansion of the railway network. Modern saw mills were set up during the nineteenth century itself. After Independence, there was a major technical change in the use of forest produce. The emphasis shifted from timber to pulpwood used by paper and rayon mills. These industries were encouraged by state governments as they created employment and met the needs of paper and clothing. They usually entered into an agreement with the government whereby the Forest Department had to supply raw material for agreed periods – extending from 5 to 30 years at agreed prices. These prices were so low that the industries had no interest in regenerating the forest even in lands earmarked for them to meet their needs. When industries exhausted raw material sources allotted earlier, they could get new areas for similar exploitation. There was dichotomy between resource use and resource regeneration, the user having little responsibility in regeneration. Once a forest was exhausted, encroachers were tempted to extend cultivation into the cleared forests. Even where forests were replanted, it was at the cost of natural forests. Huge areas of natural forests were cleared to plant trees like eucalyptus needed by the industry, destroying in the process bio-diversity in the concerned areas and also depriving the local communities of sources of their biomass supply. The National Forest Policy of 1952 made it clear that the interest of the larger economy shall prevail over local interests, and interests of the larger economy often meant interests of the industry.

To be fair, the demand from the rayon and pulp industry was only a part of the demand on forests from the larger economy. Hydro-electric projects, transmission lines, rehabilitation of people displaced by development projects, roads, mining, and above all extension of cultivation by people in search of livelihood also made large demands on areas which were rich in forests.

To compensate for the loss of rich forests, the government began to transfer huge areas from Revenue Department to the Forest Department. This resulted in a net increase in areas legally designated as Forest areas. However, this did not necessarily mean an increase in actual forest cover. Transfer of government owned "revenue" lands to Forest Department sometimes led to depriving the locals of their grazing areas and pastures. Unless their cooperation could be secured, these "waste lands" had no chance of being regenerated. Uncontrolled grazing pressure could not allow trees to come up and grazing pressure had no chance of being controlled unless grazing or fodder needs of local people's cattle were met. No concrete efforts were made till the 1980s to enlist people's cooperation and participation in forest management. Both the alienation of people from forest management and degradation of forests continued till the early 1980s.

A new movement was started to launch social forestry projects in almost all the states in the early 1980s. The basic objective of this movement was to meet people's biomass needs like fuel-wood, fodder, small wood for fencing and other agricultural purposes, and wood needed for house construction of local communities. Land, which was neither under Reserved Forests nor under cultivation, was identified for this purpose, and planted with trees enlisting people's cooperation in protecting them. The Forest Department took tremendous pains to make a success of this so that the pressure on Reserved Forests could be eased and green areas extended. The progress was slow but steady. But quite a few things also went wrong.

In their anxiety to extend tree cover, the Forest Department preferred quick growing and non-browseable trees like eucalyptus, acacia auroculiformis and pine. These trees met the needs of pulpwood industry too. Large stretches of uncultivated lands were taken up for mono-species plantations to meet the needs of industry rather than to meet biomass needs of local people. Though owned by the government, these lands had been traditionally used by people as common property resources for grazing and meeting their biomass needs. But in many social forestry projects, such lands were closed to grazing to prevent tree saplings being browsed or trampled upon and destroyed. Instead of bringing people into social forestry, it only alienated them further from grazing lands and wood lots which

met their biomass needs. This led to stiff resistance and people's movements, led mainly by NGOs like *Samaja Parivartan Samudaya* in Karnataka. The grazing pressure was diverted to Reserved Forests in the neighbourhood when people's access to grazing lands was closed. Fortunately, the Forest Department corrected its mistakes pretty soon. It started consulting people about the extent of area to be planted with trees, extent of areas earmarked for rotational grazing and the species of trees to be planted. Efforts were made to form committees of local people to look after the social forestry plots.

Soon this movement transformed itself into a larger movement for Joint Forest Management. The concept that Forests have to be managed jointly by the Forest Department and local people together caught on. Encouraged by success in Arabari village of West Bengal and also in several other areas, guidelines were issued by the Union (Central) Government to states to form committees involving local people to manage government owned forests. However, only Protected Forests, Village Forests and degraded Reserved Forests are brought under such management for regeneration and not all Reserved Forests. The principle accepted is that wherever there are communities in or near forests who depend on the biomass of the forests, such forests have to be brought under Joint Forest Management with them. Other forest areas are exclusively managed by the Forest Department itself.

The official Forest Policy also made a departure from the earlier orientation of meeting industrial needs to environment protection. The National Forest Policy of 1988 states: "The principal aim of Forest Policy must be to ensure environment suitability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to that principal aim" (para 2.2, as reported in Hiremath 1997: 154). The policy also mentions among its basic objectives (para 2.1) the need for "meeting the requirement of fuel wood, fodder, minor forest produce and small timber for rural and tribal populations" (para 2.2, as reported in Hiremath 1997: 154). No forest land can be converted for nonforest purposes without explicit permission of the Central government. This is because the state governments are under constant pressure to divert land for cultivation and other developmental purposes.

In pursuance of its objective of protecting bio-diversity, India has sought to demarcate specially protected areas and reduce human interference there. India now has 75 parks and 421 sanctuaries for this purpose, covering some 14 million hectares (which is over 4 per cent of total geographical area and 20.5 per cent of its forest area). Most of these areas received protection status only recently, since there were only 10 parks and 127 sanctuaries in 1970 (World Bank 1996: 1). However, not only the other Reserved Forests, but even these protected areas are not yet free from pressures of people for livelihood (more on this later under case studies).

As far as the question of meeting the requirement of raw material for forest based industries is concerned, the National Forest Policy leaves it to industry to enter into agreement with farmers to grow the required trees (see para 4.9, in Hiremath 1997: 162). Since cultivation in India is extended to over half of the total geographical area including marginal lands, which is very high compared to other countries, such a move can be a corrective to this situation. The less fertile lands not economical for crop cultivation can be brought back under trees though for profit. The industries are supposed to provide inputs, credit and technical advice to farmers for this purpose. But even this led to problems in North India, when farmers attracted by high prices of eucalyptus took to its cultivation on a large scale leading to a glut in their price. Not only marginal lands but also fertile and irrigated areas were used for this purpose (Saxena 1994). Fortunately in South India, farmers were more cautious and restricted eucalyptus cultivation to less fertile, semi arid areas where other crops had uneconomically low yields. This strategy prevented a glut and gave better returns to farmers.

India now has the major responsibility of protecting its rich tropical forests and biodiversity. India is counted among the twelve megadiversity countries in the world. It has a wide range of eco-system from heavy rainfall regions of Kerala and North-East to arid deserts, from the snowy heights of Himalayas to Gangetic plains and semi-arid Deccan plateau. India's natural resources (agriculture, livestock, forestry and fishery), ignoring minerals, contribute nearly one-third of its domestic production and provide raw material for many of its pharmaceuticals both in Western and indigenous herbal based medicines. India has the potential of making a good commercial gain from protecting its bio-diversity.

It is not surprising, therefore, why India is among the few countries of the world which managed to increase area under forests in spite of pressures on them (see Table 3 on land use statistics). Area under forests as per the land use statistics increased from 14.2 per cent in 1950-51 to 22.6 per cent in 1995-96, when area under cultivation (involving current fallows) also increased from 45.6 per cent to 51.1 per cent between the same years. The increase in forest area occurred mainly at the expense of 'barren' lands, cultivable wastes and pastures (including fallows other than current fallows), some of which were tried to be brought under trees as part of the social forestry and joint forest management programs of the Forest Department.

It is noteworthy that though 22.6 per cent of forest area of India was under forests as per legal status in 1995-96 as seen from Table 3, only 19.5 per cent of the total area was actually under forest cover as assessed by the Forest Survey of India. Of the area under forest cover, 60.5 per cent was under dense forest with a canopy cover of 40 per cent or more, and the rest under "open forests" (CSO 1997: 26-27). The first such estimate of area actually under forest cover based on interpretation of Landsat imagery by the Forest Survey of India was for the period 1981-83. As per this assessment, the forest cover then was also 19.5 per cent, the proportion of it under dense forests being 56.3 per cent (Forest Survey of India 1989: 7). This indicates that whatever may have happened in the past, India has not only succeeded in maintaining its forest cover, but has even managed to make it more dense since the 1980s. This has been achieved against heavy odds as the problem of pressure of people on forests for livelihood is not yet resolved. The tensions between the local people, most of whom are poor, and the Forest Departments have not yet been resolved.

Pastures, fallow lands, cultivable waste lands and parts of forest lands which are available for use by the locals have long been used as common property resources. They have sustained the livelihood of local people, especially the poor, meeting their needs of biomass without their having to resort to the market. There has been a decline in the quality and quantity of these lands due to over-exploitation and encroachments. This has been tried to be corrected since the 1980s by regenerating lands, involving the local people in their management. More on this in Part II.

Table 3. Land Use in India
(Area in million hectares; percentage of total reporting area in brackets)

Land use (total geographical area is 328.73 million hectares)	1950-51	1970-71	1995-96
1. Reporting area	284.3 (100)	303.8 (100)	304.9
2. Forest area	40.5 (14.2)	63.9 (21.0)	68.9 (22.6)
3. Tree crops and groves (on private. lands)	198 (7.0)	4.3 (1.4)	3.5 (1.1)
4. Net sown area	118.6 (41.8)	140.3 (46.2)	142.2 (46.6)
5. Current fallows	10.7 (3.8)	11.1 (3.7)	13.8 (4.5)
6. Other fallows	17.4 (6.1)	8.8 (2.9)	10.0 (3.3)
7. Pastures	6.7 (2.4)	13.3 (4.4)	11.1 (3.6)
8. Cultivable waste lands	22.9 (8.0)	17.5 (5.7)	14.1 (4.6)
9. Cropping intensity*	111	118	131
10. Net irrigated area	20.8	31.1	53.5
11. (10) ÷ (4) %	17.5	22.2	37.6
12. Nonagricultural use	9.4 (3.3)	16.5 (5.4)	22.4 (7.3)
13. Barren and uncultivable land	38.2 (13.4)	28.2 (9.3)	19.0 (6.2)

Source: *Agricultural Statistics at a Glance* 1996 and CMIE Report on Agriculture 1999.

Note: Forest Area denotes area under the Forest Department of the Government, which may not necessarily be under tree cover. It excludes area under trees on lands owned by other Departments and private parties or persons.

* This is, gross sown area (net sown area *plus* sown more than once), net sown area, expressed as per cent.

Agriculture or cultivation of crops is stated to have been started in India at least 5000 years ago, i.e. around 3000 BC (Reader 1990: 183). Most of India's agriculture even today is rainfed, irrigation accounting for only 37.6 per cent of net sown area even as late as 1995-96. With a long history of cultivation extending to even marginal and less productive lands, it is remarkable that agriculture has proved itself to

be so stable and resilient that it continues to produce the yields even at the current levels using less chemical fertilisers and pesticides than many advanced countries, supporting nearly 70 per cent of population as a source of livelihood, and feeding an enormous and dense population of one billion now. Yes, there have been famines in the past and droughts occur even now. But as Amartya Sen argued, famines of the past occurred not so much on account of lack of food supply as due to lack of entitlements because of mismanagement and government indifference. He has further argued that thanks to our democracy, starvation deaths owing to droughts have disappeared after Independence. Even the severe drought of 1972-73 did not cause such deaths (Sen 1981).

A complex and ingenious strategy was developed to make a sustainable use of soils so as to maintain their productivity over centuries. This was based on a system of rotational fallowing, crop diversification, and regular replenishment of soils through organic manure. The choice of crops was such that areas were grown along with nitrogen fixing crops like pigeon pea and Bengal gram. In the process, farmers lovingly nurtured a wide variety of millets and pulses – a variety and diversity which is not so easy to come across in any other country in food grains. The Hindu rituals insist on giving "*Daan*" (charity) which should include among other things, *Navadhanyas*, or nine varieties of pulses, and no less, to earn *punya* or merit for entry to heaven. Maintaining cattle was also an important part of the strategy of taking care of soils, which *incidentally* gave farmers an additional product – milk. Cow dung was collected carefully not only from cowsheds but even from grazing lands, and deposited in compost pits. Organic leaves, collected from specially nurtured trees like pongamia, and cow urine channelled carefully from cowsheds, was mixed with cow dung in compost pits. The compost was carefully spread on the fields before sowing and ploughed into the soil. Bullocks ploughed the fields just to the required depth, enough to make the soil aerable and absorbent to suck in maximum possible rainfall. The humus from the compost helped the soils to retain moisture.

The reverence for cows and bullocks in the Hindu tradition arose out of this ecological dependence on them for farming. Reading remarks: "To the beef eating British, inclined to salivate at the mere thought of a well-roasted joint, generously apportioned, the sacred cow was the ultimate absurdity among a host of ritual customs and

traditions that thwarted their attempts to bestow European civilisation on India" (Reading 1990: 188). It was mistakenly thought in the West that the traditional belief was the basic reason for the sacred status of the cow in India, till a perceptive paper appeared by Marvin Harris (1966). The functional approach, adopted by Harris, attributed the reverence of the cow to the symbiotic relationship of benefit to both the people and cattle. He observed that there was no competition between people and cattle as believed by intellectuals. He even concluded that actually speaking there was a shortage of bullocks, considering the need for each farm family to have its own pair. To finish ploughing with the onset of rains so that sowing is timely, farmers who can afford prefer to have their own pair of bullocks (Reading 1990: 191).

In spite of this long tradition of caring for lands, the problem of land degradation and soil erosion is severe. This problem is not confined to uncultivated waste lands, but extends very much to cultivated lands as well, especially on hill slopes. As per the estimates of the Ministry of Environment and Forests, as many as 141 million hectares out of a total geographical area of 328 million hectares are subject to water and wind erosion. Erosion by wind and rain are the most significant factor in land degradation. In addition, about 33 million hectares are affected by special problems like water logging, salinity, alkaline and acidic soils, ravines and gullies, shifting cultivation and flooding (GOI 1999: 156). Though the bulk of this problem is on account of natural factors, man-made factors are also blamed for this – deforestation, extension of cultivation on hill slopes without taking precautionary measures for arresting soil erosion, overgrazing and shifting cultivation. Some of these issues will be looked into in Part II. The official strategy to counter land degradation includes treatment of catchment areas, comprehensive watershed management, low cost measures for revegetation or reforestation. The emphasis is on implementing these measures through people's participation at grass roots level. The problem areas are identified through remote sensing, and micro-level plans are made to reclaim and improve the affected lands to be implemented through local governments, NGOs and people's groups. It is hoped that with these ecological improvements, the incomes of the rural poor also would improve and reduce rural poverty.

Apart from land, water has also emerged as an important issue. In the context of the Green Revolution, there is overexploitation of underground water leading to depletion of aquifers in many areas. Tube wells and other wells have now replaced canal irrigation as the main source of irrigation. Wells now account for 53 per cent of total net irrigated area. Increasing urbanisation is also making demands on water, but both industries and cities account for less than 10 per cent of demand for water. There is need for economising water use in agriculture, treating it as a scarce resource. Unfortunately, huge subsidies and soft loans for irrigation come in the way of economising water and maximising productivity per unit of water. Water is practically free in agriculture. There is now an emphasis on rain water harvesting both in cities and rural areas. However, the movement is yet to become widespread in cities, while it has gained some momentum in rural areas especially under watershed development programs. The Green Revolution has also affected the quality of ground water in a few places due to leaching of excess fertilisers and chemicals. Apart from such man-made pollution, there are several areas as in West Bengal (as probably in Bangladesh too) where there is natural arsenic in ground water beyond tolerance levels. Water is going to be a serious issue in years to come both in quality and quantity.

Pollution control

The main agenda of the country after Independence was economic development – in agriculture, industry, infrastructure and building institutions to manage and promote development. This was the only way to end economic backwardness, poverty and under- or unemployment. Even where environmental protection was concerned, reversing deforestation and soil erosion or land degradation were considered more important than preventing or controlling industrial pollution. The relative neglect of industrial pollution till 1974 was partly because industrial development had not reached significant levels till the 1960s except in a few pockets here and there, and as such industrial pollution was not widespread and significant except in a few areas. It was also partly because an emphasis on pollution control was seen as conflicting with broader goals of economic development and poverty alleviation. Mrs. Indira Gandhi, the then Prime Minister of India, eloquently expressed this dilemma during the

Stockholm Conference on Environment and Development in 1972, when she asked: "Are not poverty and need the greatest polluters? How can we speak to those who live in villages and in slums about keeping the oceans, the rivers and the air clean when their own lives are contaminated at source? The environment cannot be improved in conditions of poverty. Nor can poverty be eradicated without the use of science and technology" (as reproduced in Rosencranz et al. 1991: 39).

In spite of this general perception, the problems of industrial pollution could certainly not be ignored particularly where they occurred in a concentrated form at a source. Such pollution affected the poor most and even deprived them of their sources of sustenance and livelihood. If, for example, water pollution affected drinking water sources or destroyed fisheries on which poor fishermen depended on their livelihood, it could not be ignored in the name of economic development or broader objective of poverty alleviation. Wherever intense pollution occurred, it aggravated poverty. Thus in India, as in other developing countries, pollution control received attention not so much on aesthetic or even health grounds, but as a livelihood issue.

Nothing significant occurred, however, in the area of pollution control in the 1950s and 1960s. Such legislation as took place (for example, the Factories Act 1948, the Industries Development and Regulation Act 1951, the River Board Act 1956, the Atomic Energy Act 1962, the Insecticides Act 1968, the Radiation Protection Rules 1971) dealt with pollution only incidentally and proved inadequate to control or prevent it. No steps were taken during this period to establish any special institutional set up to monitor and regulate industrial pollution.

The breakthrough was provided by the Stockholm Conference in 1972 referred to above. In spite of her rhetoric about poverty vs. pollution, Mrs. Gandhi lent her strong political and moral support for policies and measures to preserve the environment without of course sacrificing the goal of economic development. The Conference was taken very seriously by her, and the preparatory committee for it became the precursor of the National Committee on Environmental Planning and Co-ordination (NCEPC) set up in 1972. It had the responsibility of reviewing policies and programs for the

environment. It also undertook the appraisal of several, if not all, development projects from the environmental angle and made suggestions for their modification to avoid adverse impact. This also led to a new surge of legislative activity and institution building for environmental monitoring and regulation.

A major milestone was the enactment of the Water Conservation (Prevention and Control of Pollution) Act of 1974. It was the first serious and coordinated attempt at controlling water pollution. Since India is a federation of states, the state legislatures had to pass resolutions permitting the Parliament at the Centre to pass this Act so that a uniform code and organisational structure evolved. Under this Act, Boards for prevention and control of pollution of water were established both at the central and state levels with the necessary technical competence and legal power to monitor the implementation of the law. Without waiting for the affected people to launch legal action, the Boards could on their own initiative proceed against those individuals and firms who infringed the law. A chain of water testing laboratories was established to check water quality and pollution. The Boards could lay down standards for discharge of effluent and take action to implement them. The Boards also advise about appropriate sites for location of industry. The Boards are autonomous in nature, but their Chairmen and Members are nominated by respective governments. They are essentially technocratic in character.

To meet the expenses of the Boards, the Water Cess Act of 1977 was passed requiring industries to pay a cess on water consumption. The water cess, however, has been inadequate both in meeting the expenses of the Boards and in acting as an effective economic incentive in inducing the firms to take up pollution abatement measures because of its nominal incidence. The 25 per cent rebate on adopting pollution control measures has not been effective in this regard. It is cheaper to pay the full cess than to install pollution control plants. The regulatory power of the pollution control Boards has, therefore, remained the major instrument of environmental policy.

The next step was to control air pollution. This was taken through a separate Act, the Air (Prevention and Control of Pollution) Act of 1981. To enable an integrated approach to pollution control, the Water Pollution Control Boards were authorised to deal also with air

pollution. Hence, they are now called "Central/State Pollution Control Boards." The state level Boards were required to prescribe and enforce emission standards for industry as also for automobiles after consulting the Central Board. The automobile emission standards are monitored and implemented by the Commissioners for Transport and their staff in the respective states.

The approach of the Boards was judicial. The Acts were administered through criminal prosecutions initiated by the Boards and through applications to magistrates for issuing orders to restrain pollution. This took a long time and often the polluters got away with mild penalties which did not prove to be detrimental.

The Bhopal Gas Tragedy, which took place after the midnight of 3rd December 1984, proved to be a turning point in making environmental policy more stringent. Forty tonnes of highly toxic methyl isocyanate (MIC) gas stored in the pesticide plant of the MNC – Union Carbide, located at Bhopal, leaked into the atmosphere killing around 3,500 people and seriously injuring 200,000, a good proportion of them permanently. This led to a further spate of legislative activity and tightening up of the environmental law and implementation.

One of the first steps was to reconstitute and upgrade the Department of Environment (DOE) and transform it into a Ministry of Environment and Forests (MEF). Its stakes and powers improved significantly. The States also constituted their own Ministries or Departments of Environment. In order to avoid any unfair race to attract investments into the states, the States had to abide by the standards of pollution treatment laid down by the Centre; they could, however, make them more stringent if they wished.

A comprehensive legislation – The Environment (Protection) Act 1986 was passed, empowering the Central government to take all necessary measures to protect environment. Unlike the earlier Acts which were piecemeal, this Act covered water, air, land and the interrelationships that exist between them and human beings and other living creatures. The MEF was given powers to exercise its main functions:

(a) Coordination of activities of various states and central authorities established under law;

(b) Laying down minimum emission / effluent standards;
(c) Getting information about industrial processes and to inspect plant premises;
(d) Giving directions for closure, prohibition or regulation of industrial processes;
(e) Stoppage or regulation of supply of water and electricity or any other services to industries violating pollution standards.

It is not necessary for MEF to exercise these functions directly. Institutions like the Central and / or the State Pollution Control Boards are empowered to act on behalf of MEF, with overall control vested with MEF. Necessary amendments to earlier Acts were passed to enhance the powers of the Pollution Control Boards. The Air Pollution (Amendment) Act 1988 sought to control noise pollution. Since the Bhopal gas tragedy involved handling hazardous substance, there was further tightening up of law. Rules were framed about handling hazardous substance and a Public Liability Insurance Act, 1991 was passed to provide immediate relief to persons affected by accidents occurring while handling such substance. To help early disposal of such cases, special Environmental Tribunals were created.

Steps were taken to introduce environmental auditing of local municipal bodies. Statutory bodies and public limited companies were asked to evaluate the effect of their policies, operations and activities on the environment, particularly with respect to compliance with standards and generation and recycling of wastes. Such annual reports are expected to help in identifying and focusing attention on areas of concern and taking appropriate action. They are also a source of information to the public. The public has been granted rights of initiating Pubic Interest Litigation (PIL) under which parties other than the directly aggrieved and the PCBs, can prosecute polluters and they have the right to seek and get information in the public interest.

The Policy Statement on Abatement of Pollution made by MEF in 1992 emphasises integration of environmental considerations into decision making at all levels. It mentions that to achieve this, the following steps are necessary:

(a) prevent pollution at source;
(b) encourage, develop and apply the best available practicable technical solutions;

(c) ensure that the polluter pays for the pollution and control arrangements;
(d) focus protection on heavily polluted areas and river stretches;
(e) involve the public in decision making.

India has also been actively participating in the global deliberations on environment. India has signed the convention on Bio-diversity and the UN Framework on Climate Change in 1992. India is also a signatory to the Montreal Protocol on Ozone Layer Protection along with its London amendment. Its provisions became effective for India since September 1992, and India has already started the process of phasing out ozone depleting substances.

Instruments of industrial pollution control

Direct regulation is the main instrument of pollution abatement in India, as seen from the preceding account of legislative activity. Two more instruments which are assuming increasing significance and receiving more attention now are: Citizens' Suit provisions and economic incentives.

The following regulatory instruments are used in pollution control or prevention mechanism: (a) No Objection Certificate (NOC), (b) Consent, and (c) Standards. NOC is required in the case of new industries. The concerned State Pollution Control Board issues NOC only after considering the impact of the proposed project on environment. *Consent* is required to be taken by the entrepreneur after the completion of the industrial project but before commissioning the industrial process. This is given subject to installation of all required pollution control equipment to abate pollution. Without such consent, a factory or industry cannot start its operation. The consent has to be reviewed every year. It is renewed only if pollution standards are complied with. Consent fees are a source of revenue for the Pollution Control Boards (PCBs). In addition to the monitoring by these Boards, Health Departments of Municipal Corporations also monitor industrial units to see if any of them cause health hazard to the public.

Standards refer to specific parameters previously quantified with respect to measures for disposal, discharge and emission of solid, liquid and gaseous waste into the environment. These standards form

the basis for the enforcement of any legislation for pollution abatement. In India, the Bureau of Indian Standards attended to the pollution problem as early as 1960s. The standards developed by them have been adopted by the Government of India as the Minimum National Standards (MINAS). The main considerations in evolving them are: (a) available technology; (b) the cost of available technology; and (c) assimilating capacity of the environment. Though the standards were in existence even before the comprehensive environmental legislation, only in 1974 were they given statutory provisions for implementation. Until recently standards were based on the concentration of pollutants in effluents and emissions. This provided scope for dilution which involves wastage of water in addition to evasion of law. The new category of mass based standards makes it possible to set specific limits to encourage minimisation of waste, promote recycling and reuse, and conservation of resources. There is also a strong shift now from "end-of-pipe" or "clean-up" technologies to "clean" technologies.

PCBs carry out periodical inspection of factories, the frequency depending upon the industry type. For example, an industrial unit in the Red Category, is inspected every month or at least once in 6 months depending on the severity of pollution. The inspection is less frequent – once in two years – for small units in the Green Category. The Boards also carry out stream surveys to identify the flow of water and its characteristics. If persons or firms do not give information required by the PCBs, they are punishable with imprisonment of up to 30 months and/or fines. Persons and/or firms causing pollution beyond the standards prescribed are also punishable with imprisonment of not less than one-and-half years and up to six years with a suitable fine. The Boards are empowered to take up the prescribed works in the firms seeking consent, and recover expenses incurred from them.

Apart from source oriented standards, there are effect-oriented or ambient quality standards for air and water, which are monitored by PCBs. These standards are tried to be met by stricter enforcement of source-oriented standards. Where water pollution is due to failure of municipalities and industries to treat water, institutions and mechanisms are evolved for coordinated action for an area, a conspicuous example of which is the Ganga Action Plan. Such

coordinated plans are yet to become more widespread. Yet another instance where such coordinated action is required is in the small scale industrial units, who on their own cannot afford to install pollution abatement plants. The PCBs promote collective treatment plants in such cases, evolving a mechanism of sharing the expenses incurred.

In spite of all the stringent provisions, the process of taking action was lax till 1980s as the approach was mainly judicial. The Amendments to the Air Act in 1987 and the Water Act in 1988 not only strengthened penal provisions of these laws, but also empowered the enforcement agencies to close down polluting industries and stop their electricity and water supply. The shift from judicial to administrative enforcement is meant for better compliance. However, the Boards still have no direct powers to exact fines or order imprisonment, and have to depend on the courts of law.

Environment is too important a matter to be left only to government agencies. The constitution (42nd Amendment) Act of 1976 made the citizens of India also responsible for environment protection. The citizens, however, acquired the power to prosecute an offender through Environment (Protection) Act of 1986 and subsequent amendments to Water and Air Acts. As a result, a citizen may prosecute an offender by a complaint to a magistrate. Through a few Supreme Court decisions, the citizens have also acquired the right to information from government records such as those of Pollution Control Boards. This has led to a spate of Public Interest Litigations (PIL), and also to a radical and creative transformation of the higher judiciary (the High Courts and the Supreme Court). The Supreme Court interpreted the right to life and personal liberty to include the right to a wholesome environment. It even embarked upon administrative action such as appointing expert committees, and based on findings, gave direction for closure of polluting industries (see Rosencranz et al. 1991: 2, 3, 57 and 58).

Economic incentives play the role of being only subsidiary to regulation and are aimed at encouraging pollution control and recycling. We have already referred to the *Water Cess* above. The incidence of this Cess is quite low and has not acted as an effective incentive. There is a provision for *Depreciation Allowance* for industries on pollution plant or equipment installed. There are also exemptions

in indirect taxes so that the burden of cost of pollution control is reduced. Equipment manufactured for pollution control are exempted from central excise duties since 1990. Similarly, there are concessional rates on excise on things manufactured using industrial waste. Bricks made of 50 per cent or more fly ash are exempt from excise. In Karnataka, pollution control equipment is exempted from the levy of sales tax since 1991. There is exemption from income tax on amounts contributed to programs of conservation of natural resources. To encourage shifting of industries from over-crowded areas and to reduce pollution load, capital gains arising from sale of buildings or lands are exempt from tax if the proceeds are used to relocate the industry in a new and less polluted or crowded place.

There is provision for giving soft loans carrying concessional rates of interest for upgrading technology and modernisation, which generally leads to reduced pollution. Unfortunately, the soft loan scheme is not as extensive as it should be. Commercial banks have given no instruction to banks to give soft loans to industries to install pollution control infrastructure. The banks, however, insist on NOC from the concerned Pollution Control Boards before extending loans to industries. An industry is not likely to receive any loan for installing pollution control equipment separately, if it is a loss making unit and is not judged as credit-worthy. The Industrial Finance Corporation of India (IFCI) has started a scheme to assist particularly the small and medium scale industries through subsidies for preparing proposals for prevention and control of pollution which meets the approval of the concerned Pollution Control Boards.

A critical assessment

Before we come to shortfalls and constraints in implementing environmental policy, it is only fair to briefly list some of the positive developments that have taken place. First of all, environment policy and legislation which were piecemeal and compartmentalised till 1970s, became more integrated, focussed, holistic and consequently more directed and effective since the 1980s. Secondly, the long and time consuming process of tort law gave place to a more active approach of the Pollution Control Boards themselves launching prosecution and administrative action. Besides, even the third parties

can now launch PIL against offenders. Paradoxically, power to initiate legal action under PIL and a tendency to take extra-legal action against polluting industries have grown simultaneously. Both have indicated that neither the Boards nor the polluters can take the people for granted. Thirdly, putting environmental matters under the Concurrent List in the Constitution meant that a "race to the bottom" in these matters is severely discouraged. The State Boards can make the pollution control standards more stringent, but not more lax. Fourthly, measures like "environmental auditing" have forced industries to be more environment conscious. There is also a welcome trend towards adopting clean technologies instead of "end-of-pipe" cleaning. Technological competence of Indian industry to adopt clean technologies has considerably improved over the years, with several companies specialised in producing pollution control equipment and in offering consultancy in the field. Even where small plants cannot set up their own pollution abatement plants, there are collective treatment plants. One such plant is set up in Kadugondanahally in Bangalore for tanneries.

Now we come to shortfalls and constraints, which are by no means insignificant. Though policy and legislation may look stringent on paper, there is many a slip between the cup and the lip. The implementation of pollution control in the 1990s is certainly more effective than in the 1980s, and far more so as compared with the 1970s. Even then we cannot say that all the pollution standards are followed by all the industries. Even though Pollution Control Boards have the powers to close down offending industries, the action is hesitant and lax particularly because of the fear of causing unemployment and distress. For example, the directive to close down polluting industries in Delhi and shift them elsewhere caused the unemployment of over 50,000 workers as the industries were not in a position to shift elsewhere in the near future.

It would be useful to have some indication in hard figures of how far pollution control laws are put into effect. This can be seen from Table 4, which presents a picture of the 17 categories of highly polluting industries. In the country as a whole, 70 per cent of these industries had facilities to comply with pollution standards in 1993, which improved dramatically to 86 per cent in 1996.

The situation of water quality in the country as a whole can be broadly judged from *Water Quality Statistics of India*, published by

Central Pollution Control Board (CPCB). As per this source, there were only 65 monitoring points for BOD in 1981 in the country, 64.6 per cent of which showed excess pollution. In 1989 on the other hand, there were 242 monitoring points, only 46.6 per cent of which showed excess pollution. In regard to Coliform, there were 65 monitoring points in 1981, 60 per cent of which showed excess pollution. On the other hand, only 43 per cent of 228 monitoring points showed excess pollution in 1989 (see Mehta et al. 1997: 46). This shows significant improvement, but the battle against pollution is not completely won in terms of pollution standards. Though less than half, still a significant proportion of monitoring points show excess pollution.

Table 4. Summary Status of Pollution Control in 17 Categories of (Highly Polluting) Industries* – Statewise

	Total No. of Units excluding the Closed ones		No. of Units having adequate facilities to comply with standards		Proportion (%) of B to C
	1993	1996	1993	1996	1993 1996
Southern States (including Pondicherry)	375	375	264	340	70.4
Rest of India	1 055	1 065	741	897	70.2
Total India	1 430	1 440	1 005	1 237	70.3

Source: Calculated from CPCB Annual Reports, 1992-93 and 1995-96 (p. 163).

**Notes:* 1. The industries identified as highly polluting requiring special attention are Aluminium, Caustic Soda, Cement, Copper, Distillery, Dyes & D I., Fertilisers, Iron & Steel, Leather, Pesticides, Petrochemicals, Pharmaceuticals, Pulp and paper, Refinery, Sugar, T P P, and Zinc.

2. Since the 1992-93 Report gave the figures only for total number of industrial units, the number of closed units in 1993 were assumed to be the same in 1993 as in 1996 (from 1995-96 Report) to arrive at the figures for total number of units excluding the closed ones for 1993.

A study by Mehta et al. has analysed data gathered from NEERI program of monitoring air quality in various cities (Mehta et al. 1997: 31-43). Three air quality parameters were picked up, i.e. Suspended Particulate Matter (SPM), Sulphur Dioxide ($S0_2$) and Nitrogen Dioxide ($N0_2$). The standards set for these parameters and also the means of their minimum and maximum concentrations in the air for two

reference periods – before the implementation of pollution control and after – are presented in Table 5 for the four metropolitan cities of India. A major problem in presenting such data is the extreme volatility in readings as they are very sensitive to rain, temperature, and wind velocity which are themselves erratic. The table is updated for 1995. The table indicates a relatively better air quality in the southern city of Madras (now, Chennai). Moreover, Chennai is the only city (out of four) to show reduction in pollutants in all the parameters between the first two periods. However, Chennai's environment has worsened between the latter two periods. On the other hand, both Delhi and Calcutta have shown an improvement in all the three parameters, but they are still worse than Chennai. It is worth remembering that a city may still be polluted if there are too many polluting units, with each satisfying pollution standards.

Table 5. Level of Pollutants in Industrial Areas in Metropolitan Cities (Mean values in micrograms per cubic metre)

CPCB Standard	SPM – 500	SO_2 – 120	NO_2 – 120	P-Index
Delhi				
1978-81	435	43	32	1.76
1987-90	458	62	50	2.23
1995	415	24	41	–
Bombay (Mumbai)				
1978-81	230	60	18	1.51
1987-90	230	38	56	1.70
1995	240	44	39	–
Calcutta				
1978-81	594	62	15	2.75
1987-90	518	52	44	1.08
1995	375	49	34	–
Madras (Chennai)				
1978-81	159	20	13	0.55
1987-90	132	14	11	0.40
1995	130	15	17	–

Source: NEERI – Various Issues of Air Quality Status as presented in Mehta et al. (1997: 32, 34) for 1978-81 and 1987-90; World Bank, World Development Indicators 1999: 168-169.

There are certain impediments in the way of Pollution Control Boards being more effective. This can be illustrated by using Karnataka State Pollution Control Board (KSPCB) as a case study. The

first impediment is inadequate budget and staff strength. There were only Rs.300 (US $ 7.5) available to monitor one industrial unit in 1993.[3] A welcome change is greater self-reliance than before. Grants from the state government and CPCB which formed 78.7 per cent in the total revenues received by KSPCB in 1981-82, declined to 10.2 per cent by 1990-91 and to 2 per cent in 1995-96. Correspondingly, the reliance on own resources like water cess and consent fees has increased. The State Pollution Control Boards need to be given the powers to raise fines and penalties and rates of water cess to strengthen its finances, which in turn could also improve pollution control.

The staff strength of KSPCB is also inadequate. It had a staff of only 205 in 1994 and 198 in 1996 including both technical and nontechnical persons, as against the sanctioned (permitted) strength of 358. Its jurisdiction covers the entire state of Karnataka with a geographical area of 191,791 sq. km. and involving 138,000 industrial units as in 1993. Only 8966 units (6.5 per cent) of these industrial units could be monitored in 1992-93 and 12,254 units in 1995-96. Also, all the parameters of pollution are not monitored. For example, about 30 parameters of pollution have to be monitored as per CPCB standards in textile units, but only 5 are monitored. More than the dearth of trained man power in the country, inadequate finance is the constraining factor in having more staff for monitoring more units.

In spite of inadequate staff strength, KSPCB has somehow taken on the burden of indicating what technology to adopt to abate pollution if the industries are unable to cope with pollution. Such a technology has also to be "economically viable." A deterrent charge on effluents and emissions would have forced the firms to seek a proper technology from consultants in the field and adopt it. Under the prevailing circumstances, the industrial units have a pretext to be indifferent to environmental degradation they cause if the Board is unable to indicate an economically viable technology to abate pollution to required standards. The country is still not ripe for shifting emphasis from economically viable technology to best available technology. In the absence of a deterrent charge on effluents / emissions, there is also no incentive to evolve or adopt such a technology.

A glaring lacuna in the implementation of pollution control is in the case of small industries. They are too numerous to be monitored

by KSPCB properly. This is to some extent compensated by inspection by Health officials of Municipal Corporations. In actual practice, there is considerable relaxation in their case. They generally let out effluents in public sewers, and expect the municipality to treat them. There is scope for a user charge on them to enable the municipality to raise some finances and treat the effluents.

Another major lacuna is in checking vehicle emissions. Though the officers of the Transport Commissioner are supposed to check them, there is tremendous relaxation particularly in the case of public transport buses, lorries, auto-rickshaws and two wheelers.

There is a similar disregard for pollution at the consuming end. For example, several drugs and pesticides like DDT banned in other countries are allowed to be manufactured and used. It is a dilemma to decide which is a bigger menace – malaria or DDT pollution. Low quality detergent powders which are cheap and within the affordable range of poor and the middle class also, however, cause pollution of water bodies due to their higher phosphate content.

Though all this looks a little unsatisfactory situation, it has to be remembered that low income countries like India inflict a much lower damage on the global environment than high income countries. Though India has a much larger population, the total carbon dioxide emission from fossil fuels and cement manufacturing amounted to only 909 million metric tonnes in 1995 (1.0 metric ton per capita), compared to 5469 million metric tonnes in USA (20.8 metric tonnes per capita) (see World Bank 1999: 208-9). Yet, India has taken the task of environment protection as seriously as possible consistent with her other important goals like poverty alleviation and economic development. Interestingly, it was found that Karnataka, in spite of its much lower per capita income (State Domestic Product) spent a slightly higher proportion of its income, viz 0.027 per cent, on enforcement costs on environment policy, than a more developed country like Netherlands which spent 0.023 per cent of its national income on the same (Kuik et al. 1997: 229). In absolute terms, India spent much lower because of its low income. At higher levels of economic development, India, hopefully, would do much better in environment protection. India has also taken significant steps in using cleaner fuels and energy conservation and fuel economy. Urban

areas have rapidly shifted from fuel wood and coal to natural gas and electricity. The earlier cars which were fuel guzzlers have given place to fuel efficient models. Virtually the entire steel industry has converted from open hearth to electric arc furnaces resulting in a significant fuel economy. The cement industry has shifted from wet to dry processes, with similar effects (Repetto 1994: 4). The policy of globalisation and open door to improved technologies under the Economic Reforms is further expected to strengthen this trend.

II. POVERTY-ENVIRONMENT-DEVELOPMENT NEXUS: DIVERSITY OF PATTERNS AND ISSUES

II.1 The "Vicious Circle": A Critique

The relationship between poverty, environment and development is quite complex and is not amenable to easy generalisation. Even within a country like India, there is a big diversity of patterns and situations. To capture this diversity in terms of a single perception of "Vicious Circle" of poverty-environmental degradation – more poverty, would be naive. Nevertheless, it would also be equally naive to rule it out altogether. It is more realistic and reasonable to treat the "Vicious Circle" one of the several situations prevailing, particularly so in a vast and diverse country like India and to assess its extent.

The basis for the perception of "Vicious Circle" lies in the fact that in developing or relatively poor countries, the poor people depend directly on the natural resource environment for their livelihood. In fact, a bulk of GDP itself is generated out of the use of natural resources in such countries. Agriculture, forestry, fisheries and mining contribute a fairly good share in such countries. For example, in India, as late as 1970-71, agriculture and allied activities contributed 44.5 per cent of GDP and, mining and quarrying contributed another 1.3 per cent. Thus the economic sectors which depended directly on the use of nature accounted for 45.8 per cent of GDP in 1970-71. By 1991-92, however, the share of agriculture and allied activities sharply declined to 30.0 per cent and that of mining and quarrying increased slightly to 2.0 per cent. By 1996-97, both the shares fell further to 26.1 per cent and 1.7 per cent respectively. But these declining shares of the primary sector in GDP

are not accompanied with a corresponding decline in their shares in work force (see section I.1 above). While nonagricultural sectors have grown fast in terms of income generated, they have not grown correspondingly in terms of employment generated. The pressure of poor people, the residual not absorbed by the fast growing sectors, continues to remain on land, forests and fisheries. It is necessary here to understand the distinction between pressure on land to raise food production and pressure to earn a livelihood. The substantial increase in yields per hectare achieved during the Green Revolution eased the former pressure, but not necessarily the latter. Though there is now enough food to feed the increasing population, the continuing (though declining) poverty is still a source of pressure on land. This can get reflected in the form of encroachments into forests and other common lands for extending cultivated area, and over-exploitation of forests and fisheries. These encroachments, even if they are by the poor, have the effect of depriving the other poor of their access to the common property resources (CPRs), quite apart from the environmental effect. But encroachments need not all be by the poor. On the contrary, it is the more powerful sections of the society who are found to encroach more into CPRs (Nadkarni 1989: 127-130; Nadkarni and Pasha 1991).

The important point here is that just as the poor are dependent on nature for livelihood, they are also very vulnerable to natural calamities, environmental degradation and ecological disasters. Some of these may be natural, like floods and droughts, and some may be man-made. Even the natural disasters like floods and droughts may be aggravated by human action. For example, deforestation on mountain slopes can increase the flood proneness of areas down below. Similarly, droughts may be aggravated by neglect of water and soil management resulting in soil erosion, increased vulnerability of crops to failure of rainfall and increased instability in crop output. The poor suffer most during floods and droughts. They lose their productive assets, sometimes through distress sale, which adversely affects their capacity to resume normal economic operations when normalcy is restored. Even disasters which look temporary may have a lasting debilitating impact on the economy of the poor. The man-made ecological disasters like the poisonous gas leak in Bhopal in India in December 1984 affected the poor most. If the possibility of such disasters is not drastically

reduced, poverty aggravation is inevitable. While the poor are more vulnerable to environmental degradation and natural disasters, the question is whether they are themselves responsible for creating them, which is the "Vicious Circle" thesis.

In other words, the crucial question is whether the poor people dependent on natural resources use them in a sustainable way or not. There is a widely held view, particularly in the West, that poverty or the poor people are the main cause of environmental deterioration, because they are not in a position to use natural resources sustainably (for a review of literature see Duraiappah 1996 and Prakash 1997). This degradation in turn is feared to lead to a further aggravation of poverty, suggesting the completion of the "Vicious Circle" or the "Poverty Trap" process. The poor in this view are perceived as having a short time horizon, discounting the future benefits from conservation rather heavily due to the urgency to make a livelihood and avoid hunger. Such a view of the future leads to unsustainable use of natural resources.

The examples used to illustrate the vicious circle, generally relate to land and forests. Hardin took the case of grazing pressure on pastures or common property resources to illustrate this conceptualisation of the vicious circle in terms of what he called as the "tragedy of the commons" (Hardin 1968). The pressure on the grazing lands led to their depletion and the aggravation of poverty. Extension of cultivation on fragile mountain slopes leading to soil erosion and floods, is another example. Shifting cultivation with shortened fallow cycles is often blamed as ecologically destructive. But encroachment into forests for a permanent or settled cultivation can be even more injurious than shifting cultivation, where the farmers do not adopt measures for soil and water conservation on encroached lands. Farmers who have no title or ownership rights on lands do not take the necessary care in such lands (Nadkarni and Govindaru 1995). But to grant ownership rights on encroached lands liberally would open floodgates of encroachment on forests. Scarcity of fuelwood also is an apt example of the "Vicious Circle," where cow dung is used as a fuel in dried cake forms which could more productively be used as a manure in cultivated lands.

The perception of "Vicious Circle" as characterising the environmental degradation and poverty in developing countries is vulnerable to criticism on several counts, especially if presented in

terms of an overall generalisation. First, it is argued by several researchers that the poor too have a concern for the future and are conscious of their stake in the sustainable use of the natural resources. For example, "the poor farmers put in a tremendous amount of planning and labour into building and maintaining terraced fields, controlling soil erosion, nurturing tree species for fuel, fodder and soil fixing, and intricate soil and engineering mechanisms responsible for conserving, harvesting and distributing irrigation water" (Prakash 1997: 4-5). Where the poor appear to degrade the environment, it is basically because of lack of incentives and appropriate institutions including lack of clarity on property rights.

But the question is whether the rural poor would equally care for sustainable use of common lands even if they use their private lands sustainably. The perception in terms of the "tragedy of the commons" where each user sees himself in a zero-sum game with other users and rushes to use common resources before others make use of it, is based on the assumption of open access to them and absence of any property rights and management. Field observations on CPRs have, on the contrary, shown that CPRs have been subject to some form of collective management or the other traditionally, which ensured their sustainable use. Even in ecologically fragile ecosystems like mountain regions or arid areas, "local control over local resources, and adherence to social sanctions empowered the community to protect and enhance community stake in natural resources, and enforce measures which helped in balancing supply and demand aspects of resource use in the community context" (Jodha 1998: 2385). The existence of institutions of sacred groves and *Van Panchayats* which have evolved over the years to restrain indiscriminate use of forests, and also the *Pani Panchayats* (Panchayats for managing water distribution, cf. Deshpande and Reddy 1990) for managing irrigation tanks and canals, are a proof that the rural people in developing countries had the necessary vision and ingenuity to promote sustainable and also equitable use. The actual case studies of such instances in India have been fairly well documented (Wade 1998; Singh and Ballabh 1996). Unfortunately, the traditional institutions for sustainable use came under tremendous pressure due to their subjugation by state authority and market forces, person-oriented political patronage, and political encouragement to encroachment.

The second criticism of the "Vicious Circle" thesis is that not all environmental degradation is due to the pressure of the poor. The deforestation which took place in the nineteenth century and early twentieth century in the form of depletion of timber was mainly due to the pressure to meet the requirement of expanding railway network and wood requirement in urban areas (house construction, wooden poles for street lighting etc.). The Second World War put further pressure on the forests. The development of Iron and Steel industry in the initial stages and also that of paper and rayon industries accelerated this pressure on forests (Nadkarni 1989). Even where forest areas stayed with the Forest Department, they became poorer in timber. Much of the deforestation in Brazil is due to cattle ranching. It has been observed that if only North America and Europe cut the consumption of beef by half, deforestation in Brazil can be checked without delay. These examples show deforestation due to market forces whose impact cannot be underestimated. The same story is repeated in the case of fisheries. The over-exploitation of fisheries is by the mechanised trawlers, and not by the poor fishermen operating country boats.

When we look at the problem over a fairly long period of time, the "Vicious Circle" thesis seems to collapse totally. In the past when poverty levels were much higher in developing countries, there was not much environmental degradation. Now that poverty levels are declining significantly, it does not seem sensible to attribute environmental degradation to poverty. Obviously, other factors play a more important role.

Further evidence that the pressure on the environment comes more from the rich than the poor, lies in the pattern of carbon dioxide emissions from fossil fuels and cement manufacture, as already pointed out at the end of the Part I above. The World Development Reports clearly show that per capita CO_2 emissions of rich countries are so many times higher, and that the total emissions of several of them far surpass the total emissions of countries like India or China though the latter have much bigger populations. But there is now a sharply increasing trend in the per capita CO_2 emission of developing coun-tries too due to acceleration of industrialisation, which includes the shifting of polluting industries from the North to the South. Moreover, if we take the pattern in CO_2 emissions from another source, namely deforestation, the role of the developing

countries here becomes more important. Deforestation which took place on a large scale in the North up to the early part of twentieth century was halted there-after. Now it is difficult to restrain developing countries before they complete the same process.

A third criticism of the "Vicious Circle" is that just as not all environmental degradation can be attributed to poverty or the poor, so is not all poverty due to environmental degradation. As a matter of fact, most of the poverty in developing countries is due to a history of colonial exploitation and continuing feudal structures which are both exploitative and a hindrance to economic and social development. The development process – even to the extent that it takes place – bypasses the poor relatively, if not absolutely. The relative neglect of human development and of sectors like agriculture that have the largest potential of generating employment and meeting the needs of the masses is the major reason why the poor are so bypassed. The greed of the political leaders and officialdom resulting in massive pilferage and corruption also hinders development and comes in the way of benefits going to the poor. None of these important factors have much to do with natural resource environment. However, prevention of access of the poor to the natural resource environment has caused distress to them in several cases involving CPRs. But in such cases, the reduction in the availability of biomass needed by the poor has more often been due to the larger market forces or the state denying this access, rather than due to environmental degradation by the poor themselves.

The fourth criticism is that even to the limited extent that the "Vicious Circle" exists, it is only one of the manifold diversity of patterns and situations governing the poverty-environment nexus, as observed at the beginning of this Part. A focus on only one situation can prevent a proper understanding of the whole complexity of relationships. We shall, therefore, review the other situations of this nexus.

II.2 Poverty Alleviation vs. Environment

The growing concern with poverty, and belief in the capacity of the development process to reduce it, led to the perception that development is the primary objective of developing countries and not environment. At about the time of the Stockholm Conference on

Environment and Development in 1972, poverty was seen as the worst form of pollution. Before industrial pollution needed attention, poverty had to be first dealt with as a matter of highest priority. Not that problems of environment could be completely ignored but this consideration had to be subservient to the need to promote development and alleviate poverty. A relationship of trade-off is implicit in this perception, and reflects the dilemmas facing India and other developing countries with mass poverty. India feels that accelerating economic growth is necessary for eliminating poverty as it could not be solved only through direct programs targeted at the poor. An excessive concern with environment, it is feared, can dampen development effort and hence poverty alleviation.

A major example of this conflict is the question of developing hydro-electric power whenever this has involved submergence of forests. Electric power is seen as crucial for stepping up industrialisation and employment generation, and to improve the quality of life of people in general. The benefits from conserving forests do not look so conspicuous and immediate. The dilemma becomes acute when micro hydro-power units which have minimal adverse impact on environment are assessed as uneconomical, unstable and undependable, and when forests facing submergence through major power projects are rich in biodiversity. The loss of such forests cannot be made good by raising compensatory man-made forests elsewhere since they cannot be as rich in biodiversity as natural forests.

The Silent Valley Hydel Power Project had to be given up in Kerala for the same reasons. The interesting aspect of this was that there was a popular backing for environmental movements which brought pressure on political leaders including the then Prime Minister Indira Gandhi to give up this project. No displacement of people was involved here as in the Narmada Project, and the project would have generated significant employment. Yet, there was a strong movement in which both grass root organisations of people and intellectuals joined to save the unique forests. It is to the great credit of people of Kerala that they could have genuine concern for conserving environment and natural heritage rising above the motive of making immediate economic gains. It is not as if development concerns always weigh more with people as against environment. Where benefits from development are assess-ed as low while the cost of environmental degradation is assessed as high for the local

people, these people, have spurned and even forcefully opposed official development projects.

Nearly every development project has negative externalities, affecting a section of people adversely. Even if a development project benefits more people and people adversely affected are less, there can be no justification for carrying out that project. The adversely affected people have to be so compensated that they are at least no worse off and if possible better off. The worthwhileness of a project has to be assessed taking into account the costs of such compensation or rehabilitation of deprived people. Obviously, the additional benefits from the project have to be so high that the cost of compensation and rehabilitation can be easily absorbed and yet leave a surplus of benefits.

Even if this is done, the dilemma of poverty and unemployment on the one hand and environmental impact on the other cannot be brushed aside. The dilemma can arise from the opposite end – environmental concern leading to aggravation of poverty. One of the reasons why pollution control laws are not enforced strictly is because of the fear of unemployment that such an enforcement would cause. Several industries, particularly small units, find it difficult to observe pollution standards prescribed by law. Many of them were set up decades ago and pollution control is taken up by them, if at all, as an add-on measure instead of being a process-integrated or built-in device to prevent pollution. On many occasions they have been ordered to be closed down, usually with the intervention of the Supreme Court in response to writ petitions by environmentalists. For example, 8378 industrial units were ordered to be closed down in Delhi and relocated elsewhere (Economic and Political Weekly 1997: 1524-27). Tanneries in Kanpur which were releasing very toxic pollutants into the River Ganga and were similarly ordered to close down, are another example of this case. In all such cases, thousands of low paid workers lose their jobs and become almost destitute. Environmental concern has clearly led to severe problems of aggravation of poverty here.

Wild life sanctuaries are another example of environmental conservation having the potential of aggravating poverty by causing deprivation. There is an extensive network of protected areas in India consisting of natural forests and wild life sanctuaries, accounting

for above 4.5 per cent of geographical area, which are intended to conserve India's biodiversity. Though India's forest area is much larger (about one-fifth of geographical area), it is the protected areas that have maximum restrictions on the use of forests by local people. Many of the forest dwellers engage in shifting cultivation and hunting wildlife. When these people lived in a self-contained and isolated economy of their own, there was no problem. When, however, outside market forces penetrated these economies and started hiring the forest dwellers as agents for poaching and smuggling, human habitation began to be seen as a nuisance. Even if one or two of the forest dwellers are so used for illegal purposes, the entire group comes under suspicion. Zealous foresters tried to relocate the forest dwellers on the fringes of natural parks, which deprived even the innocent forest dwellers of their rights to traditional sources of livelihood. Concern for conservation here conflicted with local interests of the poor people, aggravating their poverty. There is now a move to achieve conservation with the cooperation and participation of the forest dwellers themselves, making them jointly responsible for safeguarding natural parks along with the Forest Department (Kothari et al. 1996). A detailed case study of Nagarhole National Park is presented in Part III to illustrate this problem in detail.

Similarly, the campaign for beautification of cities can often hit the poor hardest. Most of the poor live in slums, with hardly planned lay outs, drainage or roads. The dwellings are poorly constructed from cheap makeshift material. They are usually located in government open lands without authorisation. The campaigns for beautification take the form of demolition of huts and levelling down whole areas to raise multi-storeyed tenements and parks. Though proper notices to vacate are given several times, they are usually ignored by the slum dwellers. And then one day, they are taken by surprise, their belongings thrown out and are forced to vacate. Most often they have nowhere else to go, and they join the ranks of houseless people and end up living on the streets and in more unhygienic places than in their earlier slums. The drive for a cleaner urban environment, if it takes this form, is definitely anti-poor rather than an anti-poverty move. The more humane and practical policy is to improve conditions in slums – providing more outlets of drinking water in a clean environment, proper drainage and sanitation, rather than demolition of slums.

In spite of the possibility of conflict between development and environment concerns in many instances, negative externalities including environmental problems cannot be ignored by developing countries. This is because, if they are ignored, the negative externalities caused thereby also aggravate poverty. For example, the introduction of chrome tanning in the tanneries of North Arcot promoted employment and increased incomes for quite a few in an otherwise economically backward area. Yet, it led to contamination of the river on the banks of which the industry was located, which in turn affected drinking water as well. This forced the poor downstream villages to search for drinking water much farther away. It cut into their time available for remunerative work, apart from causing severe hardship (more on this in Part III under case studies). Heavily polluting industrial units are ordered to be closed down by courts for the same reason.

Developing countries are now realising that whatever the rhetoric of preferring development over environment, environmental problems cannot be ignored by them if they care for the poor. This has raised the costs of development for the developing countries now. At a comparative stage of development of the present advanced countries, both the human costs and environment costs could be relatively ignored by them. The developing countries of today cannot, however, permit themselves this luxury.

II.3 Destructive Development

We cannot take for granted that all economic development is necessarily poverty alleviating. It is possible for "development" projects to be capable of stepping up the rate of growth of GNP, and yet deprive the poor of their employment and even of their access to their natural resource environment. Elitist development, focussed only on the rich, either urban or rural, may belong to this category. Additionally, development projects may also be environmentally destructive. These are cases of destructive development, aggravating poverty as well as environmental degradation. Unfortunately, negative externalities are hardly included in measuring GNP, and such projects get clearance.

An example of this is provided by the case of shrimp farming in the coastal areas of Andhra Pradesh and Tamil Nadu. Both the

urban and rural rich bought off paddy cultivating areas from poor farmers and converted them into aquaculture plots for shrimp farming. Salt water was mixed with natural water, driving these lands permanently out of paddy cultivation. It may have created jobs for a few and raised their incomes. But a study carried out by the Peoples' Union for Civil Liberties (PUCL) showed that for every person employed in shrimp farming, five agricultural workers were rendered jobless. Moreover, the cost of creating a job in shrimp farming was several times higher than in agriculture which it displaced (as reported in the Deccan Herald, July 26, 1997: 24). Not all shrimp farming is destructive and most of it may not indeed be so. But if shrimp farming was confined to natural sites of brackish water, such a tragedy described above would not have occurred.

Another example of destructive development is converting natural forests and grazing lands used by the poor into industrial plantations. In the name of social forestry, several such areas were brought under eucalyptus, pine and such other trees needed by the industry. In the first two decades after Independence, thousands of hectares of natural forests in the Western Ghats were converted to eucalyptus plantations though they were not suitable for the climate. It deprived the poor of their access to sources of biomass vital to their livelihood, and damaged the ecology of the regions and destroyed biodiversity.

Such cases illustrate destructive or immiserising development, under which even if development may help a few poor people, it makes many more worse off and miserable. Development projects of this type are not even amenable to correction by paying compensation to the adversely affected people. This is because the cost of compensation to prevent people from becoming worse off is so high that it far exceeds the additional benefits in the form of value added or income generated by the project. If an honest cost benefit analysis, incorporating adequate compensation and cost of rehabilitation, as well as valuation of environmental damage caused by the project, were to be undertaken, such projects would not be considered viable. Lack of transparency in project appraisals comes in the way of proper selection of projects. When projects are launched without such a transparent appraisal, it only induces strong resistance in democracies. The continuing and

strong movement against Narmada Project is because of the fear that it may be an example of destructive development.

II.4 Environment Helped by Poverty

The consumption patterns of the rich vis-à-vis the poor are such as to indicate that environment is protected today because of the poverty of the poor. If the people of developing countries reach the standards of living of Americans and Europeans and adopt their life styles, it is doubtful if the aggregate consumption of resources and the quality of our environment could be sustained at all. What has prevented the further deterioration of environment or its collapse is the fact that the life styles which make massive demands on the environment are confined only to a fraction of the world's population and the rest are forced to be frugal.

For example, both between countries and within countries, the consumption of fossil fuels and carbon dioxide emissions are accounted for mainly by the rich. Even the per capita consumption of potable water, a scarce resource, is many times higher among the rich. The poor do not use swimming pools and tub baths. Many of them do not even have a single outlet of tap water in their houses and have to fetch drinking water from a distance outside their houses. Such circumstances cannot permit wasteful use of water.

Even if land is scarce from the point of view of the society, it may not be so perceived by rich landlords owning hundreds or thousands of acres. They economise on labour necessary to take care of soil erosion and water conservation. Land degradation through neglect is more likely in larger holdings than in the small. In many such instances, it is found that poverty has promoted environment, which is ironic and sad.

Waste recycling takes place to a much greater extent in developing countries like India than in developed countries. Wastes which are largely incinerated in developed countries are brought in to reuse or recycled in developing countries. For example, old newspapers are carefully stored by households which are then sold once in a month or so to old newspaper traders, which are then reused in industries such as fire cracker making or recycled in paper and pulp industry. Similarly, glass bottles and plastic wastes are collected and sold.

This is possible because even the low trade margins involved in the collection of waste are considered worth earning. The poor, especially their children, do not mind working hard at unimaginably low wages because even this is difficult to come by.

A special case of environmental cause promoted by the poor, but at a great cost to themselves, needs attention. This is the case of urban rag pickers helping waste recovery and recycling. Over half, sometimes even up to 75 per cent, of urban workers, eke out a living in informal sectors at low incomes. Among them, women and children earn particularly low incomes. Waste picking is one such occupation where women and children dominate. The parents almost force their children to supplement their meagre earnings and hence children account for over 60 per cent of workers engaged in waste picking. Women account for 30 per cent and men for the remaining 10 per cent (Venkateswaran 1994: 48). The earning of these children ranges from Rs. 10 to 60 per day (US $ 0.25 to 1.5), but closer to the lower figure in most cases. A survey in Bangalore showed that about 8.6 per cent of the total waste generated and 14.4 per cent of waste received is taken care of by waste pickers (Beukering et al. 1994: 22).

These waste pickers have to be distinguished from traders in waste and also retail collectors of used newspapers. Also a lot of waste is turned into compost in several cities, which is not touched by the waste pickers. The waste pickers usually concentrate on glass, metals and plastic materials. They hardly use gloves and operate with bare hands. A survey in Delhi showed that children suffered from as many as 6 cuts to their fingers on average (quoted in Venkateswaran, 1994: 51), exposing themselves to tetanus, hepatitis B and other infections. Long exposure to hot sun often induces nose bleeding. Fumes in disposal sites result in respiratory problems. Since they operate essentially in unhygienic surroundings, they are exposed to various forms of diseases. Containers of chemicals expose them to risks of chemical poisoning.

Apart from health costs, the waste picker children bear others costs, mainly the cost of deprivation. Though primary schooling is compulsory up to 14 years of age, it is difficult to enforce it among the poor even though schooling is free. Their parents give greater weight to the pittance that children bring as supplementary income. In the task of waste picking, no skill formation takes place and no

mobility to more paying occupations is promoted. The children wait till they get unskilled manual work on daily wages.

A few NGOs like Waste-Wise in Bangalore have tried to organise these street children, giving them gloves and push carts to collect waste directly from households in more hygienic conditions (so that scavenging is avoided). Even special schooling is provided in evening hours so that they can became literate and are made capable of acquiring skills. This way, recycling is promoted with least personal cost to the poor waste picker children. If we depend on continuation of poverty for conserving environment, such a conservation itself is not going to be sustainable. Moreover, since the general incidence of poverty itself is declining significantly over the years, its role in helping waste recovery and recycling would also be declining. The trend in future would have to be towards more sophisticated ways of handling waste, consistent with human dignity.

II.5 The Virtuous Circle: Possibilities

If the poor people depend for their livelihood on the natural resource environment, and if institutional mechanisms are so developed that they make sustainable use of it or even improve it, we have good possibilities of a virtuous circle operating instead of a vicious circle. An improvement in the natural resource environment improves the resource base of the poor and can alleviate poverty, which in turn can strengthen their capability to enrich their environment. A vicious circle, to the extent it operates, can simply be turned into a virtuous circle where the poor who degrade environment are turned into its protectors and promoters.

This is not just an imaginary possibility. Many instances have shown that India's rural people have been ingenious enough to turn a vicious circle into a virtuous circle, particularly when they had the benefit of inspired leadership and guidance. This is illustrated by the case study of Ralegaon Siddhi, taken only as an example here.

Ralegaon Siddhi[4] was a small village perpetually drought prone and poverty stricken in Ahmednagar district of Maharashtra (Western India). Only one industry thrived there – illicit distilleries, which helped the men to forget their miseries and frustrations in the evenings but at a great cost to themselves and their families. They

systematically over grazed and exploited their surrounding forests and had shortage of both fodder and water. Both their agriculture and animal husbandry were in a poor state. Most of the families lived in absolute poverty.

One of their own villagers, Anna Hazare, who had joined the army, returned to the village in 1975. In a previous war with Pakistan, he had the mortifying experience of seeing every one of the soldiers in his group being killed except himself. He thought that God saved him for a purpose – the purpose of helping the poverty-stricken people of his village to overcome backwardness and misery and to lead dignified lives. He won the confidence of the villagers by renovating an old village temple using his retirement benefits, and used the temple as a centre for holding discussions with village people about development activities. He felt that moral reconstruction was a basic prerequisite to village development. He built a youth club and put a ban on all the distilleries and liquor shops in the village. This helped people to save money for their families, buy more and better food, and also to work better.

He mobilised local people to offer voluntary physical labour (*Shramadan*) for development schemes planned by them. To the extent that the schemes needed money, he sought loans from cooperative societies and banks. He and his people rejected the idea of donations from outside and relied on their own efforts and *Shramadan*. They went about systematically to take an inventory of the natural resources and devised plans for their sustainable use and enhancing their productivity. One of the first steps was to regulate free grazing and regenerate the uncultivated wastelands. They took the village watershed as a unit for planning, took up civil works to conserve soils and water and store rainwater. They built the necessary check dams and developed agroforestry themselves. Once the grazing lands and water storage capacity was restored, they developed animal husbandry. Cowdung was used as a precious resource to generate biogas, with the remaining sludge used as manure. The village got clean drinking water and also enough milk not only for home consumption but also for sale in the neighbourhood cities.

This task was combined with attention to other dimensions of development – achieving total literacy, full enrolment in schools and health care. They fought social evils like dowry and exploitation of

scheduled castes and tribes. The weaker sections were integrated into the mainstream and equality was promoted. It has thus become a model village and a centre of development tourism. What is more, by developing the necessary institutional base, Hazare has tried to see that people depend on themselves and not on his constant guidance, so that it remains a model village even if he is not on the scene.

There are many such examples now in India like Ralegaon Siddhi. Sukhomajri (Chopra et al. 1990) and Pani Panchayat (Deshpande and Reddy 1990) have attracted wide publicity (for a few more case studies see Nadkarni 1990; Singh and Ballabh 1996; Dantwala et al. 1998). The process of forests being overexploited by local people was tried to be converted into a virtuous circle by the now well known Arbari experiment of Joint Forest Management in West Bengal in 1970. The initiative was taken by a government forest officer, A.K. Bannerjee, who involved the village communities in the protection of natural forest by giving them responsibilities and also a share in the benefits from joint management. Now it has become a major movement throughout the country and guidelines have been given to States to promote it (SPWD 1992).

These examples are mainly from the rural sectors. But there should be similar possibilities in the urban sectors too, involving slum improvement and informal sector development. The case of street children working as waste pickers can for example, be turned into a virtuous circle if child workers' health and schooling are taken care off, and at the same time waste recovery and recycling takes place in hygienic ways as described in the preceding section.

There are two basic ingredients in the process of generating a virtuous circle. One is the idea of *Chakreeya Vikas Pranali* or cyclic system of development, and the other is peoples' mobilisation and their involvement (Chopra and Kadekodi 1999: 232-3). Both ingredients are closely integrated. Regeneration and renewal are basic to the whole process, which includes minimising pollution and depletion and encouraging recycling and reuse. There is also emphasis on the dignity of physical labour and its voluntary contribution. But this is not confined to the poor. If the rich are not in a position to contribute physical labour, they have to contribute in terms of resources in kind or money. The benefits are shared equitably. For example, in Pani (Water) Panchayats, every rural household has

equal share in irrigation and water resources. The equal rights to water are, however, tradeable so that even the landless labourers gain from irrigation resource generated. Equality may not fully be achieved in all cases, but now every one in villages is keenly conscious of the concept and the poor do not hesitate to articulate their rights openly. The village committees for managing common lands have equal representation from all rural households, and women are tried to be given their due role, through a reservation of one-third of seats. Grass roots level democracy is used to integrate environmental regeneration and rural development to alleviate poverty.

II.6 Women and Environment

Probably the first victims of any environmental degradation are the women among the poor. Deforestation leading to fuel wood crisis, for example, forces the village women to travel for miles in search of fuel wood (Agarwal 1986). This involves waste of their energy and their productive time which could have been employed in more remunerative work. Shortage of drinking water also imposes the same hardships on women. They have to bring pots after pots of water from great distances to cook and wash. Fodder scarcity also affects women first since the care of livestock is their responsibility including fetching fodder for milch animals and plough bullocks which are stall fed.

This burden on women has an impact on the girl children too. When the mothers' time is spent in fetching fuel wood and drinking water, girl children are kept at home and discouraged from attending schools. They have to look after younger children, sweep the house and do other household chores.

Women are also immediate victims of smoke in the houses, when the poor households cannot afford cleaner fuels like natural gas and electricity. Both rural and urban women who have to wash clothes are affected by the quality of detergents they use, since washing is done mostly by hand. Professional washermen (dhobies) are also exposed to them, except in major cities where washing machines are used by hotels, hospitals and rich houses.

This vulnerability to environment also makes women become agents of eco-restoration in organised efforts (Nadkarni 1990). Women have taken keener interest in planting fruit, fodder and fuel

wood trees around their houses and also their common lands. They took enthusiastic role in preventing over exploitation of forests by commercial interests. There are instances where even in the face of apathy and indifference on the part of the male folk, women have launched struggles for protecting the grazing lands and forests from disruptive developments like mining (Bhat 1987). Women's participation is valuable also in improving conditions of sanitation in rural areas as well as in urban slums. Since women are so closely linked with health and environment, they represent a constructive and protective force for environment (Sarin 1987: 76). They can thus play a crucial role in turning vicious circles in to virtuous circles.

III. CASE STUDIES

III.1 Conservation vis-á-vis Local Rights: The Dilemma of Nagarhole National Park in Karnataka[5]

India is regarded as one of the twelve megadiversity countries in the world. According to a World Bank Report, the country has over 45,000 identified plant species, one-third of which are unique to India. It has over 81,000 identified species of animals. About 14 per cent of its 1228 bird species, 32 per cent of its 446 reptile species, and 62 per cent of 204 amphibians are unique to India (World Bank 1996: 1). This diversity has tremendous importance, not all of which can be valued easily in money terms. It is feared that if it is wiped out, a major bio-resource would disappear, the cost of which is simply not acceptable to the country and the world at large.

This diversity is facing unprecedented threat to its survival. Some 10 per cent of all plant species and over 21 per cent of the 372 mammal species are endangered. India has, therefore, sought to protect its flora and fauna through a wide network of 75 Protected National Parks and 421 Sanctuaries covering over 14 million hectares or 4.5 per cent of its geographical area.

While commercial and industrial pressures have also taken a toll on rich forests, local pressures for extension of cultivation to eke out a livelihood are also a major factor behind threat to biodiversity not only in other forests, but even in National Parks and wild life sanctuaries. Though some protected areas have no or little human

population, quite a lot of them have people living both within the forests and on the periphery. The forest dwellers are mostly tribals, whose economy and livelihood are dependent on the forests. However, their economy is not any longer isolated from the outside world. They cannot make a living only out of gathering forest produce, particularly as their aspirations have increased, being aware of the luxuries of civilisation outside the forests. Their food habits are changing and their economy is getting commercialised. Not content with mere food gathering, they have been cultivating lands surrounding their hamlets or *hadis* (settlements) and tend to kill animals attracted by crops. Since even crop cultivation is not sufficient to make a living, they also go for wage labour outside forests. Their exclusive dependence on the forest produce is, therefore, a myth at least in present day India. Even where they depend on forests, it may not always be consistent with conservation particularly in the case of extension of cultivation by burning down forests. Forest officials are also afraid that a few of the people living within and at the periphery of forests help smugglers and poachers in taking out precious timber and other forest produce (like skins, bones, horns and ivory) derived from killing wild life. Senior forest officers specialising in wild life protection claim that "man and wild animals cannot co-exist" (attributed to Praveen Bhargava, quoted in the Hindu Survey of Environment 1997: 170). In any case, under the terms of the Wildlife Act of 1972, settlements within a national park are illegal.

The official approach to conservation in such parks and sanctuaries is to relocate the forest dwellers on the periphery of these protected areas, by constructing colonies or settlements for them. Here there is provision for construction of houses, which are invariably better than those in which they lived in the forests, and also for allotment of land for cultivation. The colonies also make it possible to take care of needs such as primary education for children, family health care, drinking water, sanitation and even electricity. Forest officials argue that with such facilities people would be even better off than they were before. Living outside the forests also enables the relocated people to have easier access to employment and other earning opportunities in the outside world. The officials argue that these people actually want to enjoy the comforts of the outside world, its facilities and earning opportunities, which the forests cannot provide. In any case, in the protected parks

they cannot be given the freedom to extend cultivation, kill wild animals, or cut trees as they want. More than the forests, it is the outside world which will give them a better fare, though in the short transitional period there could be problems of adjustment. So at least is the view of forest officials.

The NGOs who work with the tribals think differently. They emphasise the rights of the local people, especially the tribals, living in the forests. Conservation should be achieved by suppressing their rights. They assert also that apart from their right to livelihood, the tribals also have rights to keeping their way of life which is dependent on gathering forest produce like wild fruit, tubers and honey, and also cultural-cum-religious rights of worshipping forest deities. They also point out that India is a signatory to the UN Declaration on Forced Evictions since 1991, and is duty bound to honour that commitment. According to the declaration, "Forced evictions constitute a gross violation of Human Rights." The NGOs are afraid that not only the tribals may often be forced or pressurised to relocate, but even the rehabilitation package may not be implemented properly. There are leakages in funds allotted for rehabilitation and governments do not have a good record of having executed rehabilitation plans to the satisfaction of the relocated people (Hiremath et al. 1997).

These problems and dilemmas are well illustrated by the Nagarhole National Park (as popularly known) in Karnataka. The state has dense moist deciduous forests in Coorg and Mysore districts, known for their rich biodiversity. These forests are a part of the Niligiri Biosphere Reserve covering adjoining forests in Kerala and Tamil Nadu as well. Initially only 284 sq. km. were notified in 1955 as a sanctuary, covering the area which was earlier used as a royal hunting preserve of the Maharaja of Mysore. A subsequent notification in 1975 extended the area to 572 sq. km. under The Wild-life Preservation Act of 1972. A further notification in 1988 extended the Park area to 643 sq. km., which stands till today. It was also renamed in 1992 officially as the Rajiv Gandhi National Park (Hiremath et al. 1997). The coverage of the park had to be extended from time to time because tiny and fragmented protected areas cannot support the conservation of large carnivores like tigers and lions, or of landscape herbivores like wild elephants. They need extensive areas with least human intervention.

The Park has 54 tribal settlements or *hadis* with 1550 families and 6145 persons as per the 1991 census. The tribals inhabiting the Park belong to different communities, known as Jenu Kurubas, Betta Kurubas, Hakki Pikki, Yeravas and Soligas. Jenu Kurubas are the dominant tribe, deriving their name from their specialisation in gathering wild honey (Jenu); they also hunt and gather other forest foods. Betta Kurubas are also hunter gatherers, and specialise in crafting bamboo utensils. Hakki Pikkis specialise in bird trapping. Yeravas and Soligas are also food gatherers and cultivate lands to raise food crops. Soligas also herd goats.

The trends in tribal population within the Park could not be gathered. However, the tribal population in the two districts where the Park is located (Kodagu and Mysore) has shown an increase between 1961 and 1991 and also in the state as a whole. While the proportion of tribal population in the total population remained almost the same in Kodagu district (8.4 per cent in 1961 and 8.3 per cent in 1991), it actually increased in Mysore district (from 1.0 per cent in 1961 to 3.2 per cent in 1991). The literacy rates among the tribals also have increased noticeably, though slower than in the total population. While the literacy rate among tribals was only 25.5 per cent in 1991 in Kodagu district, it was 68.4 per cent in the total population. The difference was much smaller in Mysore district, 31.5 per cent among tribals and 47.3 per cent among total population in 1991. Female literacy also is much lower among tribals, 21.5 and 22.5 per cent in the two districts respectively, as compared with 61.2 and 38.0 per cent respectively in the same districts in total population in 1991.

Agriculture inside the Park has threatened wild life as swamps are drained and converted to fields. About 5000 head of cattle graze inside the Park, mostly in the outer buffer zone, leading to habitat degradation (World Bank 1996: 90).

State efforts at relocating the forest dwellers outside the Park had started from the early 1970s and over 350 families were resettled by early 1990s just outside the Park areas. The rehabilitation work in the past was far from satisfactory, since the Government lacked the resources to do it properly. J.P. Raju, the President of the South Zone Adivasi (Tribals) Forum and the Tribal Farmers' Association said in a Press Note in 1994 that the resettled tribals lived in a rural slum, with nothing except the Government built huts. They used to cultivate

about 2 hectares on average per family in the forest (which was evidently not authorised), and when they shifted they had no other means of livelihood except offering daily wage labour in nearby coffee plantations. They were not paid any compensation for their loss of livelihood in the forests nor given any land even after "rehabilitation" (Cheria 1995: 37).

This experience led to grave misgivings both on the part of tribals living within and on the periphery of the Park, and on the part of NGOs working with them. The Park suffered extensive damage in 1992 due to fire set off by mob fury (Basappanavar 1992). The fire was so extensive that it raised suspicion of organised vandalism. The National Park faced damage due to fire once again in 1996, and to a lesser extent in 1999. The relations between the Government and NGOs reached an all-time low. It was publicly alleged by the Minister of Forests in Karnataka that NGOs had gone to the extent of inciting tribals to set fire to the forests (Rajashekhar 1999: 19).

A part of the misunderstanding was due to a plan to start a 3-star hotel, the Taj Resort, within the National Park at Murakkal, to cater to the needs of eco-tourists. The tribals and NGOs felt that the Government was against tribals as they were poor and powerless, while it was eager to please the lobby of hotel and tourism industry without caring for the damage to forests caused by such eco-tourism. In other words, the very sincerity of the Government about conservation of forests and wild life was challenged. The Government's plans to raise resources from eco-tourism to support conservation efforts may have to be shelved if this resistance to the Tourist Resort continues.

It is pertinent to note here that a lot more tribal population is outside the National Park than within it. Of the 32,000 *adivasis* (tribals) residing in and around the Park, some 25,855 live around but outside the forests. Even among the 6145 *adivasis* living within the Park, a little more than half are on the fringe or periphery, though within Park limits (Hiremath et al. 1997: 4). Most of the *adivasis* outside the Park came out of the forests on their own volition several decades ago, mainly to make a better living than they could within the forests. A recent visit to these areas and discussions with tribals (by colleague Pasha) revealed that they actually lead better lives

than those remaining within the forests, though this could be taken to be as seen from the perspective of an educated person living in a city. They have better houses, better access to earning opportunities, better income, electricity, clean drinking water, school facilities for children, and better access to transportation. Some of these families have obtained land from the Government for cultivation under anti-poverty schemes and also bullocks to plough such land. Some of them have cattle and small ruminants. Their new surroundings also have biomass to meet their requirements of fuel wood and fodder though not perhaps as much as in the forest. What is important, however is that they have much less dependence on forests now than in the past, and they are better for it. Regarding forest deities left behind, they did not seem too much at a loss as a result, as they could set up new altars or occasionally visit their earlier sacred spots.

Even the problem of those living within the Park limits does not seem beyond solution. Only a little over 3000 *adivasis* live deep within the forests and almost an equal number on the fringe. Since those on the fringe already have contact with the outside world and are living more on wage labour outside, persuading them to relocate with the offer of an attractive rehabilitation package would not be difficult. Even if the remaining 3000 or so prefer to stay in the forests, they could be absorbed within the personnel required to guard and monitor the forests either on regular salary or offering similar incentive. To do this successfully, however, the Forest Department may need additional financial help.

Such a financial help is now available to India including Karnataka at least to some extent, in the form of the Eco-Development Project, supported by IDA credit (US$28 million) and also a grant under Global Environment Facility (US$20 million). Karnataka's share in the Eco-Development Project is US$9.04 million. The project is being implemented through the Ministry of Environment and Forests, the Government of India and Forest Departments of 7 States including Karnataka. Though the direct purpose of the project is to help conservation of biodiversity in protected areas by improving their management, it also covers tribal development and village eco-development to minimise or compensate for the adverse impact of conservation efforts on tribals and other villagers. It will enhance the resources available with the Government to properly take care of resettlement and rehabilitation of forest dwellers to the extent

relocation is found necessary. Forced eviction is not permitted in any case, but the Project would make it possible to offer an attractive rehabilitation package by which forest dwellers can be persuaded to relocate and resettle.

The Resettlement and Rehabilitation package developed for the park covers the following: (i) two hectares of cultivable land to each family on the periphery outside the park, along with supply of agricultural implements; (ii) a one bedroom dwelling with attached toilet, on the allotted plot of land; (iii) electricity, drinking water, schooling and other common facilities; (iv) common pastures and fodder plantations; (v) village approach road, cattle pond, and other community development work; (vi) developing the skills of families for self employment, such as tailoring, bee keeping, mushroom cultivation, carpet weaving, masonry and being guides for eco-tourists; (vii) one member of the rehabilitated tribal family would be given a job in the Forest Department as watcher, guard or other post depending on educational qualifications; in addition, other members of such families would be involved in wage employment for forestry work.

As a first step, the Ministry of Environment and Forests, Government of India, have approved the conversion of Reserve Forests outside park limits for this purpose, covering 752 hectares. The process of finishing roads, layouts and house construction is in full swing. Some 50 tribal families have already given their consent to move out. The rest depends upon two interrelated things: (a) the sincerity and efficiency of the Government in implementing the resettlement and rehabilitation package, and (b) the attitude of NGOs, whether one of a stand-off or cooperation in implementing and monitoring the package.

A few NGOs have suggested that the principle of joint forest management, applied in the case of community forests, should be extended to the management of Protected Areas such as National Parks and Wildlife sanctuaries. They argue that this would convert the supposed enemy of conservation into its promoter. The forest dwellers who are seen as a threat to conservation could be agents of conservation, if only they are involved in its management, they argue. The professional wild life experts dismiss this as a romantic idea. They argue that wild life conservation is simply incompatible with

human settlements within parks, with people cultivating areas for raising crops and grazing cattle there. Cultivation and grazing has to be taken completely out of such parks. Collecting forest produce like firewood, fodder, wood required for housing or construction, can be permitted in community forests with some regulations, but even a regulated exploitation would cause problems in wild life sanctuaries. When benefits accruing from forest use for personal benefit are minimised, there cannot be much scope for joint forest management of protected areas. The forest dwellers could however, be employed as forest guards or watchers. Employing them can enable park authorities to benefit from the knowledge of tribals about wildlife and forests, but the latter cannot be given the freedom to exploit the forests as in joint forest management. It will be interesting to see how this debate will be concluded in India because this question has emerged not only in Nagarhole National Park in Karnataka, but also in other parks such as the Rajaji National Park in North India.

III.2 Industrial Pollution and Its Impact: Tanneries in Tamil Nadu[6]

Industries may generate employment and incomes for the poor, and help the country to earn foreign exchange. But this is no sufficient justification for ignoring their adverse impact by way of negative externalities like pollution. Pollution is ultimately a human problem and may make the lives of the poor miserable. If the negative effects are so significant as to offset their positive contribution to the economy, it may not be worthwhile to have such industries at all as it amounts to "destructive development". However, closing down industries may not be the only solution, particularly if it is possible to control and reduce negative effects to keep them within safe levels.

Tanneries in Tamil Nadu provide a good example of an industry which has generated employment even for the poor, helped the country to earn valuable foreign exchange, and yet has generated serious adverse impact, polluting water and land. Tanning of leather dates back to ancient times in India. However, it was in highly scattered individual units, using mainly chemicals derived from trees and herbs. An improvement in tanning technology was achieved through what is known as the East India (EI) tanning process in the

second part of the nineteenth century. This facilitated processing on a large scale, which however did not start till the beginning of the twentieth century. Mechanisation of tanning dispossessed many cottage tanners. For example, nearly 16,000 such tanners lost their jobs in Tamil Nadu (Murthy 1987: 91).

Though EI tanning process, combined with mechanisation, displaced cottage tanners, it did not have other harmful effects like the chrome tanning process introduced in the early 1960s (Murthy 1987: 91). EI tanning was based only on natural materials like vegetable oils, bark and wood extracts. The waste effluent was disposed off to irrigate cultivated lands as manure. Farmers believed that it actually increased the fertility of the soil and increased yield.

Tamil Nadu traditionally has a reputation for producing excellent quality of leather, used mainly for export. The first mechanised tannery was set up in Tamil Nadu in the 1930s in Ambur in Vellore district on the banks of Palar river. Soon the industry spread in the district on the banks of the same river. Sunny climate throughout the year, local availability of tanning materials like myrobelan, bark and wattle, cheap labour and abundant chloride free water of the river helped this expansion, apart from British support. The local farmers welcomed the industry, as the effluents were considered as a good manure (Murthy 1987: 91-92).

Unfortunately, the forest resources used as raw material for tanning were over-exploited without caring for regeneration. The wood barks were no longer available, and it was not economical to import them from the forests of other states due to heavy transport costs. Meanwhile the Central Leather Research Institute at Madras (now, Chennai) came out with a new process using heavy metals like chromium in the 1960s. This was successfully adopted by many units. Tanning, which took as many as 18 days under the EI technology, needed only 24 hours with the new process (Murthy 1987: 93). It took little time to overwhelm the whole industry. Many more industrial units were also started, apart from the earlier units also switching over to the new process.

The effluents of chrome tanning, however, had disastrous effects on farms, when farmers unwittingly continued to use them as manure. The crops died and fields were rendered unproductive. The effluents released in the river also affected the quality of drinking

water, as even the underground aquifers were effected. The water from the drinking water wells around the river became undrinkable, and women had to go great distances to fetch drinking water, from one to even 5 or 6 kilometres. Children were pressed into service to help, discouraging schooling. Water from a public drinking system started in 1965 to supply 4.8 million litres per day, was declared unfit for human consumption (Murthy 1987: 95). No alternative arrangements for drinking water were made. To reduce dumping of effluents into the river, lands were purchased from farmers for the purpose with a promise of jobs in tanneries. More lands became unproductive and became only dumping grounds.

The data provided by Murthy (1987: 93) on the impact is revealing. While the number of tannery workers increased from 4,000 to 9,000 between the 1960s and 1975, the number of farming families dropped from 23,000 to a mere 8,400. This means that the increase in employment provided by tanneries was more than offset by the decline in farm employment. The land rendered unfit for use increased from 240 hectares to 6400 hectares. The number of polluted wells increased from 48 in 1960s to 250 in 1975 and to 10,000 by 1984 covering over 200 villages.

By 1980s, the district was known as the "Dollar district", producing about 80 per cent of the country's leather output. Its exports increased from Rs.30 crores in the 1960s to over Rs.248 crores in 1975. But production of important crops which were the main source of income for the people of the region dropped by over 22 per cent between 1960s and 1975. No farmers were paid any compensation either by the industry or the government (Murthy 1987: 97).

The working conditions of workers were deplorable. The farmers-turned-workers in the tanneries worked with harmful chemicals with bare hands, with no protection. The women workers had to remove hair from the hides by using sodium sulphite. Skin rash was rampant. A test conducted on some 600 tannery workers showed zero sperm count (Murthy 1987: 95-6).

Health conditions in Ambur town were appalling. Skin infections and gastro-enteritis were extremely common. And so were amoebiasis, giardiosis and Milk diarrhoea. Cholera also took its own toll. All this is not surprising because the Biological Oxygen Demand (BOD) level

in the polluted water had reached 20,000 mg per litre in water, while the safe limit for drinking is only 3 mg per litre (Murthy 1987: 97).

In response to this tragedy the Tamil Nadu Pollution Control Board sent notices from time to time to tanneries to stop pollution. The time limits given to them to install effluent treatment plants were extended as many as 15 times because of strong political lobbying. The industry simply complained of non-availability of viable and efficient pollution treatment technology. But the tanners found they had reached limits which began to affect the industry itself. Since the river bed was polluted up to 100 km., they found it difficult to get chloride free unpolluted water anymore for the industry.

The affected people and NGOs did not, however, keep quiet. Some 20,000 people were mobilised in a protest march, with women carrying polluted drinking water in earthen pots and breaking them in front of municipal authorities after offering it to them to drink. Seminars were organised to spread environmental awareness and report on the damage caused by the industry. Pollution monitoring committees were set up by people. At last a public interest litigation petition is reported to have resulted in the closure of polluting tanneries and efforts are made to set up collective plants and revive the industry.

IV. CONCLUSION

India is a country of tremendous complexity and diversity, even in studying the nexus between poverty, environment and development. Its rate of growth of GNP has jumped from below 3 per cent up to 1980s to above 5 per cent during the 1990s. But this jump has not been enough to make a substantial impact on poverty. The incidence of poverty has declined significantly over the last three decades, but still every third Indian is below the poverty line. Direct, target oriented programs alone are not enough to deal with this problem, and stepping up economic development, particularly agricultural development, is considered to be the more effective strategy to eliminate poverty. The direct programs will also have to continue on a larger scale, but they also need more resources which can be generated only through higher growth rates.

These higher growth rates and higher levels of development have to be achieved in a way that does not degrade the environment further. In fact, just as there are pressures to achieve higher levels of development, there are equally strong pressures to reverse environmental degradation, conserve India's rich biodiversity, and see that industrialisation proceeds in a humane and environmentally sound way. India is committed to this requirement and has set up an elaborate institutional machinery to protect environment, backed up by suitable legislation. But this has been a difficult task, given the low levels of per capita income, shortage of financial resources with the government, and pressures to raise resources to promote infrastructure and economic development.

In a country like India, environment is also a source of livelihood to many, particularly the poor. Environmental degradation has tremendous human costs, and hits the poor most and directly too. We have to be particularly cautious about destructive development which reduces total welfare, doing more harm than good. Every development project may have some negative externalities which can be taken care of, if the additional income (net of direct costs) generated by it is large enough to provide for minimisation of adverse effects (for example by pollution prevention or control), and to meet compensation to, or rehabilitation of, the people deprived by the projects. In the case of a destructive development, this is not possible. Every project should undergo a proper appraisal duly taking into account environmental costs so that such projects, which are not worthwhile, are not taken up in the first instance.

Unfortunately, even conservation projects may have an adverse impact on the poor, for example where conservation is in global or national interests, but where the dependence of the poor on forests for livelihood is seen as a hindrance to their conservation and to wildlife. Here too, as in the case of development projects, the adverse effect on the poor has to be minimised and the poor have to be properly compensated and be settled in case they are shifted out of wild-life sanctuaries. The dilemmas and debates involved in this are illustrated by the case of Rajiv Gandhi (Nagarhole) National Park in Karnataka and similar Parks elsewhere.

India, like several other developing countries with low levels of per capita income, has the difficult task of achieving higher

levels of development, without causing, or at least minimising, human and environmental costs of economic growth. The present developed countries ignored these costs with impunity when at comparable levels of income, and could achieve higher levels of development with much greater ease than today's developing countries. The developing countries of today cannot afford such a luxury. Both domestic legislation and international conventions to which they are a signatory do not allow this.

Though the developing countries have contributed much less to environmental costs, they have also to shoulder greater responsibilities in environmental care such as biodiversity conservation, the benefits of which are global. These countries have to do this at significant costs to themselves, in terms of both direct costs and forgone development opportunities. It is the duty of developed countries to help the developing countries to shoulder these responsibilities. Such help as is provided by GEF is a small fraction of the real cost borne by these countries, and a more generous gesture is called for. One cannot any longer have environmental prevention through continuation of poverty and depriving these countries of development opportunities. It is far better for the globe if instead the developing countries are helped in their struggle to achieve higher levels of development in an environmentally sound way.

NOTES

[1] Hearty thanks are due to Dr. Virginia A. Miralao (AASSREC) and Dr. Malama S. Meleisea (UNESCO) for their kind encouragement and support, and to participants for their helpful suggestions at the 13th Biennial Conference of the Association of Asian Social Science Resource Councils (AASSREC) at Seoul, October 1999, where an earlier version of the paper was presented.

[2] The attention given to this has made a wag remark that we (Indians) have shown more seriousness in estimating poverty than in alleviating it!

[3] Comparable figures for later years could not be estimated due to nonavailability of required data at the time of writing.

[4] This account is based on my personal visit to the village and interview with Anna Hazare and his associates, and also on Awasthi (1998).

[5] Thanks are due to the officials of the Karnataka Forest Department for help and to Dr. Syed Ajmal Pasha for enlightening me on ground realities based on his field visits.

[6] This case study relies rather heavily on Murthy (1987), up-dated on the basis of press reports and personal inquiries with persons like Dr. J.S. Amannath familiar with the area.

REFERENCES

Agarwal, Anil, Darryl D'Monte, and Ujwala Samarth. 1987. *The Fight for Survival: Peoples' Action for Environment*. Centre for Science and Environment, New Delhi.

Agarwal, Bina. 1986. *Cold Hearths and Barren Slopes: The Wood Fuel Crisis in the Third World.* Allied, Delhi.

Amarnath, J.S. 1997. "Externalities Analysis and Economic Valuation of Tannery Pollution Hazards In Vellore District," Ph.D. Thesis, Dept. of Agril. Economics, Centre for Agril. & Rural Development Studies, Tamil Nadu Agricultural University, Coimbatore.

Bose, Ashish. 2000. "North South Divide in India's Demographic Scene," *Economic and Political Weekly* 35(20): 1698-1700.

Awasthi, Ramesh. 1994. "Rural Development through People's Mobilization: A Case Study of Ralegaon Siddhi," in Dantwala et al., eds., 1994, pp. 74-91.

Basappanavar, C.H. 1992. "The Tragedy of Nagarhole," *Deccan Herald*, Bangalore, Spectrum Col umn, April 10.

Beukering, Peter van, Madhushree Sekher, Reyer Gerlaugh, and Vijay Kumar. 1994. "Analysing Urban Solid Waste in Developing Countries: A Perspective on Bangalore, India," CREED Working Paper No. 24, International Institute for Environment and Development, London.

Bhat, Radha. 1987. "Women Against Mining: A Struggle for Survival," in Agarwal et al., eds. (1987).

Brandis, Dietrich. 1897. *Indian Forestry*. Oriental University Institute, Woking. CSO. 1997. *Compendium of Environment Statistics – 1997*. Central Statistical Organisation, Government of India, New Delhi.

Cheria, Anitha. 1995. *Why Does Nagarhole Burn? Adivasi, the State and the World Bank*. Edwin, Madras.

Chopra, Kanchan. and Gopal Kadekoli 1999 *Operationalising Sustainable Development.* Sage, New Delhi.

Dandekar, V.M. and N. Rath. 1971. *Poverty in India.* Indian School of Political Economy, Poona

Dantwala, M.L., Harsh Sethi, and Pravin Visaria. 1998. *Social Change Through Voluntary Action*. Sage, New Delhi.

Deshpande, R.S. and Ratna Reddy. 1990. "Social Dynamics and Farmers' Society: A Case Study of Pani Panchayats," *Indian Journal of Agricultural Economics* 45(3): 356-61.

Dev, S. Mahendra., Kirit Parikh, and M.H. Suryanarayana. 1991. *Rural Poverty in India: Incidence, Issues and Policies.* Paper No. 55, IGIDR, Mumbai.

Dev, S. Mahendra and Ajit Ranade. 1997. "Poverty and Public Policy: A Mixed Record," In *India Development Report 1997* ed. By Kirit S. Parikh, Oxford University Press, Delhi, pp. 61-76.

Duraiappah, A. 1996. "Poverty and Environmental Protection: A Literature Review and Analysis," CREED Working Paper Series No. 8, International Institute for Environment and Development (IIED), London.

Forest Survey of India. 1989. *The State of Forest Report 1989.* Ministry of Environment and Forests, Government of India, New Delhi.

Gadgil, Madhav. and Prema Iyer. 1987. "On the Diversification of the Common Property Resource Use by the Indian Society," Paper presented at the Seminar on Common Lands, 23-24 November, at Dharwad, organised by Samaja Parivartana Samudaya and Centre for Ecological Sciences, Indian Institute of Science, Bangalore (unpublished).

Gadgil, Madhav and Ramachandra Guha. 1995. *This Fissured Land – An Ecological History of India.* Oxford University Press, New Delhi.

GOI – Government of India (1999) *Economic Survey 1998,* New Delhi

Guha, Ramachandra. 1989. *The Unquiet Woods: Ecological Change and Peasant Resistance in The Himalaya.* Oxford University Press, New Delhi.

Hardin, Garrett. 1968. "The Tragedy of the Commons," *Science* 62: 1243-48.

Harris, Marvin. 1966. "The Cultural Ecology of India's Sacred Cattle," *Current Anthropology* 7: 51-59.

Hiremath, S.R., ed. 1997. *Forest Lands and Forest Produce As If People Mattered.* National Committee for Protection of Natural Resources and Samaj Parivartan Samudaya, Dharwad.

Hiremath, S.R., P.G. Dandavatimath, and B.J. Krishnan. 1997. *Report of the Study Team on Nagarhole National Park and Tribals*. Janapara Vijnana-Tantrajnana Samsthe, Dharwad, April.

Jodha, N.S. 1998. "Poverty and Environment Resource Degradation – An Alternative Explanation And Possible Solutions," *Economic and Political Weekly*, Sept. 5-12, pp. 2384-90.

Kothari, Ashish., Neema Singh, and Saloni Suri, eds. 1996. *People and Protected Areas*. Towards Participatory Conservation in India, Sage, New Delhi.

Kuik, O.J., M.V. Nadkarni, F.H. Oosterhuis, G.S. Sastry, and A.E. Akkerman. 1997. *Pollution Control in the South and North: A Comparative Assessment of Environment Policy Approaches in India and the Netherlands*. Sage, New Delhi.

Mehta, Shekhar, Sudipto Mundle, and U. Sankar. 1997. *Controlling Pollution: Incentive and Regulations*, Sage, New Delhi.

Murthy, Narayana. 1987. "Murder by Poisoning: Death of the Palar," in Agarwal et al., pp. 89-101.

Nadkarni, M.V. 1990. "Use and Management of Common Lands," in Cecil Saldanha, eds., *Karnataka State of Environment Report IV*, Centre for Taxonomic Studies, St. Joseph's, College, Bangalore.

Nadkarni, M.V. 1997. "Broadbasing Process in India and Dalits," *Economic and Political Weekly*, 32(33 & 34): 2160-70.

Nadkarni, M.V. and Syed Ajmal Pasha. 1991. "Developing Uncultivated Lands: Some Issues from Karnataka Experience," *Indian Journal of Agricultural Economics* 46(4): 543-554.

Nadkarni, M.V. and V. Govindaru. 1995. "Nobody's Child: the Economic and Institutional Aspects of Soil Conservation in India," *Journal of Environment and Development* 4(1).

Nadkarni, M.V., Syed Ajmal Pasha, and L.S. Prabhakar. 1989. *The Political Economy of Forests Use and Management*, Sage, New Delhi.

Parikh, Kirit. 1999. *India Development Report 1999-2000*. IGIDR, Mumbai.

Prakash, Sanjiv. 1997. "Poverty and Environment Linkages in Mountains and Uplands: Reflection On the Poverty Trap," CREED Working Pages Series No. 12, IIED, London.

Rajashekhar, D.V. 1999. "The Tribal Question Hangs Fire," *Deccan Herald*, Bangalore, Spectrum Column, April 23.

Reader, John. 1990. *Man on Earth*: *A Celebration of Mankind*. Harper Row, New York.

Repetto, Robert. 1994. *The 'Second India' Revisited: Population, Poverty and Environmental Stress Over Two Decades*. World Resources Institute, Washington DC.

Rosencranz, A., Shyam Divan, and Martha L. Noble. 1991. *Environmental Law and Policy in India: Cases, Materials and Studies*. Tripathi, Bombay.

SPWD-Society for Promotion of Wasteland Development. 1992. *Joint Forest Management Regulations Update*, New Delhi.

Sarin, Madhu. 1987. "Women, Environment and Peoples' Subsistance," in Agarwal et al., eds., pp. 65-76.

Saxena, N.C. 1994. *India's Eucalyptus Craze – The God that Failed*. Sage, New Delhi.

Sen, Amartya. 1981. *Poverty and Famines*: *An Essay on Entitlement and Deprivation*. Clarendon, Oxford.

Singh, Katar and Vishwa Ballabh, eds. 1996. *Co-operative Management of Natural Resources*. Sage, New Delhi.

Tendulkar, S.D. 1998. "Indian Economic Policy Reforms and Poverty: An Assessment," in I.J. Ahluwalia and I.M.D. Little, eds., *India's Economic Reforms and Development*. Oxford Univ. Press, New Delhi.

Tendulkar, S.D. and L.R. Jain. 1996. "Growth, Distributional Change and Reduction in Rural Poverty Between 1983 and 1987-88; A Decomposition Exercise for Seventeen States in India," *Indian Journal of Agricultural Economic* 51(1 and 2): 109-133.

UNDP. 1999. *Human Development Report*. OUP, New York.

Venkateswaran, Sandhya. 1994. "A Childhood in Waste, Waste Picker Children," *Social Action* 44(3): 46-58.

Wade, Robert. 1998. *Village Republics: Economic Conditions for Collective Action in South India*. Cambridge University Press, Cambridge.

World Bank. 1996. *Staff Appraisal Report – India – Eco-development Project*. Report No. 14914, South Asia Department II, Agriculture and Water Division, World Bank, Delhi.

World Bank. 1999. *World Development Report 1998-99*. Published for World Bank by Oxford University, New York.

World Bank. 2000a. World Development Report 1999-2000.

World Bank. 2000b. *India – Policies to Reduce Poverty and Accelerate Sustainable Development*. January 31, Report No. 19471-IN.

Chapter 3

ENVIRONMENT AND POVERTY IN CHINA: THE CURRENT SITUATION AND TRENDS

ZHENG YUXIN, WANG SONGPEI, QIAN YIHONG AND YAN LIN[1]
Center for Environment and Development Studies
Chinese Academy of Social Sciences, Beijing

I. PREFACE

Dramatic changes have taken place in China's rural areas since the open and reform policy was carried out twenty years ago. One distinct feature of the change is the alleviation of poverty. During the short interval of six years from 1978 to 1984, the number of the poor in China decreased from 250 million to 125 million, and the incidence of poverty dropped form 30.7 per cent to 14.8 per cent. This rapid change in China's poverty was called as "the great campaign of poverty alleviation in the world" (UNDP 1998). By 1998, the number of the poor in China had decreased to 42 millions, the incidence of poverty cut down to 4.6 per cent. The per capita net income in the counties which were identified as poor, had increased from 206 yuan RMB in 1985 to 1318 yuan RMB in 1998. In all, the poverty population decreased by a big margin.

The main reason behind this success is that farmer's income significantly accelerated since 1978 during the period of economic reform. Farmers benefited directly from rapid development of the economy. With the deepening of reform of the economic system and enhancing of the market economy, the income gap between the

Chinese farmers and urban residents was bridged constantly: The incomes as well as the quality of life improved owing to the development of rural industry and other non-agricultural sectors. On the other hand, with the uneven development of rural enterprises among the different regions, the gaps in developmental levels widened. Some areas with fragile ecosystem, abominable geographical conditions and lack of natural resources face severe difficulties in their economic development process. The income of urban residents kept an upward tendency continuously even as the incomes of farmers rose rapidly. But with the process of the reform, unemployment is increasing.

The environment problems in China arose not only because of the industrialisation and urbanisation, but also due to ecological deterioration resulting from poverty. Such environmental deterioration problems became very complicated and hard to deal with because of the multiplicity of the sources of environmental pressures. China has been facing problems of both kinds – problems caused by deforestation and soil erosion, and problems of industrial pollution and urbanisation. These environment problems not only exit at the same time but also affect each other, so that China bears a heavy environmental cost. The Chinese society and economy did not take the necessary countermeasures earlier to meet environment problems, because of the compulsion of continuous and rapid economic development, industrialisation and urbanisation. China is still short of enough financial capability to support the environmental cause. The public consciousness of environment and the idea of environmental rights are still at a preliminary stage.

In the past two decades, the sustained and rapid development of China's economy was realised under relatively stable conditions of environment. This is because of the dual existence of part improvement and part deterioration of the environment. But the environment situation is still grave, although a vicious cycle "poverty and environment" is brought under control initially. The Chinese government is striving to improve both the environment and the success of poverty alleviation. The plan of poverty reduction clearly states that the objective is to satisfy basic food and clothing needs of the 80 million persons estimated to be living in poverty in 1994 within the last seven years of this century until the year 2000. In 1995, Chinese government announced the target of environment

protection and a long term target for 2010 in the Ninth Five Year Plan, to keep the total quantity of pollutants discharge unchanged basically, and simultaneously to obtain a rapid economic growth. It can be predicted that these targets in the programs of national economic and social development will be realised.

II. THE POVERTY SITUATION AND POVERTY ALLEVIATION EFFORTS IN CHINA

II.1 The Quantity and Distribution of the Rural Poor in China

Comparing the net income per farmer with his basic needs of life, and identifying the basic standard of nutrition and the other basic level of necessities, China adopted the criterion of absolute poverty in rural areas. The poverty line defined by the National Bureau of Statistics

Table 1. Rural Population Living in Poverty, 1978-1998 (millions)

Year	World Bank Estimates			National Bureau of Statistics Estimates	
	Population living in poverty	Percentage of rural population living in poverty	Poverty line (Yuan)	Population living in poverty	Percentage of rural living in poverty
1978	260	33	100	250	30.7
1980	218	27			
1981	194	24			
1983	123	15			
1985	96	12	206	125	14.8
1988	86	10	236		
1990	97	12	268	85	10.8
1992					
1993		8	400	80	8.9
1994		7	530	70	7.8
1996	70	7		58	6.3
1998				42	4.6

Source: UNDP, *Human Development Report 1998*;
Action for Combating Poverty by Chinese Government 1996.

in 1986 was 204 yuan, the standard was raised to 580 yuan in 1996. The figures of rural poor and their percentage to total rural population are presented in Table 1 here, both as per World Bank estimate and the estimates by the Chinese Government.

The counties where the level of per capita income of rural residents is below the poverty line are designated as poor counties. The project of poverty alleviation under the Chinese government is carried out according to the distribution of the poor counties, a basic organisation structure.

The distribution of the rural poor according to the counties is given in Table 2. From 1986 to 1994 the number and proportion of poverty counties and poverty dramatically decreased in the east area, compared with the middle-west area, especially the west area.[2]

Table 2. The Distribution of Poor Counties and Poverty Population among the East, Middle and West Regions (1994)

Indicator	East Region	Middle Region	West Region	China
Number of poor counties	105	180	307	592
Distribution of poor counties, %	17.7	30.4	51.9	100.0
Number of poor people, thousands	13 846	20 301	35 907	70 054
Distribution of poor people, %	19.8	29.0	51.3	100.0

An important feature of rural poverty in China is that it is concentrated in fragile ecosystems, as in mountainous counties. According to a 1998 report of the National Bureau of Statistics, the mountainous region had as many as 20.5 per cent poor counties, while hilly regions had only 6.8 per cent and the plains had only 4.4 per cent. The same characteristic is seen from the percentage of population below the poverty line, which is 23.2 per cent in the mountainous region, and only 4.4 per cent in the hilly and 3.0 per cent in the plains. The fragile ecosystem of mountainous regions has disadvantages in terms of location and climate and faces environmental problems like poor soils and soil erosion.

II.2 Poverty Alleviation in Rural Areas and Factors Behind its Success

China has made great achievements in respect of poverty alleviation since the reform and opening up of the economy. There is no question about all this success being attributed to the rapid development of the economy. A total of 200 million people emerged above poverty, which was the result of the overall economic development, especially the outcome of rural growth (see Table 3). However, all poverty cannot be eradicated by growth alone. Removing the remaining poverty relies on the enforcement of policy of poverty alleviation and institutional arrangement.

Table 3. The Change of Yearly Net Income of Farmers and Value of Agricultural Output (1956-1997)

	1956	1965	1978	1985	1995	1997
Farmer's net income per capita (yuan)	72.92	99.09	133.57	397.60	1 577.74	2 090.13
Total value of Agricultural output (billion yuan)	61	58.4	139.7	361.9	2 034.1	2 458.7

Source: The Almanac of China's Statistics 1991-1997.

The main causes for the rapid development of rural economy in China can be said to be the following:

(a) The economic reform oriented to the market economy across the country: The market economy mechanism gave a huge impetus to China's economy, which was under the control of the planned economy system. It is a basic prerequisite for the rapid economic development in rural areas.

(b) The effectiveness of the family planning policy: Since 1980's China has been carrying out the one child policy in urban areas and two children policy in rural areas. Thus the rate of population increase was brought under control, which played an active role in stopping the vicious cycle of "poverty and environment." The natural increase rate of population was cut

down to around 1.10-1.44 per cent, below the average rate of the world. This meant a reduction in pollutant discharges and energy consumption. China takes the policy of birth control policy and environment protection as fundamental policies. The increase in population cannot be reversed in a short time; it is estimated that the population in China will amount to 1.3 billion in 2000, 1.4 billion in 2010 and 1.6 billion in 2050. The problem of huge population has been and will be the most severe difficulty in China's development, especially in the development of poverty regions.

(c) The reform of land system in rural areas: China initially started the system of the People's Communes in rural areas, and implemented a system of contracted household responsibility related to output. At the end of 1970s, the rural reforms starting from the system mentioned above began to break the deadlock of the old system of rural economy, and the right to use land was returned to farmers. The household responsibility system (HRS) had significant impact on grain production, which made farmers producers and managers on the basis of self-responsibility for their own profit and loss. The farmers turned to be independent producers and obtained the right to participate in the development of economy and to enjoy the gains of development. Starting from 1979, the state adjusted the distribution polices related to farmers: (1) The state adopted the policies of tax reduction and tax exemption for agriculture totalling 4 billion yuan from 1979 to 1988. (2) In 1979, the state raised the prices of 18 kinds of main agricultural products by 21 per cent, which were later adjusted many times. Both the reform of system and the adjustment of the prices speeded up agricultural development. The rate of domestic agricultural production increased by 6.69 per cent per year during the period from 1977 to 1979 and 1983 to 1985; but during the thirteen years before it, the annual increment rate was only 2.22 per cent. From 1978 to 1984, the net income of rural person per capita increased by 15.1 per cent.

(d) The development of rural enterprises and non-agricultural industries: Under the system of contracted household responsibility, the productivity of agriculture increased sharply. The concealed surplus labour in the shadow of system of "the big pot" was exposed, and the surplus labour

could be transferred to non-agricultural sectors; on the other hand, the individual farmers and agricultural collectives had idle funds to develop rural enterprises. Besides, with the stimulating role of urban industries, favourable policies regulated by the State and especially the incentive of the market economy, the development of rural enterprises was speeded up greatly. The rural enterprise played an important and active role in absorbing surplus labours, promoting a process of decentralised industrialisation and urbanisation.

(e) Shifting of rural population: The migration to cities is a fundamental way to solve the problem of the surplus labour, improve the level of farmer income and alleviate poverty. This slowed down the widening gap between the rural and urban sectors, and at the same time, provided the chances for the people in poverty areas to eradicate poverty and to improve the quality of life of poor families.

But success in combating the poverty relied not only on the rapid development of China's economy in the past two decades, but also on the related policies to directly combat poverty. In September of 1984, an announcement on the Alleviation of Poverty Areas was proclaimed by the Chinese government. The Fourth Session of the People's Congress resolved to set the poverty alleviation in the early revolutionary army's basis areas, ethnic areas, and poverty areas as an important part of the Eighth Five-Year Plan, and of national economic development. Since then China formerly started the work of poverty alleviation on a large scale. The World Bank observed that "the Chinese government has taken great pains to carry out the program of poverty alleviation in the most disadvantaged rural areas in the country. The efforts in China were much more a success than in the most developing countries." During the thirteen years from 1986 to 1998, China had constructed 88 million mu farmlands, solved problems of drinking water related with 62 million peoples and 75 million livestock, and constructed roads of 350,000 km., (the proportion of counties opened to auto-traffic increased from 84 to 99 per cent), and erected the circuits of 400,000 km. (the proportion of counties that set up the circuits went up from 77.8 per cent to 97 per cent). The conditions of production and daily-life improved greatly, and the cause of science, education, culture, health and social affairs was promoted at a high

speed with the transition from planned to market economy. The strategy of poverty alleviation had to be transformed from the pure economic aids to measures of overall rectification as well as the exploration. Infrastructure constructions and program of economic development further strengthened the mechanism of self-investment in the poverty areas.

The National 8-7 Poverty Reduction Plan designed in 1993 and worked out in 1994, is a guiding document for poverty alleviation until 2000. The document proposed that from 1994 to 2000, the country concentrate on satisfying 80 million persons' food and clothing needs in the poverty areas throughout the country. To fulfil the tasks, the governments at all levels increased investments on the program greatly and implemented a set of favourable policies to promote economic and social development in poverty areas.

China's allocation for poverty alleviation comes from governmental budgets and the national treasury system, the loans with the newly established Agricultural Development Bank and funds for expanding employment opportunities in place of granting relief. Table 4 shows a big increase in China's allocation for poverty alleviation:

Table 4. The Allocation for Poverty Alleviation (million yuan RMB)

Year	1985	1989	1990	1995	1996	1997
Amount	3 200	4 000	4 600	9 800	10 800	15 000

The Chinese government convened a high level meeting on poverty alleviation in June, 1999. The conference proposed that "we should strive to satisfy the needs of the 10 million people in rural poverty areas within this year and the next year." The government set a historical target of completing the overall task of poverty reduction at the end of the twentieth century, which showed the confidence of the Chinese Government.

At the Apex of the organisational arrangement for implementing poverty eradication program, the Central Committee of Chinese Communist Party and State Council had set up a Leading Group under the State Council. Similar organisations were established at

all provincial levels including autonomous regions and counties, so that a complete operation system emerged. The Leading Group changed its name into "The State Council Leading Group for Poverty Reduction" (LGPR), which is in charge of *The National 8-7 Poverty Reduction* plan.

Apart from the above measures, the government implemented preferential policies in respect of infrastructure and protection of natural resources for poverty areas. In the central government budgets for infrastructure arranged by the State Committee of Economy Planning, two-thirds of the budget was allocated to the middle and west areas. The investments were increased greatly in recent years. The Committee made significant efforts to combine agricultural projects with poverty alleviation and satisfying poor people's food and clothing needs. Huge investments were made for drinking water and water conservation. Besides, projects were taken up related with expanding employment opportunities in place of relief, ecological protection projects, and preventing soil erosion. The new preferential policies included preferential loans policy and preferential financial and tax policy for regional economic growth. Expanding foreign trade in poverty areas is another useful measure.

The National Committee on Science and Technology of China (currently renamed the Ministry of Sciences and Technology) regulated "Sparking Plan" which aimed at the target of poverty alleviation by way of the progress of science and technology, and carried out the "Project of Warm". The government also started the vacation education retraining courses aimed at the rural area throughout the country, and some training courses during the winter to ensure that every poor household got one or two kinds of skills. From 1995 to 1998, about 15 million persons were trained each year. At the same time, the National Agricultural Departments and social scientists across the country were active to popularise the agricultural technologies to improve the farmer's skills. They introduced the advanced technology to the rural areas, improving the utilisation of natural resources and their productivity.

The governments at various levels mobilise the whole society to promote the progress of the poverty alleviation plan, and ask every involved department of the government to link up with relevant poverty areas. Every administrative unit of the government at

various levels is asked to join the fight against poverty through a variety of mentoring or partnership schemes, e.g. eastern provinces working with designated inland sister provinces, and the departments of provinces, prefectures and county governments. They should help the poverty villages to set up new projects, particularly the industry projects. Until 1995, the total amounts of the direct and collocate investments for the poverty areas had reached 5 billion yuan. The Departments, organisations and the society trained 11 million farmers. Every year, lots of volunteers, including teachers, doctors and technicians, went down to the grass-roots units in poverty areas to carry on the course of training and to do the work of popularising agricultural skills.

The Central Government mobilised 6 provinces on the coastal areas and 3 municipalities, 4 cities with independent budgets to link up with 10 provinces and autonomous regions in the west areas as the units geared to poverty alleviation. The relation of mutual benefit between the east and west areas was set up to promote the mutual development and narrowing the gap between them. The central government asked the industrialised counties and cities to link up with counterpart counties (sister counties) in poverty areas in the western provinces in order to make full use of the advantages of the enterprises in advanced counties in human resources, skill, information, market-oriented management and investments, and to help the poverty areas to set up projects related with farming, fishing and manufacturing.

One of the policies of poverty alleviation in China is mobilising all the forces in society to help the poor people. The most notable projects related to this are the "Glorious Project," "Hope Project" and "Happy Project." Some 2,296 entrepreneurs of non state-owned enterprises or private enterprises joined the "Glorious Projects." "Hope Project" helped 1,800 thousand children who were deprived of the opportunity of education to go to school, by setting up 5600 "Hope Schools."

Poverty alleviation programs successfully made use of financial aid from international organisations. The amounts of the loans from international organisations and foreign governments reached 2 billion USD. There are some projects carried out currently, such as the Project of Poverty Alleviation in the Southwest of China, Project

of Poverty Alleviation in the Qinba Mountain areas. The two projects respectively received the loans of 247 million USD and 200 million USD from the World Bank. Financial aid or loans with favourable conditions were also received from the Grain Organisation of UN and International Fund for Agriculture Development.

In 1999, the State Council of China proclaimed *The National Environment Protection Planning*, which is the guiding document for the projects of protection of the ecosystem and environment in the twenty-first century. The Plan regulates the projects till the middle of the twenty first century with three kinds of plans in the short, middle and long terms. The target of the short-term plan is that soil erosion caused by the human action should be brought under strict control from now to 2010, and the amounts of farmlands should be increased to 600,000 sq. km. The amount of land harnessed from controlling the desertification should reach at 22 million hectares; the amounts of forest land returned from the cultivate lands should reach to 5 million hectares. The target of the middle-term plan is that the environment of ecosystem across the country should be improved dramatically in twenty years from 2011 to 2030. The amount reclaimed desert land should be increased to 40 million hectares, the amounts of new forest lands reached to 46 million hectares, with which the percentage of forest cover would reach 24 per cent of the total area of the country. The target of the long-term plan is to have eco-friendly systems throughout the country geared to the need of the sustainable development to be established from 2031 to 2050. It is believed that *The National Environment Protection Planning*, will be the guiding document in the work of protecting the ecosystems and environment.

China has a long history of controlling soil erosion. It has reclaimed the soil-eroded areas to the extent of 580,000 sq. km. since 1950 up to now. The well-known Project of Harnessing Small Drainage Area on the Loess Plateau eradicated absolute poverty significantly. The goal of poverty alleviation is approached by way of carrying out projects of ecological agriculture, improving the soils and increasing agricultural yield. China strives to combine environmental projects with improving the living conditions of people.

The major part of agricultural investment went to the projects of comprehensive harness. The projects include the following:

(a) Improving the lower-middle yield cultivated lands: Since the 1990s, China has been improving the lower-middle yield lands on 8 million hectares. Especially the project of improving the low yield lands in the plains of the Yellow River and the plains of the Hai River helped around 30 million rural population to eradicate poverty.

(b) Water and soil conservation: China has constructed terraced fields and turned desert into new farmlands on 11 million hectares during the past 50 years. The lower yield land among the semi-dry areas were turned into stable yield farm land. The level of precautions taken against calamities in agriculture held back the tendency of poverty caused by them. China has made great achievements in controlling soil erosion. It has reclaimed 4,500 thousand hectares of eroded lands in the drainage of the Plain of the Yellow River, 5,600 thousand hectares in the drainage of Changjiang River, 3 million hectares in drainage of the Plain of Songliao River, 2 million hectares in the Plain of Haihe River, 1,400 thousand hectares in the plain of Huai He River, and 1,100 thousand hectares in the plain of Pear River. All these huge projects were completed by way of investment of manpower by farmers and special funds from the State. The target of poverty alleviation was realised through the improvement of ecology and agro-environment, and enhancement of the capability for economic growth.

(c) Irrigation and water conservancy: China suffers from flood disasters frequently. The scale of the water conservancy in China is large. The Chinese government invested 5 billion yuan in the construction of irrigation and water conservancy, the manpower involved being 1.7-2.0 billion each year in the past. After the construction and enhancement of the projects in successive years, China's farmland has expanded on a rather big scale and the conditions have improved vastly.

(d) Controlling Desertification: China is one of the countries which suffers seriously from desertification. Three thousand and three hundred twenty (3,320) thousand sq. km. of land, equivalent to 34 per cent of the land in the country, are

affected by desertification. Around 400 million people live in the border areas of the desert or the semi-desert areas. Ten per cent of the land invaded by desert was reclaimed and a total 22.25 million mu of affected lands were turned into farmland. China plans to reclaim 20 per cent of the total amount of land affected by desertification, and to cut down the scale of desertification to 1,000 sq. km. per year. The major way to alleviate poverty in the areas is to bring desertification under control. At the same time, China has improved the environment of the human life and capability of controlling natural disasters through the above efforts.

(e) Integrated measures for agriculture growth: China has striven to tackle the problems in the large areas such as the Huanghuai plain, Songnen plain, Lioahe delta plain, Taihu plain, Jianghan plain and Chengdu plain in a comprehensive way for several decades. The project of comprehensive governance of Jianghu region in Jiangxi province has attracted great attention and support from international organizations. The Chinese government and international organisations invested several hundred million yuan in the project of comprehensive governance and reclamation of 160,000 sq. km. to help 2 million farmers alleviate poverty, with environmental pollution and deterioration under effective control.

(f) China faces grave difficulty in alleviating poverty where rural life conditions and natural resources are very fragile and the quality of life of the population is not good. It is difficult for them to do trade in the market and face competition; they also lack comparative advantage in natural resources; at same time they have little chance to obtain income from non-agricultural sectors. The majority of the poor were liberated from the state of poverty relying on the overall economic growth. But non-market measures should be used in the process of poverty alleviation, and this is becoming a decisive factor in eradicating the remaining poverty.

To realise the target of reducing the 20 million poverty population remaining, the Chinese government distributed special funds to develop and improve the condition of education and health in poverty areas. The special funds for education support constructing the primary and middle schools. The State Commission of Economy

Planning carries out the project of poverty alleviation with special funds of 200 million yuan. The project of sanitation infrastructure in rural areas has been completed with the investment of 14 billion yuan during 1990. The government will distribute the funds continuously for the development in the old revolutionary basic areas, non-Han ethnic areas and other border areas.

II.3 Urban Poverty Problems

In 1970s, the reforms oriented to the commercial market and rapid economic growth not only brought a rise in the living standard of urban and rural residents but also expanded the income gap among urban residents. The average living standard of urban residents in China was still much higher than that of the rural residents. In 1980's, there was a very limited number of urban residents who fell below poverty line and only 40,000 people were qualified for relief in 1993 (Tangjun 1998).

With the deepening of reform in economic system and further adjustment of industrial structure since the 1990s, the State-owned enterprises (SOEs) were allowed to merge, announce bankruptcy or have restructuring. In addition, the redundant workers and staffs were allowed to "go-off and given new jobs as labour diversion", and the policy of "reduce redundant labourers and improve efficiency" was introduced. As a result, the problem of the hidden unemployment gradually came out. In the late 1990s, the number of laid-offs (unemployment) gradually increased. The poverty groups consisted mainly of the jobless, laid-offs and retired workers. The situation of urban poverty can be seen from Table 5.

A joint investigation in 1998 (Wang Chengen 1999) showed that the poor households in Shanghai of China did not fall into such poverty of "being in rags and hungry," but their average income was only 71 per cent of that of the lowest 10 per cent income group (average income of 340 yuan) in urban areas. In Shanghai, the area at the high price level, their income could only support their simple daily meals. In addition, they could not enjoy their normal life as a society member, showing "a social shortage" in spirit and culture and "a material shortage" in basic living conditions. The result of this

investigation has a representative significance in respect of the poor people in urban areas of China.

Table 5. The Chinese Urban Population Living in Poverty

Year	Poverty line (Yuan)	Number of population in poverty (millions)	Percentage of population in poverty
1991	752	14.15	5.8
1992	837	11.65	4.5
1993	993	13.20	5.1
1994	1 300	15.26	5.7
1995	1 547	12.42	4.4
1996	1 671	17.16	4.2
1997	1 700	11.68	4.1

There are many elements that affect the changes in income distribution, but the main elements are the results of the changes in social welfare system and economic development. The distribution of the poor population has also regional characteristics. Most urban poor residents are living in Central and Western areas, especially in the less developed cities (Li Ruojian 1998). The rate of poverty in urban areas is quite different between different provinces.

The poor households located in urban areas in 1996 accounted for 85 per cent of the total households; among them, 56 per cent lived in the Central area and 29 per cent lived in Western area. The poor workers were all from heavily indebted enterprises, closed factory or enterprises, less productive enterprises, the areas where large-scale SOEs were located, old industrial base of three provinces in the Northeastern areas, in textile industry, light industry, forest industry, coal industry and military industry. The increase of poor population was the result of the adjustment in industrial structure and the reforms on the SOEs system. The laid off workers from SOEs (7.1 million) accounted for 66.8 per cent of the total laid-off from all enterprises (10.7 million) in 1998.

The elasticity of employment in China shows a downward tendency; new employment opportunities in the labour market are becoming less. The total labour supply in 1998 was 28.6 million and the opportunity of employment was 13.73 million. The new

opportunities in 1999 are lower than that in 1998, and the number of workers in poor living condition and laid-off workers will increase in the future years as a tendency. The poverty issue in urban areas of China is an inevitable phenomenon during the economic institutional reforms. This transition of system and institutional changes may make a great contribution to the growth of economy and improvement in productivity, but, they also bring with them an adverse effect on many people. The reform in China is aimed at limiting such effects gradually. In the meanwhile, the Chinese Government has speeded up reform on social security system.

In May 1998, the Chinese government announced a strategy of providing basic living security to laid-off workers and a re-employment program. The Ministry of Labor and Social Security will give it top priority, and also to give a pension to people. The target is for setting up a social security system and employment mechanism within about 5 years. By the end of 1998, a lowest living security system was established in 600 cities and 1,242 counties of China. With the establishment and completion of the social security system, especially the three systems including (1) the social security system for laid-off workers, (2) the insurance system of unemployment and (3) the lowest living protection system will efficiently reduce the pressure of poverty on the urban areas of China.

III.4 Relative Poverty[3]

It is a major target of the Chinese government to improve the basic living condition of absolute poverty population and reduce the number of people in poverty. As pointed out by President Jiang Zemin, "Up to the end of this century, most of the poverty people in rural area can live in a comfortable condition, but that is under a very low standard and unstable. The backward production condition will not be altered totally in many places. Once meeting natural disaster, part of them could resuffer poverty again." Even though the poverty people in urban area are not in the state of poverty threatening their survival, their income level constrains their physical and mental demand. With the introduction of the market mechanism, the income gap between income groups and regions is becoming larger and larger in China. In the interest of speedy economic development, it is right to accept the principle of "giving priority to efficiency and giving consideration to equality simultaneously." So,

with the reduction of absolute poverty not being changed in short run, the trend in increasing relative poverty is getting serious.

In Table 6 we see that the ratio of the average income of the highest 10 per cent of households to that of the lowest 10 per cent is increasing.

Table 6. Average Annual Income per Capita in City Area for Different Income Groups (Yuan)

Year	Number of households surveyed	National average	Lowest income (first 10%)	Highest income house-holds (last 10%)	Ratio of highest 10% to lowest 10%
1985	17 143	821	483	1 384	2.87
1990	35 660	1 523	860	2 676	3.11
1991	36 730	1 713	1 007	2 956	2.94
1992	36 290	2 032	1 127	3 663	3.25
1993	35 390	2 583	1 360	4 906	3.61
1994	34 940	3 502	1 735	6 838	3.94
1995	35 520	4 288	2 178	8 231	3.78
1996	36 730	4 845	2 454	9 250	3.77
1997	37 890	5 189	2 456	10 297	4.19
1998	39 080	5 458	2 505	11 021	4.40

Source: China Statistics Year Book (1986 to 1999).

In Table 7, we can see that the income gap between city and rural area increased at first and then decreased, reflecting the process of reform and development in China. Nonetheless, the difference between city and rural area is still quite large up to now.

The income difference between regions among rural areas, is also getting larger in rural area with the overall growth in income levels. In order to show the trend clearly, we select five typical provinces and draw their annual income per capita in Fig.1. The annual income per capita in Hebei province was lowest in 1978, in Guangdong and Zhejiang were highest and in Yunnan and Guizhu were lowest in 1998. Some studies show that the gap in development

of Township and Village Industry between regions is the major factor affecting farmers' income.

Table 7. Per Capita Annual Income of Rural Households and City Households (Yuan)

	1985	1990	1995	1996	1997	1998
(1) Rural households	397.60	686.31	1 220.98	1 577.74	2 090.13	2 161.98
(2) City households	821.4	1 522.79	4 288.09	4 844.78	5 188.54	5 458.34
(2) ÷(1)	2.07	2.22	3.51	3.07	2.48	2.52

Source: China Statistics Year Book (1986 to 1999).

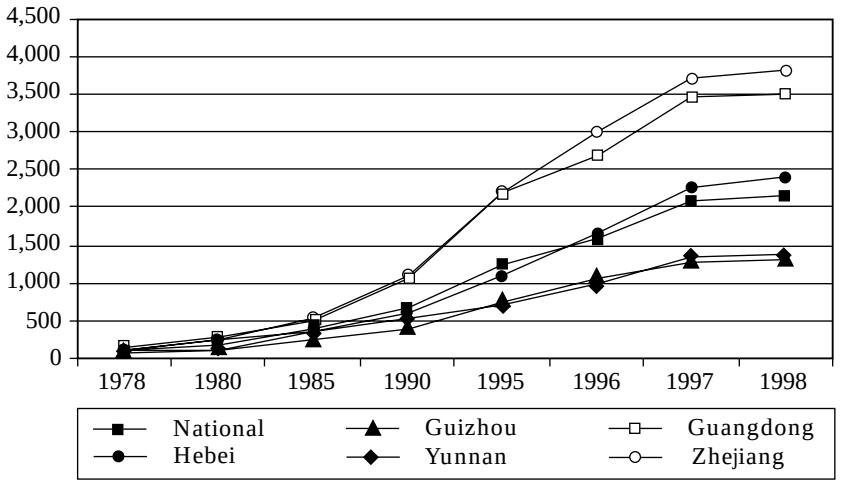


Figure 1. Per Capita Annual Net Income of Rural Households in Typical Regions (Yuan)

After realisation of the target of eliminating absolute poverty by the end of this century, relative poverty will still exist for a long time in both city and rural areas. Their living standard is much lower than average. Disaster, disease, and any accident will make them fall into a miserable condition. At present there is no unified standard to gather statistics on relative poverty in China. However, the solution of relative poverty will finally depend on economic growth and distribution policy. The Chinese government has made, and is making,

a series of relevant decisions and policies, such as, to speed up the development of western China, to improve social security and to adjust the taxation system, so as to effectively alleviate the poverty problem which has persisted for centuries.

II.5 Conclusion

There are many studies of the poverty issue in China. The results show: (1) Poverty occurs mainly in the rural areas; the poor rural population is larger than that in urban area (Li Shi et al.). (2) There is another part of population which is not so poor but which still remains vulnerable. Any natural or man-made disaster may make them suffer from poverty again. For example, it is estimated that 5-15 per cent of flood victims, about 10-30 million people, resuffered poverty during terrible floods of 1998 (Tang Jun 1999). (3) Although the large gap between the central, western regions and the eastern regions attracts the attention of the Government, the gap will remain for a long time because of the limitation of the developmental condition and natural resource conditions. (4) The geographical distribution of the rural poverty area in China has an obvious regional characteristic. The poor population and poor counties have a close relation to the weak ecological-belt between the South and North (Li Zhou and Su Ruomei). (5) There is a poor class in urban areas, and the high growth in unemployment will continue in the immediate future. The gap between opportunity of employment and labour supply has become larger. The situation of the fight against poverty in urban areas cannot be viewed very optimistically. (6) The education capacity and condition are different between poor and non-poor in rural and urban areas. This issue is not obvious now because the education influence on income is not felt much yet. But with the development of economy, there will be more opportunities for urban educated people. Education will have an effect on income. (7) The size of a family has an impact on the extent of poverty, justifying the birth control policy practiced in China.

III. CHINA'S ENVIRONMENTAL CONDITIONS AND TRENDS

III.1 The Situation and Trends in Industrial and Urban Pollution

China has been on a road of rapid growth during the 20 years following the economic reform. The sustained growth has helped in shaking off poverty in China but has also raised new issues regarding the environment. Current environmental issues are also the result of earlier conditions in China. In the 1980s, when China entered a primary stage of industrialisation, the environment had to be exploited as done by the developed countries in the past. China faced a weak eco-system resulting from national poverty. The industrial-structural characteristics at this stage of industrialisation caused severe pollution in industry, and the main factor behind this was that coal was the main source of energy in China. However, the Chinese industrial and energy structure cannot be changed overnight. Although the Chinese government took environmental protection measures and sustainable development as a basic state policy in the 1990s, expanded investment in environmental protection, and strengthened supervision, the current environmental situation cannot be expected to be bright. According to the National Bureau of Environment Protection, China's environmental situation is as the follows.

Fig. 2 shows the trends of historical emission of pollutants, in which we can see that the emission of main pollutants (except for solid waste) is basically keeping stable and is not going up with economic growth. According to statistics, the air pollution, and particularly the TSP pollution in the cities of China, is falling in general, but the data in 1997 showed that the average TSP was 291 ug/m^3. Sixty seven (67) cities were above second grade (200 ug/m^3) amounting to 72 per cent. The annual average value was 200 ug/m^3 in the cities of Northern China and 200 ug/m^3 in Southern China cities. The pollution of car exhaust is getting more and more heavy with city growth. The pollution of nitrogen oxide was heavy in Guangzhou, Beijing, Shanghai, and the annual average value was above 100 um/m^3. The areas of acid rain distribution are expanding, the annual average pH value of the precipitation in 1997 fell; in the range between 3.74-7.79, there are 44 cities under the pH 5.6 acidity intensity; frequency of acid rain is becoming high.

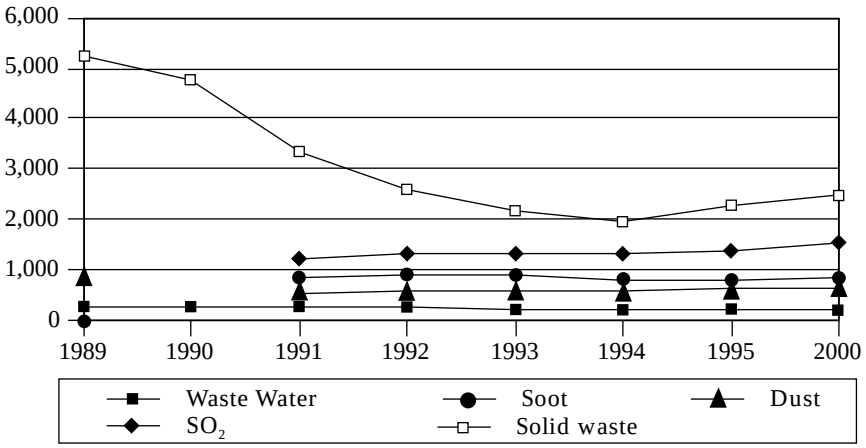


Figure 2. Historical emission of pollutants

Seven drainage areas, lakes and reservoirs, and parts of subterranean rivers and coastal areas, suffered pollution. The northern dry areas and many cities are short of water. Both water shortage and pollution of water have become constraining factors for the economy and society. The water quality of the rivers in cities is continuing to worsen.

The discharge of industrial solid wastes is declining gradually every year, but the areas occupied by wastes are expanding annually. The discharge of both rubbish and occupied areas in cities is increasing. The environment is getting worse in urban areas. The main factors are changes in consumption habits and growth of urban population. Discharge of waste water from cities is increasing. In 1997, the discharged volume of organic waste water formed 45.4 per cent of the total waste water. The discharge of cooking smoke and SO_2 was 20 per cent of the total smoke discharge. The share of discharge of wastes by urban population is much higher than that of the other economic sectors in the Chinese industry. In 1996, the government put more efforts to supervise and control the environmental pollution and closed 15 kinds of small enterprises, and reduced discharge of waste water. Table 8 shows that the discharged volume of waste water from the township enterprises increased fast during the Eighth Five-Year Plan. In 1997, though the discharge volume was reduced, organic waste water showed a

tendency of growth. In 1998, China put more effort to control city environment and put more funds to manage the environment. With the attention of the people turned to environmental protection and the introduction of monitoring and managing measures, pollution will be controlled in the process of urbanisation. With the development of township enterprises and speedy development in the central and western areas, the environment pollution in China is spreading from the city to rural areas, and from eastern coastal areas to the central western areas.

Table 8. Wastes Discharge from Township Enterprises and Daily Life in Cities: A Comparison

Polluted Materials		1989	1995	1997
Waste water (billion ton)	Township Enterprises	2.68	5.91	3.9
	Daily life in City			18.9
COD (million ton)	Township Enterprises	1.769	6.113	4.07
	Daily Life in cities			6.84
Smoking dust (million ton)	Township Enterprises	5.43	8.49	8.80
	Daily Life in Cities			3.08
Industrial dust	Township Enterprises	4.7	13.253	9.57
SO_2 (million ton)	Township Enterprises	3.597	4.411	4.89
				4.95
Industrial solid wastes (million ton)	Produced Volume	76	380	
	Discharged Volume	27	180	

III.2 The Situation and Trends in Rural Environment

The damage to rural ecology in China is a question partly left over by history, but during the 1950s to1980s the question became more serious. Since the 1980s, systematic eco-protection and control measures have been introduced. In the 1990s, eco-destruction has been contained to some extent.

Forest destruction

Forest is a crucial subsystem in natural ecological systems. The conversion of forest area in China directly influences soil erosion, desertification and floods. The situation of forests in China can be seen from the general forest surveys. The proportion of forest cover rose from 12.98 per cent in the 1980s to 13.92 per cent in the 1990s. This is a great achievement of the afforestation campaign for more than 10 years and we are relieved to find it a turning point in the ecological state in China. The increase was in young and middle aged forests. The mature and old forests still remained in deficit. During 1989~1993, the stock of mature and old forest declined by 55 million m^3. The primeval forests formed only 14 per cent of mature and old forest, and it closely related to the situation where rare plants and animals are on the brink of extinction. Reduction in the mature and old forest areas will result in an irreversible loss.

Soil erosion

Soil erosion includes three types: erosion by action of water; alkalisation of soil; and soil erosion by the action of wind (in the case of desert encroachment in a frozen belt). The first two kinds of soil erosion are related to human activities.

Since the establishment of the People's Republic of China in 1949, it has been a basic principle to improve the agricultural productive condition by controlling soil erosion. This was temporarily interrupted by political movement. Soil erosion was getting worse until the 1980s, after which it began to be efficiently controlled. The area affected by soil erosion, which was 1.16 million sq. km. in the 1950s (or 12.1 per cent of total area) increased to 1.60 million sq. km. during the 1980s (16.7 per cent of total area), and then declined to 1.44 million sq. km. during the 1990s (or 15 per cent of total area). About 0.6 million sq. km. (or 6.3 per cent of total area) are under control. In the process, a lot of farmland was returned to the forests and grasslands as a part of a large-scale afforestation campaign. Ten per cent of eroded areas were restored between 1980s and 1990s. This is a turning point of the state of ecology in China. Of course, this is still only a beginning to improve eco-systems, and there is still a long way to go to solve the problems.

Desertification

Desertification is another longstanding ecological problem which became more serious in recent years. Table 9 shows the basic state of desertification in China.

Table 9. Type and Area of Desertification in China (1993)

Types of Desert Area	Areas (million km.^{2})
Forever desert area	0.137
Desert area	0.197
Desertification 100 years ago	0.123
Desertification in the last 100 years	0.074
Deteriorated grassland	0.9
Total	1.234

The rate of desertification in China is speeding up. The desertification increased from an annual increase of 1,560 sq. km. during 1958-1975 to 2,100 sq. km. during 1976-1986. This rate further increased to an annual average of 2,460 sq. km. since 1987. Desertification and soil erosion are both influenced by human activities. It destroys the eco-system, but controlling desertification is more difficult than controlling soil erosion. Chinese and Japanese experts analysed the condition of desertification in northern China, and concluded that about 94 per cent of desertification was caused by disruptive productive activities of the people who live there. Of the affected area 31.8 per cent is due to deforestation, 28.3 per cent to unreasonably cultivated farmland, and 8.3 per cent is caused by unreasonable exploitation of water resources. Desertification has now become the most serious environmental problem.

Biodiversity

Biological diversity is a research field in which breakthrough achievements have been made in ecological construction in China, including the three aspects of natural protection construction, rare animal reproduction, and seed quality preservation.

The natural protection area at the State level was doubled during 1991-1996 to a total of 0.72 million sq. km., accounting for

7.2 per cent of the total State land area. Among 780 public forest parks, 250 parks are at the State level.

In order to strengthen protection of rare animals, China has already established 200 reproduction bases of rare animals until 1995. And further more, the National Control Centre of Rare Animal set up 17 agents in the main ports.

In order to strengthen the protection action of crop seed quality, one national gene bank and one reserved crop gene bank, 23 local gene banks, 25 medium term seed stocks, and 2 seed quality stocks were established in 1995.

The management of biological protection is difficult. The animals and other living beings in protected biome are often caught and sold by illegal hunters. Even rare animals like Panda can not escape from killing and sale. The more serious problem is that the living condition of biological things is destroyed in biome. No living condition means that species can not survive. In addition, the more difficult task is to let the rare biological livings breed in reproduction centres and go back to the natural environment. If the rare biological living can not go back to the wild, it is impossible for the centre to save and protect the rare species.

III.3 Estimation of the Cost of Environmental Damage

In order to calculate the economic cost of the environmental damage in economic growth process and quality of economic development of the whole country, it is necessary to calculate the annual loss caused by the environmental destruction in China. This work has been done since the 1980s in China. In the 1990s, the study and analysis of economics of environment damage were done in different aspects by several study groups of the State Environment Protection Bureau. The main groups are: The Research Centre of Environment and Development in the Chinese Academy of Social Sciences and the Research Centre of Environment and Economic Policy of the State Environment Protection Bureau. In the same period, some well-known organisations such as the World Bank and the institutions in USA were free to do their research. A recent research report done in 1997 by the Research Centre of Environment and Development in the Chinese Academy of Social Sciences calculated

the economic loss caused by environmental and ecological damage and made an approximate evaluation. The main result is as follows:

(1)	Pollution Cost	100 billion yuan
	Among them, air pollution cost (township industry)	40 billion yuan
	Water pollution cost (township industrial and farm chemical products)	56 billion yuan
	Solid wastes pollution cost	4 billion yuan
(2)	Ecological cost	230 million yuan
	Among them, cost of deforestation	54 million yuan
	Grassland destruction cost	24 million yuan
	Farmland destruction cost	40 million yuan
	Water resource destruction cost	12 million yuan
	Disaster caused by human activities.	100 million yuan

The total cost of environment is equivalent to 10 per cent of GDP at the prices in 1993. The ecological cost is 7 per cent of GDP, and the pollution cost is 3 per cent of GDP. This is a conservative estimate of the total cost.

III.4 Conclusion

The environmental condition during 1991-1997 is as follows:

(1) Pollution was still heavy but part of environmental quality has improved.

(2) Achievements were made in the areas at county or whole country levels, but the pollution from transportation, from daily life, urban industrial pollution, agricultural pollution increased rapidly and went out of control. This became an important issue to be dealt with urgently later.

(3) The status of protecting the destroyed forest and soil erosion issue was straightened up but its negative effect was still quite strong. The desertification in China became worse and the stock of mature forest and over-matured forest continued to fall. The priority attention should be paid to desertification. The main problem in natural resource protection in China was management. Some rare species in China did not have protection yet, such as Chinese Paddlefish.

(4) The cost of environment damage during 1991-1997 was equivalent to 10 per cent of GDP showing a big loss in the economic development process in China.

IV. THE RELATION BETWEEN ENVIRONMENT AND POVERTY IN CHINA

In China, environment and poverty has a correlation because 95 per cent of the poor live in the countryside relying on farming activities for livelihood, and hence dependent directly on nature. Seventy per cent of the poor in the countryside in China are living in ecologically fragile regions. In such regions, the bad environment is the main reason for and also a result of the poverty. The poverty has a complex influence on the environment.

IV.1 Population and Environment

The population in absolute poverty position has a great negative effect on eco-environment of their basic living condition. The large population in China is the main determinant of the large demand for environmental resources. The direct pressure of the population on the environmental and natural resources has surpassed the carrying capacity of these resources in some areas. The high rate of growth of the population in the fragile ecosystem in the South and North China combined with unreasonable exploitation of environment enhanced the negative impact on the ecology and environment. Soil erosion and desertification caused by the over exploitation of resources for basic living of the large mass of poor population provides the evidence for the negative influence of population pressure.

IV.2 Environment and the Agricultural Structure

Before the reforms, China was guided by the principle of "take grain production as a top priority" under the planned economic system. It was a period of the shortage economy. Lands suitable to plant the other crops were forced into grain production. Some poor areas faced contradiction between crop pattern and climate conditions due to the weak ecosystem, and the agricultural growth was impeded. This type of pure farming not only restricted the comparative advantage in production but also destroyed agricultural resource base resulting in poor living conditions. However, as Table 10 shows, the imbalance was gradually corrected and land used

for forestry, animal husbandry and fishing was correspondingly increased within the cropped area, and the proportion of area under food grains declined a little over the years.

Table 10. Changes in Chinese Agriculture (%)

		1952	1965	1978	1985	1990	1997
Agricultural structure	Cultivated land	86.9	81.0	79.3	69.3	64.7	60.7
	Forestry	12.0	15.0	15.5	22.1	25.8	25.8
	Husbandry	0.7	2.2	3.6	5.2	4.3	4.1
	Fishing	0.4	1.8	1.6	3.5	5.4	9.4
Planting structure	Grain crops	89.2	86.8	80.4	75.8	76.5	73.3
	Industrial crops	9.0	8.9	9.6	15.6	14.4	14.6
	Others	1.8	4.3	10.0	8.6	9.1	12.1

IV.3 Environment and Rural Industrialisation

The township enterprises reduce poverty in the countryside but also introduce environmental pollution. The township enterprises established during reform and opening out, relieved the contradiction between population and land. The township enterprises provided a lot of job opportunities for rural labourers and were a main element in the income increase of farmers. But these township enterprises were at a low technology level and did not take efficient measures of pollution control and even lacked a sense of environmental protection. As a result, the volume of polluted wasted water has been increasing (Table 11). The Chinese environment protection authorities have strengthened the control on water pollution since the middle of the 1990s. On September 30, 1997, 60,000 polluting enterprises of 15 categories were closed down. The environmental situation in 1997 showed that the amount of industrial waste water and industrial dust was reduced. With upgrading of technology and industrial structural optimisation, the negative influence of township enterprises on environment is getting smaller and is under control.

Table 11. Pollutant Emission of Enterprises of Township and Villages in 1989 and 1995

Pollutant	1989 (ten thousand ton)	1995 (ten thousand ton)	Percentage of national emission in 1995
Waste water	26.8	5.9 (billion ton)	21.0
COD	176.9	611.3	44.3
SO_2	359.7	441.1	23.9
Smoking Dust	543.0	849.5	50.3
Industrial Dust	470.0	1 325.3	67.5
Solid waste	0.76	3.8	37.3

IV.4 Poverty and Environment: From Vicious Circle to a Sound One

With 20 years reform and opening to the outside world, the circle of poverty – environmental deterioration was under control. This achievement is attributed to the correct policy by the government and reasonable option of technology. There are many successful experiences and cases. Two are described below for illustration.

The volume of annual rainfall in Dingxi, one of the typical places in the middle of Gansu province and Xihaigu regions in Ningxia province, is 150~450 mm and evaporating amount is as high as 1500-2000 mm annually. These places are well known as poverty areas with a dry eco-environment in nine years out of ten. The central government supports them with special aid fund of 200 million yuan to change the poverty condition. At the beginning of construction of three western regions, the strategy of the aid-the-poor was to build horizontal terraced fields, and collect rain water by digging a hole. Technology of covering young plants with plastic film was introduced there. The aim is to find out an efficient way to reserve, utilise and save the water for the poor people in the dry and less dry areas to live.

Some of the poor households in areas with hard natural condition and over-population are organised to migrate to the newly developed irrigation areas. About 0.6 million poor people migrated thus during the 10 years' efforts. The aim of this program is: move in the first year, live in at the second year and satisfy the needs of food and

clothing, live in comfortable life in 4-5 years. In this way, the migration not only produced economic efficiency, welfare efficiency but also better eco-efficiency. There is a sound circle of good circulation of eco-system in migration areas because of large-scale conversion of the desert-edged land into farming lands. The reduced population and more farmland gave quite a large space for living and created good living conditions to satisfy the food and clothing needs.

Caohai lake is a National Natural Preservation zone located in Weining county of Guizhou province with an area of 9600 hectares. This area formed by the main lake valley of Caohai is the home for Black Neck Crane, the first grade National-protected rare bird which is facing extinction. It is a well-known kingdom of birds with 100 thousand of 185 categories of birds. The international crane foundation and other organizations are concerned with the program of co-development and research on Caochang and aid poverty alleviation. But Weining where Caochang is located is a rather poor county at the State level where there is a large poor population, a few farmlands and low grain production. It is difficult to shake off poverty and build up fortune. Forty (40) per cent of the people live under the poverty line. To make a living, the peasants along the lake open up the wasteland, do over fishing and hunt and kill rare animals without permission resulting in a vicious circle of reduction in income, birds and fish. With the finance of the TUP and the ICF (International Crane Foundation), the experiment of poverty alleviation with environmental protection has achieved success. This program helps the poor with a small amount of loan and makes a contract with the households prohibiting the peasants from doing any damage to environment. After training and organising a peasant environmental protection team, the peasants who destroy environment become protectors of the environment. In this way, the peasants participating in poverty aid programs improve their capability for self-development and management, promoting economic efficiency relieving the pressure on the Preservation Zone and helping sustainable development.

IV.5 CONCLUSION

It is history that the Chinese people have changed the disadvantaged economy and culture since the foundation of the People's Republic of China. It is history that the Chinese people shook off poverty. However, only after Reform, the poor population in the rural areas had an opportunity to participate in the drive for economic progress and made 200 million poor people enter a phase of good lifestyle from poverty position within 20 years. Neither market economy has all power nor is the planned economy devoid of any merit. In the process of the Reform, the space where the poor group ever benefits from equal distribution is being cut down. The weak group of society who lack technology, knowledge and property will be in disadvantaged position. The poor population, especially, in the rural area, belong to this weak group. It is an objective of the Chinese government to let them participate in the market and development and comparatively share the result of social and economic growth and improve both their living quality and environment.

The environment in China in the process of the industrialisation came under stress. Although the vicious circle of environment and poverty is being restricted in China, the environment damage resulted from chasing benefits is increasing and getting even worse. During the fight against poverty, China has taken various measures to shake off poverty and create useful and sustainable poverty alleviating models such as comprehensive control on mountain areas, small valley and developing eco-agriculture.

In the society of China in the twenty-first century, social justice and equality are getting more and more attention of the public and the government, due to an enlarging gap between the poor and the rich. It is China's objective to achieve a coordinated development of both economy and environment by letting more and more people share the fruits of the Economic Reform on the principle of "giving priority to efficiency and consideration to fairness", and reducing the negative effects of the Reform. China is a highly organised socialist market economic system and has the ability to reduce damage to environment as much as possible.

V. CASE STUDIES

V.1 Exploring Sustainable Development in Poor Mountain Areas: The Case of Danfeng County in Shaanxi Province in China

Natural and economic conditions of Danfeng County

Danfeng County of Shaanxi Province is located in the eastern part of the southern Shaanxi region in China, at the southern foot of the eastern ranges of the Qingling Mountains. It is 240,601 hectares in space. Situated between 110^0 7' 49" and 110^0 49' 43" *E*, and between 30^0 21' 33" and 30^0 57' 4" *N*, it is at the upper and middle reaches of the Danjiang (a tributary of Hanjiang water system which is immediate tributary of the Yangtze River). In the territory of Danfeng County, there are both mountains and valleys. The plain is limited between two mountains in the north and south. Most of the area is mountainous. It belongs to a transitional monsoon semi-humid climate from north subtropical area to warm temperate area. Being distinct with four seasons, it has no severe cold winters and burning hot summers. With plenty of rainfall, it is endowed with unique conditions to develop forest industry.

There are 26 townships in Danfeng County, 327 administrative villages, 2415 teams of villagers. It has a population of 292,597, in 75995 households. The arable land in the county is 221034 *mu*, 0.76 *mu* per capita. Underdeveloped in industry, the total agricultural and industrial output value in 1998 was RMB 557.34 million, of which agriculture accounted for 231.00 million RMB, or 41 per cent. The grain yields, reduced after drought, were 77189 tons, only 264 kilograms per capita. The total revenues from rural economy were RMB 54.293 million, and annual per capita net income was only 799.1 RMB. It is classified as national level poverty county.

Destruction of the ecological environment is the main reason for poverty

The natural conditions in Danfeng are suitable for growing trees, and historically it was well known for its green mountains and clean water. According to "Annals of Shangzhou", the ecological environment was sound with dense forests and wild beasts during the Qianlong Reign of Qing Dynasty. Economically, it was an important communication hub between Southeast and Northwest

China as well as a brisk business center. Its strategic importance in transportation and economy declined as modern economy developed and railroad became an alternative means of transportation. In the past one hundred years, many forests were destroyed in wars one after another. After the founding of the People's Republic of China, the demand for grains and firewood has been rising dramatically due to the rapid population growth. Farmers reclaimed wasteland on large scale and destroyed many forests. In addition, there were policy mistakes. All this reduced the forests in the entire county to 1231.2 thousand *mu* in 1975, making the forest cover 34.09 per cent. Particularly in the two northern and southern districts, there was very little cultivated land in valleys, and most on hillsides. Seventy six (76) per cent of the cultivated fields are on hillsides of more than 25^0 and some on hillsides of more than 60^0. These fields were not able to be irrigated and seldom fertilised, and the yield was little. They were usually abandoned two years later when soil fertility was exhausted, and then other forests would be reclaimed to become farming land. The rotation of reclamation and abandonment has led to vicious circles of ecological environment, and serious water and soil erosion. Severe damages of ecological environment have resulted in frequent natural disasters which have become a great danger to economic development of Danfeng County. In 1986, the population in absolute poverty who were not properly fed and clothed, was 173 thousand, that is 64.8 per cent of the then entire population of the county.

Integration of environment improvement and poverty alleviation

Organised poverty alleviation programs in Danfeng County started in 1986. Over the past 13 years, more than 140 thousand people (79.4 per cent of the population in poverty) have been relieved of poverty and are properly fed and clothed. Poverty in Danfeng County is a result of economic development opposed to natural ecological systems. The process of alleviating poverty in Danfeng County, was therefore based on the following understanding: (1) Human concepts and behaviour must be changed. When right economic ideas are adopted and right economic activities are undertaken, ecology and economy can harmonise in the development of these systems. Otherwise normal operation of natural ecological system will be interrupted and sustainable economic development

will be hindered. All people in the county should be mobilised to improve its ecological environment and solve the problem of poverty. (2) Mountainous areas must be developed to fight against poverty. Vegetation in the mountainous areas was severely damaged and people became poor. Now environment in mountainous areas must be rehabilitated and developed to alleviate poverty. There is no alternative short-cut for that. (3) Trees must be planted to make people rich. Forests are main players in ecological system in mountains. Afforestation along with developing good grasslands is the only prescription for damaged mountainous areas to protect ecological environment. Meanwhile, forests are also major resources in the economic system in mountainous areas. Developing forest industry is pragmatic choice for poverty-driven people in these areas to alleviate poverty and become rich.

Upon this clear understanding, guideline policies were formulated in Danfeng County to rely on its farmers to rehabilitate environment and utilise ecological resources of mountainous areas to extricate themselves from poverty and get rich. The goal of this program is to achieve harmonious development of ecology and economy through rebuilding a benign cycle of ecological improvement in mountainous areas leading to social and economic development to a new phase of sustainability.

The fight against poverty programmes in Danfeng County are generally divided into three phases: *The first phase* was from 1986 to the first half of 1990. During this period, "blood transfusion" type of poverty relief programs were undertaken through government relief money and materials to maintain people's livelihood. This method could not mobilise farmers in poverty to change ecological environment, and alleviate poverty to become rich. When government relief money and materials were used up, farmers returned to the state of poverty. *The second phase* from the second half of 1990 to the end of 1993 was to fight against poverty by introducing development programs. The purpose was to shift from "blood transfusion" to "blood making." These measures were designed to fight against poverty by introducing projects or through preferential choices of assistance. It meant to initiate projects with the expectation of high returns to mobilise and benefit farmers nearby to alleviating poverty quickly. However, it resulted in "assistance to industry not agriculture" (the established projects were all industrial projects to

expect high returns), and "assistance to valley areas not mountainous areas" (profitable township and village enterprises were all located in valleys not in mountainous areas), and finally "assistance to the rich not the poor" (the poorest farmers did not get benefits).

The *third phase* was from 1994 onwards. The experience and lesson were learned from the first two phases. On the one hand, the policy of shifting from "blood transfusion" to "blood making" was affirmed, but on the other hand in terms of specific measures, addressing poverty in rural villages was emphasised and poor households were targeted. To help poor rural households develop economy, ecological environment must be protected and utilised by starting with suitable farming and animal husbandry. The core guideline is to subjectively rely on the efforts of poor farmers to improve ecological environment, and objectively to make full use of ecological resources available so as to turn "potential productivity" into "real productivity." In practice, these measures have worked very well. During the six years from 1992 to 1998, the number of rural households in poverty had fallen from 25,583 to 9,120, a reduction by 64 per cent, and the number of people in poverty had fallen form 132,460 to 36,486, a reduction 72 per cent. Average income per capita rose by 89 per cent from 420 yuan in 1993 to 794 yuan in 1998. During the first two phases of fight against poverty programs from 1986 to 1994, poverty relief fund of 4.64 million yuan or 9.4 yuan on an average for every household was given, but the rate of repayment was only 3.8 per cent, and most of it was lost half way during the process. Since 1994, the fund has been allocated to rural households directly, and the rate of return has risen substantially. It has become "true poverty relief" and "relieve the real poor."

Achievements of rehabilitating ecological environment and alleviating poverty

In a short period of 13 years, great achievements were made when the poverty relief programs started in 1986. In the spring of 1985, the standards were set up for the Qingba Mountain areas in Shaanxi Province to define people in poverty: 150 yuan or below of annual per capita net income for poor counties, and 120 yuan or below for households and township in extreme poverty. By these standards, the entire Danfeng County was classified as county in poverty. Forty

thousand four hundred sixteen (40416) households and 177347 people were in poverty, 68.2 per cent and 70.2 per cent of the total households and agricultural population respectively. Six thousand eight hundred thirty four (6834) households and 29194 people were extremely poor, and Huayuan Township was the poorest township with annual net income per capita of 64 yuan. In the process of 13 year's long fight against poverty, many measures had been taken to help farmers alleviate poverty in Danfeng County. The table below illustrates the major measures taken by people in Danfeng County to fight against water and soil erosion to improve ecological environment.

Table 12. Major Measures and Achievements in Afforestation and Improving Ecological Environment by 1998 in Danfeng County

Projects and measures	Unit	Figure
Total recovered space of soil erosion	km^2	918.4
Of which recovered in 1998	km^2	85.0
Major measures taken	hectares	8 230
1. building terrace fields, fields on embankments, fields on flood land	hectares	5 776
2. Afforestation: water and soil conservation forest economic forest	hectares	773
3. closing hillsides to facilitate forests	hectares	1 187
4. planting grass	hectares	277
Completed cubic meters of earth and stone	1 000 m^3	91 567.9
Input of man-days	1 000	145 669.0

It is shown in the table that by 1998, 918.4 sq. km. of water and soil eroded space had been recovered, through the fight against poverty campaigns in recent years. Eighty-five (85.0) *mu* has been recovered since 1998. During the campaign, measures targeting at improving ecological environment through afforestation were taken, and 150 million men-days were invested to remove 90 million cubic meters of earth and stone. The recovered space accounted for 34 per cent of the total water and soil erosion area, and as high as 73 per cent in some areas where greater efforts were made. On this basis, forest vegetation has been rehabilitated and developed remarkably. The recent development of forest vegetation is illustrated in Table 13.

Substantial progress has also been made in the past 13 years in guiding farmers to alleviate poverty. By the end of 1998, although the standards of poverty were raised greatly year by year, the remaining poor households and population had been reduced to 9,120 and 36,486 respectively. Thirty one thousand and two hundred ninety six (31,296) households and 140,861 people had alleviated poverty over the years, accounting for 77.4 per cent and 79.4 per cent of total poor households and population in 1985. In 1998, annual per capita net income amounted to 799.1 yuan, and per capita grain production was 300 kg, very close to, although still lower than the national averages of 883 yuan and 350 kg. These are great achievements made through the strategy of alleviating poverty on the basis of reconstructing ecological environment.

Table 13. Progress in Afforestation (forest figure in 1000 mu)

Year	Forest figure	Space growth over 1975(%)	Forest coverage(%)
1975	1 231.2	–	34.09
1992	1 932.1	57	53.46
1994	2 305.1	87	63.90
1997	2 367.6	92	65.49

Major measures taken to alleviate poverty by rehabilitating and improving ecological environment, and utilising ecological resources

In the fight against poverty programs in the past 13 years, policies have been put in place to guide farmers to be self reliant to improve ecological environment and utilise ecological resources, and thereby to alleviate poverty and become rich in a progressive manner. In this regard, the following measures were taken regarding (1) correcting the relationship between people and nature; and (2) introducing micro-credit schemes.

1. Correcting the relationship between people and nature

The relationship between people and nature was correctly handled to promote forms of farmers' participation in comprehensive programs to develop and improve small watersheds. Households of farmers were organised by townships to rehabilitate ecological environment by taking small watersheds as units. The essence of the

method is to combine ecology with economy by correctly handling four key issues:

(a) *The small watershed*

Fight against poverty must start with putting ecological environment in good order. However, improvement of ecological environment in mountainous areas through afforestation program costs a great deal of manpower, materials and fund, and is a giant time-consuming project which needs a lot of hard work. To complete the program in a well planned way and ensure its effectiveness at different phases progressively, the whole process was decomposed and small watersheds were defined as breakthroughs in the whole programs. Small watershed is the smallest natural unit in ecological system in the formation of soil erosion, ecological deterioration as well as in rectifying water and soil erosion and protecting ecological environment. Households are the most common and the smallest economic units in rural areas in China today, and thus the strategy was to rely on rural households (the smallest economic units) to improve the quality of small watersheds (the smallest ecological system) in order to develop in an eco-friendly way.

(b) Relying on correct policies and appropriate institutional arrangements

Having paid great attention to the afforestation programs in mountainous areas, the Chinese government has made a great deal of fund available to improve ecological environment. However, afforestation programs have hardly resulted in growing woods and these programs have done very little to improve ecological environment and condition of the situation of poor farmers. This was because, in implementing these programs, ecological and economic concerns were disintegrated, and there was no coherent link between the state programs of improving ecological environment and fight against poverty. Having learned the lesson, people in Danfeng County came to realise that remedying ecological disorder in mountainous areas is not only an environmental problem but also a problem of in what way farmers will be organised to develop economy. Powerful technical measures as well as policy and institutional measures are needed. Along with this line, farmers are contracted to manage land on hillsides or the management right of hillsides is auctioned to farmers. The two measures separate management from ownership.

Take an example of the second method. When the auction of Jingshuigou of Qiligou Village was organised by Majiaping Township, the management right of hillsides of 1000 *mu* was sold to 13 rural households, and the largest sale was 300 *mu* and 30 *mu* for the smallest. The rights would remain valid for 30 years, which can be inherited by younger generations of the households, as well as be traded and transferred. Rural households who bought the management right were entitled to all the produce and handling of the products. A contract was signed between the township government and the household to safeguard the rights. In contracting and auctioning management right in other townships, contract periods can be as long as 70 years or even more. Lengthy contract period encourages farmers to integrate self-interest with the targets of rectifying ecological environmental problems, and therefore combines the goal of government to achieve ecological benefits and the goal of farmers to alleviate poverty, through developing an environment friendly economy.

(c) *Integration of protecting and utilising ecological environment*

With "development being the undebatable principle," society must move forward and the standard of people's living must be improved. The ideas and practice of "protection of ecological environment for the sake of protection," and "natural protectionism" at the expense of constraining economic development, have no future. However, at the same time, it must be noted that ecological system has its limit. Utilisation of ecological system without any protection of it will undermine the foundation of economic development and finally hinder economic development. The right approach to handling ecological resources is the principle of "utilisation with protection and protection with utilisation." The harmonious utilisation and protection of ecological resources has been enhanced in Danfeng County, guided by this principle.

The construction of "basic farm fields" is the core issue in handling ecological environment and in achieving a balance between protecting and utilising ecological resources. Rapid population growth, shortage of grains, and severe water and soil erosion on hillside fields are fundamental causes of ecological destruction and poverty of farmers in Danfeng County. It is strictly prohibited by the state to reclaim farm fields on hillsides of more than 25^0. However,

the ecological destruction through reclaiming farmland from forests cannot be eliminated till the problem of grain shortage of poor farmers is solved. It is proven empirically that minimum per capita grain production is proportionate to the protection of ecological environment in mountainous areas. This means that to protect ecological environment, grain production must be intensified, i.e. to chose a number of fields suitable for growing grain and turn them into terrace fields in which water, soil and fertilisers can be conserved. Then improved varieties and new technologies can be applied to increase unit production. By so doing total grain production rises through intentional extended reproduction to meet the needs of farmers. Other hillside fields from which water, soil and fertilisers are easily eroded, are to be returned to forestry to prevent expansion of hillside fields and prevent deteriorating destruction of environment. Based on the present unit production in Danfeng, the requirement of one *mu* per person is put forward to. It has thus been proven that it is crucial to integrate protection with utilisation of ecological environment, and to harmonise ecology and economic development.

(d) *Comprehensive development and utilisation of resources in the mountainous areas*

The final goals of developing and protecting small watersheds are to effectively develop and utilise ecological resources in mountainous areas, and to help farmers alleviate poverty and become prosperous. The following measures have been taken to achieve the goals:

First, comprehensive development and utilisation. Ever since the development of small watersheds began, it has been decided that the problem should be handled in a comprehensive manner taking into account mountains, water, forests, farm fields and roads. Measures appropriate to local conditions have been taken to develop vertical vegetation. It must be recognised that ecological and economic systems in small watersheds exist vertically. In small mountainous watersheds, in climate on different parts of hillsides may be suitable for different plants and animals, and therefore the structure of agricultural production and formation are arranged accordingly. A vertical farming model has been adopted in Danfeng County "with forests on upper parts of mountains, orchards on the middle parts and terrace fields on the lower part." This model has proven to be environment friendly and cost effective.

Second, defining key industries in accordance with resource advantages. Selective development and utilisation of natural resources can help the emerging of key industries and products so as to achieve maximum ecological and economic benefits with limited human resources, materials and funding. The specific measures taken by Danfeng County are as follows:

First, to start with land farming and animal husbandry. It was decided to take traditional land farming and animal husbandry as a breakthrough to start off economic development to alleviate poverty. The method could best use local resources and was suitable for skills of local farmers. It required good supporting conditions of transportation, information and market. After this major breakthrough, the development could be upgraded gradually, and therefore was effective in reality.

Second, to establish key industries on a stable foundation of ecological and economic harmony. Surveys and researches have demonstrated that land farming and animal husbandry had made best use of ecological resource advantages. Growing walnuts, chestnuts, mushrooms and beef product are the four major businesses to help farmers alleviate poverty. They have been operated very well in the past few years, particularly growing mushrooms, mainly fragrant mushroom and tree fungi. The resources and climate are suitable for growing fungi, and historically it has been a tradition. Over the recent years artificial bacterial spawns have used and technologies have been developed, and the production has multiplied. It has helped poor farmers increase their incomes and has contributed a great deal to the economic growth of the county. In 1998, the production of mushrooms in Danfeng was 776 tons, valued at 37.35 million yuan, averaging 137.1 yuan per capita of agricultural population. The share of revenues from mushroom in aggregate rural economy rose from 2.5 per cent to 6.8 per cent from 1987 to 1998, and per capita incomes from growing mushrooms rose from 10.4 yuan to 127.6 yuan. Farmers in some townships have alleviated poverty by growing mushrooms.

2. Microcredit schemes

Micro-credit programmes have given loans to farmers to alleviate poverty, and resources in the whole society have been mobilised to assist poverty alleviation. Fight against poverty in Danfeng County

not only target to improve the relationship between men and nature, but also to improve human relations. Effective policies and institutions have been put in place to make full and rational use of mountain resources to enhance sustainable development of the society and economy.

(a) *Micro-credit programs are facilitated to give loans to poor farmers*

In 1996, with the help of Chinese Academy of Social Sciences, the Bangladeshi model of micro-credit programs was introduced through the Institute of Rural Development under the Academy and adjusted to local conditions. First, loans must be given directly to households to address the targets and purpose of poverty alleviation, and prevent them from being lost somewhere in between. Second, they are small loans, 1,000 yuan at one time, to match the productivity of poor farmers and their ability of repayment. Third, they are lump-sum loans and to be paid back by smaller sums gradually. It is regulated that the loans are to be paid back every 10 days (every 15 days in some places). This method not only helps economic development but also is convenient for repayment. It used to be difficult to get loans as well as to get the loans repaid, and most loans became bad loans. Fourth, the method is flexible. Five households may become a small group on voluntary basis, and they insure themselves collectively, and no individual guarantee and mortgage is needed. It has solved the problem of difficulty in getting loans, and has strengthened the supervision of repayment. It is also suitable to the level of management in poor rural areas and reduced cost of management. Fifth, micro-credit programs target women. It mobilises the capability and initiatives of rural women who are industrious and thrifty in managing their households, and operate businesses economically. Status of women in family and society has been increased through operating programs of land farming, animal husbandry and craft suitable for family business, and through having opportunities to study technologies. The micro-credit programs have reduced the risk of the lender, the government and the borrower, farmers; and eased their burdens. The ideas of development, risk, pressure and repaying loans are also reinforced among farmers. The pressure of repaying loans has been turned into the driving force of earning money to pay back, and to alleviate poverty to become rich. The experience of the past two years shows that

the process of poverty alleviation has been accelerated and the use of poverty relief fund has become more efficient. The rate of repayment of loans used to be only 3.8 per cent and now has risen to 95 per cent and more. Capital turnover was usually once a year, and now has been increased to three times a year. The micro-credit programs have resolved three difficulties in the fight against poverty: to get poverty relief money to rural households, to identify poverty alleviation programs, and to get loans repaid. Now the government, the bank and poor farmers are all satisfied. Since this program meets the needs of poor Chinese farmers, the experiment of Danfeng has been extended to other 10 counties in Shaanxi Provinces and then further to all 50 state level poor counties, each adapting it to its own local specifications.

(b) *Resources in all society are mobilised to assist poverty alleviation*

Being a state-level poor county, Danfeng County in many years of fight against poverty, has given full play to the advantages of socialist system, and has mobilised resources available in the county and elsewhere to facilitate poverty alleviation programs. The work has been effective. The Chinese Academy of Social Sciences began to participate in the fight against poverty in 1993, and has done a lot for the county. Leaders of the Academy have gone to poor mountainous areas to initiate poverty relief projects, and to solve specific problems. Experts of the Academy are often organised to study the situation and problems in Danfeng County and summarise its experience to advance the work of poverty alleviation. Secondly, in the anti-poverty activities, the principle of tackling the core issues has been adhered to, i.e. putting people on top of the agenda and increasing input in human resources. Over the past few years, the Academy has supported 128 poverty alleviation programs in Danfeng, of which 44 are education programs with an input of more than 2 million yuan including building 14 primary schools, assisting 1250 children to return to school; as well as 39 health care projects including setting up training centres for doctors and building health care stations in some poor mountainous areas. It also has helped build 4 roads in rural areas. In addition, the Bangladeshi model of poverty alleviation has been introduced to train staff and promote micro-credit programs. All have played a positive role in helping poor farmers in Danfeng County to alleviate poverty rapidly.

Conclusion

Danfeng is a typical state-level poor county in China, where the destruction of ecological environment and poverty are serious. In the past 13 years, great achievements have been made in the fight against poverty, and in improving ecological environment. Useful lessons on the following five aspects may be learned from this experience.

There is a close link between poverty of farmers and destruction of ecological environment. The destruction of ecological environment in Danfeng is the fundamental reason for the poverty of farmers, and therefore fight of poverty program must start from improving ecological environment. The formulation and implementation of poverty alleviation policies must be integrated with rehabilitating and improving ecological environment. The experience of Danfeng County proves that when ecology achieves a benign circle, the economy is also operated in benign circles.

Rational institutional arrangements are needed to alleviate poverty. The experience of Danfeng County tells that farmers have to rely on themselves after all to alleviate poverty. The real help for farmers to alleviate poverty and to be properly fed and clothed, is not "blood transfusion" from the government, but rather to facilitate farmers to "make blood" through their own hard work. At the same time, various institutional and technical measures must be taken and property rights must be clarified to form incentive mechanisms and necessary material benefits must be facilitated to encourage farmers' voluntary participation.

The relationship between utilisation and protection of ecological resources must be properly handled. In Danfeng County, ecological resources, in the first place, are to be utilised, but protection of ecological environment is the precondition of utilisation. The two must be properly combined and harmonised to facilitate a sustainable development. First of all, to achieve the harmonisation, grain production must be sufficient but not at the expenses of reclaiming farming land through destruction of forests. To ease the tension between grain demand and protection of ecological environment, the construction and maintenance of basic farming land must be well worked out to prevent forests and grass being damaged. Second, resources must be well chosen and utilised to

become the key industries to alleviate poverty. In the process of development and utilisation, the relationship between utilisation and protection of resources must be properly handled.

Developing and improving small watersheds through rural households is a successful measure. Rural households being business entities, farmers take the initiatives in developing environment friendly economy in the mountainous areas. Environmental improvement is integrated with economic development, giving more economic incentives to farmers to improve ecological environment. Small watershed as the basic unit of environmental protection and economic development is suitable at the local level, utilising all resources and developing appropriate industries. This measure is effective and successful in Danfeng County.

Assistance from the society is needed in poverty alleviation. The reasons of farmers' poverty caused by destruction of ecological environment are many folded. Poverty alleviation is the responsibility of many departments and sectors, and the socialist system in China had made all this possible. In the anti-poverty campaigns, resources of different departments were mobilised. Called by the central government, the Chinese Academy of Social Sciences has participated actively in poverty alleviation programs. The introduction of the Bangladeshi model of micro-credit has been successful; and assistance of science and technology, and the introduction of other resources have been effective. Ultimately, poverty alleviation programs mainly rely on farmers themselves, though supported by various departments.

V.2 Poverty in Resource Cities: Zhong Zhan District of Jiao Zuo City, Henan Province

Urban poverty in China, compared with that in other countries, has its particular causes. The urban poverty population in China also has distinct distribution and features. First, the standards of defining the poverty population in urban and rural areas in China are different. In 1997 the Chinese poverty line for the urban area is 1,700 RMB / year. However, due to the disparity between the regional living standards, the real poverty lines of the cities and the towns are not the same. Secondly, the urban poor areas do not include the mobile labour coming from the rural areas. Thirdly, the urban poor in China are not in absolute poverty, but only relatively poor. The living quality

of the population manages to guarantee enough to meet the food and clothing needs, but is much lower than the average living standard of the urban population. Fourthly, the urban poor do not show the feature of a community, nor a close connection with the environment. Last, with the deepening and strengthening of the economic reform and structural adjustment, urban poverty has been increasing and, the urban poor are dominated by "the unemployed, the laid-off, the retired from poorly operated enterprises and others dependent on these people." They reveal strong professional and regional characteristics. In recent years, groups of this kind were from textile industry, forestry and coal, etc. Urban poverty is receiving the attention of the Chinese government and the society, especially the issues on the sustainable development and urban poverty in some mining industry. Therefore this case study chooses the poverty and environment issue in the mining industry.

Types and features of the mining industry cities in China

The mining cities based on exhaustible resources have played an outstanding role in the industrialisation and urbanisation process of China. The mining-industry cities are divided into nine types which are: coal mine cities or iron mine cities as by the mineral deposits; energy-type or metallurgy-type cities as by the property; newly-built, middle or later stage built cities as by different development stages; cities in the exploitation, development, production enlargement, production bloom, production decline and exhaustion of resources as by the conditions of resource, market and technology; large, medium and small sized cities as by the city scale; mining-industry cities which have 15 per cent of its population accounted by the main property employees as by city functions; city with or without backing as by the causes of the city formation; assimilative cities, cities emerging from nothing, cities with old and new features coexisting as by the city patterns; excavating or processing cities as by the production content; and cities in the hinterland or on the coastline as by the locations.

China has a large number of the mining-industry cities, which are mainly the products of the planned economy and were very contributive in the socialism construction process. However, through nearly one hundred years of extraction, the mines are nearing exhaustion. These cities have to suffer poverty caused by resource

exhaustion and due to incapability in getting rid of their reliance on the mining industry.

The problems faced by the resources-exhausted mining industry cities:

(1) As the resources of the mining industry can not be regenerated, the mining industry enterprises have to be closed down due to the exhaustion of the resources. This meant readjustment in the production structure and retrenchment of surplus of labour. The laid-off workers are regarded as the objects of the poverty alleviation projects. Poverty alleviation in the mining industry has always been a key field in the urban poverty alleviation. Chinese government invested a large amount of capital in the transformation of the mining industry. This is basically a poverty alleviation fund, though it may look like production oriented. The city economy's over reliance on mining excavation and mineral processing industry makes the transformation of sunk capital difficult. It is only through developing new lines of production as a substitute that the city may extricate from its poverty and disadvantage.

(2) The development of the mining industry has a great impact on the environment, mainly on the soil resource, which weakens the regional ecosystem. With the end of the mining, the waste water and residue exert long term impact on the regional ecosystem, which takes great energy for ecological restoration.

(3) The development of the mining industry also influences the social structure and service functions of the city, and the lack of clear division among the enterprises, the society and the political power make the conflicts in the social systems even complicated. Most of the mining industry cities are located far from the big and medium sized cities and the commercial areas, and have a single service function. In the population of the mining industry cities, coal industry employees account for the largest percentage and thus is the most influential group.

(4) The relation between the price of resource products and that of the consumer products is unfavourable to the economic development of the city.

Urban impoverishment in the district of Zhong Zhan in Jiao Zuo City, He Nan Province

1. Urban impoverishment caused by the exhaustion of resources

Jiaozuo as one of the first built big-scale mining industry cities in China, developed and bloomed thanks to the emergence of the coal extraction industry. Zhong Zhan, as one relatively independent district in the city, has three medium-sized coal mines which are Li Fen Mine, Wang Fen Mine and Zhu Fen Mine respectively, each with 4000-5000 employees. The residents in the area mainly are the family members of the miners, the number of which reaches more than 80,000 compared with the 12,000 local population.

In China, the wage level in the coal industry has always been higher than the national average, thus the residents in the Zhong Zhan district have enjoyed a relatively high income level and consumption level in the He Nan Province. The average wage of the coal industry employees was about 7,000 RMB per year in the early nineties, which is relatively high in the He Nan province. Compared with the other cities in the Province, the occurrence of absolute impoverishment in Jiao Zuo was lower rate during this period.

In the 1980s, with the gradual exhaustion of the coal resources in the main mining area of Jiao Zuo, mines started to close their business one after another. The property transformation in the Zhong Zhan District has lasted for ten years; however, it is a long-term and arduous task. The requirements for social security and social aid sharply increased and the local employment rate decreased a lot, and the occurrence of poverty also grew at the same time. According to the statistics provided by the concerned authorities in the Zhong Zhan District in 1998, the laid-off workers accounted for nearly 50 per cent of the local poor, and the rest included those retired who still have to provide for their families.

The exhaustion of the coal resources in the Zhong Zhan District is the main reason for the regional poverty. The closing of the coal mines lead 13,000 employed to become idle, which means either to be laid-off or two workers taking turns on one position. From 1991-1999 the workers in the Wang Fen Mine and Li Fen Mine decreased from 13,000 to nearly 6,000. After that some of the technicians in the coal industry were moved to other mines, and

1,000 people found jobs in other enterprises. The number of the employed in the area decreased nearly 50 per cent. In the past five years, the Wang Fen Mine, Li Fen Mine and Zhu Cun Mine have hardly hired any new workers, which directly influences the development of the local labour market, and makes it difficult for the young people to find jobs in the market as the newcomers. In addition to the three mines, the Zhong Zhan District has built several enterprises. However due to the institutional restrictions, the three mines are regarded as belonging to the central government, while the newly built enterprises belong to the local government, which only absorb the labour force from enterprises outside the mines but not the workers and the laid-off from the mining industry. Therefore, the enlargement of the accommodation of the labour force by the newly built enterprises could not absorb the surplus labour coal industry.

Before the closing, the miner wage of the Wang Fen Mine was 7,000 RMB per year, and after that the wage of the workers who went to other industries declined to 5,300 RMB per year. This average low wage restricts the capability in providing aid to the poverty population by the relatives and kin, and causes the quantity of the aid by the government to be increased.

In 1999, workers were laid-off in the Wang Fen Mine and 995 workers in the Li Fen Mine. It is a misunderstanding that urban impoverishment means a decrease of the living standards in the laid-off workers. In fact, in the Zhong Zhan District, the living expenses of the laid-off workers are to some extent highly guaranteed. As the society and the government are deeply concerned about them, the welfare system of the laid-off workers is improved and the living expense fee is given on time every month. If the fee is lower than the local minimum income (150 RMB per month per person), then the government provides subsidies. The reason why the poor families are mainly those of the laid-off workers is that these workers still have their family support.

The transformation of property (or fixed capital) in the area owing to the exhaustion of the resources was started about 3-5 years ago. Wang Fen Mine as backed by the financial support from the Chinese Coal Industry Ministry, has a chemical plant as its main project in the transformation. Fifty-six million (56,000,000) RMB

were invested in the plant which is expected to provide 2,000 working positions. In addition, there are ferro-alloy plant, package factory, etc. All these plants face the problems of inadequacy in technology, high cost and low competitiveness. The depression in the transformation has kept the employees' income at a low level. And due to the delays in launching the transformation, all the new projects including the chemical plant and the ferro-alloy factory have not started making profit. The difficulties in the capital turnover make it impossible for the enterprises to pay wages in time, and also cause the impoverishment at different degrees. Chinese government regulates in the urban social security system plan that the poverty alleviation fund to the urban impoverishment should be provided equally by the local government budget, the social security fund be paid by the hired workers, and the fund be drawn from the enterprises' profits. The poor operation of one enterprise will impact directly on the capability of aiding the poverty population.

The property transformation of the mines in the Zhong Zhan District and the establishment of new manufacturing industries in the area started after 1990. The delay in the reform caused inefficiency and loss. A lesson may be drawn here that plans for the transformation should be prepared before the exhaustion of the resources in the resource cities. The pluralism of the property in the city and the prompt improvement of the property structure are important elements in guaranteeing the sustainable development of the resource-based cities.

That the retired workers still have to support other people is the important reason for the poverty in the retired group. The wage of the retired workers is about 300 RMB per month, which is relatively high compared with that of the workers on the job. The occurrence of the poverty in the retired workers is low in the mines and the local government has always put the matter first and paid the wages in time. The Wang Fen Mine, for example, need to pay the extra 16,000,000 RMB to the retired workers so as to make up the inadequacy of the social pensions.

In 1996 the three mines had 6,100 retired workers, which was nearly at the 1:1 ratio with the number of the workers on the job. The latest investigation on the Wang Fen Co. Group shows that there are 2,400 retired workers, 900 laid-off workers and 2,400

workers on the job. This means that the workers on the job are overburdened with the support responsibility, which restricts the development capability of the area.

The social income in the Zhong Zhan District shows an obvious declining tendency, as the regional average income level begins to decrease with the reduction in employment. In 1991 the local average wage is 7,000 RMB per year/person, and it decreased to 4,820-4,500 RMB in 1998. This has chain reactions through a decline of the city consumption power, and in commercial and service business, the reduction in employment rate and of the wage level in the relative careers, and the slump of the industries serving the city, including food processing and livestock industry, and vegetable industry. The income growth rate in the villages is also affected consequently.

2. Environmental damage caused by the coal excavation and the impact of the sinking of the earth surface on the poverty alleviation in the countryside

The sinking of the earth surface caused by the over excavation of the mines made the countryside of the Zhong Zhan District suffer from the significant economic losses. The sinking area is mainly located in the south of the District, i.e. the Zhu Cun Village which is itself in the plain area and has the best soil in the district, while the rest of the District is on a hilly land. Due to the over-excavation in the coal mines, the cultivated land of the village declined from 30000 mu to 10000 mu. Many of the farmlands were abandoned and the farmers no longer invested. It becomes difficult to increase the income of the farmers. The reduction of the cultivated land and the geographic disasters caused by the sink of the earth surface made the farmers suffer economic losses.

The roads in the villages are frequently damaged by the sinking of the earth surface. The sink of earth caused by the excavation of coal mines should have been protected by corrective projects by the mine, but the mine enterprises do not have sufficient capital for the purpose. The retirement of the coal mines left many problems for the environment which require great amount of financial support. The ecological restoration projects of this kind, have not been listed on the agenda of the mines and government due to inadequate financial resources.

Main actions undertaken by the Mining Management Bureau and the Government of Zhong Zhan District for poverty alleviation

The poverty alleviation of the Zhong Zhan District is promoted together by government, the enterprises and the society, which is a typical solution by China in its economic transition period.

The new social security system of Zhong Zhan District was formally established in March 1998. The social security of the District used to be divided into two systems. Before 1998, the mines in the District belonged to the National Coal Industry Ministry which was responsible for the social security affairs of the mines. In 1998 with the readjustment of the Chinese governmental institutions, the National Coal Industry Ministry was abolished and the Mining Management Bureau of the Jiao Zuo city which is in charge of the three mines, descended from a national mine unit at central level to an enterprise subject to the provincial mining management department and further descended to a local enterprise. The social aid fund of the employees in the mines in the Zhong Zhan District was formerly paid by the National Coal Industry System and after the Reform it gets resources mainly from the local government and the enterprises.

The Management Authority and Management Method of the Social Aid: With the deepening of the reform of the market institution, the pattern that the enterprises responsible for the social aid begins to develop into a co-responsibility with clear definition of tasks between the enterprises and the government. The social security and the aid to the poverty population have been moved into the hand of the government, and the Zhong Zhan District has formally established the social security system oriented by the government and put it into operation since March 1998. The Civil Affairs Bureau of the local government is in charge of the city poverty population fund, which is provided by the city government and the district government each of whom pays 50 per cent of the fund, i.e. 100,000 RMB. The fund is granted by the inhabitants, quite different from the old pattern of granting by the employees' working units, thus enlarging the coverage. Up till now, the aid-receiving population accounts for 0.6 per cent of the overall population of the Zhong Zhan District. The aid is granted monthly with the amount referring to the local minimum living standard (105 RMB per month / person). The objects

of the social security system in the District are mainly the laid-off workers' families, which account for 80 per cent of the aid-receiving population.

Chinese Social Security System is now in the transition period. The enterprises are still burdened with many social security tasks. There are two kinds of actions undertaken by the enterprises in aiding the poor: (a) One is to contribute to the living expense subsidy paid to the laid-off workers. The enterprises are responsible for one third of the living expense payment to the laid-off workers, which is actually shared by the government budget, social unemployment insurance fund and the enterprises. In order to alleviate poverty and protect the living of the employees from dropping below the minimum living line, the enterprises require one member of the couple retrenching to be laid-off in the process of employees. It is estimated that the poverty occurrence rate in the District was lowered by 50 per cent by this measure. (b) The other is to provide aids and subsidies through the enterprises welfare fund to the residents who though above the minimum living line, have real difficulties in living, to which the trade union is mainly responsible. This kind of aid is also indispensable to the alleviation of the poverty. According to the investigation in Wang Fen Mine, each family of this kind receives 600 RMB subsidy every year before the Spring Festival.

Poverty Alleviation of the Retired Workers: Due to the high ratio of senility in the retired workers of Zhong Zhan District, it is still not sufficient to draw 20 per cent of the wage total of the workers on the job as social pensions. Thus the National Coal Industry Bureau as the authority in charge made a new regulation in 1999, that in addition to the 20 per cent, each mine should add 15.05 per cent of the wage total to the pension. Consequently, The Wang Fen Mine has to pay the extra 16,000,000 RMB apart from the payment to the Social Unemployment Insurance Fund for the workers on the job and the retirement fund for the employees so as to make up the inadequate part of the retired workers' pension.

The sustainable development of mining cities

The Sustainable Development of the Mining Cities faces many constraints:

(1) Mining cities developed on the basis of the exploitation and operation of the mining resource. However due to the impossibility in the continuous usage of the resources, the mining economy is doomed to experience decline and exhaustion. If the economy is based on the single mining industry, and relies too much on one specific product without cultivating new industry as substitutes, then the city will be in poverty once the resources is exhausted.

(2) The development of the mining industry exerts great impact on the environment of the city and the neighbouring area. The environment of many mining cites has been severely polluted and the damaged earth resources can not be restored. Some of the cities have to face the dilemma of the exhaustion of the resources and the heavy task of ecological improvement.

(3) The mining industry is highly labour-intensive. In the early period of the mining cities a large percentage population was "half worker half farmer." An apparently high level of urbanisation was combined with a low education level. Thus, the labour force has few opportunities of finding new positions once the resources are exhausted.

(4) The transformation cost of the mining industry is very high. It includes investment in new property, human resources and in technology, long period for ecological restoration and investment to replace out of date infrastructures in the mining cities. Most of the mining cities in China are the societies dependent on the enterprises, and the heavy social burden makes the property readjustment in these cities a very painstaking process, during which the impoverishment of the employees in the mines is also aggravated.

Therefore, the sustainable development of the mining cities should have its unique solutions:

(1) It is necessary to master the cycle of the mining industry, and use the capital accumulation gained in the production bloom to promote the development of the other industries and a third property. The city economy though on the dominant property, has to foster the new substitute property, and in the meantime cultivate new economic growth strong points. This will start the development cycle earlier than that of the exhaustion of resources. The urban poverty caused by the

closing of some of the mines in the Zhong Zhan District can then be avoided.

(2) To enhance the inter-regional relations among the mining cities, sustainable development of the mining cities should be closely connected with the regional development. The relations with the neighbouring countryside, mining cities and economic circles should be strengthened with reliance on the central city, so as to radiate the power of the mining cities, promote the regional economy, alleviate the poverty in the areas and stimulate the mining cities to open their development spaces.

(3) Strengthen environmental protection, so as to have a harmonised development between the environment and economy in the mining cities. The environmental problems stemming from the development of the mining cites are not beneficial to the existence and development of the residents both in the mining area and in the region at large. Some disasters caused by the excavation of the mines bring about even more ecological problems to the neighbouring countryside. Therefore significant consideration should be given to the environmental problems caused by the early excavation in the mines, and the mining cities should cut the cost of ecological repair, and insist on a harmonised development between the environment and the economy.

NOTES

[1] Translated by Chen Zhensheng, Zhou Yunfan, Shen Jinjian and Wu Qianlan.

[2] According to the National Development Program of the Seventh Five-Year Plan, the whole country is divided into three economic zones: the Eastern zone includes twelve Provinces and Cities: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiansu, Zhejiang, Fujian, Shangdong, Gaunxi and Hainan; the Middle zone (nine Provinces and Autonomous Regions): Shanxi, Inner Mongolia, Jilin, Helongjian, Anhui, Jiangxi, Henan, Hubel, Hunan; the Western zone (nine Provinces and Autonomous Regions): Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Ningxia, Qunhia, Xinjiang.

[3] Source: Ministry of Labour and Social Security.

REFERENCES

Chen, Fan. 1998. "Some Issues on Poverty in China," in *Rural Manuscript* No. 9.

Fu, Min, ed. 1996. *Behavior of Government in Shaking off Poverty*. Hubei Science and Technology Publishing House.

Li, Chenggui. 1999. *China's Agricultural Policies: Structure and Applied Analysis*. Beijing Social Sciences Publishing House, January.

Li, Chenggui. 1999. "Formation, Changes and Adjustment of Agricultural Structure in China," in *China's Rural Ecoomy* No. 5.

Li, Zhou, Ruomei Sun, et al. 1997. *On Relationship Between a Way of Cultivation in Poor Mountain Areas and Eco-Changes*. Shanxi Economic Publishing House.

Mo, Rong. 1998-99. "Situation of Employment and Prospect in China," in *China Analysis and Forecast on Chinese Social Situation*. Beijing Social Sciences Publishing House, Jan.

Office of Aid Poverty Under State Council. "A Collection of Document and Speech in Tree Western Areas (1990-1997)."

Statistics Publishing House. "*A Year Book of China's Statistics* 1990-1998."

Tang, Jun. 1998. *A Study on Poverty Line of Urban Poor Residents*. Shanghai Social Sciences Publishing House.

Tang, Jun. 1999. "An Analysis on Poverty and Fight of Against Poverty in China," *in Analysis and Forecast on Chinese Social Situation*. Beijing Social Sciences Publishing House, Jan.

Tao, Siming. 1998. "Pressure on Protection Zone of Caohai Region and Sustainable Management," *Environmental Protection* No. 3.

Wang, Chengen, Jingyu Cai, and Jun Tang. 1999. "Living Situation and Demand of Urban Poor households," *A Case Study.*

Wang, Huijong. 1998. "Review and Prospect of Aid Poverty Work in China," *A Collection of Social Aid Poverty Seminar,* July.

Xu, Haoling. 1997. *Environmental Issue to the Next Century – A Study Report*. July.

Zhao, Renwei. 1999. *Re-Study on Income Distribution of Chinese Residents*. China Finance and Economics Publishing House, Beijing May.

STATISTICAL APPENDIX

Table A.1 Land Characteristics

Item	Area	Percentage to Total Area (?)
Total Land Area (10 000 sq. km.)	960	100.00
By Topographic Feature (10 000 sq. km.)		
Mountains	320	33.33
Plateaus	250	26.04
Basins	180	18.75
Plains	115	11.98
Hills	95	9.90
By Altitude (10 000 sq. km.)		
Under 500 m	241.7	25.18
500-1 000 m	162.5	16.93
1 000-2 000 m	239.9	24.99
2 000-3 000 m	67.6	7.04
Above 3 000 m	248.3	25.86
By Land Use (10 000 hectares)		
Cultivated Land	9 497	9.83
Forests	13 370	13.84
Water Area inland	1 747	1.81
Area of Grassland	40 000	41.41
Useable Area	31 333	32.44
Others	31 986	33.11

Notes: Most figures in this table were obtained from surverys in previous years. The figure of cultivated land is underestimated, and is subject to further verification.

Table A.2 Natural Resources

Item	1997
Land Resources (10 000 hectares)	
Forest Resources	
Total Standing Stock Volume (100 million cu.m)	117.85
Forest Area (10 000 hectares)	13 370
Stock Volume of the Forest (100 million cu.m)	101.37
Forest-coverage Rate(?)	13.92
Water Resources	
In land	
Surface Water Volume (100 million cu.m)	28 124
Surface Runoff (100 million cu.m)	27 115
Melt-Water Volume of Glaciers (100 million cu.m)	560
Shallow Ground Water Volume (100 million cu.m)	8 287
Hydropower Resources (100 million kw)	6.76
Developable Resources	3.79
Inland Water Area (10 000 hectares)	1 747
Cultivatable Area	675
Cultivated Area	467
Sea	
Theoretical Sea-energy Reserves (100 million kw)	6.3
Coastal Area (10 000 sq. km.)	28
Seabeach Area (10 000 sq. km.)	2.08
Cultivatable Area in Marine Areas (10 000 hectares)	260.01
Cultivated Area (10 000 hectares)	71.6
Cultivable Area in Shallow Sea and Sea beaches (10 000 hectares)	242.0
Cultivated Area (10 000 hectares)	55.6
Mineral Resources (Ensured Reserves) (100 000 000 ton)	
Coal	10 024.9
Iron Ore	463.5
Phosphate Ore	152.0
Sylvite	4.6
Salt	4 075.0

Notes:
a. Figures on natural resources do not include those of Taiwan Province.
b. Figures on land and water resources in this table were obtained from surveys in previous years. The figures are subject to further verification.
c. Figures on forest resources were taken from the Third Forest Census (1989-1993).

Data on mineral resources refer to 1993.

Table A.3 Major Rivers

River	Drainage Area (sq. km.)	Length (km)	Annual Flow (100 million cu. m)
Changjiang River (Yangtze River)	1 808 500	6 300	9 513
Huanghe River (Yellow River)	752 443	5 464	661
Songhuajiang River	557 180	2 308	762
Liaohe River	228 960	1 390	148
Zhujiang River (Pear River)	453 690	2 214	3 338
Haihe River	263 631	1 090	228
Huaihe River	269 283	1 000	622

Table A.4 Population and its Composition (unit: million persons)

Year	Total Population (year-end)	By Sex				By Residence			
		Male		Female		Urban		Rural	
		Pop'n	Proport. (%)	Pop'n	Proport. (%)	Pop'n	Proport. (%)	Pop'n	Proport. (%)
1952	575	298	51.90	276	48.10	72	12.46	503	87.54
1957	647	335	51.77	312	48.23	99	15.39	547	84.61
1962	673	345	51.29	328	48.71	117	17.33	556	82.67
1965	725	371	51.18	354	48.82	130	17.98	595	82.02
1970	830	427	51.43	403	48.57	144	17.38	686	82.62
1975	924	476	51.47	449	48.53	160	17.34	764	82.66
1980	987	508	51.45	479	48.55	191	19.39	796	80.61
1985	1 059	547	51.70	511	48.30	251	23.71	808	76.29
1990	1 143	589	51.52	554	48.48	302	26.41	841	
1991	1 158	595	51.34	564	48.66	305	26.37	853	73.63
1992	1 172	598	51.05	574	48.95	324	27.63	848	72.37
1993	1 185	605	51.02	580	48.98	334	28.14	852	71.86
1994	1 198	612	51.10	586	48.90	343	28.62	855	71.38
1995	1 211	618	51.03	593	48.97	352	29.04	859	70.96
1996	1 224	622	50.82	602	49.18	359	29.37	864	70.63
1997	1 236	631	51.07	605	48.93	370	29.92	866	70.08

Notes: Data in 1982-1989 were adjusted on the basis of the 1982 and 1990 National Population Censuses. Since 1990, data have been estimated on the basis of the annual National Sample Surveys on Population hanges. Data of other years were taken from the annual reports of the Ministry of Public Security. Data in this table include the military personnel, but exclude the population of Hong Kong, Macao and Taiwan.

Chapter 4

POVERTY AND ENVIRONMENT IN A NEWLY INDUSTRIALISED COUNTRY: THE CASE OF KOREA

YOUNG-PYOUNG KIM
President, Korea Institute of Public Administration, Seoul

I. INTRODUCTION

South Korea is a mountainous country, 66 per cent of the land consisting of densely forested, rugged mountains. The Korean peninsula has a long history of human habitation. The land has rich soil and the climate consists of four distinct seasons. It is a populous country with 45.5 million persons inhabiting 99,268 sq. km. With 459 persons per sq. km., Korea has one of the highest population densities in the world. Reflecting relatively recent urbanisation, the vast majority of the population resides in urban areas. Fully one half of the population is congested in six metropolitan areas.

Only four decades ago, Korea was a typical agrarian society stricken by war and poverty. Most people lived in widely dispersed rural areas. The environment was not included in the list of people's concerns. Emergence from poverty was the most pressing mission of the nation, and in its name many social evils such as military coup d'etats, family disorganisation and environmental pollution were justified. Korean environmental problems have arisen from industrialisation and its consequent urbanisation. It is a kind of Faustian contract for Koreans to graduate from poverty at the sacrifice

of the environment. After they came to enjoy a relatively prosperous life, they raised environmental problems as a matter of balance. Poverty was the base which they must start from rather than the burden which they must lay down.

This paper seeks to examine the relationship between poverty and environment in Korea. This is a country profile as part of the Poverty and Environment Project of AASSREC's joint research program. The emphasis required by the project is to describe a schematic outline of the Korean situation in terms of the linkages of poverty and environment. This paper looks at poverty and environmental degradation in a newly industrialised country. The first part of the paper provides some descriptions and statistical data about the Korean poverty and environmental situation. The second part discusses how the matter of poverty and environment has been dealt with in the context of economic development through industrialisation. The third tries to depict government policies which have influenced the environment of poor people in Korean society. The final part casts light on the role of non-governmental organisations (NGOs) regarding the issue of poverty and environment. Implications are drawn in the conclusion.

II. COUNTRY PROFILE ON POVERTY AND ENVIRONMENT

II.1 Poverty Features in Korea

Thanks to successful industrialisation, poverty issues such as chronic malnutrition and poor sanitation are proving to be largely problems of the past. Absolute poverty has decreased drastically in the past 40 years. However, Korea's newly industrialised society has come to experience such new problems as urban crime, traffic congestion, family disorganisation, and arguably the most serious one, environmental degradation. Yet protection from poverty is still an issue as urgent as protection of the environment.

Capitalist economic growth usually entails worsening income distribution in developing countries. However, the Korean developmental experience defies this trend. Income distribution during the rapid industrialisation period has shown relatively low inequality largely due to the lowered unemployment rate (Song 1994). Korea's Gini coefficient in 1988 is 0.34, which is lower than that of


China
East Sea
Kimpo WLS
Seoul
Inchon
Yellow Sea
Ulsan
Metropolitan City
Pusan

Australia (0.42), the USA (0.38) and even Japan (0.35). In fact, Korean distributive indices have largely improved in the course of economic development. The Gini coefficient in 1996 was 0.295 while the figure for 1993 was 0.31. The richest 10 per cent population earned 23 per cent of GNP in 1996 while the poorest took only 2.8 per cent. The figures for 1988 were 27.6 per cent and 2.8 per cent, respectively.

The incidence of poverty as measured by the proportion of the population below the poverty line has fallen significantly, matching levels typical of advanced countries. Whereas the incidence of poverty was 40.9 per cent in 1965, the figure dropped sharply to 9.8 per cent by 1980 and has continued to fall. In 1991, 3.1 per cent of the population, or 1.4 million persons, were below the poverty line (Roh 1995).

Another telling statistic is the number of poverty-stricken recipients of government assistance. It has successively decreased since 1985 in spite of the yearly raising of legal poverty standards. There were 2,273,000 recipients in 1985 and 2,255,000 in 1990. The figure dropped to 1,755,000 by 1995, and dropped a further 24 per cent by 1997.

The standards for determining eligibility for government assistance are dependent on such variables as income level, family property ownership, inflation rate, and other factors recommended by concerned research institutes. Poverty is of course defined in relative terms. For example, the per capita poverty income line was set at $2,400 thousand ($3,400) in 1996, compared to $960 thousand ($1,900) in 1992. The threshold for family property ownership was set at $25,000 thousand ($35,000) in 1996, which was a big jump from the 1992 standard of $10,000 thousand (about $20,000). The standards of legal poverty are determined in terms of economic conditions, government financial capacity and the priority of social policies. The standards have been largely consistent for a decade. The government reports that the legal poverty standards in 1998 reflect the full range of minimum living expenses for the first time in Korean history (MHW 1998).

The statistics regarding legal poverty are the only available source which furnishes concrete numbers about those living in poverty, yet these figures should be interpreted with caution. For example, one half of the total population lives in metropolitan areas

and only one fifth of them are rural dwellers. Yet of those legally designated as in poverty, only one quarter live in metropolitan areas. This, however, may be misleading because soaring land and housing prices in metropolitan areas would suggest that family property ownership in these cases is being overvalued in the designation process. Accordingly, it can be argued that Korean public assistance programs place too much weight on illiquid housing assets while placing too little weight on the ability to cover daily living expenses.

Taking into account the numbers cited in government poverty protection programs, rural poverty would appear to be much more serious than urban counterpart. Focusing solely on disposable income, however, Korean poverty appears to be much more an urban phenomenon than a rural one. For example, the incidence of urban poverty was 8.7 per cent in 1991, while the rural counterpart was 2.8 per cent. The argument is more plausible when considering the fact that monthly living expenses even at the minimum level are much higher for urban than rural dwellers (Park 1997; Kown et al. 1993; SIK 1992-1998; FIES 1992-1998).

Korean urban poverty seems to be a product of rapid industrialisation and urbanisation in the last four decades. Not only the rural poor migrated to cities so as to seek new opportunities. The rural rich also sent their children to cities for a better education. Migration to urban areas was so widespread that the urban-rural population ratio of 20-80 in the early 1960s came to be completely reversed by the middle of the 1990s. Thus, in terms of sheer numbers, current poverty issues in Korea centre more on urban than rural areas.

The tide of urban migration developed a unique shape in Korean urbanisation. Most poor migrants flocked into urban squatter settlements as a consequence of soaring urban housing prices. Low income residents frequently settled in urban fringe areas where housing prices were relatively low and job information for unskilled labourers was easily available. Most urban squatter settlements were located on or near hills, flooded plains, garbage processing plants, sewage treatment facilities, and other areas which are prone to adverse environmental conditions. They build or rent their dwellings, which are often illegal, thus implicating a risk of government expulsion or relocation. Moreover, their housing construction often fails to meet government safety requirements.

The number of impoverished households is informally estimated to be about one million. According to an informal report of 1998, the government estimates a potential poverty class about 1,940,000 plus the legal-designated poverty class of 1,175,000. Potential poverty is inferred from the consequences of the sudden economic crisis which began in late 1997 and occasioned an IMF bailout. The figure represented a worst case estimate for a government bracing for escalating expenditures associated with a soon-to-be expanded social safety net.

The Korean government maintains several poverty protection programs. The most universal is the livelihood protection programs in which the government is offering social welfare programs to the legally-designated impoverished. There are three types of these programs. "Home-stay care" is directed to those who have no capacity for both labouring and providing sufficient living arrangements. Assistance usually includes living expenses, temporary work in public employment schemes, educational assistance, medical assistance, and intermittent job training. "Institutional care" is provided to those who are interned in social institutions because they have no housing or no ability to subsist through home-stay cares. The level of protection for both types of programs is about the same. Finally, the third type of program is "self-reliance care" in which one of the family members has a labouring capacity, but their income level is below the poverty protection level. The protections in this category include medical assistance, educational assistance, and the opportunity for public employment such as street cleaning or park maintenance. Sometimes, the government will extend them loans for small businesses.[1]

The largest part of those receiving government assistance consist of households with people over 65 years old or under 18 years old. Average ages of the people receiving home-stay protection and self-reliance protection are 63 and 52 years respectively. Households with disabled persons are the third largest part. Because of their health condition, opportunities for gainful employment may be quite limited. This is why the government has continually expanded the benefits afforded to these citizens.

Another kind of welfare program for the poor is medical aid.[2] Not only those legally designated as impoverished are beneficiaries

of medical assistance. Low-income individuals who are deemed unable to provide for their own medical needs are also eligible to public medical assistance. Such medical assistance, along with public-private medical insurance schemes, is an important part of the medical welfare system in Korea.

1998 was a cruel year for the Korean poor. The economic crisis which began in late 1997 produced massive unemployment. The socalled enterprise-restructuring to cope with the crisis was mainly aimed at laying-off unskilled labours. Of the estimated 1.3 million newly unemployed, 800 thousand are included in the marginal classes which are not protected either by legal poverty protection or by any other form of social safety net.[3] As part of unemployment protection measures, the government increased the number of emergency livelihood protection recipients up to 310 thousand by appropriating an additional ₩180 billion.

A new phenomenon observed along with the economic crisis is a massive increase in the number of homeless people. The homeless may be more desolate than the legal poverty class. There are no exact statistics of this poverty class.[4] As of the end of 1997, 13,000 were interned in 43 institutes receiving government assistance. The government provided an additional ₩20 billion for emergency care for them during 1998, plus the routine annual appropriation of ₩11.6 billion. In spite of increased government efforts, the majority of the homeless are presumed to be out of reach of government help. With good weather, they disperse to many urban parks and other facilities. During the winter, most of them tend to congregate around metropolitan railway stations or subway stations so as to protect themselves from the elements. Since these places are open to the public, they can access such areas freely and often seek handouts. Such behaviour contributes to the degradation of urban public facilities. Government authorities try hard to intern homeless people in welfare institutes and to offer them some social adaptive training, but such efforts achieve only partial success. Fortunately, the number of homeless is decreasing as the economic situation improves in 1999. But this new social phenomenon has brought out new aspects of the poverty problem as well as new challenges for maintaining the quality of the environment in metropolitan areas.

II.2 The Korean Environmental Profile

Industrialisation has provided Koreans with a better quality of life in general, but not in all respects. Environmental degradation has been arguably the most significant cost of industrialisation. Three decades of rapid economic development required not only the consumption of tremendous amounts of non-renewable resources such as fossil fuels and minerals, but also resulted in the pollution of air, water and land with enormous volumes of toxins and hazardous materials.

The cost of rapid industrialisation has been an accelerating rate of environmental degradation, as evinced by many indicators. For example, the number of registered automobiles in Korea has been increasing exponentially from 30,000 in 1960, to 84,000 in 1975, to more than 800,000 in 1985, to over 6,000,000 in 1995. The number of auto-vehicles surpassed the level of 10 million in 1998. The number of average riders per vehicle was 704.3 in 1975. It had become 90.9 in 1985 and reduced to 7.8 in 1995. Naturally, the amount of pollutants emitted from the cars would be proportionate to their number. Energy consumption is another indicator associated with environmental degradation. Energy consumption per capita (unit: TOE) increased from 0.72 in 1975 to 1.15 in 1985, and more than doubled over the following decade, reaching 2.72 in 1995 (SIK 1998).

Air quality tends to vary seasonally and regionally. In Korea, fuels are consumed in greater amounts in the winter for heating as temperatures often plunge well below freezing. Regionally, air quality seems to be worse in poor communities than in rich ones since the latter tend to use cleaner, more convenient, though more expensive fuels. Poor households largely rely on briquette coals for heating, the price of which has been much lower than clean fuels like natural gas and petroleum (Kim 1994). But we must pay attention to the fact that the difference between the communities has not been stubbornly resistant to change. Rapid economic development makes the poor capable of following the rich in fuel consumption sooner or later.

The deterioration of environmental quality may be unavoidable under the circumstances of industrialisation. But the situation in Korea is not hopeless. With the increase in income, Koreans began to invest in the protection and preservation of environment.

From the 1990s, air quality has actually improved in most of Korea's metropolitan areas, where the worst sources of pollutants such as high density of manufacturing factories, congested traffic jams and the massive burning of fuel for heating are to be found. Such pollutants as SO2, TSP and CO have been remarkably reduced while NO2 and O2 (ozone) have been slightly increased largely because of the explosion of cars on the streets. We can attribute this improvement largely to government policies aimed at encouraging the switch to cleaner (e.g. lead-free) fuels since the late 1980s.

The water quality in major rivers, on the other hand, has become ever much worse. On average, BOD has been increasing 25 per cent per decade. A hopeful sign is that the Korean government successfully expanded the capacity of sewage treatment systems from 5.2 million tons per day in 1991 to 15 million tons per day in 1997 – a threefold expansion in only 6 years. If the expansion of the system continues as planned, the trend in river quality could be reversed. Most tap water in the nation is produced from river water.

It is not possible to claim that ocean water quality is improving in major coastal areas. It is fluctuating every year, but the ocean water quality at present is about the same level as in 1990. We can conclude that it has not significantly deteriorated during the most recent decade in terms of BOD. However, we are experiencing environmental warnings in other respects. Red tides in the ocean and green tides near dams have been observed both more frequently and in wider, more dispersed areas of water. This has been largely due to accumulated organic pollutants associated with feeding fodder used in fish farming.

Overall, the immediate future for water quality does not appear to be very bright. While it is true that waste water treatment facilities have increased 3 times in terms of capacity in the 1990s, this progress is less impressive than it sounds. This is because, at the same, the volume of waste water to be treated has been increasing at a comparable, albeit slightly lower, rate. People are awaiting a dramatic improvement in environmental policies. Otherwise, it is certain that they must suffer from contaminated drinking water and food in the near future.

Another environmental threat in Korea is solid waste and sewage. Domestic waste has been reduced in the 1990s, thanks to the replacement of heating fuels from briquette coal to LNG, LPG, and/or petroleum. Another effective policy for waste reduction has been government measures to introduce designated trash bags which must be purchased by users. These measures have been very effective in reducing domestic and food wastes. However, an opposite trend can be seen in the increasing volume of industrial waste and sewage as well as specified waste, which are shadow indices of industrial prosperity. Specified wastes include such diverse elements as waste acid, alkali, oil, organic solvents, synthetic compounds, sludge, gypsum, and animal remnants, all of which are most troublesome to safely dispose of. Another disturbing trend is the increase of waste discharge at sea, since the government appears to have few effective means to curb this activity.

Many other environmental quality indices show a similarly clouded picture of contradictory trends. Certain aspects of environment quality have been improving in recent years with most environmental indices of traditional pollutants coming within tolerance levels specified in government regulations. On the other hand, Koreans are exposing some previously unexperienced problems in terms of acid rain, smog-covered skies in major cities, and river contamination. More serious is that these forms of environmental deterioration are accelerating.

III. POVERTY AND ENVIRONMENT IN THE CONTEXT OF DEVELOPMENT

Korean urbanisation is a direct consequence of industrialisation. For example, the population of Seoul was around 500,000 in 1948 when the Republic of Korea was founded. It was the capital city of the Chosun dynasty for more than 500 years. Its population at present is over 10 million – a twentyfold increase in only 50 years. The "Great Capital Area" including Inchon, Suwon, Eujongbu, Songnam and other small cities surrounding Seoul is a huge combined metropolis whose population accounts for almost half of the national population of 46 million.

Metropolitan cities have mushroomed as a consequence of rapid development. Urban areas, which contain more than 80 per cent of the national population, have been the seedbeds of industrialisation

and economic prosperity. At the same time, they are also the major locus of poverty problems as well as environmental maladies.

The environment-poverty issues arise more often in urban than rural settings in Korea. Housing conditions and living locations bear a close relationship to environmental degradation in cities. In particular, the selection of housing location is a function of household wealth. Considering most Korean environmental problems are associated with manufacturing processes and urbanisation, it is clear why low-income communities bear greater environmental burdens than the affluent. Communities close to unwanted land uses such as waste landfills, incinerators, sewage treatment plants, lead smelters, refineries, and other noxious facilities are much more likely to be communities of the poor. The community as a whole may be a consequence of social evolution: The affluent tend to move out of, and the poor into, an environmentally disadvantaged community. Consequently, environmental impacts are accounted for by community-level rather than individual-level characteristics such as simple income.

However, the demarcation between the poor and the rich communities is not yet clearly structured in most Korean cities. Four decades may be a period too short to draw a distinctive sociological differentiation. In addition, Korean society is one of the most homogeneous nation in the world in terms of race, language and culture. There is no social resistance to school zoning in which poor and rich children are educated in the same classroom. Rather, the notion of a breed apart is considered abnormal in Korea.

Despite the relatively low degree of social cleavage, urban housing prices do separate the poor from the rich, not only geographically, but also in terms of quality of life. The living conditions of poor communities in terms of environmental quality seem to be far below that of some affluent communities. In Korea, thus far there has been relatively little research examining the relationships between poverty and environment. Lacking concrete data, journalistic insights may be useful along with anecdotal evidence gleaned from various sources.

Towards an efficient development strategy, the Korean government has constructed many industrial parks in or near key cities in which manufacturing factories were concentrated. As a

by-product, environmental pollution discharges also accumulated in the areas. It is a natural consequence that the communities near the industrial parks represent the areas most likely to suffer from harmful substances emitted by chemical industries, from disturbing noises from construction sites, and from bad odours from waste treatment facilities. Those areas are usually close to the poor communities within a city.

A poor community, even distant from an industrial park, is typically environmentally disadvantaged in other respects as well. Hilly locations and narrow lanes are unfavourable in terms of removing domestic wastes, especially the heavy briquette coal ashes, to the roads accessible by garbage trucks. This means dirty remnants are more prevalent, and cleaning them is more costly.

Another difficulty in many poor communities is water access. In the Seoul metropolitan area, for example, 98 per cent of residents have access to tap water but 12 per cent of them rely on community water supply facilities for common use. The water quality should be the same in the area regardless of economic status. But the location may affect the reliability of water supply. Poor communities scattered on hilly slopes sometimes experience inadequate water supply due to the lack of pumping pressure and the erosion of water pipes. Poor, hilly communities with unreliable tap water supply may also be confronted with environmental damages stemming from water shortage rather than water contamination.

One research report published in 1994 found that the level of air pollution in poor communities was much higher than in rich ones, mainly because of the fact that poor households largely relied on briquette coals for heating fuel, the burning of which produced considerable amounts of CO and CO2 as well as smoke fumes (Kim 1994). This report, however, is already obsolete, given the Korean pace of change. At present, a majority of even poor urban households rely more on LPG, LNG, or petroleum than briquette coals. Annual statistics of urban air pollution show that the amount of air pollution from heating systems has drastically decreased, while that from other polluting sources including industry, transportation, and electric generators has increased, though at a moderate rate. Recent reduction in briquette coal usage contributed to improved air quality in poor communities. Unequal exposure to air pollution is no longer tied as much to community type in a given city. Rather, it is more a function

of whether polluting industries are concentrated in a particular city or not. Such cities as Ulsan, Changwon, Pohang, Inchon and Banwol, all of which are the home of large-scale industrial parks, are known to suffer from the worst air quality in the nation.

III.1 Government Policies on the Environment of the Poor

The improvement of environmental quality, particularly in the 1990s, is attributable to both governmental efforts and to non-governmental citizen groups' activities. Korean economic prosperity has led these groups to consider quality of life not only in a narrow material sense, but also in terms of environmental quality, community welfare and leisure. More and more people have started joining environmental NGOs and responding to environmental problems in a more manifest manner through organised activities.

The Korean government had taken a stance of negligence about, if not hostility against, environmental issues until it established the Ministry of Environment (MOE) in 1990 (the minister of which is a full member of the Presidential cabinet). Development-driven authoritarian regimes regarded environmental concerns as an obstacle to the goal of economic growth. They tended to be suppressive, or even oppressive, about environmental citizen movements, in spite of the cosmetic enactment of anti-pollution institutions.

As a formal institutional measure, the Korean government first enacted the Anti-Pollution Law in 1963, just one year after the first Five-Year Economic Development Plan was launched. A minuscule portion (0.005 per cent) of the government budget was allocated for the first time for anti-pollution functions in 1970 (Moon and Yang 1995). In 1977, the Anti-Pollution Law was replaced by the Environmental Preservation Act. An article proclaiming "the people's right to a clean and healthy environment" was included in the revised constitution of 1980. At the same time, a semi-independent and sub-ministerial agency, the Environment Administration, was established to take charge of the government functions for environmental protection. However, the government's level of commitment to tackling environmental pollution, as indicated by budget appropriations and meaningful actions taken, would suggest that the aforementioned measures were largely symbolic and cosmetic.

The birth of the MOE was a turning point indicating the Korean government made environmental concerns a major policy priority. It signalled a significant change in the institutional arrangements in national politics. Since the ministerial empowerment of the agency, government appropriation for the environmental sector has been considerably expanded. Reflecting increased policy priority, MOE tried to make various environment-related laws, regulations, and institutions more systematic and took a cooperative stance toward citizen environmental movements. The importance attached to environmental policy has been remarkably increased, especially in the later half of 1990s. Government appropriation for the environmental sector was 0.27 per cent of GNP in 1993, but was quickly increased to 1 per cent after 1995.

A new era has started in the Korean history of environmental protection and preservation. New democratic governance expanded the space for NGOs to help awaken and foster environmental values. International circumstances have also changed in favour of environmental protection since the Rio Environmental Conference of 1992 and the agenda to link trade with environment adopted by GATT/World Trade Organisation in 1994. Such changes led the government to recognise some industrial implications of environmental values. Societal awareness of the importance of environmental quality to the quality of life was added to what was previously a sole pre-occupation with increasing national wealth (Kim 1998; Moon and Yang 1995; Kim et al. 1994; OGI 1997: 76).

Environmental protection policies are generally purported to improve environmental quality as a public good. Moreover, environmental improvement benefits both the rich and the poor. Since most environmental protection efforts rely on regulatory policies, they inevitably have a redistributive effect, taking income from one group and in effect giving it to another. Social regulation, including environmental regulation, usually attempts to redistribute income in a broad sense to a large latent group which would be adversely affected by the negative externalities associated with production and consumption activities (Williams and Matheny 1995: 68). In sum, either intentionally or unintentionally, environmental protection policies may alter distributional outcomes (Paehlke 1989: 274).

Even with such distributive implications, regulations on environmental common goods typically are not targeted to a specific

social class or income level. Thus, only a few cases provide a clear distributive effect on low income classes. However, regarding Korean environmental policies, there appear to be examples of policies whose distributional consequences adversely affect the poor.

The first example is environmental conservation zones. The Korean government maintains ecological conservation zones to protect endangered species, indigenous species, natural forests and marine ecology. Another conservation system is the water resource protection zone around the upstream areas of major rivers to keep the tap water source clean. Conservation zones have been extended to wide areas. The total size of ecological conservation is 91 sq. km., and for water protection it extends to 1,149 sq. km. (MOE, 1992-1998). People living in and around these areas face a variety of economic constraints and costs. For example, the use of chemical fertilisers and pesticides is limited in water protection zones. Normal cultivation of agriculture as well as construction activities are sometimes prohibited in the areas. It is important to note that, because these areas are usually remote and rural, the average income level of the inhabitants tends to be far lower than urban industrial areas. A large proportion of people's complaints regarding environmental regulatory policies emanate from such conservation areas.

It is clear that these conservation measures are not deliberately intended to alter income distribution. Certainly, there is no unequal treatment of people on the basis of income in these areas. Some of them may enjoy the well-conserved environment in the areas. However, the conservation policies tend to strike the less-advantaged because there are no systematic compensation schemes to reverse the economic dislocations produced by these policies. Compensation tends to be indirect. The government provides various types of support to the areas in terms of construction of village warehouses, maintenance assistance for farm equipment, and educational assistance for the children in the areas in the form of libraries, school buses, and other school facilities. The government also assists with such income-generating projects as cooperative agriculture, organic fertiliser programs, and farm road and waterway construction. These forms of support in conservation areas are often less than adequate compensation for the loss of potential income.

The case of clean air policy may also involve some distributional implications. Clean air policy enforces emission criteria by

which polluting companies are classified as blue, green, yellow and red according to the volume of pollution and the frequency of law infractions. Another requirement for clean air is the use of clean fuel like LNG and the limited use of solid fuel like coal.

Most companies classified as red generally belong to marginal industries in the Korean market. Usually their businesses are small and their technology is outdated. The labourers working in such marginal industries are also marginal in terms of income level. The stricter the implementation of clean air regulations, the less likely these companies will survive. If the labourers of marginal industries are laid-off due to environmental protection policies, they may have difficulty in finding a new occupation. Skills found in marginal industries may be outmoded in the job market. A labourer from the marginal industry could end up permanently unemployed. Without special job training for them, the clean air policies are likely to achieve environmental benefits at the expense of marginal industries and their labourers.

The required use of clean fuels may have negative effects on income distribution in another respect. Due to the shortage of urban land, large populations are living in tall apartment complexes which are required to use clean fuel. Consequently, clean fuel policies increase housing expenses. Those who live in an apartment complex used to be the middle class in the Korean society since new residential facilities with central heating systems are much more comfortable than traditional housings. Recent urban redevelopment projects turn many urban squatter areas into apartment complexes. Urban redevelopment projects are merited in and nearby downtown. With the clean fuel policy, the poorest cannot afford the increase in housing expenses. They tend to leave newly assigned apartments. The clean fuel policy lets the poorest lose a chance of better housing. They have to find another squatter settlement which is likely to be worse in living conditions than before in terms of transportation, water supply and distance from downtown. Korean clean fuel policy tends to make conditions for the worse-off in society even worse.

Finally, and perhaps most importantly, the Korean strategy of industrialisation has had profound environmental impacts on the poor. For a variety of reasons, as described above, the Korean government constructed industrial parks at the early stage of industrialisation in 1960s and 1970s. Manufacturing factories were

induced to concentrate in the industrial parks. Each industrial park was broadly specialised; for example, heavy industry in Pohang and Ulsan, and chemical industry in Yochon and Onsan. Not much attention was paid to environment protection in the early industrialisation stage. Because of the concentrated polluting facilities, indigenous people residing nearby industrial parks suffered very much from the range of pollutants emitted from many different manufacturers.

The most critically distressed victims of environmental pollution were farmers and/or fishermen living nearby polluting industrial parks, many of whom were already living under conditions of minimal subsistence. The government authorities did not made any systematic attempts to protect them at the time. (See the case study below of the relocation of environmental victims from the Ulsan Industrial Park.)

III.2 NGOs on the Issues of Environment and Poverty

As indicated above, Korea's "Economy First" policy had treated environmental pollution as nothing more than an inevitable by-product of economic growth. The government took an oppressive position against environmental claims before its democratisation in 1989. Sporadic protest movements staged by local residents living near polluting industrial establishments were the only legitimate citizens' response accepted by the government. Once a protest movement broke out, participants were confined to local residents who were directly affected. The pollution damage disputes were resolved through quiet negotiation between the victims and the offenders. Such negotiations were usually mediated by government authorities in a quick manner (Moon and Yang 1995). Environmental protest movements at the time were a type of self-help effort on the part of those whose patience overran the zone of tolerance.

Before democratisation, anti-pollution movements were limited in scope and scale. They were organised temporarily to achieve such specific goals as the repayment of pollution damages or to coordinate opposition against backyard construction of dangerous facilities like nuclear power plants or toxic chemical plants. Only a few environmental NGOs tried to support the protest movements. Once their goals were achieved they were normally dissolved.

Citizen groups constituting a general environmental movement have blossomed since the start of the 1990s, largely due to increased democratisation and greater citizen awareness of environmental quality of life issues. These groups came to merge or coalesce into several umbrella organisations. The Anti-Pollution Movement Coalition is one of the most salient among the environmental citizen groups. The YMCA and the Coalition for Practicing Economic Justice also incorporated environmental issues into their agendas. Their activities expanded into environmental education, environmental monitoring, resource recycling, campaigns for strengthened environmental protection laws as well as public campaigns for environmental preservation. They also provided assistance to the victims of local environmental damages, including physical materials, spiritual support, technological knowledge and legal assistance.

A major concern of the citizen groups is to conserve the environment, which may be well matched with the interest of middle class citizens. Those who have available time and wealth are able to participate in an environmental citizen organisation on a voluntary basis. Their provision of support to environmental victims might often mean assistance to less well-off individuals.

Awareness is concern. When people learn to calculate their interests with a long-term view based on shared values, social class is not the critical determinant for a citizen's participation in NGOs. As environmental concerns became widespread in 1990s, they came to be a common subject of all classes in the society.

One interesting feature of Korean environmental NGOs is that most of their leaders are more proactive than polemic and more inclined to the progressive camp than to the business camp. Most of them were once involved in democratisation movements during the authoritarian regimes. Once having achieved democracy of the political regime, they turned their attention to some new future-oriented social movements, which include consumer protection, women's rights, and fair transactions against chaebol leaders (Korean business tycoon) as well as environmental protection. No doubt, environmental movements have been the most popular among voluntary citizen campaigns.

Another characteristic of these groups is a strong tendency to help the poor and the weak in society. NGOs follow a moral world-view. Environmental offenders are usually associated with business circles. They are powerful, strong and rich while environmental victims are seen as powerless, weak and poor. NGOs should be on the side of social justice. To help the poor and the weak is to realise justice. Even under autocratic oppression, NGO leaders took the risk of being jailed for teaching the environmental victims to unite, and for initiating what, at the time, were deemed unlawful protests. It was an environmental NGO which started a proxy law suit against pollutants on behalf of a number of unorganised powerless poor people. Korean NGOs are perceived to be the most reliable means of helping poor environmental victims in society. In many cases the efforts of environmental NGOs have prevented or delayed the emergence of a poverty trap among environmental victims.

III.3 Conclusion: Poverty and Environment in a NIC

The issue of the poverty-environment nexus is based on the criticism that the current environmental protection paradigm tends to institutionalise policies which result in greater environmental burdens being borne by low-income and/or minority communities vis-a-vis more advantaged groups. Poverty-and-environment theses focus on two lines of argument. In a developed country, low income populations typically experience higher-than-average exposure to selected air pollutants, hazardous waste, contaminated foods, and unhealthy conditions in the workplace (US EPA 1992). On the other hand, many less developed countries are caught in a vicious downwards spiral in which "poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival ever more difficult and uncertain" (WCED 1987: 27). Thus, the poor are both the agents and victims of environmental destruction.

It seems to be evident that low-income people live in or move to ecologically vulnerable areas because they are poor. However, many commentators on the poverty-environment hypotheses like to point out the importance of conditioning factors, while rejecting the universality of the theses (Hayes 1999; Reardon and Vosti 1995; Bullard 1995). Socioeconomic context as well as government

policies are the key to understanding specific poverty-environment linkages. Current environmental policies are executed at the juncture of science, technology, economics, politics, and ethics. Government policies mirror the larger social milieu where the poverty-environment linkages are constrained and structured.

Korea has been a rapidly developing country which now more closely approximates an industrialised, urbanised society than an agriculture-based, rural society. Korea is a homogeneous society in which income level does not imply a racial bias. Even though unequal environmental distribution turns out to be a social malady, it is more related to area and community than to income level. Korean society traditionally maintains a high degree of concern for equity, partly due to Confucianism and partly due to the legacy of its North-South confrontation. If environmental damages are systematically concentrated on the impoverished, the issue may yet emerge at the forefront of policy priorities.

Government policies and social dynamics helped, intentionally or unintentionally, to prevent any vicious circles involving poverty status in society and environmental degradation from forming. In the process of rapid industrialisation, many poor people have been victimised by environmental pollution from industrial facilities. The poverty status has not directly contributed to the degradation of environmental quality. It may be true in Korea that poor people have been experiencing higher-than-average exposures to selected pollutants. However, this is not a consequence of social bias. In Korea it is not, at least until now, a vicious circle in which poverty begets poverty due to over-exposure to, or forced contribution to, environmental degradation.

IV. CASE STUDIES

IV.1 The Relocation of Environmental Victims from the Ulsan Industrial Park[5]

Ulsan was a small coastal city located at the southeastern tip of the Korean peninsula at the time that President Park's regime announced plans to construct an industrial park there. Plans for the Ulsan Industrial Park (UIP), which was designed to house petrochemical industries, were a principal part of the First 5-Year

Economic Development Plan. The Plan constituted the nation's first major push towards industrialisation in the immediate aftermath of the coup d'etat of 1961. The military junta quickly formulated the Plan and began aggressively implementing it in a bid to secure legitimacy for their newly acquired power. At that time, Korea was facing absolute poverty, with per capita income of less than $100. Rapid economic development was desperately needed, and fervently pursued. The UIP represented the hope of national industrialisation through which Koreans could escape from poverty. Moreover, they were willing to sacrifice environmental quality for the sake of industrialisation. For the most part, very little attention was paid to environmental protection in the early stages of industrialisation.

The UIP system has been very successful in terms of industrialisation. UIP is now host to giant manufacturers who have come to symbolise Korean development, including Hyundai Motors, Hyndai Shipbuilding, Hankook Fertiliser, and Yukong Petroleum. The industrial park system has been expanded to more than 15 parks in the Ulsan area. As of October 1999, 447 manufacturing companies and 144 related corporations were thriving in the system. (See the maps in the appendices.) The park system now covers some 46,000,000 m^3, and is supported by extensive infrastructure. Ulsan's rapid development can be readily seen in its population growth. When the industrial park was established in 1962, Ulsan's population numbered 85,000. Over the course of the next 35 years, it developed into an independent metropolitan area with a population exceeding 1 million.

Ulsan was originally surrounded by farmlands, coastal mud flats, and ocean waters, with the local population enduring subsistence-level poverty generation after generation. The local population consisted mostly of farmers tilling small holdings or coastal fishermen. Upon the construction of UIP, all Ulsan citizens, including future victims, welcomed the plan since they expected better employment opportunities, windfall increases in land values, and swift acceleration of the local economy.

However, most factories housed in the UIP were heavy polluters. At the early stage of industrialisation, the Korean Government relied upon imported foreign technology, with capital funding coming from international loans. Yet the technology imported tended to be of the heavily pollution-generating type that had already been abandoned

in more developed countries. While the latest in pollution-minimising technology was readily available, the associated costs were deemed unacceptably high, and it was seen as an unaffordable luxury.

Because of the concentration of polluting facilities, indigenous people residing near industrial parks suffered a great deal from the multitude of pollutants emitted from the many different manufacturers. As pollution accumulated, it came to threaten not only their health but their livelihoods. Especially acute were 3 types of pollution: air pollution, ocean pollution, and noxious odours. The variety of pollutants included toxic chemicals, sulfur dioxide, hydrogen chloride, and ammonia gas. Industrial waste water included such heavy metals as copper, lead, and arsenic, as well as many nonferrous metals.

Given that the industrialisation policy centred on nourishing and growing infant industries, the government was loath to burden these new firms with possibly growth-retarding environmental regulations. Therefore, the government was deliberately slow to establish institutions and procedures to protect the environment. Though an administrative division devoted to environmental protection was established in 1973 within the Ministry of Health and Welfare, many have concluded that this served as mere window-dressing as the division was given neither the resources nor the regulatory authority to carry out its mandate. Moreover, reflecting the rampant corruption that flourished under state-led development during this period, many officials were fond of receiving bribes rather than rectifying illegal environmental practices. Leaving aside the issue of the quality of the oversight provided, the sheer number of environmental protection officials was also far less than was required. In any case, the environmental policies themselves were seriously distorted under the formidable pressure of the powerful industrial associations.

Environmental damage was acutely felt because there was little in the way of buffer zones between the industrial parks and adjacent residential areas so as to ease the effects of emitted pollutants. Neither the arrangement of the UIPs, nor the city of Ulsan itself, was subject to much foresighted design. Planners were simply outpaced by the breakneck speed of development. Indeed, urban planning itself was in its infancy as the concept of zoning had

not fully taken root. As a consequence, heavy polluters were sited next to residential areas. Moreover, no sooner was a new industrial park constructed in suburban areas than new migrants to the city surrounded it. The Ulsan city government would then be pressed to construct another industrial park in another suburban area and the process would repeat itself. Before long, the entire area became interlaced with industrial parks and residential areas, with few green areas.

As Ulsan and its industrial parks expanded in size, indigenous citizens and their farmlands were besieged by modern facilities. As the city population grew, the original inhabitants became a minority group. The unfortunate consequence was that this group was paying an increasingly high price for the intensive industrialisation being visited upon it; at the same time it was becoming merely a minority voice in its own community. Their complaints fell on deaf ears as development-oriented government officials paid little attention to ecological destruction as well as community destruction, especially in the early part of industrialisation in the 1960s and 1970s. Officials' only concern was to achieve the goal of attracting more industries to their industrial parks.

The people living in the most contaminated areas largely consisted of poor indigenous farmers and fishermen. Politically and economically they were largely powerless. According to survey research conducted in 1985, more than half of them earned a monthly household income of less than ₩300,000 (approximately $500). As the farmland and the ocean were stricken by pollutants from chemical industries, their economic bases were eroded. Rosy expectations that initially welcomed the construction of UIPs gave way to a reality of degraded lands and waters.

Pollutants adversely affected agricultural production in the area. Ulsan used to be surrounded by excellent agricultural plains, yielding abundant harvests of rice and fruit, particularly pears. As industrialisation and pollution increased apace, rice crops yellowed before maturing. Fruit trees and other crops went into decay year after year. Signs of unsustainable stress on the environment were clearly evident, with even the local climate seemingly affected. Spells of even mild drought during the spring seasons caused shortages of water for irrigating rice paddies. Dredging of river sand for

construction projects led to backward flows of sea water up the Taewho River and salinisation of agricultural plains.

After a series of government investigations carried out in 1979 concluded that continued damage to agricultural production had been the consequence of toxic gases emitted from UIPs, more than 50 manufacturers were held responsible and began to offer compensation. Nevertheless, the damage to the agricultural sector had been done, and production (and profitably) continued to dwindle. By the 1990s, the area had been almost completely given over to industrial and residential purposes, with UIPs and vast apartment blocks dominating the landscape. With agriculture largely gone, damage arising from pollution would fall fully, and squarely, on the human beings that had displaced it.

Original inhabitants, as well as hundreds of thousands of newcomers, have suffered from known and unknown diseases and their symptoms, including eye irritation, skin diseases, general or local paralysis, and respiratory diseases. Naturally, both children and the elderly have been most victimised, with symptoms being most often reported during the summer months. Particularly alarming was the increased incidence of tuberculosis. Some 163 new cases were reported in 1970, with this figure increasing to 686 in 1979. Periods of dense smog, often lasting three and four days, especially during the summer months, were critical in aggravating respiratory diseases.

More irritating to the general population were foul odours associated with chemicals emitted from petrochemical plants, metal-related manufacturers and paper mills. Noxious odours caused a variety of mental and physiological stresses, giving rise to headaches, nauseousness, breathing difficulties, allergies and loss of appetite. The problem of foul odours became increasingly serious as the density of manufacturing factories passed a certain threshold. Indeed, complaints arising from foul odours formed the largest percentage of environment-related complaints reported to the city authority during the early part of 1990s, when Ulsan's population had already surpassed 600,000. Yet the problem of foul odours defied fundamental solution. Closing the offending facilities is not the way victims wanted the problem solved, as many of the these same individuals depended on these factories for their livelihoods.

Ocean pollution was more elusive and complicated than air pollution. Most UIPs were not located directly on the waterfront, and illegal emissions were difficult to trace back to their source. Fishermen experienced decreasing catches and began to suspect that this problem was related to contaminated waste water being emitted from UIPs. There was a chorus of complaint when critical evidence was witnessed. In the process of constructing a pulp factory in 1978, vast amounts of sludge visibly contaminated the adjacent seawater and devastated coastal fisheries in the area.

Each Korean coastal village has a loosely organised fishery union. The fishery union is not a formal administrative unit itself, but effectively a subsidiary unit of the local fishery cooperative. The unions have been in existence for a long time, and provide for collective action to promote the members' common interest. When fishery unions in the Ulsan area discovered the reason for their reduced production, many unions coalesced to take collective action against the pulp factory. Demonstrations took place in front of the factory, and they blocked access to the plant while demanding compensation.

After successfully obtaining compensation in this way, they made deals with other manufacturers whenever finding suspicious evidence of pollution. In the 1980s, fishery unions were able to obtain compensation associated with damages stemming from accumulated contaminants from a variety of suspect manufacturers.

Before the indigenous people's collective protest activities, their complaints were disregarded by the municipal authorities as well as by the offending corporations. They had neither the money nor the power to file lawsuits against business conglomerates or the government. They chose to wage a long-term war against the strong. All they could do was to incessantly agitate against their offenders. When they found their tactics successful in making their offenders responsive, they never refrained from protesting against them. However, as this approach was associated with large social costs, government and industry had to search for more effective means of addressing their concerns.

To reduce environmental disputes involving ocean pollution, the government in 1982 designated Ulsan's immediate coastal areas as off-limits to fishery activity. Those who lost their livelihoods as a

consequence formally requested that the government provide housing relocation. The relocation program involved government subsides to help them find new housing. Participation in the program increased as a number of unexplained pathologies occurred among the people living near the Ulsan coastal area. Among the symptoms reported were severe pain in the limbs and loin, general neuralgia and paralysis, and skin discolouration. More than 700 people received medical attention for these ailments in 1982 and 1983.

Before people took collective action, many options, including a relocation policy, had been informally discussed among the people and the officials. After taking power through a coup d'etat in 1979, President Chun Doo Hwan, who was eager to woo the people, ordered the local authority, upon his visit to the city, to make a plan for relocating environmental victims. However, formulating an effective relocation program was by no means simple.

The plan required enormous funds, placing a heavy financial burden not only on the central and local governments, but also on the polluting firms. Naturally, agreement among the different levels of government and affected firms was not easy to achieve when attempting to formulate a concrete plan. Indeed, one of the most difficult problems to overcome was the simple fact that many of those affected did not favour relocation. Almost half (47.5 per cent) wanted to remain in their hometown, preferring instead greater efforts to reduce pollution by rigidly implementing new policy measures. Among those polled, only 32.5 per cent favoured relocation. As could be expected, those favouring relocation generally owned their land, while tenants – who were facing the prospect of less compensation – were generally against relocation.

In the midst of such dissonance, it took time to formulate a feasible policy. The Ulsan city government eventually presented its first program for relocating people from severely polluted areas in 1985. What follows is a description of the main elements of this diverse program.

First, relocation projects would be implemented in several stages in accordance with the severity of environmental pollution. In Stage I of the program (March 1986-February 1990), 621 landowners and 720 tenants participated in the relocation program. The government purchased 2,192 buildings. In Stage II (September

1987-February 1990), 1,030 landowners and 309 tenants were compensated, with 2,324 buildings being purchased. Stage III (December 1988-February 1991) saw the largest relocation effort, involving 1,979 landowners, 622 tenants, and the purchase of 5,031 buildings. Stage IV (March 1990-December 1997) took place most recently and involved 1,128 landowners, 1,058 tenants, and the government's purchase of 6,544 buildings (see the table in the appendices).

A second noteworthy feature of the program concerns the awarding of compensatory damages. Compensatory damages were awarded for foregone land, buildings, mineral rights, fishery licences, fishing boats and equipment, agricultural plants and equipment, as well as for tomb relocation and moving costs. The Law on Acquisition and Compensation for Land for Public Use was applied with necessary modifications for this particular program (involving the calculation of individual compensatory damages). The central government was responsible for purchasing real estate (land and buildings) and for providing compensation with regards to movable properties such as licences and equipment. For their part, polluting firms provided compensation with regards to intangible assets such as foregone business opportunities and mineral rights. Moving costs were paid for by the regional government. Lands vacated by relocated environmental victims were turned into new industrial parks, albeit with the aim of siting cleaner industries within them. Tenants who rented houses and apartments in the designated areas were not entitled to the regular compensation package. However, they were given preferential access to apartments newly constructed by the regional government specifically for the relocation program.

A third characteristic of the program was its complexity, which resulted not only from the multiple (and sometimes conflicting) objectives of the program, but also from the numerous government agencies involved. With regards to the central government, the Economic Planning Board played the role of coordinator, formulating the comprehensive plan and monitoring its implementation. The Ministry of Construction was responsible for re-configuring both the industrial park system and land use policies in accordance with the program. The Ministry of Commerce and Industry made sure that polluting firms met their compensatory obligations, even arranging loans if necessary. It also recruited new firms that might be

suitable candidates for location in the newly purchased industrial park land. The Ministry of Finance helped the new firms obtain necessary capital financing. The Environmental Protection Administration was responsible for allocating liability for compensatory damages to individual firms. It was also obliged to implement a credible policy to decrease pollution in the affected areas. Finally, the government of Kyungsannamdo Province (within which the city of Ulsan is located) orchestrated the relocation program. The provincial government also had final responsibility for constructing new housing for relocated individuals, paying their moving costs, and taking care of other miscellaneous business.

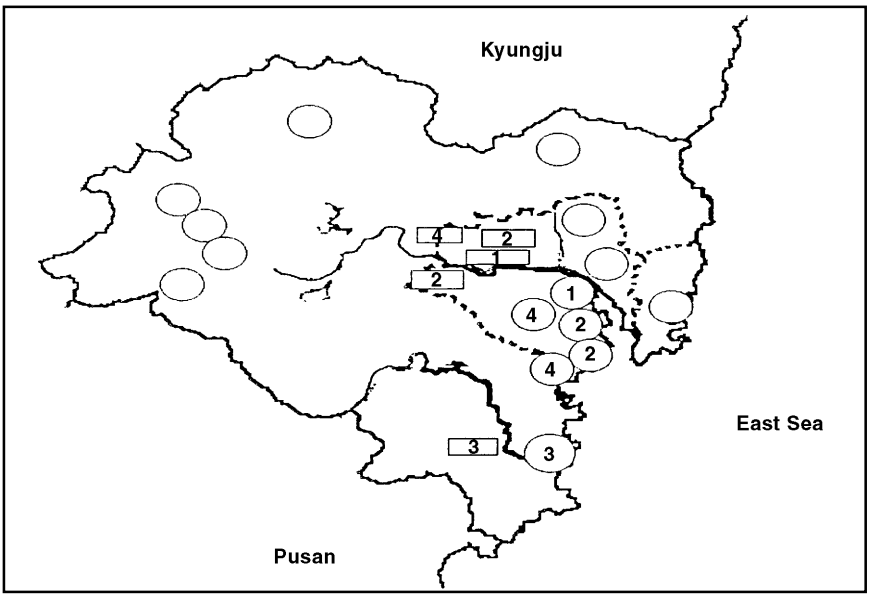
Average total compensation for a land-owning household was about 20 million won (approximately $30,000), paid over time in 4 or 5 instalments. However, this amount was insufficient to cover the cost of building a new home. Many of these households had no other option but to move into the apartments constructed by the government. Government paid compensation only to landlords whose properties were fully evacuated. This placed responsibility on landlords to evict their tenants so as to be entitled to compensation. Worse for tenants was the fact that the number of newly constructed rental apartments fell far short of demand. Only 640 tenants out of 2,700 received the privilege of renting an apartment constructed by the government. The remainder had to find alternative housing whose rental costs exceeded the newly constructed (effectively government-subsidised) apartments.

As the relocation programs in the Ulsan area were directed towards compensating property owners, it seems clear that there was inequitable treatment of property-less tenants. Moreover, as tenants are more likely than property owners to be underprivileged, many became still worse off under the relocation program. Worse still was the fact that the relocation program was essentially a remedial action designed to better conditions for victims of environmental pollution, yet it was landlords (many of whom were absentee) who received compensation while directly victimised tenants were not. The government did not directly pay compensation for pollution damage itself. Finally, those tenants working in the fishing and agricultural industries saw the bases of their livelihoods destroyed.

The relocation programs have been criticised as reflecting more the interest of local business circles and the convenience of government administration than the protection of environmental victims from their worsening physical and economic health. The areas evacuated by the programs were included in the extended industrial park system and subsequently occupied by new manufacturing plants. However, the program did not include any occupational training for those who lost jobs because of relocation. This was particularly important because, again, the relocation program was associated with the destruction of the existing local economic base upon which indigenous people had relied for centuries. The Ulsan city authorities also paid little attention to the relocated poor after the completion of the program, as evidenced by the fact that the authorities maintained no post-relocation records on them. The programs have been criticised by environmental groups and scholars as being designed primarily to silence local opposition to pollution-generating industrialisation, instead of truly seeking to ameliorate the deteriorating health and welfare of those victimised. The relocation programs have been criticised as being motivated primarily by the government's desire to avoid annoying, disruptive annual disputes over compensatory damages for pollution.

In fairness, the authorities themselves may have been lacking the requisite resources and expertise to deal with the relatively new social problem of victimisation from development-induced environmental destruction. In many cases, it may not have been wilful disregard in an effort to placate local business interests. Ironically, however, it did help to free the environmental victims' lives from ever-worsening environmental damage. After relocation, they had to find new opportunities in the context of a turbulent industrialisation process. Their situation was not much different from the one their fellow Koreans had to cope with at the time. As the industrialisation quite successfully proceeded, most relocated victims dispersed to find a new livelihood and/or to migrate to other cities. The relocation program did help to obviate a poverty trap in which the environmental victims go on subsisting on a low level of income. What cannot be concealed is the fact that those environmental victims were more sacrificed to the industrialisation process than other social groups. In Korea, recent environmental improvements, if any, are in some ways an indirect repayment for these unwilling sacrifices of industrialisation.

Ulsan Metropolitan City



○	Industrial Parks
① ② ③ ④	Relocated Industrial Parks and the Stage of Relocation
1 2 3 4	Apartment Areas constructed by Ulsan City Government of relocated people: The number stands for the Stage of Relocation Program
● ● ● ● ● ● ● ●	Old Ulsan City Boundaries before its extention into a metropolitan city by real line bountries

Table 1. A Summary of the Relocation Program Carried Out by Ulsan City

	Residents agreed with relocation		Residents disagreed with relocation		Buildings purchased by government	Housing constructed for those relocated		Program period (compensation carried out)
	House-owners	Tenants	House-owners	Tenants		Units	Area (m^2)	
1	621	720	–	–	2 192	839	172 550	'86.3 - '90.2
2	1 030	309	–	–	2 324	1 256	252 605	'87.9 - '90.2
3	1 979	622	311	26	5 031 (847)*	2 101	466 216	'88.12 - '91.2
4	1 128	1 058	–	–	6 544	1 603	368 565	'90.3 - '97.12

* Number in parentheses is the number remaining unpurchased

IV.2 Construction of the Kimpo Landfill and the Local Poor[6]

As Korean society becomes increasingly industrialised and urbanised, less and less space is available for environmentally-adverse facilities. This is particularly true of landfills, which have been the traditional mainstay of Korean waste management. As of 1998, more than 1,000 landfills, most of them relatively small-scale, were scattered around the country. Yet over 60 per cent of these are scheduled for closure in the near future. Anticipating the looming shortage of landfill space, the government began drawing up plans in the late 1980s to construct 8 gigantic regional landfill sites. Not surprisingly, each of these sites has confronted, or is confronting, stiff resistance from nearby residents – a classic example of the NIMBY (not in my back yard) phenomenon. The first designated waste landfill site (WLS), near the Kimpo area, warrants particular attention because it illustrates not only how the Korean government has tried to manage NIMBY resistance, but also how a single waste management project can change the course of national environmental policy.

Seoul is the centre of Korean industrialisation. In 1948, when the Republic of Korea was founded, its population was 500,000. Now the population of Seoul exceeds 10 million. Moreover, a great deal of population growth has taken place in the suburban areas around the city of Seoul itself. Most municipalities surrounding Seoul

have turned into metropolitan cities and urban areas, including Inchon, with a population of 2.5 million, Suwon with 850 thousand, Puchon with 800 thousand, Songnam with almost 1 million, Koyang with another 750 thousand, as well as many other mid-sized cities. All together this area comprises what is termed the Capital Metropolitan Region (CMR) and contains over 20,000,000 people – nearly half of the entire national population. Both Seoul and Inchon are independent metropolitan areas with their own local governments, while the other cities fall under the jurisdiction of Kyongki Province, which surrounds both Seoul and Inchon. Thus, three upper-tier sub-national governments – Seoul, Inchon, and Kyongki – have jurisdiction over different parts of the CMR.

The CMR is responsible for 60 per cent of national waste generation. Thus, CMR waste management is not simply a local problem, but a subject of national policy. In 1986, having long experienced difficulty finding appropriate waste-fill sites, the three governments of the CMR petitioned the national government to construct a gigantic WLS. After reviewing many alternatives and conducting environmental impact assessments, in 1989 they selected the Kimpo coastal area[7] as the site for the WLS. This area had been a mud flat reclaimed by a construction company for agricultural purposes. The Ministry of Environment (MOE) purchased the land and made an agreement with the three CMR governments regarding the construction and operation of the Kimpo WLS.

The Kimpo WLS is enormous in size, extending 19,580,000 m^2, and is intended to contain 280,810,000 m (approximately 278 million tons) of wastes during its scheduled 30 years of operation, which began in 1991. Initial construction of required infrastructure began in 1989, and is scheduled to continue until 2016. The site is the primary destination for ordinary wastes generated in the CMR. The site processes some 7,000 truck-loads (over 30,000 tons) of waste on a daily basis. Kimpo WLS consists of many different types of infrastructure, including a sewage disposal plant, methane gas processors, a waste inspection platform, garbage truck tonnage machines, vehicle cleaning facilities, as well as specific roads for waste transport. The CMR WLS Management Cooperative has been formed to oversee both construction and operation of the Kimpo WLS.

The Kimpo WLS is surrounded by such municipal wards as Kumdan-dong and Kuman-dong[8], which are part of Inchon, and Yangchon-myon, which is part of Kimpo-kun (a county of Kyongki Province). The two municipal wards of Inchon were part of Kimpo before 1995. These areas are suburbs of Inchon, a port city on the Yellow Sea which has become an important hub of Korean industrialisation. Located in the CMR only 40 km. from downtown Seoul, these particular areas, as well as Kimpo-kun in general, began urbanisation just before Kimpo WLS came under construction. In contrast to many other Korean rural areas where populations were thinning, the population near the Kimpo WLS sharply increased in the 1980s.[9] During this period, the population growth rate was nearly 8 per cent annually. Immediately after the Kimpo WLS came into operation, the growth rate reversed to minus 8 per cent. In the five years after operations commenced, from 1991 to 1996, the population in the central area of Inchon increased more than 30 per cent, while that in the surrounding rural areas decreased more than 14 per cent as many people appeared to give up farming. Overall, land prices in the area have remained stable.

Just a quarter century ago, the Kimpo WLS area consisted of typical traditional rural towns where 70-80 per cent of the people engaged in agriculture. The area was one of the finest agricultural plains in the Korean peninsula. Reflecting increasing urbanisation, the proportion of the population engaged in farming fell from 45 per cent in 1970, to 29 per cent in 1980, to 14 per cent in 1991, to 9.5 per cent in 1998. Quite a number of people depended on fishing for their livelihoods before the coastal mud flats were reclaimed. The proportion of fishermen in the population, which had been around 5 per cent in the early 1980s, dropped sharply to near zero per cent over the course of a decade. Some of this reduction was offset by increasing employment in the livestock industry in the 1980s. However, after operations began at the Kimpo WLS, the proportion working in the livestock industry dwindled, being reduced by more than one half by the close of the 1990s.

However, it should be noted that the declines witnessed in the primary sector were more attributable to urbanisation rather than the operation of the Kimpo WLS. Moreover, it was a decline relative to an ascendant secondary sector. Because the Kimpo area is categorised as a border zone with North Korea, much of the area

is placed under constraints with regard to military protection and zoning for development. What this effectively means is that those wishing to build manufacturing plants in the area face far more constraints than is the case with other areas. In spite of the difficulties, more and more manufacturing plants have been built in the area because it affords easy access to the industrial hubs or Seoul and Inchon. Indeed in the five years following 1987, the number of plants more than doubled. By 1992, the secondary industry in the Kimpo area consisted of 1,367 manufacturing businesses employing more than 30,000 workers. Most of them were small companies employing less than 50, and half of these establishments were illegal in the sense of violating zoning constraints and operating without proper licenses.

During the planning process for the Kimpo WLS, a number of government organisations were involved. The Economic Planning Board was responsible for project financing. The Ministry of Agriculture, Forestry and Fisheries agreed to transform the land reclaimed for cultivation into a waste landfill site and licensed further coastal reclamation. The Ministry of Environment was responsible for making waste management policy. The CMR governments participated in the decision-making process as both potential user and operator of the waste management infrastructure. They agreed to establish the Construction Centre for CMR WLS, which served as the government arm responsible for making contracts with construction companies. After completion of Stage 1 of the construction, at the beginning of landfill operations, the CMR WLS Management Cooperative was established to take over responsibility for normal operations.

As could be expected, people living in the Kimpo WLS voiced opposition to the construction of such an environmentally abhorrent facility. To make peace with the local people, the government authorities made them many promises in the planning stages. At almost every stage of the policy process, each government authority was forced to make peace with the local people. With each government entity making various promises at different stages in the planning process, the local people received a raft of promises designed to placate them. However, government bureaucrats participating in succeeding stages typically lacked the jurisdiction, the means, or perhaps simply the inclination to fulfil promises made

by other government agencies. They could be described as having been unresponsive, if not negligent, with regards to demands by the local people to keep some other agencies' promises. Conflicts between the local people and the government authorities were the natural consequence.

With the opening ceremony of Kimpo WLS on November 20, 1991, the local people found themselves facing a reality that fell far short of the rhetoric of government promises. Unfulfilled government promises included sanitary land-fill methods which could kill bad odour from garbage, safe and clean transportation by garbage trucks, and complete protection of underground water with an adequate sewage treatment plant. Within months the promise that only sorted general wastes would be put in the Kimpo WLS was broken. The Ministry of Environment made a decision to allow industrial waste to be transported to the Kimpo WLS on April 20, 1992. A daily newspaper reported a government action plan to use police forces to block any local protest activity against the decision. The local people came to realise that the government authorities had cheated them, and had little intention to uphold their promises. This proved to be a turning point, as the news (ironically) motivated the local people to unite. They formed a civic movement to protect themselves against further unfavourable unilateral decisions by the government.

They organised the "Civic Action Committee (CAC) on CMR WLS" in April 1992. The CAC began to wage a series of protest demonstrations, conducted systematic surveillance of industrial waste importation, and blocked access of garbage trucks in and out of the WLS. Thousands of local people participated in the CAC's call for action. The Kimpo-kun Council passed a resolution in support of the local people's protests, turning the CAC's demands into a kun(county)-wide concern. After several days of blocking access to garbage trucks, garbage began piling on every street corner, bringing about a crisis of waste management in the CMR. The local people's demands quickly became a national issue.

The government authorities conceded in early May 1992 that formal dialogue between the government and the local people was necessary. The Minister of Environment visited the Kimpo WLS, admitted that poor decisions had indeed been made, and made a commitment to involve local people in future policymaking to the

maximum extent possible. As a gesture to demonstrate the government's newfound sincerity, he immediately honoured one of their demands by replacing the secretary general of the CMR WLS Management Cooperative.

A Business Forum was established to institutionalise formal dialogue between CAC representatives and government specialists in charge of whatever matter was under discussion. The government specialists represented the relevant entities involved, including the Ministry of Environment, Seoul Metropolitan Government, Inchon Metropolitan Government, Kyungki Provincial Government, and the CMR WLS Management Cooperative. The government authorities, after witnessing the explosive power of the CAC, changed their strategy for dealing with local demands. They changed their attitude from one of negligence and disregard to persuasion and conciliation toward the CAC representatives.

The Business Forum between government specialists and CAC representatives met monthly on a regular basis. Special sessions could also be convened when requested by any side. The Forums were convened quite often in the early stages (17 times in the first half year from late May to the end of December 1992). After this period, the forums were convened roughly once a month.

The parties realised a series of agreements and ordinances designed to improve the operation of the CMR WLS Management Cooperative. The CAC was given considerable power with regard to the operations of the Cooperative, as well as some power with regard to sanctions in the event of rules violations. The CAC ensured that it retained power to intervene in WLS operations, as well as the power to inspect the contents of incoming wastes. The Business Forum made a series of ordinances regarding the times during which wastes could be delivered to the WLS, the maximum volume of daily incoming waste, the types of permissible waste, the areas to be covered by the Kimpo WLS, even the colouring of trucks according to waste transported. What follows is a sampling of the measures agreed to by the Business Forum.

The areas of Kimpo surrounding the WLS received special treatment from the government as compensation for their environmental and economic losses of the people. Many favours were dispensed as a response to requests from the CAC. The government

paid more than $84 billion (over $100 million) during the period between 1992 and 1996 for special projects in the area. Table 2 shows the diversity of the projects.

Table 2. Special Projects in Kimpo Area

Projects	Budget ('000 won)
Land purchase for common income generation	6 347 680
Village improvements	15 236 860
Village community centre construction	1 513 460
Community facilities construction	12 470 000
Fuel system constructed and repaired	1 150 000
Welfare centre constructed	11 219 000
Water purification improvements	1 968 000
Tap water system constructed	17 516 000
Commuter buses for the villagers	25 000
Road construction for the villagers	7 143 000
Projects to support the villagers	6 000 000
Scholarships for village students	400 000
Relocation of villagers who had serious damage from the WLS	2 948 000
Research project of relocation	836 000

These projects were the products of a bargaining process between the government specialists and CAC representatives. Most projects have been related to the management of the WLS or compensation to the local victims of the WLS. The villagers sometimes demanded bold projects such as founding a technical college in the area, or extending the Inchon subway system to the WLS villages – projects which in any case were beyond the control of their counterparts across the negotiating table.

The most impressive project the CAC demanded involved changing waste treatment methods in the CMR, which eventually resulted in shifting the entire national waste management policy. The villagers asked that food waste be incinerated as this waste was a major contaminant of underground water in the area. They blocked importation of wastes originating from local governments

which had not established a concrete plan for incinerator construction. Every local government had no other choice but to abide by the CAC's demand to construct incinerators so as to process their own food wastes. Consequently, the CAC became a more powerful tool for switching waste management policy than any government authority in Korea. A local government in CMR must maintain incinerators for its own food wastes as a condition to use Kimpo WLS for non-food wastes. Not only did the total daily volume of incoming wastes to the Kimpo WLS decrease year after year, but the behaviour of CMR people underwent a change with regards to waste treatment. They had to sort out their wastes before throwing them away. Futhermore, the expected life of the Kimpo WLS was extended in an environmentally friendly manner.

The Business Forum between government specialists and CAC representatives has proven to be a model case of successful compromise between environmental offenders and environmental victims (most of whom in this case were poor). It also suggests how environmental victims who are usually weaker in social dynamics can mobilise to hold out against the enormous power of government. What follows are the reasons for the successful dialogue between the antagonistic counterparts.

(1) The government authorities acknowledged the CAC's power and the legitimacy of its demands to take part in policy making regarding the operation of the CMR WLS. CAC has not simply been one participant among many in the policy process. It has been the counterpart of government authorities in the bargaining process. The CAC has maintained effective veto power over government proposals, and has been directly involved in implementing the rules and ordinances of the CMR WLS Management Cooperative. It was a paradigmatic shift for the Korean Government to give such veto power in policy making to an unregistered citizen organisation. The Korean government had long operated under the notion that policy making is solely the prerogative of government organisations. The CAC was no more than a spontaneous, ad hoc organisation which had not attained any legal status, and thus was not able to enter into any legal contract with a government agency. Notwithstanding the legal handicap, CAC has been the counterpart of the government authorities in

the Business Forum. The government chose to take an inexpensive road of cooptation rather than an expensive path of traditional legal orthodoxy so as to expeditiously deal with the challenges caused by the CAC's power to block wastes being transported into the Kimpo WLS.

(2) CAC representatives maintained full legitimacy and backing from the local community because they were elected by the villagers. This is in contrast to many other cases where representatives of environmental victims were captured by the government authorities and the affected community lost faith and trust in them. That CAC's compromises with the government authorities were accepted without cynicism or suspicion by the villagers was a testament to the legitimacy it enjoyed. This legitimacy, in turn, provided the power that CAC representatives could use to propose bold projects. When necessary, they received consultation from an environmental research institute which is affiliated with an environmental non-governmental organisation. CAC representatives even asked an expert from the research institute to attend the Business Forum so as to help them make informed judgments regarding when and how to compromise. These consulting experts have been more neutral to the agendas of WLS and more scientific in their argumentation than the CAC representatives or the villagers. Indeed, being environmentalists themselves and being motivated to help environmental victims, they were even less susceptible than the villagers themselves to being captured by the government authorities. The government specialists, who also possessed expertise and perhaps similar professional training, found the consulting experts a better partner for exchanging dialogue than the CAC representatives. Conversations between the experts from both sides helped to forge agreement. The government authorities also asked the consulting experts to persuade the villagers when it came to explaining the limits and functions of government. The consulting experts have been an important bridge and stabilising influence in the Business Forum. They also served as a bridge between the CAC and its local constituency. By also meeting directly with villagers, they provided the villagers with the opportunity to receive information regarding the CAC's position and situation, and

consequently contributed to the CAC's legitimacy and trust within the constituency.

(3) The Business Forum has been a success in terms of providing solutions that benefit both parties. In those heady days in 1992, the government authorities faced an urgent problem of how to deal with the mountain of waste that was accumulating everyday in the CMR. As the government had not found better methods of treating industrial wastes, they had opted to dump it in the landfill. Since it is almost certain that choosing any other would-be landfill site would also have invited local opposition, the Kimpo WLS was seen as the practical, least-worst site of choice. In the worst case, the government could rely on its coercive powers to clamp down on local opposition. But this is a very costly option, not least for the government. Accordingly, and wisely, the government eventually chose conciliation over confrontation. Making compromises with the local people has proven to be a beneficial course of action for the government authorities.

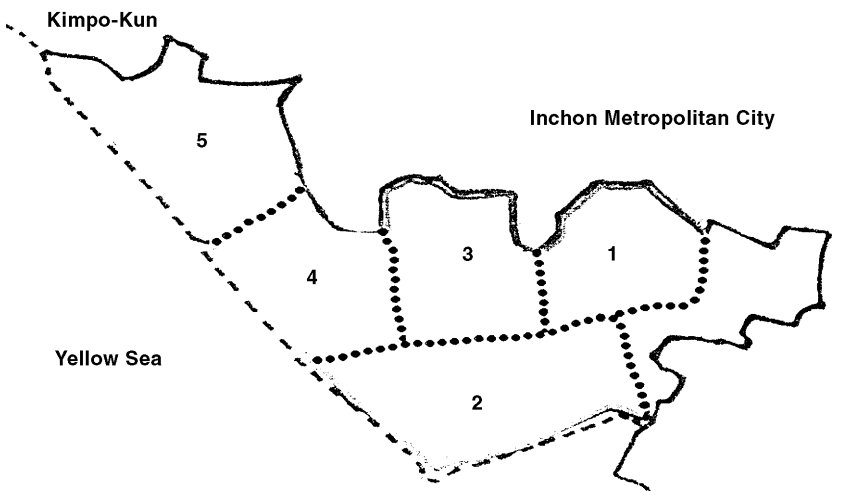
Not coincidentally, the period during which the local people of Kimpo engaged in protest activities against the government authorities was a period involving a wider transition from authoritarian regimes to true democratic governance in Korean politics. The government bureaucrats could not afford to choose a path which directly contradicted the increasingly powerful democratic tide. The local people might have sensed the leeway to wage a struggle they could not have tried just a few years prior under the authoritarian regime.

However, even when the motivation for agreement and willingness to compromise were clearly evident between the local people and government, the sheer number of technicalities involved with dealing with so many entities could thwart policymaking. The CAC had to deal with many partners, the governments of Seoul, Inchon, Kyungki, the Ministry of Environment as well as CMR WLS Management Cooperative, each of whom had different (and oftentimes conflicting) preferences and calculations of self-interest. Not infrequently, the most challenging task lay not with reaching compromise between the local people and government, but rather with building consensus among the government authorities themselves.

At the same time, it was difficult for the local people to build trusting relationships with government representatives in the Business Forum because of the Korean government's rotational personnel system. Every two years, they faced figures who were new to the Forum, new to the issue, and did not have a strong incentive to build lasting harmonious relationships with them. The government representatives at the table were expecting to leave the position in the near future. They were usually not negotiation specialists, either.

Notwithstanding the technical difficulties, government representatives had to deal with the threat of a potential waste management crisis in the CMR. They were faced with the ever-present threat of the local people to block waste transportation into the Kimpo WLS if necessary. A failure of negotiations meant the failure of their career as a public officer. Such urgency and mutual threat made both sides sustain negotiations and eventually identify compromises that yielded mutual benefits.

Kimpo Waste Landfill Site



Original Coastal Lines
Reclaimed Areas from the Sea
The Stage of WLS Construction

NOTES

[1] A trend of livelihood protection recipients is shown in the appendix. For further references, the size of social welfare expenditure and the types of institutes for deprived people are presented in the appendix.

[2] Beneficiaries of this program are shown in the appendix.

[3] These numbers are cited from an informal report circulated for policy makers.

[4] A recent newspaper article reported the number of the homeless nationwide as 6,000, but no reference was made for a citation. Jungang Ilbo, Sept. 14, 1999.

[5] Written by Young-Pyoung Kim with assistance of Hoi-Sung Chung.

[6] Written by Young-Pyoung Kim with assistance from Chang-Ki Lee.

[7] Kimpo(-gun) is a county in Kyungki Province, bordering the city of Inchon, which is located on the Yellow Sea coast.

[8] The system of vertical layers of government in Korea is complex, which different structures for independent metropolitan areas versus provinces, and for urban areas versus rural areas. Fortunately, an understanding of this system (for example, an understanding of the difference between a "-dong" and "-myon") is not necessary for readers of this paper.

[9] Unfortunately, despite our best efforts, we were unable to come up with definitive data on the income levels of those living in the areas immediately surrounding the Kimpo WLS. This is largely due to the fact that the Korean government simply does not produce income statistics on a sufficiently disaggregated basis so as to identify income levels for individual sub-municipal or sub-county units. In other words, income data are not available for individual *dongs* (wards) within a city or for *myons* or *eubs* within a *kun* (county). Moreover, data do not exist on the incomes of those who emigrated from the affected areas after the Kimpo WLS was constructed vis-a-vis those who remained. Nevertheless, referring to the remaining affected population as largely poor can be made with some confidence on the basis of interviews, anecdotal evidence, logic, and past experience. Interviews with local villagers coupled with anecdotal evidence

concerning their living conditions clearly suggest that the vast majority of the residents can be classified as poor. Moreover, it seems logical to assume (and indeed there is anecdotal evidence to support the notion) that those who emigrated from the deteriorating areas surrounding the Kimpo WLS were those with the transferable job skills and financial means to do so – namely, the relatively well-off. While many of those who remained did so less out of choice than necessity; they lacked the socioeconomic mobility to simply "vote with their feet." This certainly would not be inconsistent with previous cases involving the introduction of locally-unwanted land uses into a community.

REFERENCES

Literature in English

Hayes, Adrian C. 1999. "Poverty and Environment in a Rich Nation: The Case of Australia," Paper prepared for the 13th Biennial Conference of the Association of Asian Social Science Research Councils, Seoul, 18-22 October 1999.

Kim, Ik-Ki., Kwang-Hee Jun, and Yoon-Chul Jung. 1994. "The Urban Poor and Environmental Management in Korea: A case Study of Wolgoksadong, Seoul," Asian Journal of Environmental Management 2(1): 1-9.

Kim, Young-Pyoung. 1998. "Poverty and the Environment in Korea: Issues Yet to Be Tied," Korean Social Science Journal 24(2): 111-127.

Moon, Suk-Nam and Jong-Hoe Yang. 1995. "Development and Environment in Korea," Journal of Contemporary Social Sciences (Hyundae Sahoe Kwahak) 6: 239-278.

Paehlke, Robert C. 1989. Environmentalism and the Future of Progressive Politics. New Haven: Yale University Press.

Reardon, Thomas and Stephen A. Vosti. 1995. "Links Between Rural Poverty and the Environment in Developing Countries: Asses Categories and Investment Poverty," World Development 23(9): 1495-1506.

Rullard, Robert D. 1995. "Decision Making" in Westra, Laura and Peter S. Wenz, eds., Faces of Environmental Racism: Confronting Issues of Global Justice. Lanham, MD: Rowman & Littlefield Pub., pp. 3-28.

Song, Byung-Nak. 1994. The Rise of the Korean Economy. Hong Kong: Oxford University Press.

U.S. Environmental Protection Agency (US EPA). 1992. Environmental Equity: Reducing Risk for all Cmmunities, Vols. 1 & 2. Washington, D.C.: GPO.

Williams, Bruce A. and Albert R. Matheny. 1995. Democracy, Dialogue, and Environmental Disputes: The Contested Languages of Social Regulation. New Haven: Yale University Press.

World Commission on Environment and Development (WCED). 1987. Our Common Future. Oxford: Oxford University Press.

Literature in Korean

Kwon, Soon-Won, Jeong-Woo Lee, and Mae-Kyong Kim. 1993. Livelihood Stability of the Poverty Class and Self-Help Policy Implications. Korea Development Institute: Monograph.

Ministry of Environment (MOE). 1991-1998. Annual Report of Environment.

Ministry of Health and Welfare (MOHW). 1991-1998. Annual Report of Health and Welfare.

National Statistical Office. 1991-1998. Social Indicators in Korea (SIK). Seoul: Government Printing.

National Statistical Office. 1992-1998. Annual Report on the Family Income and Expenditure Survey (FIES). Seoul: Government Printing.

Office of Government Information. 1997. Comparative Survey of Citizens' Awareness on Social Issues.

Park, Chan-Yooung. 1997. "A Validity Analysis of the Regional Differentiation for Selection Standards of Livelihood Protection Recipients," Journal of Health and Social Affairs 17(2). Korea Institute of Health and Social Affairs.

Roh, Incheol. 1995. "The trend of low-income class and Policy Issues: with a focus on self-help assistance," in Korea Institute for Health and Social Affairs, The Trends and Properties of Low Income Class in Korea. Monograph.

STATISTICAL APPENDIX

Table A.1 Statistics of Government Poverty Protection Recipients

	1990	1993	1995	1997
Home stay care	339 423	338 168	307 401	296 988
Self-reliance care	1 835 385	1 580 000	1 369 832	1 039 908
Institutional care	81 383	82 875	77 671	76 769
Total No. of LP	2 256 191 (5.3)	2 001 043 (4.5)	1 754 904 (3.9)	1 413 665 (3.1)
Medical aid beneficiaries	4 246 000 (9.9)	2 366 000 (5.4)	1 989 585 (4.4)	1 642 125 (3.6)

Source: Annual Reports of Health and Welfare., 1990-1997.
* Nos in ( ) represent as % of total population.

Table A.2 Trend of Social Welfare Expenditures (billion won and per cent)

	1985	1990	1995	1998
Social Welfare Expenditure	12 532	27 456	51 881	70 264
Social Security % of Gov't Expenditure	3.2	5.4	5.6	6.7
Public Assistance % of Gov't Expenditure	1.2	1.4	1.1	1.6
Welfare Service % of Gov't Expenditure	0.6	0.8	1.2	2.4
Public Assistance % of Social Welfare Expenditure	37.3	26.0	19.6	23.9

Source: Annual Reports of Health and Welfare. 1985-1995.

Table A.3 Types of Welfare Institutes, 1997

	Nos of Institutions	Ave Nos of Inmates	Ave Nos of Workers
Institutes for children	274	62	11
Institutes for the aged	173	55	11
Institutes for the disabled	180	89	21
Institutes for women	67	47	5
Care institutes for mental disorders	73	242	15
Institutes for the homeless	43	301	21

Source: Annual Report of Health and Welfare.

Table A.4 Trends of Livelihood Protection Recipients

	Total	Home-Stay Care	Self-Reliance Care	Institutional Care
1980	1 829 056	282 000	1 500 056	47 000
1985	2 273 150	282 000	1 928 000	63 150
1990	2 256 191	339 423	1 835 385	81 383
1995	1 754 904	307 401	1 369 832	77 671
1998	1 175 000	301 000	798 000	76 000

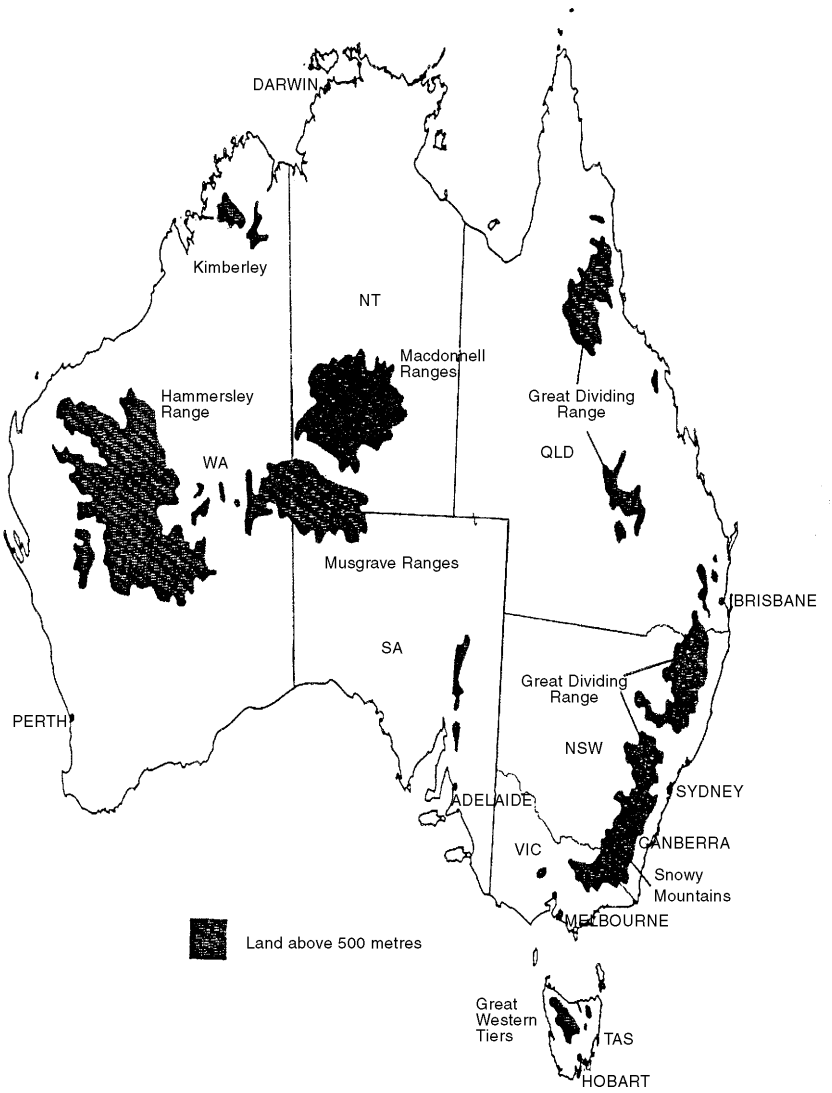
Source: Rearranged from SIK & Annual Reports, 1980-1998.

Table A.5 Perceptions of Environmental Pollution, 1997 Survey (Per cent)

	Seriously Deteriorated	A Little Bit Deteriorated	Acceptable As Usual	Improved
Air Pollution				
National Ave	19.5	50.5	28.3	1.7
Urban	21.8	52.7	28.3	1.7
Rural	10.0	41.5	46.7	1.7
Water Pollution				
National Ave	14.4	49.6	33.1	2.9
Urban	14.7	49.8	32.3	3.2
Rural	13.0	49.0	36.1	1.9
Waste Pollution				
National Ave	14.5	41.4	33.5	10.6
Urban	14.9	40.3	32.7	12.2
Rural	12.8	45.9	36.9	4.3
Noise Pollution				
National Ave	16.4	44.1	35.3	4.3
Urban	17.6	45.3	32.6	4.5
Rural	11.3	39.6	46.2	2.9
Surrounding Pollution				
National Ave	9.5	39.2	43.7	7.5
Urban	9.8	39.4	42.5	8.3
Rural	8.6	38.4	48.6	4.4
	Seriously Unsafe	**A Little Bit Unsafe**	**Acceptable As Usual**	**Relative Safe**
Pesticide Pollution of Agricultural Products				
National Ave	6.8	39.4	32.6	21.2
Urban	7.8	43.5	31.8	16.9
Rural	3.9	27.3	34.9	33.9

Source: SIK, 1998.

Australia and its Topography



Chapter 5

POVERTY AND ENVIRONMENT IN A RICH NATION: THE CASE OF AUSTRALIA

ADRIAN C. HAYES
Research School of Social Sciences
The Australian National University Canberra

The international debate about poverty and the environment has focused mostly on the links in developing countries, especially in rural areas.[1] The Brundtland Commission argued, "Many parts of the world are caught in a vicious downwards spiral: Poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival ever more difficult and uncertain" (WCED 1987: 27). The World Bank estimates about half of the world's poor live in rural areas that are ecologically fragile. "Land-hungry farmers resort to cultivating unsuitable areas – steeply sloped, erosion-prone hillsides; semiarid land where soil degradation is rapid; and tropical forests where crop yields on cleared fields drop sharply after just a few years" (World Bank 1992: 30). Many of these families, especially the poorest of the poor, lack the resources needed to avoid degrading their environment and "overuse" the remaining resources in their struggle to survive. "It is not that the poor have inherently short horizons; poor communities often have a strong ethic of stewardship in managing their traditional lands. But their fragile

and limited resources, their often poorly defined property rights, and their limited access to credit and insurance markets prevent them from investing as much as they should in environmental protection" (World Bank 1992: 30).

What about a developed country like Australia? Are there any significant links between poverty and environment in this case? What kind of environments do poor people live in in a rich country? Should policies aimed at addressing the needs of the poor take environmental factors into account? This chapter looks at these questions. Researchers and policy makers in Australia normally treat the topics of poverty and environment quite separately. This chapter is a first attempt to bring them together. Part I looks at the nature of poverty in Australia, its incidence and distribution: Who are the poor and where do they live? The political economy which is responsible for poverty in Australia has also had a devastating effect on the natural environment. Part II gives a short overview of the impact of human settlement on the continent. The main agents of environmental degradation have not been poor people struggling to survive but commercial farmers with a "poverty of understanding" of the unique characteristics of the Australian environment. Part III describes the natural and constructed environments of poor people today, drawing on case studies. Part IV draws some conclusions on poverty-environment relationships in Australia.

In a rich country like Australia few poor people are dependent on their own direct exploitation of natural resources for their livelihood, and their low consumption means in fact they generally have less impact on natural resources than the non-poor. Nonetheless there is evidence to suggest that in rich countries, as in poor, the geography of poverty is becoming more pronounced (Leonard 1989). Where one lives in the landscape is an important determinant of one's access to resources in natural and constructed environments. In rich countries poverty-environment links are qualitatively distinct from those in poor countries, but they still play a decisive role in determining the life-chances and quality of life of poor people. Policies aimed at poverty eradication in rich countries need to be predicated on a sound understanding of these linkages.

I. POVERTY IN AUSTRALIA

I.1 Definitions and the Henderson Inquiry

Who are the poor in Australia? Where do they live? If we were to use the World Bank criteria for developing countries – say, US$370 per person per year in 1990 – then there is virtually no poverty in Australia. However, as Saunders (1996: 227) reminds us, "the World Banks' focus was on absolute poverty – not having enough income to be able to secure minimum levels of food, clothing and shelter. In rich countries like Australia, poverty is conceived in relative rather than absolute terms. This implies that poverty is defined not in terms of a lack of sufficient resources to meet basic needs, but rather as lacking the resources required to be able to participate in the lifestyle and consumption patterns enjoyed by other Australians. To be relatively poor is thus to be forced to live on the margins of society, to be excluded from the normal spheres of consumption and activity which together define social participation and national identity."

Poverty it seems was rediscovered in the English-speaking rich countries in the 1960s (Abel-Smith and Townsend 1961; Harrington 1962; Henderson, Harcourt and Harper 1970). The landmark study of poverty in Australia was the 1975 Commission of Inquiry into Poverty (1975). It used a "poverty line" – subsequently known as the Henderson poverty line (HPL) – defined as the income needed by an income unit if they are to be able to afford a lifestyle which would be generally considered by the society as "not living in poverty." "Income" here includes wages after tax plus child allowances paid by the government (while later revised updates of the HPL included all after-tax disposable income); an "income unit" is an economic unit made up of related individuals who live together, defined in terms of four main types, namely, single people, married couples (de jure or de facto) without children, married couples with children, and single parents. The HPL was considered by the researchers at the time to be an austere measure: "we have drawn our? poverty line? at an austere level ... It cannot seriously be argued that those below this austere line, whom we describe as? very poor,? are not so" (Commission of Inquiry 1975a: 13).[2] It was also designed to allow poverty to be estimated both before and after taking housing costs into account, since an important aspect of the welfare state in

Australia has been to provide subsidised housing to low-income families.[3]

The 1975 Commission estimated headcount indexes of poverty using data from an Australian Bureau of Statistics (ABS) Income Survey conducted in 1973 which it sponsored. The Commission estimated 10.2 per cent of all income units were in poverty (corresponding to 8.2 per cent of the population), and a further 7.7 per cent were estimated as "rather poor," defined as having income less than 20 per cent above the poverty line. The after housing poverty figures were lower (reflecting disproportionately low housing costs for many low-income income units), at 6.7 (representing 6.4 per cent of the population) and 3.0 per cent, respectively. Among the main income unit types those with the highest poverty rates before housing were: aged single males (36.6 per cent), aged single females (31.0 per cent), and fatherless families (36.5 per cent). The poverty figures after housing tell a somewhat different story: aged single males, 13.0 per cent; aged single females, 8.4 per cent; and fatherless families, 30.0 per cent. The poverty rates for the single aged are lower after housing because many own their own homes and have relatively low housing costs. Fatherless families are "clearly the poorest group" after housing costs are taken into account (Commission of Inquiry 1975a: 19). Among all income units below the poverty line 72.2 per cent had heads not in the workforce.

The 1975 Henderson Inquiry remains the most important benchmark for all subsequent poverty studies in the country and the HPL has enjoyed quasi-official status. Estimates of the HPL are updated quarterly by the Institute of Applied Economic and Social Research in Melbourne (IAESR). The Henderson poverty line has been frequently criticised, especially on methodological grounds, but alternative measures which have been proposed have limitations too and none has received wide acceptance (Saunders 1994: 218-260).[4]

I.2 Growing Inequality During the 1980s and 90s

The 1980 and 90s have been a period of major economic restructuring in Australia, but making the nation's economy more competitive globally has been accomplished at the expense of social development, resulting in growing income inequality, rising

unemployment, and increasing poverty (Fincher and Nieuwenhuysen 1998; Maegher, Buchanan and Watson 1999). The latter trend is especially evident during the 1980s if poverty is measured by the Henderson poverty line (Saunders and Matheson 1991; Saunders 1994). Table 1 gives HPL estimates for three separate years during the 1980s, and Table 2 gives the incidence and structure of poverty by income unit type for the same years. The incidence of poverty for all income units rises from 10.7 per cent in 1981-82 to 16.7 per cent in 1989-90. The trend is towards higher incidence of poverty for all income unit types: the incidence of poverty among single people increases from 12.2 per cent in 1981-82 to 20.4 per cent in 1989-90, for couples with children from 7.2 per cent to 10.5 per cent, and for sole parents from 43.5 per cent to 58.0 per cent. There is an especially marked increase among the aged, from 8.3 per cent in 1981-82 to 19.5 per cent in 1989-90.

It is striking that of the four broad family types shown in Table 2 poverty is highest among singles and single parent families, and lowest among couples (especially among couples without children). The overall structure of poverty by household type does not change very much during the decade, except that while the aged account for only 16.4 per cent of income units in poverty in 1981-82 the figure rises to 26.3 per cent in 1989-90. It is also interesting to note that while the incidence of poverty among single parent units has increased significantly, poor single parent units expressed as a percentage of all poor income units has not (19.2 per cent in 1989-90).

These statistics need to be interpreted with care. Saunders (1994: 272) points out, "For much of the 1980s, the pension was indexed to prices, while the poverty line was adjusted in line with movements in household disposable income per capita.... [e]conomic growth saw the latter rise faster than prices, causing many elderly people reliant mainly on a pension to move from just above the poverty line to just below it (not because their real income was falling, but because the poverty line was rising in real terms)." Thus the marked increase in the poverty rate among the aged in Table 2, especially among the single aged, undoubtedly exaggerates the extent to which their financial situation relative to need becomes more dire during the decade.

As already noted, the 1975 Henderson Inquiry found that the great majority of income units below the poverty line were not in the workforce. Among those non-aged adult income units not in the workforce 30.9 per cent were in poverty, while for those in the workforce the figure was 3.9 per cent. For those non-aged units in which the head was unemployed (in the sense of having been out of full-time work for 8 weeks or more in the last year), 16.6 per cent reported annual disposable income (including unemployment benefits) below the HPL (Commission of Inquiry 1975a: 18). The Commission also sponsored a special survey of social security beneficiaries in June 1973, measuring income during the actual period of unemployment on a weekly basis. Only 7.5 per cent of unemployed income units had income above the HPL; even after housing the figure only rose to 18.5 per cent (Commission of Inquiry 1975a: 133). Unemployment benefits were insufficient to keep unemployed income units out of poverty.

Table 3 shows the trends in poverty by labour force status during the 1980s. These data, taken from Saunders (1994: 272-275), are likely to underestimate the amount of poverty due to unemployment, since they measure income on an annual basis and head of income unit is defined as unemployed if out of work for 8 weeks or more during the year. In 1989-90 the incidence of poverty was 32.0 per cent among the unemployed (down from 42.6 per cent in 1981-82), and only 1.7 per cent among those with full-time work. The incidence of poverty was 23.5 per cent for other non-aged income unit heads in the labour force (including part-time workers, those who worked for only part of the year, and those who were unemployed for less than 8 weeks); it was 56.5 per cent for units with heads (of working age) not in the labour force.

Gregory and Sheehan (1998) extend the trend analysis into the 1990s (using poverty estimates for 1996 based on microsimulation). Unemployment has risen significantly since 1974, from around 2 per cent to around 9 per cent in 1996; more people are unemployed today, and for longer. They conclude, “Two things seem beyond doubt: that there has been a substantial rise over the past twenty-five years in the propensity of the unemployed to be poor and that this, combined with the large and persistent rise in unemployment, means that by 1996 unemployment was the overwhelming determinant

of poverty for income units where the head is in the labour force" (Gregory and Sheehan 1998: 119).

I.3 Poverty Among the Indigenous Population

The 1975 Poverty Inquiry was unable to document clearly the poverty status of Aboriginal and Torres Strait Islander peoples at the national level because of deficiencies in the data. Separate studies commissioned by the Inquiry found that 47 per cent of Aboriginal households in Brisbane were below the HPL (44 per cent after housing), and 22 per cent in Adelaide. The Inquiry commented, "There is no recent study of the incomes of rural Aboriginals, but our impression is that they are generally lower – because of higher unemployment for instance – and we expect the incidence of poverty to be consequently higher" (Commission of Inquiry 1975a: 261).

Ross and Whiteford (1992; cited in Saunders 1996: 234), using 1986 data, found the overall poverty rate among Aboriginal families with children was 43.2 per cent, almost three times the rate for non-Aboriginal families (15.0 per cent). Half of all Aboriginal children were living in poverty in 1986, including one fifth in severe poverty (i.e. in families with income below 80 per cent of the poverty line). Ross and Mikalauskas (1996) extended the analysis using the 1990-91 Income and Housing Costs and Amenities Survey and the 1991 Census.[5] They estimate that poverty rates (using the Henderson poverty line) are 2 to 2.5 times as high for Indigenous couples with children as for similar non-Indigenous income units (Table 4). Poverty rates are much higher for single parents with children, but the Indigenous rates in this case are only 1.3 to 1.5 times as high as the non-Indigenous rates. They estimate that in 1991 50.1 per cent of all Indigenous families with children have incomes below the HPL (compared to 20.9 per cent for non-Indigenous families), and that consequently 57.6 per cent of all Indigenous children are living in poverty (compared to 22.9 per cent for non-Indigenous children). Put differently, "it can be estimated that while the Indigenous population accounted for only 1.6 per cent of the total population in 1991, Indigenous children accounted for 2.7 per cent of all children and 7.1 per cent of children in poverty" (Ross and Mikalauskas 1996: 14). Joblessness is a major factor underlying the high incidence of poverty among Indigenous income units, but even when the unit head is employed the incidence of poverty is higher than for similar units among the non-Indigenous population. The poor

health and welfare of Indigenous children and adults resulting from these socioeconomic conditions are now well documented (ABS 1999).

Two further points on using Henderson's approach to income poverty when comparing Indigenous and non-Indigenous poverty rates deserve to be noted. First, the approach itself is based on the cultural assumptions of the non-Indigenous society and in this way can be seen as culturally biased (Altman and Hunter 1998: 247-252). The definition of income units, for example, reflects non-Indigenous institutions of household structure and income sharing, and also the way the Australian welfare state builds on these institutions in "targeting" those units held to be most in need; the definition is not so close to a lot of Indigenous experience "with more communal traditions and styles of living [where] a single household typically contains at least two separately identified income units" (Ross and Mikalauskas 1996: 6).

Second, "use of the Henderson poverty line may appear to imply that poverty in the non-Indigenous community is very like poverty in the Indigenous population, except that a much higher proportion of Indigenous individuals are affected. Without detracting from the seriousness of poverty in the non-Indigenous community, this would clearly be a complete misunderstanding of the nature of Indigenous poverty. Consideration of the statistics on Indigenous health and life expectancy and rates of imprisonment, for example, show that the degree of poverty affecting Indigenous individuals is entirely of a different order from the poverty experienced by the rest of the population" (Ross and Mikalauskas 1996: 7). Many commentators have noted that poverty among Aboriginal and Torres Strait Islander peoples often has more in common with absolute poverty in developing countries than with the relative poverty typical of most OECD countries (Hunter 1999; Young 1995).

I.4 Urban and Rural Poverty

Australia is a highly urbanised society. Table 5 shows incidence of poverty by place of residence as reported by the 1975 Henderson Inquiry: The overall poverty rate in Sydney (1972-73) was 8.8 per cent of income units; in Melbourne, 7.3 per cent; in other metropolitan areas, 9.4 per cent; in other cities, 10.4 per cent; and in rural areas (with population less than 25,000), 14.4 per cent (Commission of

Inquiry 1975a: 149). There was considerable variation in poverty rates among the different parts of cities (e.g. the inner and mid-west part of Sydney reported 13.9 per cent of income units below the HPL, while the outer south had a rate of 4.5 per cent), but overall poverty rates were higher in rural areas than urban. These patterns reflect the distribution of population groups (the aged, the unemployed, home-owners, etc), differences in wages and employment opportunities, and differences in housing costs. The main 1973 ABS Income Survey sponsored by the Commission, however, did not include farming families since for methodological reasons it excluded all self-employed people.

For a number of reasons it is not possible to measure the income poverty of farming families (and other self-employed income units) in the same way as for other units. Other research sponsored by the Commission showed "that the income of the farming enterprise, after allowance for depreciation, capital expenditures and loan repayments, is a poor guide to the disposable income of the farm family. The income of the farming enterprise as recorded for tax purposes may be low, but because some of the expenditures charged against income, such as depreciation, is not a cash outlay, the family may have enough cash to live comfortably. Moreover, during the year the number of sheep or cattle on the farm may have increased substantially; this is not treated as income, but the stock is available for sale to increase income in subsequent years. Again, although in one year the farming enterprise may be unprofitable, if the family has a substantial equity in the farm they may be able to borrow for living expenses. For farm families, wealth is relevant as well as income" (Commission of Inquiry 1975a: 178). For these reasons the Commission sponsored a separate national survey of farm families, measuring income relative to the HPL on a cash surplus basis. The reference year (1972-73) was generally a good year for farmers, yet even so 11.3 to 12.8 per cent (depending on the exact measure used) of farm families received income less than the poverty line. The Commission concluded, "it is clear that a considerable number of people are living on marginally commercial holdings who, even in a good year, have inadequate incomes" (Commission of Inquiry 1975a: 180).

The Commission also documented poverty in rural communities among people who themselves are not farmers but whose own livelihood depends on the economic vitality of the community in

which they live. There are pockets of rural poverty, with people with low income and living in sub-standard housing, along with high rates of ill health, low educational attainment, lack of labour skills, etc; and often low self esteem. Poor families in the country have additional problems of transportation and lack of job opportunities which exacerbate their overall situation (Commission of Inquiry 1975a: 187-195). These characteristics can in turn lead to a lack of opportunities for their children.

The Australian economy has changed significantly over the last 25 years in connection with globalisation and economic restructuring. The data on how these changes have affected the locational distribution of poverty are patchy but it appears there is significant spatial divergence associated with the unequal regional distribution of unemployment and of increasing income inequality. McDonald (1995: 5-6) reviews a lot of the evidence and argues "there are a relatively small number of regions heavily affected by restructuring particularly in manufacturing industry which accounts for very large numbers of unemployed persons." Fincher and Wulff (1998: 151) point out, "Productive investment is increasingly concentrating in the major capital cities (particularly Sydney and Melbourne) while at the same time the population is dispersing throughout the country." Gregory and Sheehan (1998: 123) confirm that "increased neighbourhood polarisation of employment and income is a very real fact in Australian cities in the 1990s." Economic restructuring has contributed to spatial inequality. A recent report produced by the Australian Housing and Urban Research Institute (1999) claims 40 per cent of the population in metropolitan regions is living in environments of economic opportunity and 31 per cent in areas of community vulnerability.

There is some counterurbanisation in Australia today involving low-income groups, but again the data do not yet allow a rigorous analysis. Some urban dwellers who lose their jobs as a result of micro-economic reforms may choose to capitalise their homes and move to non-major urban areas, seeking a new life where housing and other costs are cheaper. Similarly, the retired and the aged, or those dependent on welfare, may move to small towns to minimise living costs. Some of these migrants, particularly the aged, may find their disadvantaged situation only exacerbated in their new environment where they lack ready access to many services they need (Wulff,

Flood and Newton 1993). The Australian Housing and Urban Research Institute (1999) finds that despite their surging population growth many holiday and retirement areas along the east coast are economically vulnerable. Bell (1999) argues we may see more "consumption-related moves" from major urban centers in the future. Hugo (1999) emphasises such counterurbanisation is still highly selective, both in terms of the migrants and in terms of the non-major urban receiving areas (mostly in south Queensland and along the north coast of New South Wales).

I.5 Poverty and Environment

Poverty studies in Australia have not focused systematically on the *environments* of poverty, either natural or constructed. In fact the income poverty approach pioneered by Henderson tends to divert attention away from explicit consideration of environmental factors. The 1975 Commission recognised that poverty has many dimensions, but predicated their approach on the reasonable assumption that in a modern society like Australia income is usually fundamental: "[I]t is clear that an adequate income is fundamental to a person's security, well-being and independence. It enables him to provide housing, education, food, transport and other essentials for himself and his family. An adequate income allows him freedom of choice and freedom to participate in activities of his choice. It contributes greatly to personal freedom and the extent of opportunities available" (Commission of Inquiry 1975a: 2). The Commission noted that environmental factors can also cause or contribute to poverty: "People can be in poverty not only by having a low income but also by ill health, lack of education, inability to speak the English language, or ignorance of the legal system, to name but a few.... If people are excluded from using [community] services, personal and social problems arise; exclusion from the benefits of these services can in itself cause poverty" (Commission of Inquiry 1975a: 88). The Commission did not pursue this latter line of inquiry systematically, however.

An alternative approach to measuring poverty indirectly (in terms of disposable income relative to a standard of need) is to measure it *directly* in terms of the living standards actually experienced by people. This approach, first pioneered in Sweden, has been used in Australia by Travers and Richardson (1993), and by researchers

at the Australian Institute of Family Studies in the Australian Living Standards Study (McDonald and Brownlee 1994). The latter study, for instance, measured many dimensions of living conditions, including health, housing, employment, economic resources, human capital, transportation, community services, physical environment, safety and security, recreation and leisure, social and political participation, access to information, and family relationships. While such an approach makes it very difficult to produce a single poverty measure it does allow a more meaningful and systematic analysis of poverty-environment links. The Living Standards Study data have not yet been analysed from this point of view.

The Travers and Richardson (1993) study focuses empirically on material well-being, but the authors also discuss the relevance of the notion of spheres of life for the analysis of inequality and poverty. They draw on the work of Michael Walzer, for whom injustice is less a matter of inequality on a particular dimension of life, such as wealth or income, than it is of "if one of the many spheres of life comes to *dominate* the others, so that one's standing in one sphere determines one's standing in all" (Travers and Richardson 1993: 3). This pluralistic perspective ties in with Amartya Sen's (1992) capabilities approach to poverty, examining the positive freedoms an individual has to function in different spheres of life. "'You could be *well off* without being *well*. You could be *well* without being able to lead the life you *wanted*. You could have got the life you *wanted*, without being *happy*. You could be *happy*, without having much *freedom*. You could have a good deal of *freedom*, without *achieving* much. We can go on'" (Sen, cited in Travers and Richardson 1993: 8). It would be interesting to explore poverty-environment links from this perspective, but such an undertaking is beyond the scope of the present chapter.

Travers and Richardson (1993: v) focus on material well-being defined as "that aspect of human well-being that can be affected by a change in produced goods and services." They do not study empirically other aspects of "living decently" such as self-respect, fredom, dignity, or love, except to the degree that enjoying these aspects depends typically on a certain degree of material well-being. It appears to us, however, that these other aspects of quality of life (Hayes 1997; Nussbaum and Sen 1993) deserve further study in relation to poverty-environment links. It could be that in a rich country with postmodernist cultural themes that non-material aspects

of quality of life are increasingly important to well-being in society, and that the quality of the natural and constructed environments play a crucial determining role here.

II. AUSTRALIAN NATURAL AND CONSTRUCTED ENVIRONMENTS

Before looking at specific poverty-environment links it will be helpful to give a brief historical overview of some of the main population-environment interactions in the country. For a modern nation Australia's origins as a British penal colony are unusual. It was nineteenth-century agriculture, however, which provided the impetus for independent economic development. "Wool made Australia a solvent nation, and, in the end, a free one" (Hancock 1930, cited in Dovers 1992: 4-5). Later gold and other minerals brought further prosperity and more immigrants. Australia's status as a rich nation was attained on the strength of her primary industries. Theorists since Marx have grappled with the question of why there should be so much poverty in the midst of prosperity in a rich nation. In the case of Australia there has been a further contradiction built into her political economy, namely between her unique natural environment on the one hand and European farming methods developed over centuries to exploit very different kinds of landscape on the other. The early colonists thought they merely had to apply the techniques they brought with them. "The story of rural resource use in Australia is the story of realising the impotence of much of this baggage and the discarding, invention and reshaping of the contents of the tool kit of land management. Again and again realities – soils, drought, economic crises, technological limitations and chance – were to disturb and overcome the way people thought things were or believed they should be; the prevailing ideology overcome by practicality" (Dovers 1992: 2).

A common perception of Australia among people who have little acquaintance with the continent is that it is a vast under-populated country rich in natural resources. The overall population density in Australia is currently about 2 persons per sq. km., compared to 164 for Western Europe, 29 for the United States, and 123 for Eastern Asia (UN 1999: 95, 99, 102). To many visitors Australia appears quite "empty," except in the major capital cities of Sydney (population 3.8 million), Melbourne (3.2 million), and Brisbane (1.5 million). Many

Australians also share this perception, but in recent years an alternative assessment grounded in a fuller scientific understanding of the uniqueness of the Australian environment has been gaining acceptance. The question whether Australia is "empty" or "full" is now vigorously debated (Birrell, Hill and Neville 1984; Cocks 1996; Day and Rowland 1988; Harding 1995; House of Representatives Standing Committee for Long Term Strategies 1994; Stone 1995).

The debate between what Day and Rowland (1988) call the "national developmentalists" and the "conservationists" goes beyond material matters of economics and ecology and has profound implications for national identity. Bolton (1992: 23), for example, writes, "One way of looking at the environmental history of Australia is to see it as a conflict between those who exploited the country to serve preconceived economic goals and imported attitudes of mind, and those on the other hand who sought to create a civilisation where human use of resources was compatible with a sense of identity with the land." This conflict has parallels in Australian art: while Aboriginal art expresses a powerful sense of identity with the land, the art of white settlers often expresses a sense of homeliness, the art of a people for whom any profound notion of belonging to the natural environment which envelops and supports them remains a dream (Allen 1997).

II.1 The Geologically Comatose Continent

The ecology of Australia is quite different from that of Asia, Europe, or other lands settled by Europeans. Apart from the mountains of the Great Dividing Range in the east the continent is mostly flat and of low elevation. Since New Zealand and New Caledonia broke away some 80 million years ago the continent has remained in a "geological coma" (Flannery 1994: 78). Even the subsequent breaking away of Meganesia (the land mass containing Australia along with Tasmania and New Guinea) from Antarctica some 40 million years later was associated with little geological change over most of Australia, although there has been some volcanic activity in the eastern mountains. As a result of this remarkable geological stability the continent contains some of the oldest rocks in the world and some of the poorest soils. Australia has few naturally good soils for agriculture. The rate of soil regeneration over most of Australia is extremely slow (with the eastern and

southeastern seabord again being the main exception). Vital nutrients have been leached from Australian soils over millennia and they contain only half the level of nitrates and phosphates of comparable soils in other semi-arid regions of the world. Around 120 million years ago, when there were no polar ice-caps and the Earth's sea-level was considerably higher than it is today, the continent's interior was covered by an enormous inland sea making it today highly susceptable to salinisation. Less than ten per cent of the land area has productive soils, and only two-thirds of this is located where the climate makes it suitable for agriculture.

Australia's climate too is unique. Rain does not come predictably at certain seasons of the year, and droughts may last several years[6]; when rain does finally arrive it may come in a deluge that is difficult to use productively. "Australia is the only continent on Earth where the overwhelming influence on climate is a non-annual climatic change" (Flannery 1994: 81). The El Niño Southern Oscillation (ENSO) comprises dramatic but erratic shifts in oceanic and atmospheric weather patterns in the Pacific. During an "El Niño" the south-east tradewinds which normally flow across the Pacific weaken and may reverse, allowing warm water from around the west Pacific to expand towards South America, causing heavy rains in Chile and Peru and drought in Australia. When the tradewinds reassert their westward flow the warmer water is again concentrated in the western Pacific, producing precipitation in Australia.

These unique physical characteristics are responsible for Australia's distinctive flora and fauna. Native life-forms originating in Gondwana have evolved over the last 40 million years in Australia in physical isolation from life on other land masses and have adapted to the continent's unusual low-energy environment; the scleromorphy of eucalypts (conserving nutrients and moisture) and the hopping motion of kangaroos (conserving energy) are examples of this (Flannery 1994; Kohen 1995). Paradoxicaly, it is the very lack of nutrients and the uncertain weather which are responsible for Australia's exceptionally rich biodiversity. Species have evolved through coadaptation so as to exploit every niche in the ecosystem and recycle nutrients and energy efficiently. Highly coevolved

ecosystems are also extremely fragile, however, since if one or two key species are removed the whole structure can collapse.

II.2 Impact of the Indigenous Population

It is now believed Aborigines have been in Australia for 70,000 years or longer. They most likely migrated from southeast Asia during an ice age when only a narrow channel of water separated Australasia from Asia. Although their numbers were never large – it is now believed the Aboriginal population may have reached 600,000 before white settlers came, but almost certainly not more than 1 million – over the millennia they left their mark on the landscape, radically changing the flora through their use of fire and perhaps hunting the megafauna to extinction (Flannery 1994). Recent scholarship makes it clear that the Indigenous population did not simply roam across the landscape taking what they needed but deliberately *managed* the land. "The Aborigines reshaped the land within the limits of their technology. Their fires decreased tree cover and reduced the genetic diversity of the forest. They changed the soil structure with the constant regime of fire, increasing erosion rates. The Aboriginal farming system did not conserve the landscape of Australia. It created a new landscape which was more productive than the landscape they found" (Cary and Barr 1992: 63). Nonetheless it can be argued that once these changes were effected over millennia the Aborigines lived more or less in a balanced and sustainable relationship with the environment (Chase and Sutton 1998).

Aside from fire traditional Aboriginal tools, primarily spears and sticks, had relatively low environmental impact. When they gathered vegetables and tubers they would often take care the plants would still be able to grow; the people along the Nesbit River, for example, when collecting yams used specialised techniques designed to protect the supply for future seasons. Above all they had a special relationship with the land: Land was not a property to be exploited in secular ways, but rather they belonged to the land, which itself was sacred (Mulvaney and Golson 1971). "They were intimately familiar with everything in [their natural environment], and the life they led demanded that they should have this detailed knowledge. They also believed that they shared the same life-essence with all the natural species and

elements within the environment. Their social world was expanded to include the natural world. Conversely, their natural world was humanized, and this was true for the land as such" (Berndt and Berndt 1996: 136-137). Some have speculated that a latent function of sacred sites was to preserve the stock of biodiversity, so that areas after harvesting could quickly be replenished by natural seeding processes and ecological succession.

Other Aboriginal customs served to keep population numbers down. Rather than prolong the life of the aged and infirm in some clans they were often left behind to die as the clan made its seasonal migrations. When the clan returned to the spot the next year the bones would be ceremonially placed on the ledges of sacred gorges. Before the arrival of Christian missionaries families in the Tiwi Islands would marry teenage daughters to the eldest clan members; it was rare she would have a child with the elder and would wait until after his death when she was free to marry a younger man before having children of her own. Women in nomadic groups are known to space births; having more than one infant to carry at a time could undermine the survival of the group.

Since Europeans arrived in Australia conditions for Aborigines have changed dramatically. Aborigines are no longer able to practice their traditional migratory movements and live off vast areas of land. Instead many now rely on government welfare payments. Many still prefer to live in small remote communities (Coombs 1974), and the new land rights regime which has been established during the last 20 years appears to have strengthened this preference for a pre-colonial settlement pattern and encouraged the Indigenous population to move towards even smaller and more dispersed settlements throughout the inland areas and along the northern coast; some remote outstation settlements may consist of just 20 or so inhabitants, related by family or clan (Taylor 1999).

Aborigines in remote areas will still often travel large distances (usually by car) for sacred rites and ceremonial reasons, but most do not practice traditional hunting and gathering for their livelihood. Unlike the case of swidden farmers in Southeast Asia (Hidiyati et al. 1999), their loss of the use of large areas of land has not resulted in their exploiting the smaller areas still available to them more intensively. They now make less demands on natural

resources than before white settlement. Their livelihood today is often dependent on the state, and severely constrained by lack of access to employment opportunities, health and social services, and by lack of relevant skills and the kind of human capital needed to participate fully in the mainstream of Australian society.

II.3 Land Use Among White Settlers

It is the white settlers of the last 200 years who have had a more dramatic impact on the environment. When the first white settlers landed in New South Wales in 1788 they had no clear understanding of the new and strange continent, nor could they have. They had no knowledge of the great variability in climate, the low nutrient status of the soils, or of the importance of fire as a land management tool used by the indigenous population. They assumed the Aborigines' impact on the land was slight and transitory and that what they saw was "virtually untouched" virgin land (Lowenthal 1997: 234).[7] They set about subduing both the land and the indigenous population, and rarely (if at all) questioned their right to do so. They introduced land use practices which led, unwittingly for the most part, to widespread environmental degradation (Bolton 1992). Meanwhile the calamities they wrought on the Indigenous population were often more deliberate and premeditated (Hughes 1986).

The settlers found the environment more difficult to tame and cultivate than expected. The colony's first governor, Captain Arthur Phillip, wrote that "in the whole world there is not a worse country. All that is contiguous to us is so very barren and forbidding ... here nature is reversed [and] nearly worn out." They attempted to impose their European system of agriculture on the land, introducing sheep and cattle and numerous other exotic species. But this system of agriculture had been developed over centuries as an adaptation to a different environmental regime. When applied to the Australian landscape, except in a few locations where conditions were most favourable, it invariably meant exploiting the natural resources (on which agriculture depends) in ways and at rates which were unsustainable (Watson 1992). Initial high yields for the first few years were all-too-frequently followed by rapid declines in productivity and quite often complete collapse of the ecosystem.

The early settlers greatly overestimated the carrying capacity of native pastures for sheep, for example. Thompson (1979: 1-2) quotes a letter written to the Governor of Victoria in 1853 by an early pastoralist. The writer describes how when he first occupied his land it was "lovely dark green pasture – all eatable, nothing had trodden the grass before."[8] By the time of his writing, however: "The long deep-rooted grasses that held our strong clay hills together have died out, the ground is exposed to the sun, and it has cracked in all directions. The clay hills are slipping in all directions, also the sides of precipitous creeks, long slips, taking trees and all with them. All the creeks and little watercourses were covered with a large tussocky grass, with other grasses and plants to the middle of every watercourse." Sheep have hard hooves which are more damaging to Australian fragile soils than the soft feet of marsupials, and pastures take longer to regrow when the soils are low in nutrients.[9] Consequently soils are soon washed away where there is no grass to bind them and torrential rains and floods follow a period of drought.

Settlers introduced many exotic animal species aside from sheep and cattle (Rolls 1969). Foxes were introduced for hunting, camels for transportation across arid regions, goats for milk and meat, and pigs. Introduced species often had a destructive impact on the environment (Table 7). Settlers also introduced exotic plant species, either deliberately as crops or for some other purpose, or accidentally. Table 8 lists introduced plant species which now rank among Australia's most threatening weeds.

The settlers' ubiquitous practice of cutting down trees was probably their most severe contribution to environmental degradation. They did this sometimes for timber, often simply to clear the land for farming. Further forest stands were destroyed when fires lit by pastoralists to produce new grass for their sheep ran out of control. The eminent historian W.K. Hancock put it bluntly: "The invaders hated trees" (quoted in Bolton 1992: 38). The "main enemies of Australia's trees were the pastoralists," who from about 1860 went on to adopt ringbarking "on an enormous scale" as a cheap and efficient way to destroy them (Bolton 1992: 42; see also Powell 1976: 89-92). Table 6 shows estimates of the changes in Australia's vegetation from the 1780s to the 1980s.[10]

Despite manifold signs of resource depletion and environmental degradation throughout the nineteenth century there was little public interest in conservation.[11] There was no landed aristocracy in Australia with a close sentimental attachment to the land and an accompanying ethic of responsibility for maintaining it. The land was viewed by many settlers as alien, to be used only for commercial profit. Many were convinced that "rain follows the plough." The supplies of land and forest at the time seemed limitless and pioneers whose land lost its productivity could always move on and open up new tracts. Meanwhile the political traditions of the settlers, with the majority from the British Isles, made them disinclined to look to government to regulate land management. Occasional laws and decrees regulating the use of natural resources were introduced, but were rarely enforced.[12] In short, there was little incentive to use resources more conservatively. "Throughout modern Australian history the odds have been stacked against the development of public attitudes which would make for enlightened policies on environmental conservation" (Bolton 1992: 22)

II.4 Australian Agriculture Today

The role of agriculture in Australia's economy today seems paradoxical. On the one hand the Australian economy is far more dependent on the exploitation of natural resources than is true for most OECD countries, with agriculture accounting for 25 per cent of its export earnings derived from trade in commodities (and mining and petroleum products accounting for another 35 per cent) (OECD 1998). "Agriculture is an export-oriented industry. In 1993-94 the recorded value of Australia's farm exports was $17,618 million (on a balance of payments basis). Wool ($3,368 million), meat ($3,922 million), and wheat ($2,311 million) were the most important export earning commodities, accounting for more than half of all rural export income. Other significant export earning commodities included cotton ($732 million), dairy products ($1,273 million), sugar ($1,231 million) and rice ($322 million)" (ABS 1996b: 49).[13] On the other hand the Australian landscape and climate, as we have seen, seem peculiarly ill-suited to agriculture. Three points help explain the paradox.

First, while the natural endowment of the landscape is low the total area available is vast. Australian farmers compensate for low productivity per hectare by utilising more hectares. The estimated total area of agricultural establishments in Australia in 1994 was 469 million hectares, representing 61 per cent of the total land area (ABS 1996b: 22). Australian agriculture has been innovative in developing the technology and machinery to make this possible. The ratio of numbers of farmers to the area of land they farm in Australia is extremely low by international standards. There has been an increase in the average farm size over the years, and a decrease in the number of farms, although average farm size appear to have stabilised over the last decade. Nonetheless, "relatively small [by Australian standards] agricultural establishments have continued to dominate the Australian farming scene. At 31 March 1994 ... about 66 per cent of farms were less than 500 hectares in size" (ABS 1996b: 37).

Second, Australian farmers use advanced techniques and are highly specialised. Around 80 per cent of total output is accounted for by just 7 commodities: wool, wheat, beef, sugar, butter, milk, and sheep-meats.

Third, much of the history of Australian farming, and to a significant extent still today, can be regarded not so much a question of cultivating the soil as of *mining* it. The soil formation rates of most Australian soils are extremely low, and the rate of soil loss in most agricultural regions exceeds this. "While this loss of soil resources can initially be masked by applying fertilisers, there comes a time when the amount of top soil being removed limits the effectiveness of such a process" (ABS 1996b: 99).

The most comprehensive source of data on land degradation in Australia is still the 1975-77 survey undertaken by the Department of the Environment, Housing and Community (Table 9). It needs to be emphasized these data are estimates, based on subjective assessments made or collected by state officials (Conacher and Conacher 1995: 14). The estimates vary widely by state, with 91 per cent of the land in use in New South Wales being judged as requiring treatment, and only 3.6 per cent in Tasmania. Nevertheless some experts believe these figures (i.e. 40-50 per cent total farmland requiring treatment) can be regarded as conservative estimates of

degradation today, since problems such as erosion and salinisation appear only to have increased over the last 20 years. Awareness of the problems has increased and *Landcare* programs are widespread, but as Vanclay and Lawrence (1995) stress these programs have so far not been able to reverse the major trends in degradation. The recent Salinity Audit of the Murray-Darling Basin underscores the seriousness of the problems (Murray-Darling Ministerial Council 1999).

This pattern of natural resource use by agriculture provides the context for understanding rural poverty in Australia today.[14] Larger farms with proportionately lower labour costs and other efficiencies of scale are often better able to withstand the inevitable drought years; smaller farms are more likely to go bankrupt.[15] The net effect is a smaller rural population. As a result many rural communities are currently losing services such as banks and medical personnel. Current practices and trends in agriculture are not ecologically sustainable, nor can they sustain a substantial rural population (Lawrence and Vanclay 1992; Murray-Darling Basin Ministerial Council 1999; Watson 1992). Some more environmentally sustainable agricultural practices are listed in Table 10.

II.5 Urban Settlement

As already noted, Australia is a highly urbanised society. By world standards Australian cities have been widely regarded as good places to live, providing quality housing and convenient access to basic services in health and education as well as diverse employment opportunities. Australian cities grew rapidly after World War II, stimulated by the post-war baby-boom, high levels of immigration, and economic prosperity. In 1950 the level of urbanisation was 75 per cent; in 1960, 81 per cent; and in 1970, 85 per cent, at which level it has more or less stabilised (with the urban population growing at the same rate as the population as a whole, currently about 1.2 per cent per annum). Public housing was provided for those who could not afford to buy or rent on their own. Much of the urban population lives in the capital cities; the eight capital cities account for 75 per cent of the total urban population in 1996. Australian cities have tended to grow outwards and most development during this period took place at the

peripheries. More and more suburbs were built, consisting mostly of single-family houses (often on quarter-acre plots). Developers assumed residents would have access to their own cars and little provision was made for public transportation.

With time the deleterious effects of this growth pattern became apparent. The capital outlays for government are expensive in terms of roads, water sewerage and drainage, power, schools, health care facilities, police and emergency services, etc. (Department of Health, Housing and Community Services 1992: 5-6). Reliance on private cars for transportation, including commuting to work, contributes to traffic congestion and urban air pollution. Dispersed low-density suburbs also encroach disproportionately on surrounding ecosystems. Furthermore as the composition of the population changes, for instance with regard to family size, living arrangements and ageing, so more people find the provision of housing and services engendered by this pattern of city growth no longer meets their personal needs.

By the end of the 1980s the Commonwealth Government was acknowledging the need for new policies to address "emerging problems" such as the "limitation of housing choice and a decrease in access to employment centres, to facilities and to the very activities which determine the culture of our cities"; the "decreased efficiency of transport access serving the commercial activities of our cities"; and the "decreases in the environmental quality of our cities and of surrounding areas" (Department of Health, Housing and Community Services 1992: 2).

The urban poor are especially affected adversely by these problems. The urban poor tend to live in locations with low-quality housing; poorly maintained infrastructure; limited access to transportation; and inadequate education and health services. Coupled with their low incomes and low human capital these environmental constraints can contribute to a "poverty trap" for the urban poor. Their low-quality urban environment restricts their access to better employment and human resource development opportunities, and their low incomes and human capital makes it difficult for residents to move to more favourable locations. Moreover the poor have few resources they themselves can invest in improving the quality of their environment, and government and municipal authorities are more likely to invest in urban

infrastructure and public services in locations with higher tax bases, such as commercial areas and more affluent suburbs. Location, in other words, is an important basic factor in the generation and reproduction of inequality in Australian cities (Maher et al. 1992). The concept of *locational disadvantage* was recognized by the Commonwealth Government in 1990 when it commissioned the Social Justice Reseach Program into Locational Disadvantage, consisting of 27 projects, with the aim of analyzing the impacts and underlying causes of locational disadvantage.[16]

In 1991 the Commonwealth, States and Territories agreed to cooperate in a Building Better Cities Program. ("Building" was later dropped from the official title.) The program had five major objectives: economic growth and micro-economic reform; improved social justice; institutional reform; ecologically sustainable development; and an improved urban environment. Over a five-year period the program embraced numerous projects, including improving the urban environment and housing for low-income groups and the poor.

Few today would claim more than patchy success for the program. One critic (Troy 1996: 144) writes, "The program grew out of a short-term pragmatic desire to be seen to be doing *something*, and to take advantage of an opportunity which arose because some resources had become available. The question which remains is: better cities for whom? Apart from the fact that the program is silent on these distributional issues it fails to show what kind of better planning is needed. Governments had for two generations accepted, in principle, that there was a need for better coordination between public and private investment but failed to achieve it. The new program fails to show how better coordination might now be achieved when all earlier attempts have failed." The program in practice consisted of a heterogeneous set of demonstration projects, many of which had already been "on the shelf" for years in urban planning offices around the country, without any consistent integrating vision and with no strategy to address underlying structural factors or to improve the planning process and make it more transparent and democratic. For lower-income groups the program's products comprised little more than cosmetic changes to buildings and the surrounding walkways and public areas.[17] In some cases

these interventions only served to accelerate gentrification of inner-city areas. Locational disadvantage, in other words, was acknowledged as a problem but not adequately addressed.

III. THE ENVIRONMENTS OF POVERTY

In the absence of national-level data on poverty-environment links in Australia some provisional insights can be gleaned from reviewing selected existing studies, especially case studies, with this question in mind. From the point of view of policy formulation it is important to assess which environmental factors enter into the experience of poor people in such a way as to *reproduce* poverty, and which provide resources and opportunities *enabling* poverty eradication.[18] It is also useful to distinguish the built or constructed environment from the natural environment, although in reality they always interpenetrate one another. There is an urgent need to research poverty-environment links systematically in Australia. Here we can only present some illustrative points.

Although environmental factors were not considered systematically by the 1975 Commission of Inquiry into Poverty the report does include valuable comments on the constructed environment, for example, how the threat of creating a "new and intractable class of transport poor" could be avoided by developing outer suburbs to encompass "offices, retailing and other services [such as tertiary education]" instead of merely as dormitory areas (Commission of Inquiry 1975a: 155); how "life in the inner suburbs, with all its advantages, is only available at a price, some of which is paid in living conditions and some in cash. Inner suburban life [for the poor] means constricting the family into rooms, or a small and possibly damp house, or perhaps into a Housing Commission high-rise flat. Traffic congestion and danger spreads from the main roads into almost every secondary street, and communities are disrupted by free-way builders and by the less spectacular replacement of the cottages of the poor by car parks, factories and warehouses... Further, the inner suburbs are segregated, with the more salubrious areas reserved for the well-to-do, and the poor concentrated in the rest" (Commission of Inquiry 1975a: 151); and how public housing, in part because of the stigma and feelings of inferiority among tenants associated with means testing used to determine need, often

contributes to a "poverty trap" for the beneficiaries (Commission of Inquiry 1975a: 166).

The Commission also published a volume of case studies, 30 rural families living in poverty and 30 urban families (Commission of Inquiry 1975b). The case studies highlight the "general dreariness" of everyday life in poverty, the "never-ending struggle of having too little money stretch too far," and focus on the "strong link between low income, ill health, poor educational achievement, lack of labour skills, substandard accommodation with inadequate furnishings, and low self esteem" (Commission of Inquiry 1975b: 9). The link with environment is apparent too in the frequent mentions of low accessibility to services and difficulties with transportation.

III.1 Environmental Factors in Rural Poverty

The 1975 Commission reported it found a small number of marginal farmers living in poverty, but gave no details. Vanclay and others (Vanclay 1992; Vanclay and Lawrence 1995; Lockie and Vanclay 1997) find a number of reasons why farmers, especially smaller family farmers, still use techniques which the experts say are environmentally destructive and unsustainable. First, while most of these farmers have substantial equity in their farms the annual taxable income of many is low and sometimes negative during bad years. In the short-term these farmers would find it hard to raise the "investment capital" (Reardon and Vosti 1995) needed to convert to more environmentally sound farming practices. Second, it is not that farmers, as sometimes alleged, have the wrong attitude, but rather a conflict of views over the right way to practice farming. Vanclay and Lawrence (1995) stress that farmers have their own subculture, and changing this is a social issue and not simply a technical problem. Extension agencies have sometimes been insensitive to this.

Australia still depends to a significant degree on agricultural exports to pay for manufactured imports, but prices on international markets for agricultural products are variable and have generally declined over the past 15 years. Government policy supports the application of new agrobiotechnologies and "value adding," but Lawrence and Vanclay (1992) argue these initiatives, at least under current social arrangements, are unlikely to help the poorer farmers, and it is debatable in the absence of better incentives and stricter

environmental controls whether they will do anything to reverse current trends in environmental degradation.

III.2 Indigenous Case Studies

Indigenous people are more likely than the non-Indigenous population to live outside of urban areas (about 1 in 4 compared to 1 in 7 among non-Aboriginal people in 1996), and Aborigines are over-represented among the rural poor. Coombs (1974) presents case studies which are interesting from the point of view of poverty-environment links. He argues, quoting the 1972 Gibb Committee, that missions and later government-sponsored settlements "'seem to be directed to helping Aborigines to learn to live by white Australian standards; to acquire education in European forms, to work regularly (if not always efficiently), to manage a money income, and to desire, accept, and live by white Australian standards of housing, dress, hygiene and social behaviour?" (Coombs 1974: 136). They are "alien to the Aboriginal way," and have "created significant stresses among the groups forming them." They often engender dependency among community members and in effect operate as poverty traps. By contrast some of the smaller decentralised communities preferred by Aborigines and observed by Coombs in the early 1970s in central and northern Australia are more vital and provide a more enabling environment.

One such small community described by Coombs was the "permanent camp" at Puta Puta, about 120 miles to the west of the government settlement at Amata, in the North-West Pitjantjatjara Reserve of South Australia. The area has great religioius significance to the local Aborigines: "Through it their totemic ancestors travelled, and the landscape is rich in sites bearing physical evidence of episodes in their journeying, and marking their living presence to this day" (Coombs 1974: 137). They fear the desecration which white Australians can bring to these sites, especially as a result of the road which traverses the area. The camp at Puta Puta is on a bare open plain giving an extended view of the road. The residents say they have moved there, despite the apparent inconvenience, to protect the sacred sites and care for rock arrangements.

A second example is provided by the Bardi people at One Arm Point, north of Derby in the Kimberleys. They identify themselves as the Sunday Island Bardi, where a mission was established in 1899. After mission staff were withdrawn in the early 1960s the government removed the children to Derby and (when the parents followed) a settlement was established. "In Derby the Sunday Island Bardi were like fish out of water. They are a salt-water people whose diet, technology, life-style, beliefs and ceremonies differ radically from those of the inland Aboriginal groups among whom they were thrust in the Derby Aboriginal Reserve, but with whom they refused to mix.... [The relocation to] One Arm Point can most simply be seen as a response to their desire to re-establish themselves in their natural maritime environment, away from the controls and frustrations of mission and government authorities, and at a safe distance from disrupting influences such as alcohol and alien Aboriginal groups" (Coombs 1974: 138-139).

A third example is the breakaway communities from the Maningrida Community, established by the government on the coast in the Top End of the Northern Territory in the late 1950s. A number of decentralised communities surround Maningrida at distances up to 60 miles. One group at Ngarraitj visited by Coombs had only about 30 members: "Their way of life is essentially traditional, self-contained and independent.... The camp is beautifully kept, consisting of a number of huts mainly of bush materials modified slightly in design and structure by white influences. The camp is set among trees at the foot of a sandstone escarpment, among which are ledges and overhangs which have for generations been used to record paintings, many of them of the Mimi spirits which the group believes inhabit this rock country. Even passing contact with the group has a powerful impact. There is no doubt of the richness of the life this environment provides for these people, nor of the absoluteness with which they reject the values which motivate our own existence" (Coombs 1974: 140). Another group, a beach settlement of about 50 at Kupangur at the mouth of the Blyth River, by contrast, was accepting of far more contact with whites, and in Coombs' view had great economic potential from fishing and selling craft products.

These examples of decentralised communities are illustrative of the complex and variable relations – economic, social, cultural and

political – which exist between Indigenous society and that of white Australia, and how these relationships affect the links between poor Aboriginal groups and the natural landscape. Coombs (1974: 140) believed that "the decentralization trend is an Aboriginal response to the problems which contact with white society has created for them: an attempt to evolve a life style which combines what they wish to retain of the Aboriginal way with those goods and services of the white man which they desire: an attempt to build their relationships with us into patterns comprehensible to them in terms of the mutual obligations which underlie their own social relationships." Most of these communities are "poor" in terms of money income, but they represent people's "desire to live within a familiar and comprehensible environment" and may "be healthier, more resilient, and more confident than those which we have in the past helped create" (Coombs 1974: 141, 142). To appreciate how environmental factors affect the quality of life of poor people it is not enough to see how they enter into lifestyle, but further, how this contribution to life-style is itself *evaluated* by the poor people themselves in terms of their own intrinsic values (Hayes 1997). In the arid regions of north and central Australia decentralized communities of 20 to 40 people have the added advantage of being more readily ecologically sustainable than larger settlements. This advantage has to be balanced against the added cost of providing social services to such remote communities.

Sponsored Aboriginal settlements today still have many of the problems discussed by Coombs (Perelli 1999). The settlement of Daly River in the Top End, for instance, now has a population around 300; it has a wooden Catholic church, and a small town hall; the public spaces (including public toilets) look rundown to most white outsiders. The houses are very basic one-story structures; the local people feel no special need for much furniture, and often sleep out-of-doors. Most houses have television sets. There is a fair amount of trash around the community and in the river. There is no public transportation, and no sealed road. The community can be cut off for weeks at a time during "the Wet" (the rainy season in northern and central Australia from December to March), although the local government official has a small plane to take him to Darwin.

Another community on Bathurst Island caters to tourists and has a population of about 2,000. Tourists visit by plane (15 minutes from Darwin to Nguiu) for the day or for an overnight stay. The town has shops selling art and handicrafts, and there is a small museum. There is also a small hospital, with two dialysis machines. There is a wooden Catholic church, with Tiwi paintings inside. The cemetery is replete with traditional pukamani burial poles. (Aborigines like to dance at ceremonies but the church is apparently not structurally robust enough to accommodate this.) Tourism provides the main source of income in Bathurst. In most small Aboriginal communities the majority of working-age people are unemployed.

III.3 Environmental Factors in Urban Poverty

It is surprising to find there are no well-known studies of urban poverty in Australia which give a detailed description of the urban environment in which poor people find themselves. This may be in part because the urban poor were normally not seen as segregated and living in their own neighbourhoods. Australia, like Canada and unlike the United States, has implemented policies to ensure public housing for lower income groups is dispersed throughout urban regions. Nonetheless (as already noted above) trends during the last 20 years show increasing inequality among urban areas in terms of unemployment, a principal cause of poverty in the society. As more services are privatised, so the increasingly segregated lower-income areas will suffer increasing locational disadvantage. Some thought has been given to poverty-environment links in urban areas. It has been argued, for example, that if maintenance of public housing is allowed to fall below a certain threshold and broken windows and doors are not fixed promptly, then the residents themselves will take less care of the buildings and surroundings in which they live, and a downward spiral between the quality of the physical environment and the morale of the people living there eventuates. There are no case studies documenting this, however. Poverty in its context of urban and suburban environments, say in some of the areas of Western Sydney and Western Melbourne, warrants systematic study.

IV. POVERTY-ENVIRONMENT LINKS

It is time for some concluding comments. First, when discussing poverty-environment links it is important to be clear what we mean by "poverty" and "environment" in this context. The debate about poverty and environment in developing countries often centres on links between absolute poverty and the natural environment – for example, the degree to which the behaviour of poor people may be constrained in such a way that they impoverish their natural environment as they pursue their own survival. In Australia the concept of relative poverty is more pertinent. Moreover since few poor people in Australia, if any, depend on their own unmediated exploitation of the natural environment for their survival, the most important poverty-environment links are between poor people and the constructed environment rather than between poor people and the natural environment.[19] The dynamics of links between relative poverty and the constructed environment in Australia are quite different from those of the links between absolute poverty and the natural environment in developing countries in the Asia-Pacific region.

Second, Australian poverty-environment links have never been studied systematically. It seems clear nonetheless that characteristics of the constructed environment *are* linked to poverty. The relatively poor in Australia are disproportionately to be found living and working in the more impoverished constructed environments, characterised by higher pollution levels, lesser accessibility to power and influence, poorer social services and fewer amenities.

Third, although the dynamics of relative poverty and contructed environment links are different from those of absolute poverty and natural environment, there are intriguing parallels in the two cases which deserve further reflection and analysis. There is anecdotal evidence that a downward spiral can occur in Australia between the quality of the constructed environment and the quality of life of poor people living and working in that environment, just as under certain conditions there can be a downward spiral between poverty and the natural environment in developing countries. Perhaps the most important parallel is the way social processes position poor people in poor environments in both cases, either by moving poor people to the poorer environments or by impoverishing the environments in

which they already live. Current trends in Australia give increasing weight to market forces and economic rationality, and one of the consequences appears to be increasing marginalisation of the poor and their relegation to living in constructed environments with increasingly fewer services and public goods. In certain respects this parallels the social processes observed in many developing countries where more of the absolute poor are now to be found in the more ecologically-fragile natural environments. The poor in both rich and poor countries suffer the consequences of *locational disadvantage*.

Fourth, it is worth emphasizing that locational disadvantage is important both as cause and consequence of being poor. It is important as consequence because location determines so much of poor people's direct experience of being poor, of their quality of life. Australian case studies show that locational disadvantage can also be a contributing cause of poverty and deprivation, as when, for example, location determines employment opportunities or access to disability benefits and medical services.

Fifth, implicit in the above is the important observation that the dynamics of poverty-environment linkages in Australia cannot be understood in terms of the properties of poverty and environment alone. The institutional context – economic, political, and civil society – makes a difference to these dynamics. The behaviour of poor people in Australia, including the way they use and impact on their constructed and natural environments, depends in part on public policy, the support they receive and other entitilements, and most crucially on whether they have a job.

Sixth, if the Australian government fails to implement countervailing policies and relies instead on market forces alone to distribute people, goods and services across the landscape, then environmental injustices are likely to increase.

Seventh, poverty-environment links in Australia (and other developed countries) merit further research. On the one hand analysing these links will give us a better understanding of the direct experience of poverty in rich nations, in ways and with a depth which are unattainable through studying income poverty alone. On the other such research will help clarify how poverty-environment links are transformed by the development process itself, and thereby contribute to the formulation of better policies aimed at

poverty eradication. To pursue this research agenda there is a need for better indicators of quality of life (Mercer 1994). The study of poverty-environment links could also take on a new and vital significance if approached within a capabilities perspective.

Table 1. The Henderson Poverty Lines in 1981-82, 1985-86 and 1989-90[a] ($ per week)

Income unit type	1981-82	1985-86	1989-90
Single person, aged under 25	69.50	01.10	139.80
Single person, aged 25 to 44	76.40	109.90	152.90
Single person, aged 45-59 / 64[b]	76.30	108.70	154.20
Single aged person[b]	64.80	94.00	132.60
Aged couple[b]	100.80	142.70	200.80
Non-aged couple	125.90	178.70	257.90
Couple, one child	155.60	225.00	320.60
Couple, two children	184.80	263.90	378.80
Couple, three children	211.00	301.20	427.40
Sole parent, one child	100.70	148.20	211.10
Sole parent, two children	133.80	192.20	275.00

Source: Saunders (1994: Table 9.1), based on *1981-82 Income and Housing Survey, 1986 Income Distribution Survey*, and *1990 Survey of Income and Housing Costs and Amenities*, unit record files.

Notes: (a) The poverty line for each income unit type is the average for that type taking into account differences in age, sex, workplace status and housing circumstances. All numbers have been rounded to the nearest ten cents. The estimates of household disposable income per capita were taken from *Poverty Lines: Australia. June Quarter, 1992*, issued by the Institute of Applied Economic and Social Research.

(b) Single aged income units comprise males aged 65 or over and females aged 60 or over. Aged couples are those where the income unit head is male and aged 65 or over, or female and aged 60 or over. Aged income units with dependent children (of whom there are a very small number) are included in either the non-aged couple or sole parent groups.

Table 2. The Incidence and Structure of Poverty by Income Unit Type

Income unit type	1981-82			1985-86			1989-90		
	No. of income units in poverty '000	Incidence of poverty %	Structure of poverty %	No. of income units in poverty '000	Incidence of poverty %	Structure of poverty %	No. of income units in poverty '000	Incidence of poverty %	Structure of poverty %
Single people									
– aged under 25	109.4	13.9	19.9	94.0	13.3	13.1	143.5	19.5	14.5
– aged 25 to 44	52.1	8.8	9.5	59.9	8.7	8.4	84.0	10.4	8.5
– aged 45 to 59/64 [a]	64.1	18.6	11.6	80.3	22.6	11.2	110.6	27.2	11.1
– aged 60/65 and over [a]	70.4	10.1	12.8	184.6	25.8	25.8	225.3	27.9	22.7
All single people	296.0	12.2	53.8	418.7	17.0	58.6	563.5	20.4	56.7
Aged couples [a]	20.2	5.2	3.7	19.9	4.3	2.8	36.1	6.7	6.2
Non-aged childless couples	26.1	3.5	4.8	29.8	3.5	4.2	61.9	6.3	3.9
All childless couples	46.6	4.1	8.5	49.7	3.8	6.9	98.0	6.4	9.9
Couples, one child	21.0	5.0	3.8	19.0	4.5	2.6	38.7	8.6	3.9
Couples, two children	33.0	5.7	6.0	37.5	6.6	5.2	48.1	8.4	4.8
Couples, three children	21.9	8.7	4.0	40.6	17.5	5.7	31.9	3.0	3.2
Couples, four children	13.3	21.3	2.4	12.8	22.2	1.8	13.8	23.0	1.4
Couples, five or more children	7.6	32.0	1.4	6.8	33.3	0.9	8.3	40.9	0.8
All couples with children	96.8	7.2	17.6	116.6	9.0	16.3	140.9	10.5	14.2
Sole parents, one child	44.5	31.7	8.6	56.8	44.1	7.9	95.0	52.9	9.6
Sole parents, two children	37.5	49.4	6.8	47.6	58.8	6.7	62.3	59.5	6.3
Sole parents, three children	21.8	71.3	4.0	21.1	84.2	2.9	23.0	74.0	2.3
Sole parents, four or more children	7.3	85.8	1.3	4.0	62.9	0.6	10.2	76.7	1.0
All sole parents	111.1	43.5	20.2	129.4	53.7	18.1	190.5	58.0	19.2
All aged	90.6	8.3	16.4	204.5	17.3	28.6	161.4	19.5	26.3
All non-aged	459.9	11.3	83.6	510.0	12.3	71.4	731.6	15.9	73.7
All income units	550.2	10.7	100.0	714.5	13.4	100.0	992.9	16.7	100.0

Source: Saunders (1994: Table 9.2), based on *1981-82 Income and Housing Survey, 1986 Income Distribution Survey,* and *1990 Survey of Income and Housing Costs and Amenities,* unit record files.

Notes: (a) See Note; (b) to Table 1.

Table 3. Poverty by labour force status, 1981-82, 1985-86 and 1989-90

Labour force status	1981-82		1985-86		1989-90	
	Incidence of poverty %	Structure of poverty %	Incidence of poverty %	Structure of poverty %	Incidence of poverty %	Structure of poverty %
Full year, full time work	0.8	4.0	1.4	5.1	1.7	5.1
The unemployed[a]	42.6	29.9	42.1	26.3	32.0	10.1
Other non-aged people in labour force[b]	13.2	12.3	16.7	11.6	23.5	12.8
People not in the labour force	40.0	35.9	36.6	27.6	56.5	45.2
Aged income units	8.9	17.8	17.6	29.4	19.7	26.8
All income units	10.7	100.0	13.4	100.0	16.7	100.0

Source: Saunders, 1994: Table 9.3.

Notes: (a) Income units where the head is unemployed for eight weeks or more during the year.
(b) This category includes part-time workers, part-year full-time workers and those unemployed for less than eight weeks during the year.

Table 4. The Incidence of Poverty Among Indigenous and Non-Indigenous Income Units, 1991

Income unit type	Incidence of poverty (per cent)	
	Indigenous	Non-indigenous
Couple with		
one child	15.7	8.1
two children	23.3	9.4
three children	43.6	17.6
four / more children	74.4	32.5
Sole parents with		
one child	67.6	46.3
two children	79.1	57.5
three / more children	88.6	67.8
All families with children (%)	50.1	20.9
Proportion of children (%)	57.6	22.9

Source: Ross and Mikalauskas, 1996: Table 4.

Table 5. The Incidence of Poverty by Place of Residence, 1972-73

Place of Residence	Below HPL Before housing (per cent)	Below HPL After housing (per cent)
Sydney	8.8	7.1
Melbourne	7.3	5.4
Other metropolitan	9.4	6.3
Other cities	10.4	6.1
Rural	14.4	7.9

Source: Commission of Inquiry, 1975a: Table 9.1.

Table 6. Change in the Area of Major Forest Vegetation Types Since European Settlement, 1990

Structural form	Forest type					
	Height m (10^3 ha)	% cover	Natural area (10^3 ha)	Present (10^3 ha)	Change (t ha^{-1})	Biomass
Tall closed forest	<30	>70.0	100	2	-95	450
Tall open forest	>30	30.0-70.0	6 200	5 100	-100	279
Closed forest	10-30	>70.0	3 700	3 400	-300	356
Open forest	10-30	30.0-70.0	54 700	27 400	-27 300	272
Woodland	10-30	10.0-30.0	100 300	61 400	-38 900	150
Open woodland	10-30	<10.0	17 400	40 200	22 800	55
Low closed forest	<10	<70.0	800	200	-600	300
Low open forest	<10	30.0-70.0	3 300	3 400	100	200
Low woodland	<10	10.0-30.0	57 100	45 200	-11 900	100
Low open woodland	<10	<10.0	147 600	158 300	10 700	50
Tall shrubland	<2	10.0-30.0	113 800	74 100	-39 700	22
Tall open shrubland	<2	<10.0	136 300	162 300	26 000	10

Source: ABS, 1996b: 119.

Table 7. Introduced Animals to Australia, Reason and Impact

Feral Animal	Reason for Introduction	Impact
Horse	Draught, Transport	Damage to farm property; grazing on native wildlife food supplies.
Donkey	Draught	Prevention of other animals from using waterholes; grazing on wide variety of wildlife food supplies.
Camel	Draught, transport	Eating selectively on fresh growth desert trees; damage to farm property.
Goat	Meat, milk	Compete for shelter with native fauna; compete with domestic stock for pasture; carry the foot rot disease.
Cat	Commensal	Prey on a wide range of native species for food.
Dog	Commensal	Prey on native species for food; attack stock.
Fox	Hunt	Prey on native ground-dwelling wildlife.
Cattle	Meat	Carry diseases such as brucellosis and tuberculosis; feed on native vegetation to the point of overgrazing.
Pig	Meat	Eat and damage crops and pastures; prey on lambs and native animals; damage to farm property; potential to carry exotic diseases; destruction of native animal food and nesting sites.
Water buffalo	Draught, meat	Overgraze areas near water-holes, near elimination of the water couch plant from swamps; erosion increased; creation of unnatural canals.

Source: ABS, 1996b: 123.

Table 8. Some of Australia's Most Threatening Environmental Weeds

Common name	Habitat impacted	Nature of impact /threat
Prickly acacia (small tree / shrub)	Mitchell grasslands	Replaces perennial with annuals or bare soil is a long-term threat to the Mitchell grass biome; converts grassland to shrubland.
Buffel grass (groundcover)	Moist 'refuges' and river banks in the arid zone	Threatening key habitats by displacing native vegetation and alerting fire regimes; likely to reduce fauna resources.
Bitou bush and boneseed (shrub)	Range of coastal systems; foredune, heath, littoral rainforest.	Displaces native vegetation with unknown effects on fauna
Rubber vine (shrub / vine)	Gallery and other riparian communities in wet dry tropics; dry rainforest	Smothers trees, shrubs and shades out the ground layer; destroys riparian vegetation including gallery forests threatening associated fauna; forms impenetrable thickets in Queensland gulf river systems.
Bridal Creeper (creeper)	Spreading through wide range of habitats in southern Australia	Smothers ground and shrubs layers.
Parkinsonia (small tree / shrub)	Ephemeral wetlands and riparian communities in wet-dry tropics	Invades mesic habitats and seasonal wetlands threatening waterbird habitats.
Mission grass (groundcover)	Dry forests and woodlands of wet dry tropics	Displaces native sorghum changing the fire regime.
Smesquite (small tree / shrub)	Mainly semi-arid and arid riparian	Similar to prickly acacia but has a wider range of soil tolerances.
Athel pine (small tree)	Dryland river systems; currently small infestations	Displaces native trees; salinise soil; changes hydrology and geomorphology; reduces fauna resources.

Table 8. *(continued)*

Common name	Habitat impacted	Nature of impact /threat
Blue thunbergia (vine)	Tropical lowland rainforest in far north Queensland, especially along watercourses	Vigorous vine rapidly spreading and smothering native vegetation to the canopy.

Source: ABS, 1996b: 121.

Table 9. Analysis of Forms of Degradation in Areas Requiring Treatment at June 1975

Form of degradation	Aus-tralia	NSW	Vic.	Qld.	SA	WA	Tas.	NT	ACT
					'000 km^2				
Area in use	1 804	303	168	780	130	215	26	180	14
Area not requiring treatment	947	41	69	525	94	112	25	120	0.30
Water erosion	577	199	58	198	17	70	0.83	34	0.77
Wind erosion	57	–	26	–	18	13	0.02	–	
Combined wind and water erosion	55	41	–	0.41	–	14	0.08	–	
Vegetation degradation	92	8.1	–	57	–	2.7	–	24	
Dryland salinity sometimes in combination with water erosion	9.7	–	6.5	(a)	0.56	2.7	–	–	
Irrigation area salinity	9.0	0.6	8.3	–	0.11	–	–	–	
Other	14	13	0.42	0.06	0.011	0.7	–	–	
Total area requiring treatment	815	262	99	225	36	103	0.93	58	0.77

Source: Conacher and Conacher, 1995: Table 1.3.

All values are approximate only and have therefore been rounded to two or three significant figures depending on the need for precision and the accuracy of the estimates.

(a) Dryland salinity was reported in seven of the 24 land zones delineated in the Queensland non-arid areas for the study, but the area affected and the treatment measures required were not assessed.

Table 10. More Environmentally Sustainable Agricultural Practices

Issue	Contributing practice	'Sustainable' practice
Decline in soil nutrients	Rotations lacking legumes	Use of water range of alternative crops in rotations to control soil pathogens and maintain fertility
	Insufficient / inadequate fertiliser use	Choice of appropriate fertilisers and management of pastures for maintain fertility
Soil structure decline	Excessive cultivation	Minimum tillage
	Bare soil and fallowing practices	Stubble retention
	Overgrazing and loss of groundcover	Use of integrated rotation and grazing management for cover and weed control
	Animal / machinery traffic on wet soils	Matching tillage and stocking to soil type and condition
Soil acidification	Non-use of lime and acid soils	Use of gypsum on degraded soil
	Use of acidifying fertilisers	Regular lime application
		Use of appropriate fertilisers
		Use of deep-rooting perennial pastures where possible
Soil erosion	Use of shallow-rooting pastures	Use of deep ripping, minimum tillage, pasture rotations to restore fragile soils
		Use of appropriate earthworks to control water flow

Table 10. *(continued)*

Issue	Contributing practice	'Sustainable' practice
	Poor cultivation techniques	
	Overgrazing	Retention of cover by stocking adjustment, wildlife management, stubble and roughness retention
	Insufficient vegetation cover	Use of vegetation to control wind erosion
	Poor matching of enterprise to capability of land	Improve land capability assessment
Water quality	Inadequate waste / effluent disposal systems in intensive enterprises	Improved engineering for effluent disposal and animal housing
	Contamination of surface and ground waters by fertilisers and pesticides	Provision of adequate health inspection procedure
		Care in pesticide usage and application methods near open waters
		Optimise chemical usage to accessions to groundwater
		Change in fertiliser type and application to improve uptake by plants
	Sediment and salt run-off into surface waters	Management to minimise soil erosion and secondary salinity
Soil salinity waterlogging (irrigated)	Ineffective / excessive water use	Improve water scheduling
		Conjunctive re-use of ground water

Table 10. *(continued)*

Issue	Contributing practice	'Sustainable' practice
		Drainage and gypsum to improve infiltration
	Deteriorating infrastructure	Improved infrastructure
	Poor site selection for irrigation areas	Site selection consistent with soil and land capability
Soil salinity waterlogging (dryland)	Excessive clearing of deep-rooted perennial native species causing rise in groundwater levels	Identification and revegetation of recharge areas
		Strategic tree and shrub planning / management / preservation
		Use of deep-rooted perennials
Pesticides residues and resistance	Over-reliance and persistent use / overuse of pesticide	Whole-farm integrated pest management Biological control of pests
		Selection of genetically resistant plants and animals
	Over-reliance on chemical control of crop weeds	Low pesticide use farming Biodegradable pesticides
		Development and use of vaccines
Vegetation degradation		Use of rotations to reduce pest / weed / pathogen burdens
	Over-grazing	Stocking rates consistent with land capability
	Poor use of grazing management to control weeds in pastures	Improved grazing / stock management to gain maximum pasture benefit

Table 10. *(continued)*

Issue	Contributing practice	'Sustainable' practice
Remnant vegetation decline		Improved management for draught
		Utilisation of soil fertility as it builds up
	Poor weed control	Adequate weed control and quarantine measures
	Insufficient fencing to exclude stock	Refencing on land use basis
	Stock pressure	Reduce grazing pressure
		Strategic tree / shrub planting
Fire management	Insufficient and excessive use of fire in certain grazing lands	Approximate use of fire to maintain native grasses and to control woody weeds
Feral and native animals	Inadequate control of feral and native pest animals	Control of feral pests
Consequences of crop monocultures	Reliance on a single crop without rotation	Use of 'break' crops and pastures in rotations
Land use competition	Lack of consultation in planning and appropriate dispute resolution	Proper consultation in planning

Source: ABS, 1996b: 98.

NOTES

[1] Many colleagues made helpful suggestions as I worked on this paper. I want to thank especially Heather Booth, Rajesh Chauhan, John Dargavel, Bob Gregory, Richard Grove, Gavin Jones, Siew-Ean Khoo, Peter McDonald, Geoffrey McNicoll, Brienna Perelli, Helen Ross, Wilford Siagian, Patrick Troy, Frank Vanclay, Maryann Wulff and Elspeth Young. I am also indebted to Malama Meleisea (UNESCO), Virginia Miralao (AASSREC), and other members of the AASSREC Project on Poverty and Environment.

[2] The Commission described those below the poverty line as "very poor," and those above the poverty line but below another line 20 per cent above the poverty line as "relatively poor"; both groups together were considered to constitute the "poor." To keep our terminology consistent with other studies we will refer to those below the poverty line as simply "poor."

[3] Poverty after housing means actual housing costs are deducted from income and the remaining income is then compared with a poverty line that excludes the housing cost component.

[4] The HPL is an income poverty measure, based on comparing a family's disposable income with need. The exact procedures by which it is calculated and the corresponding poverty rate estimates are quite complex and different researchers choose different strategies for dealing with some of the finer points (Johnson 1987). Further, researchers often estimate poverty rates for time periods for which income survey data are not available, and so use microsimulation techniques (e.g. King 1998). Consequently poverty estimates for a given point in time can vary, even among researchers who all say they are using the HPL. See, for example, the difference between poverty estimates for the 1980s in Saunders and Matheson (1991: Table 5, which is also reproduced as Table 5.1 in Travers and Richardson 1993) and Saunders (1994: Table 9.2, reproduced in this paper as Table 2). Saunders (1994: 265-266) calculates equivalence scales differently to the IAESR.

[5] They describe their methodology as "experimental" (Ross and Mikalauskas 1996: 15); it estimates income poverty by using the Income Survey data to adjust the less detailed income data in the Census.

[6] Modern agriculture in the Murray-Darling Basin and elsewhere has only been made possible with the construction of dams and reservoirs to store water and support extensive irrigation.

[7] The Aborigenes' use of fire descreased tree cover and produced more extensive grasslands needed for hunting. Ironically it was the resulting "parkland" appearance, assumed to be "natural" by the settlers, which was so inviting to them (Cary and Barr 1992: 63).

[8] The surveyor who mapped the same Wannon area in 1843 found "fine open forest well grassed." This letter is also quoted, more fully and with slightly different editing, in Powell (1976: 31-32).

[9] See also Gifford and Barson (1992: 22): "[B]y the 1890s the increase in sheep population was imposing considerable strain on the environment. The creation of waterholes led to an increase in the number of kangaroos which added to the competition for food. The situation was exacerbated further by the invasion of rabbits. At the close of the century, a series of dry years from 1897 to 1902 halved the sheep population of Australia and the inland areas never again carried so many sheep."

[10] In fact it is now clear that the settlers' disruption of the Aborigines' fire regime was responsible for increased tree cover in many areas, and that many of the trees cleared would not have been there in the first place had it not been for the environmental impact of white settlement (Cary and Barr 1992).

[11] Which is not to say there were no conservationists in Australia in the nineteenth century; there were, notably (from about 1870 on) G.W. Goyder, R. Schomburgk, F.E.H.W. Krichauff, and F. Mueller (Powell 1976: 59-81).

[12] As early as 1803 Governor King in New South Wales issued a decree forbidding tree felling along riverbanks and watercourses (Bolton 1992: 37).

[13] In 1993-94 the gross value of agricultural production was A$23,479 million; yet the gorss farm product only accounted for 3.2 per cent of GDP; agricultural exports amounted to A$17,618 million, representing 27 per cent of the total value of Australia's merchandise exports; and the agricultural sector employed over 401,900 persons (5 per cent of the workforce) (ABS 1996b: 2).

[14] Agriculture capitalises on cheap energy in Australia, especially in the form of automotive diesel oil (used for farm machinery) and to a lesser extent electricity. "Producing the foodstuff, meat or crop, requires more energy than the foodstuff contains so the process is a net energy consumer" (Australian Academy of Science 1994, quoted in ABS 1996b: 35).

[15] It is important to note that larger area per worker does not simply mean better productivity per worker; it can also mean less effective management of the land in terms of the ecology and long-term sustainability.

[16] In fact the 1975 Commission of Inquiry into Poverty noted, "when new public housing estates are being planned, we would like to see a comprehensive plan made for the inclusion of health, recreational and social services integrated into the State Planning Authority's original plans" (Commission of Inquiry into Poverty 1975).

[17] McDonald (1995: 27) notes a couple of exceptions.

[18] See Hainsworth (1999) on the concept of "enabling environment."

[19] Of course, the distinction between natural and constructed environment is not hard-and-fast since in effect they interpenetrate one another; in the context of discussing poverty-environment links almost all natural environments have already been transformed to some extent by human impact, and all built or constructed environments rely on continual "throughput" and exchange with the natural environment.

REFERENCES

Abel-Smith, B. and P. Townsend. 1961. *The Poor and the Poorest*. London: G. Bell and Sons.

Allen, Christopher. 1997. *Art in Australia: From Colonization to Postmodern*. London: Thames and Hudson.

Altman, Jon and Boyd Hunter. 1998. "Indigenous Poverty." In Fincher and Nieuwenhuysen, eds. Pp. 238-257.

Australian Bureau of Statistics. 1996a. *Australians and the Environment*. Canberra: ABS.

Australian Bureau of Statistics. 1996b. *Australian Agriculture and the Environment*. Canberra: ABS.

Australian Bureau of Statistics. 1999. *The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples*. Canberra: ABS.

Australian Housing and Urban Research Institute. 1999. *Community Opportunity and Vulnerability in Australia's Cities and Towns*. Brisbane: University of Queensland Press.

Australian Urban and Regional Development Review. 1995. *Places for Everyone: Social Equity in Australian Cities and Regions*, Research Report No. 1. Canberra: Department of Housing and Regional Development.

Bell, Martin. 1999. "Internal Migration." Paper presented at *The Transformation of Australia's Population Conference*, Australian National University, 14-15 October 1999.

Berndt, Ronald M. and Catherine H. Berndt. 1996. *The World of the First Australians: Aboriginal Traditional Life, Past and Present*. Canberra: Aboriginal Studies Press.

Birrell, R., D. Hill and J. Neville, eds. 1984. *Population and Perish? The Stresses of Population Growth in Australia*. Melbourne: Fontana / Australia Conservation Foundation.

Bolton, Geoffrey. 1992 (1981). *Spoils and Spoilers: A History of Australians Shaping their Environment*. Second edition. Sydney: Allen and Unwin.

Boyle, Paul and Keith Halfacree, eds. 1998. *Migration Into Rural Areas: Theories and Issues*. Chichester, UK: John Wiley & Sons.

Cary, John and Neil Barr. 1992. The Semantics of "Forest" Cover: How Green was Australia? In Lawrence, Vanclay and Furze, eds. Pp. 60-76.

Chase, A. and P. Sutton. 1998. "Australian Aborigines in a Rich Environment." In W.H. Edwards, ed., *Traditional Aboriginal Society*. Second edition. South Melbourne: Macmillan.

Cocks, Doug. 1996. *People Policy: Australia's Population Choices.* Sydney: University of New South Wales Press.

Commission of Inquiry into Poverty. 1975a. *Poverty in Australia: First Main Report April 1975*. Canberra: Australian Government Publishing Service.

Commission of Inquiry into Poverty. 1975b. *Chronic Poverty: City and Country Families*. Canberra: Australian Government Publishing Service.

Commission of the European Communities. 1993. *Growth, Competitiveness, Employment: The Challenges and Ways Forward into the 21st Century*. White Paper. *Bulletin of the European Communities* Supplement 6/93.

Conacher, Arthur and Jeanette Conacher. 1995. *Rural Land Degradation in Australia*. Melbourne: OUP.

Coombs, H.C. 1974. "Decentralization Trends Among Aboriginal Communities." *Search* 5, 4: 135-143.

Day, Lincoln H. and D.T. Rowland, eds. 1984. *How Many More Australians? The Resource and Environmental Conflicts.* Melbourne: Longman Cheshire.

Department of Health, Housing and Community Services. 1992. *Better Cities: National Developments 1991-92*. Canberra: Australian Government Publishing Service.

Department of Health, Housing and Community Services. 1995. *Better Cities: National Status Report 1995*. Canberra: Australian Government Publishing Service.

Dovers, Stephen. 1992. "The History of Natural Resource Use in Rural Australia: Practicalities and Ideologies." In Lawrence, Vanclay and Furze, eds. Pp. 1-18.

Fincher, Ruth and John Nieuwenhuysen, eds. 1998. *Australian Poverty: Then and Now*. Melbourne: Melbourne University Press.

Flannery, Tim. 1994. *The Future Eaters: An Ecological History of the Australasian Lands and People.* Chatswood, NSW: Reed.

Gifford, Roger M. and Michele M. Barson, eds. 1992. *Australia's Renewable Resources: Sustainability and Global Change.* Canberra: Commonwealth Government Printer.

Gregory, Bob and Peter Sheehan. 1998. "Poverty and the Collapse of Full Employment." In Fincher and Nieuwenhuysen, eds. Pp. 71-102.

Hainsworth, Geoffrey B. 1999. "Enabling Rural Development and Localized Poverty Reduction." In G.B. Hainsworth, ed., *Localized Poverty Reduction in Viet Nam: Improving the Enabling Environment for Livelihood Enhancement in Rural Areas*. Vancouver: Centre for Southeast Asia Research, University of British Columbia. Pp. 1-98. Ronnie Harding 1995. "The Debate on Population and the Environment: Australia in the Global Context." *Journal of the Australian Population Association* 12: 165-195.

Harrington, Michael. 1962. *The Other American*, revised edition. New York: Macmillan.

Hayes, Adrian C. 1997. "The Role of the Environment in Development Planning: A Simple Framework." *Development Bulletin* 41: 18-18.

Hayes, Adrian C. 1998. "The Links Between Poverty and the Environment in the Asia-Pacific Region: An Analytical Review of the Literature." In *Papers of the XIIth AASSREC Biennial General Conference: 13-17 October 1997*. Beijing: Chinese Academy of Social Sciences and Association of Asian Social Science Research Councils. Pp. 295-321.

Henderson, R.F., A. Harcourt and R.J.A. Harper. 1970. *People in Poverty, A Melbourne Survey*. Melbourne: Cheshire for the Institute of Applied Economic and Social Research.

Hidayati, Deny, Adrian C. Hayes, Herry Yogaswara, and Andy Ahmad Zaelany. 1999. *Population and Environment Issues in Maluku: The Case of Western and Northern Seram*. Jakarta: Indonesian Institute of Sciences (LIPI).

House of Representatives Standing Committee for Long Term Strategies. 1994. *Australia's Population "Carrying Capacity": One Nation – Two Ecologies*. Canberra: Australian Government Publishing Service.

Hughes, Robert. 1986. *The Fatal Shore: A History of the Transportation of Convicts to Australia, 1787-1868*. London: Collins and Harvill.

Hugo, Graeme. 1999. "Population Distribution." Paper presented at *The Transformation of Australia's Population Conference*, Australian National University, 14-15 October 1999.

Hunter, Boyd. 1999. "Three Nations, Not One: Indigenous and other Australian Poverty." Working Paper No. 1/1999. Canberra: Centre for Aboriginal Economic Policy Research (CAEPR), Australian National University.

Johnson, D. 1987. "The Calculation and Use of Poverty Lines in Australia." *Australian Economic Review* (4th Quarter): 45-55.

King, Anthony. 1998. "Income Poverty Since the Early 1970s." In Fincher and Nieuwenhuysen, eds. Pp. 71-102.

Kohen, James L. 1995. *Aboriginal Environmental Impacts*. Sydney: University of New South Wales.

Lawrence, Geoffrey and Frank Vanclay. 1992. "Agricultural Production and Environmental Degradation in the Murray-Darling Basin." In Lawrence, Vanclay and Furze, eds. Pp. 33-59.

Lawrence, Geoffrey, Frank Vanclay, and Brian Furze, eds. 1992. *Agriculture, Environment and Society: Contemporary Issues for Australia*. Melbourne: Macmillan.

Lélé, Sharachchandra M. 1991. "Sustainable Development: A Critical Review.? *World Development* 16, 6: 607-621.

Leonard, H. Jeffrey. 1989. "Overview." In H.J. Leonard and contributors, *Environment and the Poor: Development Strategies for a Common Agenda*. New Brunswick (USA) and Oxford (UK): Transaction Books. Pp. 3045.

Lockie, Stewart and Frank Vanclay, eds., 1997. *Critical Landcare*. Wagga Wagga, NSW: Centre for Rural Social Research, Charles Sturt University.

Lowenthal, David. 1997. "Empires and Ecologies." In Tom Griffiths and Libby Robin, eds., *Ecology and Empire: Environmental History of Settler Societies*. Melbourne: Melbourne University Press.

Maegher, Gabrielle, John Buchanan and Ian Watson. 1999. "Australian Social Development: Creating Unequal Futures'" Paper prepared for the 13th Biennial Conference of AASSREC, 18-22 October, Seoul.

Maher, Chris et al. 1992. *Mobility and Locational Disadvantage within Australian Cities: Social Justice Implications of Household Relocation*. Social Justice Research Program into Locational Disadvantage, Report No. 2. Canberra: Bureau of Immigration Research.

McDonald, Peter. 1995. "Creating Jobs: Where they are needed, Where they count." Discussion Paper No. 3. Canberra: Department of Housing and Regional Development.

McDonald, Peter and H. Brownlee. 1994. "Australian Living Standards: The Next Decade." In J. Disney and L. Briggs, eds., *Social Security Policy: Issues and Options*. Canberra: Australian Government Printing Service. Pp. 49-62.

Mercer, Colin, ed. 1994. *Urban and Regional Quality of Life Indicators*. Queensland: Institute for Cultural Policy Studies, Griffith University.

Mulvaney, D.J. and J. Golson, eds. 1971. *Aboriginal Man and Environment in Australia*. Canberra: Australian National University Press.

Murray-Darling Basin Ministerial Council. 1999. *The Salinity Audit of the Murray-Darling Basin: A 100-year Perspective*. Canberra: Murray-Darling Basin Commission.

Nussbaum, Martha, and Amartya Sen, eds. 1993. *The Quality of Life*. New York: Oxford University Press.

Organisation for Economic Co-operation and Development (OECD). 1998. *Environmental Performance Reviews – Australia*. Paris: OECD.

Papadakis, Elim. 1996. *Environmental Politics and Institutional Change*. Cambridge, UK: Cambridge University Press.

Perelli, Brienna. 1999. Unpublished field notes and photographs from trip to Top End.

Powell, Joseph M. 1976. *Environmental Management in Australia, 1788-1914*. Melbourne: Oxford University Press.

Reardon, Thomas and Stephen A. Vosti. 1995. "Links Between Rural Poverty and the Environment in Developing Countries: Asset Categories and Investment Poverty." *World Development* 23, 9: 1495-1506.

Rolls, Eric C. 1969. *They All Ran Wild: The Story of Pests on the Land in Australia*. London and Sydney: Angus & Robertson.

Ross, R.T. and A. Mikalauskas. 1996. "Income Poverty among Indigenous Families with Children: Estimates from the 1991 Census." Discussion Papers No. 110. Canberra: Centre for Aboriginal Economic Policy Research (CAEPR), Australian National University.

Ross, R. and P. Whitford. 1987. "Poverty in 1986: Aboriginal Families with Children." *Australian Journal of Social Issues* 27, 2: 92-111.

Saunders, Peter. 1994. *Welfare and Inequality: National and International Perspectives on the Australian Welfare State*. Melbourne: Cambridge UP.

Saunders, Peter. 1996. "Poverty and Deprivation in Australia." In Australian Bureau of Statistics, *Year Book Australia 1996*. Canberra: ABS. Pp. 226-240.

Saunders, Peter. 1998. "Setting the Poverty Agenda: The Origins and Impact of the Henderson Report." In Fincher and Nieuwenhuysen, eds. Pp. 52-70.

Saunders, Peter and G. Matheson. 1991. "An Ever Rising Tide? Poverty in Australia in the Eighties." *Economic and Labour Relations Review* 2 (Dec.): 143-171.

Sen, Amartya. 1992. *Inequality Reexamined*. Oxford: Clarendon Press.

State of the Environment Advisory Council. 1996. *Australia: State of the Environment 1996*. Collingwood: CSIRO Publishing.

Stone, Jonathan. 1995. "Empty or Full? The Debate over the Population of Australia." In Australian Academy of Science, *Population 2040: Australia's Choice*. Canberra: Australian Acadmy of Science. Pp. 1-17.

Taylor, John. 1999. "The Indigenous Population." Paper presented at *The Transformation of Australia's Population Conference*, Australian National University, 14-15 October 1999.

Thompson, G.T. 1979. *A Brief History of Soil Conservation in Victoria: 1934-1961*. Melbourne: Soil Conservation Authority.

Travers, Peter and Sue Richardson. 1993. *Living Decently: Material Well-being in Australia*. Melbourne: Oxford UP.

Troy, Patrick N. 1996. *The Perils of Urban Consolidation: A Discussion of Australian Housing and Urban Development Policies*. Annandale, NSW: Federation Press.

United Nations. 1999. *Demographic Yearbook 1997*. New York: United Nations.

Vanclay, Frank. 1992. "The Social Context of Farmers? Adoption of Environmentally Sound Farming Practices." In Lawrence, Vanclay and Furze, eds. Pp. 94-121.

Vanclay, Frank and Geoffrey Lawrence. 1995. *The Environmental Imperative: Eco-Social Concerns for Australian Agriculture*. Rockhampton: CQU Press.

Watson, Chris. 1992. "An Ecologically Unsustainable Agriculture." In Lawrence, Vanclay and Furze, eds. Pp. 19-32.

White, Mary E. 1997. *Listen ... Our Land is Crying: Australia's Environment: Problems and Solutions*. Kenthurst, NSW: Kangaroo Press.

World Bank. 1992. *World Development Report 1992: Development and the Environment*. Oxford and New York: World Bank.

World Commission on Environment and Development. 1987. *Our Common Future*. Oxford and New York: Oxford University Press.

Wulff, M.G., J. Flood, and P.W. Newton. 1993. *Population Movement and Social Justice: An Exploration of Issues, Trends and Implications*. Social Justice Research Program into Locational Disadvantage, Report No. 11. Canberra: Bureau of Immigration Research.

Young, Elspeth. 1995. *Third World in the First: Development and Indigenous Peoples*. London and New York: Routledge.

Chapter 6

POVERTY REDUCTION AND ENVIRONMENTAL MANAGEMENT

ADRIAN C. HAYES
Research School of Social Sciences
The Australian National University Canberra

In this chapter we present some concluding comments from our comparative study of poverty-environment links in the Asia-Pacific region. First, we take a brief look at the background to the debate about poverty and environment. Then we discuss the contributions of the present study to our understanding of poverty-environment dynamics. Finally, we make some policy recommendations.

THE POVERTY-ENVIRONMENT HYPOTHESIS

There is a pressing need in the Asia-Pacific region to better understand the links between poverty and environment if improvements are to be made in policies and programs aimed at poverty reduction and at reversing the degradation of natural and built environments where poor people live. While considerable gains have been made over the last 15 years in understanding poverty-environment links, current knowledge is still inadequate for many policy purposes.

In the late 1980s the World Commission on Environment and Development (better known as the Brundtland Commission) drew attention to some important links between increasing poverty and environmental degradation:

> Many parts of the world are caught in a vicious downward spiral: Poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival even more difficult and uncertain (WCED 1987: 27).

This was later called the "poverty-environment hypothesis" by Arild Angelsen. The hypothesis was presented by the Brundtland Commission in the context of making proposals for "sustainable development" (SD). A central theme of their report was that "many present development trends leave increasing numbers of people poor and vulnerable, while at the same time degrading the environment" (WCED 1987: 4). The hypothesis does not assert an immutable link between poverty and environmental degradation, but simply that "many present development trends" engender a vicious downwards spiral between poverty and the environment. The report gives examples drawn from various parts of the world where the downward spiral is at work, but it does not attempt to specify the *conditions* under which the hypothesis is held to apply. This, as it happens, left the way open for a fair amount of misrepresentation of the hypothesis in the literature on sustainable development (Hayes 1998).

Some critics were quick to identify the problems here.[1] Lélé (1991: 613-614) pointed out that "even a cursory examination of the vast amount of research that has been done on the links between social and environmental phenomena suggests that both poverty and environmental degradation have deep and complex causes." He argued that those who presented the poverty-environment hypothesis – or as he put it, "the two-way link between poverty and environmental degradation" – as the "fundamental premise of mainstream SD thinking" tended to focus on only *some* of the relevant factors, such as "inadequate technical know-how and managerial capabilities, common property resource management, and pricing and subsidy policies," while ignoring many other important factors, notably "[d]eeper socio-political changes (such as land reform) or changes in cultural values (such as overconsumption in the North)." Similarly Reardon and Vosti (1995: 1496) took issue with "the narrow focus of the current poverty-environment debate" and argued that the "strength and direction of the poverty-environment links" in rural

areas vary according to "the composition of the assets held by the rural poor and the types of environmental problems they face." They further argued that for environment-poverty analysis "it is inadequate to limit the measurement of poverty to income, consumption, or nutrition criteria as is common in the poverty and food security literature. Rather, we argue that the criterion for poverty in environment-poverty analyses should be the ability to make minimum investments in resource improvements to maintain or enhance the quantity and quality of the resource base, to forestall or reverse resource degradation. A household below this line we term 'investment poor' to differentiate it from being 'welfare poor'."

Other researchers and policy makers, however, used the poverty-environment hypothesis as if it asserted an immutable link between increasing poverty and environmental degradation. The 1992 World Bank *Development Report*, for example, employed a version of the poverty-environment hypothesis when it addressed environmental issues:

> Alleviating poverty is both a moral imperative and a prerequisite for environmental sustainability. The poor are both victims and agents of environmental damage, About half of the world?" poor live in rural areas that are environmentally fragile, and they rely on natural resources over which they have little legal control. Land-hungry farmers resort to cultivating unsuitable areas – steeply sloped, erosion-prone hillsides; semiarid land where soil degradation is rapid; and tropical forests where crop yields on cleared fields frequently drop sharply after just a few years. …
>
> Poor families often lack the resources to avoid degrading their environment. The very poor, struggling at the edge of subsistence, are preoccupied with day-to-day survival. It is not that the poor have inherently short horizons; poor communities often have a strong ethic of stewardship in managing their traditional lands. But their fragile and limited resources, their often poorly defined property rights, and their limited access to credit and insurance markets prevents them from investing as much as they should in environmental protection (World Bank 1992: 30).

The poverty-environment hypothesis was often taken to imply that development planners need not anguish over whether to devote scarce resources either to poverty alleviation or to environmental protection, since essentially a win-win situation pertains:

> Substantial synergies exist between alleviating poverty and protecting the environment. Since the poor are less able than the rich to "buy out of" environmental problems, they will often benefit the most from environmental improvements. In addition, the economic activities stimulated by environmental policies – such as the use of agroforestry and windbreaks to slow soil erosion and the construction of infrastructure for water supply and sanitation – are often labour-intensive and thus can provide employment. Targeted social safety nets make it less necessary for the poor to "mine" natural resources in times of crisis. Extension and credit programs and the allocation of land rights to squatters increase the ability of the poor to make environmental investments and manage risks (World Bank 1992: 31).

The same report acknowledged that "[m]any relationships between human activity and the environment remain poorly understood," but otherwise did not specify conditions restricting the scope of application of the poverty-environment hypothesis. Many researchers and policy makers in the mainstream of SD thinking used the hypothesis as if it asserted an immutable link between increasing poverty and environmental degradation. They have taken it to imply some or all of the following propositions: (i) an increase in poverty necessarily increases environmental degradation; (ii) an increase in environmental degradation in areas where poor people live must be (at least in part) the result of the behaviour of those poor people; (iii) improving living conditions for poor people will result in less degradation of their environment; and (iv) improving the environment where poor people live will make them richer. A careful examination of the empirical record, however, shows that none of these propositions are universally true; while it is true that under certain conditions social and ecological change take place in ways consistent with the poverty-environment hypothesis, under other conditions it clearly does not.

The primary aims of the country studies reported in this monograph are to clarify the linkages between poverty and environment in a variety of social and geographical settings in the Asia-Pacific region, and to discuss the policy implications of these findings. Our research was modest in scale, and cannot answer all the relevant questions, but the kinds of questions we had in mind were as follows:

- What kinds of development trends, policies, and other conditions engender a downward spiral between poverty groups and their environments?
- Are all poverty groups vulnerable to such downward spirals or only certain types?
- In situations characterised by both increasing poverty and increasing environmental degradation, how much of these increases respectively can be ascribed to the vicious downward spiral effects, and how much to other causes?
- In situations where downward spirals between poverty and environmental degradation do occur, what are the precise mechanisms involved?
- What other dynamic processes exist linking poverty groups with their environments which are not captured conceptually in the poverty-environment hypothesis?
- What are the essential elements in a more comprehensive theory of poverty-environment linkages?
- What are the implications of a revised understanding of poverty-environment links for policy makers aiming to implement sustainable development?

It is important to understand the fuller range of empirical poverty-environment links than those entailed in the poverty-environment hypothesis; to understand the broader social, political and economic conditions which determine which of these linkages operate in specific situations; and to determine how these conditioning factors and poverty-environment links can be used in fashioning better policies aimed at poverty reduction and environmental management. How has our comparative study contributed to a better understanding of these matters?

THE IMPACT OF DEVELOPMENT ON POVERTY AND ENVIRONMENT

All the contributors to this book criticise the poverty-environment hypothesis and argue that the links between poor people and their environments are far more complex than the hypothesis suggests. Development is largely responsible for this complexity. The tribals living in the Rajiv Gandhi National Park in Karnataka,[2] for example, discussed by Nadkarni in Chapter 2 (Section III.1), were urged by the Government to move out of the forest not because they had significantly degraded the forest, or because the forest was degraded for some other reasons to the point where it could no longer support their traditional way of life; but because the Government considered human settlement to be incompatible with the forest's official status as a nature conservation area (and part of the Niligiri Biosphere Reserve). Farmers in the Vellore district of Tamil Nadu (Chapter 2, Section III.2) found their land degraded not because they over-exploited it, but because of pollution from local leather tanneries after a new technology was introduced in the 1960s using heavy metals. The farmers in fact unwittingly contributed to degrading their own land by continuing to use the effluents as a fertiliser, as they had previously, but even without this pollution of the river was inevitable, and eventual contamination of aquifers was probably unavoidable in the absence of satisfactory treatment of effluents. Nadkarni cites this as an example of "destructive development." The establishment of "industrial parks" in rapidly industrialising countries can have similar polluting effects on the natural resources used by local farmers. In Chapter 4 (Section IV) Kim discusses the effects of pollution from the Ulsan Industrial Park in the southeast corner of Korea on local residents.

Development is not the only factor making poverty-environment links complex, however. Our studies also illustrate how poverty-environment dynamics vary according to the nature of the poverty in question, and by characteristics of the environments involved. We have furthermore given examples of how the social-institutional context influences poverty-environment linkages. In what follows we comment further on the contribution of our research to a broader and more systematic understanding of poverty-environment links.

Towards a typology of poverty-environment links

Nadkarni essays a systematic account of poverty-environment dynamics across a range of development situations (Chapter 2, Part II), and describes five types or configurations of these dynamics. (1) What he describes as the "vicious circle" corresponds to the downward spiral of the poverty-environment hypothesis. It occurs in situations where poor people are dependent for their livelihood on the exploitation of natural resources, especially for food (as in subsistence agriculture). If the pressure on these resources exceeds the limits of sustainable use, then a downward spiral is set in place. As Nadkarni points out, the pressure on the resources which the poor need for their livelihood is often due not only to the numbers and behaviour of poor people themselves. The fact that more prosperous farmers (who have been able to benefit from the technologies of the Green Revolution) have been able to monopolise the best agricultural land leaving inferior land for the poor farmers can be a decisive factor in pushing poor farmers into more ecologically fragile areas (Leonard 1989). Similarly swidden farmers can be locked out of conservation areas or forestry concessions, forcing them to use the remaining forest areas available to them in non-sustainable ways (Hidayati et al. 1999).

To borrow the terminology of Sunderlin and Resosudarmo (1996), the poor can behave as *agents* of environmental degradation, but the underlying *causes* of this behaviour often lie elsewhere. We now know that government development policies – especially regarding land use (agriculture and forestry) and resettlement – have often unwittingly forced poor people into poor environments, and in such numbers, that a vicious circle between poverty and environment was inevitable. In this kind of situation the downward spiral has been exacerbated by the fact that local traditional institutions governing the use of natural resources and "the commons" have been undermined by the imposition of centralised political-administrative structures and the state's appropriation of valued resources, ostensibly to support and fund development. A major implication is that even where a downward spiral does occur, policy interventions designed to break the downward spiral between poverty and environmental degradation can never in themselves resolve the underlying causes of poverty and environmental degradation. "A downward spiral between poverty and environmental degradation is a symptom of

entrenched poverty in a society, not its underlying cause" (Hayes 1998: 316).

(2) The second situation described by Nadkarni is "poverty alleviation versus environment." Development projects inevitably have negative externalities, and so frequently projects aimed at alleviating the poverty and protecting the environment of one population group (e.g. a hydroelectric plant to provide cheaper energy and lessen the pressure on local forests for firewood) can have disastrous impact on the environment and welfare of another poor group (e.g. as a result of flooding the land on which they live). The poverty-environment dynamics in this situation involve a trade-off between the relative benefits for different groups of poor (and non-poor) people due to a policy intervention. Hydroelectricity might have markedly positive economic benefits for some poor groups, and may contribute to protecting their environmental resources, but it can also make the natural resources on which other poor people depend inaccessible. A change in the relations one poverty group has with its environment often leads to changes in these relations for another poverty group.

(3) "Destructive development," in Nadkarni's typology, is development which exploits the natural environment to advance the economic interests of some groups (or increase national GDP) without an explicit aim at poverty alleviation, but which nonetheless does impact negatively on the natural resources of poor groups. Conversion of natural forests to plantations can provide foreign currency earnings, for example, but it also reduces biodiversity and can undermine poor farmers' access to needed biomass.

(4) Another configuration of poverty-environment dynamics which is often overlooked (especially by the international community) is "environment helped by poverty." The poor in developing countries not only make relatively few demands compared to the rich on environmental resources because they consume less (especialy in terms of energy per capita, but also in terms of water, where, as Nadkarni points out, the urban poor cannot afford to "waste" a lot watering lawns); they also lower their net pollution level by recycling much of their own waste, and also often much of the solid waste of more affluent groups. Poor people scavenging in waste dumps are a familiar sight in the cities of any developing country. The poverty-

environment dynamics here are complex. On the one hand there appears to be a natural synergy in the sense that the poor both help the environment by recycling, and help themselves by selling the paper, plastic, etc. they collect. On the other hand there are serious health risks to this kind of activity. Behavioural changes, such as wearing gloves and face masks when they go to the dumps, can enhance the positive links and reduce the negative effects for the poor.

(5) The final situation described by Nadkarni is the "virtuous circle": "If the poor people depend for their livelihood on the natural resource environment, and if institutional mechanisms are so developed that they make sustainable use of it or even improve it, we have good possibilities of a virtuous circle operating instead of a vicious circle."

This is the win-win situation referred to by the World Bank in its 1992 report. As Nadkarni points out, the key element that most often makes the difference between whether poverty-environment dynamics result in a vicious or a virtuous circle is institutional mechanisms. Changing local institutions to make them more conducive to a virtuous circle often requires some initiative or support from outside the community (for example with setting up microcredit schemes or giving poor farmers secure land tenure). Nadkarni recounts the story of Ralegaon Siddhi, a small village in Maharashtra, where a local leader encouraged the villagers to make the necessary institutional changes themselves with virtually no external support.[3] Regardless of whether there is external assistance or not, transforming a vicious to a virtuous circle at the local level requires mobilising the local people and implementing sound sustainable practices.

Nadkarni's typology of poverty-environment-development dynamics is one of the most systematic to be found in the literature and warrants further elaboration.

Types of poverty, types of environment

In the mid-1990s Reardon and Vosti (1995: 1495-1496) identified "five sets of gaps" in the literature on poverty-environment links in rural areas: (i) "'poverty' is usually treated as a single concept" and the way the "type of poverty influences the poverty-environment link"

is not examined; (ii) "the literature does not differentiate types of environmental change when discussing the environment-poverty link, or it focuses on a particular type of change such as soil erosion"; (iii) "the environment literature does not usually treat poverty measurement issues – level, distribution (over households), and time path (whether it is transitory or chronic), and how these can affect the environment-poverty links"; (iv) "the strength and symmetry of the causal links between poverty and environment are rarely discussed"; and (v) "insights from the literature on farm household economics and household food security strategies ... have not been brought sufficiently to bear on understanding environment-poverty links."

As mentioned earlier, they argue that the crucial criterion of poverty is not so much whether a household falls below an officially designated "poverty line" as whether they have the capital and other resources to invest in the environmental resource base on which their livelihood depends. The significance of this point is borne out by Zheng's account in Chapter 3 (Section V.1) of how a vicious circle was transformed into a virtuous circle in the mountainous area of Danfeng County in Shaanxi Province. The environment was seriously degraded through over-exploitation that occurred over decades, even centuries. The poor farmers were struggling to eke out an existence. It was only with government assistance that the watersheds could be rehabilitated; the farmers and local townships were themselves too "investment poor" to manage this on their own. But by involving local communities in rehabilitating the environment, and by guaranteeing suitable institutional arrangements to ensure that environmental resources would only be used in sustainable ways, policy interventions made it possible for farmers to break out of the downward spiral and rise out of poverty.

The significance of different types of poverty for understanding poverty-environment links needs further study. If investment poverty is the crucial dimension here, how does this relate to more conventional definitions of absolute and relative poverty? All the studies reported in this volume draw on official poverty statistics in their respective countries, where poverty is conventionally defined in terms of the income needed by a household to satisfy basic needs. Establishing an appropriate poverty line in terms of household

income or expenditure is notoriously difficult and if many people live close to the poverty line then the slightest adjustment regarding where this line is set and subsequently revised to take into account inflation can have a dramatic effect on the measurement of poverty incidence (Hayes 2000). Nadkarni point out in Chapter 2 (Section I.1) that in India in 1994, when the official poverty line set by the government is used the incidence of poverty is 35 per cent, but when the World Bank poverty line is used the rate increases to 47 per cent.

Sometimes the terminology surrounding poverty alleviation is ambiguous. It seems reasonable to use the term "poverty reduction" to include both "poverty eradication" and "poverty alleviation." Poverty eradication refers to reducing the numbers of poor people, while poverty alleviation means lessening the degree of deprivation they suffer (Hayes 2000).

Hayes suggests, in Chapter 5, that if poverty is defined in terms of human functioning and capabilities, as advocated by Amartya Sen (and UNDP 1997), this can significantly affect the way we view poverty-environment links. However there are significant data and measurement issues associated with UNDP's human development index and human poverty index (Castles 1998; Hayes 2000). The identification of poverty for targeting and monitoring in most national poverty alleviation programs is likely to continue to depend heavily on income (and consumption expenditure) approaches to the study of poverty. This constrains the empirical analysis of poverty-environment links and the usefulness of such policy research for guiding a more integrated approach to poverty reduction and environmental management.

Equally important to distinguishing different types and dimensions of poverty in understanding poverty-environment dynamics is distinguishing different types of environment. Especially important is the resilience of the environment in question (McNicoll 1990). Leonard (1989) argues that the poverty-environment hypothesis applies in those instances where we have the poorest of the poor living in ecologically fragile zones; and that three factors – namely, (i) rapid population growth, (ii) land consolidation and agricultural modernisation in fertile agricultural areas, and (iii) prevailing inequalities in land tenure – are pushing more and more of the world? poorest people into "remote and

ecologically fragile rural areas and the edge of growing urban areas," areas which can be regarded as increasingly like "poverty reservations"; and that in these areas environmental degradation and intractable poverty are becoming "more and more intertwined." "The interaction of poverty and environmental destruction sets off a downward spiral of ecological deterioration that threatens the physical security, economic well-being, and health of many of the world's poorest people" (Leonard 1989: 6).

> To sum up, the combination of development achievements in many fertile areas and increasing population pressures in areas that were previously not heavily exploited has changed the nature of poverty in the developing world in recent decades. Instead of being ubiquitous across the landscape, poverty is in many developing countries more and more concentrated into definable geographical areas. In many of these areas, poor people occupy marginal or ecologically vulnerable lands that lack appropriate infrastructure and technology (Leonard 1989: 22).

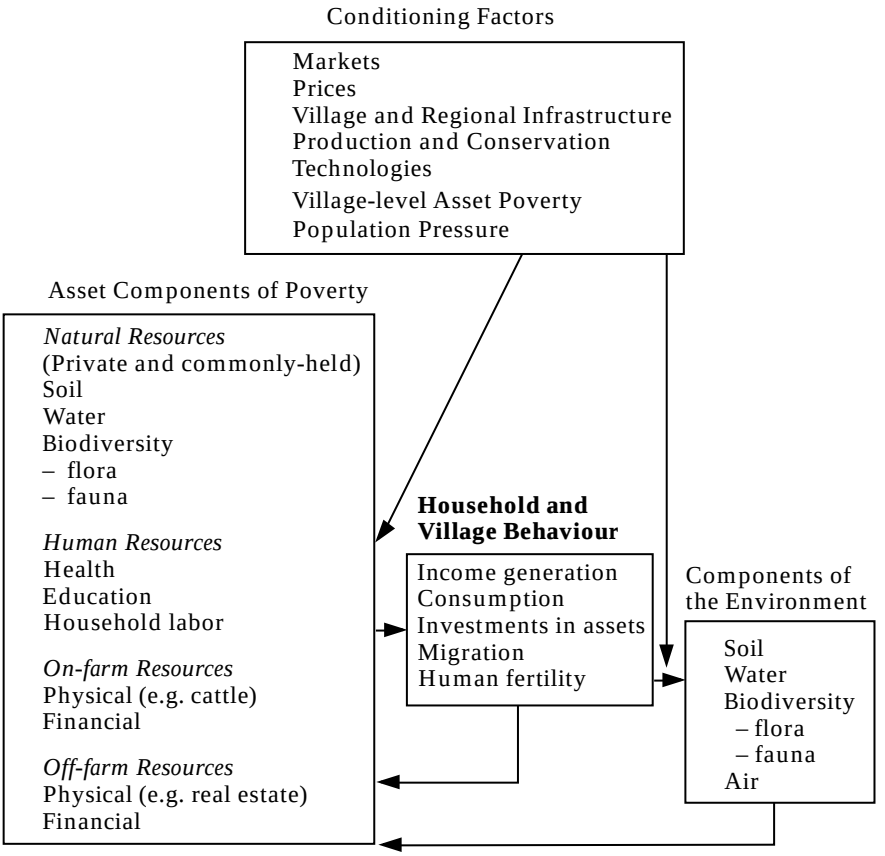
Our studies show there are many other social processes at work which result in poor people living in poor natural and constructed environments. People being relocated to make room for "development" on the land they have traditionally occupied is a case in point. Frequently relocated people end up trying to eke out a living as subsistence farmers on unsuitable land. In the case of relocating farmers from polluted areas surrounding the Ulsan Industrial Park, Kim argues (in Chapter 4 Section IV.1) that tenant farmers (rather than those who owned their own land) were especially disadvantaged by the move.

In most cases when the natural resources poor people use are degraded it is largely the result of developments taking place somewhere else for the benefit of other groups in society. Environmental degradation takes place on many dimensions. Even in cases where the natural resources on which poor people depend for their productive activities remain intact, degradation on other dimensions (air quality, water quality) can seriously affect their health and quality of life.

Institutional arrangements and social participation

The country studies reported in this volume underscore the point that poverty-environment dynamics in a given case can rarely be understood without understanding the institutional context in which they take place. Reardon and Vosti (1995) discuss this as "conditioning factors" (see Figure 1 below). It is helpful to distinguish different aspects of the institutional context, especially political institutions, economic institutions, and civil society (Bhattacharyya 1998). It is institutions within these broad sectors

Figure 1. Poverty and Environment Links



Source: Reardon and Vosti 1995: 1497.

which largely determine how poor people (both at the household and village community level) relate to their environment, via their traditional resource management practices, whether they have sufficient assets to invest in the environment, and whether they might move to more ecologically fragile locations. The country studies illustrate how some of these conditioning factors operate.

Nadkarni (in Chapter 2 Section I.2) relates how the British in India, pursuing their own political and economic interests, undermined earlier institutional patterns which on balance had probably ensured a more sustainable use of natural resources. After Independence new laws have been passed, especially since the mid-1970s, to protect the environment. "It is not surprising ... India is among the few countries of the world which managed to increase area under forests in spite of pressures on them." The shifting balance between economic and political forces determines to a large extent which resources are used and how, including which resources are left for poor people to use.

The role of the state is prominent in Zheng's analysis (in Chapter 3) of poverty and environment in China. Here too, however, the balance of forces between political and economic has shifted markedly over the last 20 years following economic reforms. The natural environment in China has been threatened by population pressure for centuries and the country has a long history of skillful and imaginative resource management. A side effect of the economic reforms has been a large "floating population," and it will be interesting to learn more in future about the poverty-environment implications of this phenomenon.

Kim's study of Korea (in Chapter 4), a newly industrialised country, gives further illustrations of shifting political and economic interests and their impact on povety-environment links. Again, four or five decades ago the emphasis was on rapid economic development, without much concern for the environment. Kim discusses the impact of this on the poor (Part III), and the subsequent policy response to do more to protect both the environment and those living in poverty.

The case of Australia, where the livelihood of poor people rarely depends on the exploitation of natural resources, is somewhat different. Hayes suggests (in Chapter 5) there are some parallels, nonetheless, and even in this case of a developed country political

and economic institutions are decisive in determining where poor people live, the assets or resources available to them, and how they interact with their environment. Environmental justice needs to take into account locational disadvantage.

A further important theme in the country studies is that civil society is also crucial to understanding poverty-environment dynamics. The India and Korea studies in particular point to the important role that mobilising poor people has played in seeking some redress for environmental injustice.

HELPING THE POOR AND HELPING THE ENVIRONMENT TOGETHER

Making the poor more prosperous will not necessarily help the environment, nor will improving environmental quality necessarily make the poor rich. Our research underscores the point that poverty-environment dynamics are contingent on numerous factors including the type and nature of poverty involved, ecological characteristics of the local environment, and a number of other conditioning factors centering on the relevant institutional arrangements which influence behaviour. At the end of the 1980s, Leonard (1989) wrote:

> Few aspects of development are so complex as the need to reconcile anti-poverty and pro-environmental goals. The policy linkages and choices to be made have not been sorted out. Neither international donors nor developing-country governments have been able to formulate a common policy agenda linking these two important concerns. Do both desired ends – poverty alleviation and environmental sustainability – come in the same package, or must painful choices ve made between them?

The answer to this question, based on our studies, would seem to be, "Sometimes." Sorting out which particular aspects of poverty alleviation can be combined with which particular aspects of environmental sustainability and addressed in a combined program, and under what speciafic conditions, is the key policy issue in this area. We conclude with a list of the implications of our research for policy makers:

- The links between poverty and environmental degradation are not always in the form of a downward spiral. Development policies

and programs should therefore never be designed on the assumption that a downward spiral exists, but rather should be based on a careful diagnostic study of poverty-environment links in the cases in question.

- Even in cases where demonstrably a downward spiral does exist, it should be recognised that while breaking the vicious circle between poverty and environmental degradation may alleviate some of the problems it is unlikely to address the underlying causes of poverty and environmental exploitation responsible for the downward spiral in the first place. A downward spiral between poverty and environmental degradation is a symptom of entrenched poverty in a society, not its underlying cause.
- There is a special need to understand the underlying forces propelling poor people to move to ecologically fragile environments, and to determine policy interventions to limit the numbers of people put at risk of downward spirals. One approach is to make some poor people responsible for protecting fragile environments and ensuring they are only used within sustainable limits.
- The poorest of the poor are often living not only in ecologically fragile environments, but frequently in inaccessible locations too. It is essential that if they are to be brought into the mainstream of development they are offered a "path to development" which is meaningful and realistic in terms of their own cultural values.
- Policies and programs aimed at capitalising on a synergy between poverty reduction and sustainable resource management should be clear about what kind of poverty is being addressed (e.g., chronic or transitory, absolute or relative, income poverty or poverty defined in terms of human capabilities), and in which dimensions (e.g., poverty eradication or poverty alleviation). Policies aimed at reducing entrenched chronic poverty will require a different approach to those aimed at transitory poverty.
- More attention needs to be given to designing interventions based on other poverty-environment links aside from those referred to in the poverty-environment hypothesis. Integrated environmental and social impact assessments could be used far more comprehensively than at present to ensure development projects do not degrade the environments of poor people (who may live and work some distance from the development site); and to ensure government policies (especially regarding land use, and

the use of other resources) do not undermine any traditional resource management institutions which remain viable at the local level.

- Policies and programs building on specific poverty-environment links require a participatory approach to design and implementation which involves all stakeholders (especially the poor). Many programs fail because the policy makers assume they understand the needs and aspirations of the poor (and of other stakeholders).

NOTES

[1] For a more complete analytical review of the critical literature see Hayes (1998).

[2] Perhaps still better known by its former name, the Nagarhole National Park.

[3] The necessary seed capital in this case came from the army retirement benefits of Anna Hazare, the local leader.

REFERENCES

Bhattacharyya, Amit K. 1998. "Introduction and Overview." In UNDP, *Combating Poverty: The Korean Experience*. Seoul: UNDP. Pp. 1-28.

Castles, Ian. 1998. "The Mismeasure of Nations: A Review Essay on the Human Development Report 1998." *Population and Development Review* 24, 4: 831-845.

Hayes, Adrian C. 1998. "The Links Between Poverty and the Environment in the Asia-Pacific Region: An Analytical Review of the Literature." In *Papers of the XIIth AASSREC Biennial General Conference: 13-17 October 1997*. Beijing: Chinese Academy of Social Sciences and Association of Asian Social Science Research Councils. Pp. 295-321.

Hayes, Adrian C. 2000. *Poverty and Deprivation in Indonesia: An Assessment of Data Sources and their Use in Managing and Monitoring Development Assistance Projects and Programs*. Report prepared for AusAID. Canberra: Demography Program, Australian National University.

Hidayati, Deny, Adrian C. Hayes, Herry Yogaswara and Andy Ahmad Zaelany. 1999. *Population and Environment Issues in Maluku: The Case of Western Seram*. Jakarta: Indonesian Institute of Sciences (LIPI).

Lélé, Sharachchandra M. 1991. "Sustainable Development: A Critical Review." *World Development* 16, 6: 607-621.

Leonard, H. Jeffrey, and contributors. 1989. *Environment and the Poor: Development Strategies for a Common Agenda*. New Brunswick (USA) and Oxford (UK): Transaction Books.

McNicoll, Geoffrey. 1990. "Social Organization and Ecological Stability under Demographic Stress." In Geoffrey McNicoll and Mead Cain, eds., *Rural Development and Population: Insitutions and Policy*. New York: Oxford University Press. Pp. 147-167.

Reardon, Thomas, and Stephen A. Vosti. 1995. "Links Between Rural Poverty and the Environment in Developing Countries: Asset Categories and Investment Poverty." *World Development* 23, 9: 1495-1506.

Sunderlin, William D., and Ida Aju Pradnja Resosudarmo. 1996. "Rates and Causes of Deforestation in Indonesia: Towards a Resolution of the Ambiguities." *Occasional Paper* No. 9. Bogor: Center for International Forestry Research.

United Nations Development Programme (UNDP). 1997. *Human Development Report*. New York: Oxford University Press.

World Bank. 1992. *World Development Report 1992: Development and the Environment*. Oxford and New York: Oxford University Press.

World Commission on Environment and Development (WCED). 1987. *Our Common Future*. Oxford and New York: Oxford University Press.

DIRECTORY OF AASSREC MEMBER-COUNCILS
As of 15 October 1999

Regular Members: Country	**Member-Councils**
Australia	***Academy of Social Sciences in Australia (ASSA)*** GPO Box 1956 University House Australian National University Canberra ACT 2601, Australia Tel.: (06) 249 1788 Fax: (06) 247 4335 E-mail: ASSA.Secretariat@anu.edu.au *Mr. Barry Clissold* Executive Officer
Bangladesh	***Social Science Research Council of Bangladesh (SSRC)*** Ministry of Planning Sher-e Bangla Nagar Dhaka-1207, Bangladesh Tel.: (88-02) 9110931 / 324687 Fax: (88-02) 817581 / 9118726 E-mail: taifur@bdcom.com a. *Mr. Abdul Hamid Chowdhury,* Member-Secretary, SSRC Ministry of Planning, Bangladesh b. *Mir Md. Rowsonazzaman* Secretary
China	***Chinese Academy of Social Sciences (CASS)*** 5 Jianguomennei Dajie Beijing 100732, China a. *Prof. Teng Ten* Vice-President b. *Dr. Chen Zhengsheng* Director, International Division Foreign Affairs Bureau

Tel.: No. 8610-65137794
Fax: 8610-65138154
E-mail: czs16@hotmail.com

India

Indian Council of Social Science Research (ICSSR)
Post Box No. 10528, Aruna Asaf Ali Marg
New Delhi-10067, India
Tel.: (9111) 617 9831
Fax: (9111) 617 9836

a. *Dr. R. Barman Chandra*
Executive Director and Member-Secretary (In Charge)
b. (Attn.:) *Dr. Vinod Mehta* (IC)

Indonesia

Indonesian Institute of Sciences (LIPI)
Widya Grah, Jalan Jenderal Gatot Subroto 10
Jakarta Selatan, Indonesia
Tel.: (062-21) 5251542 / 5225711
Fax: (062-21) 5207226 / 5225640

Dr. Arjuno Brojonegoro
Deputy Chairman for the Social Sciences and Humanities

Japan

Science Council of Japan (JSC)
22-34 Roppongi 7 chome
Minato-ku, Tokyo 106, Japan
Tel.: (+81 3) 3403-6224
Fax: (+81 3) 3403-6291

Prof. Joji Watanuki
Chair, National Committee for AASSREC
Matsunoki 1-12-4
Suginami-ku, Tokyo 166-0014 Japan
E-mail: watanuki@sophia.ac.jp
Fax: 81-3-3312-7794

DPR Korea

Korean Association of Social Scientists (KASS)
P.O. Box 108 Chungsongdong
Central District, Pyongyang, DPR Korea
Tel.: 3-3281
Fax: 850-2-3814512
Cable: KOP PYONGYANG KOREA

Dr. Chon Jong Hyok
Executive Secretary

Republic of Korea

The Korean Social Science Research Council (KOSSREC)
304-28, Sachick-dong, Chongru-ku
Seoul, Republic of Korea
Tel.: 82-2-735-2159
Fax: 82-2-737-3264
E-mail: KOSSREC@chollian.net

Dr. Byung-Young Ahn
President
Dr. Kap-Young Jeong
Secretary-General

New Zealand

Foundation for Research, Science and Technology (FRST)
P.O. Box 12-240
Wellington, New Zealand
Tel.: (64) (4) 498-7800
Fax: (64) (4) 499-2568

Dr. Emma Speight
Programme Manager, Social Sciences

Pakistan

National Institute of Historical and Cultural Research (NIHCR)
102 Faxlul Haq Road
Rauf Centre, Blue Area
P.O. Box No. 1230
Islamabad, Pakistan

Dr. (Miss) K.F. Yusuf
Consultant
House No. 605, St. 29, G-10/2
Islambad, Pakistan
Tel.: 294637

Philippines

Philippine Social Science Council
Commonwealth Avenue, Diliman,
Quezon City
Philippines
Tel.: (642) 926-2061
Fax: (632) 924-4178
E-mail: pssc@skyinet.net

Dr. Virginia A. Miralao
Executive Director

Russia

Commission of the Russian Federation for UNESCO
9 Vozdvizhenka
Moscow 121019, Russia

Dr. Larissa Efimova
Coordinator for AASSREC
C/o Moscow State Institute of International Relations
76 Vernadsky Prospect
117454 Moscow, Russia
Fax: (007-095) 434 9061
E-mail: asu@mgimo.au

Sri Lanka

National Science Foundation (NSF)
47/5 Maitland Place
Colombo-7, Sri Lanka
Tel.: 01 694170
Fax: 01 694754
E-mail: postmast@naresa.ac.lk

Mr. M. Watson, Director

Tadjikistan

Academy of Sciences of the Republic of Tadjikistan
Rudaki Street-33
734025, Dushanbe-25
Tadjikistan

Academician Sabit Negmatulldev
President

Thailand

National Research Council of Thailand (NRCT)
196 Phaholyothin Road
Bangkhen, Bangkok-9
Thailand
Tel.: (662) 579-2690
Fax: (662) 561-3049 / 579-3402
E-mail: mathuros@fc.nrct.go.th

Mr. Booncherd Sobhon
Acting-Secretary General

Vietnam

National Center for Social Sciences and Humanities of Vietnam (NCSSH)
36 Hangchuoi Street
Hanoi, Vietnam
Tel.: (84-4) 8259067 / 8265466
Fax: (84-4) 8259071

a. *Prof. Nguyen Duy Quy*
Chairman
b. *Prof. Nguyen Duy Thong*
Director
International Cooperation Department

Associate Member

Australia

Center for Intercultural Studies and Multicultural Education (CISME)
Department of Education
University of Adelaide
Adelaide SA 500, Australia
Tel.: (618) 8303 5788
Fax: (618) 8303 3604

Dr. J.J. (George) Smolicz
Director
E-mail: jerzy.smolicz@adelaide.edu.au

Mr. Abdul Hamid Chowdhury
Member-Secretary
Social Science Research Council of Bangladesh
Ministry of Planning
Sher-e Bangla Nagar Dhaka
1207 Bangladesh

Dr. R. Barman Chandra
Executive Director and Member-Secretary
Indian Council of Social Science Research (ICSSR)
Post Box No. 10528, Aruna Asaf Ali Marg New Delhi
10067 INDIA

Dr. Chon Jong Hyok
Executive Secretary
Korean Association of Social Scientists (KASS)
P.O. Box 108 Chungsongdong
Central District, Pyongyang, DPR KOREA

Dr. K.F. Yusuf
Consultant
National Institute of Historical and Cultural Research (NICHR)
House No. 605, Street 29, G-10/2 Islambad
PAKISTAN

Dr. Chen Zhengsheng
Director, International Division
Foreign Affairs Bureau
Chinese Academy of Social Sciences (CASS)
5 Jianguomennei Dajie Beijing
100732 CHINA

Dr. Arjuno Brojonegoro
Deputy Chairman for Social Science and Humanities
Indonesian Institute of Sciences (LIPI)
Widya Grah, Jalan Jenderal Gatot Subroto
10 Jakarta Selatan,
INDONESIA

Dr. Ahn Byung-Young
President
The Korean Social Science Research
Council (KOSSREC)
304-28, Sachick-dong,
Chongru-ku, Seoul,
Republic of Korea

Mr. Kazunobu Maeda
Chief Official
Science Information and International
Affairs Division
SCIENCE COUNCIL of JAPAN
Prime Minister's Office
7-22-34 Roppongi, Minato-ku,
Tokyo 106-8555
JAPAN

Dr. Larissa Efimova
Coordinator and AASSREC
Commission of the Russian Federation for UNESCO
c/o Moscow State Institute of International Relations
76 Vernadsky Prospect 117454 Moscow RUSSIA

Academician Sabit Negmatulldev
President
Academy of Sciences of the Republic of Tadjikistan
Rudaki Street – 33
734025, Dushanbe – 25
TADJIKISTAN

Prof. Nguyen Duy Quy
Chairman
National Center for Social Sciences and Humanities of Vietnam (NCSSHV)
36 Hangchuoi Street Hanoi,
VIETNAM

Dr. George Smolicz
Director
Center for Intercultural Studies and Multicultural Education (CISME)
Adelaide University
South Australia 5005
AUSTRALIA

Mr. M. Watson
Director
National Science Foundation (NSF)
47/5 Maitland Place Colombo – 7
SRI LANKA

Mr. Booncherd Sobhon
Acting-Secretary General
National Research Council of Thailand (NRCT)
196 Phaholyothin Road
Bangkhen, Bangkok – 9
THAILAND

Dr. Emma Speight
Program Manager, Social Sciences
Foundation for Research, Science and Technology
P.O. Box 12-240
Wellington,
NEW ZEALAND

Mr. Barry Clissold
Executive Director
Academy of Social Sciences in Australia
28 Balmain Crescent
Acton, ACT, 2601
AUSTRALIA

An ancient Sanskrit prayer recited daily by many in India

Swastih prajaa bhyah paripaalayantam
Nyaayena margena maheem maheeshah
Streebaalikebhyah shubhamastu nityam
Lokaah samastaah sukhino bhavantu
Kaale varshatu parjanyah Prathivee sasya shaalineem
Deshoyam kshobha rahito sajjanah santu nirbhayaah
Sarveshcha sukhinah santu sarvessantu niraamayaah
Sarve bhadrani pashyantu maakashchit dukhamapnuyaat.
Ohm! Shantih! Shantih! Shantihi!

May people have prosperity and well being! May the rulers of the world rule with justice and fair play!
May women and girl-children always face good things happening to them! May all people be happy!
May it rain on time and may this good Earth be clad with greenery!
May this country be free from violence and may good people live without fear!
May all find happiness and live without illness and disease!
May all find security and safety, and may no one face sorrow!
Oh Almighty, may peace prevail, may peace prevail, may peace prevail!