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Environmental problems inherent to a development style: degradation and poverty in Brazil

Charles C. Mueller

SUMMARY: *This paper describes how a large proportion of Brazil's urban population still lacks provision for sanitation and, to a lesser extent, access to piped water, and how this is rooted in a society with a high degree of inequality and a growing number of urban poor. It also considers why environmental economics has failed to develop operational instruments to highlight the environmental and health costs of inadequate sanitation, the benefits of improved sanitation and the options available for addressing this problem.*

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I. INTRODUCTION

AN ANSWER TO the question "What do communities need from ecological economics?", posed by a panel at the Third International Meeting of the International Society of Ecological Economics, depends, to a large extent, on the perspective of those challenged to answer it. As pointed out by Costanza,⁽¹⁾ ecological economics is far from being an established discipline with clear boundaries, widely accepted by its practitioners. By and large, the answer will be strongly determined by the position of the analyst regarding three basic elements of the concept of sustainable development. One may disagree with the scientific validity of the concept of sustainable development,⁽²⁾ challenge the vagueness and imprecision of the concept,⁽³⁾ have misgivings about the possibility of overcoming the political barriers for the implementation of sustainable development worldwide, but most would agree that environmental economics has to contend with the three central elements of the concept: the pursuit of means of meeting the needs of the present; the high priority given to the needs of the world's poor; and the requirement that all this be done without compromising the ability of

1. Costanza, Robert (1989), "What is ecological economics?"; *Ecological Economics* Vol. 1, pages 1-7. Although there should be a distinction, ecological economics and environmental economics tend to be used by the profession interchangeably.

2. See Georgescu-Roegen, Nicholas (1993), "Thermodynamics and we, the humans" in *Entropy and Bioeconomics: Proceedings of the First International Conference of the European Association for Bioeconomic Studies, Rome 28-30 November 1991*, Milano: Nagard, pages 184-201.

3. See Lélé, Sharachchandra M., "Sustainable development: a critical review", *World Development* Vol.19, No.6, pages 607-621.

4. The concept of sustainability is from The World Commission on Environment and Development (1987), *Our Common Future*, Oxford University Press, Oxford, mainly page 43.

5. See, for instance, Boulding, Kenneth E. (1966), "The economics of the coming spaceship earth" in H. Jarret (coordinator), *Environmental Quality in a Growing Economy*, The Johns Hopkins University Press, Baltimore; also Georgescu-Roegen Nicholas (1971), *The Entropy Law and the Economic Process*, Harvard University Press, Cambridge, Mass.; and Daly, Herman E. (1987), "The economic growth debate: what some economists have learned but many have not" *Journal of Environmental Economics and Management* Vol.14, pages 323-336.

6. For this school of thought the environment is a central factor leading to economic crisis in contemporaneous capitalism. Crisis stems from contradictions between the forces and relations of production on the one hand and the conditions of production on the other. See O'Connor, James (1986), "Capitalism, nature, socialism: a theoretical introduc-

future generations to meet their own needs.⁽⁴⁾

If we wish to classify strategies designed to achieve one or more of these objectives, we would probably come out with three sets of strategies:

- those giving a high priority to the maintenance or improvement of the welfare of those living in the present in the industrialized countries;
- those emphasizing the world's poor, and thus stressing the need to reduce the disparities between the North and the South;
- those stressing the survival and the ability to prosper of future generations. I would like to contend that, asked the question **what do communities need from ecological economics?**, most would, in their answer, give emphasis to aspects of one of the above sets of strategies.

If one is involved with communities in industrialized countries, there would surely be concerns about problems of poverty and inequality within those but the main thrust would be with problems of pollution and other aspects of environmental degradation associated with the North's patterns of development. In addressing the question from this perspective, an expert could rely on neo-classical environmental economics. However, given that this branch of economic thought focuses almost exclusively on the present and immediate future generations of industrialized market economies, those relying solely on neo-classical environmental economics could hardly be considered "ecological economists". However, there are instances of a more open-minded use of instruments from this branch of economic thought, interspersed with elements from other schools of thought or disciplines.⁽⁵⁾ When this happens, concerns about the well-being of the world's poor and of future generations may surface but the main problems faced by communities tend to be the determination of "optimal pollution", the conception of market instruments to achieve this, and the measurement and monitoring of the degradation stemming from the patterns of high consumption and waste-producing societies. These would be the central elements in the answers provided by those whose main perspective is that of the present industrialized economies.

Of course, there are schools of thought in environmental economics which focus heavily on the industrialized economies which are critical of their evolution and which strongly reject the neo-classical paradigm. This is, for instance, the case with the modern Marxist theory of crisis.⁽⁶⁾ These schools of thought tend to address other communities than those focused on by the typical neo-classical economist.

Others in the field of ecological economics have centred mainly on the well-being or survivability of future generations. In so doing, the problems of the present are considered, and they may express concern with today's poor, but the main concern is with the remote future. Under this perspective, the relevant community is one for those living in a time perspective that goes far into the future. Of course, it is recognized that what hap-

tion", *Capitalism, Nature, Socialism* Vol.1, No.1, pages 11-38.

7. There is a variety of approaches here. They range from those stressing reform in the patterns of development followed by the South (for instance, Sunkel Osvaldo (1981), "Development styles and the environment: an interpretation of the Latin American case" in Heraldo Muñoz (editor), *From Dependency to Development: Strategies to Overcome Underdevelopment and Inequality*, Westview Press, Boulder, Colorado, pages 93-114), to those requiring radical change (Redclift, Michael and David Goodman (1991), "Introduction" in Goodman and Redclift, *Environment and Development in Latin America - the Politics of Sustainability*, Manchester University Press, pages 1-23.

8. For an example of work that altogether rejects attempts at "modernization" western-style of poor communities, see Martinez-Alier, Joan (1990), "Ecology and the poor: a neglected dimension of Latin American history", *Journal of Latin American Studies* No.23, pages 621-639.

9. Brazil provides a good instance of this. Regulation, market incentives and public investments have resulted in a significant improvement in the environmental conditions of São Paulo, the country's main industrial city; a few years ago this city was heavily polluted. Moreover, there have been important improvements in the dramatic situation of the industrial area of Cubatão, once known as "death valley". See Baer, Werner and Charles Mueller (1995), "Environmental aspects of Brazil's economic development", *Luso-Brazilian Review* Vol.32, No.1, pages 81-99.

10. The concept of "style of development" and its relationships with the environment is developed in Sunkel, Osvaldo (1980), "Introducción - la interacción entre los estilos de desarrollo y el medio-ambiente en la América

pen in the future depends on what occurs today; the present generation must change its ways regarding the use of natural resources and the degradation of the environment to improve the ability of future generations to survive and prosper.

For others, the focus of analysis is the present generation of the South. There are at least two branches here: one which accepts "development" but which criticizes the patterns (the styles) of development that have been imposed on the South;⁽⁷⁾ and the other which rebukes "modernizing" interferences on pre-capitalist societies which are seen as the source of detrimental environmental and cultural impacts on such societies.⁽⁸⁾ For both of these branches, the relevant community is that of the Southern poor. And, at least for the first branch, a central issue is how to reduce the gap between the North and the South. It is usually assumed that the survivability of future generations must be assured but it is also felt that the burden for this must rest mainly on the present-day rich. Moreover, it can be contended that the pattern of development of the poor countries, strongly influenced by the central economies, has created a particular kind of environmental degradation which is difficult to eradicate - the degradation being a result of an inadequate provision of support and of basic public services to the growing numbers of urban poor. In many Southern economies, growth and "modernization" have led to improvements in the environmental degradation typical of the rich countries⁽⁹⁾ but they have failed to reduce the degradation associated with poverty; as a matter of fact, in some, it has significantly increased, in spite of high rates of growth in per capita income.

The main purpose of this paper is to examine an instance of this process: that of Brazil, a classical case of "uneven development". Our community is the persistent and growing concentrations of urban poor. Emphasis is given to the impacts of a particular type of environmental impact caused by poverty - the degradation generated by deficient sanitation in poor urban settlements. Section II outlines the conceptual basis of the study; section III sketches the nature of the development process in Brazil; section IV discusses the relationship between uneven development, urbanization, poverty and the environment; section V looks at the nature and extent of urban poverty in Brazil; section VI examines the deficiencies of the country's sanitary services; section VII discusses a case of the use of neo-classical tools in an attempt to address the question of what to do regarding the country's sanitary deficit; and section VIII presents the essay's conclusions.

II. STYLES OF DEVELOPMENT AND THE ENVIRONMENT

THE RELATIONSHIPS BETWEEN the economy and the environment do not evolve in the same way everywhere. Leaving aside the differences of natural ecosystems, the pattern of environmental degradation is strongly affected by the "style of development" of the economy.⁽¹⁰⁾ A country's "development style"

Latina" in Osvaldo Sunkel e Nicolo Gligo (editors), *Estilos de Desarrollo y Medio Ambiente en la America Latina*, Mexico: Fondo de Cultura Económica Vol.1, pages 9-64.

11. See, for instance, World Resources Institute (1992), *World Resources, 1992-93*, Oxford University Press, chapter 4.

12. The World Bank (1992), *World Development Report 1992 - Development and The Environment*, Oxford University Press.

13. The 1950 total was estimated, taking into consideration the fact that this year, the lower 30 per cent of the population had an income share of only around 4 per cent; the level of poverty was roughly calculated by applying this proportion to the total population. The 1988 estimate is from Tolosa, Hamilton (1991), "Pobreza no Brasil: uma avaliação dos anos 80" in João Paulo dos Reis Velloso (editor), *A questão social no Brasil*, São Paulo: Nobel, pages 105-136. The two estimates are not strictly comparable since they were obtained by different methods. However, they provide a rough idea of the expansion of poverty in Brazil.

determines how income is appropriated by different segments of society, affecting the structure of demand and thus, the composition of production; and, by helping to mould society's productive structure, it establishes its technological mix, its factor intensities and the types of natural resources employed in production.

Different development styles generate different patterns of consumption, with different environmental impacts. The distribution of income, rooted in history and affected by the development process, strongly shapes demand, establishing both the pattern of consumption and the nature of the wastes disposed into the ecosystem. In addition, the distribution of income determines, to a significant extent, the shortages experienced by the poorer segments of society.

When examining societies which experience uneven development, it becomes particularly important to understand what determines which groups will benefit most from development, and which will remain at the margin of the process. Uneven development takes place in societies which start the process of growth and structural change with considerable inequalities in the distribution of income, wealth and opportunities, and which are not significantly diminished by development. In such societies, a relatively small segment of the population has access to a substantial share of the growing production of goods and services, and large numbers have to survive with the remainder. Thus, the rich minority is likely to exhibit the consumption habits of the North and to dispose into the ecosystem substantial amounts of similar wastes and rejects but the poor also produce environmentally damaging wastes and effluents. Being deprived of access to good water, to sanitation and to adequate living sites, they impose on the environment a damaging flow of wastes and are often led to destructive behaviour towards the environment. This paper examines the latter type of environmental fall-out in the case of Brazil - a classic case of uneven development. Emphasis is placed on the inter-relations between poverty, inadequate sanitation and the environment.

III. A SKETCH OF BRAZIL'S DEVELOPMENT PROCESS

AFTER WORLD WAR II, Brazil experienced a long period of substantial growth and structural transformation, halted only in the early 1980s by economic and political problems; but in spite of the stagnation of this decade, the country is still considered a **newly-industrializing economy**.⁽¹¹⁾ Growth raised Brazil's per capita income from the low-income range in the late 1950s to the upper-middle income range in 1980,⁽¹²⁾ where it remains to date. However, the process of economic transformation has not significantly altered the country's extreme inequality in the distribution of wealth and income. Despite the impressive increments in GDP, there was a sharp increase in the numbers of the poor, roughly from some 16 million persons in 1950 to about 45 million persons in 1988.⁽¹³⁾ Moreover, as the

14. Coupled with a very high concentration of land ownership, modernization meant the cessation of paternalistic labour relations in agriculture and a widespread substitution of mechanical equipment for labour in agricultural operations. As a consequence, the "modern" agricultural areas expelled very substantial numbers of poor to the cities and to the agricultural frontier.

15. Martine, George (1992), "Processos recentes de concentração e desconcentração urbana no Brasil: determinates e implicações", *Documentos de Trabalho* No.11 Brasília: Instituto Sociedade, População e Natureza, January.

16. It is worth stressing that, despite its recent impacts on the rainforest, migration to the Amazon has not involved large numbers. In the 1970s, for instance, Brazil's north region (where the Amazon is located) absorbed some 400,000 migrants whilst the rural-urban migration involved nearly 16 million migrants. The pattern in the 1980's was similar. See Martine, George (1992), "Frontier expansion, agricultural modernization and population trends in Brazil" in Ronald Lee (editor), *Population, Food and Rural Development*, Oxford University Press.

17. Rural-urban population movements have been important even in the Amazon. Some of the cities with the largest demographic growth in the 1980s are in the Amazon and the 1991 rate of urbanization in the north region was already higher than 50 per cent (see Martine, George (1992) reference 17).

18. Urban environmental degradation has received little emphasis in the analysis of Third World environmental problems, probably because the impacts of poverty are localized as opposed to, say, those of deforestation in the Amazon, with its global effects.

country industrialized and became urbanized, the poor became heavily concentrated in a group of large cities.

Industrialization and modernization took place mostly in the country's centre-south, and especially in the urban-industrial network the nucleus of which was the city of São Paulo. With growth, the industrial centres experienced requirements for labour in excess of that generated by their natural demographic growth, attracting increasing flows of migrants in search of better opportunities. In the beginning, migrants came from Brazil's north-east, a region of persistent poverty but, more recently, the process of conservative modernization of agriculture - modernization without a previous agrarian reform - in the centre-south became the main cause of the rural-urban flow of migrants.⁽¹⁴⁾

For decades, migrants have arrived in considerably larger numbers than those warranted by employment creation in the large cities. As argued by Martine,⁽¹⁵⁾ the most striking demographic feature of Brazil in the last half-century has been not the high rates of population growth during most of the period but the considerable spatial redistribution of the population which has taken place. It combines two simultaneous processes: the migration to the agricultural frontier, culminating in the recent occupation of parts of the Amazon rainforest and an overwhelming rural-urban migration.⁽¹⁶⁾

Rural-urban migration has been pervasive in Brazil,⁽¹⁷⁾ and its incidence has been greater in the country's most developed areas. The vast numbers of migrants attracted by the large cities led to the agglomeration of the poor in inadequate areas, ill-equipped with basic urban services. This also resulted in very serious environmental degradation.

IV. UNEVEN DEVELOPMENT, URBANIZATION, POVERTY AND THE ENVIRONMENT

a. Uneven Development, Urbanization and Poverty

INEQUALITY AND THE concentration of population in Brazil's large cities together brought about two types of environmental problems:

- pollution and degradation resulting from the pattern of consumption of a relatively small group with medium to high incomes and with command over a large portion of the goods and services produced by the economy;
- environmental problems resulting from inadequate basic services, especially for those in the lower-income brackets.

Pollution caused by the automobile and degradation generated by garbage stem mainly from the former group. Congestion, inadequate sanitation, accumulation of household wastes, degradation of marginal lands together with the diseases and accidents resulting from these are environmental consequences of large clusters of poor in urban areas with inadequate public services.⁽¹⁸⁾

b. The Nature of Environmental Problems of Urban Poverty

In Brazil's large cities, substantial proportions of the population face precarious living conditions. The degradation associated with poverty is highly visible there. The urban environmental problems common to the industrialized countries - those of air and water pollution - are exacerbated by hectic growth and by increasing concentrations of poor people who have very low standards of living. Important sections of the country's large cities are characterized by:

1. Large numbers of poor, cramped in inadequate housing in often illegal or semi-legal sites, such as steep hillsides, floodplains or other areas that are vulnerable to pollution. It is only on such sites that the poor can afford to build or rent accommodation; they are affordable precisely because they are unsanitary and dangerous.

In the poor sections, the houses are usually precarious, cramped and overcrowded, lack insulation from temperature extremes or noise, and allow an abundance of dust, insects and rats. Moreover, they have limited access to basic services. The water used by residents tends to be of poor quality and of difficult access, garbage is rarely collected and sewage is inadequately disposed of. Moreover, crowded conditions facilitate the spread of diseases, aided by the low resistance of the inhabitants which stems from poor nutrition and poor health.⁽¹⁹⁾

Finally, the inhabitants of many low-income settlements located close to major roads and industrial centres often face particularly high levels of air pollution.

2. The areas settled by the urban poor are often environmentally fragile, and a concentration of population there contributes to their degradation. Moreover, they are usually dangerous and, occasionally, the threats they pose materialize through surges of flooding and landslides. Rio de Janeiro, São Paulo and other Brazilian cities often experience such calamities with many victims coming from the ranks of the poor.⁽²⁰⁾

3. Being illegal or lying outside the city's official zoning, the poor settlements suffer from considerable deficits in the basic services required for a healthy, adequate life. Due to the illegal or semi-legal nature of these settlements, authorities are reluctant to provide these services. Being under a fiscal crunch, rather they invest in improving the regulated sections of the city - those occupied by the middle and high-income families or by business. This helps to explain the precarious urban infrastructure (roads, drainage systems, green areas) of the poor settlements. And, given the large concentration of population, this leads to frequent accidents. Moreover, neighbourhoods are often waterlogged and strewn with garbage, becoming ideal breeding grounds for rats, insects and other disease vectors.

4. The inhabitants of the poor settlements often have inadequate hygiene habits. Frequently, these settlements have a high incidence of migrants recently arrived from rural areas. This means there are large concentrations of families with in-

19. Hardoy, Jorge E. and David Satterthwaite (1989), *Squatter Citizen - Life in the Urban Third World*, Earthscan Publications, London; also The World Bank (1991), *Urban Policy and Economic Development - An Agenda for The 1990s*, The World Bank, Washington, DC.

20. In 1988, for instance, torrential rains generated extensive mud-slides in Rio de Janeiro's hills, where most of the city's slums are. Hundreds of people were killed or injured, and thousands were made homeless (see *Isto É* No.584, March 3, 1988, page 16).

21. According to the World Health Organization, Brazil's intense rural-urban migration was a factor in transforming schistosomiasis into an urban disease (World Health Organization (1988), *Urbanization and Its Implications for Child Health - Potential for Action*, World Health Organization, page 25). Obviously, this was also caused by the precarious sanitary conditions in the areas in which the poor settled; this made it possible for the schistosomiasis disease vector/host to become established in water bodies in urban areas.

22. Cairncross, Sandy (1990), "Water supply and the urban poor" in Jorge Hardoy, Sandy Cairncross and David Satterthwaite (editors), *The Poor Die Young - Housing and Health in Third World Cities*, Earthscan Publications, London, pages 109-126.

23. See reference 21, page 33.

24. See The World Bank (1991), reference 19, page 50.

25. See Hardoy et al., reference 19, page 160.

fectious diseases and with educational deficiencies which results in inadequate hygienic and social behaviour. Personal hygiene is often poor and household wastes are usually dumped near the houses. This, and the lack of sanitation, creates conditions for the urban dissemination of typically rural diseases.⁽²¹⁾

5. Finally, the inadequate physical and social environments of the urban poor, and congested areas lead to domestic and street accidents, to stress and alienation, and to social instability. Unemployment and under-employment are usually high, and so is the crime rate.

c. Health and Environmental Problems of Deficient Basic Services

Next, we examine the impacts of the lack of an adequate provision of water, and of the means of disposing of human excreta and household wastes. The supply of water for drinking and washing in the impoverished urban areas has improved but in many places it is still precarious. Insufficient supplies of water, with inadequate provisions for ensuring that supplies remain uncontaminated create favourable conditions for the presence of high levels of pathogens and, thus, for a high incidence of endemic diseases such as diarrhoea, dysenteries, typhoid fever, amoebiasis and other intestinal parasites, and of food poisoning. In addition, it favours the spread of eye and ear infections, skin diseases, scabies, lice and fleas. Many of the health problems in poor urban settlements are linked to water - to the small amounts available, to the difficulty of access, and to its poor quality; the lack of facilities for its removal once used, is also serious.⁽²²⁾

A major deficiency in the poor urban settlements is that of facilities for the disposal of human excreta. According to the World Health Organization, human excreta "...are among the most dangerous substances with which people can come into contact; they are the principal source of the pathogenic organisms of many communicable diseases, particularly infections of the intestinal tract." The absence of hygienic forms of disposal of human wastes leads to "...a large incidence of infections due to the contamination of food, water or the fingers by faecal matter containing pathogenic organisms" and their subsequent ingestion by susceptible individuals.⁽²³⁾ Most of the infections contracted this way are intestinal parasites, the main cause of the high morbidity and, especially among the children, mortality rates in settlements with poor sanitation.

Inadequate garbage removal services also cause major health and environmental problems. Collection tends to be particularly precarious in the poor communities which have poor access to trucks.⁽²⁴⁾ There, refuse is usually thrown out near the houses and onto the streets, where it accumulates. The consequences are "...the disease vectors and pests it attracts, the drainage channels that become clogged and thus overflow".⁽²⁵⁾

The combined effects of these three deficiencies can be devastating. According to the World Health Organization, in the poor urban settlements of the Third World's large cities "...a child

26. See reference 23, page 7.

born today is 40-50 times more likely to die before the age of five than one born in the same moment in a prosperous developed country",⁽²⁶⁾ or, we might add, in the more affluent urban sections of the very cities in which these settlements are located.

Box 1: The Number of People Worldwide Affected by Deficient Sanitation

The number of persons harmed worldwide by the lack of adequate sanitation is staggering. According to the World Health Organization, around 480 million persons are infected with amoebiasis, 200 million with giardiasis, and upwards of 40,000 with cholera - all diarrhoeal diseases largely preventable through sanitation. Other important infections and parasitic diseases common in unsanitary agglomerations include typhoid (1 million infected), hepatitis B (200 million infected), ascariasis (700 million infected) and hookworm (700-900 million infected). There are also major tropical diseases such as schistosomiasis (200 million infected) and malaria (270 million infected).

Furthermore, it is estimated that, in 1989, some 5 million persons died from diarrhoeal diseases, 4 million of them children under the age of five. Deaths from other diseases were estimated to include 1-2 million from hepatitis B, 200,000 from schistosomiasis, and between 50,000-60,000 from problems caused by the hookworm. In addition, diseases not related to sanitation but strongly affected by the conditions in the poor settlements, such as tuberculosis and pneumonia, kill millions annually.

Finally, according to WHO, hepatitis B is related to 1-2 million deaths per year, even though it may not be the direct cause of death. There are diseases such as malaria and pneumonia which cause significant numbers of deaths which cannot be directly attributable to the lack of sanitation but the malnutrition-infection complex surely exacerbates the situation.

SOURCE: World Health Organization (1990), *Global Estimates for Health Situation Assessment and Projections*, 1990, Geneva: WHO, Division of Epidemiological Surveillance and Health Situation and Trend

27. Esrey, S.A., J.B. Potash, L. Roberts and C. Shiff (1991), "Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma", *Bulletin of the World Health Organization*, Geneva Vol.69, No.5, pages 609-621.

Investments in sanitation may have dramatic effects. An analysis of a total of 144 studies, undertaken by Esrey and associates⁽²⁷⁾ to determine the impact of improvements in water supply and in sanitation facilities on the incidence of the diseases stemming from inadequate sanitation, established an expected mean reduction in morbidity of 26 per cent from diarrhoea, of 29 per cent from ascariasis, of 27 per cent of trachoma, of 77 per cent from schistosomiasis, and of 78 per cent from dracunculiasis. Furthermore, there was a median decline of 55 per cent in child mortality; this is highly significant considering that, as shown in Box 1, some 4 million Third World children under the age of five die each year from diarrhoea and related diseases. Finally, the study noted large reductions in the severity of disease as a result of such improvements.

We have not found reliable statistics on the number of people affected by the inadequate sanitary situation in Brazil but, since the conditions are all there, we are sure they are considerable. Investments in water, in sanitation and in garbage collection and treatment would surely bring about not only a marked re-

duction in human misery but also a considerable improvement in the physical environment of the country's poor urban sections.

V. OVERALL AND URBAN POVERTY IN BRAZIL

a. Aspects of Inequality and Poverty

THE PER CAPITA income of Brazil experienced a marked increase in the 1970s, from US\$1,253 to US\$2,266; in the stagnant 1980s it declined, reaching US\$2,241 in 1988. The country's five regions showed similar trends. However, the regional disparities in per capita income should be noted. In 1970, the per capita income of the south-west exceeded the national average by 53 per cent while that of the north-east was 44 per cent lower. This discrepancy has been reduced, but only marginally; in 1988 the per capita income of the south-east still exceeded the national average by 44 per cent and that of the north-east was still 38 per cent lower. Moreover, the personal distribution of income has changed little in the last two decades, remaining highly concentrated. The Gini coefficient for Brazil as a whole fell marginally, from 0.639 in 1970 to 0.625 in 1985; and in all five regions the pattern of income distribution was similar.⁽²⁸⁾ Inequality is pervasive.

A large population, a medium-range per capita income and a high degree of inequality can only mean a very substantial number of poor. Using the poverty line method, Tolosa⁽²⁹⁾ estimated that, in 1988, nearly 45 million persons, almost one-third of Brazil's total population, were poor. Approximately half of the poor lived in rural areas and half in urban areas. In relative terms, however, the proportion of the urban poor (22.5 per cent) was substantially lower than that of the rural poor (50.1 per cent). The considerable rural-urban migration of the last 40 years has markedly reduced the rural population but has not improved the lot of those remaining behind.

In regional terms, the north-east had 23.8 million poor, or 53.1 per cent of Brazil's poor, and 58.8 per cent of the region's population but the share of the more prosperous south-east was also considerable (25.4 per cent of the country's poor and 18.5 per cent of the region's total population). However, while in the north-east the majority of the poor were rural (13.5 million persons or 75.1 per cent of the region's rural population), in the south-east the largest portion of the poor lived in cities (7.1 million persons or 13.4 per cent of the total urban population). Moreover, even the north-east had a considerable number of urban poor (10.3 million persons in 1988, 45.7 per cent of the region's urban population), concentrated in three metropolitan areas and in several medium cities.

Given the large and growing number of urban poor, the fact that all regions have problems of urban poverty and the health and environmental problems stemming from a concentration of poor in large cities, we examine the situation of Brazil's major urban areas.

28. Data on per capita income and on income distribution from Albuquerque, Roberto Cavalcanti (1991), "A situação social: o que diz o passado e o que promete o futuro" in *Perspectivas da Economia Brasileira - 1992*, Brasília: IPEA, pages 387-410, Tables 1 and 7.

29. See Tolosa, Hamilton (1991), "Pobreza no Brasil: uma avaliação dos anos 80" in João Paulo dos Reis Velloso (editor), *A questão social no Brasil*, Nobel, São Paulo, pages 105-136. The poverty line method requires the determination of the monthly income a family of average size has to earn in order to be able to purchase a basket of goods that would assure its basic needs. All families with incomes below this level are considered poor.

30. It should be noted that Brazil has other large cities, such as Brasília (2 million inhabitants) and Manaus in the Amazon (more than 1 million inhabitants). And there are many medium-sized cities (with populations between 300,000 and 1 million). However, considering the availability of data, we concentrate on the official MRs.

b. The Metropolitan Poor

For statistical and policy purposes, nine Metropolitan Regions (MRs) have been defined in Brazil (see Table 1). In 1989, the nine MRs had a combined population of 40.6 million persons, almost one-third of Brazil's total population. The smallest MR was that of Belém, in the Amazon, with 1.4 million inhabitants, and the largest, São Paulo, with almost 15 million inhabitants. The south-east had the three largest MRs, with a combined total of 27.4 million or 65.5 per cent of the total metropolitan population and almost 20 per cent of Brazil's population. However, the north/north-east had four MRs, with a 8.5 million combined population - quite a large number for an under-developed and/or frontier area. Finally, the south had two MRs,

Table 1: Brazil's Metropolitan Regions: Population (1991), Life Expectancy, the Gini Coefficient and Average Household Income (1970 and 1988)

Metropolitan Region (MR)	Population ('000)	Life expectancy (years)		Gini coefficient		Average household Income (1988 Cr\$)	
		1970	1988	1970	1988	1970	1988
North/north-east:							
Belém	1332.7	55.1	69.1	0.575	0.602	21,900	28,800
Fortaleza	2303.6	41.8	50.6	0.609	0.666	17,800	28,200
Recife	2871.3	47.0	57.8	0.609	0.648	21,000	26,000
Salvador	2493.2	48.2	68.1	0.605	0.650	26,900	36,400
South-east:							
Belo Horizonte	3431.8	53.0	65.5	0.579	0.633	30,400	39,900
Rio de Janeiro	9796.5	56.0	65.6	0.568	0.601	43,900	43,300
São Paulo	15416.4	56.6	67.1	0.545	0.557	48,600	52,900
South:							
Curitiba	1998.8	55.7	68.0	0.559	0.543	37,000	44,600
Porto Alegre	3026.0	60.5	73.1	0.535	0.578	38,000	46,200
Total	42670.3						

SOURCES: 1989 from IBGE (1994), Censo Demográfico de 1991 - Sinopse Preliminar, Rio de Janeiro, IBGE. Life expectancies, Gini coefficients and average household incomes from Albuquerque, Roberto Cavalcanti and Renato Villela (1991), "A situação social no Brasil: um balanço de duas décadas" in João Paulo dos Reis, Velloso (editor), A Questão Social no Brasil, São Paulo: Nobel, pages 23-104, Table 8. Basic data from 1970 demographic census and from IBGE's 1988 household survey.

with a 4.7 million combined population.⁽³⁰⁾

When examining the social indicators of the metropolitan regions (see Table 1), we see that all MRs experienced considerable increases in life expectancy between 1970 and 1988 but that of the north-east MRs remained significantly below those of the south-east and south. In 1988, Porto Alegre, in the South, had the highest life expectancy (73 years) and Fortaleza, in the

31. In the stagnant 1980s, the economy of all MRs slowed down. However, that of Rio de Janeiro experienced a stronger and earlier recession.

32. Between 1970 and 1991, the population of metropolitan São Paulo almost doubled, from 8.1 million to 15.4 million inhabitants. In the 1970s, it grew by 5 per annum and, in the 1980s, by more than 3 per cent per annum. See Martine, George (1992), reference 15.

north-east, the lowest (50 years). As for the Gini coefficient, except for Curitiba, the other MRs showed a deterioration in income distribution between 1970 and 1988. The coefficients for 1988 also reveal that the distribution of income was worse in the north-east MRs and better in São Paulo and in the two southern MRs but the differences are not remarkable.

Focusing on the average household real income (see Table 1), we observe that all MRs except for Rio de Janeiro had increases between 1970 and 1988.⁽³¹⁾ Moreover, both in 1970 and in 1988, the average household income of the north/north-east MRs was significantly lower than those of the south-east/south. However, the gap between the two groups has declined somewhat. In 1970, the average household income of Fortaleza (the MR with the lowest average) was only 36.6 per cent that of São Paulo's (which had the highest average); in 1988, this proportion had risen to 53.3 per cent. This does not mean that the north-east MRs are prospering remarkably but rather, that São Paulo - flooded with migrants - suffered a sharp increase in the number of households, thus experiencing a decline in its average household income.⁽³²⁾

The per capita incomes, the large populations and the considerable inequalities all point to the existence of substantial numbers of poor in most metropolitan regions. Using the poverty

Table 2: Brazil and Metropolitan Regions; 1989
Estimates of the Number of Poor

Metropolitan region (MR)	Number of poor ('000)	% of popul. poor	% of total MR poor
North/north-east:			
Belém	501.3	39.6	4.4
Fortaleza	872.6	40.7	7.5
Recife	1,302.1	47.2	11.4
Salvador	907.0	39.0	7.9
South-east:			
Belo Horizonte	894.5	27.2	7.8
Rio de Janeiro	3,069.5	32.5	26.8
São Paulo	3,069.6	20.9	26.8
South:			
Curitiba	251.9	13.5	2.2
Porto Alegre	602.2	21.0	5.2
Total of MRs	11,470.7	28.2	100.0

SOURCES: Estimates of the number of MR poor from Rocha, Sônia (1991), "Pobreza metropolitana: balanço de uma década" in *Perspectivas da economia brasileira - 1992*, Brasília: IPEA, pages 449-470. Adjusted for the trends in the 1980s revealed by the 1991 demographic census.

33. Rocha, Sônia (1991), "Pobreza metropolitana: balanço de uma década" in *Perspectivas da Economia Brasileira - 1992*, IPEA, Brasília, pages 449-470. Working with data from IBGE's 1989 household survey (PNAD) for the nine MRs, the author established a poverty line for each, considering specific consumption habits and the prices for goods and services prevailing in each, and determined the number of persons below the respective poverty line.

34. See reference 33, 449-470.

35. Employment was broadly defined to include most forms of gainful occupation.

36. Such investments will not make poverty disappear. However, they can help raise the living standards for the urban poor.

line methodology, Rocha estimated the number of poor in the nine MRs in 1989.⁽³³⁾ These estimates are given in Table 2. In 1989, the combined total numbered almost 11.5 million persons, or 28.2 per cent of the total estimated population of the MRs that year. São Paulo and Rio de Janeiro had the largest absolute number of poor (over 3 million or nearly 27 per cent of the total MR poor each) but the greatest numbers of urban poor were found in the north/north-east MRs. One can distinguish three groups, classified according to percentages of poor: the north/north-east MRs, with percentages above 39 per cent; Belo Horizonte and Rio de Janeiro, with percentages around 30 per cent; and São Paulo, together with the two southern MRs, with proportions equal to or below 21 per cent. The percentages range from 47.2 per cent in Recife to 13.5 per cent in Curitiba.

Rocha also established some of the characteristics which differentiate the poor from the rest of the metropolitan populations.⁽³⁴⁾ Among those, we stress the following:

- in 1989 the proportion of the poor unemployed⁽³⁵⁾ was 11 per cent while that of the rest of the workforce was only 3 per cent;
- the proportion of the workforce in informal occupations was 38 per cent for the poor and 26 per cent for the remaining population (still quite a high percentage);
- the proportion of poor children in the 7-14 year-old age group who were not in school was 14 per cent, while that of the non-poor was 6 per cent.

These contrasting proportions reflect two basic characteristics of urban poverty: limited opportunities (unemployment and under-employment), and the inadequate availability of basic services (exemplified by education and sanitation) which is considered below.

VI. POVERTY RELATED DEGRADATION - THE LACK OF BASIC SERVICES

TO A LARGE extent, the health and environmental problems caused by uneven development stem from urban congestion, from a deficient urban infrastructure and from an inadequate provision of basic services; the poor are both victims and factors in this. We have seen that a considerable improvement in the urban environment and in living conditions can be achieved with investments in basic services.⁽³⁶⁾ In this section, we examine indicators which reflect the situation of poverty related degradation in Brazil's metropolitan regions, concentrating on deficiencies in piped water, garbage collection and sanitary services.

Table 3 shows the proportion of metropolitan households with piped water and with access to sanitation and garbage collection services. In 1970, all MRs had a low proportion of households with piped water, with those of the north-east falling far behind; all experienced significant improvements between 1970

and 1991. However, the 1991 proportions were still too low, and the disparities remained high; the proportion of households with piped water in the south-east/south MRs was in the 85-96 per cent range, while those in the north-east were in the 71-88 per cent range.

The evolution in sanitation and garbage collection services was similar. In 1970, a very large proportion of the metropolitan households did not have access to hygienic means of disposal of excreta and waste water. The proportions ranged from a high of 74.4 per cent in Fortaleza, to a low of 36.5 per cent in Rio de Janeiro. In the 1970-91, period there were improvements but, in 1991, more than 47 per cent of the north/northeast MRs still

Table 3: Brazil's Metropolitan Regions, 1970 and 1991. Proportion of Households with Piped Water, connected to Sewers or to Septic Tanks, with Inadequate Sanitation and with Garbage Disposal Services.

Proportion of Households (%)								
Metropolitan Region (MR)	With Piped Water		Connected to Sewer/Septic Tank		With Inadequate Sanitation		With Garbage Collection	
	1970	1991	1970	1991	1970	1991	1970	1991
North/Northeast								
Belem	60.8	71.3	29.3	52.7	70.7	47.3	45.6	83.5
Fortaleza	28.9	68.5	25.6	37.5	74.4	62.5	48.2	76.0
Recife	45.7	88.2	31.4	42.3	68.6	57.7	44.3	72.1
Salvador	53.7	71.9	30.4	50.6	69.6	49.4	47.3	66.8
Southeast								
Belo Horizonte	58.1	88.5	44.7	65.9	55.3	34.1	44.5	67.8
Rio de Janeiro	75.7	86.5	63.5	73.0	36.5	27.0	70.3	79.2
São Paulo	75.4	95.7	NA	79.7	NA	20.3	87.8	96.4
South								
Curitiba	61.1	85.8	51.1	69.3	48.9	30.7	60.3	84.3
Porto Alegre	72.9	87.6	54.6	76.3	45.4	23.7	67.5	86.1

NA: Not available due to failure in processing the census data.

SOURCE: IBGE (1976), *Indicadores Sociais para Áreas Urbanas*, Rio de Janeiro: IBGE; also IBGE (1994), *Censo Demográfico de 1991 - Sinopse Preliminar*, Rio de Janeiro, IBGE.

had precarious sanitation (with a high 62.5 per cent in Fortaleza).

As for garbage removal, in 1970, less than half of the households of Belo Horizonte and of the north/north-east MRs had access to such services; Rio de Janeiro, São Paulo and the two southern MRs showed higher, but far from adequate, proportions. By 1991, the situation had improved significantly but there were the usual regional differences. Salvador had the lowest proportion (66.8 per cent), and São Paulo the highest (96.4 per cent).

37. The 1991 demographic census generated data on the number of persons living in the households grouped in each of the conditions investigated.

38. See reference 34, pages 464-465.

39. Wilhelm, Jorge, "Perspectivas urbanas: infraestrutura, atividades e ambiente" in João Paulo dos Reis Velloso (editor), *Ecologia e o Novo Padrão de Desenvolvimento no Brasil*, Nobel, São Paulo, page 81.

40. A word of caution is in order here. On occasions, the data overstate the deficiencies. When we see, for instance, that in 1991, 62.5 per cent of the households of Fortaleza were neither connected to sewers nor to septic tanks we form a very unfavorable view of the city's sanitary situation. But, according to Sinnatamby, Gehan (1990), "Low-cost sanitation" in Jorge E. Hardoy, Sandy Cairncross and David Satterthwaite (editors), *The Poor Die Young - Housing and Health in Third World Cities*, Earthscan Publications, London, page 142, in Fortaleza and Natal (another capital city of the north-east), housing in areas without sewers often relies on improved pit latrines which provide a measure of sanitation. Thanks to very favourable soil conditions, these cities have used this system with fairly good results.

To a certain extent the figures given in Table 3 hide the full extent of the problem. For instance, in 1991, the proportion of houses with piped water was quite high in almost all MRs but there were still some 7 million persons living in houses where this very basic service was not available. Of this total, about 2.8 million persons were in the north/north-east MRs, with some 4.2 million in the south-east/south MRs where there are higher concentrations of people. In São Paulo, almost one million persons live in households with no piped water (4.3 per cent of the total); in Rio de Janeiro, the figure is 2.1 million persons.⁽³⁷⁾ The picture gets worse when we consider sanitation. In 1991, the nine MRs had about 12.3 million persons living in housing with precarious sanitation. Of those, some 4.6 million were in the north/north-east MRs and around 7.7 million in the south-east and south. In São Paulo alone, there were nearly 3.5 million persons deprived of sanitation and in Rio de Janeiro the figure was almost 2 million.

The study by Rocha of the conditions faced, in 1988, by the metropolitan poor estimated that 32 per cent, or a little over 4 million persons, lived in houses without piped water, whilst the proportion for the "non-poor" was only 9 per cent. The MRs with the highest numbers of poor deprived of piped water were Rio de Janeiro (1.3 million), Recife (712,000) and Fortaleza (571,000); the total for São Paulo was 453,000 persons.⁽³⁸⁾ Similarly, 41 per cent of the metropolitan poor, or 5.2 million persons, lived in households not connected either to sewers or to septic tanks, whilst this was the case for only 14 per cent of the non-poor population. The MRs with the largest number of poor in this condition were Recife, with 82 per cent of the total poor, Salvador, with 34 per cent, and São Paulo, with 30 per cent.

It is worth a further look at the situation in São Paulo. In 1991, this MR had one of the lowest proportions of housing with inadequate sanitation (20.3 per cent) but the absolute number of poor living in these households was close to 1.1 million persons, over one-fifth of the combined MR poor in this situation. São Paulo was able to reduce its deficit in sanitation, from 47 per cent of the total poor in 1981 to 30 per cent in 1989 but the rapid growth of metropolitan São Paulo and its huge population still means a staggering number of unassisted people. As pointed out by Wilhelm, São Paulo needs to continue devoting substantial expenditure on sanitation just to keep pace with metropolitan growth. Furthermore, São Paulo currently collects the domestic sewage of 65 per cent of its households but only 19.6 per cent of this is treated. All of the sewage (treated and otherwise) is dumped in rivers in the metropolitan region, notably the Tiete river, which also receives much of the MR's industrial liquid wastes and has, for some time, been dead. There are plans to increase the volume of sewage treated to 80 per cent of the total; however, due to the economic crisis this can only be done gradually.⁽³⁹⁾

In sum, the metropolitan sanitary situation leaves much to be desired, even in Brazil's richest regions. The availability of sewer systems is still small, and a large proportion of the sewage gathered by the existing systems is disposed of raw into water bodies.⁽⁴⁰⁾

VII. HOW TO DEAL WITH THE QUESTION: SHOULD BRAZIL INVEST IN SEWER SYSTEMS FOR THE POOR?

THE AVAILABILITY OF sewage collection and treatment services has grown particularly slowly, even in Brazil's more advanced regions. One reason for this is that the implementation of these services requires heavy investment. In addition, a marked reduction in the sanitary deficit for the poor sections of the large cities would require a particularly great effort and much creativity. We saw that these areas were neglected and the deficits are considerable. However, is the investment in sanitation in poor urban sections of the large cities warranted?

This is a case where communities would benefit from guidance from ecological economics. A neo-classical environmental economist would surely offer instruments for evaluation. Ironically, however, in the use of such tools, the very fact that it is the low-income population who experience most of the effects of the sanitary deficit results in an argument against attempts at reducing the sanitary deficit; the Northern bias of the instruments would prejudice the evaluation against the community of the poor.

The study by Motta and associates⁽⁴¹⁾ provides a Brazilian instance of biased evaluation. To be fair, the study constitutes an exercise, the main objective of which was to estimate the adjustments that should be made on national accounts estimates as a result of the environmental costs of polluting water bodies with untreated sewage. Moreover, the authors are clearly unhappy with the results they obtained.

The study concentrates on urban sanitation. Using a cost-benefit methodology it calculates the discounted net benefits (benefits minus costs) for the 1970-89 period that would have resulted if appropriate investments had been made to eliminate the deficit in sewer systems.⁽⁴²⁾ The benefits were measured by adding the value of production sacrificed as a result of illnesses to the costs of hospitalization and treatment.⁽⁴³⁾ On the cost side, two alternatives were explored: the opportunity cost of the capital expenditure required to eliminate the sanitation deficit, and the medical and preventive expenditure necessary to avoid the deaths and losses in working days currently resulting from inadequate sanitation. The first option was considered superior since it would eliminate all effects from the pollution; the second deals only with the health externalities.⁽⁴⁴⁾

The main result of the exercise was that the value of production sacrificed as a result of the health effects brought about by deficient sanitation, together with the other costs, do *not* justify the capital cost of the investments necessary to eliminate the deficit in sanitation. With a 15 per cent discount rate, the capital cost exceeds the benefits by 1,300 per cent; and even with a 5 per cent discount rate it remains 50 per cent higher. However, the medical-preventive expenditure alternative was found economically viable.⁽⁴⁵⁾ The message was: it is not worth investing in sewer systems for the poor areas.

41. Motta, Ronaldo Serôa, Ana Paula F. Mendes, Francisco Eduardo Mendes and Carlos Eduardo F. Young (1991), "Perdas e serviços ambientais do recurso água para uso doméstico" *Textos para Discussão* No.258, IPEA, Rio de Janeiro, May.

42. See reference 41, page 5.

43. See reference 41, pages 6,7 and 10. The study considers the following diseases associated with unsanitary conditions: cholera, gastric infections, typhoid fever, poliomyelitis, amoebic infection, schistosomiasis and shigellosis.

44. See reference 41, page 19. Focusing on the 1970-1989 period, the study considers only the investment required *in addition* to that which was actually undertaken during that period. The medical and preventive expenditures were also for the 1970-89 period.

45. See reference 41, pages 29-31.

46. See reference 41, pages 16 and 29.

47. See reference 41, page 6.

48. Malnutrition stems both from an inadequate intake of food, and from frequent diarrhoeal bouts, common in children of poor, unsanitary settlements. Diarrhoea restricts the assimilation of nutrients by the body.

49. In their analysis of the main causes of poverty in Brazil, Camargo, José Marcio, and Ricardo Paes de Barros (1991), "As causas da miséria no Brasil: porca miséria!" in IPEA, *Perspectivas da Economia Brasileira, 1992*, IPEA, Brasília, pages 525-546 stress the role of the lack of human capital of a large proportion of Brazil's labour force and place there the blame for inadequate public services, among which are education, public health, and sanitation.

50. See reference 41, page 10.

51. See reference 41, page 22.

52. Sinnatamby, Gehan (1990), "Low-cost sanitation" in Jorge E. Hardoy, Sandy Cairncross and David Satterthwaite (editors), *The Poor Die Young - Housing and Health in Third World Cities*, Earthscan Publications, London, page 147. Moreover, construction companies and the manufacturers of sanitation equipment often pressure for the maintenance of conservative standards since they favour revenues from sanitation works.

However, if one's relevant community is that of the South's poor, such results are not acceptable. A more careful examination of the study shows that the approach to the problem was highly biased against the poor. To begin with, to a large extent the study's conclusions result from the very low opportunity costs of unskilled labour in Brazil. Given that most of those affected by the sanitation deficit were uneducated and unskilled, the value of the sacrificed production was obtained based on the earnings of the low-income population.⁽⁴⁶⁾ And if the opportunity cost of labour is low, so are the "benefits" from sanitation. No wonder, therefore, that they fell considerably below the capital cost of the investment needed to eliminate the deficit.

Moreover, the study considerably underestimates the benefits of sanitation and considerably overestimates the capital costs. The study itself indicates two sources of underestimation of benefits: due to problems of estimation the effects of the elimination of the sanitary deficit on recreation, tourism and fishing, and on the welfare (utility) of the affected population, were not considered.⁽⁴⁷⁾ However, we should not assume that such effects are negligible.

But there were other sources of underestimation of benefits, a result, to some extent, of the neo-classical biases of the methodology employed. These were:

1. The production sacrificed by infected workers, who continue to work but with reduced productivity caused by poor health. In adults, the diseases stemming from inadequate sanitation, although debilitating, often do not lead to losses in working days.

2. The nutritional status of children is made considerably worse by the diseases they catch in such an environment,⁽⁴⁸⁾ preventing them from absorbing the education provided by the little schooling they receive. Similarly, uneducated and unhealthy adults have a lower capacity and desire for self-improvement. Effects such as these have important economic consequences. They mean low productivity and a strongly handicapped labour force which earns little.⁽⁴⁹⁾ No doubt, it is difficult to place a monetary value on these effects, but it would be wrong to assume that their economic impact is small.

3. Due to the lack of data, the estimates of benefits do not include the medical expenditure for that portion of the affected population treated at home or in out-patient clinics.⁽⁵⁰⁾

Looking at the cost side of the equation, the very high estimates of capital costs result from the expensive sanitation systems assumed. Motta and associates work with investment requirements for sewer systems recommended by Caixa Econômica Federal, the government agency which finances sanitation and their operational costs were based on data furnished by a construction company.⁽⁵¹⁾ In both cases, conventional sewer systems were assumed. However, as shown by Sinnatamby, conventional sewers have evolved based on a set of rules of thumb devised by engineers, "...which have become more conservative over the years. This has added unnecessarily to sewage costs."⁽⁵²⁾ For this author "...there are over 20 different excreta-disposal

53. See reference 52, page 132.

54. See reference 52, pages 156-157; also reference 41, page 22. To be fair, the authors recognize that the sanitary technology employed in Brazil is out of tune with the country's possibilities (page 22).

55. See reference 52, pages 150-1. According to the author (page 150), "...shallow sewerage has been installed in dozens of site and service schemes at much reduced capital costs (between \$120 and \$180 per household) and in other upgrading projects in the state (of Rio Grande do Norte) and in Brazil."

56. See reference 41, pages 25-27.

57. Comissão Interministerial para a Preparação da Conferência das Nações Unidas sobre o Meio-Ambiente e o Desenvolvimento, *Subsídios Técnicos para a Elaboração do Relatório Nacional do Brasil para a CNUMAD*, Presidência da República, Brasília, June, pages 16-17.

systems which offer differing degrees of user convenience, protection against the spread of diseases and water demand for their operations", ranging from various types of ventilated improved pit-latrines and septic tanks, to simple collective systems, such as small bore sewers, and shallow sewers.⁽⁵³⁾

Sinnatamby shows that a quite efficient sewer system would require an investment ranging from US\$ 100-325 per household whilst conventional sewers cost between US\$ 600-1,200 per household. The study assumes an investment per household of US\$ 600. Considering only the most costly technology, the study arrives at the very high capital costs for the elimination of the sanitation deficit.⁽⁵⁴⁾

Under the perspective of the Southern poor, an environmental economist should look for flexible and innovative ways of facing sanitary deficiencies. Brazil, itself, has experience of unconventional approaches. In the city of Natal, in the north-east, the State Water and Sewerage Company conceived a low-cost sewerage system for two poor settlements with a combined population of 15,000 which was both affordable and efficient (it has been in use for almost 10 years).⁽⁵⁵⁾

There are also problems with the study's medical and preventive cost alternative. After establishing that nearly 90 per cent of the casualties of poor sanitation stem from dehydration produced by intestinal infections, it assumed an oral rehydration therapy and estimated the necessary expenditure both to make the therapy universally available and to instruct and assist in its application. The costs of medical services, examinations and drugs necessary to curtail the illnesses were also added.⁽⁵⁶⁾ The technical feasibility of this alternative is not an issue here. It seems naive, however, to suppose that, in a permanently contaminated environment, the diseases can be eliminated. In fact, the study's two alternatives are not mutually exclusive. Surely, the conjunction of a flexible approach to investment in sanitation and of programmes of preventive and curative medicine would produce far better results than if the same resources were spent exclusively on one of the alternatives.

VIII. CONCLUDING COMMENTS

FROM THE STANDPOINT of the community of the urban poor in Brazil, the lack of sanitation remains a critical problem. The country recently has experienced improvements, particularly with respect to piped water and, to some extent, sanitation. In fact, in the early 1960s, Brazil had one of the worse sanitary records in Latin America but this is no longer the case. However, the recent effort remains biased; it relegated investment in sewers to a distant second place and only a small proportion of the investment in sewer systems was in the poor, congested urban areas; moreover, 60 per cent of the investment in water and 65 per cent of that in sewers was in the more prosperous south-east.⁽⁵⁷⁾ It should be noted, however, that such patterns are probably consistent with the advice often furnished by conventional economics.

It is undeniable that, if Brazil is to move onto a less iniquitous development track, there must be a vigorous effort to provide sanitation to the urban poor. If this takes place, an innovative stance should be introduced into the evaluation of sanitation programmes. Ecological economics could play an important role in this evaluation by requiring that the main issues be examined from the perspective of the community of residents in poor urban settlements.

A problem with the main trains of thought in ecological economics, however, is that they have been strong in analyzing and criticizing the economic-environmental problems of modern societies but less so on devising operational instruments to give guidance in cases such as that of our example. This has not been the case with neo-classical economics; however, its instruments have theoretical flaws⁽⁵⁸⁾ and, as we have seen, can generate answers that fail to address the needs of the relevant community.

If a more equitable perspective is to prevail, it becomes necessary to look for other approaches. One alternative could be the use of cost-effectiveness analysis. In our example, goals for the reduction of the sanitation deficit would be established by the political process, sustainable sanitary engineering solutions would be sought, and economic analysis would be used to determine the least costly path for achieving these goals. A more rewarding option could perhaps be in line with the plea for pluralism, stressed by Norgaard; an important step in this direction seems to be, as suggested by van Pelt, the use of multiple criteria analysis.⁽⁵⁹⁾

Progress has been made but ecological economics still seems to be confronted with the task of devising appropriate operational instruments to help evaluate options for action relevant to specific communities, which are able to mature into well-accepted substitutes to the tools used at present, many of which derived from neo-classical economics.

58. Norgaard, Richard, "Environmental economics: an evolutionary critique and a plea for pluralism" (1985), *Journal of Environmental Economics and Management* Vol.12, pages 382-394.

59. Norgaard, Richard (1985), "Environmental economics: an evolutionary critique and a plea for pluralism", *Journal of Environmental Economics and Management* Vol.12, pages 382-394; also van Pelt, Michiel J.F. (1993), "Ecologically sustainable development and project appraisal in developing countries", *Ecological Economics* Vol.7, No.1, pages 19-42.