

Our Common Future, Chapter 2: Towards Sustainable Development

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1. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

2. Thus the goals of economic and social development must be defined in terms of sustainability in all countries - developed or developing, market-oriented or centrally planned. Interpretations will vary, but must share certain general features and must flow from a consensus on the basic concept of sustainable development and on a broad strategic framework for achieving it.

3. Development involves a progressive transformation of economy and society. A development path that is sustainable in a physical sense could theoretically be pursued even in a rigid social and political setting. But physical sustainability cannot be secured unless development policies pay attention to such considerations as changes in access to resources and in the distribution of costs and benefits. Even the narrow notion of physical sustainability implies a concern for social equity between generations, a concern that must logically be extended to equity within each generation.

I. The Concept of Sustainable Development

4 The satisfaction of human needs and aspirations in the major objective of development. The essential needs of vast numbers of people in developing countries for food, clothing, shelter, jobs - are not being met, and beyond their basic needs these people have legitimate aspirations for an improved quality of life. A world in which poverty and inequity are endemic will always be prone to ecological and other crises. Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life.

5. Living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability. Yet many of us live beyond the world's ecological means, for instance in our patterns of energy use. Perceived needs are socially and culturally determined, and sustainable development requires the promotion of values that encourage consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire.

6. Meeting essential needs depends in part on achieving full growth potential, and sustainable development clearly requires economic growth in places where such needs are not being met. Elsewhere, it can be consistent with economic growth, provided the content of growth reflects the broad principles of sustainability and non-exploitation of others. But growth by itself is not enough. High levels of productive activity and widespread poverty can coexist, and can endanger the environment. Hence sustainable development requires that societies meet human needs both by increasing productive potential and by ensuring equitable opportunities for all.

7. An expansion in numbers can increase the pressure on resources and slow the rise in living standards in areas where deprivation is widespread. Though the issue is not merely one of population size but of the distribution of resources, sustainable development can only be pursued if demographic developments are in harmony with the changing productive potential of the ecosystem.

8. A society may in many ways compromise its ability to meet the essential needs of its people in the future - by overexploiting resources, for example. The direction of technological developments may solve some immediate problems but lead to even greater ones. Large sections of the population may be marginalized by ill-considered development.

9. Settled agriculture, the diversion of watercourses, the extraction of minerals, the emission of heat and noxious gases into the atmosphere, commercial forests, and genetic manipulation are all examples of human intervention in natural systems during the course of development. Until recently, such interventions were small in scale and their impact limited. Today's interventions are more drastic in scale and impact, and more threatening to life-support systems both locally and globally. This need not happen. At a minimum, sustainable development must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings.

10. Growth has no set limits in terms of population or resource use beyond which lies ecological disaster. Different limits hold for the use of energy, materials, water, and land. Many of these will manifest themselves in the form of rising costs and diminishing returns, rather than in the form of any sudden loss of a resource base. The accumulation of knowledge and the development of technology can enhance the carrying capacity of the resource base. But ultimate limits there are, and sustainability requires that long before these are reached, the world must ensure equitable access to the constrained resource and reorient technological efforts to relieve the pressure.

A communications gap has kept environmental, population, and development assistance groups apart for too long, preventing us from being aware of our common interest and realizing our combined power. Fortunately, the gap is closing. We now know that what unites us is vastly more important than what divides us.

We recognize that poverty, environmental degradation, and population growth are inextricably related and that none of these fundamental problems can be successfully addressed in isolation. We will succeed or fail together.

Arriving at a commonly accepted definition of 'sustainable development' remains a challenge for all the actors in the development process.

'Making Common Cause'

U.S. Based Development, Environment, Population NGOs

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11. Economic growth and development obviously involve changes in the physical ecosystem. Every ecosystem everywhere cannot be preserved intact. A forest may be depleted in one part of a watershed and extended elsewhere, which is not a bad thing if the exploitation has been planned and the effects on soil erosion rates, water regimes, and genetic losses have been taken into account. In general, renewable resources like forests and fish stocks need not be depleted provided the rate of use is within the limits of regeneration and natural growth. But most renewable resources are part of a complex and interlinked ecosystem, and maximum sustainable yield must be defined after taking into account system-wide effects of exploitation.

12. As for non-renewable resources, like fossil fuels and minerals, their use reduces the stock available for future generations. But this does not mean that such resources should not be used. In general the rate of depletion should take into account the criticality of that resource, the availability of technologies for minimizing depletion, and the likelihood of substitutes being available. Thus land should not be degraded beyond reasonable recovery. With minerals and fossil fuels, the rate of depletion and the emphasis on recycling and economy of use should be calibrated to ensure that the resource does not run out before acceptable substitutes are available. Sustainable development requires that the rate of depletion of non renewable resources should foreclose as few future options as possible.

13. Development tends to simplify ecosystems and to reduce their diversity of species. And species, once extinct, are not renewable. The loss of plant and animal species can greatly limit the options of future generations; so sustainable development requires the conservation of plant and animal species.

14. So-called free goods like air and water are also resources. The raw materials and energy of production processes are only partly converted to useful products. The rest comes out as wastes. Sustainable development requires that the adverse impacts on the quality of air, water, and other natural elements are minimized so as to sustain the ecosystem's overall integrity.

15. In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

II. Equity and the Common Interest

16. Sustainable development has been described here in general terms. How are individuals in the real world to be persuaded or made to act in the common interest? The answer lies partly in education, institutional development, and law enforcement. But many problems of resource depletion and environmental stress arise from disparities in economic and political power. An industry may get away with unacceptable levels of air and water pollution because the people who bear the brunt of it are poor and unable to complain effectively. A forest may be destroyed by excessive felling because the people living there have no alternatives or because timber contractors generally have more influence than forest dwellers.

17. Ecological interactions do not respect the boundaries of individual ownership and

political jurisdiction. Thus:

- In a watershed, the ways in which a farmer up the slope uses land directly affect run-off on farms downstream.
- the irrigation practices, pesticides, and fertilizers used on one farm affect the productivity of neighbouring ones, especially among small farms.
- The efficiency of a factory boiler determines its rate of emission of soot and noxious chemicals and affects all who live and work around it.
- The hot water discharged by a thermal power plant into a river or a local sea affects the catch of all who fish locally.

18. Traditional social systems recognized some aspects of this interdependence and enforced community control over agricultural practices and traditional rights relating to water, forests, and land. This enforcement of the 'common interest' did not necessarily impede growth and expansion though it may have limited the acceptance and diffusion of technical innovations.

19. Local interdependence has, if anything, increased because of the technology used in modern agriculture and manufacturing. Yet with this surge of technical progress, the growing 'enclosure' of common lands, the erosion of common rights in forests and other resources, and the spread of commerce and production for the market, the responsibilities for decision making are being taken away from both groups and individuals. This shift is still under way in many developing countries.

If the desert is growing, forest disappearing, malnutrition increasing, and people in urban areas living in very bad conditions, it is not because we are lacking resources but the kind of policy implemented by our rulers, by the elite group. Denying people rights and peoples' interests is pushing us to a situation where it is only the poverty that has a very prosperous future in Africa. And it is our hope that your Commission, the World Commission, will not overlook these problems of human rights in Africa and will put emphasis on it. Because it is only free people, people who have rights, who are mature and responsible citizens, who then participate in the development and in the protection of the environment.

Speaker from the floor
WCED Public Hearing
Nairobi, 23 Sept 1986

20. It is not that there is one set of villains and another of victims. All would be better off if each person took into account the effect of his or her acts upon others. But each is unwilling to assume that others will behave in this socially desirable fashion, and hence all continue to pursue narrow self-interest. Communities or governments can compensate for this isolation through laws, education, taxes, subsidies, and other methods. Well-enforced laws and strict liability legislation can control harmful side effects. Most important, effective participation in decision-making processes by local communities can help them articulate and effectively enforce their common interest.

21. Interdependence is not simply a local phenomenon. Rapid growth in production has extended it to the international plane, with both physical and economic manifestations. There are growing global and regional pollution effects, such as in the more than 200 international river basins and the large number of shared seas.

22. The enforcement of common interest often suffers because areas of political

--- The achievement of common interest often fails because areas of potential jurisdiction and areas of impact do not coincide. Energy policies in one jurisdiction cause acid precipitation in another. The fishing policies of one state affect the fish catch of another. No supranational authority exists to resolve such issues, and the common interest can only be articulated through international cooperation.

23. In the same way, the ability of a government to control its national economy is reduced by growing international economic interactions. For example, foreign trade in commodities makes issues of carrying capacities and resource scarcities an international concern. (See *Chapter 3*.) If economic power and the benefits of trade were more equally distributed, common interests would be generally recognized. But the gains from trade are unequally distributed, and patterns of trade in, say, sugar affect not merely a local sugar-producing sector, but the economies and ecologies of the many developing countries that depend heavily on this product.

24. The search for common interest would be less difficult if all development and environment problems had solutions that would leave everyone better off. This is seldom the case, and there are usually winners and losers. Many problems arise from inequalities in access to resources. An inequitable landowner ship structure can lead to overexploitation of resources in the smallest holdings, with harmful effects on both environment and development. Internationally, monopolistic control over resources can drive those who do not share in them to excessive exploitation of marginal resources. The differing capacities of exploiters to commandeer 'free' goods - locally, nationally, and internationally - is another manifestation of unequal access to resources. 'Losers' in environment/development conflicts include those who suffer more than their fair share of the health, property, and ecosystem damage costs of pollution.

25. As a system approaches ecological limits, inequalities sharpen. Thus when a watershed deteriorates, poor farmers suffer more because they cannot afford the same anti-erosion measures as richer farmers. When urban air quality deteriorates, the poor, in their more vulnerable areas, suffer more health damage than the rich, who usually live in more pristine neighbourhoods. When mineral resources become depleted, late-comers to the industrialization process lose the benefits of low-cost supplies. Globally, wealthier nations are better placed financially and technologically to cope with the effects of possible climatic change.

26. Hence, our inability to promote the common interest in sustainable development is often a product of the relative neglect of economic and social justice within and amongst nations.

III. Strategic Imperatives

27. The world must quickly design strategies that will allow nations to move from their present, often destructive, processes of growth and development onto sustainable development paths. This will require policy changes in all countries, with respect both to their own development and to their impacts on other nations' development possibilities. (This chapter concerns itself with national strategies. The required reorientation in international economic relations is dealt with in *Chapter 3*.)

28. Critical objectives for environment and development policies that follow from the concept of sustainable development include:

- reviving growth;
- changing the quality of growth;
- meeting essential needs for jobs, food, energy, water, and sanitation;
- ensuring a sustainable level of population;

- conserving and enhancing the resource base:
- reorienting technology and managing risk; and
- merging environment and economics in decision making.

1. Reviving Growth

29. As indicated earlier, development that is sustainable has to address the problem of the large number of people who live in absolute poverty - that is, who are unable to satisfy even the most basic of their needs. Poverty reduces people's capacity to use resources in a sustainable manner; it intensifies pressure on the environment. Most such absolute poverty is in developing countries; in many, it has been aggravated by the economic stagnation of the 1980s. A necessary but not a sufficient condition for the elimination of absolute poverty is a relatively rapid rise in per capita incomes in the Third World. It is therefore essential that the stagnant or declining growth trends of this decade be reversed.

30. While attainable growth rates will vary, a certain minimum is needed to have any impact on absolute poverty. It seems unlikely that, taking developing countries as a whole, these objectives can be accomplished with per capita income growth of under 3 per cent. (See Box 2-1.) Given current population growth rates, this would require overall national income growth of around 5 per cent a year in the developing economies of Asia, 5.5 per cent in Latin America, and 6 per cent in Africa and West Asia.

31. Are these orders of magnitude attainable? The record in South and East Asia over the past quarter-century and especially over the last five years suggests that 5 per cent annual growth can be attained in most countries, including the two largest, India and China. In Latin America, average growth rates on the order of 5 per cent were achieved during the 1960s and 1970s, but fell well below that in the first half of this decade, mainly because of the debt crisis.^{/1} A revival of Latin American growth depends on the resolution of this crisis. In Africa, growth rates during the 1960s and 1970s were around 4-4.5 per cent, which at current rates of population growth would mean per capita income growth of only a little over 1 per cent.^{/2} Moreover, during the 1980s, growth nearly halted and in two-thirds of the countries per capita income declined.^{/3} Attaining a minimum level of growth in Africa requires the correction of short-term imbalances, and also the removal of deep-rooted constraints on the growth process.

32. Growth must be revived in developing countries because that is where the links between economic growth, the alleviation of poverty, and environmental conditions operate most directly. Yet developing countries are part of an interdependent world economy; their prospects also depend on the levels and patterns of growth in industrialized nations. The medium-term prospects for industrial countries are for growth of 3-4 per cent, the minimum that international financial institutions consider necessary if these countries are going to play a part in expanding the world economy. Such growth rates could be environmentally sustainable if industrialized nations can continue the recent shifts in the content of their growth towards less material- and energy-intensive activities and the improvement of their efficiency in using materials and energy.

Box 2-1 Growth, Redistribution, and Poverty

1. The poverty line is that level of income below which an individual or household cannot afford on a regular basis the necessities of life. The percentage of the population below that line will depend on per capita national income and the manner in which it is distributed. How quickly

can a developing country expect to eliminate absolute poverty? The answer will vary from country to country, but much can be learned from a typical case.

2. Consider a nation in which half the population lives below the poverty line and where the distribution of household incomes is as follows: the top one-fifth of households have 50 per cent of total income, the next fifth have 20 per cent, the next fifth have 14 per cent, the next fifth have 9 per cent, and the bottom fifth have just 7 per cent. This is a fair representation of the situation in many low-income developing countries.
3. In this case, if the income distribution remains unchanged, per capita national income would have to double before the poverty ratio drops from 50 to 10 per cent. If income is redistributed in favour of the poor, this reduction can occur sooner. Consider the case in which 25 per cent of the incremental income of the richest one-fifth of the population is redistributed equally to the others. The assumptions here about redistribution reflect three judgements. First, in most situations redistributive policies can only operate on increases in income. Second, in low-income developing countries the surplus that can be skimmed off for redistribution is available only from the wealthier groups. Third, redistributive policies cannot be so precisely targeted that they deliver benefits only to those who are below the poverty line, so some of the benefits will accrue to those who are just a little above it.
4. The number of years required to bring the poverty ratio down from 50 to 10 per cent ranges from:
 - o 18-24 years if per capita income grows at 3 per cent,
 - o 26-36 years if it grown at 2 per cent, and
 - o 51-70 years if it grows only at 1 per cent.

In each case, the shorter time is associated with the redistribution of 25 per cent of the incremental income of the richest fifth of the population and the longer period with no redistribution.

5. So with per capita national income growing only at 1 per cent a year, the time required to eliminate absolute poverty would stretch well into the next century. If, however, the aim is to ensure that the world is well on its way towards sustainable development by the beginning of the next century, it is necessary to aim at a minimum of 3 per cent per capita national income growth and to pursue vigorous redistributive policies.

33. As industrialized nations use less materials and energy, however, they will provide smaller markets for commodities and minerals from the developing nations. Yet if developing nations focus their efforts upon eliminating poverty and satisfying essential human needs, then domestic demand will increase for both agricultural products and manufactured goods and some services. Hence the very logic of sustainable development implies an internal stimulus to Third World growth.

34. Nonetheless, in large numbers of developing countries markets are very small; and for all developing countries high export growth, especially of non-traditional items, will also be necessary to finance imports, demand for which will be generated by rapid

development. Thus a reorientation of international economic relations will be necessary for sustainable development, as discussed in *Chapter 3*.

2. Changing the quality of Growth

35. Sustainable development involves more than growth. It requires a change in the content of growth, to make it less Material- and energy-intensive and more equitable in its impact. These changes are required in all countries as part of a package of measures to maintain the stock of ecological capital, to improve the distribution of income, and to reduce the degree of vulnerability to economic crises.

36. The process of economic development must be more soundly based upon the realities of the stock of capital that sustains it. This is rarely done in either developed or developing countries. For example, income from forestry operations is conventionally measured in terms of the value of timber and other products extracted, minus the costs of extraction. The costs of regenerating the forest are not taken into account, unless money is actually spent on such work. Thus figuring profits from logging rarely takes full account of the losses in future revenue incurred through degradation of the forest. Similar incomplete accounting occurs in the exploitation of other natural resources, especially in the case of resources that are not capitalized in enterprise or national accounts: air, water, and soil. In all countries, rich or poor, economic development must take full account in its measurements of growth of the improvement or deterioration in the stock of natural resources.

37. Income distribution is one aspect of the quality of growth, as described in the preceding section, and rapid growth combined with deteriorating income distribution may be worse than slower growth combined with redistribution in favour of the poor. For instance, in many developing countries the introduction of large-scale commercial agriculture may produce revenue rapidly, but may also dispossess a large number of small farmers and make income distribution more inequitable. In the long run, such a path may not be sustainable; it impoverishes many people and can increase pressures on the natural resource base through overcommercialized agriculture and through the marginalization of subsistence farmers. Relying more on smallholder cultivation may be slower at first, but more easily sustained over the long term.

People have acquired, often for the first time in history, both an idea of their relative poverty and a desire to emerge from it and improve the quality of their lives. As people advance materially, and eat and live better, what, were once luxuries tend to be regarded as necessities. The net result is that the demand for food, raw materials, and power increases to an even greater degree than the population. As demand increases, a greater and greater strain is put on the finite area of the world's land to produce the products needed.

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WCED Public Hearing
Moscow, 11 Dec 1986

38. Economic development is unsustainable if it increases vulnerability to crises. A drought may force farmers to slaughter animals needed for sustaining production in future years. A drop in prices may cause farmers or other producers to overexploit natural resources to maintain incomes. But vulnerability can be reduced by using technologies that lower production risks, by choosing institutional options that reduce market fluctuations, and by building up reserves, especially of food and foreign exchange. A development path that combines growth with reduced vulnerability is

more sustainable than one that does not.

39. Yet it is not enough to broaden the range of economic variables taken into account. Sustainability requires views of human needs and well-being that incorporate such non-economic variables as education and health enjoyed for their own sake, clean air and water, and the protection of natural beauty. It must also work to remove disabilities from disadvantaged groups, many of whom live in ecologically vulnerable areas, such as many tribal groups in forests, desert nomads, groups in remote hill areas, and indigenous peoples of the Americas and Australasia.

40. Changing the quality of growth requires changing our approach to development efforts to take account of all of their effects. For instance, a hydropower project should not be seen merely as a way of producing more electricity; its effects upon the local environment and the livelihood of the local community must be included in any balance sheets. Thus the abandonment of a hydro project because it will disturb a rare ecological system could be a measure of progress, not a setback to development.^{/4} Nevertheless, in some cases, sustainability considerations will involve a rejection of activities that are financially attractive in the short run.

41. Economic and social development can and should be mutually reinforcing. Money spent on education and health can raise human productivity. Economic developments can accelerate social development by providing opportunities for underprivileged groups or by spreading education more rapidly.

3. Meeting Essential Human Needs

42. The satisfaction of human needs and aspirations is so obviously an objective of productive activity that it may appear redundant to assert its central role in the concept of sustainable development. All too often poverty is such that people cannot satisfy their needs for survival and well-being even if goods and services are available. At the same time, the demands of those not in poverty may have major environmental consequences.

43. The principal development challenge is to meet the needs and aspirations of an expanding developing world population. The most basic of all needs is for a livelihood: that is, employment. Between 1985 and 2000 the labour force in developing countries will increase by nearly 800 million, and new livelihood opportunities will have to be generated for 60 million persons every year.^{/5} The pace and pattern of economic development have to generate sustainable work opportunities on this scale and at a level of productivity that would enable poor households to meet minimum consumption standards.

44. More food is required not merely to feed more people but to attack undernourishment. For the developing world to eat, person for person, as well as the industrial world by the year 2000, annual increases of 5.0 per cent in calories and 5.8 per cent in proteins are needed in Africa; of 3.4 and 4.0 per cent, respectively, in Latin America; and of 3.5 and 4.5 per cent in Asia.^{/6} Foodgrains and starchy roots are the primary sources of calories, while proteins are obtained primarily from products like milk, meat, fish, pulses, and oil-seeds.

45. Though the focus at present is necessarily on staple foods, the projections given above also highlight the need for a high rate of growth of protein availability. In Africa, the task is particularly challenging given the recent declining per capita food production and the current constraints on growth. In Asia and Latin America, the required growth rates in calorie and protein consumption seem to be more readily attainable. But increased food production should not be based on ecologically unsound production policies and compromise long-term prospects for food security.

46. Energy is another essential human need, one that cannot be universally met unless energy consumption patterns change. The most urgent problem is the requirements of poor Third World households, which depend mainly on fuelwood. By the turn of the century, 3 billion people may live in areas where wood is cut faster than it grows or where fuelwood is extremely scarce.^{/7} Corrective action would both reduce the drudgery of collecting wood over long distances and preserve the ecological base. The minimum requirements for cooking fuel in most developing countries appear to be on the order of 250 kilogrammes of coal equivalent per capita per year. This is a fraction of the household energy consumption in industrial countries.

In the developing world, mostly in the Third World, we realize that the main problem we have is that we do not have employment opportunities, and most of these people who are unemployed move from rural areas and they migrate into the cities and those who remain behind always indulge in processes - for example charcoal burning - and all this leads to deforestation. So maybe the environmental organizations should step in and look for ways to prevent this kind of destruction.

Kennedy Njiro
Student, Kenya Polytechnic
WCED Public Hearing
Nairobi, 23 Sept 1986

47. The linked basic needs of housing, water supply, sanitation, and health care are also environmentally important. Deficiencies in these areas are often visible manifestations of environmental stress. In the Third World, the failure to meet these key needs is one of the major causes of many communicable diseases such as malaria, gastro-intestinal infestations, cholera, and typhoid. Population growth and the drift into cities threaten to make these problems worse. Planners must find ways of relying more on supporting community initiatives and self-help efforts and on effectively using low-cost technologies. See *Chapter 9*.

4. Ensuring a Sustainable Level of Population

48. The sustainability of development is intimately linked to the dynamics of population growth. The issue, however, is not simply one of global population size. A child born in a country where levels of material and energy use are high places a greater burden on the Earth's resources than a child born in a poorer country. A similar argument applies within countries. Nonetheless, sustainable development can be pursued more easily when population size is stabilized at a level consistent with the productive capacity of the ecosystem.

49. In industrial countries, the overall rate of population growth is under 1 per cent, and several countries have reached or are approaching zero population growth. The total population of the industrialized world could increase from its current 1.2 billion to about 1.4 billion in the year 2025.^{/8}

50. The greater part of global population increase will take place in developing countries, where the 1985 population of 3.7 billion may increase to 6.8 billion by 2025.^{/9} The Third World does not have the option of migration to 'new' lands, and the time available for adjustment is much less than industrial countries had. Hence the challenge now is to quickly lower population growth rates, especially in regions such as Africa, where these rates are increasing.

51. Birth rates declined in industrial countries largely because of economic and social development. Rising levels of income and urbanization and the changing role of women

all played important roles. Similar processes are now at work in developing countries. These should be recognized and encouraged. Population policies should be integrated with other economic and social development programmes female education, health care, and the expansion of the livelihood base of the poor. But time is short, and developing countries will also have to promote direct measures to reduce fertility, to avoid going radically beyond the productive potential to support their populations. In fact, increased access to family planning services is itself a form of social development that allows couples, and women in particular, the right to self-determination.

52. Population growth in developing countries will remain unevenly distributed between rural and urban areas. UK projections suggest that by the first decade of the next century, the absolute size of rural populations in most developing countries will start declining. Nearly 90 per cent of the increase in the developing world will take place in urban areas, the population of which is expected to rise from 1.15 billion in 1985 to 3.25 billion in 2025.¹⁰ The increase will be particularly marked in Africa and, to a lesser extent, in Asia.

53. Developing-country cities are growing much faster than the capacity of authorities to cope. Shortages of housing, water, sanitation, and mass transit are widespread. A growing proportion of city-dwellers live in slums and shanty towns, many of them exposed to air and water pollution and to industrial and natural hazards. Further deterioration is likely, given that most urban growth will take place in the largest cities. Thus more manageable cities may be the principal gain from slower rates of population growth.

54. Urbanization is itself part of the development process. The challenge is to manage the process so as to avoid a severe deterioration in the quality of life. Thus the development of smaller urban centres needs to be encouraged to reduce pressures in large cities. Solving the impending urban crisis will require the promotion of self-help housing and urban services by and for the poor, and a more positive approach to the role of the informal sector, supported by sufficient funds for water supply, sanitation, and other services. See *Chapter 9*.

5. Conserving and Enhancing the Resource Base

55. If needs are to be met on a sustainable basis the Earth's natural resource base must be conserved and enhanced. Major changes in policies will be needed to cope with the industrial world's current high levels of consumption, the increases in consumption needed to meet minimum standards in developing countries, and expected population growth. However, the case for the conservation of nature should not rest only with development goals. It is part of our moral obligation to other living beings and future generations.

56. Pressure on resources increases when people lack alternatives. Development policies must widen people's options for earning a sustainable livelihood, particularly for resource-poor households and in areas under ecological stress. In a hilly area, for instance, economic self-interest and ecology can be combined by helping farmers shift from grain to tree crops by providing them with advice, equipment, and marketing assistance. Programmes to protect the incomes of farmers, fishermen, and foresters against short-term price declines may decrease their need to overexploit resources.

57. The conservation of agricultural resources is an urgent task because in many parts of the world cultivation has already been extended to marginal lands, and fishery and forestry resources have been overexploited. These resources must be conserved and enhanced to meet the needs of growing populations. Land use in agriculture and forestry must be based on a scientific assessment of land capacity, and the annual depletion of topsoil, fish stock, or forest resources must not exceed the rate of

regeneration.

58. The pressures on agricultural land from crop and livestock production can be partly relieved by increasing productivity. But short-sighted, short-term improvements in productivity can create different forms of ecological stress, such as the loss of genetic diversity in standing crops, salinization and alkalization of irrigated lands, nitrate pollution of ground-water, and pesticide residues in food. Ecologically more benign alternatives are available. Future increases in productivity, in both developed and developing countries, should be based on the better controlled application of water and agrochemicals, as well as on more extensive use of organic manures and non-chemical means of pest control. These alternatives can be promoted only by an agricultural policy based on ecological realities. (See *Chapter 5*.)

59. In the case of fisheries and tropical forestry, we rely largely on the exploitation of the naturally available stocks. The sustainable yield from these stocks may well fall short of demand. Hence it will be necessary to turn to methods that produce more fish, fuelwood, and forest products under controlled conditions. Substitutes for fuelwood can be promoted.

60. The ultimate limits to global development are perhaps determined by the availability of energy resources and by the biosphere's capacity to absorb the by-products of energy use.^{/11/} These energy limits may be approached far sooner than the limits imposed by other material resources. First, there are the supply problems: the depletion of oil reserves, the high cost and environmental impact of coal mining, and the hazards of nuclear technology. Second, there are emission problems, most notably acid pollution and carbon dioxide build up leading to global warming.

I work with rubber trees in the Amazon. I am here to speak about the tropical forest.

We live from this forest they want to destroy. And we want to take this opportunity of having so many people here gathered with the same objective in mind to defend our habitat, the conservation of forest, of tropical forest.

In my area, we have about 14-16 native products that we extract from the forest, besides all the other activities we have. So I think this must be preserved. Because it is not only with cattle, not only with pasture lands, and not only with highways that we will be able to develop the Amazon.

When they think of falling trees, they always think of building roads and the roads bring destruction under a mask called progress. Let us put this progress where the lands have already been deforested, where it is idle of labour and where we have to find people work, and where we have to make the city grow. But let us leave those who want to live in the forest, who want to keep it as it is.

We have nothing written. I don't have anything that was created in somebody's office. There is no philosophy. It is just the real truth, because this is what our life is.

Jaime Da Silva Araujo
Rubber Tapper Council
WCED Public Hearing
Sao Paulo, 28-29 Oct 1985

61. Some of these problems can be met by increased use of renewable energy sources. But the exploitation of renewable sources such as fuelwood and hydropower also entails ecological problems. Hence sustainability requires a clear focus on conserving and

ecological problems. Hence sustainability requires a clear focus on conserving and efficiently using energy.

62. Industrialized countries must recognize that their energy consumption is polluting the biosphere and eating into scarce fossil fuel supplies. Recent improvements in energy efficiency and a shift towards less energy-intensive sectors have helped limit consumption. But the process must be accelerated to reduce per capita consumption and encourage a shift to non-polluting sources and technologies. The simple duplication in the developing world of industrial countries' energy use patterns is neither feasible nor desirable. Changing these patterns for the better will call for new policies in urban development, industry location, housing design, transportation systems, and the choice of agricultural and industrial technologies.

63. Non-fuel mineral resources appear to pose fewer supply problems. Studies done before 1960 that assumed an exponentially growing demand did not envisage a problem until well into the next century.¹² Since then, world consumption of most metals has remained nearly constant, which suggests that the exhaustion of non-fuel minerals is even more distant. The history of technological developments also suggests that industry can adjust to scarcity through greater efficiency in use, recycling, and substitution. More immediate needs include modifying the pattern of world trade in minerals to allow exporters a higher share in the value added from mineral use, and improving the access of developing countries to mineral supplies, as their demands increase.

Indigenous peoples are the base of what I guess could be called the environmental security system. We are the gate-keepers of success or failure to husband our resources. For many of us, however, the last few centuries have meant a major loss of control over our lands and waters. We are still the first to know about changes in the environment, but we are now the last to be asked or consulted.

We are the first to detect when the forests are being threatened, as they are under the slash and grab economics of this country. And we are the last to be asked about the future of our forests. We are the first to feel the pollution of our waters, as the Ojibway peoples of my own homelands in northern Ontario will attest. And, of course, we are the last to be consulted about how, when, and where developments should take place in order to assure continuing harmony for the seventh generation.

The most we have learned to expect is to be compensated, always too late and too little. We are seldom asked to help avoid the need for compensation by lending our expertise and our consent to development.

Louis Bruyere
President, Native Council of Canada
WCED Public Hearing
Ottawa, 26-27 May 1986

64. The prevention and reduction of air and water pollution will remain a critical task of resource conservation. Air and water quality come under pressure from such activities as fertilizer and pesticide use, urban sewage, fossil fuel burning, the use of certain chemicals, and various other industrial activities. Each of these is expected to increase the pollution load on the biosphere substantially, particularly in developing countries. Cleaning up after the event is an expensive solution. Hence all countries need to anticipate and prevent these pollution problems, by, for instance, enforcing emission standards that reflect likely long-term effects, promoting low-waste technologies, and anticipating the impact of new products, technologies, and wastes.

6. Reorienting Technology and Managing Risk

65. The fulfilment of all these tasks will require the reorientation of technology the key link between humans and nature. First, the capacity for technological innovation needs to be greatly enhanced in developing countries so that they can respond more effectively to the challenges of sustainable development. Second, the orientation of technology development must be changed to pay greater attention to environmental factors.

66. The technologies of industrial countries are not always suited or easily adaptable to the socio-economic and environmental conditions of developing countries. To compound the problem, the bulk of world research and development addresses few of the pressing issues facing these countries, such as arid-land agriculture or the control of tropical diseases. Not enough is being done to adapt recent innovations in materials technology, energy conservation, information technology, and biotechnology to the needs of developing countries. These gaps must be covered by enhancing research, design, development, and extension capabilities in the Third World.

67. In all countries, the processes of generating alternative technologies, upgrading traditional ones, and selecting and adapting imported technologies should be informed by environmental resource concerns. Most technological research by commercial organizations is devoted to product and process innovations that have market value. Technologies are needed that produce 'social goods', such as improved air quality or increased product life, or that resolve problems normally outside the cost calculus of individual enterprises, such as the external costs of pollution or waste disposal.

68. The role of public policy is to ensure, through incentives and disincentives, that commercial organizations find it worthwhile to take fuller account of environmental factors in the technologies they develop. (See *Chapter 6*.) Publicly funded research institutions also need such direction, and the objectives of sustainable development and environmental protection must be built into the mandates of the institutions that work in environmentally sensitive areas.

69. The development of environmentally appropriate technologies is closely related to questions of risk management. Such systems as nuclear reactors, electric and other utility distribution networks, communication systems, and mass transportation are vulnerable if stressed beyond a certain point. The fact that they are connected through networks tends to make them immune to small disturbances but more vulnerable to unexpected disruptions that exceed a finite threshold. Applying sophisticated analyses of vulnerabilities and past failures to technology design, manufacturing standards, and contingency plans in operations can make the consequences of a failure or accident much less catastrophic.

70. The best vulnerability and risk analysis has not been applied consistently across technologies or systems. A major purpose of large system design should be to make the consequences of failure or sabotage less serious. There is thus a need for new techniques and technologies - as well as legal and institutional mechanisms - for safety design and control, accident prevention, contingency planning, damage mitigation, and provision of relief.

71. Environmental risks arising from technological and developmental decisions impinge on individuals and areas that have little or no influence on those decisions. Their interests must be taken into account. National and international institutional mechanisms are needed to assess potential impacts of new technologies before they are widely used, in order to ensure that their production, use, and disposal do not overstress environmental resources. Similar arrangements are required for major interventions in natural systems, such as river diversion or forest clearance. In addition, liability for damages from unintended consequences must be strengthened

addition, liability for damages from unintended consequences must be strengthened and enforced.

7. Merging Environment and Economics in Decision Making

72. The common theme throughout this strategy for sustainable development is the need to integrate economic and ecological considerations in decision making. They are, after all, integrated in the workings of the real world. This will require a change in attitudes and objectives and in institutional arrangements at every level.

73. Economic and ecological concerns are not necessarily in opposition. For example, policies that conserve the quality of agricultural land and protect forests improve the long-term prospects for agricultural development. An increase in the efficiency of energy and material use serves ecological purposes but can also reduce costs. But the compatibility of environmental and economic objectives is often lost in the pursuit of individual or group gains, with little regard for the impacts on others, with a blind faith in science's ability to find solutions, and in ignorance of the distant consequences of today's decisions. Institutional rigidities add to this myopia.

74. One important rigidity is the tendency to deal with one industry or sector in isolation, failing to recognize the importance of intersectoral linkages. Modern agriculture uses substantial amounts of commercially produced energy and large quantities of industrial products. At the same time, the more traditional connection - in which agriculture is a source of raw materials for industry - is being diluted by the widening use of synthetics. The energy-industry connection is also changing, with a strong tendency towards a decline in the energy intensity of industrial production in industrial countries. In the Third World, however, the gradual shift of the industrial base towards the basic material producing sectors is leading to an increase in the energy intensity of industrial production.

75. These inter sectoral connections create patterns of economic and ecological interdependence rarely reflected in the ways in which policy is made. Sectoral organizations tend to pursue sectoral objectives and to treat their impacts on other sectors as side effects, taken into account only if compelled to do so. Hence impacts on forests rarely worry those involved in guiding public policy or business activities in the fields of energy, industrial development, crop husbandry, or foreign trade. Many of the environment and development problems that confront us have their roots in this sectoral fragmentation of responsibility. Sustainable development requires that such fragmentation be overcome.

The issues that have been brought forward here, I think, are wide-ranging and maybe you know, maybe you don't know, the answers to all those issues. But at least by hearing all those questions, stories, all these expressions that have been put forward, at least you could have some idea.

You don't know the answers nor the solutions, but you could suggest the way to solve many problems and this is by suggesting either to governments, or the UN, or international agencies, to solve any problem the best way: that is to include those with direct interests in it. The beneficiaries, as well as the victims of any development issue should be included, should be heard.

I think that is the one thing, maybe that all of us are hearing here, or expecting: that in every development planning or development issue as much as possible to listen and to include, to consult the people concerned. If that is taken care of, at least one step of the problem is resolved.

Ismid Hadad
Chief Editor, Prisma
WCED Public Hearing
Jakarta, 26 March 1985

76. Sustainability requires the enforcement of wider responsibilities for the impacts of decisions. This requires changes in the legal and institutional frameworks that will enforce the common interest. Some necessary changes in the legal framework start from the proposition that an environment adequate for health and well-being is essential for all human beings including future generations. Such a view places the right to use public and private resources in its proper social context and provides a goal for more specific measures.

77. The law alone cannot enforce the common interest. It principally needs community knowledge and support, which entails greater public participation in the decisions that affect the environment. This is best secured by decentralizing the management of resources upon which local communities depend, and giving these communities an effective say over the use of these resources. It will also require promoting citizens' initiatives, empowering people's organizations, and strengthening local democracy./13

78. Some large-scale projects, however, require participation on a different basis. Public inquiries and hearings on the development and environment impacts can help greatly in drawing attention to different points of view. Free access to relevant information and the availability of alternative sources of technical expertise can provide an informed basis for public discussion. When the environmental impact of a proposed project is particularly high, public scrutiny of the case should be mandatory and, wherever feasible, the decision should be subject to prior public approval, perhaps by referendum.

It has not been too difficult to push the environment lobby of the North and the development lobby of the South together. And there is now in fact a blurring of the distinction between the two, so they are coming to have a common consensus around the theme of sustainable development.

The building blocks are there. Environmental concern is common to both sides. Humanitarian concern is common to both sides. The difference lies in the methods of each and the degree to which each side tries to achieve its own economic interest through the development assistance process.

The time is right for bridging this gap for some very pragmatic political reasons. First of all, the people of the North do not want to see their taxes wasted. Secondly, they do not want to see growing poverty, and they obviously care for the environment, be it the environment of the North, where they live, or of the South. And the majority of people in the South do not want short-term overpass solutions.

In effect, there is a political community of interest, North and South, in the concept of sustainable development that you can build upon.

Richard Sandbrook
International Institute for Environment and Development
WCED Public Hearing
Oslo, 24-25 June 1985

79. Changes are also required in the attitudes and procedures of both public and private-sector enterprises. Moreover, environmental regulation must move beyond the usual menu of safety regulations, zoning laws, and pollution control enactments; environmental objectives must be built into taxation, prior approval procedures for investment and technology choice, foreign trade incentives, and all components of development policy.

80. The integration of economic and ecological factors into the law and into decision making systems within countries has to be matched at the international level. The growth in fuel and material use dictates that direct physical linkages between ecosystems of different countries will increase. Economic interactions through trade, finance, investment, and travel will also grow and heighten economic and ecological interdependence. Hence in the future, even more so than now, sustainable development requires the unification of economics and ecology in international relations, as discussed in the next chapter.

IV. Conclusion

81. In its broadest sense, the strategy for sustainable development aims to promote harmony among human beings and between humanity and nature. In the specific context of the development and environment crises of the 1980s, which current national and international political and economic institutions have not and perhaps cannot overcome, the pursuit of sustainable development requires:

- a political system that secures effective citizen participation in decision making.
- an economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis
- a social system that provides for solutions for the tensions arising from disharmonious development.
- a production system that respects the obligation to preserve the ecological base for development,
- a technological system that can search continuously for new solutions,
- an international system that fosters sustainable patterns of trade and finance, and
- an administrative system that is flexible and has the capacity for self-correction.

82. These requirements are more in the nature of goals that should underlie national and international action on development. What matters is the sincerity with which these goals are pursued and the effectiveness with which departures from them are corrected

Footnotes

1/ UNCTAD, **Handbook of International Trade and Development Statistics 1985** Supplement (New York: 1985).

2/ Ibid.

3/ Department of International Economic and Social Affairs (DIESA), **Doubling Development Finance, Meeting a Global Challenge. Views and Recommendations of the Committee for Development Planning** (New York: UN, 1986).

4/ One example of such a decision to forgo a developmental benefit in the interest of

conservation is provided by the dropping of the Silent Valley Hydro project in India.

5/ Based on data from World Bank, **World Development Report 1984** (New York: Oxford University Press, 1984).

6/ Based on per capita consumption data from FAO, **Production Yearbook 1984** (Rome: 1985) and population projections from DIESA, **World Population Prospects: Estimates and Projections as Assessed in 1984** (New York: UN, 1986).

7/ FAO, **Fuelwood Supplies in the Developing Countries**, Forestry Paper No. 42 (Rome: 1983).

8/ DIESA, **World Population Prospects**, op. cit.

9/ Ibid.

10/ Ibid.

11/ W. Hafele and W. Sassin, 'Resources and Endowments, An Outline of Future Energy Systems', in P.W. Hemily and M.N. Ozdas (eds.), **Science and Future Choice** (Oxford: Clarendon Press, 1979).

12/ See, for example, OECD, **Interfutures: Facing the Future** (Paris: 1979) and Council on Environmental Quality and U.S. Department of State, **The Global 2000 Report to the President: Entering the Twenty-First Century, The Technical Report, Vol. Two** (Washington, DC: U.S. Government Printing Office, 1980).

13/ See 'For Municipal initiative and Citizen Power', in INDERENA, **La Campana Verde y los Concejos Verdes** (Bogota, Colombia: 1985).