

Development, Environment, and Health *

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Introduction

From history treatises we learn that the effects of social and environmental factors on human health were recognized from the most ancient times.

When primitive humans came together in bands, they did so seeking the advantages of cooperation and division of labor for protecting their members, obtaining food, etc. In seeking out caves, and, with time, improving their dwellings, they tried to protect themselves from the threats of climate, predators, and other humans as well.

In modern times, the relationships among society, the physical environment, and health have become enormously complex and assumed a vertiginous dynamic. The word *environment*, for example, can have multiple connotations. In common usage, it refers to the *physical or "natural" environment*, which contains human beings and all other living things. However, the concept of environment can also be expanded to include other dimensions, sociocultural, political, economic, etc., that are as important for health as the physical environment.

In reality, the "naturalization" of the concept of environment carries with it multiple contradictions, since nature itself is "constructed" by the action of living things, and, in particular, by human beings, through their activities in the economic, political, and social fields. In fact, the economic and social development process has repercussions for the relationships among ecosystems. Human beings, as part of those ecosystems, undergo experience changes in their morbidity and mortality profiles.

In the past 30 years in particular, the world has begun to examine the issue of development and the environment more closely and with real concern. Some of the positive historical landmarks in this process are shown in Table 1.

In addition to the significant political events mentioned, which led to dozens of declarations and agreements, thousands of articles were written and dozens of reports issued by international agencies and NGOs, focusing on different aspects of development, environment, and health, some of them linking these three dimensions and others elaborating specifically on only one or two of them (UN/WCED, 1987; OMS, 1992; UN, 1992; World Bank, 1992; FNUAP, 2001; PNUD, 2001; UNCHS, 1996; UNEP, 2001).

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Unfortunately, however, we can also report some of the countless negative landmarks of the past 30 years:

- More than 45 major industrial accidents recorded, with more than 50 deaths or more than 100 people injured or contaminated, the majority of them in developing countries (WHO, 1997)
- Chemical accident in Bhopal (India), with more than 2800 deaths from methyl isocyanate, in 1984
- Nuclear accident in Chernobyl (Russia), in 1986, with repercussions for human health that are still being felt
- Chemical accident on the Rhine River (Germany), with enormous damage to wildlife and the environment
- Continued nuclear testing in the Pacific Ocean, critically contaminating the marine environment of the region
- Existence of ballistic missiles capable of destroying the planet several times over
- Constant wars in various parts of the world, with the loss of thousands of human lives and permanent environmental damage

While these were particularly important episodes that received special attention from society and the media, we should also mention the continuing environmental threats, stemming generally from the prevailing model of development in most of our societies. These threats, shown in Table 2, are often imperceptible, but present every day.

In this review it will not be possible to cover the specific health impact health of each of the environmental threats produced by the eco-aggressive development model that has been established, in various forms, in the industrialized economies of the world, as well as developing countries and regions. The topics below were selected because of their importance in terms of the scale of damage and/or because of the existence of particularly clear evidence about their association with health conditions.

Globalization and Development

It is impossible to speak of development, and relate it to the environment and health, without speaking of the complex phenomenon known as globalization. As a dominant economic model, it began more than 10 years ago with the fall of the Berlin Wall and the dismantling of the Soviet Union. Since then, globalization has entrenched itself as the almost universal pattern of organization for societies and economies, promising rapid growth and prosperity for developing countries that abide by certain rules, such as open markets, the search for economic stability, management of foreign debt, the building up of domestic savings, etc.

Ten years afterward, with rare exceptions, the results have been frustrating for the majority of developing countries, according to many analysts and the international agencies that themselves developed and promoted the process. According to Columbia University professor Joseph Stiglitz, former

chief economist at the World Bank, the real winners in globalization are the developed countries. Their domestic savings and technological preparedness, combined with a fierce protectionism that contradicts the golden rule of open trade proclaimed for others, has made them the privileged recipients of the wealth produced by the world.

The economic austerity and open markets imposed on the developing countries by the major financial institutions, such as the World Bank itself and the IMF, did not lead to the promised growth in these countries but raised unemployment to brutal levels and spectacularly increased their technology gap with respect to the developed countries, in industry, agriculture, and other productive sectors.

In reality, in order to save jobs in rich countries with significant protection mechanisms for workers who lose their jobs, unemployment was exported through subsidies and protectionist barriers to countries without any social safety net for the unemployed. Greater labor flexibility, imbedded in the acceptance of globalization, brings with it less job security, less job stability, and lower compensation and alters the work order to the disadvantage of workers. The result of this entire process has been the exponential growth of poverty and social exclusion.

The unemployment in poor countries resulting from globalization is unequivocally a source of disease and poorer living conditions for individuals, families, and entire societies. Worsening nutritional status and a deterioration in mental health, in addition to greater difficulties in obtaining medical care, drugs, and other essential goods, are among the immediate consequences of unemployment and worsening living conditions.

Another phenomenon that accompanies globalization in the financial field is the speculative attacks of volatile transnational capital (so-called *hot money*) on the currencies of developing countries, pulverizing the purchasing power of these currencies. The collapse of local currencies makes it enormously difficult for poor countries to obtain essential goods such as food, drugs, and vaccines, on the international market. In the particular case of vaccines, the WHO/CVI reported that national budgets have shrunk in economic crises, attributable in large part to speculative attacks, and cuts in vaccine purchases are inevitable, leading to the interruption of basic immunization programs (WHO/CVI, 1998). This same organization estimates that approximately 4 million children around the world die each year from infections preventable by vaccines that exist but are unavailable to them because of the aforementioned problems linked with economic globalization.

Foreign and domestic debt, trade barriers, and the industrial and agricultural protectionism of the richest countries against the primary and manufactured goods in the export basket of the developing countries are at the root of the tremendous fiscal crisis facing these countries and their growing social debt to their people. See, just as a recent example for the Region of the Americas, the Farm Bill--a protectionist law for American agriculture--which will provide more than US\$ 180 billion in agricultural subsidies over the next 10

years, while tariffs on agricultural products from the Latin American countries grow--products that these countries depend on to provide balance of payments equilibrium, stimulate their economies, and support social programs.

The World Bank estimates that agricultural subsidies in the developed countries currently come to the fabulous sum of US\$ 1 billion *a day* and that developing countries--desperately dependent on agricultural exports--would benefit by their elimination by at least US\$1.5 billion *a year* (UN, 2001).

Faced with this powerful protectionism, particularly in the agricultural sector, poor countries end up exhausting their natural resources for export, leading to the maintenance of a vicious circle marked by the destruction of the natural environment and the exacerbation of poverty.

National and local governments of the majority of developing countries are experiencing significant fiscal crises, leaving them with few resources for investment in economic recovery and for overcoming or at least alleviating the extreme poverty and social exclusion of urban and rural populations. Almost all the fiscal revenue of these countries and successive international loans, obtained only through agreements with the IMF under harsh conditions, serves almost exclusively for rolling over the large external debt contracted in the past, under adverse conditions and often under undemocratic and corrupt governments. These debts are now subject to punitive interest rates, imposed unilaterally by international financial capital.

Notwithstanding, some noteworthy achievements in international relations have occurred in the field of health, thanks to the perseverance of some developing countries, such as Brazil. At the World Trade Organization (WTO) meeting in Doha, Qatar, in November 2001, these countries elicited a commitment by all the nations of the world to greater flexibility in the TRIPS (Trade-Related International Property Rights) Agreement, guaranteeing the right of individuals to drugs that are essential to life and the sovereignty of countries to negotiate prices or break patents on these drugs in the case of public health needs².

Lending additional legitimacy to this international commitment, in May 2002 the U.S. Senate approved an amendment to the Trade Promotion Authority Act, stating that any new trade agreement signed by the United States should respect the Doha Declaration on TRIPS and Public Health.

Regarding the question of environment and development, the situation has been quite different. During the last week of May 2002, at the meeting of the preparatory committee for the World Summit on Sustainable Development

² The Declaration affirms that "each Member has the right to grant compulsory licenses and the freedom to determine the grounds upon which such licenses are granted" as well as "has the right to determine what constitutes a national emergency or other circumstances of extreme urgency, it being understood that public health crises, including those relating to HIV/AIDS, tuberculosis, malaria and other epidemics, can represent a national emergency or other circumstances of extreme urgency". And it concludes, affirming "the commitment of developed-country Members to provide incentives to their enterprises and institutions to promote and encourage technology transfer to least-developed country".

in Johannesburg, UN Secretary-General Kofi Annan, declared in Bali that little progress had been made in environmental protection and sustainable development since Rio 92, because the industrialized nations have not been implementing the international agreements they signed at the Rio Conference. He illustrated the point with the industrialized countries' failure to meet the commitment they made at the 1992 Rio Conference: instead of doubling the 0.4% of GDP for external aid linked to the solution of environmental problems, they have cut it by half over the past 10 years.

Despite the fact that world wealth—currently estimated at US\$ 24 trillion a year—continues to increase, some 1.2 billion people around the world are living on less than US\$ 1 a day, in a situation classified as “extreme poverty”, while no less than half the world’s population is living on less than US\$ 2 a day (World Bank, 2000).

This global pattern, absurdly unequal in economic and social terms, is at the root of the most serious environmental and health problems affecting the poor sector of today’s globalized world.

The health of an enormous proportion of the 4.4 billion people in developing countries is profoundly affected by environmental issues: about 60% lack basic sanitation, practically one-third have no access to safe water, and one-quarter lack adequate housing. In addition, 20% do not have access to basic health services, 20% of children do not complete school through the fifth year, and more than 8% of children die before the age of 5 (FNUAP, 2001).

On top of the adverse economic results mentioned above, the international division of production and labor created by globalization also had significant social, environmental, and health impacts, above all from the export of economic activities that entail greater environmental risks for workers or produce hazardous waste. Less restrictive legislation to protect the environment and workers in poor countries encouraged these harmful practices by transnational companies around the world. In the case of the export of hazardous waste, the Basel Convention sought to suppress such practices, without the hoped-for results.

It is clear that we must blame these negative social and economic results not only on the developed countries and international financial institutions, but also on the political and economic elites in the countries and on (frequently corrupt) governments with low levels of social commitment.

Indeed, the poor quality of the politics and “governance” of many governments in developing countries has led to the waste of resources and the inefficacy and inefficiency of initiatives for environmental protection, health promotion, and disease prevention and treatment, when they exist. As a rule, social, environmental, and health programs are sectoral, vertical, and unintegrated; overall, the results are poor. Mobilization of NGOs and society in general to deal with problems—practice that generally improves the results of social, health, and environment programs—is neglected, when it is not rejected.

The impact of this global situation on the Region of the Americas shows that countries have different economic development processes, as well as significant social and cultural contrasts (Schaffer, 1994). At one extreme are the most developed countries, the United States and Canada, with models of development based on economies of scale, directed principally to the consumer and depending on the production of products, goods, and services; at the other extreme are found the least developed countries, with agricultural economies depending, in large part, on the exploitation of natural resources.

Both economic models have potentially serious repercussions for the environment: the first, from high consumption patterns that require large quantities of energy and principally affect air quality, and the others from the contamination of water resources, soil exhaustion, and the exploitation of nonrenewable natural resources.

Environmentally Unsustainable Consumption

More people today are using more natural resources more intensively than at any other time in history. The growing pressure on the environment is the consequence, on one hand, of greater wealth— or rather, more consumption, more pollution, and more waste— and, on the other hand, of persistent poverty— that is, lack of resources and the technologies to make use of them and lack of capacity to change these circumstances.

According to a recent report of the WWF (World Wildlife Fund) (WWF *apud* Porrit, 2002), by 2050 we would need no less than two earths to maintain humanity at its current lifestyle.

Wealth consumes energy and produces waste at a much higher rate than poverty does. We learn to extract resources to make use of them, but we don't learn how to handle the waste generated: carbon dioxide emissions, for example, grew by 12 times worldwide between 1900 and 2000, and by no less than 100 times in the industrialized economies.

The richest countries, where only 20% of the world's population lives, are responsible for no less than 86% of total spending on private consumption, while the poorest 20% of the world's population accounts for only 1.3% of this spending. A child born today in an industrialized country will contribute more to increasing consumption and pollution during his or her lifetime than 30 to 50 children born in developing countries. While the effects of poverty also contribute to the destruction of the environment, in reality the poor find themselves at the end of a long chain of causes and effects (FNUAP, 2001).

Many solutions provided by scientific advances already exist. Increasing the role of renewable energy sources (solar, wind, and biomass) in world energy use, for example, would help to reduce emissions of gases from the burning of fossil fuels. These emissions, which pollute the air and produce the greenhouse effect and global warming, are definite sources of health problems and the lack of environmental sustainability.

Population Dynamics

There is a passionate debate about the effects of population growth on the environment. Nevertheless, to examine population dynamics and its effects on the environment in isolation is to ignore the relationships among the real determinants factors, which are inequalities in the distribution of wealth, consumption patterns, and the mastery of technologies, as well as population dynamics.

It is true that the size, speed of growth, and distribution of population help to determine the relationship between people and the environment in which they live. Although an increase in population does not necessarily imply an increase in damage to the environment, just as slower population growth is no guarantee of greater protection for the environment, the combination of poverty and rapid population growth is indeed a lethal one.

The same number of people can have a very different impact on the environment, depending on social institutions, means of production, laws regulating production, and forms of *governance*. Thirty years ago, Ehrlich and Holdren (1971) described this relationship in the well-known equation $I = PAT$, which means that the impact of people on the environment (I) is a product of the size of the population (P), wealth, or affluence (A, representing *per capita* production or consumption level) and technology (T, representing unit production or income).

Below are some current data and estimates on expected global population dynamics, which suggest a possible decrease in pressure on the environment in the future, at least with respect to population growth, if adequate measures are found for the other components of the equation.

The earth's population has doubled since 1960, reaching about 6.1 billion people in 2001, growth that took place principally in the poorest countries on the planet. World population is growing at an annual rate of 1.2%, or about 77 million people each year. If this rate continues, the planet will have about 8 billion people in 2025 and 9.3 billion in 2050. In the poorest countries, if the current growth rate continues, the population will triple, going from 668 million today to about 1.86 billion in 2050 (FNUAP, 2001).

Fertility is falling worldwide and in all world regions. Nevertheless, it is much higher in poor countries and among poor people within these countries. One positive aspect is that fertility has fallen to a little less than three children per woman of child-bearing age in the developing countries; that is, about half the rate in 1970. This trend is projected to continue, with the expectation that the rate will reach about 2.17 children per women by about 2050 (FNUAP, 2001). In other words, it will have reached the replacement level³.

³ The fertility replacement rate is the rate necessary only to ensure the stability of the population over the long term; replacement is assured, in most populations, by a fertility rate of 2.1 children per woman of child-bearing age.

Global life expectancy is growing for a number of reasons, including a reduction in infant mortality. From a world mean of 46 years in 1950, it grew to 66 years in the year 2000 and— except in the zones most affected by HIV/AIDS — people are healthier throughout their life cycle than at any other period in history.

For both of the indicators mentioned above, however, the disparity between rich and poor countries is striking. The number of older adults (people over 60) is also growing. According to estimates, it will triple in the next five decades, jumping from roughly 600 million to over 2 billion. Nevertheless, the AIDS epidemic, particularly in Africa, could change this entire picture in the coming years.

Water and Water Resources

A shortage of water for human consumption will likely be the principal environmental problem of the new millennium. The planet has approximately 1.4 billion km³ of water, but 97% of it is saltwater; only 3% is freshwater. Of this 3%, 77% is found as ice, in the polar regions, 22% is underground water, and only 1% is in rivers and lakes.

Thus, it is estimated that the amount of freshwater available for consumption only comes to 40,700 km³/year. Since about two-thirds of this volume drains into the oceans from rivers, the actual availability is 14,000 km³ a year or 2,300 m³/person/year. The minimum quantity of potable water required is 50 liters per person per day, that is, 18 m³/person/year (WHO, 1997). Of the water consumed in the world, 70% is for irrigation and for cattle, 20% for industry, and 10% for homes.

Brazil is the country with the greatest availability of freshwater per person among all the countries of the world, although its distribution is very unequal: abundant in the North and Center West, for example, it is painfully scarce in the Northeast Region, as all we know, with devastating consequences for the quality of life and health.

Between 1900 and 1990, world demand for water grew sixfold. This is two times more than population growth, as a result of factors such as urbanization and the intensive use of water in industrial and agricultural activities. About 1.75 billion people on the planet already face severe water shortages, and by 2025, an estimated 3.3 billion people will not have water for irrigation. The most affected areas are Africa, Central Asia, and the Middle East. If current consumption patterns are not changed through adequate water resource management and usage policies, the demand will continue to grow unsustainably (FAO, *apud* WHO, 1997).

In recent decades, increasing scarcity has stimulated the use of aquifers--extensive underground water reserves that represent 97% of the world's freshwater--for consumption and irrigation, above their capacity for replenishment by rainwater. Experts calculate that, each year, 160 billion m³ of water are removed from these reserves-- the equivalent to 80 times Guanabara

Bay—and many of them are already beginning to exhibit the effects of excessive consumption.

World resources of potable water are threatened not only by the unsustainable exploitation of surface and groundwater and by poor management of these resources, but also by pollution with domestic waste (sewage), industrial waste (diverse substances, such as heavy metals and POPs), and agricultural waste (herbicides and pesticides) that are discharged without treatment into lakes and rivers. This contamination particularly compromises the already small fraction of fresh water that is actually available for human consumption, as mentioned above.

Drinking contaminated water or using it in irrigation for crops, in personal hygiene, and in the kitchen seriously threatens human health. Among the problems caused by the shortage of water or its contamination is the spread of diseases, such as intestinal parasites, diarrhea, hepatitis, schistosomiasis, cholera, and typhoid fever, which kill than 5 million people per year.

The Second World Water Forum, which took place in March 2000, issued the Declaration of The Hague on Water Security in the 21st Century. According to the document, seven challenges must be overcome to ensure that water is available in a sustainable form: meeting basic needs; securing the food supply; protecting ecosystems; managing risks; valuing water; sharing water resources; and governing water wisely.

Urban Development: Population Concentration, Production, Consumption, and Pollution

Increasing urbanization poses enormous challenges, with catastrophic effects on the environment and health. Every day, about 160,000 people leave the countryside for the cities. Today, almost half the inhabitants of the planet live in urban areas. The majority of cities in the developing countries suffer from a lack of adequate water, sewerage, and refuse services and thousands of totally unhealthy dwellings.

Given the high concentration of people and productive activities and their high levels of consumption, cities produce considerable volumes of waste and pollution of both domestic and industrial origin. Urban growth also implies greater dependence on transportation systems, leading to air pollution from the burning of fossil fuels, as well as the risk of accidents.

Demand for public services in the areas of health, education, water supply, sewage treatment, refuse collection, etc. is growing geometrically with the increase in urban populations. In deep fiscal crisis, caused by external debt, trade barriers, and protectionism on the part of rich nations, as mentioned earlier, national states and local governments do not have the available resources to deal with the complex exponential growth of cities.

Some 30% to 60% of the urban population in lower-income countries lives in housing of the worst order—that is, without drinking water, waste

treatment, or garbage collection, with overcrowding and other unhealthy conditions (UNCHS, 1996).

The complex issue of water—already explored above in its dimension as a natural resource— also has an important dimension for human consumption, particularly in cities. According to a recent PAHO study on Latin America and the Caribbean (2001), about 130 million of the Region's 497 million inhabitants lack drinking water services in their residences; to this should be added a significant number for whom service is deficient in terms of access, continuity, and quality.

With respect to sewage treatment, the situation is even more worrisome, since 255 million lack sewerage connections and only 86 million make use of sanitation systems with adequate waste disposal. Only 13.7% of the wastewater from the 241 million people with residences linked to sewerage systems receives treatment. This means that the waste from 208 million people flows untreated into bodies of water on the receiving end (OPS, 2001).

With the growing contamination of water resources noted earlier in this article, the cost of treating water supplies continues to rise. Local and national governments do not have sufficient resources or do not prioritize investments in basic sanitation. Thus, progress in terms of coverage and the quality of water supply and sanitation systems fall far short of what is needed. The impact on the environment and health are visible, with the persistence of high levels of intestinal parasites, diarrhea, hepatitis, and other diseases spread by untreated water.

World refuse production has reached astounding levels. The United States alone generates about 200 million tons a year, with an average of 725 kg per person. Proliferation of disease vectors that affect human beings and the contamination of waterways are among the principal consequences of this situation. Waste from health services themselves poses a potential danger, because in poor countries it is frequently disposed of in the same places as ordinary refuse.

The recycling of trash is a promising development in various cities of our Hemisphere, even creating an income-generating activity for marginalized groups, which have come together in cooperatives and make an enormous contribution to reducing the volume of trash to be handled and the waste of raw materials and energy for its processing.

Industrial waste and the work environment in general make concentrated production in cities a significant risk factor for workers and the population in general. Weak environmental protection laws in poor countries and nonexistent or lax enforcement permit water, soil, and air pollution from waste known to be harmful and many others of unknown effect, discharged by industrial plants that fail to comply with relevant environmental regulations. In addition to this persistent daily flow, accidents involving these products happen with great frequency, increasing contamination or leading to deaths and injuries.

Among the many existing examples of contaminants stemming from industrial activities are persistent organic pollutants (POPs), such as DDT, PCDDs, and PCDFs, whose environmental concentrations have significantly increased in several countries of the Region. Although there is a need for more in-depth systematic studies, it is a very reasonable hypothesis that chemical compounds that enter the environment through industry and agriculture can have adverse effects on human health through the deregulation of endocrine production (CSP, 2002). In this, as in other cases, it is prudent to invoke the principle of environmental and health precaution, proposing that potentially dangerous waste be forbidden until their links with the environment and health are fully investigated.

The production and work environment itself frequently lacks the minimum safety conditions for workers, making accidents involving machinery, as well as chemical and biological poisoning an unfortunately common event in the industrial environments of Third World cities.

Atmospheric pollution has grown substantially in almost all the industrial cities of Latin America and the Caribbean. A large part of the particulate matter and gaseous emissions come from the intense urban traffic, energy production, and from dispersion of industrial pollutants, associated with adverse climatic conditions. The most common particulate matter that impacts health are lead, arsenic, nickel, cadmium, and the smoke derived from burning fossil fuels. Among the inorganic gaseous compounds are sulfur dioxide, carbon monoxide and nitrogen dioxide, as well as hydrocarbons, other volatile organic compounds, and secondary contaminants. The rising incidence of respiratory illnesses, such as asthma and bronchitis, and even of some heart conditions, is related to atmospheric pollution (WHO, 1997).

In an unequivocal link between poverty, the environment, and health, it has been shown that bad air quality in the dwellings of poor people who use biomass and coal for heating or cooking causes serious health problems. The contaminants from this combustion are as high as 100 times the environmental level considered tolerable for human beings by WHO. Women and children are the most affected. To gauge the scale of the problem, it is enough to mention that about 2 million of the approximately 3 million deaths a year worldwide linked to air pollution are from indoor exposure and 200,000 from outdoor exposure (WHO, 1997).

Table 3 shows the types of emissions for air, water, and soil from selected industrial sectors, whose activities have regular and significant impact on the environment and, potentially, on health (WHO, 1997).

The “New” Model of Rural Development: Incomplete Modernization and the Urbanization of Endemic Diseases

Economic and population growth heightens demand for wood and coal and adds to the pressure to transform forested regions into agricultural areas. Deforestation has already eliminated almost half of the world’s plant coverage:

out of a total of 62.2 million km², only 33.4 million remain. Deforestation continues at an average rate of 14.6 million hectares per year.

Forests are the ecosystem that is the richest in plant and animal species, and their destruction constitutes a serious risk for biodiversity. Moreover, it is well-known that forests act as "filters", absorbing carbon compounds and somewhat reducing the gases that produce the greenhouse effect.

Between 1960 and 1990, one fifth of the world's rainforests were destroyed, principally in Asia and Latin America; in the last decade, Brazil was the country with the largest area deforested, losing more than 22,000 km² a year on average.

Deforestation serves to create new frontiers for agriculture and extraction industries and attracts migrants in search of jobs and opportunities that do not exist in their places of origin. These human populations, generally unprotected by public health and sanitation services, are then exposed to a new habitat, where they encounter predators, as well as microorganisms and disease vectors to which they have no immunity. The results are usually catastrophic, as in the Brazilian Amazon, with the expansion of agriculture and gold panning. During this period of expansion, for example, malaria cases increased fivefold, cutaneous leishmaniasis, fourfold, and countless hemorrhagic arboviruses claimed hundreds of victims.

In addition, the waste produced by the obsolete technologies used in panning gold, such as mercury, irremediably contaminated the fish and other links in the food chain of the great rivers of the Amazon region, thus affecting the populations living along them.

New urban areas are built in this process, virtually without adequate infrastructure or essential services, creating health problems such as diarrhea, viral hepatitis, and, as a result of new habits, the spread of AIDS and other sexually transmitted diseases. Many indigenous communities in these regions are affected by this process and run a high risk of contamination by the microorganisms carried by migrant populations, in addition to the commonly experienced total subversion of their long-standing cultural traditions.

In a deadly synergy, the same migratory flow that took populations to the new extractive and agricultural frontiers of the North and Northwest of Brazil reintroduced the *Aedes aegypti* mosquito into Brazilian cities in the mid-1908s. This mosquito is the vector of dengue and urban yellow fever, which were eradicated from the country in the 1950s. It adapted itself perfectly to the new urban environment, rich in the refuse produced by the prevailing contemporary consumption pattern (i.e., bottles, cans, plastics, and tires) and new settlement patterns (shantytowns), and urban architecture (precarious dwellings that permit the accumulation of water and serve as breeding sites for mosquitoes). The result has also been catastrophic: urban epidemics of dengue, which have produced more than 2 million recorded cases in the past 15 years, with hundreds of deaths. There is now the risk that the yellow fever virus will be reintroduced in the cities, since it is propagated by the same mosquito.

Another phenomenon associated with deforestation is the urbanization of visceral and cutaneous leishmaniasis, which once were essentially rural diseases. With the felling of forests, the availability of wildlife as food sources for the mosquito vector decreases, making dogs and people the next most accessible alternatives--this in addition to the migratory process that brings human and canine populations from endemic rural zones into urban fringe areas .

The intensive use of pesticides and fertilizers, aimed at increasing agricultural productivity, has led to significant contamination of soil and water. This puts rural populations at risk of increased exposure to these substances, many of them carcinogenic, leading to miscarriages or to toxic effects on blood or neurological functions. Serious accidents have also been frequently reported. Estimates from the U.S. EPA indicate that about 1% of community water supply systems contain unsafe concentrations of pesticides. In addition, the application of these products to grains, vegetables, and fruits tremendously increases the number of people at risk of contamination by these substances.

The principal risks for health and environment from agricultural activity are listed in Table 4 (WHO, 1977).

This "new" model of agricultural development also leads to soil exhaustion and dangerous desertification. One-quarter of the earth's surface, or about 3.6 billion hectares, is threatened by this phenomenon, which is responsible for the loss of economic and biological productivity of the soil. Desertification affects about 1.2 billion human beings and has already caused the exodus of more than 135 million people. Worldwide, deserts are growing at an average rate of 60,000 square kilometers a year. In Africa, 32 million people are victims of this phenomenon, which also profoundly affects about 27% of the territory of China. Other affected areas are western South America, northeastern Brazil, the Middle East, Australia, and the southwest of the United States.

Ten Years Later: the World Summit on Sustainable Development in Johannesburg

Meeting in Rio de Janeiro in October 2001, in preparation for the subregion's participation at the 2002 conference in Johannesburg, official representatives of all the Latin American and Caribbean countries concluded that, nine years after Rio 92, the conditions for sustainable development were no better than those that existed in 1992, since poverty had increased in the Region, development needs were more pressing, and the environment had deteriorated even further (Earth Negotiations Bulletin, 2001).

We recall that Rio 92 adopted a broad and inclusive plan of action, Agenda 21 (UN, 1993), covering areas as diverse as social and economic dimensions of the environmental crisis (including combating poverty, changing consumption patterns and, in the demographic dimension, promotion of human health, and international cooperation) and the conservation and management of natural resources for development (water resources, climate, forests, oceans, biodiversity, etc.). In this field, many significant agreements resulted, such as the conventions on forests, biodiversity, desertification, and climate, as well as the Earth Charter.

It is sad to note that the major decisions of Rio 92 have not been implemented and that the environment has suffered further degradation in the past 10 years. Agenda 21 itself – with its concept of linking environmental and social issues – is not included in Rio + 10. In fact, the developed countries, which for economic reasons do not wish to face up to serious environmental problems such as the emission of greenhouse gases, insist on the rhetoric of poverty as the central and exclusive theme, promoting an unacceptable division between environmental problems and their social and economic causes.

It seems essential for the Johannesburg Summit to reaffirm the commitments made at the Earth Summit of 1992 in Rio de Janeiro, mentioned above, and for those commitments to be implemented. For this to happen, it will be necessary to overcome the current diplomatic unilateralism and construct effective, rather than rhetorical, agendas for the defense of the environment, through multilateral agreements in which all nations have the same responsibilities and commitments, including overcoming poverty.

It is necessary to reaffirm the developed countries' agreement to support the development of the poorer countries. Before 1992, that support stood at about 0.4% of GDP; 0.7% was promised, but what actually occurred was a reduction in recent years to no more than 0.2% a year.

Secretary General Kofi Annan, speaking in the name of the United Nations, limited himself to identifying water and sanitation, energy, health, agriculture, and biodiversity as the five areas that will dominate the discussions at Rio+10 (UN, 2002). Along these lines, he tentatively suggested the following goals.

- Water and sanitation – Promote access for at least 1 billion people who are without safe drinking water and 2 billion people who lack adequate sanitation
- Energy – Promote access for more than 2 billion people who lack adequate energy supplies; promote renewable forms of energy; reduce overconsumption; and ratify the Kyoto Protocol on emission of gases and climate
- Health – Deal with the effects of toxic and dangerous materials; reduce air pollution; reduce the incidence of malaria and guinea worm, which are linked to water pollution and the absence of sanitation
- Agricultural productivity – Promote the reversal of soil degradation, which affects at least two-thirds of the world's arable land
- Biodiversity and management of ecosystems – Reverse the destruction of tropical rainforests, mangrove stands, and coral reefs

Once again, as at Rio 92 and Rio + 5, the role of environmental and other NGOs will be significant. In the face of low expectations in terms of significant agreements on poverty reduction and confronting the world's serious environmental problems, and of political and diplomatic disagreements between rich and poor nations, NGOs, in some way representing civil society, will pressure for there to be at least a reaffirmation of the Rio agreements.

Despite the consequences known to all and fully reaffirmed by cumulative scientific knowledge, the socioenvironmental irresponsibility of a few developed nations, foremost the United States, could represent one of the heaviest blows to the efforts to save the world from a fatal environmental outcome that continues to approach and become more difficult to contain.

Challenges for Research

The environment-health relationship can be seen, under current conditions, as a process that can be predicted scientifically, and one that can therefore be changed to some extent, given the advances in science and technology, depending on the social and political forces that take action on the current reality.

A detailed knowledge of environmental structures and dynamics is essential for identifying disease-generating elements and relationships and the conditions and ways in which effective human-environment interactions occur, in order to understand environmental risk situations, as well as the specific exposures of particular populations and human communities.

Science has advanced toward an understanding a large number of environmental and health indicators, notably those referring to particular morbidities and pathological physical processes, but also biological exposure indicators.

Nevertheless, to make judgments and explain environment-health relationships scientifically, it is necessary to have access to historical and current information on both sides of the equation—access that is available in very few countries.

Moreover, a better explanation is needed of the relationships between current models of development and environmental and health situations in different social structures being considered, in order to develop interventions that can reduce or minimize the risks and threats from this dynamic process of interaction.

In a difficult and consciously incomplete effort, we list below some of the research priorities that we have identified in the fields of development, environment, and health:

- Relationships between development (socioeconomic factors) and environmental quality and contamination by physical, biological, and chemical agents
- Relationships between development (socioeconomic factors) and health conditions
- Health impact of physical and chemical agents used in industrial and agricultural processes and recognized as contaminants or potential contaminants
- Interactions among environment, infectious agents, and vectors
- Policies and “governance” in health and environment
- Development of new technologies and instruments to control environmental risk factors in health
- Development of new technologies and instruments to guarantee environmental quality
- Evaluation of the impact on human health and control measures for water, air, soil, and other pollution
- Evaluation and control of health risks to workers caused by working conditions
- Identification and analysis of best practice in the development of policies and interventions combining the three dimensions (development, environment, and health)
- Studies on development, environment, and health in specific ecosystems, such as the Amazonian forest, coastal Atlantic woods, semi-arid zones, etc.

Final Comments

Various UN agencies agree, at least in their rhetoric, on a concrete set of analyses and recommendations on world development, since the serious alert raised by Rio 92: environmental protection and natural resource management should be coordinated with action aimed at reducing poverty and underdevelopment, if there is to be hope for a peaceful, environmentally sustainable world in the future.

That is, today there is a broad and rare consensus among scientists, environmental activists, and experts in multilateral environmental agencies that the world urgently needs to choose new, more sustainable models of economic development in different dimensions, because of the huge risks that we all face. The richest and economically most developed countries must make binding

public policy decisions and make more responsible international commitments to fight poverty and protect the environment.

It is true, nevertheless, as Jonathan Porrit, chairman of the UK Sustainable Development Commission, states in a recent article for the newspaper *The Guardian*, that the principal global institutions are “genetically predisposed” to favor the economic over the ecological. He notes that “the IMF, the World Bank, most UN agencies and all regional and international banks have marching orders to (...) expand the global economy on behalf of OECD governments and address poverty elsewhere through more earth-bashing growth” (Porrit, 2002).

Porrit continues, “the irony is that the solutions are already to hand – and entail only a very small political risk. Start by doing right by conventional market economics: get rid of all perverse subsidies that pay people to destroy the environment. (...) Start internalizing some of the costs that allow businesses to dump on to the environment, so that the price we pay for things more accurately reflects their true costs. (...) Improve the efficiency with which we use energy and resources (...) Address the needs of poorer countries as they see them, not as we see them. Underpin their economies by securing and enhancing natural capital, rather than accelerating its destruction (...). Slow the rate of population growth by prioritizing investments in better primary healthcare and education for women, as well as far easier access to contraception. Finally, rein in “crony capitalism”, constrain the power of multinationals, channel foreign direct investment into socially-inclusive and ecologically sustainable wealth creation” (Porrit, 2002).

The time available is short. Certainly scientists involved with development, environment, and health must emphatically continue alerting politicians and society at large to the absurd risks that we all run. These risks are accompanied by irresponsible political decisions that, on behalf of a deformed pattern of economic development that is localized and temporary, incidentally favoring a small minority of humanity, takes the world ever closer to an unsustainable and dangerous environmental and human situation.

May this brief article sound the alarm!

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TABLE 1
**POSITIVE HISTORICAL LANDMARKS FOR DEVELOPMENT,
 ENVIRONMENT, AND HEALTH IN THE LAST 30 YEARS**

1970s

- 1972 – Stockholm Conference; Creation of the United Nations Environment Program (UNEP)
- 1977 – World Conference on Desertification (Kenya)
- 1977 – United Nations Water Conference (Mar del Plata)
- 1978 – WHO/UNICEF International Conference on Primary Health Care (Alma-Ata)

1980s

- 1981-1990 – International Water Decade
- 1986 – Ottawa Charter for Health Promotion (WHO)
- 1987 – Montreal Protocol: control of substances that deplete the ozone layer
- 1987 – UN World Commission on Environment and Development (WCED); *Our Common Future*, report of WCED
- 1987 – Healthy Cities Initiative (WHO)
- 1988 – Intergovernmental Panel on Climate Change (IPCC) of the UN
- 1989 – Basel Convention: control of movement of hazardous wastes
- 1989 – Adelaide Conference: Health Public Policy (WHO)

1990s

- 1990 – Creation of WHO Commission on Health and Environment
- 1991 – Sundsvall Declaration on Supportive Environments for Health (WHO)
- 1992 – UN Conference on Environment and Development (Rio 92) – The Earth Summit. Agenda 21; Creation of the UN Commission on Sustainable Development
- 1994 – UN Convention to Combat Desertification (UNCCD)
- 1994 – UN Conference on Population and Development (Cairo)
- 1994 – International Conference on Chemical Safety (Stockholm)
- 1995 – UN Conference on Social Development – Social Summit (Copenhagen)
- 1995 – Pan American Charter on Health and Environment in Sustainable Human Development
- 1996 – UN Conference on Human Settlement - Habitat II (Istanbul)
- 1996 – World Food Summit, FAO (Rome)
- 1997 – Kyoto Protocol: control of emissions of greenhouse gases
- 2002 – Joint Meeting of Ministers of Health and Environment of the Americas
- 2002 – World Conference on Sustainable Development, Rio+10 (Johannesburg)

TABLE 2
POTENTIAL ENVIRONMENTAL HEALTH RISKS
RESULTING FROM THE MODEL OF DEVELOPMENT

- Inherent risks in development
- Air pollution, internal and external
- Water pollution
- Ground pollution
- Inadequate basic sanitation
- Disease vectors, particularly insects and rodents
- Deforestation
- Desertification
- Extinction of species
- Damage to the ozone layer
- Acid rain
- Greenhouse effect
- Climate change
- Unhealthy housing
- Food contamination
- Population growth
- Chemical risks
- Occupational risks
- Radiation and other physical risks
- Natural disasters