Herald Journal of Geography and Regional Planning Vol. 2 (1), pp. 043 - 047 April 2013
Available online: http://www.heraldjournals.org/hjgrp/archive.htm

Review

Environmental management: its health implications

Dr. Jonathan Ogwuche

Department of Geography, Benue State University, Makurdi Nigeria
*Corresponding Author Email: ogwuche.jonathan@yahoo.com

Accepted May 2, 2013

Since the Earth Summit, numerous initiatives have been launched at local, national and global levels to highlight the need for health and environment actions. Health and environment have a mutual nexus between them. The environment is an assemblage of physical, chemical, biological, social, cultural and economic conditions, and these have health implications. This paper examines how development or lack of it can threaten health through environmental pollution and degradation and also how environmental development and management can provide resources for health protection. The health challenges call for concerted efforts and actions for sustainable environmental management on the parts of individuals, governments, and agencies at all levels, so as to achieve human health and well-being and the integrity of the environment.

Keywords: Environmental Health, Sustainable Development, Disease-burden, Environmental Change, Environmental Management

INTRODUCTION

The Earth Summit in Rio de Janeiro in 1992 heralded a wholly new approach to the consideration of health and environmental issues in national planning processes. By adopting the principles of the Rio Declaration and Agenda 21 as the route to sustainable development in the 21st century, the world's leaders recognized the prime importance of investing in improvements to people's health and their environment as a pre-requisite for sustainable national growth. While principle 1 of the Rio declaration provides that human beings are at the centre of concerns for sustainable development and are entitled to a healthy and productive life in harmony with nature (UNCED, 1992), Agenda 21 presents a golden opportunity for health authorities to increase their influence on national planning and to reverse the trend of environmentally damaging and health-threatening development (UN, 1993). In the same vein, the objective of the 2012 UN-water Global Analysis and Assessment of Sanitation and Drinking Water (GLASS) is to monitor the inputs required to extend and sustain water, sanitation and hygiene (WASH) systems and services (WHO, 2012b).

For decades, politicians and national planners have regarded health and environmental management programmes as social imperatives. Their argument has been that they would be taken care of once economic growth improved. The result has been low investment, deteriorating environment and shameful levels of mortality and morbidity. The economic benefits of good health and environmental quality were simply not recognized; and moreover, Skanska-Shimmck-Herzog (2012) fear that poor communities that are disproportionately affected by environment-related health issues would likely experience worse situations with climate change variability and change.

As countries formulate national plans for sustainable development, they need advocacy and guidance to ensure that past lessons are learnt and future investments in health and environmental improvement are judged on their catalytic contribution to economic development as well as for the social benefits they bring. Humans experience the environment in which they live as an assemblage of physical, chemical, biological, social, cultural and economic conditions that differ according to the local geography, infrastructure, season, time of day, and activities undertaken. Human health, on the other hand, is a vital cross-sectional issue, and is dependent on the continued availability of environmental resources and on the integrity of the environment. This explains why Pruss-Ustum and Corvalan (2006) estimate that environmental risk factors currently play a role in more than 80 percent of the major diseases and injuries around the world.

In recent years, environmental problems have

acquired new dimensions. Everywhere in the world, the environment is changing as a result of pollution and loss of natural resources. All around us, the deleterious effects on health arising from environmental degradation can be felt and seen. Indeed, a new perspective on health has clearly evolved whereby the protection of public health remains a fundamental objective of environmental policies. This requires concerted efforts and action on the part of individuals, governments and agencies at all levels, so as to achieve sustainable development where human health, human well-being and the integrity of the environment are assured.

Environmental Threats to Human Health

Although environmental threats to human health are numerous, only 'traditional hazards' (those that are associated with lack of development) and modern hazards (those associated with unsustainability) are being considered in this paper. According to World Bank (2001) traditional hazards which are related to poverty and 'insufficient' development include lack of access to safe drinking water, inadequate basic sanitation in the household and the community, indoor air pollution from cooking and heating using coal or biomass fuel, and inadequate solid waste disposal. On the other hand, modern hazards are related to development that lacks health-and-environmental safeguards, and to unsustainable consumption of natural resources. They include water pollution from populated areas, industry and intensive agriculture; urban air pollution from vehicle, coal and industry; climate change; stratospheric ozone depletion and trans-boundary pollution.

The environment in which people live (from the household to the global level) significantly affects their health. Environmental factors are, no doubt, a significant determinant of health and illness, especially in third world countries (WHO, 1996). Health, according to WHO (1992), is a state of complete physical natural and social well-being, and not merely the absence of diseases or infirmity. Health, therefore, is only possible where resources are available to meet human needs, and where the living and working environment is protected from life-threatening and health-threatening pollutants, pathogens and physical hazards. Health also includes a sense of well-being and security. Deficient living and working environments are associated with both physical and psychological health problems. Violence and alienation are also associated with overcrowded poor quality housing, deficient services, and inadequate provision of leisure and recreation (WHO, 1992). Depression is a common mental disorder, and affects more than 350 million people worldwide (WHO, 2012a). It is characterized by sadness, loss of interest or pleasure, and poor concentration. WHO (2012a) went further to say that while 14 percent of the global burden of disease is attributed to these disorders, and most of the people affected (75 percent in many low income countries) do not have access to the treatment they need.

Health outcomes that are a result of environmental condition are classified under the category of environmental health. Environmental health, according to World Bank (2001) refers to those aspects of human health, including quality of life, that are determined by physical, biological, social and psychological factors in the environment. The growing understanding of this link has led to the concept of a health-promoting environment where not only are health risks minimized but personal and community fulfillments, self-esteem, and security is encouraged.

One can look at environmental health problems from the viewpoint of the burden of death, disease and disability, and analyze the relative importance of the different environmental factors. The burden of diseases on a per capita basis is about 100 times higher in the least developed countries than in the developed countries (WHO, 1995), due mainly to contribution of environmental factors of poor housing and living conditions, poor sanitation, lack of access to clean water and safe food. Also, inequalities based on wealth and location, together with flawed policies, mean that poor people pay the most and travel the furthest for environmental infrastructure (WHO, 2011). However, achieving even the basic minimum standard of access to, say, water (20 litres per person per day of safe water from an improved source, which can be maintained if the source is within 30 minutes roundtrip from the home) remains a huge challenge (WHO, 2011). This means that the availability of good environmental infrastructure close to the home has numerous benefits, especially in terms of human health with subsequent linkages to all the other dimensions of livelihoods. Such gains in human health have an intrinsic value in terms of quality of life as a developmental end, and as a means for higher economic productivity. The environment also plays a particularly important role in determining the distribution of vector-borne diseases. In addition to water and temperature, other factors such as humidity, vegetation, density, patterns of agriculture and housing may be critical to the survival of the different species of diseases-carrying vectors. Such diseases, according to UNCED (1992), include acute respiratory infections, diarrhea diseases, infectious diseases, malaria and other tropical vector-borne diseases, injuries and poisonings, mental-health conditions, cardiovascular diseases, cancer, chronic respiratory diseases, allergies, reproductive health problems, etc. All of these diseases are most serious in the poorest countries and those living in the most difficult and impoverished environmental conditions (WHO, 2007). There is, therefore, the need for an environment - health nexus framework.

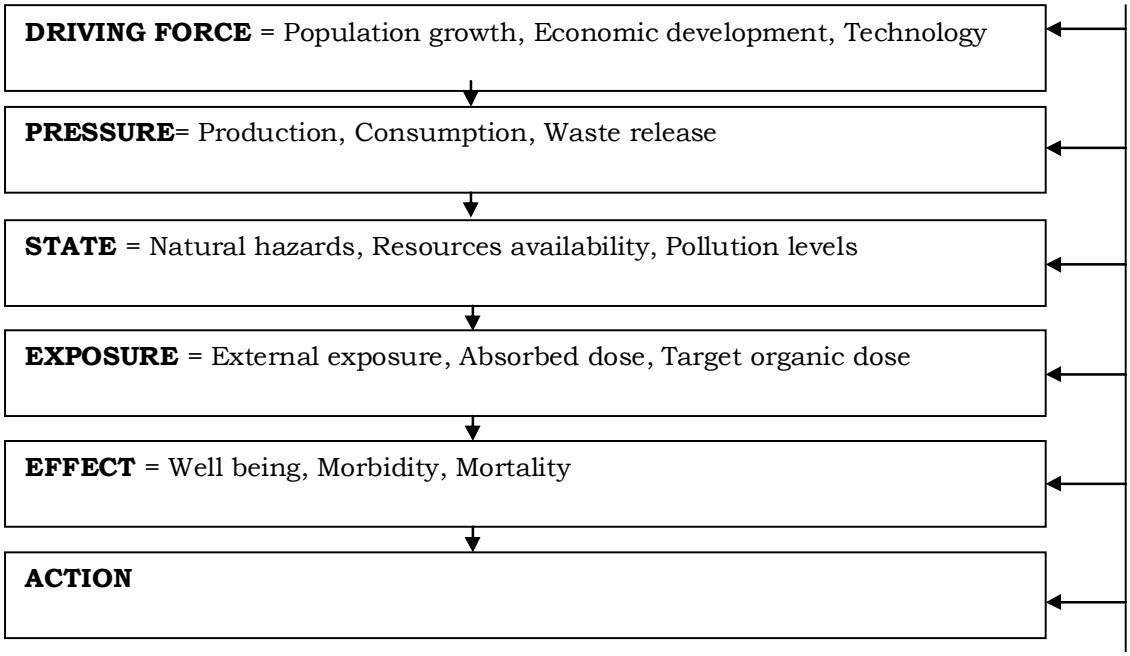

Figure 1. Health and Environment Cause-Effect Framework
Source: WHO 1997, modified after Kjellstrom and Corvalan 1995

Health-and-environment cause-effect framework

Despite the ability to identify and describe individual environmental health hazards, the relationship between human health and environment is highly complex. For instance, each of the traditional and modern hazards is associated with a variety of aspects of physical, economic and social development, which complicates the analysis of their incidence and impact. It, therefore, becomes useful to adapt a framework within which the different interactions operating between environmental health hazards and the environment can be analyzed. A health-and-environment cause-effect framework (Figure 1) was devised, to, according to WHO (1997), review the development-environment-health relationship, reveal and highlight important interactions, and to help pinpoint possible entry points for public health interventions.

This diagram is a simplified abstraction of the complex cause-effect relationship operating between driving forces, environmental pressures, environmental state, human exposures, health effects, and actions aimed at minimizing these effects. The boxes provide examples of factors acting at each level. Arrows mark the potential connections that exist between various causes and effects in environmental health.

Driving forces of environmental change and health implications

The scale of human impact on the environment is determined by a number of interdependent factors, which can be called the driving forces of environmental changes. WHO (1997) enumerates them as population dynamics, urbanization, poverty and inequality, technical and scientific developments, consumption and production patterns, economic development, and political system.

Driving forces create the conditions in which environmental health threats can develop or be averted, as indicated in the framework in Figure1. These driving forces are often associated simultaneously with a number of health and environment issues. Also government policies and programmes change the direction and/or magnitude of driving forces, and can, therefore, alleviate or exacerbate a broad array of environmental health threats. Such threats relate to household wastes, fresh water use, land use and agricultural development, industrialization and energy use. These threats affect environmental quality and in turn lead to adverse human exposures and eventual health effects. Air, water, food and land are the principal exposure routes of environmental health hazards. As a result of the combined action of driving forces at local and regional levels, environment change is gradually becoming 'globalized'. Major examples of global environmental change include climate change, stratospheric ozone depletion, trans-boundary air and water pollution, acid precipitation, loss of biodiversity, desertification and deforestation. All these influence health significantly as they have both direct and indirect health impacts.

Potential impacts of environmental pollutants on human health are evaluated on the basis of quantitative health risk assessment (HRA) (WHO, 1992). The spread of pollutants through air, water and soil, human exposure

to them, and their toxicology and pharmacokinetics in human beings are the elements involved in health modeling (UNCED, 1992). The extent of health risk assessment depends on the possible exposure pathways and how the exposures can be modeled. Hamilton (1984) pioneered a method in which potential sources of exposure to one or more chemicals are determined, the toxicity of the contaminants evaluated, and the pathways and intensity of exposure estimated. According to UNCED (1992), the objectives of health-environment modeling includes (among others)

- Identification of health-environment routes of exposure,
- Identification of agents, media, and routes of entry, and
- Delineation of control and mitigation strategies

Key Environment-Health Indicators

Using a selective set of indicators to assess the impact of environmental factors is very important. Shyamsundar (2001) gives a ranking of environmental diseases in terms of their contribution to burden of diseases as water supply and sanitation, vector diseases, indoor air pollution, urban and air pollution, agro-industrial waste etc. This list presents some intermediate and impact indicators that are most routinely used for monitoring the three most common environmental health problems – malaria, acute respiratory infections and diarrhea. While intermediate indicators refer to project, sectoral or macro inputs and outputs that affect health, impact indicators are more direct measurements of the quality of environmental health. Some environmental health indicators, as given by Shyamsundar (2001), include access to safe water and sanitation, hours per day, time taken per distance involved in collecting water, percentage of people using traditional fuels, percentage of households using insecticide treated net, infant mortality, prevalence of diarrhea and acute respiratory infection, malaria, death rate, etc. The malaria-related (vector diseases) indicators have been taken from the globally discussed Roll Back Malaria (RBM) initiative which WHO (2000) says seeks to halve the malaria burden through interventions that are adapted to local needs.

Indicators that are useful for assessing respiratory infection include availability of ventilation, children sleeping in cooking areas, and the types of cooking stoves and fuel used (Saracci, and Vineis, 2007). Access to safe water and sanitation are commonly used indicators for assessing health outcomes such as diarrhea. Also, these indicators need to be complemented with indicators such as quantity of water used per capita and hours of available water supply. It is also useful to monitor indicators such as disposal practices of faeces and behaviour practices of households

Health in Environmental Management For Sustainable Development.

There is no gainsaying the fact that environmental quality is an important direct and indirect determinant of human health. Deteriorating environmental conditions are a major contributory factor to poor health and poor quality of life, and hindrance to sustainable development.

The problems facing the health sector today are increasingly complex and multidisciplinary in nature. The health sector cannot address these problems on its own. New and innovative approaches are needed to integrate and operationalize the concept of environmental sustainability, which incorporates economic, social and political dimensions. Wide-ranging reforms are also needed to more adequately deal with assessment and management of environmental health risks within a framework of sustainable development. In the analysis of the approximate environmental contribution of health conditions, a long-term sustainable prevention rather than curative measures is advocated. For example, Africa and Asia, including China, are most affected by environmental health-related diseases, as 24 percent of the global disease burdens and 23 percent of all deaths can be prevented through environmental interventions (Pruss-Ustun and Corvalan, 2006) Effective and sustainable prevention or significant mitigation of environmental health risks requires, first, environmental preventive action through environmental management. Reducing modern risks calls for sound environmental management through pollution control and abatement measures, which in turn require setting and enforcing environment standards, developing a culture of environmental compliance and creating effective incentives.

Many countries have instituted new policy and planning tools since the Earth Summit of 1992 to make environmental concern a part of the environmental planning process. Measures to incorporate health-and-environment initiatives into national programmes have varied from country to country, depending on planning mechanisms, the current status of sustainable development in the specific country and the way in which planning responsibilities are divided. Thus, different approaches are being used for promoting health sector involvement in addressing health and environment issues. WHO (1997) stresses that in some countries, health and environment plans are prepared for inclusion in national plans for sustainable development, while in others, sectoral plans are reviewed and modified to include health and environment concerns.

The environment is a positive influence in much the same way as a healthy diet. Environmental management provides a sustainable and supportive environment for

health, which is free from major health hazards, satisfies the basic needs of health living, and facilitates equitable social interaction. Environmental management does not mean management of the environment, but is the intelligent management of activities within tolerable constraints imposed by the environment itself and with full consideration of ecological factors. It is a requirement of health where the global cycles and systems on which all life depends are sustained through environmental management. According to WHO (2006), sound environmental management brings health benefits and is essential to a sustainable interaction between people and their environment, in a world where finite resources are being depleted and the capacity of natural cycles and systems to absorb wastes are being exceeded. Human health, therefore, depends on society's capacity to manage the interaction between human activities and the physical, social, psychological and biological environment in ways that safeguard and promote health but do not threaten the integrity of the natural systems on which the environment depends. This is the heart of environmental management and sustainable development.

The physical environment has a major influence on human health not only through temperature, precipitation and composition of air and water but also through its interaction with the type and distribution of the flora and fauna (the biological environment). The biological environment is a major influence on the food supply and on the reservoirs and transmission mechanism of many diseases. For instance, WHO (2011) asserts that more than one-third of diseases in children under the age of 5 years is caused by environmental exposures, such as acute respiratory infections (from indoor air pollution), diarrheal diseases (from poor water, sanitation and hygiene), and malaria (from inadequate environmental management and vector control). Interventions such as draining marshlands within or close to settlements in malarious areas can greatly reduce the incidence of malaria by removing mosquitoes breeding sites (Ceccato, Connor, Jeanne and Thomson, 2005). Other physical environmental remedial measures include improved water and sanitation, household energy, housing, vector disease control, and pollution management. For instance, Health in Housing (HIH), a World Health Organization's collaborating programme for research, is an approach based on helping families to learn how to improve their health while upgrading their housing and physical environment (WHO, 1996).

The nexus between environmental factors and mental well-being is obvious. UNCED (1992) identifies positive forces and factors that can mediate mental disorders and social pathologies. They include policies, legislation, educational and preventive intervention programmes, environmental action programmes, community self-help programmes, urban renewal programmes, etc.

To date, much of the efforts to make the environment healthier have focused on urban renewal programmes. For instance, organized open spaces which is an important land-use category, is considered as a paradise, a family place for happiness and enjoyment and a haven for peace and for release from the pressures of the outside world (Laurie, 1983). Open spaces are part of our creative heritage and this exposure to nature enhances our psychological well-being.

In healthy cities work, attention should be given to the principle that health can only be improved by modifying the environment. Nevertheless, various environmental development activities aimed at offering health opportunities and enhancing the health status of the population can cause health hazards if they lack health and environmental safeguards (WHO, 2006). This calls for the integration of environmental health assessment and analysis into environmental management tools for any developmental activity.

Health and cost-effectiveness of environmental interventions

It is now possible to quantify the magnitude of health impacts from exposure to various environmental factors, as well as to compare the cost-effectiveness of preventive measures to reduce such exposure with health sector activities that cure the resulting illnesses. Also, laboratory and epidemiological research has attempted to identify risk factors in disease causation, which provides estimates of environmentally attributable percentages. The knowledge in the cost-effectiveness of a range of environmental interventions is very essential as it can be used to set priorities for investment and to improve budget allocation decisions. For instance, the World Bank (2001) observes that remedial measures outside health care system, such as improved water and sanitation, are capable of reducing the total burden of disease by about 30%, and that health-care interventions aimed at the same cluster of diseases affected by environmental factors, such as malaria, can reduce the disease burden by 30%. Because poor people are particularly vulnerable to the inadequate provision of services, they will benefit disproportionately from improvements to these services. For example, household surveys conducted by UNDP in Uganda in 2006 have shown that access to improved water source reduced the risk of infant mortality by 23 percent (UNDP, 2006). WHO/UNICEF (2010) also reports that in 2008, 87 percent of the population used improved water sources, and concludes that if improvements continue, the global Millennium Development Targets will be reached. This shows that the key development objective of improving people's health requires a holistic and multi-sectoral approach to mitigating major risks by integrating efforts inside and outside health - care systems.

CONCLUSION AND RECOMMENDATION

Creation of supportive environment for health depends upon full participatory and contributory actions of the members of the society as well as the cooperative action between sectors. An inter-sectoral approach is the most effective means of formulating environmental health policy, since it can help to ensure that priorities are coherent and not conflict with those of individual sectors. Also, joint programmes involving ministries of health, environment and others would enable much more to be achieved in environment and health issues.

Finally, this paper makes a clarion call for:

i. The systematic integration of Environmental Health Assessment (EHA) into various environmental management tools so as to address risks to health during project preparation, implementation, monitoring and evaluation.

ii. The application of appropriate environmental health management and technology, and effective management of manpower and material resources in diverse environmental settings.

iii. The improvement of the understanding of the linkages between health outcomes and development activities in infrastructure, energy, and the urban and rural sectors, and

iv. A holistic and multi-sectoral approach in formulating environmental health policies.

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