IMPACTS OF DISASTERS ON ENVIRONMENT AND DEVELOPMENT - INTERNATIONAL COOPERATION

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International Center for Disaster-Mitigation Engineering

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ABSTRACT

This report highlights the various issues, historical background and interactions related to the impacts of disasters on environment and development in the Asian countries, particularly in Bangladesh. It focuses on the major problems such as population pressure, poverty, industrial and domestic pollution, irrational use of chemical fertilizers/pesticides, lack of mass awareness and sense of responsibility. Conservation of natural resources, maintenance of ecological balance in the life-supporting earth system and its vitality, preservation of bio-diversity and the protection of the environment are very essential for attaining environmentally sound and sustainable development. Potential uses and applications of integrated remote sensing and geographic information system along with conventional/socio-economic data could also provide immense information particularly for environmental degradation and disasters - studies, monitoring, mitigation, damage assessment, preparedness, prevention, emergency response, reconstruction, rehabilitation through research, education, training, information exchange, regional and inernational cooperation.

Key words: Disasters, environment, development, remote sensing, GIS, environmentally sound and sustainable development.

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INTRODUCTION

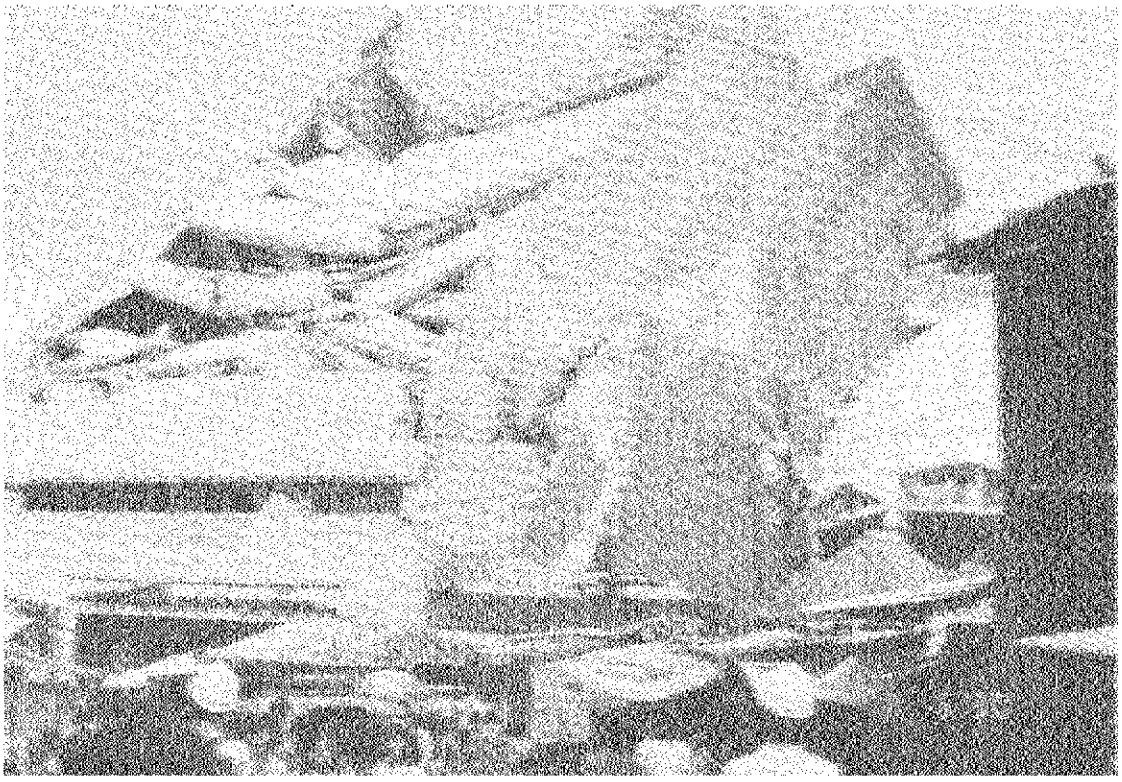
Disasters have global impacts. Most of the Asian countries, where the majority of world population live, are disaster-prone and have high density of population. They are facing tremendous problems of overpopulation, deforestation, desertification, overgrazing, soil erosion and environmental pollution. These problems are complicated by both natural and man-made recurrent disasters like floods, droughts, windstorms, storm surges, earthquakes, tsunamis, volcanic eruptions and environmental degradation.

The impacts of disasters on environment and development are manifold. Disasters create substantial environmental degradation and ecological imbalance, hinder socioeconomic development and retard the process of improving the quality of life of the people. The interactions of disasters, environment and development have both short-term and long-term effects. These interactions and interdependencies work in a complicated way, affecting people, ecosystem and bio-diversity. As such, an optimum balance is needed among these factors so all human interventions should ultimately aim at providing maximum benefits to the people, less environmental degradation and sustainable conservation of ecosystem and bio-diversity. It is very difficult to attain environmentally sound and sustainable development (ESSD) without making a compromise - optimization of the requirements of ESSD, development of adequate disaster preparedness and mitigation techniques, tackling of environmental issues, application of country-specific development strategy and other related parameters.

The Asia-Pacific region occupies about 27 percent of the solid earth and accounts for 58 percent (more than 3 billion) of the global population (about 5.5 billion). About eighty to eighty-five percent of the global disasters occur in this region with heavy casualties and severe damage. During the last twenty years alone, almost three million lives were lost and more than 800 million people were adversely affected worldwide due to natural disasters. These disasters create tremendous problems on the environment and socioeconomic development of the countries with high population density. This calls for concerted national efforts and international cooperation.

This report deals with the interactions among disasters, environment and development focusing on Bangladesh as a case study. It also highlights various issues, historical background and interactions related to disasters, environment

and development in the Asian countries, particularly Bangladesh experiences and the role of modern technologies like space sciences, remote sensing and geographic information system (GIS) in the management of natural resources and monitoring of environment and disasters. Possible international collaboration through information exchange, education, training, research and joint research projects of mutual interest is also highlighted.



A damaged building amidst a bustling marketplace in Baguio (Luzon earthquake, Philippines, July 16, 1990)

HISTORICAL BACKGROUND

The planet Earth was created some 4.5 billion years ago. Since then it has been modified continually by forces of nature and human activities. The known human history of about two million years has gone through various stages and phases of development. Human livelihood practices had shifted from hunting and gathering to domestication of wild animals and agricultural practices only during the last ten thousand years or so. Urbanization started about 5,500 years ago and people have become urban dwellers since then. The progress of civilization has been stepped up since the 18th century industrial revolution. This has opened a new era of mass production, mass consumption and mass disposal based on the behavioral principle of profit maximization. The industrial revolution and modern agricultural techniques helped increase productivity but their impacts and rapid urbanization introduced environmental problems locally, nationally, regionally and globally.

In 1827, the French mathematician B.J. Fourier warned about the problems associated with global warming. Even in 1896, renowned Swedish chemist Svante Arrhenius, who coined the term "greenhouse effect", theorized that the burning of fossil fuels would increase the amount of carbon dioxide in the atmosphere and would lead to a warming of the planet. He calculated that if carbon dioxide concentration in the atmosphere is doubled, there would be a 4.5 degree Celsius temperature rise - a figure very close to the prediction being made today. British scientist George Callender experimented in 1938 on global warming. He found that half of the carbon dioxide released is trapped in the atmosphere. Measurements of carbon dioxide concentration showed that it has increased from the pre-industrial period value of 280 ppm to 315 ppm in 1958 and 349 ppm in 1988.

The impact of changes in the physical environment on human well-being became an important public issue in the mid-1950's, mainly after pollution episodes led to health problems and disruption of ecological balances.

In the early sixties global awareness about environmental problems was created when Rachel Carson published the book "Silent Spring". During the last three decades environmental issues had been a subject much talked about. Scientific research on greenhouse effect, ozone layer depletion, global warming, sea level rise, etc., is getting priority from national and international communities. As a result of this interest and global awareness, attempts were

made to internationalize and discuss the issues in an international conference. This resulted in the Stockholm Conference in 1972.

The 1972 Stockholm Conference on human environment initiated the international effort on global environmental issues and eventually resulted in the establishment of the United Nations Environment Program (UNEP). Observance of the World Environment Day (WED) on June 5 every year also started. In fact, this Conference was an "environmental movement" which emerged in both industrial and developing countries with active participation of the public and private sectors. The intrinsic relationship between socioeconomic development and environment protection was also recognized in this Conference. It was further clarified by the Brundtland Commission Report "Our Common Future", a 1987 Report of the U. N. Commission on Environment and Development[1]. It concludes that the analysis and the programs made twenty years ago were incomplete and were going in the wrong direction. This is because twenty years ago, environmental issues were treated as simply biological and physical issues when, in fact, these issues are enmeshed in and

Commemorating the World Environment Day in Bangladesh
(Poster of World Environment Day - June 5, 1991)
Source: Department of Environment, Government of Bangladesh

cannot be separated from political, social and economic issues.

Out of this analysis came the term "sustainable development"- development for the present and provision for the future generations in terms of natural resources and environmental protection. The Commission recommends that environmental issues should be viewed in a broader context and should be integrated in economic planning and decision-making, including the initiation of the necessary reforms and improvements in the social, economic and political fields.

Meanwhile, the UN put its untiring efforts to view the environment and development issues in global perspectives and set the stage for discussions in an international conference. These efforts and discussions in the UN General Assembly helped in adopting Resolution No. 44/228 in December 1989 to hold the UN Conference on Environment and Development (UNCED) in Brazil in 1992 and set out the guidelines and principal issues. The preparation for UNCED took two and a half years during which four preparatory committee meetings were held. In addition, parallel inter-governmental negotiations were made to prepare the conventions on Climate Change and Bio-diversity.

The 1992 UNCED held in Rio de Janeiro created human history through global mass awareness about environmental problems and by treaties on "Climate Change and Bio-diversity" for the conservation and preservation of the earth's vitality and protection of the environment. This is needed for ESSD.

To study, monitor and manage environmental issues, development strategies and disaster impacts, the use of modern technologies like space sciences, remote sensing and GIS is necessary. The advent of the space age in 1957 and the subsequent development of space technology have made it possible for in-depth study of environmental changes, undertaking appropriate development strategies and monitoring and management of disaster impacts. These studies are being made at local, national, regional and global levels depending on the resolution of the technology.

Although the space age dawned in the 1950's, its wide applications only started in the 1960's with a resolution (fineness) of 1000m for meteorological satellites on the ground surface. During the 1970's the technique improved and a ground resolution of about 100m was achieved by LANDSAT. In the 1980's it was improved to 10m by SPOT. During a decade of development in the technology, the resolution improved by an order of ten.

Hopefully, greater improvement will be made. The European Space Agency (ESA) launched ERS-1 satellite in 1991 and will launch ERS-2 in 1994. In the mid-90's RADARSAT will be launched by Canada and similar satellites by other nations for getting information on the earth's resources and environment even through clouds. The multi-spectral, multi-date and multi-stage remote sensing images/data/information are powerful tools for natural resources inventory/management/monitoring, etc., for the present and for the future.

1972 STOCKHOLM CONFERENCE

The Industrial Revolution in the 18th century created environmental problems mainly in the European countries. The scientifically traditional and very conscious people of Sweden and Norway made hue and cry about the environmental degradation issues. Even in 1896 Swedish Nobel laureate chemist Svante Arrhenius predicted the global warming of the planet Earth. The Swedish Academy of Science pioneered the concept of massive tree plantation by the common people by introducing a "token coin" for planting a tree. This token coin could be exchanged for a free meal at the Academy Rest House. Sweden, which awards the prestigious Nobel Prize, was very conscious about the environmental problems and created mass awareness from the beginning. Their efforts and realization of the importance of the global environmental issues resulting from population increase and economic activities drew worldwide attention to these problems. The health of the environment and finite life-support resources system are deteriorating due to environmental degradation problems. In response to mounting public concern the first United Nations Conference on human environment was held in Stockholm, Sweden, from June 5 to 16, 1972, for in-depth discussions. A total of 113 nations participated in this Conference.

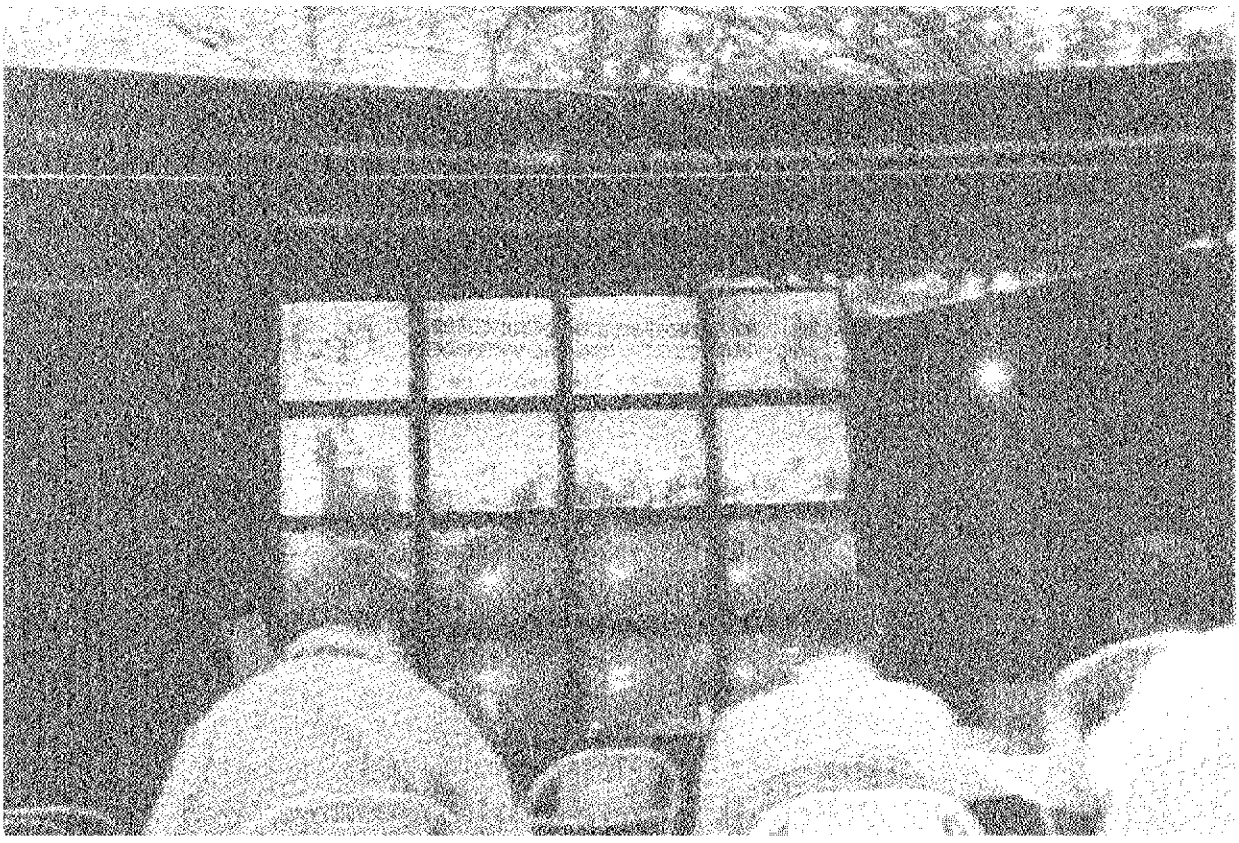
The major agenda of the Conference were as follows:

-To discuss the environmental issues in-depth,
-To prepare an action plan for the conservation of natural resources and protection of the environment,
-To decide to observe June 5 every year as the World Environment Day, and
-To resolve to establish an International Organization with a global commitment to safeguard and enhance the environment for present and future generations.

One of the resolutions has ultimately resulted in the formation of the UNEP with headquarters in Nairobi, Kenya, Africa.

The Conference ended with great hopes and aspirations and an action plan of 109 recommendations and a declaration of 26 common principles, popularly known as The Stockholm Declaration 1972 (Box A) on man's rights and responsibilities with respect to the global environment. It may be mentioned that public awareness about environment protection issues created in this

Conference has attained an action-plan stage in the 1992 Rio de Janeiro Conference. Although there were only two Prime Ministers (Sweden and India) present in the 1972 Stockholm Conference, more than 100 Heads of State/Government were present in the 1992 Rio Conference.



The Earth Summit in session (Rio de Janeiro, Brazil)

Box A

STOCKHOLM DECLARATION 1972

The Magna Carta for Our Environment

States the common conviction that:

Principle 1: Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating apartheid, racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated.

Principle 2: The natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

Principle 3: The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored.

Principle 4: Man has special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperiled by a combination of adverse factors. Nature conservation, including wildlife, must therefore receive importance in planning for economic development.

Principle 5: The nonrenewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind.

Principle 6: The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported.

Principle 7: States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

Principle 8: Economic and social development is essential for ensuring a favorable living and working environment for man and for creating

conditions on earth that are necessary for the improvement of the quality of life.

Principle 9: Environmental deficiencies generated by the conditions of under-development and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required.

Principle 10: For the developing countries, stability of prices and adequate earnings for primary commodities and raw materials are essential to environmental management since economic factors as well as ecological processes must be taken into account.

Principle 11: The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

Principle 12: Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

Principle 13: In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and coordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve the human environment for the benefit of their population.

Principle 14: Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and improve the environment.

Principle 15: Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all. In this respect, projects which are designed for colonialist and racist domination must be abandoned.

Principle 16: Demographic policies which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environmental development, or where low population density may prevent improvement of the human environment and impede development.

Principle 17: Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view of enhancing environmental quality.

Principle 18: Science and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind.

Principle 19: Education in environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving environment in its full human dimensions. It is also essential that mass media of communication avoid contributing to the deterioration of the environment, but on the contrary, disseminate information of an educational nature, on the need to protect and improve the environment in order to enable man to develop in every respect.

Principle 20: Scientific research and development in the context of environmental problems, both national and multinational, must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries.

Principle 21: States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 22: States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and

other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.

Principle 23: Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries.

Principle 24: International matters concerning the protection and improvement of the environment should be handled in a cooperative spirit by all countries, big or small, on an equal footing. Cooperation through multilateral or bilateral arrangements or other appropriate means is essential to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres, in such a way that due account is taken of the sovereignty and interests of all States.

Principle 25: States shall ensure that international organizations play a coordinated, efficient and dynamic role for the protection and improvement of the environment.

Principle 26: Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons.

Source: UN Publications 1982, GUIDE TO UNEP for the Media and Non-Gov't. Organizations, Session of a Special Character and the Tenth Session of the UNEP Governing Council, Nairobi, Kenya, 10 May - 2 June 1982, p. 47