



Research Paper

Desertification: Description, Causes and Impacts

Rohit Patel

Ph.D. Research Scholar
Department of Sociology
Banaras Hindu University 221005

ABSTRACT

Desertification is the degradation process by which a fertile land changes itself into a desert by losing its flora and fauna this can be caused by drought, deforestation, climate change, human activities or improper agriculture. Desertification is a process of degradation of the land. It occurs because of man-made activities and climate change. Desertification takes place when a particular type of biome converts into a desert biome. Desertification constitutes one of the "global" international environmental problems the world is facing. It has been recognized as a problem of significant importance since the early 1970s but the international community has never given it its full attention and commitment. In particular adequate financial resources have not been forthcoming, partly because the impacts of desertification in any given region do not spill over to other regions. The international community has addressed the threat of desertification through a convention negotiated at the level of the United Nations. It constitutes a significant effort to mainstream desertification but remains a peripheral instrument with rather weak commitments.

KEYWORDS: Desertification, Degradation, Global, Environmental problems.

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I. INTRODUCTION

Desertification is the permanent decrease in biological productivity of dryland areas. Drylands comprise 41% of the earth's land area and are home to roughly 2 billion (2 Arab) people, or 34% of the earth's population. Currently, over 25 crore people in more than 100 countries are directly affected by desertification and more are at risk. The situation is most severe in Africa, where 66% of the total land area is arid or semi-arid. Not only is desertification harmful to the earth and its inhabitants, but it is also expensive each year, the world loses US\$42 billion (3,11,40,52,200 Rs) to desertification and its effects.^[1]

Desertification is a type of land degradation in drylands in which biological productivity is lost due to natural processes or induced by human activities whereby fertile areas become increasingly arid. It is the spread of arid areas caused by a variety of factors, such as climate change (particularly the current global warming) and overexploitation of soil as a result of human activity. Throughout geological history, the development of deserts has occurred naturally. In recent times, the potential influences of human activity, improper land management, deforestation and climate change on desertification is the subject of many scientific investigations.^[2]

The official definition by the United Nations Convention to Combat Desertification (UNCCD) that has been widely used since its formulation in 1994 is: **"Desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic fluctuations and human activities."** UNCCD also highlights that it is important to note that desertification *is not* a natural process of deserts expanding to new regions, it is a form of land degradation caused primarily by human activity in vulnerable areas.

As global temperatures rise and the expands, more of the planet is vulnerable to desertification, the permanent degradation of land that was once arable. While interpretations of the term desertification vary, the concern centers on human-caused land degradation in areas with low or variable rainfall known as drylands: arid, semi-arid, and sub-humid lands. These drylands account for more than 40 percent of the world's terrestrial surface area. While land degradation has occurred throughout history, the pace has accelerated, reaching 30 to 35 times the historical rate, according to the United Nations. This degradation tends to be driven by a number of factors, including urbanization, mining, farming, and ranching. In the course of these activities, trees and other vegetation are cleared away, animal hooves pound the dirt, and crops deplete

nutrients in the soil. Climate change also plays a significant role, increasing the risk of drought. All of this contributes to soil erosion and an inability for the land to retain water or regrow plants. About 2 billion people live on the drylands that are vulnerable to desertification, which could displace an estimated 50 million people by 2030.^[3]

Much time and effort has been spent trying to define the concept of desertification. Such a task is difficult, if not impossible, because of the number and complexity of the issues involved, the interdisciplinary nature of the problem, and the range of spatial and temporal scales over which this concept is applied (Verstraete 1986)^[4]. For the present purpose, we shall define desertification as the set of all environmental degradation processes in hot drylands (hyperarid, arid, semi arid and sub humid regions), as a result of either climatic stress or human mismanagement, or both. Desertification will also include the causes (to the extent these can be identified) and the impact of degradation on natural and managed ecosystems. Clearly, environmental degradation can occur in all biomes, but the fragile nature, harsh climate and expanding area of these dry lands have made it a primary focus of attention. Desertification usually has severe long term consequences for the productivity of the land, and therefore for the populations that inhabit these regions. The word 'Desertification' was first introduced by the French forester **Aubre'ville** in his book "**Climats, Fore'ts, et De'sertification de l'AfriqueTropicale**" (Aubre'ville 1949).^[5]

Desertification Concept at UNCCD

At UNCCD today, desertification is viewed as a societal problem that creates conditions favorable for land degradation, and hence needs to be addressed through overall improvement in the living condition and economic well-being of the people. Under the Convention, the affected developing country parties are obliged to:

1. Give due priority to combating desertification, and mitigating the effects of drought
2. Establish strategies and priorities within the framework of sustainable development
3. Address underlying causes of desertification and particularly to the socio-economic factors contributing to the desertification process.
4. Promote awareness and facilitate the participation of local populations, particularly the women and youth non-governmental organizations, in efforts to combat desertification and mitigate the effects of drought.
5. Provide an enabling environment by strengthening the relevant existing legislation, enacting new laws, where they do not exist, and establish long-term policies and action programs (UNCCD, 1995).^[6]

Desertification of India

On June 8, 2014, a 63-year heat record was burned away with temperatures reaching 118°F, in what can only be described as an inferno in India. Resulting in hundreds of deaths, blackouts and riots, the unbearable heat wave in India is a symptom of a larger problem.

The Indian minister for environment, forests and climate change, Prakash Javadekar, has stated that a quarter of India is turning into desert. As the second most populous country in the world, the desertification poses as a serious problem as it threatens agricultural land quality and food security. Although India was believed to undergo desertification, previous estimates were nowhere near as drastic as reality. In 2007, India's Council of Scientific and Industrial Research predicted that by 2050 approximately 10 percent of India's land would become unusable as a result of desertification.

The vulnerability of India's land is significant. Also in 2007, the Indian Space Research Organization found in their report that 69 percent of India's land was dry enough to make it vulnerable to water and wind erosion, salinization and water logging. Despite warnings, the most recent announcement by India's environmental minister has come as a shock. What is described as the loss of productivity, land degradation in India is now estimated at 105 million hectares, 32 percent of all of India's land. One of the leading causes for the rapid desertification of India's lands is the overuse of lands and excessive grazing. Featuring 17 percent of the world's population on only 2 percent of the world's tertiary land, the overuse of land is a somewhat inevitable result. India has typically been able to support its massive population with its agricultural land. The changing rainfall patterns caused by climate change have become more erratic and have resulted in overall lower amounts of precipitation. Receiving 80 percent of its precipitation from the monsoon season, the increasingly interspersed and extreme rainfalls have provided less relief and have become more deadly.

In 2009, the Indian Meteorological Department found that the city of Mumbai has experienced a temperature increase of 1.62°C over the last 100 years and a tripling of natural disasters that will affect the city in 30 years. Increased desertification can also be attributed to other factors, including man-made influences. The loss of vegetation has been largely led by deforestation, cutting beyond permissible limits, unsustainable fuel wood and fodder extraction, shifting cultivation, encroachment on forest lands, forest fires and overgrazing. Land degradation has also been a result of the cultivation of lands with low potential or high hazard risks, the failure to adopt adequate conservation soil measures, improper crop rotation, extensive use of agro-

chemicals, the inadequate planning and management of irrigation systems and excessive extraction of groundwater.

However, there may be a possibility of desertification curtailment. Javadekar says that although many areas are on the verge of becoming deserts, it can be stopped. The threat of desertification will affect all of India, especially those in poverty. For many, the toll of climate change has already been felt. With the bleak future of barren lands, the situation of those in poverty will only continue to worsen. The warning of India's environmental minister must be heeded if India is to prevent the incoming wastelands.^[7]

Causes of Desertification

Desertification is caused by a number of factors, which have been the subject of significant debate. One can generally distinguish between climatic factors such as natural disasters and human factors such as *salinization* of water sources or overexploitation of biological resources. Climatic variations have significant impacts on dryland soils because they are inherently vulnerable to desertification processes as they already have low levels of biological activity, organic matter and aggregate stability. Indeed, dryland soils become increasingly susceptible to accelerated erosion by wind and water as plant cover decreases.^[8]

Human actions constitute the other major cause of desertification. While the data concerning human impacts on drylands is not good, a number of trends and factors can be highlighted. The direct human-induced causes of desertification include overgrazing, over cultivation, deforestation and salinization on irrigated cropland. One estimate of the direct causes of degradation allocates, for instance, the responsibility to overgrazing (35%), deforestation (30%), other agricultural activities (28%), overexploitation of fuel wood (7%), and bio-industrial activities (1%). Generally, human-induced desertification is caused by the intensification of land use. This is also linked to broad structural changes such as increasing population densities, local socio-economic development, distribution of property rights over land, and the unfavorable impacts of the international economic order. Population growth and migration to dryland areas have often been branded the primary culprits of land degradation. While increasing human population is bound to increase the pressure on natural resources, especially in situations where the basic necessities of life are not available, the relationship between population and desertification is not clear-cut.^[9]

Drylands suffer from extreme variability in precipitation, water stress, high evapotranspiration brought on by high air temperature and low humidity, as well as low soil fertility due to low deposition and decomposition of organic matter (UNEP 2012).^[10] This predisposition of drylands to degradation is further influenced by human-induced environmental changes and pressures, and the complex nature of these interactions. Factors such as overgrazing by livestock, deforestation and degradation, water stress, land use change including widespread conversion of forests and rangelands to croplands significantly impact productivity in the innately vulnerable dryland ecosystem. The causes of desertification, in general, may be divided into proximal and distal reasons. The proximal reasons are biophysical not only in terms of the vulnerability of soil due to topography and climatic factors such as temperature, rainfall and wind, but also due to unsustainable land management practices. The distal reasons that precipitate or exacerbate land degradation are far more systemic including weak institutions and poor governance, policy and market failures, demographic and socio-economic factors, and the impacts of globalization.^[11]

The following are some of the primary causes of desertification in our world-

- (1)Overgrazing
- (2)Unsustainable agriculture techniques
- (3)Deforestation
- (4)Unsustainable water management
- (5)Overpopulation and Overexploitation of natural resources
- (6)Urbanization and development of tourism
- (7)Famine poverty and political instability
- (8)Climate change.^[12]

Impacts of Desertification

Desertification is unanimously acknowledged to have significant adverse impacts for affected populations and affected countries. It is associated with accelerated soil erosion by wind or water, salt accumulation in soils, reduction in species diversity and plant biomass and reduction in overall productivity of dryland ecosystems. It often leads to the conversion of usable drylands to land that is unable to support agriculture or settlement. The loss of soil fertility constitutes one of the major socio-economic impacts of desertification with direct repercussions on yields, food production, and people's incomes. In turn, this directly contributes to the exacerbation of poverty, to migration or displacement and social breakdown with the resulting political instability that this can bring about. Losses in productive capacity caused by desertification—which include production lost because of human-induced land degradation and the cost of rehabilitation—are difficult

to estimate but are of significant magnitude. The United Nations Environment Programme (UNEP) estimated, for instance, for 1991, losses amounted to \$42.3 billion(31,36,29,54,30,000Rs).

Desertification also has a number of environmental consequences. These include a loss of endemic animal and plant species. Despite the perception that drylands are not rich in biodiversity, it is remarkable that a number of the most important food crops on which humankind relies such as wheat, barley and millet originated in arid or semi-arid lands. Land degradation also reduces resilience to climatic disturbances such as drought or human-induced impacts such as overgrazing. Further, it can also contribute to flooding and sedimentation.^[13] In the introduction of a document called 'Desertification: The invisible frontline' from UNCCD is stated: **"Desertification is a silent, invisible crisis that is destabilizing communities on a global scale."**

The following are some of the primary impacted of desertification in our world-

- (1) Vegetation is damaged or destroyed
- (2) Soil become infertile
- (3) Soil erosion gets worse
- (4) Increased vulnerability to natural disasters
- (5) Polluted sources of drinking water (6) Rise of famine, poverty and social conflicts (7) Forcing mass migrations
- (8) Caused historical collapses of civilizations
- (9) Extinction of species^[12]

II. CONCLUSION

Desertification is a natural disaster which has been made worse by human activities. Efforts are being made from the world level to solve this ecological problem. To prevent the spread of desertification, the warming of the earth has to be reduced by reducing the environmental imbalance. Therefore, the guidelines have been set in the Kyoto Convention 1997 and the Montreal Protocol 1998. Under this, there was talk of a complete ban on the use of perishable gases, including CFCs, by 2010. Due to this consensus, emissions of these gases have decreased but have not improved to the expected level.

An international campaign called Oasis to tackle the problem of desertification was launched by Future Harvest Center, Consulting in International Agricultural Research (CGIAR). Under this, the program of the United Nations was implemented by the participation of various research institutions and regional voluntary institutions, private sector, local governments and farmers in all developing countries. Oasis aims to promote science and advanced agricultural technology to ensure sustainable development to prevent desertification. This is related to the use of biotechnology and use of improved seeds in areas of low rainfall. Apart from this, farmers will be motivated for proper use of fertilizers and diversification of crops in such areas.

Many programs and efforts are being made by the Government of India and the State Government to prevent desertification, including Integrated Wasteland Development Program (1989-90)^[14], Drought Prone Area Program (1973)^[5], Desert Development Program (1999)^[6], Hariyali Yojana (2003) are prominent. To solve this ecological problem, it is necessary for all of us to be aware and this problem can be limited by government, social efforts and proper management.

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