Chapter 10
Potential Impacts of Climate Change on Land Degradation and Desertification:
Land Degradation and Climate Change

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ABSTRACT

Land degradation and desertification have been graded as a major environmental and social dispute in most of the emerging countries. Changes in temperature, wind speed, and precipitation patterns will influence plant biomass production, land use, land cover, soil moisture, infiltration rate, runoff and crop management, and ultimately, land degradation. Close relations between climate change and land degradation processes have been perceived in the past decades. Climate change models and land use models should be combined with hydrologic/erosion models to accurately compute or predict climate change impacts on land degradation. This chapter introduces the advancements in modeling of impact of climate changes in land degradation and need for the critical investigation to better understand and forecast the responses of land degradation processes to a changing climate in the future.

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INTRODUCTION

Land degradation is a process of deterioration of land caused by extreme weather conditions and human activities that pollute or degrade the quality of land and negatively affect the food production and livelihoods of the people. According to United Nations Convention to Combat Desertification (UNCCD), desertification is the degradation of land in arid, semi-arid and dry sub-humid areas resulting primarily due to human events and climatic variations. Land degradation and desertification is based on time dimensions which vary over a period of years depending on climatic factors such as drought and floods. These studies are conducted at regular interval by mapping the features of large areas which can be assessed effectively using Earth Observation (EO) data's and techniques are used by different researchers and mapped the different degradation /desertification processes (Symeonakis & Higgin bottom, 2014; Dharumarajan et al., 2018a; Dharumarajan et al., 2017c). The indicators of desertification such as soil erosion, vegetal degradation, salinization, water logging etc. can be derived from remote sensing data. Several remote sensors have become available during the past 30 years, with the potential to provide useful information for assessing land degradation (Metternicht et al., 2010). The interpretation of remotely sensed data for monitoring and evaluation of land degradation along with field investigation provides valid datasets for proper planning (Dharumarajan, Lalitha, Vasundhara, & Hegde, 2016; Dharumarajan, Bishop, Hegde, & Singh, 2018b). Different countries are preparing time series land degradation and desertification maps in order to identify the more vulnerable areas for preparation of action plan. Recently India published report cum Atlas on land degradation and desertification mapping of India which shows 29. 32% of total geographical area in India (Table 1 and Figure 1) is affected by desertification and land degradation processes (SAC, 2016).

Land degradation is a global issue affecting both developed and developing nations. Most of the severely affected countries are developing countries and they are already economically disadvantaged and their scope to withstand any downturn in productivity is limited. Global efforts to understand how climate variability has contributed to resource damage and how current and future climate change may further exacerbate the damage are critical for economic and environmental sustainability. There is a clear need for continued research into global and regional climate systems, seasonal climate forecasting, climate trends, risk assessments and communication of those risks to land managers. Decision support tools and policy development based on sound science are prerequisites for the sustainable and productive use of lands.

DIFFERENT PROCESS OF LAND DEGRADATION/DESERTIFICATION

Water Erosion

Water Erosion is detachment and transportation of soil mainly due to rainfall and surface runoff water. Flowing water carries organic and inorganic particles long with soil which deteriorate fertility of land. Severity level of erosion varies with soil type and land covers. The sheet erosion (mostly within agricultural lands) and rills are considered as slight erosion, whereas gullies and ravines are considered as severe stage of erosion (Figure 2).