

Optimal Control Applied to Dynamic Model of Climate Change: A Bangladesh Scenario

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Abstract

In recent years, mathematical modeling in terms of nonlinear dynamical systems has become the essential tools in describing and analyzing the changing phenomena of the environmental as well as ecological systems. The harmful effects of climate change on the ecosystems and environment due to global warming are the most crucial concern worldwide. Bangladesh is one of the most vulnerable countries not only in the South East Asia but also in the world. It is predicted that a large portion of the South-western region of Bangladesh will go under sea in the next 50 years due to sea level rise. Our aim in this paper is to study a mathematical model of climate change in terms of ordinary differential equations (ODEs) to discuss the potential impacts of climate change in Bangladesh and its aftermath on the ecosystems. The optimal control techniques in the form of Pontryagin Maximum Principle (PMP) has been used to investigate the control strategy of the emission of greenhouse gas (GHG). We study the model numerically using some known nonlinear ‘optimal control solvers’ and the results are illustrated with numerical simulations.

Keywords

Global warming, climate change, ecosystems, harmful effects, mathematical model, optimal control, maximum principle.