

## Climate Change and Economic Development: SEA Regional Modeling and Analysis

*by Jamie Sanderson and Sardar M N Islam*  
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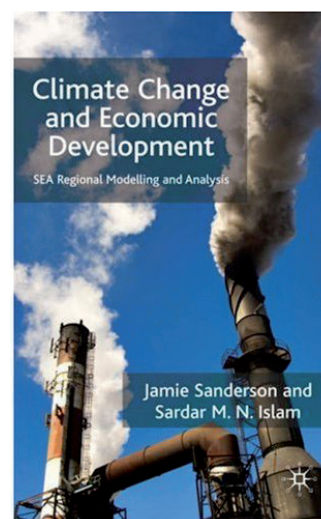
The environmental, social and economic problems associated with climate change present a unique policy challenge to every nation on earth. South East Asia has been developing rapidly in recent decades, and this presents both problems and opportunities for climate change issues. Of particular relevance are two major sectors, deforestation and energy, and the emissions from these sources in the region that is growing at higher rates than the global average. The effects of climate change are experienced by the entire nation, and all sectors of the economy – most notably agriculture, energy, and transportation – are affected. Essential infrastructure that affords us reliable services (such as water supply and water treatment) and high standards of living is impacted; and ecosystems (such as forests, rivers, and lakes) on which quality of life relies also suffer.

The effects of climate change will likely place immense strain on public budgets, particularly as the cost of infrastructure maintenance and replacement increase. At the same time, economic losses may translate into lost tax revenues. As a result,

public officials may need to raise taxes or cut services.

The indirect effects of climate change have rarely been quantified, though they are substantial. Such effects may present in the form of higher prices for products, because the prices of raw materials and energy, transport, insurance and taxes increase. As the costs for doing business increase, competitiveness of individual firms, entire sectors or regions may decline. With this decline may come a loss of employment and overall economic security.

Climate change remains as one of the challenges in the field of environmental and development economics. Developing countries/regions are at great risk from any climate change as it affects the policy of sustainable development which is crucial for any country. The book “Climate Change and Economic Development” focuses on the South East Asian (SEA) region and ex-



amines the region's vulnerability to the impacts of climate change, forecasts the environmental and economic outcomes for the region arising from its vulnerability and also the opportunities these factors provide for policy actions towards alleviating climate change vulnerability, particularly through adaptation. From a collection of regional sectoral data on various potential impacts of climate change, an aggregate impact estimate for South East Asia is given in the book which indicates that economic output will get reduced by 5.3 per cent for climate change conditions where atmospheric concentrations of carbon dioxide are double the pre-industrial level. For estimating the impact, the South East Asia Dynamic Integrated Climate and Economy (SEADICE) model is used. Using the modeling results and arguments, climate change policy recommendations have been made for the mitigation policy over the next decade.

\* The pursuit of clean development mechanism projects that will deliver foreign direct investment and technology transfer benefits and

\* Focus on no regret mitigation policy options through demand side management techniques, concentrated in the energy and forestry sectors of the economy. The policy recommendations for both mitigation and adaptation are not controversial; however, in this instance they have been supported by research based on the two aspects of literature, namely climate change impact on developing regions and climate change adaptation.

The main objectives of this book are to provide an aggregate economic impact estimate for South East Asia under two fold carbon dioxide conditions, generate forecasting result from Dynamic Integrated Climate & Economy (DICE) model that will provide policy makers insight into the economic impact that climate change might have on major economic variables, and explore adaptation to climate change as a concept and attempt to incorporate climate change adaptation

into the dynamic optimal control economic model put forward in this book.

Various impacts of climate change on economic development have been observed in the SEA region. According to estimates, there was a 1.13 per cent negative impact on GDP for SEA as a consequence of sea level rise (SLR) associated with 2.5 degree celsius warming. Climate change has affected the agriculture sector of the SEA as the estimate is found to have negative values for baseline, optimistic as well as pessimistic scenarios. In the same way, it has negatively affected the coastal, health, ecosystems, natural settlement, natural disaster and other vulnerable sectors.

The overall impact can be observed from the fact that estimated values range from the impacts of -2.6 per cent for the optimistic to -6.3 per cent for the pessimistic scenario. Meanwhile the baseline impact total is -5.3 per cent.

The implementation of the South East Asia DICE Model (SEADICE) is the focus of this book. The main findings of this book are that the Dynamic Integrated Climate and Economy Model (DICE) can be successfully modified to represent the impacts of climate change on a particular region such as SEA. This model was chosen for several reasons such as ease of use, and dynamic and optimal results. The SEADICE model differs from the DICE model in that many of its parameter values uniquely represent SEA and the region's emissions are separated from global emissions.

The book also covers a great deal of ground in the area of adaptation to climate change. It has been explained that the adaptation concept can have many meanings in many different disciplines, which has the potential to lead to confusion when applying the concept in any intellectual framework. Here adaptation is split into two: planned adaptation and autonomous adaptation. Planned adaptation occurs primarily in an anticipatory way at a group level, while autonomous adaptation occurs primarily in a reactive way at an individual level. Here it is also found that the level of technologi-

cal progress and therefore autonomous adaptation could be an important factor to consider for models of climate change impact. One more key point is that the economic growth models with endogenous technical progress are more likely to represent autonomous adaptation to climate change.

This book also considers the options for mitigation policy action in SEA. Mitigation is the act of reducing greenhouse gas emissions with the goal of preventing climate change. To achieve this, the main mitigation policy options of Clean Development Mechanism (CDM), emissions trading, joint implementation, carbon tax and no regrets are all explained and their relevance for the countries of SEA discussed.

Besides this, the options for adaptation policy are also taken into account. Adaptation is the act of reducing vulnerability to the effects of climate change. It is recommended that a regional institution be used to combine the scientific and economic resources for the task of identifying adaptation policies. Because of its resources, capabilities and proven record on environmental issues, it is

concluded that ASEAN be promoted as the institution with the responsibility for the coordination of adaptation policy identification in SEA.

Along with several advantages the book has some limitations as well. The most important limitation is the high level of uncertainty behind the science and economics of climate change. The other major limitation is the use of the SEADICE model, which bears the problem of substantial data unavailability.

However, the book is timely as it addresses crucial issues such as climate change economics, macro economic impact estimates, modeling with practical applications to adaptation in SEA etc. It explores aspects of climate change economics that have been neglected and are only recently receiving recognition in the literature, in particular the aggregate economic impacts of climate change on a developing region and the economic representation of adaptation to climate change. The book will be of immense interest to students, researchers and policy makers in the field of climate change and economic development.