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Introduction

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Global warming as a result of excess production of greenhouse gases has been on the forefront of scientific debate in the last decade. The United-Nations-sponsored Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 was the first international platform at which these issues were discussed. The predicted increase in global temperatures was expected to seriously affect natural environments, affecting the balance of ecosystems and threatening the livelihoods of thousands of people. Because of much uncertainty, fuelled by incomplete climate models and the potential costs of mitigating measures, few governments at that time were prepared to take measures to counteract or reduce the predicted effects or consider reduction of gas emission rates. This has now changed with the activation of the Kyoto Protocol of the United Nations Framework Convention on Climate Change. This protocol became active in February 2005 and recognizes the harmful effects of greenhouse gases on the environment.

One of the undesired side effects of climate change is the change in geographic distribution and intensity of transmission of vector-borne diseases such as malaria, leishmaniasis, dengue fever and Lyme disease. Several studies have predicted that under the most conservative estimate of change, these diseases will shift their boundaries to higher latitudes or altitudes, benefit from changes in precipitation and possibly increase or decrease in incidence. The vectors (insects and ticks) of these infectious diseases are cold-blooded, and their distribution is confined by a temperature range outside which environmental conditions become hostile. The parasites that they transmit usually benefit from increased temperatures, as the development rate of them is then also increased. Much of this work has remained speculation in view of the uncertainties associated with the predictions of climate change. It seems, however, prudent to examine the potential effects on health under the predicted changes, because millions of people and animals might be affected by changes in disease risk. For example, a slight rise in ambient temperature and rainfall can extend the duration of the season in which mosquito vectors are transmitting disease with several weeks. In turn, this may affect a larger fraction of the population compared to the current situation. Governments, then, need to be prepared to invest more in preventive health care and curative measures than would be the case if business were as usual.

In November 2003 we organized a workshop on Environmental Change and Malaria Risk. Participants of the workshop were drawn not only from the world of malaria but also from scientists active on the more general effects of climate change on ecology and from those working on other vector-borne diseases. Papers presented at the workshop are included in these proceedings, which give a broad overview of the problems, as well as in-depth insights in specific aspects of global change and disease

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risk. From the combined work presented here it becomes clear that many of the models used for the prediction of the effects of climate change on health need to be verified by field work. However, the models all serve as a framework from which questions pertinent to the specific issue can be developed. We hope that the enclosed work will serve as a stimulus for others to refine the models and to undertake field work needed to strengthen and substantiate the theories that predict the effects of climate change on health.