EBI K. L., BURTON I., McGREGOR G. R. (eds.), 2009,
BIOMETEOROLOGY FOR ADAPTATION TO CLIMATE VARIABILITY AND CHANGE,
United Kingdom, Springer, 281 pp.

This is the first comprehensive publication on biometeorology since Advances in Bioclimatology vol. 5, published in 1998. In between that time, the only up-to-date information on the subject was from the proceedings of the Biometeorological Congresses and International Journal of Biometeorology. The purpose of writing this book was to convey the interdisciplinary philosophy and the science of biometeorology to as wide an audience as possible, especially on the subject of adaptation.

The book "Biometeorology for Adaptation to Climate Variability and Change" is written by the finest experts in biometeorology. It is meant to provide a survey of the most interesting ideas, present investigations, as well as directions and hints for the future. This is why the reader will not find here 'historic' studies and results, but only the biggest recent projects. The language used throughout the book is more in the educational style than in a scientific style.

The book consists of 12 chapters. In the context of the challenges a changing climate presents, the core areas of biometeorology are included: human thermal environment, early warning systems against oppressive weather, plant and animal biometeorology, tourism, water resources and psychological aspects of weather and climate as well as theoretical aspects of adaptation.

The most noteworthy part of the book starts with the second chapter in which Gerd Jendritzky and Richard de Dear present the issue of human adaptation to a thermal environment. Biological mechanisms and the plans to define the Universal Climate Index *UTCI* which is now already developed, are also included. In the second chapter, there is some attention devoted to the anthropogenic climate modification and biometeorological conditions in the urban climate.

The next two chapters deal with Warning Systems of heat waves and malaria. Laurence Kalkstein and Scott Sheridan present sophisticated heat/health watch warning systems (HHWWS) that have become more widespread in recent years. Evaluated in the United States in 1990, Heat Index and Humidex aim to warn against strong heat waves that cause higher morbidity and mortality rates. At the beginning of the 21th century, the warning systems were changed to be more synoptic-based. Nowadays many cities in USA, Italy, Canada, and China use HHWWS that employ the Spatial Synoptic Classification. This is a very good example of putting science into practice and saving lives.

Kristie Ebi describes malaria as the most important vectorborne disease in the world. The problems with creating and implementing an effective

Malaria Early Warning System in less-developed countries is described. In sub-Saharan Africa malaria remains the most common parasitic disease. It is the main cause of morbidity and mortality among children under 5 years of age. Malaria causes 3 million deaths annually in Africa. Climate is one of the most important determinants in the incidence of malaria. Both long- and short-term climate forecasts are the principal components of early warning systems. However, forecasts need to be accurate enough to describe microclimatic conditions, which are especially important in the case of vectorborne diseases. Such forecasting involves the question of sufficiently accurate predictions of rainfall in areas where meteorological stations are widely spaced. Despite many uncertainties, there is no doubt that early warning systems are of a great importance and there is a need for their development.

The comprehensive chapter 5 is dedicated to the rising problem of plant-induced human allergy, and suggestions for adaptation are given. Allergy affects about 500 million people and many of these people are allergic to pollen. Rhinitis, conjunctivitis and asthma are strongly correlated with areas where there is a concentration of pollen. These pollen intensive areas are, in turn, highly dependent on the weather. Climate change may shift the boundaries of species range and as a result, modify the local spectra of allergenic pollen. Therefore there is a need to provide detailed forecasts of forthcoming pollinating seasons. Such forecasts should be based on universal parameterizations and include the possibility for adjustment of the model setup using real-time observations of future climate.

Chapter 6 and 7 deal with plant and animal biometeorology and its response to climate challenges, which is not a part of this review.

The parts 8 and 9 deal with two economy sectors that are highly sensitive to climate change: tourism-recreation and the water sector. Daniel Scott and colleagues present the tourism-recreation sphere which is recognized as the sector that is supposed to be the fastest in response to climate change. But there is an notion that information about the effects of climate on tourism among investors and workers of this sector, is inadequate. This section includes the survey of governmental campaigns for the adaptation of climate change strategies e.g. in agriculture, building standards (heating and cooling), coastal management plans,

emergency management (warning systems) etc. Also, the role of public education was emphasized. All of those areas are strongly connected with business. Chris de Freitas next takes a look at how the water sector and its management practises is adapting to climate change. The basic question is whether a warmer climate in the future will intensify the hydrological cycle that determines the global distribution of water resources, and what will be that type of intensification? Forecasting rainfall is much more difficult than forecasting air temperature. This is why adaptive actions to climate change are much slower in the area of hydrology and water resources than in other fields. The author presents a wide range of 'supply-side' actions (where the focus is on increasing capacity) and 'demand-side' actions (where the focus is on managing demand, and changing various practices). He also provides classification of such adaptive options as: technological, behavioural, economic and legal adaptive measures.

The next chapter presents psychological perspectives on adaptation to weather and climate which is something that geographers and climatologist are not accustomed to. Here the whole perspective is based on the Protection Motivation Theory created as a model of disease prevention. This model could be successfully used to better understand human adaptation to climate change. The Protection Motivation Theory consists of three main components: information sources (from the environment or from intra- and interpersonal sources), cognitive mediating processes (threat assessment, adjustment and coping appraisals, assessment of response costs which are strongly associated with protection motivation – different in every person), and adaptation mode. Understanding the human decision making and action-taking processes is very important for all warning and emergency systems responsible for saving people in dangerous situations.

The next section takes a look at the future. Firstly, Andris Auliciems takes us to a higher perspective, to look at the perceptions of human adaptation to climate change within a paradigm of climatic determinism. He presents a theoretical construction for thinking about the impacts of climate and human response, the principles of human adaptation to atmospheric variability, and the unknown future adaptation to the climate. A very interesting discussion is presented about the Intergovernmental Panel on Climate

Change (IPCC). The author makes us consider the scientific objectivity of this body. He describes IPCC as an organization engaged in improving the environment but also interested in retaining political support, prestige, and financial support. He discusses the scientific basis of using models as well as results which depend upon the emissions scenario, with estimates of the air temperature by the end of the century rising to within the range of 0.6°C-4.0°C. He states "within a human generation, highly speculative models and hypotheses have been elevated by consensus to theory status". Apart from the individual opinions of each climatologist on 'more natural' or 'more anthropogenic' causes of climate change and the scale of climate change, the arguments presented in this chapter are significant and worth being fami-liar with.

The last chapter is written by three editors of the book. This chapter summarises the contents of the whole book. The areas biometeorology needs to be involved in and explore are noted, especially those areas in which society needs help to better understand and adapt to an uncertain future climate. This chapter also emphasizes the new, reliable data on climate change, climate--human relations, and the need to create new models for studying the complex interactions between the different sectors of the economy and climate changes.

The strength of the book lies with its authors who are experienced, well-known and involved in the practise of biometeorology. But the authors are also the weakness of the book because the authors mainly present the results of their own studies or the studies in which they were involved, which puts a constraint on the range of information presented. The most visible gap is urban biometeorology presented as one separate chapter. There are some issues of urban climate in chapter 2 and 3 but they are only scattered mentionings rather than a complete picture of the subject. A drawback is the publication's high price (c. 108 £ paper back or 75£ as e-book).

This book could be recommended to all interested in climate change, adaptation, climatology, biometeorology but also human studies, and to all engaged in creating warning systems against hazardous weather phenomena. The book is for students who are just starting to study biometeorology to scientists who find many new sources in the wide lists of references appended to each chapter.

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GEOGRAPHIA POLONICA

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