

Preface

Inducement for the Book

A breakthrough in soil evaluation was achieved in the year 2006. The working group, Soil Classification of the International Union of Soil Sciences, published a new version of the World Reference Base of Soil Resources (WRB) for improving international communication about soils. It enabled an apposite name to be allocated to all soils of the globe. This name characterises typical features of soils and the processes behind them.

At the same time discussion about the need to improve public awareness about the functions of soils for humankind had reached a climax. It seemed to be difficult or even impossible to characterise soil functions using globally valid evaluation schemes. This was a momentous occasion for the editors and some of the authors of this book to remember a vision of the Russian geographer V.V. Dokuchaev (1846–1903), the father of modern soil science. He pointed out that the findings of soil science needed to improve the food security of the population. According to his vision, the characterisation and classification of soils should focus on characterising and maintaining or even improving their fertility.

Interesting work was carried out by scientists from the United States, Australia and New Zealand to evaluate the performance of soil for cropping and grazing. Russia, too, has long-standing traditions in such work. The approaches had a clear focus on soil structure but did not closely correlate with crop yields outside of their home areas, because other soil and climate factors dominated, such as drought.

Based on all these considerations the framework of the Muencheberg Soil Quality Rating (M-SQR) was born: a system which allocates fertility numbers to soils. Now we had a combination of two tools available to characterise soils by meaningful names and by their fertility potential. We were keen to test the feasibility of the M-SQR along with the WRB in very different climate and soil regions. The Russian partners and the German Federal Office for Agriculture and Food (BLE) were very open for this idea. In 2007 the project 05/07 “Indicators of fertility and function of agricultural soils” got started. It enabled joint fieldwork about soil

classification and evaluation on numerous agricultural sites in both countries. The main partners were the Institute of Soil Science and Agrochemistry (ISSA) from Novosibirsk, Russia, and the Leibniz Centre of Agricultural Landscape Research (ZALF) from Müncheberg, Germany. Two years later the Pryanishnikov All Russian Research Institute of Agrochemistry (VNIIA) Moscow joined this project. Many sites studied and sampled were in Siberia.

Another small-budget project “Effect of climate change in boreal and sub-arctic ecosystems on water quality and soil functions, code 01DJ12058” was supported by the German Federal Ministry of Education and Research (BMBF) and enabled this cooperation between ZALF Müncheberg and ISSA Novosibirsk to be deepened jointly with IWEP Barnaul during 2012–2013. Overall, more than 15 joint publications appeared as an outcome of both projects.

Contacts deepened, and the network of researchers became broader. Gaps in the knowledge became clear and interest in closer cooperation accrued. However, first it was necessary to combine the numerous results, to interlink them with other running projects and extremely innovative activities, and to make them available for application in research and practice. That is the intention behind editing this book.

The focus on Siberia was obvious because of the exciting, remote landscapes and their great potential for the future of the population and of our whole planet. Land degradation and desertification are threats there which will have implications not only for food security but also for water resources and their quality, for biodiversity, the livelihood of the population and other crucial targets of landscape development and evolution. We put the emphasis on the unity and interactions between land and water, their resources, functions and quality. Reliable data are required about the status of land and water resources based on advanced, internationally proven and acknowledged methods.

One of the most important recognitions of our project activities was that many scientific and practical solutions for monitoring of land resources are available in Europe but not yet in Siberia.

All this is to be revealed in detail and some more eyes must be opened to see the potential improvements and the need for them. Learning from neighbours and cooperating with them helps to avoid same mistakes that they have already made, and it helps to save time and money. Based on the knowledge and technologies presented here, it is the responsibility of the current generation of scientists, decision-makers and other stakeholders that practical measures of monitoring and sustainable resources have to be taken.

Purpose of the Book

This book summarises the outcomes of the above-mentioned projects and of a number of other recent studies related to the topic of land and water monitoring and management. It is intended to be a source of information for all those dealing with its subject: methods for the characterisation and wise utilisation of land and water

resources in Siberia. Besides information, it aims to deliver motivation for thinking about applications and new site-adapted solutions. It will also provide understanding and confidence that those better solutions are feasible based on the power of scientific-technical innovations and people's creativity and efforts in handling them.

The book will not overfeed readers with facts and data. The main intended innovation of the book is its focus on transferrable novel methods. Scientific tools will be proposed for measuring, evaluating, modelling and controlling processes in the landscapes of Siberia, especially in rural landscapes. The application of these new scientific tools requires not only open minds but also high levels of motivation and education. In some cases investments are needed. Thus, outreach and the adaption of new methods can only be realistically carried out in the framework of pilot studies based on further strengthened international scientific cooperation. The book is to serve as an advanced platform for new and more sustainable research cooperation between inventors and protagonists of new methods coming from different leading research institutions of Russia, Germany and other regions of the globe.

Content and Structure

The book offers a broad array of methods to measure, assess, forecast and control land and water resources: laboratory and field measurement methods of water and soil quality, methods of resource evaluation, functional mapping and remote sensing methods for monitoring and modelling large areas. It contains methods for ecosystem modelling, and the field monitoring of soils, and methods and technologies for optimising land use systems.

The book has 32 individual chapters in four parts and seven thematic clusters. In order to focus on the scientific value of individual chapters and the expertise of their authors, the editors have decided to keep the structure on a flat level of hierarchy and to allocate the chapters to four parts of the book only. These are

Part I, "Environmental and Societal Framework for Monitoring and Managing Land and Water Resources". It analyses the status of land and water resources in Asian Russia, evaluates the agri-environmental research and points out gaps in the knowledge.

Part II "Methods and Case Studies for Understanding and Monitoring the Landscapes of Siberia", presents further advanced research studies from Siberia about water and land monitoring and their methodologies.

Part III "Novel Approaches and Technologies of Application Potentials for Siberia" offers methods developed outside Siberia, but with great potential to be applied there in the near future.

Another Part IV "Synopsis and Overall Conclusions" consists of the chapter "Potential of Applying Novel Monitoring and Management Methods to Siberian

Landscapes” It reviews all thematic clusters and their individual chapters, summarises the overall book and draws conclusions for the application of novel methods.

Readers and Authors

Our addressees are scientists, planners, teachers, students, decision-makers and all readers who feel responsible for initiating the sustainable use of resources by scientific-technical innovations. Readers will gain some information and inspiration for their own work from this book. Based on this, they are encouraged to find their individual optimum when drawing conclusions and acting imaginatively.

Readers are also encouraged to contact the authors for more information. The chapter authors are pioneers behind novel methods, as well as being innovative and experienced scientists. Most of them come from Russia and Germany, others from different regions of the globe. Possible divergences between the findings, conclusions and statements of individual authors are natural. Data given in the various chapters of this book may include slight uncertainties, biases and inconsistencies. The editors have made no attempt to harmonise them because this is natural and reflects the different sources and local and temporal scales of the data. The chapter authors’ conclusions do not necessarily need to coincide with the particular opinion of the editors. Chapters reflect the views of their author, and editors cannot be held responsible for any interpretation which may be made based on the information contained therein.

It is important to mention that in some chapters, trade names are used to provide specific information about proven technologies applied in the study. Mentioning a trade name does not constitute a guarantee of the product by the authors or editors. It does also not mean a preference for, or recommendation of this product.

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Ms. Anne Koth (Dresden) proofread the chapters with prudence and expertise. The Springer publishing house ensured that the editorial and printing process was smoothly managed and completed. The editors would like to thank all funding bodies and other supporters for their help and engagement.

It was our pleasure to serve as editors of this book by coordinating and reviewing the written concepts and findings of motivated, enthusiastic scientists. We hope that our book can contribute to initiating the sustainable use of the land and water resources in Siberia.

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