Introduction

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Part 1 of the book contains six chapters on energy matters. **Part 2** of the book is devoted to water issues.

In **chapter 1**, Erno Schaaks (Universiteit Maastricht) analyses wind turbines along the borders of the Euregion Meuse-Rhine, in particular the access by NGO's to the administrative courts in the event of cross-border environmental disputes arising from the negative environmental effects of wind turbines. Wind energy is currently a much-discussed topic, including in the Euregion. Environmental organizations are not always happy with the construction of wind farms; conflicts may arise, especially when such installations are sited close to the border with a neighbouring country, between those responsible and the authorities in that country.

Schaaks examines one legal aspect of wind energy generation in the border area of the Euregion Meuse-Rhine, namely the legal position of environmental organizations as regards access to the administrative courts in the neighbouring country in the event of cross-border environmental disputes arising from the negative environmental effects of wind turbines in the Euregion. The author concludes that this issue is not dealt with in the same way in all the countries making up the Euregion. Despite the Aarhus Convention and the EU legislation based on it, tension is likely to remain between unrestricted access to the administrative courts in a neighbouring country and the principle of subsidiarity invoked by the separate states.

In **chapter 2**, Barbara Wijnands (Universiteit Maastricht) reports her study on the liberalisation of the European electricity market from an historical and legal point of view. Her contribution examines the liberalization of the electricity market in detail. It shows the disagreements on the European level in the 1980s but also the fast progress made in the 1990s. It further discusses Directive 2003/54/EC which only recently entered into force.
The effect on the legislation of the three Euregion Meuse-Rhine countries is also discussed. Germany was the first country to achieve a fully liberalized electricity market, followed on 1 July 2004 by the Netherlands. The Belgian market is liberalized on federal level but on regional level not all customers are yet eligible. Still, comparing the current situation to that of the 1980s it is amazing to see how much has been achieved.

The liberalization of the electricity market is still young and has to proof whether the object from the Lisbon Strategy of making the European Union more competitive market on global level will be reached. Also, the different national electricity Acts are all adopted relatively recently and have to proof that they regulate the electricity markets sufficiently and effectively. Time will show how effective the European legislation implemented in the national legislation will be.

In **chapter 3**, Michael Lülsdorf (Universiteit Maastricht) analyses the liberalisation and integration of the European electricity market and their impact on the electricity markets in the Euregion Meuse-Rhine. The European electricity markets are subject to fundamental changes, which are largely driven by European internal market and environmental policies. Whereas internal market policy aims at liberalising and integrating the separate national electricity markets, environmental policies aim at internalising the negative effects of electricity generation. Accordingly, Directive 96/92/EC laid the basis for the past and current changes in the European electricity markets. Yet, a comparison of the electricity markets of Germany, the Netherlands and Belgium shows that national electricity markets are still subject to major differences.

These national differences can also be observed between the electricity markets in the different partner regions of the Euregion Meuse-Rhine. These national differences represent significant obstacles for Euregional market integration. In additional to national differences, a lack of cross-border information exchange and intelligence are made responsible for the low level of Euregional electricity market integration. Finally, general characteristics of electricity consumers might also contribute reasons for low cross-border Euregional market integration. In this regard it was argued that current integration obstacles are potentially more severe between the German, Dutch and Belgian partner regions than between the Dutch and Belgian partner regions. Furthermore it is suggested that cross-border electricity market integration is currently less attractive for household customers than for industrial customers

In **chapter 4**, Thomas Voßen (Rheinisch Westfälische Technische Hochschule Aachen) presents an intercultural and multidisciplinary approach to the water and energy situation in the Euregion Meuse-Rhine, using the perspectives of economy and ecology. The emission trading system presents new challenges to the industry. Before deciding about a strategy on how to deal with emission trading, companies need to know how they can assess their own status concerning energy-relevant issues. This chapter shows general methods of how to get an overview on the energy usage. This is done by examining already existing data for energy-relevant information. Where no data is available, he shows how the basic laws of thermodynamics can be used to calculate the required information. Examples are given on how to use the theory in the industrial environment. Next various approaches to analyse the information are shown. The advantages and disadvantages of top-down, bottom-up and abc-analysis are discussed and an example is presented, in which the results of an abc-analysis are shown. The last section gives ideas about what can be done to improve the energy efficiency. A focus is placed on measures that are easy to implement and do not interfere much with normal production business. Finally some scenarios for the validation of early action measures are shown and how the use of different balancing hulls affects the assessment of early actions.

Europe agreed to reduce its CO_2 emission according to the Kyoto protocol. While the burden for each European country is different, all nations work together to reach the same goal. With the common goal in mind, it is only natural to think of the Euregion as one of the linking regions in Europe. Energy usage reductions will help each nation in the Euregion to improve their economic rating. And together they will achieve their promised goal concerning the protection of our atmosphere. So the ideas and concepts discussed within this paper will be of the same benefit regardless the part of the Euregion where energy savings are made. In the recent times there has been much discussion about the emission trading system. This chapter gives the reader an idea, which tasks a company faces and how to deal with them. Despite all the aspects of the trading part in emission reductions, there is still the need to improve energy efficiency and thereby reduce the operating costs. The author shows where the operator should start with the improvement of his machines.

In **chapter 5**, Richard Radloff (Rheinisch Westfälische Technische Hochschule Aachen) analyses European emission trading for companies in the Euregion Meuse-Rhine. The paper gives an introduction to the problems of greenhouse gases and climate change and describes international climate policy. The European emission trading system, which will be implemented in 2005, is explained as of February 2004. Furthermore, potential effects on companies within the Euregion are described. Scenario analyses, focussing on the energy intensive industry prevailing within the Euregion, will outline potential effects. Finally some operational and strategic tasks for companies are noted.

The European Union is about to have an emission trading system introduced. Emission certificates, of carbon dioxide as well as the main greenhouse gas, will be traded between companies in the EU from 2005. The obligation of emission reductions and the emission trading system will affect companies in different ways. Companies will be affected especially in the Euregion Meuse-Rhine, where there is much energy intensive industry. The numerous uncertainties and lack of experience with emission trading systems make the effects for companies hard to assess. For companies it could be a gain or an unbearable burden.

In **chapter 6**, Nele Stas and Lieve Vanotterdijk (Limburgs Universitair Centrum Diepenbeek) analyse 'phytoremediation' in the 'Kempen area'. The authors conducted research into the feasibility of soil remediation by phytoremediation in the area of the area in the central southern Netherlands known as The Kempen. They worked as follows: first, they explored the theory to comprehend the basics of their study. Second, they investigated whether it is feasible to remediate the soil of The Kempen, which is heavily contaminated with heavy metals, by planting energy crops such as willow and poplar. Willow and poplar, belonging to the so-called short rotation coppice crops, are not only energy crops, but also have the ability to absorb heavy metals from the soil. After the uptake of the heavy metals, the tree can be harvested.

Then energy can be produced from the trees by co-firing them in the Langerlo power plant and thus reduce phytoremediation costs.

Part 2 of the book is devoted to water issues.

In **chapter 7,** Peter Snoeks and Thijs Vanbilsen (Limburgs Universitair Centrum Diepenbeek) discuss the so-called 'Operational Basin Model-Demer' (OBM_Demer). Floods are not only a modern phenomenon; they have always existed, but because of the current trends of urbanization and building on the banks of the rivers there are more and more problems with floods. Floods cause a lot of material and emotional damage and sometimes they even claim lives. Frequently, the victims are surprised by the rapidly rising water and do not have enough time to undertake action. To counteract this, the Ministry of the Flemish Community has decided to set up a project called the "Demer Operational Basin Model", in short, the Demer OBM. This is a computer model that tries to forecast when floods are going to happen so that the authorities can take the necessary steps to limit the damage cause

As society has evolved, it has become more complex, seemingly at an increasing pace. This complexity affects aspects of society and has special relevance for environmental decision making. Not only are citizens re-evaluating the services they expect from the environment and also increasing their willingness to sacrifice other consumption in favour of enhanced environmental services, but the character of environmental issues is becoming more complex as well. Incomplete information, uncertainty, systemwide change, trans-frontier impacts, current causes that have far-reaching future effects and possibilities of catastrophic change. All of this complicates the environmental decision making process.

Decision-makers are left with the problem of evaluating potential outcomes and choosing policies to achieve these outcomes in the presence of this intense complexity. Decisions that are well intended can lead to losses in social welfare as unexpected outcomes develop, or as outcomes have unexpected consequences. Decision-makers therefore have a great need of a framework which structures information in a way which makes the complexity more tractable, but still takes into account the implications of the complexity. Cost-benefit analysis is an analytical tool which has the potential to significantly advance this process.

While society has become increasingly complex, the authors have entered a political era where the social benefits of governmental activities are increasingly questioned. The increase in the unintended outcomes and unexpected consequences resulting from public policy that we have been experiencing has led to an increasing call from many quarters to subject all government programmes to cost-benefit analysis scrutiny, because cost-benefit analysis provides a means of comparing complex projects, even when benefits and costs occur during different periods of time (http://www.ncedr.org).

It appears extremely suitable to conduct a cost-benefit analysis of the Demer Operational Basin Model (OBM-Demer) environmental project, to establish whether the project is economically profitable.

In **chapter 8**, Holger Borchardt (Rheinisch Westfälische Technische Hochschule Aachen) provides an interpretation and evaluation of the data of the Geoecological River Quality Classification Scheme in the Euregion Meuse-Rhine (Geul and Inde River). Data collected according to the Geoecological River Quality Classification Scheme of Northrhine-Westfalia are used to detect areas characterized by man-made bank erosion and areas marked by accumulation of eroded material. Two cross-bordering rivers, the Geul and the Inde, located within the Euregion Meuse-Rhine, the triangle of Belgium, the Netherlands, and Germany, were taken as examples. The catchment areas of these rivers are located on the northern slope of the High Venn mountains.

The results show connections between land use, vegetation, and bank erosion. There are differences between the mentioned countries with regard to land use, the status of the riparian strip, and bank erosion. Grassland dominates the floodplains of the Inde and Geul Rivers, especially in the Netherlands, where a riparian strip is less developed. The riparian strip in Belgium is broader and generally well developed, the proportion of bank fixation is low. In Germany, a high proportion of bank fixation prevents bank erosion.

The Geo-ecological River Quality Classification Scheme comprises deficiencies. For instance, the intervals of the parameters are relatively long (50 % of a 100 m-segment), the possibilities to interpret some parameters in detail are low. The subjectivity of the surveyors leads to deficiencies too. But nevertheless, the Geoecological River Quality Classification Scheme is a valuable tool because it gives a quick overview over the geo-morphological state of a river.

In the last chapter of part 2, **chapter 9**, Catherine Fraikin (University de Liège), presents the results of modelling wave propagation, coastal currents and induced topographic changes. She suggests a model of sea bottom evolution. This model consists of three main parts : the first describes wave propagation, taking simultaneously into account refraction, diffraction and reflection but also energy dissipation caused by wave breaking. This mathematical model is solved by the numerical method of finite volumes, using an iterative resolution (GMRES). Several validations of this model have been carried out on many examples such as harbours of various geometries and depths.

The wave induced currents are computed in the second part, based on the concept of the radiation constraints describing the excess of flux momentum caused by the waves. A model based on the complete Navier-Stokes equations integrated on the depth and

associated with appropriate forcing and friction terms is used. This model is computed as an update of WOLF software (HACH, ULg) and is applied to some examples such as beaches with or without coastal structures.

Finally, the third part deals with sediment transport. It exhibits the topographic modifications of the coastal sea bottom caused by the waves and their currents. A pseudo-time stepping loop execution of these three models ends this work. It gives us an operational tool to describe the topographic evolution of coastal areas caused by incident waves, induced currents and resulting sediment transport, fulfilling the objectives of this paper.

Concluding observation

As the reader can see, this book is the result of successful euregional co-operation between the four ALMA-universities in the Jacques Delors Master Class of 2003-2004. Three chapters have been delivered by students of Universiteit Maastricht (NL), three chapters by students of Rheinisch Westfalische Technische Hochschule Aachen (D), two chapters by students of Limburgs Universitair Centrum Diepenbeek (B), and one chapter by a student of Université de Liege (B). We hope the reader enjoys as much reading these nine chapters as the students had writing them and we as university professor had in supervising their research.

The Steering Committee Jacques Delors Chair

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