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IN CENTRAL AND EASTERN EUROPE

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COMPARISON OF TWO DIFFERENT INTEGRATIVE APPROACHES FOR SUSTAINABLE WATER MANAGEMENT PRACTICES

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1. INTRODUCTION

The management of water resources linked with the protection of the environment and risk prevention coming from the agricultural practices are the main issues presented in this paper. Particular attention must be paid to integrated strategies for the closing of substance cycles in catchment areas with a strong view to nutrient and phosphorus cycles. Dealing with the elaboration and implementation of a regional planning and decision support system (DSS) we introduce two different integrated approaches for future sustainable landscape development. It is indispensable to stakeholders to provide a comprehensive set of adequate concepts and strategies to introduce clear and realistic ideas and activities to impede and reduce detrimental substance fluxes to surface water (rivers, lakes) and ground water.
Participation and stakeholder consultation are the key to improved water resource management. European water policy has to address the increasing awareness of citizens and other involved parties of their water. At the same time water policy and water management are to address problems in a coherent way.
The best model for a single system of water management is management by river basin - the natural geographical and hydrological unit - instead of according to administrative or political boundaries. The implementation of the Directive therefore requires a spatial perception of the catchment and the initiative for dialogue across boundaries – administrative, traditional, and national.
There are two main reasons for an extension of public participation. The first is that the decisions, on the most appropriate measures to achieve the objectives in the river basin management plan, will require balancing the interests of various groups. The economic analysis requirement is intended to provide a scientific basis for this, and it is essential that the process is open to the scru-tiny of those who will be affected. The second reason concerns enforceability. The greater the transparency in the establishment of objectives, the imposition of measures, and the reporting of standards, the greater the care member states will take to implement the legislation in good faith. Additionally, greater transparence increases the power of the citizens to influence the direction of environmental protection, whether through consultation or, if disagreement persists, through complaints procedures and court action. Caring for Europe's waters require more involvement of citizens, interested parties and non-governmental organizations (NGOs).

2. MATERIALS AND METHODS

2.1 FIRST METHOD BASED ON A HIERARCHICAL STRUCTURED FRAMEWORK

The concept introduced by Klug (2002) is a hierarchical knowledge base founded on spatial explicit biogeophysical data. The spatial utilization decisions are described in a systematic and transpar-ent way. The decision model provides information about the trajectories of development which a functionally diverse landscape could take on the grounds of interdisciplinary ecologyrelated scientific criteria. The aim is to designate zones for intensive and extensive land use, which are balanced with compensatory zones for exploitation, protection or regulation. Spatially derived land-scape visions are shown to be a powerful tool for a more reasoned matching of landscape units to land use.
The expert model integrates three main modules and three additional information tools. First, a hierarchical framework determines the priority of functions from extensive to intensive land use, which can be allocated to an area. This model is directly connected to a matrix of rules concerning the superimpositions of functions like utilization, protection and regulation. Eco-

logical buffer stripes and compensation areas between opposing borders of land use types are suggested after deriving the hierarchical framework. The three additional information tools comprises (I) a table of standard values, threshold values and critical values as well as international norms which are interrogated in the main model; (II) a table with the used assessment and evaluation procedures, leading to data applied in the hierarchical model; and (III) a matrix of structural indicators (landscape metrics) containing information on biotic and abiotic functions and processes in the landscape.

2.2 SECOND METHOD BASED ON THE 'GENERAL SYSTEMS THEORY'

The second methodology is based on human and ecological self organizing systems (KAY et al. 1999). The root of the concept based on the 'General Systems Theory' as well as new approaches in chaos and complexity theories. Accordingly, the relevant human entities (local actors, stakeholders, institutions, cultures, values and visions) as well as ecological entities (biogeophysical factors) are conceptually mapped in a hierarchical relationships. The dynamic of mutual feedback loops are summarized over diverse space- and time scales. The outcome of this systems assessment is a basis for a scenario exploration process. Visions and goals are defined in human entities and added with ecosystems thresholds in ecological entities. After taken the decisions which organizational entities of the ecosystem are to stimulate by which means, the requisite human and ecological infrastructure is to identify and presented in the aimed situation status. The methodology is an ongoing adaptive and heuristic process and therefore accompanied by a continuous monitoring-, analysis- and management strategy. It is being able to recursively correct and reformulate analysis and goal formulations. The fundament of this management concept is given by diverse approaches for ecosystem analysis in literature. The SOHO (Self-Organizing Holarchic Open) methods of the publication from KAY et al. (1999) has been modified and further adapted to the special requirements of European regions and extended using GIS and remote sensing methods.

3. RESULTS

The first model represents a hard fact method to clearly show the functions and processes, whereas the second model more relies on a soft (system) methodology, accepting uncertainty and continually changing systems. Both models are able to provide a good basis for stakeholders discussions. On the one hand based on strong facts and on the other in putting more emphasis on the creation of reconnaissance and sensitization among participants for (natural) systems and their specific behaviors and interactions. Both approaches use GIS as an integral part of Decision Sup-port System (DSS). The inductive derivation of the hierarchical structured framework of the first approach leads to an output map illustrating how a functionally 'idealized' state should be shaped by reallocation and buffering. Comparing this model with the current state of the landscape derived from remotely sensed data shows the call for actions to close substance cycles. In the second approach, a recursive soft systems methodology uses GIS and RS techniques more to incorporate biogeophysical understanding of nature into scenario exploration. The methodology thus helps to create a common understanding between stakeholders and planners, and facilitates the successful adoption of new planning initiatives for water management.

4. CONCLUSIONS

The implementation of both concepts in heterogeneous local and regional landscape-, master- and development plans is demonstrated in two case studies. Both case studies demonstrate the need to prepare for and initiate modifications in choices and farming practices to adapt to and mitigate the impacts of nutrient cycling while balancing social needs such as tourism development.

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