Abs. Nr. OR-072

Integrated Flood Plain Management from a European Perspective

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Objectives of The EU Water Framework Directive

On 23 October 2000, the "Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy" (The EU Water Framework Directive or WFD) was finally adopted.

By means of this directive, the basis for a co-ordinated policy for water protection in Europe was set up. The special aspect of this directive is the holistic consideration of all kinds of water with the following specific guidelines:

- extensive examination of river basins shall be undertaken,
- the uses of different types of water bodies should be very specific,
- a combined approach to pollutant emissions and sources and to single and grouped parameters shall be adopted,
- common environmental quality standards ("good ecological status") and emission limit values for certain groups or families of pollutants should be laid down as minimum requirements in Community legislation.

Through The EU Water Framework Directive, new initiatives leading to more ecological oriented water protection are addressed. Economic reflection will also become more influential. The structure and the framework for a Europe-wide network exists now and will operate continuously.

Important components like water bodies and groundwater dependent terrestrial ecosystems are included in the WFD, but flood plains as a whole are not a direct objective (Horlitz 2002). An entire floodplain may be benefited by the objectives laid down for a water body, such as water quality and bank structure. However, maintenance and restoration of flood plains can have great importance for achieving good ecological status and, therefore, must play at least a supplementary role in the programme of measures.

A very new and interesting aspect of the directive is the duty of administration boards to inform and participate all interested and concerned people. This obligation (article 14) is focused on the formulation and subsequent implementation of the basin management plans for each river basin. This means that timetables, programmes of measure implementation and the most important issues of water management have to be given due notice and published.

The Elbe-Ecology-Project

The River Elbe together with its drainage basin is one the most important river ecology systems in Europe. Along the river, unique environments still exist but there are obvious problems with eutrophication and pollutants. As a consequence, the German Federal Ministry of Education and Research (BMBF) set up a large scale research programme within the Research Association “Elbe Ecology”. The University of Applied Science of Northeast Lower Saxony contributed with research on natural resources including analysis of water and soils and investigation of pollution of fodder plants in the flood plains to derive appropriate land use strategies and scenarios for nature protection (Urban 2002). During the course of this project, many users and agricultural institutions were asked to take part and to discuss ecological problems and alternative possibilities for land use in order to achieve a sustainable ecological and economic system. A very constructive dialogue was established (Evers 2000).

From a regional to an international perspective

Many activities take place in the European Union to co-ordinate activities in water management, especially in order to realise the Water Framework Directive. In relation to this directive, the Department for Technology, Water and Computing of the University of Applied Science of Northeast Lower Saxony has set up communication with several water concerned institutions. In the case of sustainable land use and spatial planning, an intensive exchange exists with universities, water boards and county councils in the Netherlands, Great Britain, Sweden and Norway that abut the North Sea.

Through this co-operations several aims have been identified:

- information exchange about polluted flood plains (reasons and possible solutions)
- discussion about different ways of planning systems for sustainable land use
- inventory of different data bases and computer models to analyse and visualize
- inventory of different Decision Support Systems (DSS)

A Decision Support System (DSS) is a computer-based system to visualize complex circumstances based on digital data and models for users, concerned people and decision makers in administration or policy. Through socio-economic and socio-environmental scenarios, possible solutions are shown by a multi-disciplinary DSS.

The existing and future results of the Elbe-Ecology-project will be incorporated into a land use management system by GIS and other Geodata based systems. With the development of a suitable internet user interface, a land use DSS for the flood plain of the River Elbe will be established and will provide a valuable tool for public participation. With the additional input of European partners, it is expected that an international, integrated perspective of water management will emerge.

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Temporal and Spatial Variations of Sediment Flux Along Godavari River, India

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Abstract

The quality and quantity of total suspended solids (TSS) are determined by topography, climate, vegetation, geology, and basin size and water volume of the drainage basin. In addition the river transports are influenced by anthropogenic activities such as dam constructions, pollution, land use which modify the hydrological regimes of the river, trap a great quantity of river suspended sediments and increase river water salinity. Indirectly, the suspended solids affect other parameters such as temperature and dissolved oxygen. Because of the greater heat absorbency of the particulate matter, the surface water becomes warmer and this tends to stabilize the stratification. This, in turn, interferes with mixing, decreasing the dispersion of oxygen and nutrients to deeper layers. Suspended solids consist of an inorganic fraction (silts, clays, etc.) and an organic fraction (algae, zooplankton, bacteria, and detritus) that are carried along by water as it runs off the land. The inorganic portion is usually considerably higher than the organic constituents.

Parameters such as daily water discharge, TSS, fine, medium and coarse sediments are measured at 12 locations along Godavari River and its tributaries. The data is collected at Dahelgaon, GR.Bridge, Yelli, Mancherial, Perur, Polavaram on Godavari River; at Purna and Saigaon on upper tributaries such as Pranahita and Manjeera; at Navarangpura, Jagdalpur, and Pathagudem on Indravathi River; at Konta on Sabari tributaries. The upper reaches at Dahelgaon, GR Bridge and Yelli recorded a very high sediment flux upto 15mg/l. There is a gradual increase in flux rate among these three locations over the period. Deccan basalts in highly weathered form and good agricultural land use

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are the main causes for high flux in these parts of the basin. Similarly the locations at Purna and Saigaon also recorded higher flux rates due to similar geological conditions. Indravathi River flowing through Gondwana sediments yields less flux comparative to the Deccan traps and the same is observed over the years at Navarangpura, Jagdalpur and Pachgaon monitoring stations. Suddenly there is a drastic reduction in sediment flux at Mancherial location (on main Godavari river) which falls to the one fifth to one tenth of the upper reaches may due to construction of dam SRSM at Pochampad and low erosion rate of Gondwana sediments. During 1969 at Mancherial flux was recorded upto 5-7 mg/l which in subsequent years has fallen to 1-2 mg/l due to construction of dams and reservoirs. Further down stream at Perur sediment flux is upto 12 mg/l in 1969 with an average of 7-8 mg/l reduced to 2-4 mg/l in 1973 and 1-2 mg/l in 1975 which further reduced to less than 1 mg/l by 1990. At Polavaram the abundance of flux was 1-2 mg/l during 1969 in June and July where as it increased to 11mg/l in September the same year. Such high flux rate after 1980 had fallen to1-2 mg/l with water discharge upto 30,000 cumsec.

The data collected at ten locations on Godavari River depicts that it is the temporal variation in discharge does not coincide with that of the total suspended solids, the peak concentration of which attains well before the maximum discharge. Concentration is generally observed to be higher during June-July, dropping during the peak discharge. This lag between maximum TSS and peak discharge may be attributed to the remobilization of sediments deposited in the riverbed and floodplain. It is therefore seems that large amounts of fines are transported during the first rains, as flow increases initially. Subsequent floods would detach sediments of larger diameter, which are generally carried in the lower water column. The secondary TSS peak is probably in effect of atmospheric dust input in addition to the erosion. TSS of Godavari River is of one to two orders lower than the Himalayan Rivers. Temporally there is a drastic cut down and almost reduced to one tenth in the flux abundance all along Godavari River over the years due to human activity.

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Spatial and Temporal Scale ^{234}Th:^{238}U Disequilibrium in the Arabian Sea: Implications to Sinking Particle Fluxes

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Abstract

"Sinking particle fluxes" within the coastal and open ocean regimes have raised considerable debate and interest in terms of net removal or "export" of carbon from the euphotic zone. Major research programmes including the JGOFS (Joint Global Ocean Flux Study) have made significant efforts to find ways to determine this important component of the global C-cycle. In this context, sediment traps and ^{234}Th:^{238}U disequilibrium are the two methods that are often used to measure particle export from the upper ocean. International efforts are currently underway to provide a better understanding of the accuracy of ^{234}Th method in deriving the particle fluxes, especially those of POC.

^{234}Th ($t_{1/2}$ = 24.3 days) is a particle reactive radionuclide that is produced in seawater from its soluble and conservative parent, ^{238}U. The disequilibrium between ^{238}U and the measured total ^{234}Th activity in the water column is assumed to reflect the net rate of particle export from the upper ocean on time scales of days to weeks. During the Indian JGOFS in the Arabian Sea, a linear relationship has been established between ^{234}Th export fluxes and integrated column (0-100 m) primary productivity; suggesting the usefulness of ^{234}Th as a survey tool. Furthermore, water column derived ^{234}Th export fluxes exhibit a decreasing trend from North to South; viz. 2300-1250 dpm m^{-2} d^{-1} during the late NE monsoon (February-March), 1685-1345 dpm m^{-2} d^{-1} for the inter-monsoon (April-May) and they are of comparable magnitude (~2200 dpm m^{-2} d^{-1}), basin-wide, during the summer-monsoon (July-Aug). it is noteworthy that the northern

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Arabian Sea is characterized by relatively enhanced particulate ^{234}Th export throughout the year (1685-2300 dpm m^{-2} d^{-1}); a feature sustained by both summer upwelling and convective

mixing in the winter. The ^{234}Th removal rates (as quantified from the ^{234}Th activity balance) and measured ratio of ^{234}Th to POC and PON on sinking particles have potential to constrain C-export fluxes from the surface Arabian Sea.