THE FIRST PROJECT WORKSHOP BROUGHT A FIRST LEVEL OF UNDERSTANDING BETWEEN THE PROJECT TEAM, THE FUNDERS, THE LOCAL COMMUNITIES AND INTEREST GROUPS

Workshop

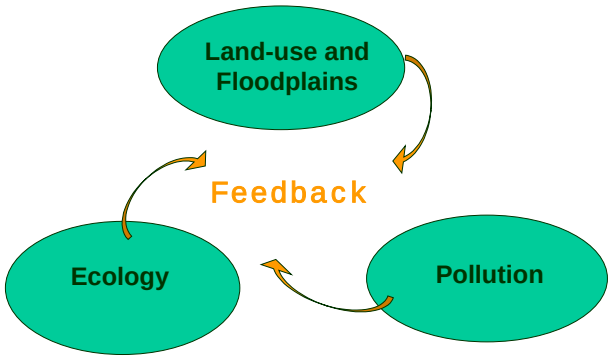
REPORT AND ACTIONS

1 WORKSHOP FOCUS

This whole day Workshop held on 25th November 2003, brought together the following key groups of people to understand and discuss the project:

- Funding Agency – World Bank Consultant
- Project Co-ordination Unit – Management team and Expert consultants
- Bulgarian Government Ministry Representatives – various Ministries
- Mayors and Deputy Mayors from 6 Municipalities in the project area
- Non-government organisations and interest groups
- MWH Project Team and Facilitator

The morning was devoted to presentations on the technical issues and understandings of the project. The afternoon was the opportunity to form three discussion groups and to raise awareness in three focus areas:



The afternoon discussions in particular demonstrated the importance of this project to both the Government of Bulgaria and to the local communities. There is a very strong community interest in the project and a strong wish that the next Workshop is held in the vicinity of the project to ensure that the communities are more directly involved and the project team is all exposed to the project issues.

The main themes which were identified during the day are listed in the next column.

Bulgaria is not the major polluter of the Danube River

Bulgaria is said to contribute only 4% of the nutrient load and other pollution in the River Danube. This project will not therefore make a significant impact in itself but can be used as political tool and demonstration of the ability and need to utilise the natural properties of wetlands for environmental protection.

Demonstrate nutrient trapping benefits

Nutrient trapping is and must remain a key component of the project and the assembly of proper baseline information and a monitoring and management plan are essential components

Local communities looking for environmental, social and economic improvement through the project

The interest from the local communities was very strong and there is a clear social and economic potential to develop from the project. The communities want to see some definite improvements and protection to their livelihoods and local interests. Particularly strong interest was shown in the related developments of constructed wetlands to provide sustainable and affordable wastewater treatment for the communities.

There is a need to clarify and collectively agree the objectives

MWH emphasised the interactions between different components of the project. There are many opinions relating to appropriate water levels of the wetlands – wetlands are constantly changing in nature and man can influence and impose regimes which will have an impact on the local ecology and habitats. Some industries may not be possible – others may develop. It is therefore a sensitive and critical issue to look at the broad picture and to engineer an optimum acceptable wetland regime.

2 CLIENTS/WB-GEF EXPECTATIONS

The workshop gave the opportunity to the Project Co-ordination Unit and Bulgarian Government officers together with other stakeholders to present their expectations and discuss them with MWH and between themselves. The PCU team, the WB and the PCU consultants confirmed their strong interest in addressing the following issues throughout the project:

Nutrient Trapping

There is a strong expectation that the project can demonstrate that the restored wetlands will reduce the nutrient load and other agricultural pollution flowing into the River Danube and the Black Sea basin. The project is considered as a pilot that will encourage restoration of around 16 similar sites along the River Danube, which would act as nutrient traps and reduce the pollution in the River Danube.

Although we recognise that the restoration of the two sites in this project will only offer reduction in the nutrient load entering the River Danube from Bulgaria, we believe that the repetition of the project and the implementation of appropriate management plans, on a local, regional and European level could noticeably influence the reduction in pollution levels reaching the Black Sea.

It is important to realise that the impact of this project on the Danube nutrient levels will be minor. However, it is the combination of this project, the management plans, on a local, regional and European level, could noticeably influence the reduction in pollution levels reaching the Black Sea.

It is important to realize that the impact of this project on the Danube nutrient levels will be minor. However, it is the combination of this project, the management plan, and the repetition of this process that cumulatively will provide meaningful reduction in pollution in the Danube River.

Transboundary Pollution

Although about half of the country drains into the Danube RIVER, Bulgarian\ is not the largest contributor of nutrient loads to the river. Bulgaria, though, has to meet its international commitments according to the EU Water Framework Directive, the Nitrates Directive, the habitats and Protection of wild Birds Directives, and other international agreements to reduce trans boundary pollution in the Danube and the Black Sea basins. Bulgaria is an active member of several international and regional organizations responsible for the clean up of the Danube River and the Black Sea.

The representatives of the Bulgarian Institutions (Ministry of Environment and waters, Ministry of Forestry and Agriculture, Regional Inspectorates (of Environment and waters)) expressed their concern that despite the international initiatives, Romania and Serbia significantly contribute to the trans boundary pollution flowing into the Danube River. In Romania the Turnu Magurele nitrate fertilizer plant and the industrial plants in Giurgiu, discharging industrial wastewaters, and the mining sites along the Danube tributaries in Serbia are major sources of trans boundary pollution in the Lower Danube.

As in Bulgaria, there are only a handful of existing WwTW's and sewerage systems in Romania along the river, and industrial and domestic wastewaters are discharged with no or very little treatment into the Danube. Representatives of the Bulgarian MOEW suggested they could use the results of the current project for cross border cooperation with their Romanian counterparts. MWH has recently provided support to the Romanian Ministry of Development in a pilot project for protection of the Danube wetlands in the Cama Dinu Inlets Area and are happy to share the Romanian experience with this project.

Restore Biodiversity

The project was historically started as a biodiversity restoration and conservation project. The donors consider the project to have significant biodiversity conservation benefits.
Bulgaria is among the European countries with the highest level of biodiversity and rich natural ecosystems. Thus the restoration of the wetlands

at the two project sites will help restore and conserve natural habitats in globally significant ecosystems. Fish, birds, and plant species, protected by Bulgarian and international legislation are expected to return to the wetlands sites.

Social Effects

The local communities are among the poorest in Bulgaria. The funding and the Bulgarian institutions hope to demonstrate how ecologically sustainable agricultural activities can improve livelihoods.

Promoting and supporting agricultural and entrepreneurial activities within the project region will ensure the sustainability of natural resources, which are compatible with biodiversity conservation issues. The PCU expects also that the local communities will benefit directly from improved fishery production in the Danube River.

The project is expected also to lead to increased capacity of the central, regional, and municipal institutions to manage the Danube catchment basin in environmental and economically sustainable manner.

Fishing

The income of the local communities along the Danube traditionally relied on fishing. The destruction of the fish spawning sites within the artificially drained wetlands at the project site as well as the deteriorating river water quality has resulted in significant reduction of fish population. This has deprived the local population from an important source of income during the last few decades. The expectations of the funding institutions, the Bulgarian authorities, and the local communities are that the project will lead to increased fish populations and directly benefit the local population.

MWH findings, concerns, and recommendation concerning fish populations are described in Section 6 – Ecology of this report and the Ecology sections of our workshop presentation included as Appendix 1 of this report.

Ecotourism

The restoration of the biodiversity at the two sites could lead to development of ecotourism especially in the Kalimok/Brushlen area. The donors expect this to result in employment increase and potentially regional development. The local representatives of the PCU and the protected territories authorities (Persina Nature Park Directorate and Kalimok/Brushlen Protected Site Administration) as well as NGOs demonstrate high level of commitment and keen interest in the future development of this site for ecotourism.

3 LOCAL COMMUNITIES EXPECTATIONS

The local communities have shown a significant interest in the project since its conception.

The MWH team particularly appreciates the keen interest, participation and positive reaction of the 6 mayors in our discussions. All mayors' emphasised the need to focus on action and the positive change expected for the local population.

Protect Water Supply

Many communities in the region of these wetlands rely on deep wells for potable water supply. The mayors expressed their concern that the deep ground waters used for potable water supply could be negatively influenced by the polluted Danube waters entering the restored wetlands. Since the wetlands are expected to act as nutrient/pollutant sinks the pollutants concentrated in the wetlands might negatively affect the potable water quality in the two areas. MWH hydrologists and hydrogeologists will consider this concern in detail during the hydrological and hydrogeological modelling in the Feasibility Study.

Protect Private Agricultural Land

The protection of the private agricultural land in the Kalimok/Brushlen area from flooding is a major issue for the local population. This issue will be discussed in further details in the Feasibility Study report.

Wastewater Treatment Alternatives

There are no WwTWs along the Bulgarian section of the Danube River. The settlements in the two areas have no sewage collection systems as well.

MWH made presentations about the latest technological developments in low energy natural wastewater treatment systems for rural populations, which the company has actively developed and promoted. In particular the constructed wetkand project in northern Greece funded by the EC as a demonstration of appropriate technology and the *Errol* project in Scotland – the first AeroFac system to be installed outside of the USA.

Both the PCU and the local mayors were very interested in these and other waste to energy options.

Because of the keen interest demonstrated at the workshop by the mayors in the constructed wetlands design, operation and management, the Director of the MWH team, *Peter Lawrence* was asked to explain with an additional presentation about his own experience in constructed wetlands around the world. The presentation is included in Annex 2 of this report.

Although this is not part of this project scope, there was discussion with the local communities about how to work together to find and environmental and economically viable solution to the wastewater collection and treatment problems in the two areas.

As a result of the discussion the PCU and local communities agreed to explore funding to organize a study tour of the interested local officials to the constructed wetlands site, designed by MWH in Greece (the picture below).

The intention would be to tour this successfully operating site and to share Bulgarian and Greek local community experiences. The project demonstrates an effective and affordable wastewater treatment and management strategy for smaller EU communities. A further visit to the Scottish Enhanced Facultative Lagoon project was also discussed.

MWH commented that from their research into the performance of constructed wetlands and lagoon systems by other around the world there were many variations and as many poorly operating systems, as there were good ones. Whilst the concepts are relatively simple it is vital to have the best overall management advice to ensure that basic principles are established for the best technological developments for long term sustainability.

Access

The access to the restored wetlands sites in the Kalimok/Brushlen area is another concern for the local community. Currently the area is used for hunting and bird watching, and provides access to the river for recreation and fishing. The access to

The sites may be affected once flooding behind the dykes takes place to restore the wetlands.

Fertilizers Use

Currently there is an active agricultural farm in the Kalimok/Brushlen area, which uses leased land for production of wheat and maze. The production is located on land within and outside the protected territories. The stakeholders expressed their concern that the farm uses substantial amounts of fertilizers.

On the Belene island the prison also uses a significant part of the inland for africultural purposes. The stakeholders suggested that MWH should contact the prison authorities and obtain information regarding the fertilizers and pesticides application during the last few years.

The stakeholders and MWH team who participated in the Pollution Discussion Group agreed that more sustainable agricultural practices such as organic farming and management of organic waste should be promoted locally which will lead to increased income and be environmentally effective.

Land Use

The duration and timing of the land flooding in a “typical” year was described in hydrology part of the workshop presentation included in Appendix 1 of this report. The presentation suggested that the springtime would likely be the most common period in the year when flooding will take place. In reality there could be many occasions in the year where water levels in the Danube River are high enough to allow inundation of the proposed wetlands. The critical matter to explore in the feasibility report is to provide better definition to the periodic flooding and understand if this can be tolerated to enable some farming activity. It is important to appreciate that the wetlands in this project are likely to be only a component part of flood plain therefore grazing of animals in the higher dryer parts of the flood plain and out with any special conservation or protected areas may be possible.

4 BELENE ISLAND ISSUES

Inlet Issues

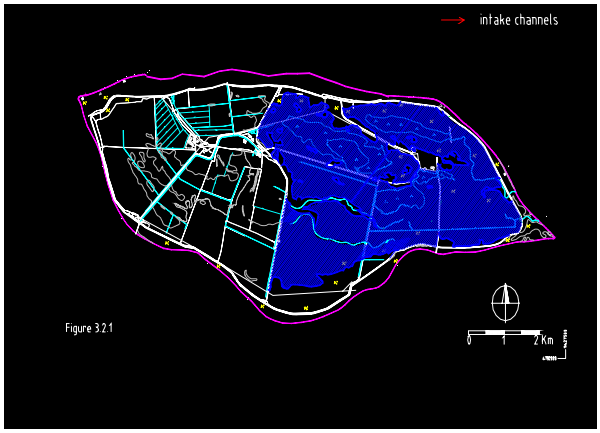
The MWH experts and some members of the Steering Committee raised the matter of the optimal manner in which to flood the wetland according the ecological requirements and the prevailing hydrological conditions. An option was introduced to construct one more inlet structure on the north side to ensure enhanced flooding of all areas. The location of this third inlet follows a natural watercourse and avoids any deep cuts or earth movement. The presence of more inlets will improve the environmental conditions in the wetland and will ensure stepwise filling of naturally formed locations of old marshes.

Although the location of the outlet on the southern channel has the possibility of accepting organic and thermal pollution, as well as requiring a fair amount of earth movement, it does provide some management flexibility, and the means to increase the water levels within the island.

Design Flood Levels

MWH estimated the design flood levels on the basis of detailed hydrological and hydraulic modelling. Discussions during the workshop confirmed the applied approach that allows using elevation 20.5 m as a suitable design flood level. In this manner we will have better flooding of all site as shown in the annex. The flooding process will start at elevations above 18.00 (inlet sluice threshold elevation) and will fill gradually the wetland area. The idea is to keep water depth 0.3-0.5 m deep long enough to ensure sustainable habitat for spawning. If the hydrological conditions are favourable we can expect through-flow in the wetland with water residence time sufficient for nutrients trapping.

A flood map is attached detailing the area of innundation of water on Belene Island under a water level of 20.50 m in the River Danube



Sluices Levels

The levels of sluices are determined by existing elevations at suggested inlets and outlets locations. Elevation 18.00 was selected for inlets that allows stepwise filling of the wetland and avoids the necessity of earth moving for approach channels.
The proposed outlets are located at the lowest points of the wetlands that lend to drain the area naturally. The appropriate engineering structures comprising the sluices will be designed in accordance with the relevant site investigation reports using specialist MWH in-house developed analysis and design software.

Nuclear Power Plant

The future NPS Belene construction site located on the mainland to the south of Belene Island, was also a topic of discussion. The NPS will have a cooling system utilising water taken from the Belene River branch and released back in the river several hundred metres downstream. Main concerns raised are related to:

- Potential thermal pollution due to warm water, and possible interference of NPS cooling structures and wetland's south inlet.
- Suitability of wetland water for the cooling system – the possibility of growths causing blockages was agreed to be an issue the NPS Authorities would have to address
- Potential increased radiation levels in the region.

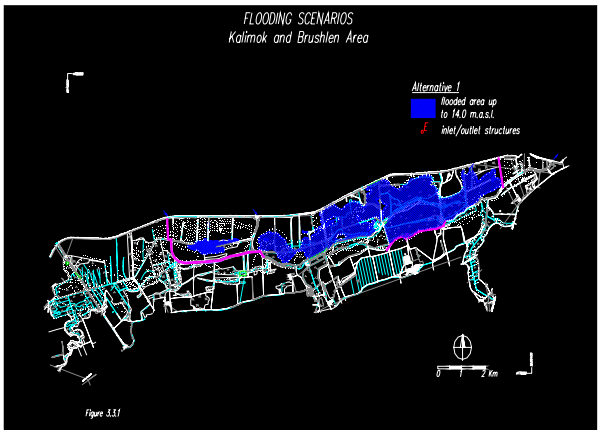
It was agreed that there would need to be full environmental impact studies for the project to proceed, which would address all these (and more) issues.

5 KALIMOK ISSUES

Inlets

MWH concerns that preliminary proposed inlets as numbers and locations are not the optimal configuration for healthy wetland that we intend to introduce. The long distance between inlets and the lowest spots of the wetland can not ensure sufficient flow and timely exchange of water with proper dissolved oxygen content. To reduce these effects the MWH team will revise the conceptual design of the flooding scheme to make available more flowing water in the wetland and to avoid the possibility of periods of stagnating water. Special attention will be paid to attempt to maintain flow through the old fish ponds through spawning season (May-June). In such manner we can keep water depth at 03 - 0.5 m for spawning and will improve water exchange in the wetland. Similarly the design of the through flow of water will ensure at first high water level no invasive species will exist and ideally the draw down period will provide sufficient retention time to ensure nutrients trapping is effective (4-6 days).

A flood map is attached detailing the area of innundation of water on Kalimok under a water level of 14.00 m in the River Danube.



Private Land Ownership Issue

The mayors of the settlements next to the wetlands raised questions about the future of private lands in and adjacent to the area. MWH takes in its design outlines all necessary measures to protect existing land uses. Concerns raised by the representatives of local communities included

1. the poor performance of the existing drainage system
2. the presence of a private land plots at the west end (3.5 ha) and east end (50 ha) of the wetland. The lots situated in the east will be protected by new dykes. The small lot to the west is located at the proposed main inlet structure. The two options to be considered by the PCU are to compensate the owner with another piece of land outside of the wetland or to relocate the inlet structure and reduce the wetland area. The former option is preferred.

Potable Water Issues

Local Mayors and local communities representatives raised concerns about the possible change of water quality in their water supply sources and wells used by local people for drinking as a result of wetland restoration. In the small villages in the area there are insufficient sewerage facilities leading to the potential for contamination of the groundwater, which may compromise local domestic water supplies. There is also a perception that the ground water level will rise in some areas west (village of Brushlen) with the implementation of the wetland project upsetting current farm practices. MWH will conduct detailed ground water modelling and analysis to give an answer to this problem.

Communities Benefits

Together with the general aim of this project – wetland restoration and nutrients trapping, one of objectives is to support economic growth and improve social life in local communities. We expect the communities' benefits to have wide spectrum of patterns.

- Wet meadows forming in southwest part of wetland can be used for organic pastures.
- The increased spawning opportunities in restored wetland will benefit the fishing in the Danube River.
- The restored wetlands and enhancing bio-diversity will offer a good environment for waterfowls and other birds usually nest in this territory, which will attract bird watchers, and variety of nature loving enthusiasts. The environmental tourism can be a good source of an additional income for local people and can promote many services related to this activity.
- Introducing an organic agriculture will allow the local farmers to increase their income by producing high priced goods.

Stakeholder Association

The federation of Nature Conservation NGO's "Green Balkans" has a special interest to see a healthy wetland in the Kalimok area and in particular in the former fish farm territory. MWH suggests outlining appropriate water path map that will establish slow flowing water in former fishponds during flooding period to avoid stagnant water and to ensure spawning grounds for fish entering in wetland.

6 ECOLOGY

Wetlands Restoration Issues

Some hydrologists approach wetland restoration with three concerns: 1) hydrology, 2) hydrology and 3) hydrology. This old joke highlights the ecologists' concern that it takes more than water to make a wetland. Although water levels are very important to wetlands, MWH ecologists are reviewing this project to make sure the wetland design considers the ecological and restoration goals of this project.

The restoration of wetlands is a complex process, as it involves taking into account both abiotic and biotic factors. The hydrological, hydrologeological and engineering results obtained so far by the MWH team were discussed in details with regard to the wetlands restoration at the two sites. The workshop participants agreed that restoration can not result in pre-disturbance conditions, but the sites will emulate ecological characteristics similar to the time of predisturbance.

Water Levels

Wetland characteristics and selective pressures can commence with a minimum of two weeks of soil saturation during the growing season. To a point, the more water during the growing season, the more rapid the recovery of wetlands. There are several concerns related to water levels:

- Rate of flooding
- Duration of water levels
- Dissolved Oxygen
- Water clarity

Rate of Flooding: MWH recommends that the flooding should occur slowly at the start of the growing season (March), which will stimulate the germination of the native seed bank in the soil. Rapid and prolonged submergence of the native seed bank will not lead to germination.

Duration of Water Levels: MWH recommends that careful design considerations are given to the duration of water levels. The potential for fish entrapment is considerable, if the water levels are not maintained. In other words, if we allow the fish to enter the site and spawn, we must also make sure the adult fish have enough water remaining to find their way back to the Danube, and that the fish fry have enough time to develop and find their way back to the Danube River.

Water Clarity: Sunlight must be able to penetrate the water to allow for the aquatic plant community to blossom. Long term aquatic plants can increase dissolved oxygen levels through photosynthesis. Unlike algae, which have a high turnover rate, the aquatic plants do not create large Biochemical Oxygen Demand levels.

Dissolved Oxygen: Dissolved oxygen is critical for the health of the wetland ecosystem. Dissolved oxygen is inversely related to the amount of BOD. Biomass such as decaying algae, plant litter, organic loads from grazing etc contribute to high BOD, and thus lower dissolved oxygen. Higher temperatures also contribute to a loss of dissolved oxygen. MWH recommends that DO levels be modeled based on the various hydrological inputs. This is a critical matter of concern. We may find that the River Danube groundwater replenishes the dissolved oxygen, and there is no concern, but MWH feels it is a critical parameter as low dissolved oxygen levels will cause a loss of aquatic habitat, and increase the mosquito population.

Spawning Grounds

Traditionally, fishing has been a major source of income for the communities along the Danube River. In past few decades the fish population in the Danube has dramatically decreased. This decrease is due, in part, to the destruction of the fish sprawling habitats and the deteriorated river water quality.

By improving the spawning grounds, the restoration of the two wetland sites is expected to result in an indirect increase in the fish population and species diversity of the Danube River. Our concerns and recommendations associated with fish are presented in the respective sections on ecology of each site in the workshop presentation (Appendix 1).

Bioaccumulation

A very important issue raised in discussion was that of bioaccumulation risks to the ecology and to human health. If the wetlands are used successfully to remove pollutants, the potential downside is that elements such as heavy metals will accumulate in the tissues and become a potential hazard to bird and animal food-chains –

potentially reaching human beings. At this point the heavy metal concentrations, and levels of common organic pollutants such as PCB's is not well known.

This issue will need to be assessed at design stage and may not be fully understood but will certainly have to be monitored into the future.

Mosquitoes

Mosquitoes are a major concern as a nuisance and also as a potential vector to transmit disease. Mosquitoes tend to breed in stagnant water with low dissolved oxygen levels. The mosquito larvae hangs under the water surface with a tube at the surface which draws oxygen into its body.
A healthy wetland does not support large mosquito populations, as it has high levels of oxygen, which supports mosquito predators such as the damselfly, dragonfly, waterstrider, backswimmers, predacious diving beetles, birds, frogs, and many fish species.

MWH can provide a number of examples for reduction of mosquitoes in restored wetlands- recently a 1,500 acre wetland restoration in the USA reduced the mosquito population by almost 90%.

Sedimenation

It is true that sedimentation is a natural process. However, in this case, nature would be able to flush the system of sediments more easily if the dykes did not exist, and the flows were more frequent (prior to channelization). The result is that the wetland areas will be prone to sedimentation, but the rate of filling is unknown. MWH recommends the careful analysis of sedimentation prior to project commencement, as several design features could be utilized to reduce the sedimentation of the wetland areas.

If sedimentation is not addressed, the threat of a short-lived wetland most be accepted.

Watershed Management Plan

The Management Plan should address both regional and local considerations. Within the region, the management of agricultural runoff, sewage and animal waste must be emphasized. Control of these nutrient inputs would improve overall water quality, and thus the local wetland habitats.

The local management plan must tackle the operation of the sleuths and the habitats.

The operational management plan should identify key individuals and assign responsibility for opening and closing the gates, minor repairs, and how to identify potential concerns.

The ecosystem management must address issues such as public access, invasive species, nutrient monitoring, and species population monitoring, and habitat monitoring. A great deal of effort and thought should be given to this plan, as it is critcal to the sustainability of this project.

Data Needs

Ideally we would be able to utilize digital (GIS) maps such as: a current map of habitat types, soil types, and hydrology maps (model outputs) and contour maps to help us design and predict the outcome of this project.

Data on sedimentation is desperately needed to predict the level and rate of filling, and the potential pollutant load from the sediments.

Water quality data of the Danube at each site, including common toxins such as PCB or others as determined by upstream industry.

7 DESIGN ISSUES

Dykes

The Danube River main dykes at Belene and Kalimok/Brushlen built half century ago to protect people from flooding are now the subject of a detailed survey. The intention is to improve their status and to be used by locals in proper manner as roadway to the Danube floodplain.

The raising of inland dykes to the designed elevations will protect and improve the agricultural land next to wetlands. The mayors attended the VM Workshop stressed on need to have reliable system to protect all lands used for intensive agriculture. MWH outlined such a system of dykes and drainage channels in order to improve the present day situation. These dykes will protect in some respect also the restored wetlands. Stability of new designed and upgraded dykes is our prime task. The dykes linking the main Danube dyke and inland areas at Kalimok will be constructed to serve as access roads. An appropriate cover will be designed to ensure crest stability.

Avoid stagnation of water

Stagnant water can compromise the aim of wetland restoration. The healthy wetland requires enough dissolved oxygen in water that means flowing water and in this manner it will reduce or eliminate mosquitoes and provide a hospitable environment for spawning.

Special design pattern are outlined to maintain a slow but permanent flow in wetland during flooding periods and to prevent spots that contain stagnant water.

Nature and man

A project aim is to demonstrate that it is possible to rectify the deterioration to nature caused by man's interference in the past by re-creating natural marshes along the river. Care and attention will be given to ensuring the productivity of the area to the community by selecting areas for well-drained agricultural plots as well as developing other revenue attractions.

The benefits of such action can be in two ways

- increasing biodiversity in nature
- improving the quality of life among local people.

Wetlands can attract more visitors for bird watching, recreation and other activities that will increase economical strength in local towns and villages.

Management Plan

It was agreed that the restored wetlands will need a well-formulated Management Plan that addresses issues regarding implementation of identified priority objectives. On the management plan side it is critical if the benefits to environment and to social and economic interests of people living in neighbouring settlements is to be realized. The plan should assist farmers with transition to economic activities related to wetlands.

Lifetime

A fundamental question for design purposes as well as for monitoring the project success is *How long can we expect the restored wetland to live?* Or what we will do after 10 or 15 years with the wetland if the conditions and character of the wetlands were to change? It was important to appreciate that the performance of the wetlands will forever be at the mercy of the dynamic changes from the forces in nature. Climate change and sediment transport in the Danube River are two such examples of how nature will affect the wetland regime through time.

The design life therefore needs to attempt to accommodate such variable with careful assessment of:

- Water and sediment balance – these are two mayor elements controlling wetland life. Annual flooding
- Nutrients trapping process: it is natural the wetland to trap a significant amount of nutrients carried by water.
- River hydrology determines the process of flooding and empting the area of wetlands. Reliable forecast of river flow on the base of existed data allow us to outline the engineering structures.
- Physical processes: the healthy wetland requires physical processes supporting sustainable biological life. The vegetation growth will produce biomass which is discussed in Section 6.