European Commission

NWRM

Natural Water Retention Measures

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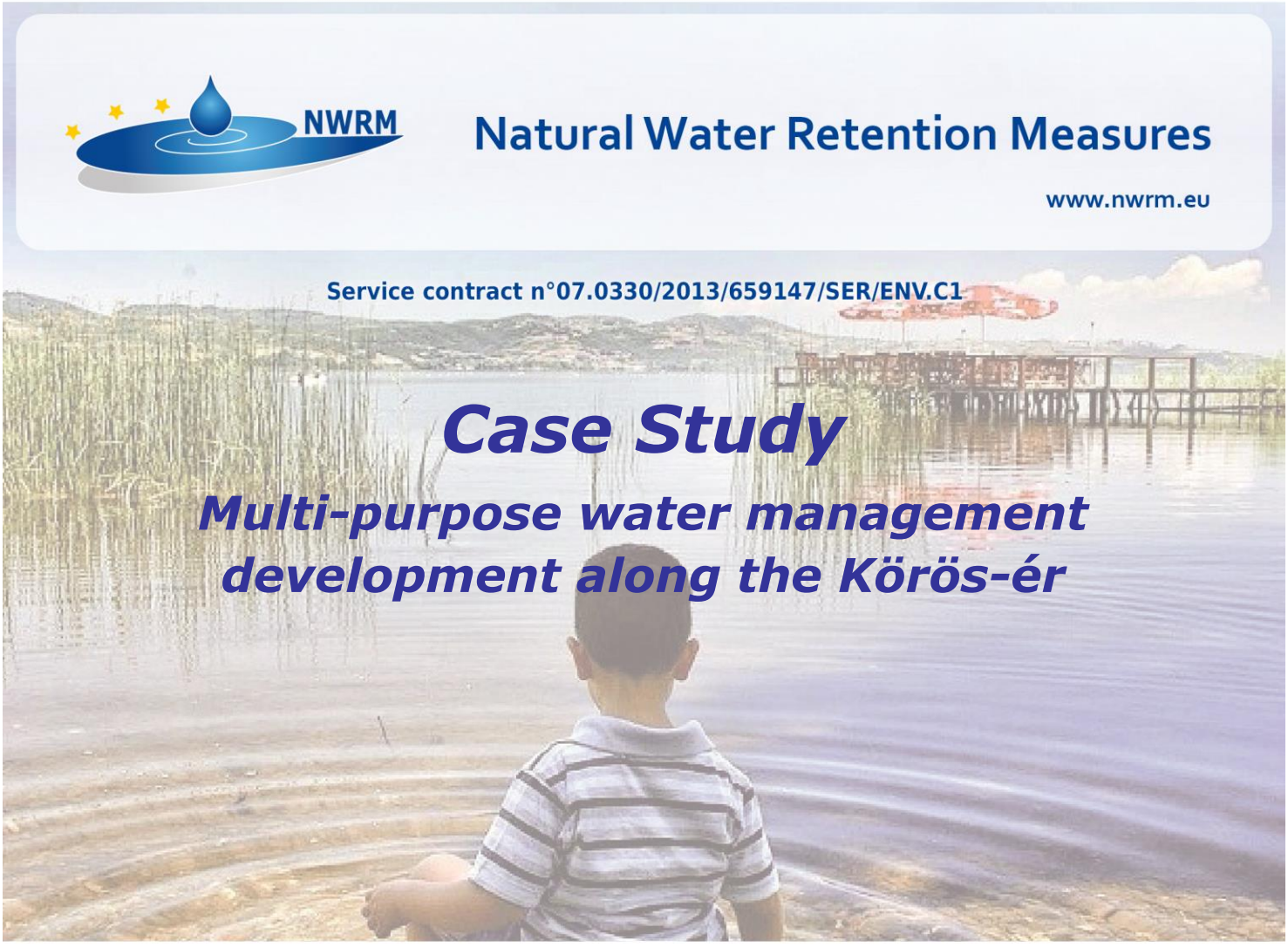

# Case Study

## Multi-purpose water management development along the Körös-ér

Environment

*This report was prepared by the NWRM project, led by Office International de l'Eau (OIEau), in consortium with Actéon Environment (France), AMEC Foster Wheeler (United Kingdom), BEF (Baltic States), ENVECO (Sweden), IACO (Cyprus/Greece), IMDEA Water (Spain), REC (Hungary/Central & Eastern Europe), REKK inc. (Hungary), SLU (Sweden) and SRUC (UK) under contract 07.0330/2013/659147/SER/ENV.C1 for the Directorate-General for Environment of the European Commission. The information and views set out in this report represent NWRM project's views on the subject matter and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this report. Neither the Commission nor any person acting on the Commission's behalf may be held Key words: Biophysical impact, runoff, water retention, effectiveness - Please consult the NWRM glossary for more information.*

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# I. Basic Information

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| Application ID | *HU_03* | | |
| Application Name | **Multi-purpose water management development along the Körös-ér** | | |
| Application Location | Country: | Hungary | |
| | NUTS2 Code | *HU2, HU3* | |
| | River Basin District Code | *HU1000* | |
| | WFD Water Body Code | | |
| | Description *(free text, short description of the location)* | *Körös stream drains to the Tisza river at its middle section, Bács-Kiskun County* | |
| Application Site Coordinates *(in ETRS89 or WGS84 the coordinate system)* | Latitude: 47.047282, | Longitude: 19.984447 by google map | |
| Target Sector(s) | Primary: | Agriculture | |
| | Secondary: | Urban | |
| Implemented NWRM(s) | Measure #1: | *U11* | |
| | Measure #2: | *N3* | |
| Application short description | Upgrading the stream's water management structures to be able to cope with both water extremes: temporary excess quantities (water logging, torrential rains) and water shortage. Reconnecting former floodplains at the estuary on a 2500 meter section. Upgrading the sluices to be able to retain water and the cleaning of the flow bottlenecks to facilitate runoff at flood events. At the settlement section of the stream the development targeted to provide the capacity necessary to drain the residential area. Upstream of the settlement retention pond were created to control runoff through the town and store water. | | |

# II. Policy context and design targets

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| Brief description of the problem to be tackled | *The Körös stream catchment lies in the most droughts stricken region of Hungary. There are repeating surface water resource shortages, the ground and subsurface water levels are declining at the uppers section. There are nutrient overload in the stream and in the ground water as well both from point and diffuse sources and both agricultural and urban. There are hydro-morphology problems as well.*<br>*Meanwhile recurring water logging periods cause temporary problems for the settlement and the agricultural areas.* | |
| What were the primary & secondary targets when designing this application? | Primary target #1: | Regulation of hydrological cycle and water flow |
| | Primary target #2: | Regulation of the chemical status of freshwater |
| | Remarks | *Enhance infiltration into the soil at the detention ponds to recharge subsurface resources* |

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| Which specific types of pressures did you aim at mitigating? | Pressure #1: | WFD identified pressure | *4.1.2 Physical alteration of channel/ bed/ riparian area/ shore of water body for agriculture* |
| | Pressure #2: | WFD identified pressure | *1.3 Point - IED plants* |
| | Remarks | Other FD pressure: water logging on agricultural land and urban sites | |
| Which specific types of adverse impacts did you aim at mitigating? | Impact #1: | WFD identified impact | *Nutrient pollution* |
| | Impact #2: | WFD identified impact | *Altered habitat due to hydrological changes* |
| | Impact #3: | | *Altered habitat due to morphological changes* |
| | Remarks | | |
| Which EU requirements and EU Directives were aimed at being addressed? | Requirement #1: | WFD-achievement of good chemical status | *High nutrient and salinity level, dissolved oxygen status medium, not fulfills the requirements of good potential.* |
| | Requirement #2: | WFD-achievement of good ecological status | *Hydro-morphological status. No zoning, lack of morphological variability along the water course.* |
| | In the WFD categorization the stream is designated as heavily modified water body, the goal is good ecological potential | | |
| Which national and/or regional policy challenges and/or requirements aimed to be addressed? | This area is part of the highly concerned region of The National Droughts Strategy Text | | |

## III. Site characteristics

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| Dominant Land Use type(s) *Select from the drop-down menu with the CORINE LU types and codes.* | Dominant land use | *211* |
| | Secondary land use | *112* |
| | Other important land use | *Type in the relevant Code Level3* |
| | Remarks | |
| Climate zone | warm temperate dry | |
| Soil type | *Calcisol* | |
| Average Slope | nearly level (0-1%) | |
| Mean Annual Rainfall | 300 - 600 mm | |
| Mean Annual Runoff | 0 - 150 mm | |
| Average Runoff coefficient (or % imperviousness on site) | 0.2 - 0.3 | |
| | The potential evapotranspiration of the area is around 800mm annually. | |
| Characterization of water quality status (prior to the | The chemical status of the waterbody doesn't reach the good potential because there is significant nutrient load from a point | |

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| implementation of the NWRMs) | source polluter. This point source is the sewage treatment plan of a food processing plant in the town. . The biological status is weak. There is no risk of priority substances.<br>Acidity is good status pH 8.04-8.34<br>Salinity status – medium<br>ammonium N load – weak status<br>Nutrient components status - medium |
| Comment on any specific site characteristic that influences the effectiveness of the applied NWRM(s) in a positive or negative way | *Positive way: The areas that are necessary for the development of the structures belong to public ownership. Upstream from the settlement there is interest for recreational use of the stored water* |
| | *Negative way: The watershed belongs to three counties NUTS HU102 , 322, 331, and two different regions HU1, HU3 that belong to two different regional development fund subsidy level. It caused big difficulties and delay to secure EU funding and acknowledge the overstretch characteristic of the project.*<br><br>*Along the middle section of the stream there are privately owned agricultural lands without interest to change arable farming that constrains the retention capacities.* |

## IV. Design & implementation parameters

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| Project scale | Large (e.g. watershed, city, entire water system) | *Size of the Körös stream catchment is 481 km2. The length of the water course is 40 km* |
| Time frame | Date of installation/construction (MM.YYYY) | *08.2011* |
| | Expected average lifespan (life expectancy) of the application in years | *33 years* |
| Responsible authority and other stakeholders involved | *Name of responsible authority/ stakeholder* | *Role, responsibilities* |
| | 1.Közép-Tisza-vidéki Vízügyi Igazgatóság (the responsible water directorate) | initiate the project, the provider of the public water management services of the area by law |
| | 2.Local governments of the area | help public acceptance, scenic fit |
| | 3.Duna-Ipoly National Park | advice on ecology questions |
| | 4.Water Management Association South Pest County | representative of farmers interest towards the water services |
| The application was initiated and financed by | EU Regional Development Fund KMOP-3.3.1/C-2008-0003 | |
| What were specific principles that were followed in the design of this application? | Planning principles from the feasibility study are:<br>Keep in mind the social rationality of protection against water logging in areas where drainage cost more than the yield of farming the land use change should promote.<br>Surplus water that pose threat to life and property must be drained.<br>Residential and agricultural water management must be harmonized and surface water runoff must be reduced by retention and storage | |

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| | Conditions that are necessary to reach the good ecological status of water must be provided, especially for the quality of the retained water | | |
| Area (ha) | Number of hectares treated by the NWRM(s). | *5 ha at the estuary* | |
| | *The application intends to control surface flows of the 480 km2 catchment. At a recent stage of the development, with 5 hectares restored, there are temporarily flooding areas at the estuary.* | | |
| Design capacity | The volume of the detention pond above the town is 50-60 thousand m3. The retention capacity at the estuary is 50 thousand m3. The retention and assimilation capacity of the connected meadows are not calculated, the planning is in progress. | | |
| Reference to existing engineering standards, guidelines and manuals that have been used during the design phase | | *Reference* | *URL* |
| | 1. | Planning activity is driven by the WFD goals, but at the moment there is no widely accepted standards to the activity what the water directorate summarize as "management of waterlogged areas by water retention" | |
| Main factors and/or constraints that influenced the selection and design of the NWRM(s) in this application? | Detention pond and online storage capacities were introduced upstream of the settlement in order to slow control runoff and to provide surplus water at low water periods to prevent water quality problems (of high pollutant concentration) downstream. This was the solution that required only public land along the water course. | | |

## V. Biophysical impacts

| **Impact category** (short name)<br><br>Select from the **drop-down menu** below: ⇩ | **Impact description** (Text, approx. 200 words) | **Impact quantification** (specifying units) | |
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| | | Parameter value; units | % change in parameter value as compared to the state prior to the implementation of the NWRM(s) |
| Runoff attenuation / control | *Runoff is attenuated by the detention pond upstream the settlement. The flow inside the settlement is controlled by the capacity increase of the crossing culvert.* | 50-60,000 m3 | previously 0m3 |
| Peak flow rate reduction | *Peak flow is reduced by the capacity of the detention pond. While on other parts of the catchment no runoff attenuation developments were made. The emphasis was given to the creation of storage areas.* | | |
| Impact on groundwater | *Measures impact on groundwater is positive, there are enhanced possibility of infiltration at the retention pond.* | | |

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| | *The reason of applying a closed culvert (among other aspects) across the settlement was the protection of groundwater, because an open watercourse would drain the groundwater at low water periods.* | | |
| Impact on soil moisture and soil storage capacity | *Detention ponds and storage areas will increase infiltration, but only have very local effect* | | |
| Restoring hydraulic connection | *At the stream estuary 5 ha can be inundated.*<br>*Along the 31km middle section there are places where protected areas are reconnected to get water at high water periods.* | | |
| Water quality Improvements | *The detention pond above the settlement will serve as a reserve for dilution when water quality problems arise due to low water quantities in the stream. (The effluent of the town's treatment plant discharges into the stream)* | | |
| WFD Ecological Status and objectives | *Half sided maintenance works along the stream to keep clean the peak flow cross section and provide the necessary zoning.* | | |
| Reducing flood risks (Floods Directive) | *Flood risk is managed with the upstream detention pond, the upgrade of the culvert across the settlement, the provision of the necessary drainage capacity of the stream and the creation of buffer zones at the estuary* | | |
| Mitigation of other biophysical impacts in relation to other EU Directives (e.g. Habitats, UWWT, etc.) | *The upgrade of the lock at the estuary enable the fish migration between the Körös stream and the Tisza* | | |
| Soil Quality Improvements | *Has the NWRM impacted the overall soil quality? In which way? Please provide some explanatory text. Provide details on specific pollutants (N, P, soil carbon/organic matter, physical properties-bulk density, etc.)* | | |
| Other | *Please described any other biophysical impacts not captured in the predefined list* | | |

## VI. Socio-Economic Information

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| What are the benefits and co-benefits of NWRMs in this application? | There are lower defence costs at water logging periods because no pumping costs will be raised at the estuary lock where temporary storage area was created.<br>Amenity benefits in the settlement where a new 4 hectare park was created above the track of the culvert. | | |
| Financial costs | ***Total:*** | *3.667.000 €* | *The present value of the project. The calculations assumed 5% discount rate for the 30 year period of the project. The HUF-EURO exchange was calculated on 2008 € average exchange rate* |

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| | *Capital:* | *3.730.000 €* | *It is higher than the total because project calculations include the estimated cost reduction in operational costs* |
| | *Land acquisition and value:* | *145.000 €* | *Land value is part of the capital cost* |
| | *Operational:* | *Value in €* | *There are cost savings due to forgone pumping cost 88.800€* |
| | *Maintenance:* | *25.400 €* | *The Net Present Value of total maintenance cost 57.100€, but there is a forgone cost of desludging 31.700€* |
| Were financial compensations required? What amount? | *Was financial compensation required: No* | | |
| | *Total amount of money paid (in €):* | | |
| | *Compensation schema:* | | |
| | *Comments / Remarks:* | | |
| Economic costs | *Actual income loss:* | | |
| | *Additional costs:* | | |
| | *Other opportunity costs:* | | |
| | *Comments / Remarks:* | | |
| Which link can be made to the ecosystem services approach?<br>*Hint: The actual benefits of improving nature's water storage capacity are essentially linked to an improved provision of some of the following ecosystem goods and services:*<br>- *Freshwater for drinking.*<br>- *Water provision to deliver water services to the economy both for drinking and non-drinking purposes.*<br>- *Water security (reliability of supply and resilience to drought).*<br>- *Health security (control of waterborne diseases).*<br>- *Flood security and protection.*<br>- *Storm surge protection.*<br>- *Biomass production.*<br>- *Amenities (associated to habitat protection): fish and plants, tourism, recreation, and others.*<br>- *Benefits of improved coastal water quality and ecological status for a sustainable commercial production of shellfish with human health and* | The development can be linked to services: Flood security and protection,<br>Amenities – the improved environment enhances local recreation<br>Ecological status – fish population from Tisza re-appeared in previously unreachable sections | | |

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| *welfare values.* | |

## VII. Monitoring & maintenance requirements

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| Monitoring requirements | Water quality monitoring for chemical and biological components follows the changes since the implementation. There is a qualification of the water body by the WFD components every year: Oxygen status, organic materials; nutrient load; acidity; salination, also priority substances. The biomonitoring includes: fitoplankton, Macrofita, macrozoobenton, fish fauna.<br>Chemical parameters and fitoplankton are collected on monthly bases, the other annual bases<br>There are three sample point above the settlement, below the discharge point and at the estuary |
| Maintenance requirements | There are regular supervisions of the infrastructure what the responsible water directorate operates in its whole district. Maintenance works are based on this. |
| What are the administrative costs? | No site specific cost assigned it is included in the monitoring activity of the directorate |

## VIII. Performance metrics and assessment criteria

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| Which assessment methods and practices are used for assessing the biophysical impacts? | The WFD status survey took place in 2005 before the project implementation process. The monitoring results are compared to the annual qualification of the monitoring result, published in the regional water directorate's yearbook |
| Which methods are used to assess costs, benefits and cost-effectiveness of measures? | No ex-post cost effectiveness analysis was made. |
| How cost-effective are NWRM's compared to "traditional / structural" measures? | The development was a mix of different type of measures. There is no possibility to compare by such dimensions. |
| How do (if applicable) specific basin characteristics influence the effectiveness of measures? | |
| What is the standard time delay for measuring the effects of the measures? | |

## IX. Main risks, implications, enabling factors and preconditions

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| What were the main implementation barriers? | The upgrade of the works can provide a much bigger retention potential if landowners next to the public lands along the watercourse engage in adapting their land use to temporary water cover. The recent barrier in operation is the lack of this common engagement. |
| What were the main enabling and success factors? | Enabling factor was the initiative role of the |

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| | water directorate and its co-operation with the national park to. The main enabling factor was the availability of funds that make possible to tackle problems that the settlement faced. |
| Financing | The funding source is the EU Regional Development Fund KMOP-3.3.1/C-2008-0003 |
| Flexibility & Adaptability | The implemented measures are flexible. From technical point of view it can service higher water retention needs and governing water to adjacent areas if the necessary land use agreements are set. |
| Transferability | |

## X. Lessons learned

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| Key lessons | The development aims to manage both water extremes of a small water course: (1) water logging problem in residential and agricultural areas and (2) low water or lack of water in the stream that results in bad water quality due to point and diffuse effluents. The installed technical elements are necessary, but not sufficient parts of creating NWRM measures. The water directorate could use only the limited public lands along the water courses. These areas can provide only a limited set of the potential effects. Water quality improvements by natural assimilation needs more land to interact with the polluted water.<br>EU funds can help overcome the technical shortages, but it can't avoid the interest resolution between the different public and private interests. The installed works are ready to supply higher level of water retention in landscape scale if stakeholder agreements will be created in the future. . |

## XI. References

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|---|---|
| Source Type | *Project Report* |
| Source Author(s) | Middle Tisza District Water Directorate |
| Source Title | KÖRÖS-ÉRI BELVÍZFŐCSATORNA MEDERFEJLESZTÉSE ÉS REKONSTRUKCIÓJA<br>Riverbed development and reconstruction of the Körös-stream drainage channel. – Feasibility study |
| Year of publication | 2008 |
| Editor/Publisher | |

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|---|---|
| Source Type | *Other (specify)* |
| Source Author(s) | Middle Tisza District Water Directorate |
| Source Title | 2011, 2012 Yearbook of the Middle Tisza District Water |

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|---|---|---|---|
| | Directorate | | |
| Year of publication | 2011, 2012 | | |
| Editor/Publisher | | | |
| Source Weblink | http://www.koroserfejlesztese.hu/ | | |
| Key People | | *Name / affiliation* | *Contact details* |
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