Water Balance model for the Danube basin

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Why water balance at Danube level?

- Achieving good water ecological and quantitative status need knowledge about available water resources
- Danube countries proved to use different calculations and models

Need for a common approach in developing a Danube wide water balance was identified in previous studies, they should contribute to:

- Better understanding of main components of water balance on basin and sub-basin levels,
- Framework for evaluation of management policies leading to good quantitative status of water bodies,
- Developed and commonly accepted tool to be used for DRBMP and nationals RBMP,
- Assessment of the climate change impacts on elements of water balance.

Proposal for future directions of the ICPDR Water Balance activity

by the Lead Countries of the ICPDR Water Balance activity, Hungary and Serbia

DISCUSSION PAPER

for the ICPDR Working Meeting of National Experts on Water Balance (30 March 2021, online)

A) Introduction

This document is based on the background document "Support in identification of future scope, technical solutions and next steps towards a Danube wide water balance". The Background Document provides a good overview of the status of the current activities related to water balance in the Danube basin and a thorough explanation of feasible options for each of the crucial questions for future ways of developing a Danube wide water balance.

• A Scoping study on hydrological modelling of water balance was finalised in March 2019, it analysed the needs and the necessary elements of an improved water balance for the Danube River Basin

• A Water Balance Questionnaire was disseminated to get feedback from the Danube countries on the scope, issues and technical solutions related to water balance assessment, and completed in 2019/2020 (including replies from AT, BA, HR, CZ, DE, HU, RO, RS, SK and SI)

• A Water Balance Background Document was prepared in 2020, under the guidance of lead countries Hungary and Serbia, as a background document for the organization of the meeting of national experts on water balance.

Steps taken so far under the ICPDR water balance activity

ICPDR Working meeting of National Experts on Water Balance

At the OM-23 (December 2020) the ICPDR asked "the RBM EG, in close cooperation with lead countries HU and RS, to prepare a final background document on the water balance and to agree and prepare the next steps, including a working meeting of national experts on water balance in 2021, prior to RBM-53".

- Online event with presentations and discussions
- 10 Danube countries present + EC, stakeholders, modellers
- Good working spirit, positive outcomes

Topics discussed:

- objectives of the water balance activity (i.e. what the Danube water balance model should be used for),
- data needs and availability (what is already reported and what needs to be added),
- suitable models, given the objective and the data needs (scale, need for an ensemble or a new model, etc.),
- a roadmap towards the Danube water balance model



- In principle, the Working Meeting agrees to develop a **Danube Water Balance model** in a way that a **Danube Water Management model** can be established in a consecutive phase, but first we should fully focus on the Water Balance model and discuss the objectives of the Water Management model later on.
- A robust Water Balance model is needed and should be set up as soon as possible covering the entire Danube Basin.
- Assessment of **climate change** effects on the hydrology is a very important objective, **groundwater and ecosystems** should also be considered.
- It is agreed that a **single, basin-wide model** should be used at both the **Danube basin-scale and the sub-basin scale**, it should be a realistic model, using existing experience, data and knowledge.



- The Working Meeting agrees that additional data reporting should be minimized as far as possible and the **use of global/regional data** could be considered wherever available. Available and less complex data should be used.
- Enough data is available in different scales, its management can be challenging, but there are solutions.
- Water balance data needs should be streamlined with other ICPDR initiatives, data collection streams where possible.
- Potential data collection problems should be clearly defined, data availability to be checked.
- **Pragmatic and holistic** approach to a water balance model are needed.

key messages and conclusions

- Groundwater data should be included in the model from the beginning as adding it later can be problematic.
- Water balance assessment should be performed for a period of 30 years if possible and water balance should be assessed at least once in 6 years.



- It was concluded by all participants that there is neither need nor possibility to make any decision on the future model during this meeting.
- Lots of data are available, there are some good models in hand with a lot of choice of water quantity related parameters which could be included in the water balance model.
- One of the key issues is maintenance / continuous support to the model once it is ready.
- **Simple and robust model** to provide appropriate results with as **little effort** as possible in terms of the input data processing, testing and update is supported by the Working Meeting. NO complex system with extreme high-tech skills and expertise should be required, rather something like MONERIS or other product that will allow national experts from the Danube countries to run it with some external support and additional resources.
- A freely available model or a commercial model should be chosen, provided that purchase, operation and maintenance **costs are affordable** for all Danube countries. External support should be provided for the model maintenance.
- We should not start from scratch, but a more detailed analysis of already existing models should be the next step! We
 need to define framework conditions and what is needed from the model in 3-5 years' perspective. Lead Countries'
 experts should continue clarifying the details of the presented models in this respect after the Working Meeting.
- The spatial resolution should be less than 1,000 km² for semi-distributed or 1 to 10 km² for fully distributed models, the temporal resolution of model results should be daily.

Topic 4: Roadmap towards the models –
key messages and conclusions

	PHASE I
04-05/2021	Initial model assessment by Lead countries' experts
06 /2021	Main lines of future water balance activity is agreed and an Ad-hoc Water Balance Expert
	Group established
07 - 09/2021	Detailed model assessment and input data sources and availability assessment
09/2021	Decision on project content and essential partners other than parties
	Drafting of project proposal starts (drafting Group)
01/2022	Project application for fund
09/2022	Project starts
	PHASE II
03/2023	Data collection and preparation (hydrological time series and GIS)
09/2023	Model calibration
12/2023	Model validation
06/2024	Outputs processing and evaluation of results
12/2024	Dissemination of results
03/2025	Start-up at Danube basin and sub-basins
2029	Re-calibration

- The Working Meeting agreed that **main directions and milestones** of the Water Balance activity should be presented to and discussed in the 53rd RBM EG meeting and agreed at the ICPDR Standing WG meeting 2021 a **clear commitment from the Danube countries** is needed.
- It has been reiterated that the process of developing the Danube Water Balance is managed within the ICPDR by two Lead Countries (HU and RS), supported by a team of national experts nominated by HoDs.
- The Working Meeting agreed that a **drafting group of national experts, interested project partners and associated partners** should be established – guided by two lead countries (HU and RS) and in the frame of the team of national experts – to work on the future ToRs of a project on water balance.
- The Working Meeting agrees that a **multidisciplinary consortium** mainly consisting of the Danube basin member states organizations and companies should be established and a **project proposal** on preparing a Danube Water Balance model should be prepared by a drafting group and **submitted to new EU MFF calls** at the end of 2021.

Hydrologic Cycle Components Watersopperson Precipitation Franspiration Evaporation Groundwater discharge

 Lead Countries (HU and RS) will continue – with the support of the national water balance experts already nominated – in preparing the next steps towards the future project Terms of References.

Proposed way forward

- A drafting group of national experts, interested project partners and associated partners shall be established to work on the ToR of the Water Balance project in the frame of the group of national experts.
- As a further step, relevant organizations and companies from the Danube basin and beyond shall be **identified as potential partners** of a multidisciplinary consortium. Also, an organization/partner will be nominated to lead the preparation of the project proposal on the development of a Danube Water Balance model in close collaboration with the drafting group, in autumn 2021.
- A **project proposal** is planned to be submitted in response to EU MFF calls in 2022.



ICPDR resolution

Hydrological Modelling of Water Balance

The Standing Working Group

- Takes note of the results of the Working Meeting of National Experts on Water Balance (30th March 2021);

- Agrees that a single, Danube basin-wide water balance model should be set up with affordable costs, on the basis of already existing data and as little additional data collection by Danube countries as possible;

- Agrees that the water balance model should also be applicable at sub-basin level and compatible with other ICPDR initiatives (MONERIS, Danube HIS, SOLUTIONS);

- Supports the involvement of national experts and stakeholders as well as the establishment of a core drafting group to work on the preparation of an international water balance project and therefore asks ICPDR contracting parties to confirm nominations of national water balance experts and welcomes any additional nominations by 15th July 2021;

- Asks the Lead Countries (HU and RS) to continue with the support of a core drafting group of national water balance experts (out of the pool of nominated national water balance experts) preparing the necessary steps towards the Terms of Reference and assist in establishing the consortium of the future water balance project for the Danube River Basin for submitting it to EU MFF calls at the end of 2021 or the beginning of 2022.



Thank you for your attention!