

## Preparing FAIRway 2 works in the Rhine-Danube corridor

### MINUTES (final)

#### Stakeholders' Forum Meeting 12 (SHFM12)

Date	11.12.2024
Time	10:00 – 12:00
Place	Online meeting (Google Meet): <a href="https://meet.google.com/ezt-fvgw-ubo">https://meet.google.com/ezt-fvgw-ubo</a>
Participants	See List of Participants (LoP)
For the minutes	Katarina Marinković, Predrag Živadinović

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The presentations are available for download on the [Stakeholders' Forum website](#).

#### Welcome note

Mr. Ljubiša Mihajlović welcomed all to the 12th Stakeholder Forum meeting for the Project "Preparing FAIRway 2 Works in the Rhine-Danube Corridor". He introduced himself as a representative of the Directorate for Inland Waterways. The Serbian Ministry (MGSI) is a project partner responsible for organising and coordinating the Stakeholder Forum in the project.

The formal end of the project is foreseen to be on 31.12.2024., at least from the perspective of the grant agreement's contractual obligations. However, the contract for modelling activities between the Serbian contractor (Hidrozaod) and the Serbian beneficiary (Ministry) will continue in 2025. The next steps and plans for 2025 will be discussed during the meeting.

Focus of this Meeting will be directed toward the MCA, which was initiated long ago. Additionally, ideas for future interventions or training works on critical sectors will be presented during the day.

Ms. Marina Ilić, the chairperson of the forum meeting, provided an overview of the agenda and the presentations scheduled for the meeting.

## Modelling & Multi-Criteria Analysis of the common Danube section

**Multi-criteria analysis and 2D Modelling** (Nikola Rosić, Hidrozavod DTD, 2024-12-11\_PPT\_SHFM12\_MCA-2D-modelling\_Rosic.pdf)

The presentation emphasizes the Multi-Criteria Analysis (MCA) methodology, starting with the criteria and indicators that guide the scoring process.

Since the last Stakeholders' Forum Meeting, two new indicators were introduced based on suggestions from Stakeholder Forum Members, with weighting coefficients redistributed accordingly. The scope of the project remains confined to specific sectors along the Danube and limited to hydrodynamic and morphological simulations within the main channel.

The first group of criteria focuses on the project's primary goal: improving navigability, with minimal critical feedback. However, naming adjustments were made to sub-criteria based on suggestions. The second group of criteria, containing the largest number of sub-criteria and indicators, forms the foundation for scoring. A new sub-criterion, "physical naturalness of solution," was included, incorporating quantitative indicators such as "number of structures difference."

In the hydromorphology sub-criteria, a new indicator, "bank erosion length ratio," was added. Indicators referencing differences and ratios were defined relative to "doing nothing" scenario. These additions necessitated further redistribution of weighting coefficients and adjustments to acceptable score ranges.

Consultants highlighted long-term erosion issues identified in previous projects and proposed solutions to minimize impacts on sediment transport. Lateral connectivity indicators were expanded with two new additions under hydromorphology and naturalness of solution criteria.

Environmental concerns related to dredging are to be evaluated based on dredging volume, while bird and fish population sub-criteria now include indicators for nesting, wintering, spawning, and fish migration. Feedback from stakeholders, including Tibor Mikuška, has been integrated into updated reports which will be distributed to the SHF after the meeting.

Numerical simulations are underway for the "doing nothing" scenario. Four scenarios—doing nothing, structural measures, fairway realignment, and small-scale restoration—are being assessed. These scenarios include features like removing existing structures and creating side channels.

Future steps prioritize finalizing the MCA definition and defining criteria, sub-criteria, and indicators to enable scenario definition. Iterative processes involving numerical simulations will refine scenarios, culminating in the application of MCA as the final step. Finalizing the MCA definition is critical to advance scenario development.

### **Questions & Answers:**

**Q (Mr. Tibor Mikuška, Croatian Society for Bird and Nature Protection):** *The key question was framed around the concept of a potential score, which could range from 0 upwards, alongside the definition of an acceptable score tied to key navigation criteria. It was emphasized that, in a "do-nothing" scenario, the score would be 1, setting the minimum acceptable score at 1 or greater. The distinction was made that, while the potential score could be negative or reach 0, the acceptable score for the project must exceed 1, thereby surpassing the baseline established by the "do-nothing" scenario.*

**A (Mr. Nikola Rosić, Hidrozavod DTD):** Criteria and indicators should be analyzed first, followed by determining the acceptable range. However, it was noted that the lower limits had been set to align with the project's main objectives. While it was acknowledged that the lower limits for the first sub-criteria are relatively high, adjustments could be made if necessary. Nonetheless, it was emphasized that presenting scores for the first set of criteria that fail to align with the project's main objectives would not be appropriate for this type of project.

**Q (Mr. Georg Rast, consultant):** *I would like to recommend making the first set of N1 DC recommendations clearer. As mentioned, all measurements are based on a 200-meter fairway width, a 2.5-meter fairway depth at ENR (Etiage navigable et de régularisation), and a curve radius. However, when reading the DC recommendations, the context seems quite different in the recommendation paper. Therefore, I would suggest explicitly stating that the measuring parameters are definitively linked to the 200-meter fairway width to ensure clarity and avoid any confusion.*

A (Mr. Nikola Rosić, Hidrozavod DTD): Minimal water depth below which recommended fairway width is not met anymore. This represents the vertical distance between that elevation and the low water navigation level. For instance, if there is a vertical distance of one meter above the low water navigation level, dredging or other measures may be required if the minimal requirements are not met. Essentially, this vertical distance serves as a criterion derived from elevation.

**Q (Ms. Jasna Muškatirović, Danube Commission):** *What optimal mean? If somewhere should be written what are those recommendations mean? Recommendation for that ratio? The fairway is a rectangular shape. The question is what is the top width? Fairway is same at the top and the bottom because it's a rectangular shape. It's a width. It's one value.*

A (Mr. Nikola Rosić, Hidrozavod DTD): Ratio means ratio between some scenario and doing nothing scenario's values. Water depth and top width will be analyzed along the selected sections and average values will be used for comparison with corresponding average values for doing nothing scenarios. I agree. It's a width.

**Q (Ms. Kerstin Böck, WWF Austria):** *There is a question regarding the understanding of the acceptable score for the DC recommendations. Does the acceptable score refer to the „do-nothing“ scenario? Would such a case be automatically excluded, as indicated by the score of 1 in the example provided in the shared document? For clarity, the understanding of the acceptable score is that a score within the range of 1.5 to 2 would still be considered acceptable and included. If the score falls outside this range, the scenario would be excluded. An excess score of 1 would indicate that the scenario is no longer an option, which is typically the case for the „do-nothing“ scenario.*

*There was some confusion regarding the statement that the „do-nothing“ scenario cannot be considered. It was initially thought that the „do-nothing“ scenario was still under discussion as an option, not just the baseline. However, this appears to have been a misunderstanding.*

A (Mr. Nikola Rosić, Hidrozavod DTD): It was discussed that scenarios can be separated and ranked. Scenarios that do not meet the minimum acceptable score will not be deleted, but efforts will be made to find ways to improve navigability for all scenarios, including those involving restoration measures.

The second scenario, involving fairway realignment, is referenced, while "doing nothing" remains the base scenario and will be run, though it can be excluded from further consideration. The goal is to identify ways to improve navigability, particularly in restoration scenarios, and to present the scores for all scenarios.

This approach applies to all criteria and sub-criteria, with the primary objective being to find solutions that achieve acceptable scores.

**Q (Mr. Arno Mohl, WWF Austria):** *The "do-nothing" scenario, as the baseline, serves as a reference point. However, if modeling demonstrates that it actually leads to an improvement in the situation, it is difficult to understand why it should be excluded. Nevertheless, as clarified, the "do-nothing" scenario is intended purely as a reference scenario, providing a comparative foundation, and should not be excluded even if it shows positive outcomes.*

A (Mr. Nikola Rosić, Hidrozavod DTD): The focus is on analyzing interventions that can improve navigability. While the "do-nothing" scenario means no intervention is made, the objective is to find solutions that offer improvements in comparison to this baseline approach. Even if the "do-nothing" scenario may lead to improvements, it is not the primary focus of the project. The goal is to propose alternative solutions that enhance navigability, providing options for improvement rather than simply analyzing the "do-nothing" scenario. Ultimately, the aim is to present viable solutions for better navigability, though the decision-making lies beyond the scope of this Terms of Reference of the modelling contract.

**Q (Mr. Arno Mohl, WWF Austria):** *If modeling indicates that the "do-nothing" scenario improves the situation, it becomes a valid option for navigation, even though it involves no interventions. The dynamic nature of the river means that such improvements could evolve over time, with potential for both positive and negative impacts. For instance, past interventions have led to downstream issues, illustrating the river's dynamic and unpredictable behavior. While the effects on navigation can be either positive or negative, it's important to recognize that predicting these outcomes with certainty remains challenging.*

A (Mr. Nikola Rosić, Hidrozavod DTD): As mentioned, if the "do-nothing" scenario improves navigability, it will raise the lower limits for other scenarios. While it might be argued that this is sufficient for other

objectives, it's not the consultant's responsibility to make that determination. The consultant's role is to analyze and identify potential measures, not to decide on their adequacy.

The materials produced will serve as a basis for decision-makers to use in their discussions and decisions. Therefore, further conclusions on these topics are not for the consultant to make.

***Q (Mr. Daniel Trauner, Environment Agency Austria): The acceptable score of 0.25, as I understand, suggests that a certain level of deterioration in the parameters or criteria is deemed acceptable. However, this raises an important concern regarding the deterioration of water quality and biological parameters, particularly given the key principle of the Water Framework Directive, which emphasizes the non-deterioration of water quality.***

***To address this, it would be necessary to justify how the acceptable score aligns with the overarching principle of the Water Framework Directive. If any deterioration is allowed, it should be thoroughly explained and supported by sound reasoning, ensuring that it does not conflict with the directive's objectives of maintaining or improving the ecological status of water bodies.***

A (Mr. Nikola Rosić, Hidrozavod DTD): Water quality can only be assessed through expert judgment, as there is no available data or models for a detailed analysis in this project. The focus will primarily be on aspects related to interventions, especially dredging. Dredging volume is most closely associated with water quality parameters, and virtual dredging volumes will be presented for all scenarios to evaluate potential effects on water quality.

Additionally, certain structures may significantly alter water depths, which can influence temperature, a key physical water quality parameter. These changes can, in turn, affect chemical and biological parameters. However, due to the lack of data and models, a deeper analysis of water quality is outside the scope of this project.

As mentioned, this project serves as a preparatory phase, and a more detailed environmental impact assessment should follow to further explore these issues.

***Q (Mr. Tibor Mikuška, Croatian Society for Bird and Nature Protection): Two additional criteria were proposed: one is the riverbed incision criterion, which can be calculated, and the other is the boundary possibility indicator. Have these been accepted? The riverbed incision is addressed through the riverbed volume ratio, and river meandering is covered by the bank erosion length ratio. The bank erosion length ratio was introduced in response to previous suggestions. The bank erosion length ratio refers to the section of the bank prone to river erosion. A question has arisen regarding the calculation of the SHDI index. What is the basis for this calculation, and which base map is used? Additionally, there is an issue with the index being highly dependent on the surface area. How is the proportion of each area calculated? The river-only area, from bank to bank, would result in a lower index than the river plus floodplain area. How is this factor considered?***

A (Mr. Nikola Rosić, Hidrozavod DTD): The floodplain area is not included in the analysis due to the absence of floodplain geometry data, which was not provided to the consultant. Therefore, the focus will be on the main river channel. For ecological value, low flow discharge has been chosen as an indicator because of its significant ecological importance.

It is acknowledged that this approach could be formulated differently. Additionally, using water depths at bankfull discharge to assess the distribution of water depths along the selected section could also provide valuable information on the unevenness of water depths, serving as a good hydromorphological indicator, highlighting the diversity of water depths and morphological features. This will be considered in future assessments, and the consultant will look into possible amendments.

Ultimately, the decision was to use low flow discharge as the primary indicator, and the assessment will be based on the results of 2D simulations of morphological alterations.

***Q (Ms. Kerstin Böck, WWF Austria): In the comments, an additional criterion was proposed, which pertains to the potential effects of measures on protected wetlands, such as biosphere reserves or gravel bars. I was wondering if this has been considered. It is perceived that there should be a pre-determined approach to assess whether a specific measure impacts the goals, such as avoiding further degradation or preventing additional bank erosion, etc.***

A (Mr. Nikola Rosić, Hidrozavod DTD): The introduction of a criterion related to the number of structures, with a negative score for each additional structure, is a valid approach for assessing the impact of

infrastructure on the environment. This criterion ensures that each new structure is carefully considered, both in terms of its necessity and its potential environmental consequences.

However, it's important to differentiate between structures that are designed to improve navigability or stability and those that might cause negative effects. To refine this approach, it might be helpful to not only score the presence of structures but also evaluate their potential positive or negative impacts on ecological functions, such as sediment transport, water quality, or biodiversity.

The goal of removing existing river training structures could also be seen as a positive step towards restoration or improving hydromorphology, so this approach aligns well with environmental conservation objectives. Thus, the score for structures could be further nuanced based on their intended purpose and environmental implications.

***Q (Mr. Georg Rast, consultant): Regarding the criterion for the naturalness of a solution, it is unclear whether the number of structures is truly an appropriate measure. Physical naturalness is understandable, as it primarily relates to the mere presence of river training structures. At the moment, no alternative suggestion comes to mind.***

A (Mr. Nikola Rosić, Hidrozavod DTD): It primarily pertains to the presence of river training structures. Additionally, the names of the relevant documents can be included. This may be linked to the criteria addressing issues of lateral connectivity.

***Q (Mr. Tibor Mikuška, Croatian Society for Bird and Nature Protection): I also commented on the fact that, in addition to nesting and wintering, consideration should be given to foraging opportunities during the spring and fall migrations. This area supports over 20,000 water birds daily due to the available feeding opportunities. How would these issues be addressed? It was also mentioned that the scores for the impacts of the solution should not use the scenario with a value of 1. With improvements, the score would increase from 1 to 2. However, significant deterioration would disqualify the solution. What is the definition of "significance"? Similar to sediment and water quality, deterioration would essentially result in a score of "not possible." Does deterioration disqualify the solution, or does it indicate that the solution requires modification?***

A (Mr. Stefan Skorić, Hidrozavod DTD): The comments were noted, and efforts were made to address and incorporate your suggestion in the updated version of the document. Regarding all other comments related to birds or fish, these were also considered and included in the next version of the MCA documents. These updated documents will be distributed after the meeting, along with other inputs provided by SHF experts during this meeting. Changes to the bank or the velocity of the main channel of the Danube are considered significant deterioration, particularly in relation to the bird population, with a primary focus on the wintering population of the Danube.

***Q (Mr. Georg Rast, consultant): When discussing technical solutions, adaptability to changing climate conditions is now always a requirement. While this can be assessed qualitatively, it may not be measurable quantitatively. From a technical perspective, any planned investments in structures, reconstruction of structures, or structural interventions should also be evaluated in terms of their adaptability to changing climate conditions. The key point is that the hydrological investigation has shown an increase in ENR by approximately 15 to 20 centimeters. However, after 10 or 20 years, the ENR may decrease by 20 centimeters. In the meantime, certain works might have been executed that no longer align properly with the new conditions.***

A (Mr. Nikola Rosić, Hidrozavod DTD): The focus here is on addressing adaptability, specifically in relation to climate change as the main cause. Adaptability is incorporated as part of climate change vulnerability, but it is assessed qualitatively, as explained. Climate change sensitivity will be evaluated based on the sensitivity of the results to hydrological inputs, particularly in the context of the purpose of specific interventions. In the simulation, the hydrological sensitivity will be analyzed to understand its impact on the proposed solutions.

## 2D modelling activities – Definition of a scenario for analysis *(Nikola Rosić, Hidrozavod DTD, 2024-12-11\_PPT\_SHFM12\_MCA-2D-modelling\_Rosic.pdf)*

The proposal builds on previous work while incorporating new ideas, focusing on structural river training measures with innovative elements like chevrons, for which Serbia has some prior experience. Initial discussions with colleagues from Ployput led to the identification of a few river training structures, including chevron seals and side channels, as part of a first scenario, with potential for additional sub-variants to be analyzed.

Chevrons, curved structures with elliptical heads, direct flow in two directions to modify bottom shear stresses, targeting stabilization of the main channel, which is critical for navigation. This concept also provides ecological benefits by creating habitats for fish and birds. The dimensions and number of chevrons remain subject to further engineering considerations. Additionally, the bank near Kopački Rit is left unprotected in the scenario to examine how erosion might influence navigation parameters.

Bottom sills were proposed along the left bank of the Danube, near the town of Apatin, to enhance conveyance along the right limit of the fairway, where sediment deposition presents significant challenges. The objective is to redistribute bottom shear stresses, thereby improving navigation conditions near the right fairway limits.

The rationale behind the secondary channels proposal is to address shallow areas near the left bank of the Danube, where sediment deposition is problematic. The proposed excavation of these channels aims to provide ecological benefits while improving navigation conditions downstream by reducing sediment accumulation. This would alter the sediment regime, creating more favorable conditions for navigation further downstream.

A similar approach is suggested for the section, where navigation conditions were relatively stable in 2023 but issues are anticipated downstream. By reducing sediment load, we expect improved conditions downstream in the Staklar area. Reducing shear stress in the main channel should, in theory, decrease bed load and enhance conditions further downstream. However, this assumption needs to be validated through numerical simulations.

### **Questions & Answers:**

***Q (Mr. Georg Rast, consultant): That is all acceptable, but the key question is regarding the dimensions of the new excavated side channel. What are their exact dimensions? Additionally, what is the optimal distance for the bottom sills? Given the number of variables, will these be modeled, and what is the objective in optimizing such a solution? I am wondering whether a bottom sill with just 2 or 3 meters in height will have any significant effect. Previous investigations have shown that if the sill does not restrict at least one third of the depth, there will be no effect. Therefore, I would recommend reviewing the experiences gained from the Serbian project.***

**A (Mr. Nikola Rosić, Hidrozavod DTD):** That is a good question regarding the objective, and it can also be considered in the context of the MCA. We have requirements related to improving navigability, which define our objectives. These objectives are tied to our MCA criteria or a group of criteria that can be addressed by the proposed measures. Therefore, we should vary the number and distance between these measures to assess their impact on the criteria. Aspects related to fish, including the height and dimensions of bottom sills, were discussed with Vesna. The objectives and criteria will be aligned with the MCA, and various dimensions will be analyzed accordingly.

**Additional information (Mr. Zoran Rašić, TA):** We have already discussed the proposed solution, and I would like to mention that the criteria you, Georg, have addressed will be further developed through modeling. At this moment, I believe we are not able to provide a precise definition of this criterion.

We need to complete the figures, input the discharges, shear stress, and then compare and analyze them to ensure that the criteria are properly addressed. At this point, I believe we can only discuss the proposal and consider how to optimize the proposed structures. That is all for now, I think.

A (Mr. Nikola Rosić, Hidrozavod DTD): We have already created some drawings using CAD software and the model. We began with a water height of approximately 2 to 3 meters regarding the bottom sills. We also started working on the chevron dimensions, but this information has not been shared yet.

Chevrons are relatively new and innovative structures, and we are gathering relevant data based on experiences from previous projects. Of course, one chevron has already been implemented in Futog, so we are obtaining information from that.

Although we have not yet obtained data regarding the environmental impact, we do have some drawings. However, as I mentioned, I cannot provide much detail at this stage, as it is an ongoing process. Regarding the bottom sills, we have already made the necessary drawings, while for the chevrons, we have their positions in the horizontal plane. We are currently analyzing the heights of the crest levels and will continue to do so.

The goal here is to propose a solution that will have minimal negative impacts on hydromorphology and, of course, on biodiversity.

***Q (Mr. Arno Mohl, WWF Austria): I have a question regarding the measure. In the example from Apatin, you showed the upstream area where the chevrons are indicated, and there is a Google photo showing these chevrons. On the right bank, upstream, there are some tree stumps—about three, I believe. Could you also consider these in your modeling and assess what the impact would be if they were removed?***

A (Mr. Nikola Rosić, Hidrozavod DTD): We can analyze the model and any modifications to the geometry, including the possibility of removing the structures.

We've considered the Croatian side of the bank as non-modified (natural) for the purpose of the analysis and future solutions. We can also evaluate the impact of removing the structures and examine the mutual effects of the two types of objects.

Thank you for your comments; they are valuable and could lead to a solution. As I mentioned, this is an ongoing process, and we initially allocated four months for this type of consideration. In river engineering, there are numerous recommendations, but they are not always aligned. It's important to note that the Danube is a unique river. While we appreciate past experiences, we need to verify, recheck, and reanalyze our solutions.

Additional comment (Mr. Dejan Trifunović, Danube Commission): There is a small comment regarding the excavation of the two secondary channels. It should align with both the financial and technical criteria within the MCA, as well as the future cost-benefit analysis. I believe we cannot propose criteria that fall outside the realm of feasibility.

On the other hand, in terms of proposals, we do not see any nature-based solution except for the fourth scenario, which involves the creation of side-arms. Are there any other proposals within the scope of nature-based solutions?

A (Mr. Nikola Rosić, Hidrozavod DTD): Yes, we also included an illustration of the removal of bank reinforcements, which can be considered a natural-based solution. However, the term "nature-based solution" is quite broad.

### **Summary of procedural aspects & conclusion during the SHFM#12 meeting**

During the meeting, the MCA Word document was directly edited, with participants systematically going step-by-step through each group of criteria and their associated indicators. For each group, the acceptable score ranges and weighting coefficients were carefully examined and discussed.

The discussion for each group of criteria was thorough, and the terminology was fine-tuned in line with the deliberations carried out during the previous SHF meeting. Upon integrating all input for one group, participants proceeded to discuss the next group of criteria. This iterative approach ensured that all groups were addressed in detail, leading to a shared and comprehensive understanding among all participants.

As an outcome of the meeting, the updated MCA document will be sent to all participants after the meeting. This revised version will serve as the foundation for the next steps, including the definition and fine-tuning of scenarios. The summary of discussions is provided in the minutes above, offering a reference to the various exchanges and outlining the steps agreed upon for moving forward.

## Next steps & AOB

- Adoption of the final version of the MCA and 2D model for the “do nothing” option (as soon as possible)
- 2D modelling (numerical simulation of all options) until the end of January
- The next (13) SHFM on **6<sup>th</sup> February** (and agreeing on the dynamic of holding the next SHFM depending on the results achieved and the need for discussion)
- Application of the MCA to the proposed solution by mid-March
- Preparation of the study and submission of the final report in mid-April 2025

## Upcoming Meetings

Meeting	Date / time	Place
Stakeholder Forum Meeting #13	6 <sup>th</sup> February 2025	Online

## Attachments

- List of participants (separate file)
- Presentations (Stakeholder Forum website: <https://www.viadonau.org/en/company/project-database/preparing-fairway-2-works-in-the-rhine-danube-corridor-study/stakeholder-forum>)