2nd WP3 Expert Meeting

Vienna

Day 1 - Monday 11.03.2019

SWME – WP3

Summary of activities and deliverables of WP3.

CUEI has send out a document with a collection of terms and definitions. Not all partners received this important document. Therefore, it will be send out again to all partners. There we can include the common agreed definitions of active and potential floodplains as well as the FEM-parameters.

USZ - Progress of the DFGIS Database

The progress of the DFGIS Database was presented by the University of Szeged.
The filled metadata file plus the shapefiles of active floodplains should be uploaded to the FTP server by each country. For both USZ has uploaded a template to be used by the partners. All data will be stored on this database (FTP server).
Discussion:
What means active floodplains? – A definition will be added to the terms& definitions document from WP5.
Difference potential and potential realistic floodplains? → BOKU suggested to postpone this discussion to the next session, because there is a presentation related to potential floodplains.
Polygon of the Danube river channel provided by USZ is also available on the server. Countries are able to update it with their own data of the river channel.

BOKU - Active Floodplains

The current status of active floodplains from each country was presented by BOKU. It was decided that the partners could send BOKU their objections concerning the active floodplains until 19.03.2019. If BOKU does not receive any objections per email from the partners until this date, the active floodplains will be seen as accepted. Some partners (Germany, Hungary) are still in discussion with their authorities or internally and they will need more time to finish their discussion. As soon as Germany and Hungary have their approval, they will upload the active floodplains of their country to the FTP server.

BOKU - Potential floodplains - methodology

There was almost no feedback or input from the partners related to their *realistic* potential floodplains until the agreed deadline (08.03.2019). Therefore, BOKU presented some ideas on how to identify potential *realistic* floodplains. The outlines of the $HQ_{extreme}$ are available for the whole Danube from the Danube Floodrisk Project and are already on the FTP server for each country. Hence, these outlines are seen as the most important data basis for the identification of *realistic* potential floodplains. Additional helpful information could be gained from historical maps (if available) and from land use maps.
Data basis:

- $HQ_{extreme}$ boundaries from Danube Atlas (easiest one, available on FTP server)
- Historical maps
- Land use

REMARK:
BOKU presented their original ideas and explained how to get realistic potential floodplains in 4 steps. During the discussion, the partners agreed that there is an additional step necessary for the identification of potential floodplains, because the last step (Discussion with stakeholders) is not possible within the timeframe of Danube Floodplain. Hence, the project partners will define the operational potential floodplains for the project Danube Floodplain. The name operational potential floodplain was not part of the discussion, but to avoid confusions BOKU suggests using the wording operational instead of realistic potential floodplains. The wording of the three potential floodplains (visionary, operational, realistic) can still be discussed and suggestions are welcome.

BOKU presented their ideas for the identification of potential floodplains, we could have three types of potential floodplains: *visionary, operational* and *realistic* potential floodplains. BOKU explained how to get from the *visionary* to *operational* and from *operational* to *realistic* potential floodplains in 5 steps:

1. Identify ***visionary* potential floodplains** with HQ extreme or historic maps
2. Exclude settlements, infrastructure and streets to get potential floodplains (mostly the case, but not always → e.g. relocation project in Austria Machland)
3. Exclude agricultural land where no compensation is possible or too expensive → discuss whether this is already done here or later during the implementation?!
4. **Danube Floodplain scenarios for *operational* potential floodplains**
5. Discuss with stakeholders to define ***realistic* potential floodplains** and the technical aspects (e.g. cut in dykes)

Ad 2: In general, settlements, infrastructure and streets should be excluded from the *visionary* potential floodplains using GIS programs. We should keep in mind that there are successful relocation projects in the basin (e.g. relocation project in Austria Machland) and that projects, which were unrealistic in the past, could become realistic in the future (e.g. relocation project Machland in 2001 unrealistic; after flood event 2002 project was implemented). Due to pragmatic reasons, settlements, infrastructure and streets might have to be excluded within this project. Alternatives for exclusion of settlements could be part of the guidelines of WP5.

Ad 3: It depends on the countries if agricultural land is used as an exclusion criterion but it should be evaluated individually for each potential floodplain.

Ad 4: It was decided that we will define **Danube Floodplain scenarios for *operational* potential floodplains**, which are accepted by the partners, but we are aware of the fact that to implement *realistic* potential floodplains further steps have to be done such as stakeholder consultation etc.

Ad 5: The discussion with stakeholders (e.g. farmers etc.) is **not** part of the project Danube Floodplain, but would be necessary for the identification of *realistic* potential floodplains.

It was decided that each country should go through the explained steps, which would lead to two maps. A map of all *visionary* and one of all *operational* potential floodplains. The FEM will be applied only on the *operational* potential floodplains. During the discussion there were some concerns regarding the publication of the *visionary* potential floodplains, because these floodplains include settlements, hence it was agreed to publish only the map of the *operational* potential floodplains and to put the *visionary* potential floodplains into the guidelines of WP5.

BOKU - FEM parameter minimum

GOAL: Selection of final parameters for evaluation with FEM

Hydrology

Peak reduction ΔQ

Discussion: A 2D model, if not available 1D model or at least engineering approaches should be used. For the hydrological input data, three different potential data sources were presented. Which data source the countries use, will be decided by them individually. Further discussion will be necessary concerning thresholds for the evaluation etc., but first we need results for the quantitative parameters to see which thresholds might be suitable.

Flood wave translation Δt

Discussion: Partners discussed the total duration of the flood wave and how to determine it. Due to pragmatic reasons, it was suggested by TUM to use the mean flow for the determination of the total duration of the flood wave. The flood wave starts when the mean flow is reached and ends when the mean flow is reached again. Instead of the mean flow also the HQ_1 could be used. Partners agreed that details such as the determination of the total duration of the flood wave, thresholds etc. can only defined when all results are available. Some partners suggested also to determine Δt for smaller flood waves such as HQ_{10} as well. Additional information like the Δt for HQ_{10} would be really interesting and if there is enough time, we could consider this suggestion, but at the moment we should start with the calculation of Δt for a HQ_{100}.

Hydraulics

Water level change Δh

Comparison of water level with and without floodplain – determined in the river channel.

Ecology

Land use

CLC dataset – 44 different classes

Discussion: Some partners mentioned that this parameter is not very suitable for the category ecology and suggested to shift the land use parameter to the category socio-economics. All partners accepted this proposal.

Existence of protected species

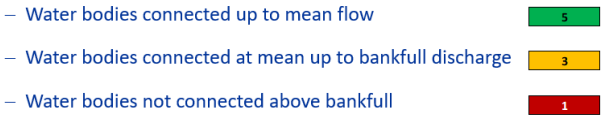
Due to feedback before the meeting, this parameter was moved to the minimum class.
Natura 2000 datasets can be used, there are all protected species listed. For Serbia the Emerald Network is a good basis.

Discussion: There was a short discussion about the consideration of specimen of each individually protected species on the floodplain, but these numbers are not available for every species. In order to keep the parameter simple, it was decided to count only the number of the protected species for this parameter.

Connectivity of floodplain water bodies

1D or 2D models can be used to determine this parameter. Other potential options would be a DEM and water levels for MQ and bankfull discharge.

Discussion: There was a discussion about the assessment (1 point, 3 points, 5 points) of the connectivity and some descriptions were changed. The new suggestion is:



We also discussed the definition of bankfull discharge. At natural conditions, the bankfull discharge is around HQ_{1-2}. For areas, which are influenced by human activites, the bankfull discharge is harder to define and for these areas, the bankfull discharge has to be defined individually. Some partners mentioned that their floodplains do not have water bodies. For them, this parameter is not applicable. If this is the case for a lot of partners, we will adapt this parameter.

Socio-economics

Damage potential

BOKU wanted to apply the parameter on the Austrian floodplains with the help of the data of the Danube Atlas from the Danube Floodrisk Project, but the data is not available by now. BOKU asked the ICPDR for the data, but the ICPDR does not have it.

Potentially affected people

Same data problems as with the Damage potential.

Therefore, BOKU suggested to use two other minimum parameters for the category socio-economics, namely the **Land Use** and **Potentially Affected Buildings**.

Land Use

BOKU adapted the description of the parameter in socio-economical terms. With the assessment of the land use types of the floodplain, we want to evaluate the vulnerability of the floodplains. Land use that is adapted to future inundation will minimize the socio-economical vulnerability of the floodplain (flood-adapted land use gets the highest rating, non-adapted (crop farming, settlements) the lowest).

Potentially Affected Buildings

The potentially affected buildings are easy to determine and a good indicator for the damage potential on a floodplain. The more buildings are affected, the higher the damage potential is. Potential sources could be orthophotos, digital cadastral maps and land charge register.

The minimum parameters were accepted by the partners. Some changes in the calculation itself can be possible if necessary. (e.g. Connectivity of floodplain water bodies, potentially affected people)

BOKU - FEM parameter medium and extended

The medium and extended set of parameters were presented and some examples were given.

BOKU will provide a detailed description and the working flow for each parameter in a handbook.

Day 2 - Tuesday 12.03.2019

BOKU - FEM -Approach

BOKU presents the ideas for the floodplain evaluation, where the minimum parameters of each category are must do's and the partners can choose additional parameters from the medium and extended classes. The results of the chosen additional parameters will NOT be included in the final FEM-evaluation, but the results will be shown as additional information and will support the decision makers. With this approach, it will be possible to compare the floodplains with each other, because everyone has to calculate the same minimum parameters. BOKU suggests to use a point/scoring system for the evaluation of the floodplains. Each parameter receives, based on the assessment, points (min. 1 max. 5). For each category the mean value of the parameters within the specific category will be calculated, which leads to a total value for the category and to the sectoral effectivity. The wording of sectoral effectivity is still to be discussed. Other suggestions for effectivity are priority, gaps, potential.
REMARK: BOKU suggests to use the term performance

Some partners suggest to put the terms like effectivity, potential floodplains etc. in the project glossary.

BOKU suggests creating an overall Floodplain Evaluation Matrix, where the sectoral results for each floodplain will be integrated. With this overall Floodplain Evaluation Matrix it will be possible to cluster the results. The clustered results will present the Floodplain performance. Partners liked this idea.

Furthermore, BOKU also presented the possibility of weighting the parameters and the category different, but at the moment, the partners prefer the example of BOKU without a weighting.

For the operational potential floodplain assessment, the same procedure is necessary and the results will be shown in a second overall matrix.

It is mentioned that it could be possible that some parameters are not suitable for the floodplain. The suggestion is that we may have to use the term "not applicable" in the evaluation. Therefore, BOKU will send out a table where partners can select which parameters they want to calculate on which floodplain and the method to do so (e.g. 2D, 1D, engineering approaches or not applicable). The table will have one sheet for the active and one for the operational potential floodplains. The table for the operational potential floodplains can be filled after the partners provided operational potential floodplains. If "not applicable" is selected, an explanation in the comment section should be provided.

If there is a parameter most countries mark as "not applicable" (especially for the minimum parameters), it will be necessary to adapt the parameter or use another one.

Further, it was discussed, how the results could be shown on the Danube Floodplain GIS. Some ideas were:

- Active and potential floodplains (different colors)
- Colors for the different evaluation groups or symbols for the categories
- Fact sheet will appear by clicking on the active or potential floodplain

Not all active floodplains will be evaluated with the FEM due to some country specific reasons. There was a short discussion how to present these floodplains in the DFGIS. One idea was to give these floodplains another color (e.g. grey).

TUM – WP4 1D&2D Modelling

On the second WP3 expert meeting in Vienna on March 12th 2019 the WP4-leader (TUM) presented the procedures for the 1D model chain in order to assess the trans-regional efficiency of floodplain restoration measures.

According to the discussions at the meeting, the following **decisions** (marked in green) for the procedures in 1D modelling for activity 4.1 were made by the PPs:

1D model availability and responsibilities

- **Drava** will not be considered anymore in the 1D model chain (decision by LP due to inconsistency in the AF)
- Suggested 1D model of **Austria** (Flux Floris) cannot be applied for the DFP purpose; therefore a new 1D model will be tried to set up (by whom?); otherwise 2D models will be applied (decision until the end of March 2019)
- The responsibility for the **Sava** modelling is not given yet; JCI waits for the official agreement of the Sava Commission to use the model in DFP (until March 22nd 2019)

1D models delineation

- The German 1D model starts at the border between Baden-Württemberg and Bavaria in Neu-Ulm. This was decided by the federal states authorities because the restoration effects upstream of the Iller inflow (i.e. at the federal states border) will be neglected by this large tributary (600 m^3/s from Danube, 1000 m^3/s from Iller in HQ100).
- Slovakian 1D Danube model will not be used as it is completely included in the Hungarian model
- Between Iron Gates I and the Timuk inflow (Bulgarian border) no 1D model is available. It is agreed by the PPs to skip this Danube section at the two Iron Gates dams in the model chain, as it has a highly unnatural flow regime.
- The model chain will end at Silistra (BG) / Calarasi(RO) because downstream no continuous 1D model is available and the Danube delta doesn't have a one-dimensional channel
- Sava will be modelled from the Croatian border till the Danube confluence. The Slovenian section of the Sava River is not included in the model
- At the tributaries Morava and Tisza PPs need to cooperate because for now the models end at the state borders.

Restoration scenarios in 1D models

On the Vienna WP3 meeting PPs decided to apply only 2 scenarios: the current state with all active floodplains (R0) and the restoration state with all operational potential floodplains restored

On the earlier WP4 Expert Meeting in Munich in December 2018, PPs agreed on using 4 scenarios with a temporal implementation (R1 short term, R2 medium term, R3 long term). But as the definition of short to long term is difficult and each single floodplain is anyway evaluated separately for act. 3.2 (FEM), the PPs decided that the two scenarios showed above are enough.
How to technically implement the restoration scnenarios in the models will be discussed in a workshop at one of the next meetings in order to generate a harmonized approach which is comparable for all floodplains. PPs are invited to deliver suggestions and examples.

Hydrological Input source

- At the WP4 Expert Meeting in Munich in December 2018, the PPs decided to use **SWIM data** as the hydrological input for the 1D models. This is a very valuable data source to receive hydrographs for different flood events (HQx) at each point in the catchment. The existing 1D models were mainly used for the delineation of flood maps (Flood directive or Floodrisk project) and thus modelled with a **steady state**, which is not suitable for the DFP purpose.
- PPs (mainly BOKU) propose to apply real events data (close to a HQ100 and up-/downscale it) from the gauging stations where available, only at sections with no sufficient data and gauging stations SWIM data can be provided by TUM
- It is decided that observed runoff data at gauges from real events can be used by the PPs in the 1D models if enough data is available, also for the major tributaries. If data is missing, PPs can ask TUM to provide input hydrographs from SWIM.
- To allow comparability of flood events among partners, samples of SWIM data at gauges will be analyzed by TUM and compared with observed data until the end of April.

HQs – Choice of hydrological scenarios

- HQ100 will be analyzed, furthermore smaller flood events, will be investigated, too: 2-5 year event, 10-20 year event (as in 2D modelling)
- Extract from SWIM or use real events at gauging stations and down-/upscale events if necessary
- Typical flood wave shapes should be applied. At least for the HQ100 a steep and a flat hydrograph must be simulated by PPs to analyze different flood volumes.

Modelling sections

- TUM suggested to analyze sections along the Danube which have a similar hydrological catchment (e.g. Upper Danube until Bratislava, Danube until large tributaries, tributaries as one section itself). Thus, the combined effect of consecutive restoration measures in potential floodplains in one section can be analyzed.
- PPs agreed to use such modelling sections. Some partners suggested to make them smaller, e.g. each 100 km at gauging stations, for other partners, the analysis of sections is more valuable if the sections stretch out over state borders (e.g. retention effects of German measures in Austria). TUM will provide a new proposal of sections which can be verified or modified by PPs.
- In a first step, modelling partners will obtain the data for the three hydrological scenarios and run R0 and R1 simulations for each modelling section. This can be accomplished individually by each PP once their model(s) is ready to run. If the modelling section crosses a border, PPs need to agree on the hydrographs they use.
  ➔ Number of simulations:
  At least 8 in each section: at least 4 hydrological scenarios scenarios (1 for HQ2-5, 1 for HQ10-20, 2 wave types for HQ100) for 2 restoration scenarios

Downstream effect of measures - cooperation with down-/upstream PP

After modelling the sections themselves, in a **second step** the trans-regional effect of measures on the downstream river section is analyzed. To assess the trans-regional effect of restoration measures, output hydrographs from the upper section need to be transferred to the downstream section PP as input for their model. The lower modelling PPs decide until where they want to analyze if there is an effect of the upper PP's restoration measures.

DRSV – Update Act. 3.3

The current methodology for the delineation of active floodplains cannot be used for the Tisza tributary. It would be one floodplain for the whole river. Therefore, it is suggested to try the delineation with another width factor (e.g.2:1). Anthropogenic structures can help to delineate the floodplains. BOKU agreed to help and will have a look at the data.

Gantt chart:

We edited the Gantt chart according to the decisions during the meeting. It will be sent to the other WP3 activity leaders first to collect their inputs and as a next step the new version will be send out to all partners.