



DHRAM Water Flow Analysis Tool

User Manual

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Parts of the DHRAM Water Flow Analysis Tool

The DHRAM Water Flow Analysis Tool works on Microsoft Excel platform. The toolset consists of two MS Excel calculation sheets: **DHRAM_FlowbaseEmpty.xls** and **DHRAM_Comparison.xls**.

For calculating basic statistical discharge factors from the flow data, you need the file **DHRAM_FlowbaseEmpty.xls**. If you also want to assess the significance of the hydrological alterations between unimpacted and impacted flow situations, you also need the file **DHRAM_Comparison.xls**.

Calculation of basic statistical discharge factors

- 1) Open the file **DHRAM_FlowbaseEmpty.xls** by Microsoft Excel. When opening the file, you have to enable the macros programmed into the calculation sheet.
- 2) Go to Flowdata –worksheet. You need the daily flow figures from the study period, whose length can vary from 1 to 50 years. **Copy the flow data from its original source and paste it to the the worksheet starting from the cell B2.** The daily flow data inserted to the worksheet have to be organised into columns, so that one column corresponds the flow figures of one study year starting from 1-January and ending on 31-December. **The years with incomplete data must not be used in the calculations**, but only such years with complete data from every day during the year. **Insert also the figure of the first year of the study period into the cell B1.**
- 3) After inserting the daily flow data to the worksheet, the basic discharge factors are calculated automatically. To view the flow charts of the study years, click the button '**Go to Flow figures – worksheet**'.
- 4) To view the statistical discharge factors calculated from the given data, click the button '**Go to Summary –worksheet**'.
- 5) To view the discharge factors in drawn charts, click the button '**Go to DHRAM charts**'.

Comparing the unimpacted and impacted flow circumstances and assessing the significance of the flow alterations

- 1) If you have daily flow data from unimpacted and impacted flow regimes, you can compare them to each other and assess the significance of the alterations in flow circumstances. At first, you have to calculate the basic statistical discharge factors for the flow data from both the unimpacted and impacted circumstances using the calculation sheet **DHRAM_FlowbaseEmpty.xls**.
- 2) Open the file **DHRAM_Comparison.xls** by Microsoft Excel. When opening the file, you have to enable the macros programmed into the calculation sheet.
- 3) Click the button '**Go to Regulated –worksheet**'. Note, that the '**Regulated**' corresponds in this case **the flow circumstances altered/changed from the original/natural state**. Save the calculations done by the **DHRAM_FlowbaseEmpty.xls** –file as the file name '**FlowbaseRegulated**' and keep the file open. Now by clicking the button '**Update regulated data**', you can insert the data to the **DHRAM_Comparison** -calculation sheet.
- 4) Click now the button '**Go to Recalculated –worksheet**'. Note, that the '**Recalculated**' corresponds in this case **the original/natural flow circumstances not altered/changed or flow figures recalculated from the flow data measured simulating the natural state**. Save the calculations done by the **DHRAM_FlowbaseEmpty.xls** –file as the file name

'**FlowbaseRecalculated**' and keep the file open. Now by clicking the button '**Update recalculated data**', you can insert the data to the DHRAM_Comparison -calculation sheet

5) Now the calculations are done automatically. To view the flow comparison and the impact classification, click the button '**Go to Comparison –worksheet**'.

6) To view the comparison charts, click the button '**Go to Charts –worksheet**'.

What kind of data can be used in the DHRAM comparisons?

Usually there are problems to find suitable data for making the comparisons between unimpacted and impacted flow circumstances, while the data describing the natural flow circumstances is not available. There are three possibilities to apply the DHRAM method depending of the data availability.

1) Using the recalculated flow data (recommended)

The most recommended way of applying the DHRAM is using the flow data recalculated from the measured flow data in the altered state simulating the flow in the original/natural state. This is the most reliable way of making the comparison, as there is no need to estimate the effects of the data used to the reliability of the results.

2) Using the measured flow data from the natural state

If there are no recalculated flow data simulating the natural/original state, the measured data from the natural/original state can be used. In the interpretation of the results, the user has to take into account, that the differences in hydrological and meteorological circumstances between the study periods (i.e. temperature, precipitation, evaporation, snow and ice circumstances etc.) may affect the results and impact points given by the DHRAM comparison.

3) Using the flow data from a reference site

In the case when no recalculated or measured flow data from the original state are not available, a measured data from a chosen reference site can be used. The reference sites have to be chosen very carefully, or otherwise the results and the impact points given by the DHRAM comparison may be very unreliable. In many cases, it may be impossible to find a reference site for DHRAM comparison method.

In Finland, the following criteria have been used in choosing the reference site for a study point located in the stream just below the outlet of a lake. There are hardly any reference sites which could fulfil all criteria below. The user must be very critical when using the criteria and estimate the effects on the results of the differences between the characteristics of the study and the reference site.

1. There must not be any regulated or modified lakes above the reference lake.
2. The distance between the study and the reference site can be at maximum 100 km.
3. The area of the lakes above the study and the reference sites has to be in the same size category (+/- 20%).
4. The lake percentage of the upper drainage basin above has to be almost the same (+/- 1%) in both sites.
5. The ratio of the area of the upper drainage basin and the lake area has to be almost the same (+/- 2%) in both sites.
6. The location of the both sites have to be almost similar in their watercourse, i.e. they both have to located either in the upper, central or lower parts of the drainage basin of the whole watercourse.