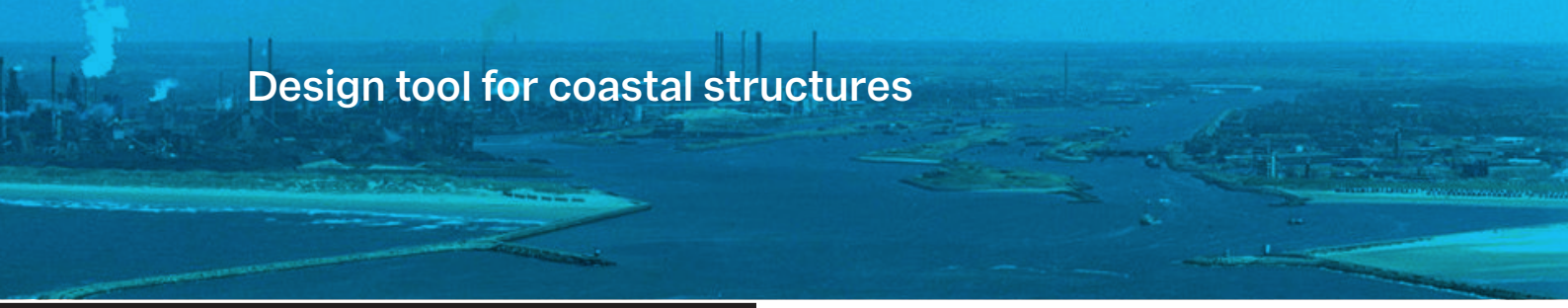
BREAKWAT

Design tool for coastal structures

Deltares systems



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BREAKWAT is useful for everyone who, even if occasional, is involved in the conceptual design of coastal structures, for example by teaching (universities), designing (consultants), testing (research institutes) or constructing (contractors). BREAKWAT is an ideal tool for those who wish to apply the results of the latest research and development and wish to do this quickly and efficiently.

General

BREAKWAT is a conceptual design tool for several types of coastal structures under wave loading. Rubble mound breakwaters with armour layers of rock material or concrete units, berm breakwaters, vertical caisson structures, reef type structures and near-bed structures can be designed using BREAKWAT up to a conceptual design stage.

The first version of BREAKWAT has been released by WL|Delft Hydraulics (the predecessor of Deltares) at the end of the 1980's. Since then BREAKWAT has been widely used by a large group of users at contractors, engineering companies, universities, research institutes, etc. throughout the world. New developments in the design of coastal structures, as well as software developments in general have been incorporated in BREAKWAT In the future, BREAKWAT will be updated with new design formulae based on recent and future laboratory and field research.

BREAKWAT uses state-of-the-art design formulae to perform calculations of the hydraulic response:

- wave height distribution
- wave run-up
- wave overtopping (empirical formulae and neural network)
- wave transmission
- wave reflection

and of the structural response:

- stability of main armour layer of rock material
- stability of main armour layer of concrete units
- stability of rear side (with and without crest elements)
- stability of toe berm
- wave forces on caisson structures

of several types of structures:

- rubble mound breakwaters
- berm breakwaters (profile development)
- low crested structures
- reef type structures and near-bed structures
- vertical (caisson) breakwaters

Photo by: BeeldbankVenW.nl, Rijkswaterstaat

General features of Breakwat

Breakwat is a Microsoft Windows based product. The general features of Breakwat are:

- flexible set-up, easy to specify input parameters and easy view of numerical and graphical results
- report-ready graphical presentation of results
- input and output files in ASCII format possibility to calculate and compare several calculation scenarios
- possibility to copy data to and from clipboard
- export options to text editor or Microsoft Excel
- 'hard' and 'soft' limits for validity of design formulae
- extensive digital help function (user manual and technical background)

- **Appearance of Breakwat**

  The program starts by displaying the window in Figure 1. Hydraulic and structural responses can be calculated for several types of coastal structures. These structure types are a subdivision of the main classifications in the program structure, which are rubble mound structures and vertical (caisson) structures. To support the user, a calculator which can be used to determine simple parameters such as the wave steepness, the relation between volumes and masses and the relation between the several wave periods (Tp, Tm, Tm-1.0) is available as well.

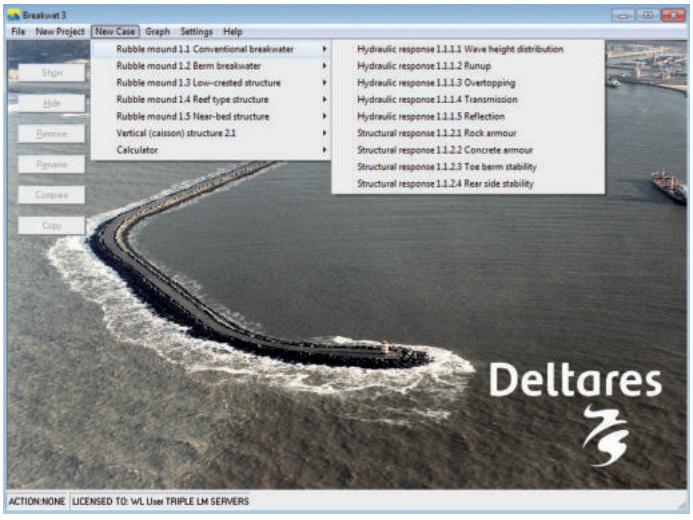

Figure 1 Start window of Breakwat with overview window

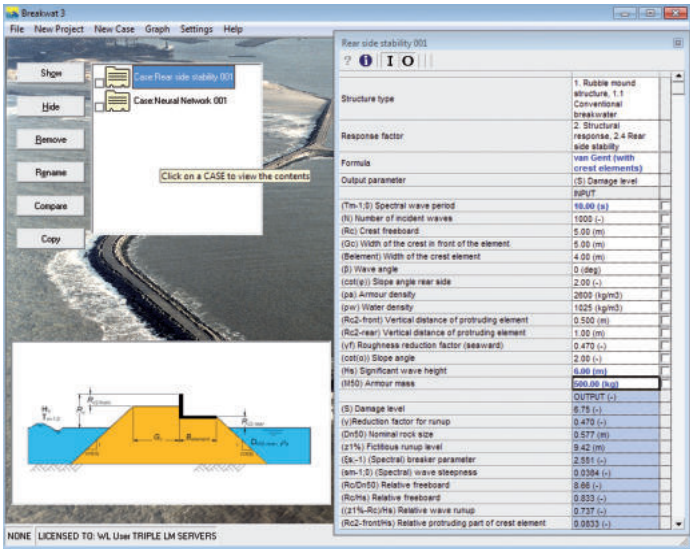

Figure 2 Example of an input / output window and a definition sketch

After selecting a certain hydraulic or structural response, an input/output window and a definition sketch appears. An example is given in Figure 2. For several cases it is possible to choose between several conceptual design formulae to perform the calculation. Besides design formulae also a Neural Network is incorporated to predict wave overtopping. Once the required input for the calculations, consisting of values for the various input parameters, is specified, the output is directly calculated and presented. In some cases it is possible to specify a range of values for certain input parameters in input tables, see Figure 3.

The output consists of values for several output parameters, a range of values for certain parameters or a graph. If input parameters are specified with input tables, the output can be

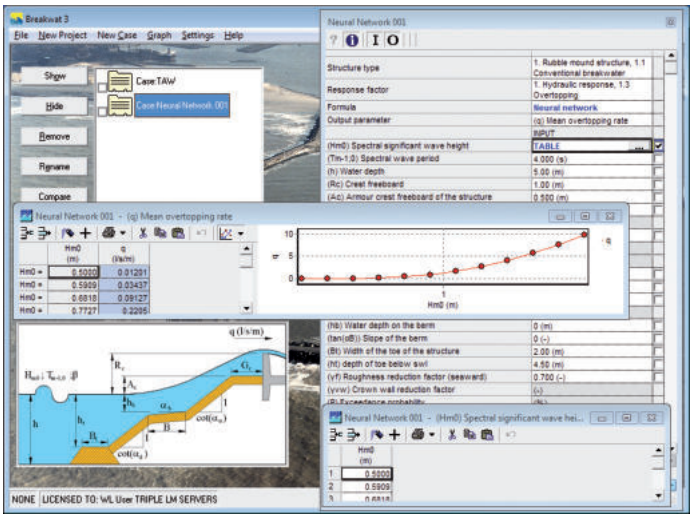

Figure 3 Example of an input/output window where input is specified in an input table

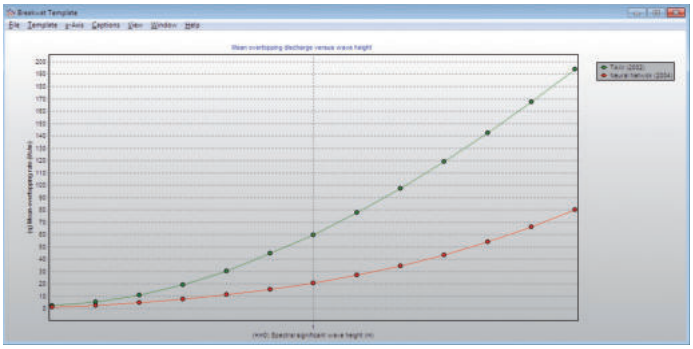

Figure 4 Example of an output window where two methods are compared

displayed in a graph. Other output ranges can be added to an existing graph, see Figure 4, and the appearance of a graph can be adjusted with a graphical editor. It is also possible to compare the output of several cases with drag-and-drop facilities. Furthermore, cases can be compared numerically, see Figure 5.

The results of calculations can be saved in ASCII format for future use. It is also possible to print the results to a text editor or to Microsoft Excel to further process the data.

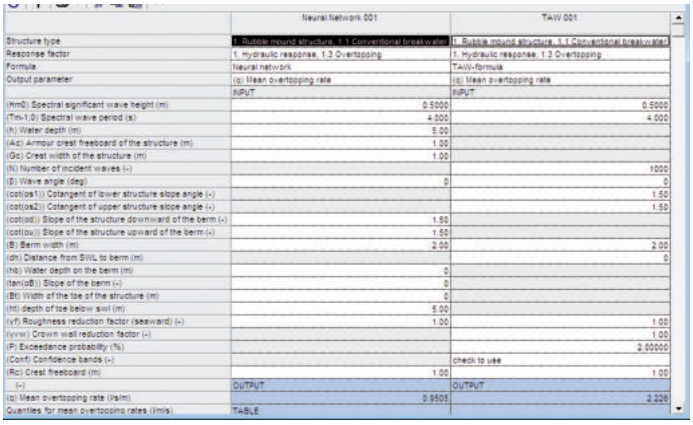

Figure 5 Comparison of different design formulae to calculate wave overtopping

Manual

The help function can be activated at any time in Breakwat. The help function gives access to a digital document in PDF format, which consists of an extensive user and technical manual. The document includes hyperlinks to enhance the efficiency. The user manual supports more experienced users of Breakwat, as well as first-time users. In this manual some program-specific terms are defined, such as the program structure, the general screen layout, the graphical capabilities and the I/O procedures. An example calculation is also given, including a tailor-made graphical presentation of the results. The technical manual describes the technical background of all the items included in Breakwat and provides guidance on the use of the design formulae.

Design tool for coastal structures

System requirements

The advised minimum requirements are a configuration consisting of:

	Minimal
Operating System	Windows 10/11 (2004) English version
Processor	i5-5300u CPU 2.3GHz or higher
Memory (RAM)	8GB or higher
Disk free	250 GB HDD (for saving model output)

License

For this software package, node locked and floating licences can be issued. For more information on how to purchase this package please contact: software@deltares.nl or visit our website: www.deltares.nl/software

Support

Deltares systems tools are supported by Deltares. A group of 70 people in software development ensures continuous research and development. Support is provided by the developers and if necessary by the appropriate Deltares experts. These experts can provide consultancy backup as well.

On-line software

The wave overtopping prediction tools NN Overtopping & XGB Overtopping are freely accessible through the Deltares website: https://www.deltares.nl/en/software-and-data/products/overtopping-neural-network.

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Deltares systems

PO Box 177
2600 MH Delft
Boussinesqweg 1
2629 HV, The Netherlands

31(0)88 335 8188
software@deltares.nl
www.deltares.nl/software