Interactive group modelling - MapTable

BwNReport_SetupInteractiveDredgePlanningTool (1).pdf

Building with Nature Guideline

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Interactive group modelling (MapTable)

Type: Hardware and Software

Project Phase: Initiation, Planning and Design

Purpose: Allowing for interactive modelling with a group (eg. stakeholder meetings) on digital design tables

Requirements: Knowledge on modelling tool that is applied on MapTable

Relevant Software: Compatible modelling tools

5 Basic steps towards Building with Nature

Related Building solutions

Ecological landscaping of seabed

Feeder beaches

Managed realignment

Perched Beaches

Creating hanging and floating structures

About

The term MapTable refers to both hardware and software that function as a design and decision-support tool. The MapTable hardware consists of a large, potable touch-screen design table that can be used as an instrument in spatial planning processes. MapTable software is an umbrella term for software that is suitable for use together with a digital design table. MapTables can be used for interactive design processes with stakeholders, and can assist in visualising potential problems and solutions. This tool page focuses on explaining the MapTable concept and software, including spatial databases and models that can predict impacts of designs of construction works for these projects.

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Purpose

Related Projects

Adaptive monitoring of sand extraction areas - Maasvlakte 2 extension, NL

Sand nourishment - Sand Engine Frisian IJsselmeer Coast, NL

Sand nourishment - Sand Engine Delfland, North Sea, NL

Tidal flat nourishment - Galgeplaat, NL

Related Tools

Coastline intervention tool - Holland Coast - ITHC

Fibre-optic distributed temperature sensing for monitoring morphological changes

The purpose of MapTable is to help identify and quickly evaluate design alternatives in an interactive setting, for instance during a meeting or workshop. The concept was designed for an interactive setting, where multiple stakeholders with different backgrounds jointly brainstorm to come up with alternative solutions and out-of-the-box ideas. In such a setting, quick evaluation of alternatives can support the interactive design process and decision-making on an integrated solution. During a meeting or workshop all participants are encouraged to take part in the design process to achieve the best possible alternative. It serves as a useful communication tool for involving stakeholders.

The MapTable concept is applicable in a wide range of projects. The concept, as it was developed, aims at projects related to hydrodynamics, morphology and ecology and their interrelations. An interactive tool developed for the MapTable concept can visualise geographic changes in, for example, a coastal zone, an estuary or a river bed. Within a very short time (a few minutes at most), a first estimate of the effects on various design aspects is delivered. New insights or ideas can thus be quickly evaluated and results presented on the spot. The interactive tool is based on simple but robust models that allow for quick evaluation of different design alternatives. Making use of simple models is both an advantage (quick, interactive) and a drawback (less accurate). Results of a session are preferably verified with more detailed models and further analysis before final decisions are made.

To apply the MapTable concept one requires three basic inputs:
a) a set of routines (i.e. Matlab routines);
b) a database of local conditions and
c) a predictive model.

Together it forms a tool application. It needs to be well prepared, linked and tested before it can be used in an interactive design session. This tool page is developed for decision-makers and discussion leaders to support the use of the MapTable concept in their projects. Therefore we assume that a tool application is available and can be used directly in an interactive session. Tips and tricks for developers to modify an existing tool application or develop a new tool application are provided briefly hereafter.

Building with Nature interest

Within a Building with Nature development it is always a challenge to bring different parties and knowledge fields together, to develop new ideas in cooperation with multiple stakeholders with various backgrounds and to synthesise group ideas. The BwN approach aims to come up with eco-friendly and eco-dynamic developments and designs. Stakeholders are invited to become part of the design process, where visualisations can assist to clarify the BwN concepts, stimulate communication and gain attention from additional stakeholders as well as the broader public.

Project phases

The MapTable concept can in principle be applied in all project phases:
I. Initiation phase: to develop and evaluate alternative visions on a project area.
II. Planning & design phase: to develop and evaluate alternative solutions for a well defined problem.
III. Construction phase: to evaluate alternative construction methods.
IV. Operation & Maintenance phase: to evaluate alternative maintenance methods.

However, a specific tool can be designed for a specific project phase and might therefore not be directly applicable in a different phase.

How to Use

Various skills and background knowledge are required depending on the chosen setting and purpose. For a good interpretation of the results, the user should have basic knowledge of the different fields called upon in the tool. To setup a new model application within an existing tool for a different geographical location, an experienced specialist is needed. In case the tool is used in a workshop or during a stakeholder meeting, a facilitator is required with basic skills in hydrodynamics and morphology to translate and interpret results for the group.

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Requirements

To run an interactive design session you need:

a) MapTable software;
b) a database of local conditions (depends on the tool);
c) a predictive model.

All these requirements need to be well prepared, linked and tested. Such combination is suitable to study one specific design issue at one location.

Applications

Using a tool application in a workshop setting or developing a new tool application, requires basic skills and capacities of the user or user group. The requirements depend largely on the preferred level of adaptation of the tool application. A case can be developed based on:

1. current tool applications, where no adaptation of the tool application is required;
2. current tool applications in a different geographical setting, where the existing tool application will be adapted to meet the new geographical settings; and
3. a new tool application.

Important note. Cases and tool applications can be developed to address a specific problem for a specific geographical area. Prior to a workshop, these tool applications have to be modified or developed. Modification of a tool application or the development of a new tool application, including adequate testing, might take a significant amount of time. Requirements are listed in the tables below. Listed requirements for level 1 case development are also required for levels 2 and 3, and requirements for level 2 are also required for level 3 case development.

Required skills and capacity

Case development	Required capacity
1. Existing tool existing geographical location	Facilitator Basic knowledge of hydrology, morphology and ecology Modelling experience Basic experience with contracting in a marine environment
2. Existing tool, different geographical location	Hydrodynamic modeling experience
3. New tool development	Programmer with experience with MatLab, Python, JavaScript, XML

Technical requirements

Case development	Required software	Required hardware
1. Existing tool application, existing geographical location	Web browser, GoogleEarth plug-in	Computer with internet connection (for GoogleEarth) visualiser (i.e. beamer, screen)
2. Existing tool application, different geographical location	Hydrodynamic model [*] (Delft3D, SOBEK, ...), MatLab [**], OpenEarth Tools Pythonxy (for testing)	
3. New tool	MatLab [**], OpenEarth Tools, Pythonxy (for developing)	

[*] *for some model packages a license might be required*

[**] *or these software packages a license is required*

Phased plan process

To start the process one shall define the design challenge as clear as possible, and the goal shall be set with a clear ambition. Then it can be determined which tool can be used to help solve the facing challenges. You might conclude that an existing tool is not ready for your location, or that there is no existing tool you can use. Please then follow the steps explained in the next section. The same sequence is used as above to describe the cases.

Existing tool application, existing geographical location.

The following approach is used in the case that a tool is developed and applicable for the geographical area of interest, and is applied as a means for communication in an interactive workshop setting with stakeholders.

Step 1: Start with a kick-off meeting where all stakeholders are present. During this kick-off meeting the problem analysis should be presented and the aim of the session clarified. A demonstration of the MapTable tool will familiarise the participants with the tool and indicate what input is required from them. When the participants are familiar with the tool, a draft inventory of requirements and wishes regarding the final result can be made. During this step, the design requirements should be discussed (i.e. maximum allowed ecological impact is met when the impact is everywhere below a value of '3'). This might result into small required adaptation of the tool settings on the spot.

Step 2: In a second step the stakeholders start brainstorming on possible solutions and intervention concepts. The aim of this is to collect a set of viable alternative solutions that the stakeholders are willing to assess and compare, using the MapTable application.

Step 3: The resulting alternatives will now be modelled and evaluated with MapTable. During this process, some small adjustments may be made to the different designs. The results will be discussed with the stakeholders and the best solution will be jointly decided upon. This can be performed with the use of the selection method as defined in step 1.

Step 4: For the final solution a detailed design can now be made and carried forward. If required, more detailed models can be applied to determine the effects of the proposed design with a higher accuracy. The results of the MapTable tool applications can be used as input for the detailed design models.

Existing tool application, different geographical location.

In the case that a tool with the desired purpose already exists, but the geographical location of your project has not been modelled, the tool has to be adapted before it can be applied in a workshop. This means that spatial data needs to be obtained from other sources (e.g. models) and be prepared according to the input requirements for the chosen model. One shall be aware that these steps might consume a significant amount of time. For documentation refer to the MapTable Handbook (Werf ten Bosch, 2009) (Dutch only).

Step 1: Develop a hydrodynamic numerical model for the area of interest. Validate and calibrate the model.

Step 2: Develop the hydrodynamic and morphological database.

Step 3: Develop an ecological (response) database.

Step 4: Adjust the user settings in the tool as required. Some response settings might have to be changed to match the local conditions.

New tool application.

If no existing tool applications is suitable for the case at hand, a new tool can be developed that is compatible with MapTable. To develop a new tool application, the developer needs to have experience with the programming tools as listed above. For the MapTable concept, a flexible interface (a GUI) was designed that in principle any other tool can be plugged into it. To develop your own tool, you can follow the steps below:

Step 1: Define the required result and user input. What result should the tool provide? What switches and controls should be available to the user?

Step 2: Define the physical processes and determine how they interact. Develop a workflow and determine the required modules. Check which modules from existing MapTable tools can be used.

Step 3: Develop the tools and draft the required databases. A step-by-step approach to fill the databases is provided in the handbook.

Step 4: Test the tool and draft databases, and make amendments where necessary. Once finalised, the tool can be used as described in the other step-by-step approaches.

Practical Applications

1. Interactive Design Tool - Holland Coast
2. Interactive River tool
3. Interactive Dredge Planning tool
4. Interactive O&M tool: Streamline tool

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1. Interactive Tool Coastal Intervention: application Holland Coast

An interactive design tool has been developed to get an indicative insight in effects of measures on long term coastline development. The tool was developed for the Dutch sandy coast, the Holland Coast. A coastline model (in which the various hydrodynamic processes are numerically modelled) has been developed and linked to a web viewer for the Holland Coast. Mega nourishments, maintenance nourishments, groynes and revetments can be drawn in a map in this web viewer. Thereafter, the coastline model computes the indicative effects of these measures on coastline development in a few minutes. All stakeholders can see the effects of their design ideas directly in the web viewer.

In Coastal Workshop sessions with multiple stakeholders, this interactive tool has been used to support the development of alternative visions for the Holland Coast in 2100.

The application of the MapTable concept and tool application in this setting has resulted in:

- a fast and plausible estimate of morphological effects of various coastal interventions;
- interactive visualization of results by presentation using Google Earth.

During the sessions it was learned that participants were very keen to participate in the interactive process. They were motivated to come up with various alternatives and to understand the processes and resulting effects.
More information on the tool application can be found on the page of the Interactive Design Tool - Holland Coast.

2. Interactive River tool: application Dutch Rivers

MapTable tool applications have proven its use in several Dutch 'Make Room for the River' projects. During meetings with stakeholders, effects of measures, like a side channel, a floodplain excavation and relocation of levees, have been estimated with the help of MapTable. For these projects, the hydrodynamic model WAQUA was plugged into the MapTable tool application.

This MapTable tool application has been developed by Deltares and Meander, commissioned by Rijkswaterstaat. More information can be found in the user manual and in the audit report (Dutch only).

3. Interactive Dredge Planning tool: application Singapore

Nowadays static dredging criteria are used to avoid ecological damage. Aim of this study was to use ecologically relevant criteria instead of static dredging criteria for the assessment of dredging activities. Therefore, a dredge plume modelling tool has been developed for the waters around Singapore. This tool can make rapid assessments on the effects of dredging operations on vulnerable coastal ecology. A dredging operation can be planned on a digital map and users can specify the characteristics of this dredging operation. The tool will make a quick assessment of the expected plume dispersion and stressor intensity at relevant locations. Furthermore, this stressor can be translated into an expected effect on ecology by adding others tools on Species Responses (e.g. for seagrass) . Users can optimise their proposed dredging operation based on this quick assessment of the ecological impact.

More information can be found on the Tool page of the Interactive Dredge Planning Tool Singapore. A tutorial on the use and a guideline about the setup of the Interactive Dredging Tool are under development.

4. Interactive O&M tool: Streamline tool

The aim of the Stroomlijn project is to optimise the maintenance of floodplain vegetation, because high vegetation can affect extreme water levels in rivers. A MapTable tool application has been applied to evaluate maintenance strategies in this project.

References

>> Read more

Suggestions for further reading about MapTable software:

- Dongen, B. van (2009). *Audit MapTable 2.0.* In opdracht van Deltares.

- EcoShape (2012), *Interactive Dredge Planning Tool, setup and guideline*. Dordrecht (the Netherlands).
- Werf ten Bosch (2009), J. van de. *MapTable 2.0 Help, gebruikershandleiding en technische documentatie bij MapTable versie 2.0.* Meander Advies en Onderzoek. (In Dutch)

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