

Geographic information tools for sustainable planning in the Dutch Delta

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Introduction

Land use in the Netherlands is a complex system of spatial entities (cities, harbours, water basins, agricultural and nature areas), which are interconnected by networks of roads, rivers, digital infrastructure and flows of people, goods and information. This a dynamic system that changes due to demographic, economic and natural developments (Meyer, 2005). Furthermore, spatial planners working on the future of the Netherlands have to reckon with uncertainties connected to urban and economic developments, water safety and climate change. However, not only the spatial entities make this a complex system, also political and policy aspects create complexity and should be taken into account in studies of future regional development. The geodesign approach to landscape planning (Steinitz, 2012) would enable spatial planners to develop, alter and evaluate alternative futures, and ease the participation of actors in the planning process (Albert & Vargas-Moreno, 2012). Moreover, application of contemporary high standard geo-information tools provide rapid input and feedback mechanisms for design proposals.

The project Integrated Planning and Design in the Delta (IPDD, 2013) aims to develop theories, methods and practical approaches for planning and design of complex areas like the Dutch southwest delta (SWD). IPDD proposes an alternative framework for geodesign in complex planning for Steinitz' framework (Steinitz, 2012). Though both frameworks stimulate development of integrative regional concepts and facilitate mutually-beneficial decisions regarding regional planning. To support the methodology development in IPDD the SWD is seen as a complex adaptive system (CAS) (Dammers et al, 2013). To make this complexity manageable and visual a model (the 'Diamond') is chosen in which the relations between the nine most important subsystems are presented (Figure 1).

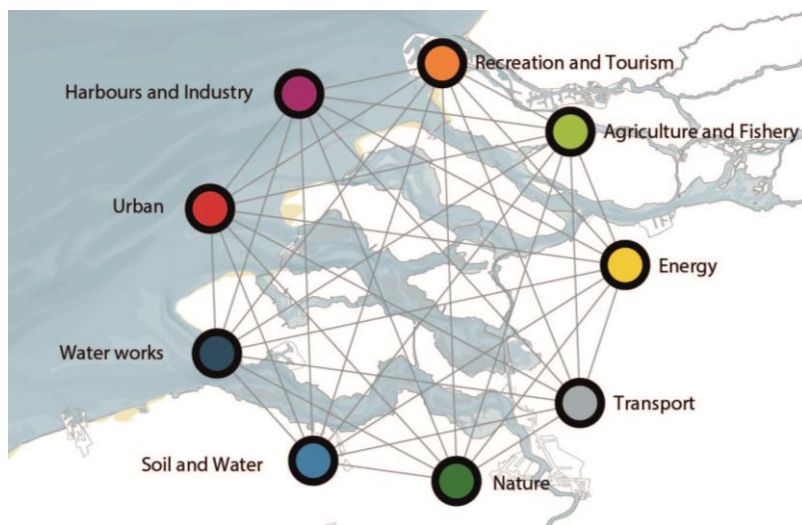


Figure 1. The Diamond: a conceptual model for the relationships between subsystems of the southwest delta a part of complex adaptive systems.

Another aspect of the developed methodology is a balanced attention to the disciplines: science, design and governance. To support relations between these disciplines a Delta Envisioning Support system (DENVIS) is developed. This support system aids participants in experimenting and creating more integrative regional concepts for the SWD. The systems primary purposes are communication, making mutually-beneficial decisions and gaining insights in the problems and possibilities in the SWD.

Delta Envisioning Support

DENVIS deals with the complexity of the SWD-system. Furthermore, it tries to be integrative with a focused game technique based on the 'Diamond' that should solve problems in and between subsystems and use opportunities to connect subsystems. Another unique aspect of DENVIS is also its ability to connect science, design and governance. Where science encompasses the knowledge and information

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provision, e.g. fact-finding to validate the feasibility of the regional concepts. Design is engaged in the spatial translation of issues and the visualisation of the regional concepts. Governance in the game brings in the actors, their visions for the SWD and the interactions and negotiations of the participants in the development of the regional concepts.

DENVIS is a six round serious game, played with two 9-player groups simultaneously. The rounds are:

1. Formulation of core values and issues of the SWD
2. Presentation of actors' ambitions, finding conflicts and synergy
3. Development of vision: designing regional concepts
4. Improving regional concepts based on feedback
5. Exploring governance arrangements for the SWD
6. Presentation and evaluation of the regional concepts

Several feedback mechanisms provide gaming elements to DENVIS. Feedback is given on among others suitability and integrality. Suitability is assessed using a computer model, running suitability maps from the Land Use Scanner (Hilferink and Rietveld, 1999) and rates the suitability of the allocated land use. Integrality feedback comes from the 'Diamond', the more subsystems involved and connected in the design, the more integrative the regional concept is considered. Besides, having two separate groups creates competition for the best integrative regional concept for the SWD.

Geo-information tools

To ensure a dynamic and interactive course in the game, several geographic information tools are deployed, supporting the participants in their development of regional concepts for the SWD. These tools are a MapTable, the 'spatial intervention scheme' and the 'iMaps' tool.

MapTable

The MapTable, more commonly known as surface table, is a large interactive touch screen table. This particular instrument is equipped to interactively present geographical information, and is used in DENVIS to support the participants in exploring their values and ambitions as well as the issues in the SWD. Furthermore, the MapTable's drawing functionality enables to process the spatial input from the actors for the design of the regional concepts.

Spatial Intervention Scheme

The spatial intervention scheme (Figure 2) is developed in collaboration between design and science, and is applied to explore solutions for the SWD. This interactive tool provides ideas and scenarios for possible future developments in the SWD based on existing plans and visions. Interrelations between interventions are visualised using highlighting and obscuring of the interventions. This way it is made visible which interventions are complementary and which are not. This should help actors to propose solutions for their ambitions but also strengthen their negotiation position towards other actors. The spatial intervention maps, as presented in the scheme, are georeferenced and available in the MapTable for spatial analysis or the design of regional concepts.

iMaps

iMaps is a tool developed for the special need of spatial planners and designers to view spatial data without too much technical difficulties or being bothered by metadata or tables. The tool requests geographical information from available web-mapping services and presents them in a visually attractive way to the user. By doing this, the geo-information becomes more interesting for viewing and investigating. In DENVIS this tool is used for fact-finding of topics presented by the participants. By presenting spatial data of the study area and beyond actors can find extra background information about their or others disciplines. Available information can be presented to the whole group via the MapTable

Though each tool has its distinctive purpose, integration, relation and exploration; the combination of the three tools offer a unique setting to investigate the study area. Since all geo-information is available in all three tools, it provides for both individual and group exploration, and exchange and interaction of findings and visions.

Evaluation

Both DENVIS and the associated tools have been evaluated during several application sessions. Project members, external researchers and actors from the SWD have had the possibility to experience DENVIS and give their feedback on it. Till now there have been three important sessions: one with IPDD-

researchers, to validate that DENVIS connects with the research goals; one session with researcher from the Netherlands Environmental Assessment Agency (PBL), to test DENVIS and its tools; and lastly a session with actors from the SWD to apply the game in a real world setting.

To evaluate DENVIS and its tools a short questionnaire was created using indicators from the Technology Acceptance Model (Davis, 1989) and the Hedonic Information Systems (Van der Heijden, 2005). These indicators, usefulness, ease-of-use and enjoyment, give feedback on the usability of the tools in DENVIS. Using this questionnaire and observations insight is gained in the usability of DENVIS and its associated tools in the spatial planning.

The participants were generally positive about the use of the instruments in the DENVIS sessions. It is considered "a new and enjoyable way to view and process information", in contrast to the usual paper materials. The specific organisation of and access to geo-information was well received, and considered "unique" by most participants. Unfortunately, the ease of use and the speed to process information are still a bottleneck in the course of the game. Despite these technical hitches DENVIS and its tools scored an average of 5.4 on a 7-point Likert scale. The integrative aspect of DENVIS was particularly praised by the participants, but still needs further development and testing in practice.

Conclusion

The IPDD-project has applied a geodesign approach in research and in practice, by developing and deploying geo-information tools to support the development of region concepts. The design of regional concepts using the integrative and interactive setting of DENVIS did result in wider supported designs. Actors from all nine subsystems were actively developing the designs themselves. Besides the spatial organisation of the designs, special attention was paid to the political and policy aspects concerning the regional concepts, resulting in governance arrangements.

The applied geo-information tools supported the whole gaming process by providing interactive and dynamic geo-information about the area. Through this comprehensible information participants gained a better understanding of the SWD and its complexity. Though, further development is needed to make the tools more intuitive and easier to use for users and integrate them even better in the design sessions of DENVIS.

Literature

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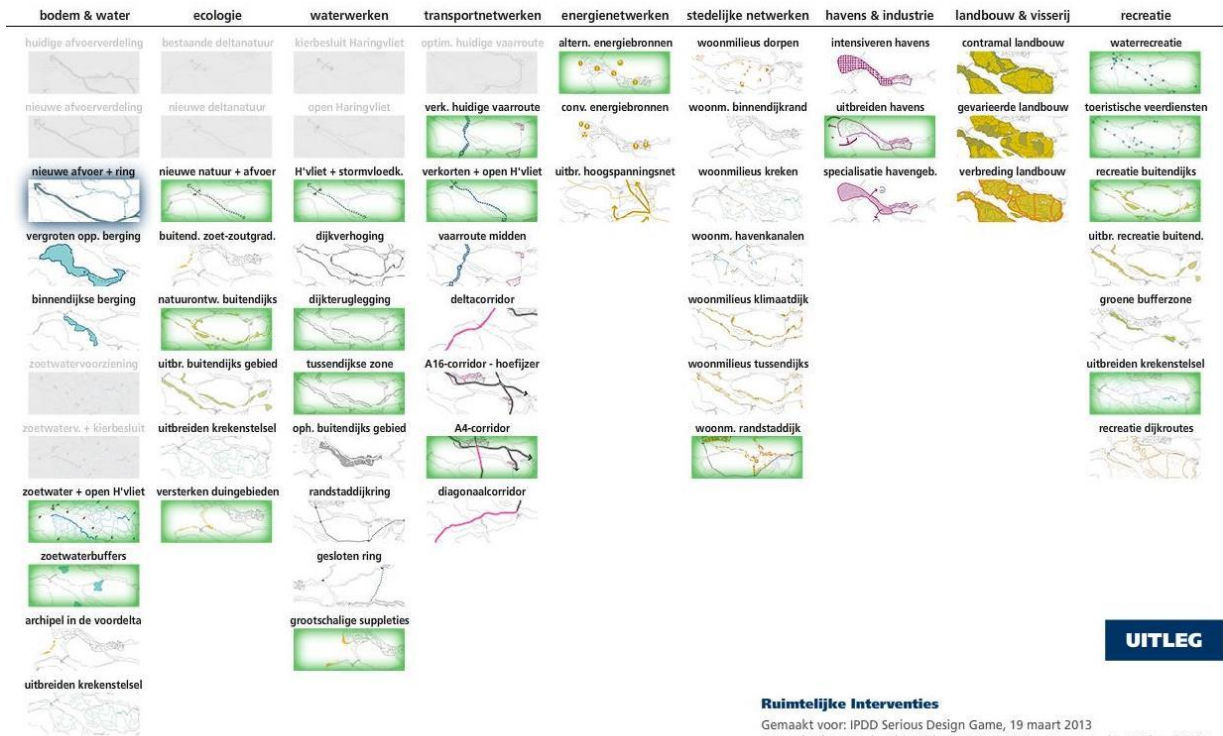
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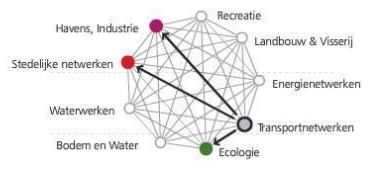
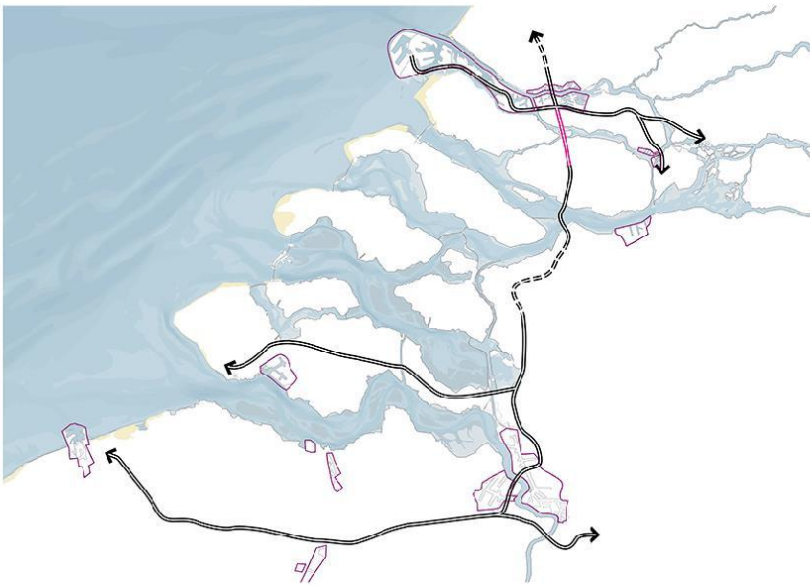
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UITLEG

Ruimtelijke Interventies
 Gemaakt voor: IPDD Serious Design Game, 19 maart 2013
 Gemaakt door: Roderick Duinker (MUST/WUR) en Jaap van der Mijden (WUR)

Transportnetwerken - A4-corridor



- Nieuwe snelweg
- - - Opwaarderen bestaande provinciale weg (in aanleg)
- = Opwaarderen bestaande snelweg

- PM
- Opwaarderen bestaande snelweg A4 i.c.m. nieuwe snelweg
- Voorlopige tracé A4-Zuid. Als er bij Oud-Beijerland een aansluitpunt komt, kan dit bijdragen aan een betere verkeersafwikkeling van de hele regio en kan het de huidige knelpunten op de A29 en de N217 verlichten.

Bronnen:
MIRTVAR, 2011

TERUG

Figure 2. Screenshots of the 'spatial intervention scheme', showing per subsystem possible interventions for the SWD and their relationship to complementary interventions (top) and detailed information (bottom).