Book of abstracts

The Future River

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Contact NCR

ir. K.D. Berends (Programme Secretary)	telephone:	+31 6 21 28 74 61
Netherlands Centre for River Studies	e-mail:	secretary@ncr-web.org
c/o University of Twente	www:	http://www.ncr-web.org
P.O. box 217		
7500 AE Enschede		
The Netherlands		

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Prototyping Virtual River

R.J. den Haan[1*], V.J. Cortes Arevalo[2], M.C. Van der Voort[1], S.J.M.H Hulscher[2]

[1] *University of Twente, Department of Design, Production and Management, Faculty of Engineering Technology, P.O. Box 217, 7500 AE, Enschede, the Netherlands* [2] *University of Twente, Department of Water Engineering and Management, Faculty of Engineering Technology, P.O. Box 217, 7500 AE, Enschede, the Netherlands*

Introduction

Serious games are increasingly used as facilitation tools in learning environments. In such learning environments, individuals meet, interact and exchange perspectives to resolve conflicts and determine collective actions (Keen et al., 2005; Pahl-Wostl et al., 2007). In the river management context, there are some examples of serious gaming environments; learning environments based around serious games (i.e. Lankford and Watson, 2007; Valkering et al., 2009; Stefanska et al., 2011; Savic et al., 2016). While these all have different goals and approaches, they have in common that players manage a river – from a stretch to a complete basin – from different roles or perspectives, either cooperatively or competitively. As part of the RiverCare research programme, we are developing a serious gaming environment titled Virtual River (VR). Here, we report on the challenges that the VR targets, the implications the targets have for VR and prototyping efforts.

Targeted river management challenges

For the development of VR, an interview study focused on identifying current challenges in Dutch river management (Den Haan et al., 2017). Three challenges were identified: (1) creating flexibility in a controlled river system; (2) sustaining the integrated approach in the maintenance of floodplains; and (3) formulating future river basin management policies to adapt to climate change. Interview respondents displayed diverging perspectives towards the first two challenges (Den Haan et al., 2017). It is therefore interesting to facilitate the exchange of these perspectives in the VR.

The first challenge, creating flexibility in a controlled river system, relates on one hand to water managers who showed a preference for controllability and therefore approached the floodplains from a fixation point of view while permitting change. On the other hand, nature managers approached the floodplains from a development point of view following natural processes. These two approaches seem incompatible. However, both acknowledged

that floodplains require regulation in relation to for example vegetation development to safeguard flood safety, the challenge therefore relates to its execution, not to its necessity.

The second challenge, sustaining the integrated approach in the maintenance of floodplains, relates to maintenance hardly being included during the planning of Room for the River projects. Now that Room for the River projects are (nearly) completed, floodplain maintenance is mostly executed sectorally whereas project planning was integrated across sectors. Consequently, river management actors are concerned that floodplain areas might not develop as planned.

Implications

Targeting these two challenges in the VR has some implications for its design. First of all, when playing the VR, we want players to experience how plan-making and maintenance affect each other. This way, players would experience how – and if – objectives set in a project's plan-making phase are reached in its maintenance phase. To achieve this, players in the VR are, collaboratively, responsible for managing a riverine area for thirty years, where they pursue specified goals, are able to apply spatial riverine measures and plan for maintenance. Secondly, we want players to experience the need for control and stability – e.g. comply with the flood safety norms, reduce uncertainty – as well as the need for development and flexibility – e.g. reach floodplain target images, react to unforeseen events.

Prototyping

We are developing the VR in iterative cycles. At the time of writing, a cycle involving a first, playable prototype is completed. In this cycle, the VR was developed as a board game to test and evaluate some main elements and game rules we intend to implement and refine in further prototypes. Testing these elements and rules in a board game early on enabled us to see whether these could work as intended and what the perceived complexity of players on these are.

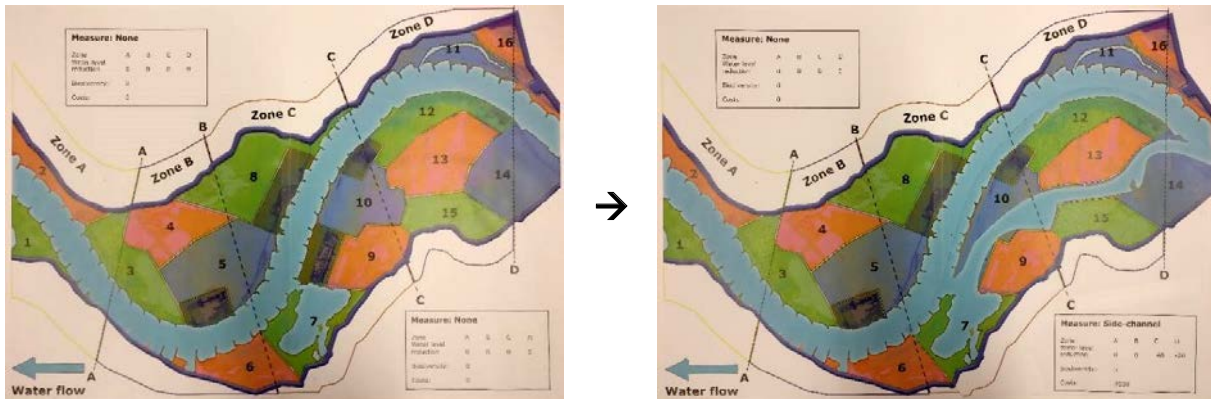In the board game, players are asked to manage a riverine area for four turns,

Figure 1. Virtual River's board game prototype with no measure implemented (left) and implemented side channel (right)

representing time steps of five years each. The area contains two major floodplains (see figure 1). Players have a specific role, each with its own budget and objective. At the start of the game, players collaboratively discuss whether or not they would like to apply spatial measures. Each major floodplain has the option of doing nothing or applying one of two possible spatial measures. Applying these measures may be valuable to increase flood safety, by lowering water levels, and ecological value. The area's arrangement is complete when players decide on which spatial measures to implement and how the costs are shared between players. Next, the four turns start. Each player now has to manage their management units: the floodplain areas that they own. To show the different ownerships, management units have different colours on the game board (see figure 1). Each management unit must have a management style, for example intensive nature management or half-natural maintenance management. In addition to setting or changing management styles, players may perform resets on management units. Depending on the management style or resets executed, the roughness of each maintenance unit might change between turns to reflect vegetation growth or succession. Similarly, this may result in more or less biodiversity between turns.

Test sessions and first results
Three test sessions were executed with the initial board prototype. Goal of the test sessions was to evaluate (1) the overall setup for the VR based around management units; (2) initial game indicators displaying player progress worked as intended and were understood by players; and (3) how giving players roles and individual objectives influenced the game play. One test session was executed with design researchers, one with game designers and one with researchers modelling river management measures. The test sessions revealed that the overall approach for the VR based around management units worked as intended. Players in all test sessions indicated that they learned how the river functions. However, players indicated that the complexity of the management units was high. The initial game indicators were understood by players, but were also experienced as a black box that they had trouble with relating to their actions. As for the player roles, during two test sessions these created some, at times tense, negotiations and conflicts. During the third session, the roles were mostly ignored.

Acknowledgements

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