



## **POLICY BRIEFING NOTE 5**

# **The Water Management Benefit Game: a card game to explain lake cause- effect relationships**

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## INTRODUCTION

Using games to discuss complex and discipline-specific concepts can offer a novel way to provide scientific knowledge to stakeholders. Such serious games<sup>1</sup> can translate sectoral terminology into a joint understanding of water quality issues. The **Water Management Benefit Game** is a game-based approach for players to practice identifying the cause-effect relationship that occur in lake ecosystems. In the game, the players create sets of three cards (tritets) to track the impacts that management actions might have on water quality and ecosystem services provisioning. Subsequently, the players must collaborate to discuss and agree on whether the cause-effect relationships make sense. The use of this game can lower communication barriers and help enhance skills for decision-making in lake management.

## BACKGROUND

- Many lake ecosystems are continually degrading due to a range of pressures that have adverse effects on water quality.
- These pressures include, for example, changes in catchment land use practices that might increase the flow of nutrients or sediment to lakes, and on-going changes in climate extremes such as drought and more extreme storms.
- Management actions need to account for the impacts that such pressures have on lake water quality to prevent the loss of the socio-economic benefits that lakes produce.
- This policy brief describes the Water Management Benefit Game, a game developed during the MANTEL MSCA training programme that was developed to help train water managers and other stakeholders on tracking cause-effect relationships between actions and lake water quality and services.

## OVERVIEW OF THE WATER MANAGEMENT BENEFIT GAME

The “Water Management Benefit Game” (WMBG) is a specialised lake version of the card matching game “The Benefit Game” which was previously developed at the eco-



consultancy company Witteveen+Bos ([www.witteveenbos.com](http://www.witteveenbos.com)). This card game is about actions that enhance water quality in lakes and the benefits that these quality improvements generate for society. The game trains the brain to think in terms of cause-impact chains. This is a key skill necessary for conducting cost-benefit analyses in lake ecosystems and can be applied to help create effective lake management plans that take environmental, social and economic endpoints into account.

This water quality version is a special edition of the broader mother game, which included a different set of cards covering more working fields than water management. This is a 'serious game', defined as a game 'in which education (in its various forms) is the primary goal, rather than entertainment.'<sup>1</sup> When the game is played, players are encouraged to discuss the validity of the cause-impact relationships between a three-card chain built using cards from a game pack. Stimulating discussions around the plausibility of a cause-effect chain and finding consensus between the group is the main goal. This game uses technical terminology, and so professionals or highly trained individuals, such as water managers or water policy makers, are the ideal participants. Alternative uses of the game can be using it to support explanations of the concepts, for example, explaining the cause-effect chain and demonstrating the multiple effects that a single management action could have, or the multiple actions that could instigate a specific effect.

## THE SCIENCE BEHIND THE GAME

The conceptual framework behind the game is the DPSIR (**D**rivers, **P**ressures, **S**tate, **I**mpact and **R**esponse) causal framework, which identifies five different components in describing the interactions between the environment and humans (Fig. 1):

**Drivers:** Human-related activities that may have environmental effects, such as urbanisation, agriculture

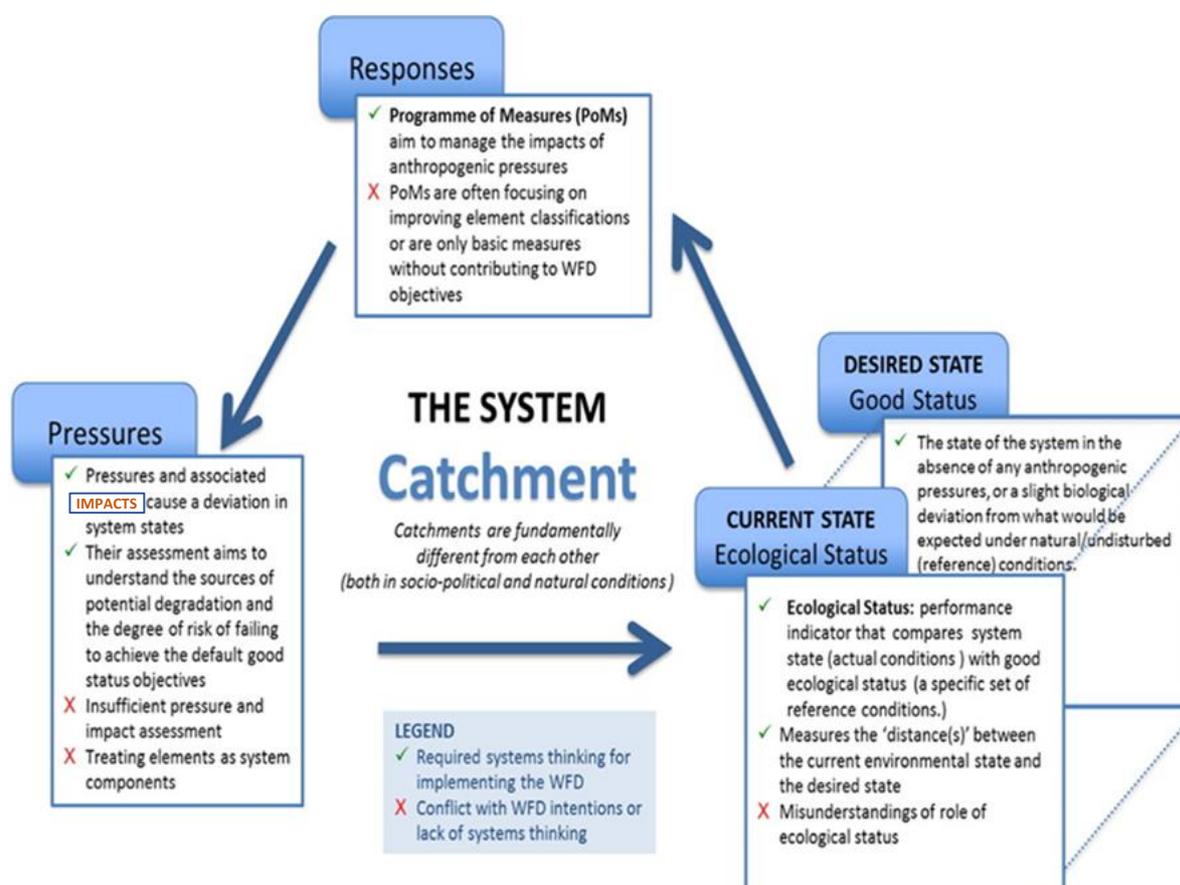
**Pressures:** Direct environmental effects of drivers, such as human-induced nitrogen emission, or nutrient or other chemical pollution

**State:** The environmental conditions that characterise an ecosystem, e.g. water quality

**Impacts:** The effects on human health and ecosystem health (ecosystem service provisioning), e.g. reduced fishing opportunities, reduced recreation possibilities.

**Responses:** The societal response to mitigate the negative impacts on ecosystem service provisioning, e.g. legislation, education, waste water treatment

The DPSIR framework has been adopted by the European Environmental Agency and is widely used for the implementation of the Water Framework Directive by various member states (Fig. 1).



**Fig. 1:** Application of the DPSIR framework to the River Basin Management Plans carried out under the Water Framework Directive<sup>2</sup>.



## HOW THE GAME IS PLAYED

The WMBG game consists of a deck of cards, with a set of rules which describes the game-play. The cards include the following: 65 'Action' cards; 65 'Quality' cards and 65 'Benefit' cards (Fig. 2).

- Action cards describe management “measures” (also known as response in the DPSIR framework). These have been based on (Dutch) River Basin Management Plans. They might, for example, say ‘Build nature friendly shorelines’ or ‘Remove barriers in waterways.’
- Quality cards describe the characteristics of the lake (also known as state in the DPSIR framework), such as biodiversity, water clarity etc., that can be affected by a given management Action.
- Benefit cards describe the effect of a measure on ecosystem services (also known as the impact in the DPSIR framework). They might be, for example, ‘Increased onshore recreational activities’ or ‘Decreased damage from climate change (storms drought etc.).’

The participants take turns playing cards to collaboratively develop cause-effect “chains” sets that contain one Action card, one Quality card and one Benefit card. Under the rules based on the management measures, the cause-effect chain will first trace the impact of an Action measure on a specific Quality, or characteristic, of the lake. Following this step, participants identify a cause-effect link between the given Quality card and the Benefit towards a lake ecosystem service. The player that placed the last card in a three-card “chain” which has been discussed and approved by the group is permitted to take the chain from the playing field. The player with the most card chains at the end of the game is designated as the winner. A second set of playing rules can be implemented that focus more on ecosystem services, tracing the cause-effect impact from a Benefit card to a Quality card and an Action card.



**Fig. 2:** Cards from the WMBG include Action cards (red cards), Quality cards (yellow cards) and Benefit cards (green cards).

### GAME AVAILABILITY

The WMBG is under copyright of E.C.M. Ruijgrok at Witteveen+Bos. Training events with the game can be organized with Witteveen+Bos ([see contact details below](#)).



## ABOUT MANTEL

*MANTEL (Management of Climatic Extreme Events in Lakes & Reservoirs for the Protection of Ecosystem Services) was an EU funded Marie Skłodowska Curie Action (MSCA) European Joint Doctorate Innovative Training Network (2017-2021, Grant Agreement 722518) that focused on training a cohort of Early Stage Researchers to investigate the effects of the climate extremes on water quality, providing training in state-of-the art technology, data analysis and modelling, and linking to the water management sector.*

## REFERENCES AND ADDITIONAL READING

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