AQUADIGM

THE FUNCTION AND MANAGEMENT OF AQUATIC ECOSYSTEMS IN THE CHANGING ENVIRONMENT: THE EFFECTS OF PARADIGM SHIFTS

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Project background

An old and widely accepted paradigm in limnology is that internal phosphorus (P) loading induced by oxygen deficits controls the water quality of many lakes. Therefore artificial aeration is a commonly used lake management method. However, many lakes are shallow and aerobic release of P also may be an important regulator of the water quality. Alternative P release mechanisms can be more important than the oxygen deficit driven release, influencing the efficiency of artificial aeration. Due to the changing environmental conditions, the circumstances in lake ecosystems (thermal stratification, wind effects) may also have changed to an extent that the importance of the phosphorus cycle mediated by oxygen deficits has decreased.

Pressure from the public and media affects the possibilities of lake managers to apply the results of scientific studies in management. Even well-planned restoration projects may fail if the goals and methods of the project are not in harmony with expectations of the public and/or authorities.

To evaluate the validity of the oxygen-internal loading paradigm and to improve lake management in the future, the AQUADIGM consortium studies

1) The role of oxygen deficits in regulating internal nutrient loading
2) The effectiveness of artificial aeration as a management tool
3) The historical formation and spread of the current water management paradigms
4) The future of water management paradigms

Subprojects 1 and 2 are led by J. Horppila,
Subproject 3 by I. Massa and
Subproject 4 by P. Tapio.

The study structure

Sub-project 3 clarifies the formation of the current paradigms. With the information provided by this sub-project we can thus determine the facts that form the footing of the current paradigms and identification of barriers of paradigm shifts (Figure 1).

Updated information on the role of oxygen in internal loading and effectiveness of aeration as a restoration tool are collected in sub-projects 1 and 2 with meta-analysis of existing data and with new data from the field (Figure 1). By doing this we can estimate

- the dependence of water quality on the magnitude of internal loading from anoxic areas (meta-analysis)
- long-term relationship of total internal loading to anoxic internal loading (meta-analysis and new sediment data)
- effects of aeration on water and sediment quality (meta-analysis of existing data from aerated lakes and non-aerated lakes and new sediment data)
- the possible negative effects of aeration (new data from aerated lakes)

In sub-project 4, the possible future changes in management strategies are studied with international expert view surveys and national stakeholder workshops based on state-of-the-art knowledge and by providing the participants the new research results from sub-projects 1, 2 and 3 (Figure 1). Scenarios on the consequences of new management strategies are also produced.

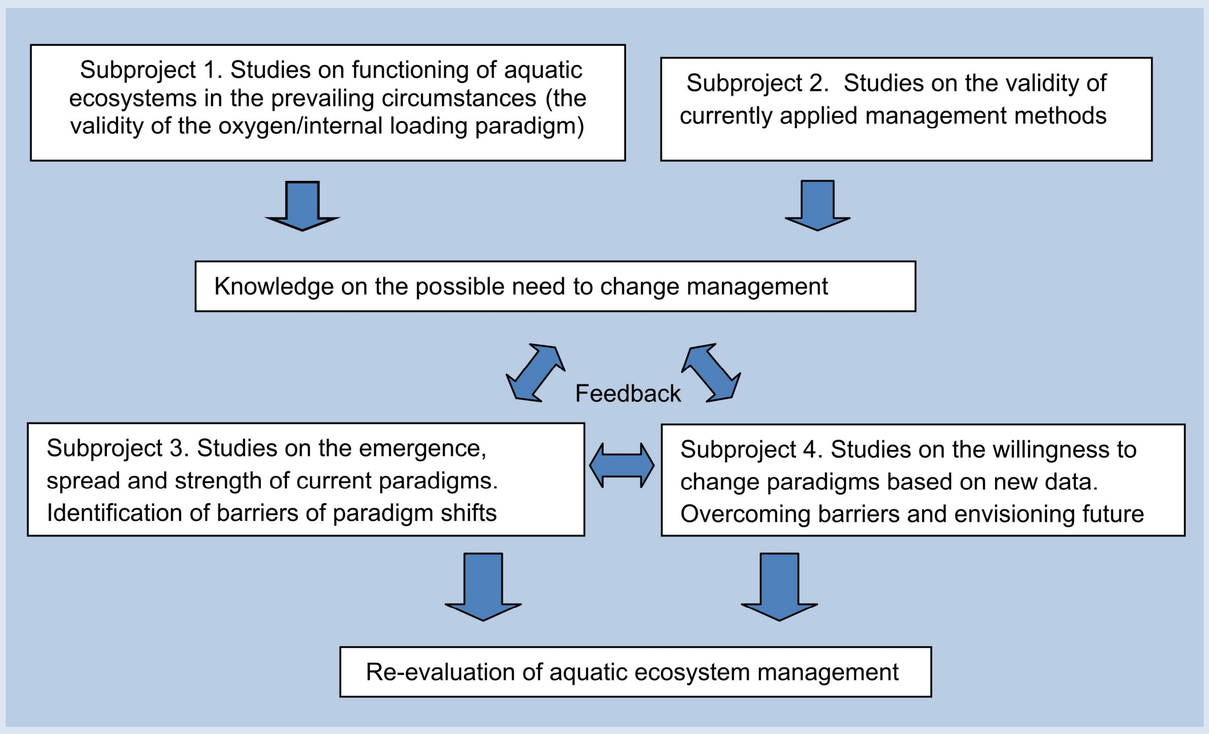

Figure 1. The structure of the AQUADIGM consortium studies

The project will develop a novel way to frame problems coherently by acknowledging both evidence-based policy and the multiple views of the current and future water management practices. The approach of integrating new research results to environmental policy can be applied to a variety of environmental problems.