

NATURE REHABILITATION FOR THE RIVER RHINE: A SCENARIO APPROACH AT DIFFERENT SCALES

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Abstract

Nature rehabilitation has become a major policy in river management in the Netherlands. A scenario approach combined with an expert system can support decision making. The methodology is illustrated by two case studies at different scales. In the Rhine-Econet study three scenarios for river management are presented and evaluated for the network function of some bird species. A second case concerns the Gelderse Poort area with two scenarios both aimed to enlarge the surface of the natural areas but in a different way. By means of the GIS-based landscape ecological decision support system LEDESS the ecological impact on vegetation and fauna has been assessed. Results are discussed. Although a lot of assumptions have to be made the results of both studies facilitate discussion and decision making about which nature policy targets are desirable and realistic.

1. Introduction

During the last decade the concept of river rehabilitation was introduced in river management in the Netherlands (Van Dijk *et al.* 1995). This policy is related to political issues such as sustainable exploitation of natural resources and biodiversity and has been enhanced by the need to reduce the total area of agricultural land, due to increasing production surpluses. In the past, river floodplains were predominantly used by agriculture in spite of seasonal inundation. Nowadays, the same conditions give restricted use to agriculture, so that floodplain areas may be transformed into nature areas. Those floodplains are considered now as important areas for nature rehabilitation. Changes in land use, however, may have serious impact on other river functions which also have to be fulfilled. Situated within the most densely populated part of Europe, the River Rhine is intensively used for navigation. Extremely high discharges in 1993 and 1995 have stressed again the water discharge function and flood protection as high-priority issues (Silva & Kok 1996).

Thus, modern river management is confronted with conflicting interests and land use claims from various sectors. The outcome of the future developments in these sectors is uncertain. To cope with this uncertainty, scenario studies are believed to be useful tools in the decision making process. However, examples of scenario studies for nature policy are scarce. This paper will contribute to a methodology of scenario studies on nature policy for river systems.

First, the scenario approach will be introduced as well as the decision support instrument used for comparison of outcomes of the various scenarios for nature poli-

Rehabilitation Of The River Rhine

D.P. Loucks



Rehabilitation Of The River Rhine:

Rehabilitation of the River Rhine J. A. van de Kraats, 1994 This volume cover many aspects of the Rhine ecosystem including biological communities in the river affected by environmental changes emission and fate of pollutants accidental spills ecotoxicological effects and restoration of fish stocks and floodplain ecosystems **Ecological Restoration of Aquatic and Semi-Aquatic Ecosystems in the Netherlands (NW Europe)** P.H. Nienhuis, Ramesh D. Gulati, 2013-03-14 This work presents the state of the art of aquatic and semi aquatic ecological restoration projects in The Netherlands Starting from the conceptual basis of restoration ecology the successes and failures of hundreds of restoration projects are described Numerous successful projects are mentioned In general ecological restoration endeavours greatly benefit from the progressive experience achieved in the course of the years Failures mainly occur through insufficient application of physical chemical or ecological principles Spontaneous colonization by plants and animals following habitat reconstruction is preferred However sometimes the re introduction of keystone species e g eelgrass salmon beaver is necessary in case the potential habitats are isolated or fragmented or if a seed bank is lacking thus not allowing viable populations to develop Re introducing traditional management techniques e g mowing without fertilization low intensity grazing is important to rehabilitate the semi natural and cultural landscapes that are so characteristic for The Netherlands **Rehabilitation of the Lower River Rhine** W. Admiraal, Netherlands, 1990 **River restoration: a strategic approach to planning and management** Speed, Robert, Tickner, David, Naiman, Robert, Lei Gang, Sayers, Paul, Wei Yu, Li Yuanyuan, Huang Houjian, Cao Jianting, Yu Lili, Zhao Zhongnan, 2016-09-19 **Habitat Rehabilitation for Inland Fisheries** Philip Roni, Food and Agriculture Organization of the United Nations, 2005-01-01 This technical paper reviews current information on the effectiveness of habitat rehabilitation techniques for inland fisheries based on published evaluations of projects including studies on roads improvements and sediment reduction riparian and floodplain rehabilitation placement of habitat structures in lakes and streams and the addition of nutrients to increase aquatic production It also sets out information on planning prioritising and monitoring rehabilitation projects *Ecological rehabilitation of the river Rhine* Rijksinstituut voor Zuivering van Afvalwater, Rijksinstituut voor Volksgezondheid en Milieuhygiëne, Rijksinstituut voor Visserijonderzoek, 1988 *River Futures* Gary J. Brierley, Kirstie A. Fryirs, 2012-09-26 Across much of the industrialized world rivers that were physically transformed and ecologically ruined to facilitate industrial and agricultural development are now the focus of restoration and rehabilitation efforts River Futures discusses the emergence of this new era of river repair and documents a comprehensive biophysical framework for river science and management The book considers what can be done to maximize prospects for improving river health while maintaining or enhancing the provision of ecosystem services over the next fifty to one hundred years It provides a holistic overview of considerations that underpin the use of science in river management emphasizing cross disciplinary understanding that builds on a landscape template The book frames the development of

integrative river science and its application to river rehabilitation programs develops a coherent set of guiding principles with which to approach integrative river science considers the application of cross disciplinary thinking in river rehabilitation experiences from around the world examines the crossover between science and management outlining issues that must be addressed to promote healthier river futures Case studies explore practical applications in different parts of the world highlighting approaches to the use of integrative river science measures of success and steps that could be taken to improve performance in future efforts River Futures offers a positive practical and constructive focus that directly addresses the major challenge of a new era of river conservation and rehabilitation that of bringing together the diverse and typically discipline bound sets of knowledge and practices that are involved in repairing rivers It is a valuable resource for anyone involved in river restoration and management including restorationists scientists managers and policymakers as well as undergraduate and graduate students

The Biodiversity Crisis and Crustacea - Proceedings of the Fourth International Crustacean Congress J. Carel von Vaupel Klein, 2000-06-01 The papers in this volume have been grouped according to the main sub themes of the congress and primarily deal with the biodiversity issues of invasive crustacea ecology and behaviour and fisheries and aquaculture

Restoration of Degraded Rivers: Challenges, Issues and Experiences D.P. Loucks, 2013-04-17 In the continued quest for increased economic benefits from our water resources numerous structures and operating policies for controlling the river flow have been built and implemented These structures and associated operating policies can facilitate navigation they can provide greater quantities of reliable water supplies to meet agricultural industrial and municipal water demands they can generate hydroelectric power and energy and they can provide increased flood protection recreation and other benefits Over the past half century we have converted many of our rivers into engineered waterways These straightened often periodically dredged engineered rivers are complete with dikes reservoirs weirs and diversion canals All this engineering has enhanced economic development However as rivers and their floodplains become stressed from the excessive use and misuse of their resources their contribution to economic development can be threatened Evidence of economic and ecological degradation especially in relatively large river systems such as the Danube the Mississippi the Rhine and the Volga has increased our appreciation of beneficial roles natural aquatic and terrestrial ecosystems play in water quantity and quality management We have recognized the need to pay more attention to letting nature help us regulate water quantity and quality rather than working against nature and its variabilities and uncertainties Today there are efforts underway in many developed river basins to de engineer or return these straightened and controlled rivers to a more natural state

Rivers of Europe Klement Tockner, Urs Uehlinger, Christopher T. Robinson, 2009-01-31 Based on the bestselling book Rivers of North America this new guide stands as the only primary source of complete and comparative baseline data on the biological and hydrological characteristics of more than 180 of the highest profile rivers in Europe With numerous full color photographs and maps Rivers of Europe includes conservation

information on current patterns of river use and the extent to which human society has exploited and impacted them Rivers of Europe provides the information ecologists and conservation managers need to better assess their management and meet the EU legislative good governance targets Coverage on more than 180 European rivers Summarizes biological ecological and biodiversity characteristics Provides conservation managers with information to resolve conflicts between recreational use of rivers their use as a water supply and the need to conserve natural habitats Data on river hydrology maximum minimum and average flow rates seasonal variation in water flow Numerous full color photographs Information on the underlying geology and its affect on river behaviour

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