

Micro-Pollutant Regulation in the River Rhine

Laura Mae Jacqueline Herzog

Micro-Pollutant Regulation in the River Rhine

Cooperation in a Common-Pool Resource
Problem Setting



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*It's easy to throw something into the **river**,
but hard to get it out again.*

Indian proverb

*Surface water is like an opened heart.
Everyone has access to it.¹*

Interview N° 9

¹Original wording: *Das Oberflächengewässer ist wie ein offenes Herz. Alle haben Zugang dazu.*

To my sister, Lola

Preface

In a world with a growing population that demands more food and more water, the question of how we use and protect the vital resource of water is fundamental. In a world that is further facing the threat of an increase in temperature, which will increase the pressure of water stress and water scarcity around the world, the question of how we use water sustainably is crucial.

I conducted the research that led to this book because I am interested in how people use water as a resource and in how we can detect water contamination, what measures exist to prevent this contamination at its source, and what solutions we have once the pollution is in the world, i.e., in water. Moreover, I am interested in how humans interact with each other when they face a water pollution problem. It is the people who influence nature, often in a negative way. So it is the people who have to work out ways together that reduce this negative influence and turn it into a careful and sustained handling with nature and its resources.

This book therefore focuses on the interactions of collective actors who are affected by water pollution and are supposed to deal with this environmental problem, in this case, the contamination of surface water with micro-pollutants.

Micro-pollutants are a relevant issue as we humans are constantly and increasingly producing them through our use of chemicals in our daily lives and the manufacturing processes of the goods we consume. The chemical substances emerging from these actions are released to the environment, ending up in the water cycle.

One of the most inspiring aspects of my investigation of actor cooperation in water quality management was the commitment of the people I spoke to. They had all made water the focus of their work; they all took care of its good condition.

I want this book to be an inspiration as well for graduates and Ph.D. students trying to find their way in the middle of their research, for practitioners of water management looking for examples of effective water quality management, for

scholars of common-pool resources wanting to gain insights into collective action in a large-scale common-pool resource setting, for researchers applying Social Network Analysis and looking for an exemplary application, and for anyone interested in managing the world's most valuable resource, water.

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Laura Mae Jacqueline Herzog

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I want to thank my uncle, Hermann Ehninger, for his passionate engagement with my topic and his valuable insights about the world of chemicals in general and the chemical industry in Basel with all the downsides to it in particular.

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Finally, I deeply want to thank all the experts who have found the time to listen to and answer my questions and all the individuals who took their time to respond to my questionnaire. This book would not exist without their commitments.

About the Book

This book analyzes cooperation among actors involved in the management of a specific common-pool resource problem: the pollution of the resource surface water. It enhances theories on cooperation and collective action in common-pool resource settings that until now have mainly focused on the maintenance and success of cooperation but less so on its emergence. The book asks: *Why do actors cooperate in the management of a common-pool resource problem of over-appropriation?*

Borrowing from studies on the severeness of a resource's threat and theories of the ecology of games framework (EGF) and the Advocacy Coalition Framework (ACF) to make assumptions about the causes for cooperation, the present study enriches common approaches of CPR theory. To structure the study of the social-ecological system that surface water, its appropriators, and their rules-in-use form, the research employs the social-ecological system framework (SESF) and tests its range of applicability.

The study conceptualizes the social phenomenon of cooperation as consisting of three different elements: actors' joint goal, actors' collaborative interactions, and actors' exchange of information. Actors collaborative interactions and their exchange of information are each operationalized as actor networks. The research assesses the factors triggering two actors to engage in collaborative interactions through inferential network analysis, applying an exponential random graph model (ERGM) technique. A descriptive social network analysis (SNA) examines the patterns of actors' collaboration and information exchange networks and assesses the explaining factors more thoroughly. Combined with a qualitative analysis of the management processes' contexts, these analyses enable the interpretation of the model's results.

The research applies the methodological approach to three cases of surface water pollution management in three different sub-catchment areas of the river Rhine: the Moselle basin, the Ruhr catchment area, and the Rhine at Basel.

The book is of interest for scholars of collective action, common-pool resources, water management, and the ecology of games framework, for undergraduate and graduate students keen on gaining a deeper understanding of a sound research design, for students of public policy analysis, for researchers applying Social

Network Analysis, for scientists who apply the social-ecological system framework (SESF) in their research, and for practitioners in water quality management. More precisely, the book offers the following insights for the respective interest group:

- Scholars working with the *theory of the commons* or researching on *cooperation in the context of environmental problems* find an overview of the research field's evolution in Chap. 2, an applied conceptualization of cooperation in the context of water quality management in Sect. 4.1, and a discussion about new insights to this field of research in Sects. 7.1 and 7.4.
- Undergraduate and graduate students find useful insights on the superstructure and the content of a neat *research design*, on the features of a mixed-method case study design, and on the process of case study selection and the procedure of gathering their own data in Chap. 3 and an overview of a research's evaluation criteria in Sect. 7.2.
- Scholars and students working with *Social Network Analysis* find an introduction to this analytical method in Sect. 3.5. and its exemplary application in Sects. 4.2 and 5.1.
- Section 3.1 offers an overview of the key features of *public policy analysis*.
- Scholars applying the *social-ecological system framework* (SESF) get an insight on the framework's contribution to case study selection and actor identification in case study research in Sects. 3.2, 3.3, and 3.4.
- Scholars researching on the *threat of environmental problems* and actors' perception thereof find an exemplary study of actors' perception of an environmental problem and its implication for collective action in Sect. 5.2.
- Scholars of the *ecology of games framework* (EGF) are invited to follow the identification of forums' bridging and bonding capital in the context of water quality management in Chap. 6.
- Scholars working on *water management* and *water laws* find their share in the description of the European, the Swiss, the German, and the Luxembourgian water legislation in the case study descriptions in Sect. 3.3 and in the overview of stakeholders' perception of water quality management in the Rhine basin in Sect. 4.3.
- *Practitioners of water management* are invited to read Chaps. 5 and 6 that inform on the specific contexts of water quality management in three regions of the Rhine basin and the factors enhancing actor cooperation therein and the insights for practitioners in Chap. 8.

The book finds that depending on the current *stage* of the actors' management process and actors' cooperation therein, cooperation is triggered by different factors. At the beginning of actors' cooperation within a CPR management process, the actors' *perceptions* of the problem matter. In the ongoing of the management process, the actors' *participation in the so-called forums* enhances actors' activity in cooperation. Once cooperation in a CPR management process is established and mature, the actors' *co-participation* in these forums ensures the cooperation's consolidation.

Apart from these “evolutionary” dynamics of cooperation, the study shows that the actors’ affiliation to (a) the group of *policy implementers* and to (b) the *same territoriality* matters as well. Point (a) reveals the mutual dependency of those realizing the solutions to the CPR problem at stake, while point (b) is of concern in cross-border CPR management situations where actors from different jurisdictions have to work together.

A further aspect shown to have influence on cooperation in a CPR problem situation is a supra-national legal guideline that explicitly demands the management of the specific CPR problem. For the present case, this legal guideline is the European Union’s Water Framework Directive (2000/60/EC) that requires the EU member states to ameliorate the ecological and chemical status of the European water bodies.

Aside from cognitive factors at the early beginning of resource management, it is mainly institutions that enable the long-lasting establishment of cooperation in CPR problem settings in the Rhine basin.

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Contents

1	The Compelling Nature of Water Pollution as a Common-Pool Resource Problem	1
1.1	The CPR and the Policy Problem of Micro-pollutants in Surface Water	4
1.2	Defining the Key Terms: Management Process, Collaboration, and Cooperation	7
1.3	Theoretical Explanations for Cooperation and Methodological Approach	9
1.4	Societal Relevance of the Research	12
1.5	Structure of the Book	13
	References	14
2	Theories and Theoretical Contribution	19
2.1	Theories of Noncooperation	20
2.1.1	The Prisoner’s Dilemma: A Non-cooperative, Nonzero-Sum Game	21
2.1.2	The Tragedy of the Commons	25
2.1.3	The Theory of Collective Inaction	26
2.2	Theoretical Concepts on Collective Action and Common-Pool Resources	28
2.2.1	A Theoretical Concept of Cooperation’s Core Relationships	29
2.2.2	Preconditions for Collective Action in CPR Settings	30
2.2.3	The IAD Framework: An Analytical Tool to Assess Collective Action	32
2.3	Factors Supporting Cooperation in CPR Settings	33
2.3.1	Recognizing the Environmental Problem	34
2.3.2	The Ecology of Games Framework (EGF): How Forums Matter	37

- 2.3.3 The Advocacy Coalition Framework (ACF):
Actors’ Shared Beliefs 39
- 2.3.4 Theoretical Relevance of the Research 41
- References 42
- 3 Methods and Cases 47**
 - 3.1 A Public Policy Analysis 48
 - 3.1.1 The Policy-Making Process 48
 - 3.1.2 The Policy Problem..... 49
 - 3.1.3 The Solutions to a Policy Problem..... 52
 - 3.1.4 Policy Networks..... 54
 - 3.2 The Conceptual Framework Guiding the Research 55
 - 3.2.1 The Social-Ecological System Framework (SESF)
and Its Critique..... 56
 - 3.2.2 Conceptualizing the Variables..... 59
 - 3.3 Case Study Design and Case Studies 64
 - 3.3.1 The Case Study Design: A Mixed-Method Study..... 65
 - 3.3.2 The Case Studies and Their Selection Criteria 68
 - 3.3.3 The Micro-pollutant Management Process
at the Rhine Basin at Basel 76
 - 3.3.4 The Micro-pollutant Management Process
in the Ruhr Region 81
 - 3.3.5 The Micro-pollutant Management Process
in the Moselle Basin..... 87
 - 3.3.6 Similarities and Differences Between the Case Studies 93
 - 3.4 The Data Collection Process 93
 - 3.4.1 Document Analysis 97
 - 3.4.2 Actor Identification 98
 - 3.4.3 Expert Interviews 100
 - 3.4.4 The Survey 103
 - 3.4.5 Response Rates and Handling Missing Data 108
 - 3.5 The Data Analysis Methods 114
 - 3.5.1 Descriptive Social Network Analysis..... 114
 - 3.5.2 Exponential Random Graph Models (ERGM) 119
 - 3.5.3 The Qualitative Analysis: A Case Comparison 121
 - References 122
- 4 Empirical Analysis I: On Cooperation..... 133**
 - 4.1 The Constituting Elements of Cooperation..... 134
 - 4.1.1 Aiming Towards the Same Goal 135
 - 4.1.2 Coordinating Each Other’s Actions:
Actors’ Collaboration..... 138
 - 4.1.3 Exchanging Resources 140
 - 4.1.4 Relating the Three Elements 144

- 4.2 A Network Perspective on Collaboration, the Core of Cooperation 146
 - 4.2.1 The Macro-level: Reciprocity, Fragmentation, and Components..... 147
 - 4.2.2 The Meso-level: Factions..... 151
 - 4.2.3 The Micro-level: Core, Important, and Peripheral Actors..... 153
- 4.3 Actors' Perceptions of Cooperation..... 163
 - 4.3.1 ... in the Basel Case Study..... 163
 - 4.3.2 ... in the Ruhr Case Study 166
 - 4.3.3 ... in the Moselle Case Study..... 170
- 4.4 Qualitative Comparison I: Cooperation at Different Stages 173
- References..... 177
- 5 Empirical Analysis II: On the Emergence of Cooperation 179**
 - 5.1 The Exponential Random Graph Model..... 180
 - 5.2 Problem Perception and Cooperation 183
 - 5.2.1 Problem Perception as Initial Trigger: The Moselle Case Study 185
 - 5.2.2 Knowing the CPR Problem: The Ruhr Case Study 191
 - 5.2.3 Mastering the CPR Problem: The Basel Case Study 195
 - 5.2.4 Actors' Similar Viewpoint on the CPR Problem 198
 - 5.3 Actors' Participation in Forums and Cooperation 199
 - 5.4 Actors' Shared Beliefs and Cooperation..... 201
 - 5.5 Actors' Attributes and Cooperation 206
 - References..... 209
- 6 Empirical Analysis III: On the Consolidation of Cooperation 213**
 - 6.1 The Forums for Water Quality Management in the Rhine Basin..... 214
 - 6.1.1 The Diversity of Forums Actors Attend 215
 - 6.1.2 The Key Forums for Micro-pollutant Management in the Rhine Basin 220
 - 6.2 Forums' Bridging and Bonding Capital..... 221
 - 6.2.1 ... in the Basel Case..... 224
 - 6.2.2 ... in the Ruhr Case..... 227
 - 6.2.3 ... in the Moselle Case..... 229
 - 6.3 How Forums Reinforce Cooperation in CPR Problem Situations 232
 - 6.4 Qualitative Comparison II: The Factor Time and Triggers for Cooperation 236
 - 6.4.1 Cooperation in an Evolving CPR Management Process..... 236
 - 6.4.2 Cooperation in an Established CPR Management Process 237
 - 6.4.3 Controlling Factors and Cooperation in CPR Situations 238
 - 6.4.4 Contextual Factors and Cooperation in CPR Situations 240
 - References..... 243

- 7 Conclusion I: Theoretical Insights on Cooperation in CPR Settings** 245
 - 7.1 Factors Contributing to Cooperation in a CPR Problem Setting 246
 - 7.2 Explanatory Strength of the Results 248
 - 7.2.1 Construct Validity..... 248
 - 7.2.2 Internal Validity..... 249
 - 7.2.3 External Validity..... 250
 - 7.2.4 Reliability..... 251
 - 7.3 Discussing the Methods 252
 - 7.4 Contributions to Theory 253
 - References..... 256
- 8 Conclusion II: Insights for Practitioners** 259
 - 8.1 Actors in the Center of Attention 259
 - 8.2 Cooperation Across Borders 260
 - 8.3 Forums as Transmitters of Knowledge and Trust 260
- Annex** 263

About the Author

Laura Mae Jacqueline Herzog is a postdoctoral fellow at the Chair of Resource Management chaired by Prof. Dr. Claudia Pahl-Wostl at the Institute of Environmental Systems Research, University of Osnabrück. She is interested in the different uses and the sustainable management of common-pool resources (CPR), in particular the common-pool resources water and land.

In her research, she investigates the interactions of humans with water and land resources, the influences of these interactions on the respective ecological system, and the potential conflicts of interest emerging from such. She is interested in how such influences on nature can be shaped sustainably and how resource conflicts can be moderated and resolved. Taking into account the respective institutional framework, i.e., the laws and regulations that influence water and land management and the state of the respective human-influenced ecosystem, she pursues an interdisciplinary approach, looking at the social-ecological systems she examines from a socioscientific as well as a natural scientific perspective.

She currently works as research collaborator in the BiodivERsA and Belmont Forum research project *LimnoScenES* that investigates the short- and long-term pressures due to climate change and intensifying land and water use on north temperate lakes. The project develops scenarios of future human-freshwater interactions that enable the maintenance of lakes' biodiversity and ecosystem services.

Laura M. J. Herzog received her doctorate from the University of Bern, where she worked as a research assistant at the Chair of Policy Analysis and Environmental Governance chaired by Prof. Dr. Karin Ingold at the Institute of Political Science. This book is her doctoral thesis.

Laura M. J. Herzog studied political science at the Otto-Suhr-Institut of the Freie Universität Berlin with a research focus on political ecology, environmental conflicts, and the concepts of human security and Responsibility to Protect (R2P) in postwar settings. In her diploma thesis, she analyzed the local mobilization of social movements in two Peruvian mining regions using social movement theory.

She has published in the *Policy Studies Journal*, *Ecology and Society*, and *Global Environmental Change*.

Abbreviations

A	Actor
ACF	Advocacy Coalition Framework
Art.	Article
AUE BL	Amt für Umweltschutz und Energie, Basel Landschaft/Cantonal Office for Environmental Protection and Energy, Basel Country
AUE BS	Amt für Umwelt und Energie, Basel Stadt/Cantonal Office for the Environment and Energy, Basel City
BDEW	Bundesverband der Energie- und Wasserwirtschaft/Federation of the Energy and Water Industry
BMBF	Bundesministerium für Bildung und Forschung/Federal Ministry of Education and Research
BMEL	Bundesministerium für Ernährung und Landwirtschaft/Federal Ministry of Food and Agriculture
BMG	Bundesministerium für Gesundheit/Federal Ministry of Health
BMJV	Bundesministerium der Justiz und für Verbraucherschutz/Federal Ministry of Justice and Consumer Protection
BMUB	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit/Federal Ministry for Environment, Nature Conservation and Nuclear Safety
CEO	Chief executive officer/Geschäftsführer*in
CPR	Common-pool resource
CV	Control variable/s
EGF	Ecology of games framework
EQS	Environmental quality standards
EU	European Union
ERGM	Exponential random graph model
DV	Dependent variable
DVGW	Deutscher Verein des Gas- und Wasserfaches/German Technical and Scientific Association for Gas and Water
DWP	Drinking water plant

Eawag	Eidgenössische Anstalt für Wasserversorgung, Abwasserreinigung und Gewässerschutz/Swiss Federal Institute of Aquatic Science and Technology
FGG	Flussgebietsgemeinschaft Rhein/River Basin Commission Rhine
FOEN	Federal Office for the Environment/Bundesamt für Umwelt (BAFU)
FRG	Federal Republic of Germany
FSVO	Federal Food Safety and Veterinary Office/Bundesamt für Lebensmittelsicherheit und Veterinärwesen (BLV)
GOF	Goodness of fit
I	Interactions
IAD	Institutional Analysis and Development Framework
ICPR	International Commission for the Protection of the Rhine/ Internationale Kommission für den Schutz des Rheins (IKSR)
IKSMS	Internationale Kommissionen zum Schutz der Mosel und der Saar/ International Commissions for the Protection of the Moselle and the Saar
LAWA	Bund/Länder-Arbeitsgemeinschaft Wasser/German Working Group on Water Issues of the Federal States and the Federal Government
LWG	Landeswassergesetz/Federal Water Act
IV	Independent variable/s
GS	Governance system
MCMC MLE	Markov Chain Monte Carlo for Maximum Likelihood Estimation
MKULNV	Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes NRW/Ministry for Climate Protection, Environment, Agriculture, Nature Conservation, and Consumer Protection of NRW
MUEEF	Ministerium für Umwelt, Energie, Ernährung und Forsten Rheinland-Pfalz/Ministry of the Environment, Energy, Food and Forestry of Rhineland-Palatinate
n	Number
NGO	Nongovernmental organization
NRW	North Rhine-Westphalia
O	Outcomes
OGewV	Oberflächengewässerverordnung/Surface Water Ordinance
par.	Paragraph
PFAS	Fluorosurfactants/Perfluorierte Tenside
PFOS	Perfluorooctanesulfonic acid/Perfluoroktansulfonsäure
RLP	Rhineland-Palatinate
RS	Resource system
RU	Resource unit
SECO	Staatssekretariat für Wirtschaft/State Secretariat for Economic Affairs
SES	Social-ecological system

SESF	Social-ecological system framework
SNA	Social Network Analysis
SWG	Saarländisches Wassergesetz/ Water Management Law of the Federal State of Saarland
UBA	Umweltbundesamt/German Federal Environmental Agency
UoA	Unit of Analysis
WFD	European Water Framework Directive (2000/60/EC)
WHG	Act on Hydrologic Balance/Wasserhaushaltsgesetz
WPA	Federal Act on the Protection of Waters/Bundesgesetz über den Schutz der Gewässer (GSchG) (SR 814.20)
WPO	Waters Protection Ordinance/ Gewässerschutzverordnung (GSchV) (SR 814.201)