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Overview of LAGOONS book project: the target audience and chapters summary

Coastal Lagoons in Europe: Integrated Water Resource Strategies





Integrated water resources and coastal zone management in European lagoons in the context of climate change



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¹PP Restricted to other programme participants (including the Commission Services)

RE Restricted to a group specified by the consortium (including the Commission Services)

CO Confidential, only for members of the consortium (including the Commission Services)

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1. Foreword

In this report we present an overview of the book project activities, namely an overview of the contents and target audience, including a brief summary of each chapter and the list of contributing authors.

The book details:

Title: Coastal Lagoons in Europe: Integrated Water Resource Strategies

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This book is a major result of the LAGOONS research project (<http://lagoons.web.ua.pt>). LAGOONS stands for “*Integrated water resources and coastal zone management in European lagoons in the context of climate change*” and was a three-year project (running from 2011 to 2014) funded by the European Commission on the call topic of ENV.2011.2.1.1-1 Lagoons in the context of climate change, under the 7th framework programme (FP7); contract no. 283157.

The key concept of LAGOONS project was that successful management of coastal lagoons is dependent not only on scientific information but also on the governance systems in which this knowledge is used at the interface between science, policy and stakeholders, including the local population. LAGOONS project seek to address the issues surrounding climate change related ‘bottlenecks’. Such events include for instance high precipitation in winter, which can lead to floods and changes in the water quality; and heat waves in summer, which can also result in changes in water quality. In management terms, LAGOONS seek to contribute to the decision-support methodologies for a coordinated approach to the Water Framework Directive and the Marine Strategy Directive. In addition, LAGOONS proposes actions foreseen in the goals of the Europe 2020 strategy - *A strategy for smart, sustainable and inclusive growth*.

In all, nine research institutes from eight countries participated in the project and in total, more than 30 scientists together with PhD and MSc students contributed to the work. This large group of researchers came from many different academic backgrounds, namely climate science, scenario building, modelling, ecology, biology, policy development and economics. For the purpose of this book we also invited LAGOONS ‘sister’ project ARCH (funded in the same EU call) and an expert on marine ecosystem services, member of LAGOONS advisory board, to contribute directly to this book. Others, while not listed as authors, have contributed significantly but indirectly through their research. This large pool of scientific knowledge and experience created a unique possibility to explore and analyse management challenges in coastal lagoons from various angles and entry points.

2. Book Outline

The book focuses on integrated management strategies seen in a land-sea and science-policy-stakeholder perspective and consists of 22 chapters. The following outline is provided to inform readers from various scientific background and professional work areas about the various topics discussed in the individual chapters of this book.

Chapter 1 identifies and discusses the pan-European management challenges of lagoons and coastal zones, seen from the context of three perspectives: governance, environment and modeling. This chapter provides examples of how inter and intra-institutional interactions influence the implementation of existing laws and regulations; discusses a number of environment-management options seen from a human well-being and sustainable development perspective; identifies major challenges in numerical modelling for solving practical management problems. This chapter is highly recommended for decision makers and managers because it is an overview of the key issues that should be considered in management.

Chapter 2 provides an overview about the key concepts, which were in the basis of the LAGOONS project, under a management context. It also sets the scene for the following chapters, by introducing the project objective, concept and methodology, and introduces readers to the four case study lagoons. This chapter is intended as an introduction for all readers.

Chapters 3-10 systematizes the knowledge base regarding the physio-geographical background and management story of each of the four case study lagoons. More specifically, **Chapters 3-4** are devoted to Ria de Aveiro coastal lagoon (Portugal); **Chapters 5-6** focus on Mar Menor coastal lagoon (Spain); **Chapters 7-8** are dedicated to Tyligulskyi coastal lagoon (Ukraine); **Chapters 9-10** are centred on Vistula coastal lagoon (Poland/Russia). These chapters are intended as supportive information for all readers.

Chapter 11 provides a short overview of trends in climate and land use in Europe that are currently observed and expected in the future and describes shortly the tools used for creating scenarios of climate change, and for impact assessment at the river basin scale. This chapter is recommended as a reference guide for modelers using the eco-hydrological model SWIM.

Chapter 12 provides a short overview of the challenges to improve integrated coastal lagoons modelling in the context of climate change. This chapter is recommended as a reference guide for modelers.

Chapter 13 briefly describes methods and results of climate impact assessment for the four European lagoons and their drainage basins, under a set of 15 ENSEMBLES climate scenarios, within a time horizon until 2100. This chapter is recommended for scientists, decision makers and managers because it is an overview of the key results under the climate change context.

Chapter 14 describes the methodology used to involve stakeholders in the identification of the main challenges facing the lagoons, and how they contributed to the formulation of possible future scenarios. This chapter is recommended for scientists, decision makers and managers because it is an overview of the engagement of local communities.

Chapter 15 assess the impacts of potential socio-economic and environmental changes on water quantity and quality in the drainage basins of the four European lagoons. This chapter is recommended for scientists, decision

makers and managers, giving an overview of the key results under different possible future socio-economic and environmental scenarios.

Chapter 16 assess the impact of combined climate change and socio-economic changes in the drainage basins in the water quality of the four European lagoons. This chapter is recommended for scientists, decision makers and managers as it is an overview of the key responses of coastal lagoons under different possible future socio-economic, environmental and climate scenarios.

Chapter 17 assess coastal lagoons response using key bio-indicators and implications on ecological status in the scope of Water Framework Directive. This chapter is recommended for scientists, decision makers and environmental managers.

Chapter 18 provides an overview of the LAGOONS ‘sister’ project ARCH: Architecture and roadmap to manage multiple pressures on lagoon. This chapter is intended as an introduction for all readers.

Chapter 19 systematizes the results from an integrated vision for ecosystem services, environmental SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis and human well-being in a Pan-European perspective. This chapter is recommended for scientists, decision makers and managers as it gives an overview of the key results combining different scientific disciplines in a multidisciplinary approach, together with the view of stakeholders.

Chapter 20 systematizes the results from the DPSIR (Drivers-Pressures-State-Impacts-Response) framework applied to the society vision for tourism in 2030 in European coastal lagoons. This chapter is also recommended for scientists, decision makers and managers since it is an overview of the key results combining different scientific disciplines in a multidisciplinary approach, together with the view of stakeholders.

Chapter 21 provides an overall Pan-European management perspective from various angles and methodological frameworks as well as the overall strategy recommendations from the four case studies. This chapter is highly recommended for decision makers and managers because it is an overview of the key issues that should be considered in management of coastal lagoons.

3. Summary of the chapters

1. Challenges in the Policy – Environment – Modelling management context

GD Gooch, AI Lillebø, P Stålnacke, FL Alves, M Bielecka and V. Krysanova

Summary – The management of freshwater, transitional waters and coastal waters poses a number of challenges for policy-makers, decision makers, scientists and other stakeholders. This chapter discusses the management challenges in coastal lagoons seen from the context of three perspectives: Policy, Environment and Modelling. More precisely, the chapter first introduces a theoretical framework for the analysis and then provides examples of how inter and intra-institutional interactions influence the implementation of existing laws and regulations in the management of lagoons and coastal zones. The chapter then presents and discusses a number of environment-management options for coastal lagoons and coastal zones as seen from a human well-being and sustainable development perspective. The third and final section of the chapter is devoted to the identification of major challenges in numerical modelling as seen from the perspective of a science-management context, with particular focus on the choice of models, data inputs, outputs, and the suitability of a model for solving practical management problems.

2. The LAGOONS project in a management challenge context

AI Lillebø and P Stålnacke

Summary – The main objective of the LAGOONS project was to develop science-based strategies and a decision support framework for the integrated management of coastal lagoons and its drainage area. The starting points of the project were that (i) the successful management of coastal lagoons is dependent not only on scientific knowledge but also on the governance systems in which this knowledge is applied, and (ii) the importance of the interface between science, policy and stakeholders (including the citizens).

The focus was on an increased understanding of land to sea processes and the science-policy-stakeholder interface all in the context of climate change. To achieve the proposed objectives, the multidisciplinary scientific knowledge in the project group was combined and integrated with the knowledge and views of local stakeholders, using a participatory approach. With this innovative approach, applied to four selected lagoons that reflect the diversity of coastal lagoons of European Member States, we developed integrated scenarios of future possible economic development and environmental impacts in the four selected European coastal lagoons. This chapter provides an overview about the key concepts, which were in the basis of the LAGOONS project, under a management context.

3. The Physio-geographical background and the Ecology of Ria de Aveiro

AI Lillebø, OMCC Ameixa, LP Sousa, AI Sousa, JA Soares, M Dolbeth and FL Alves

Summary – This chapter systematizes the knowledge base regarding the physio-geographical background and ecology of Ria de Aveiro coastal lagoon. This lagoon is located on the north-west coast of Portugal and is integrated in the Vouga River basin area, which is the main freshwater source into the lagoon. The Vouga River basin is one of the ten hydrographic regions defined in Portugal. This hydrographic region is divided in four main groundwater bodies of which Aveiro Quaternary is the most important in terms of groundwater recharge and water availability. The Aveiro region corresponds to the northern sector of the Portuguese Occidental Meso-Cenozoic sedimentary basin, being characterised by a temperate maritime climate, with warm summers and rainy winters. The geographical location of the Ria and its natural resources contribute largely to its recognised environmental value at national and

international levels. This mesotidal shallow lagoon presents unique ecological characteristics, it supports a diversity of life with several classified habitats and it has one of the largest continuous salt marshes in Europe, being also an important area for migratory birds. The Ria's natural capital is an important factor for the development of the region, providing several ecosystem goods and services and contributing to the well-being of the local population.

4. The Management Story of Ria de Aveiro

LP Sousa, AI Lillebø, JA Soares and FL Alves

Summary – This chapter systematizes the knowledge base regarding the management story of Ria de Aveiro coastal lagoon and the surrounding municipalities (Albergaria-a-Velha, Aveiro, Estarreja, Ílhavo, Vagos, Mira, Murtosa and Ovar). The Ria's natural capital is an important factor for the development of the municipalities in the lagoon area. The unique environmental, cultural and socio-economic features support high added value economic activities, such as agriculture and livestock, fishing, aquaculture, salt production, industry, tourism, and recreational activities. The Ria de Aveiro is managed within a complex policy and legislative context, with a wide variety of institutions and actors engaged in the use and management of the lagoon. The complexity of the territorial and governance contexts has always been a challenge. Water management associated with spatial planning and territorial management have become, in recent decades, a major target for the different stakeholders (local and regional, public and private). This chapter discusses and presents the legal and institutional frameworks of Ria de Aveiro.

5. The Physio-geographical Story of Mar Menor

A Marín, J Lloret, J Velasco and C Bello

Summary – The Mar Menor, a hypersaline lagoon located in a semi-arid region of southeast Spain, is one of the largest coastal lagoons in the Mediterranean, covering an area of approximately 135 km². The importance of the lagoon and its salt marshes in terms of biodiversity has been recognised in numerous international protection schemes: it has been listed as a Ramsar International site since 1994; it is considered a Special Protected Area of Mediterranean Interest (SPAMI), established by the Barcelona Convention in 2001; and a Site of Community Importance (SCI) to be integrated in the Natura 2000 Network (EU Habitats Directive). This area is also a Specially Protected Area (SPA) for nesting, migration and wintering of aquatic birds, and is protected by European legislation (Birds Directive 79/409/CEE).

The lagoon and the associated watershed areas comprise a wide variety of natural resources facilitating human use, including large tourist resorts and intensively irrigated agriculture. During the last decades these human activities in the area have caused substantial changes to the environment, including changes to the plankton population, replacement of macrophyte species, and undesirable jellyfish blooms. Although numerous studies have been carried out focusing on the Mar Menor, a better understanding of the consequences of losses to biodiversity and the increase of eutrophication in the lagoon is still necessary. The consequences of global climate change for this area and the possibility of aggravated eutrophication in the Mar Menor Lagoon needs to be addressed in order to develop successful management strategies to protect this valuable ecosystem and its services.

6. The Management Story of Mar Menor

J Lloret, A Marín, J Velasco and C Bello

Summary – The Mar Menor Lagoon is managed within a complex legislative and policy context, with a wide variety of institutions, policy and decision-makers. It is therefore necessary to develop an integrated and holistic management framework with common objectives and guidelines. This in order to promote a more sustainable development of the area and protect its environment, natural resources and biodiversity. This is particularly important given the expected consequences of climate change.

Our understanding of the interactions between the processes in the river basin and the lagoon functioning and its 'health' is crucial to design successful strategies in the Mar Menor, and to reduce or palliate the possible consequences and impacts of future global climate change in the area

7. The Physio-geographical Story of Vistula Lagoon

G Różyński, M Bielecka, P Margoński, I Psuty, L Szymanek, B Chubarenko, E Esiukova, D Domnin, A Domnina and V Pilipchuk

Summary – This chapter describes the physical and geographical setting of the Vistula Lagoon including a general description of the lagoon's drainage basin and the meteorological, geological and physiographic characterization. The chapter also covers issues around water resources and quality, natural resources and marine ecosystem services. The entire chapter serves as an introduction to a more detailed description of current and future issues and problems, related to more sustainable management of the Vistula Lagoon in both a transboundary and climate change context. The most acute environmental problem of the Vistula Lagoon is its significant vulnerability to eutrophication. A second problem is the flood risk in both parts of the lagoon. Another serious problem is the population of cormorants especially in the Polish part of the lagoon.

8. The Management Story of Vistula Lagoon

G Różyński, M Bielecka, P Margoński, I Psuty, L Szymanek, B Chubarenko, A Domnina, M. Kolosentseva, O Tataruk, J Przedzrymirska and J Zaucha

Summary – This chapter systematizes knowledge on the management (especially water and environmental) of the Vistula Lagoon. It faces difficulties typical for a transboundary basin, administered by legal entities representing two entirely different legislation systems. The most obvious environmental management problems include overfishing in both parts and the absence of joint monitoring programs of the lagoon. These problems can be attributed to the transboundary character of the lagoon, despite the existence of formal mechanisms of transboundary cooperation between Poland and Russia. There is an obvious gap in practical transboundary cooperation and in cooperation between stakeholders themselves at all levels, both in the Polish and the Russian parts of the lagoon. Other factors include uneven development of different municipalities around the lagoon and different incongruous and divergent sectoral activities (Lagoons Technical Brief, Issue No. TB1). Even though the lagoon is monitored regularly, information on main meteorological, hydrological and water quality parameters for both the Vistula Lagoon itself and the river basins is very scarce and incomplete. The transboundary feature of the lagoon with one EU country (Poland) and one non-EU country (Russia) adds to the complexity of efficient management of the area. There is a need to identify the interactions (and possible feedback loops) between climatic change and socio-economical development jointly for both countries. This is needed in order to achieve efficient management and assessment of the lagoon's future carrying capacity, especially in terms of discharge of pollutants, predominantly nutrients (Lagoons Technical Brief, Issue No. TB1).

9. The physio-geographical background and the ecology of Tyligulskyi Liman Lagoon

Y Tuchkovenko, N Loboda and V Khokhlov

Summary – This chapter summarizes the knowledge base on the physio-geographical background and ecology of the Tyligulskyi Liman Lagoon. The lagoon is located between the Dnieper and the Danube Rivers and is one of many lagoons in the Ukrainian part of the north-western coast of the Black Sea. The lagoon is connected to the Tyligul River basin, which is the main freshwater source for Tyligulskyi Liman. The natural resources of Tyligulskyi Liman include a unique coastal landscape, a rich flora and fauna, and mineral therapeutic muds. It is also an important place for weight gaining, nesting and rest of migrant birds. Tyligulskyi Liman is included in the Important Bird Areas List and is

a Ramsar wetland site primarily due to the waterfowl habitat of international importance. The areas adjacent to the lagoon are mainly used for agriculture. The lagoon's unique characteristics are threatened by anthropogenic and climate change pressures. Numerous artificial reservoirs in the lagoon's drainage basin decreased the river water discharge. During the last decades, water salinity in the lagoon increased considerably due to reduced freshwater inflow from the drainage basin and to intensive summer evaporation. As a result, the species composition of fresh-brackish and brackish complexes is being substituted by marine and brackish-marine ones

10. The Management Story of Tyligulskyi Liman

O Gubanova, Y Tuchkovenko, V Khokhlov, S Stepanenko, S Baggett

Summary – This chapter presents the management aspects of the Tyligulskyi Liman Lagoon. Tyligulskyi Liman is managed under a complex policy and legislative context. Administratively, the territory is managed by the Odessa and Mykolaiv regional state administrations in Ukraine. However, Tyligulskyi Liman is also part of a landscape park. In Ukraine, the law on the Natural Protected Areas determines different regimes for the use of park lands. Thus, Tyligulskyi Liman is also liable to additional management issues. The lack of coordination between different institutional bodies is the main reason for many conflicts in the Tyligulskyi Liman area. Thus, in this chapter, the stakeholders and social groups of Tyligulskyi Liman are well scrutinized. The contribution of the lagoon to the economic welfare of surrounding communities is currently low. Indicatively, in the last years, fish catches were around 350 tonnes mainly of economically low-valued species. However, some considerable socio-economic gains can be made in the future from the use of therapeutic muds. The proper promotion of the scenic landscapes can also contribute to the development of ecotourism. The National Environmental Strategy of Ukraine is described as an appropriate action to amplify a better economic and environmental status in Tyligulskyi Liman

11. Application of modelling tools and data to assess climate and land use change impacts at the catchment scale

V Krysanova, C Hesse, A Stefanova and F Hattermann

Summary – This Chapter first provides a short overview of trends in climate and land use in Europe that are currently observed and expected in the future. After that, tools used for creating scenarios of climate change, and tools for impact assessment at the river basin scale are shortly described. The next section presents climate scenarios and the model SWIM used for impact assessment in the drainage areas of four European coastal lagoons: Ria de Aveiro, Mar Menor, Tyligulskyi and Vistula. The last section describes data requirements and availability for the impact assessment study in the four drainage areas. The SWIM model was calibrated and validated for the drainage areas of all four lagoons and applied to assess climate and land use change impacts. The results of impact assessment are briefly described in the following Chapters 13 and 15.

12. The challenges to improve integrated lagoon modelling in the context of climate change

M Bielecka, et.al.

Summary – In this study an integrated lagoon modelling approach is presented. It was implemented for four European lagoons: Ria de Aveiro (Portugal), Mar Menor (Spain), Tyligulskyi Liman (Ukraine) and Vistula Lagoon (Poland/Russia). Climate change impact was included as well. Therefore each of the lagoon faced many challenges, especially with respect to providing a consistent approach to the problems in all lagoons. In this Chapter main challenges concerning selection of

appropriate models, coupling them, setting up, calibrating and validating including problems with data availability, are presented.

13. Impacts of potential climate change on lagoons and their catchments

C Hesse, M Bielecka, A Stefanova, M Robakiewicz, R Staroszczyk, M Zalewski, V Khokhlov, Y Tuchkovenko, J Lloret, J Lencart e Silva, JM Dias, AI Lillebø, B Chubarenko and V Krysanova

Summary – Climate change is supposed to remarkably affect future conditions of coastal lagoons and their catchments and should be considered in the management plans of these water bodies. This chapter briefly describes methods and results of climate impact assessment for the four European lagoons: Ria de Aveiro (Portugal), Mar Menor (Spain), Tyligulskyi Liman (Ukraine) and Vistula Lagoon (Poland/Russia) and their drainage basins, under a set of 15 ENSEMBLES climate scenarios, within a time horizon until 2100. Generally, all regions show continuously increasing trends in temperature, but precipitation is projected to decrease on the Iberian Peninsula, to increase in the Baltic region, and no clear trend in precipitation was found for the Black Sea area. The results of climate impact assessment show diverse projections of changes in river discharge and nutrient loads as well as in nutrient concentrations in the lagoons resulting from the applied climate scenarios for the four case study areas. A combined impact assessment taking into account possible future changes in land use and management as well as in climate is recommended for development of adaptation measures appropriate for these vulnerable coastal areas.

14. Engagement of local communities and integrated scenarios part 1: building qualitative scenario storylines and their quantification

S Baggett and G D Gooch

Summary – This chapter describes how stakeholders were involved in the identification of the main challenges facing the lagoons, and how they contributed to the formulation of the qualitative scenario. It also explains the methodology used to quantify certain socio-economic aspects of the scenarios. The chapter demonstrates that a combination of focus groups, citizen juries and workshops can be used to provide informed input into discussions on the desirable or undesirable future of a lagoon.

15. Potential impacts of socio-economic and environmental changes on four lagoon drainage basins

A Stefanova, V Krysanova, C Hesse, S Turtumøygard, L P Sousa and J A Soares

Summary – In this study we assessed the impacts of potential socio-economic and environmental changes on water quantity and quality in the drainage basins of four European lagoons. In each case study, four specific qualitative scenarios and narrative storylines were translated into quantitative scenarios and these were applied to the eco-hydrological model SWIM. We analysed the model outputs in terms of changes in the total freshwater and nutrient ($\text{NH}_4\text{-N}$, $\text{NO}_3\text{-N}$ and $\text{PO}_4\text{-P}$) inputs to the Ria de Aveiro (Portugal), Mar Menor (Spain), Tyligulskyi (Ukraine) and Vistula (Poland/Russia) lagoons as well as alterations in groundwater recharge and actual evapotranspiration rates in the lagoons drainage basins. Depending on the economic development and environmental awareness assumed for the different scenarios and case study areas, the implemented land use and management (concerning agriculture and water) changes showed quite diverse impacts on water resources in terms of tendency (increase/decrease) and impact intensity (high to low impact) for the various components under study.

16. Lagoons impact integrated scenarios

M Bielecka, M Robakiewicz, M Zalewski, V Khokhlov, Y Tuchkovenko, J Lloret, J D Lencart e Silva, J M Dias, AI Lillebø, B Chubarenko and R Staroszczyk

Summary – Impact of combined climate change and socio-economic changes in catchments of four European lagoons: Ria de Aveiro (Portugal), Mar Menor (Spain), Tyligulskyi Liman (Ukraine) and Vistula Lagoon (Poland/Russia) is presented. Influence of four possible socio-economic scenarios on the lagoons' water quality is discussed. Response of the four lagoons to different scenarios was moderate to small. In all cases Set Aside and Crisis scenarios resulted in some reductions of nutrient concentrations, whereas Managed Horizons and Business As Usual scenarios resulted in some increase of nutrients concentrations. The greatest changes (up to 25%) were predicted in the Vistula Lagoon and the least in the Tyligulskyi Liman (less than 5 %) and Ria de Aveiro (from 8% to -21%). Need for implementation of some adaptation measures is recommended in case the least favourite scenario happens.

17. Lagoons response using key bio-indicators & and implications on ecological status (WFD)

A Marin et al.

Summary – The Water Framework Directive (WFD (2006/60/EC) requires member states to assess the ecological quality status (EcoQS) of coastal lagoons. This chapter briefly describes the recent environmental changes of the EcoQS for four European lagoons: Ria de Aveiro (Portugal), Mar Menor (Spain), Tyligulskyi Liman (Ukraine) and Vistula Lagoon (Poland/Russia), by means of M-AMBI index, and provides a description of the main benthic habitats identified according to the sediment type, presence macrophyte meadows, salinity and benthic assemblage. Results show a high proportion of the Ria de Aveiro habitats were scored as 'high status EcoQ'. According to the disturbance classification of M-AMBI index most of the bottoms of the Mar Menor lagoon were classified as 'Good EcoQ'. The shallow sandy bottoms of Tyligulskyi Liman lagoon were classified as High or Good EcoQ' but the deepest areas were impacted by periodic anoxia events. In Vistula lagoon, the lowest disturbance level characterizes the benthic biocenosis at the bottom covered by mixed and sandy sediments ('Good EcoQ'), while the highest level is typical of the muddy bottom fauna ('Moderate EcoQ').

18. ARCH: Architecture and roadmap to manage multiple pressures on lagoons

G D Breedveld, G Bouma, A M P Oen and A Slob

Summary – The ARCH research project aims to overcome the boundaries between the multiple scientific disciplines involved in the management of lagoon and estuary systems. The central objective of the ARCH research project is to develop participative methodologies in collaboration with the involved managers, policy makers and stakeholders to manage the multiple problems affecting lagoons in Europe, using ten different case study sites. This will generate realistic solutions and provide roadmaps for their implementation at the lagoon scale. Important components towards this goal include (i) the promotion of an integrated research approach, (ii) the employment of a true participatory process and (iii) formulating realistic strategies towards sustainable lagoon management.

19. European coastal lagoons: an integrated vision for ecosystem services, environmental SWOT analysis and human well-being

AI Lillebø, C Spray, FL Alves, P Stålnacke, JA Soares, LP Sousa, AI Sousa, V Khokhlov, Y Tuchkovenko, A Marin, J Loret, M Bielecka, G Rozynski, P Margonski and BV Chubarenko

Summary – A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis was applied to four selected European lagoons, in order to have a Pan-European view of the factors that represent an advantage versus disadvantage for the provisioning of ecosystem services. This analysis allowed delineating an approach to transform threats in opportunities, by maximizing the strengths and minimizing the weaknesses foreseeing human well-being. The analysis was applied by combining different scientific disciplines in a multidisciplinary approach, together with the view of stakeholders, including local citizens from Ria de Aveiro coastal lagoon (Portugal), Mar Menor (Spain), Vistula Lagoon (Poland and Russia) and Tyligulskyi Liman Lagoon (Ukraine). The SWOT analysis was complemented with a set of ecosystem based approach questions distributed and completed at each case study lagoon by stakeholders, during a workshop. The questionnaire helped to gain understanding of the stakeholders' perception of the benefits provided by each lagoon, the main beneficiaries, and how the key benefits should be managed in the near future (2030). Overall, the application of the SWOT analysis combined with the stakeholders participatory processes seems to be a very useful tool to present an integrated vision for the management of coastal lagoons at the European level.

20. The DPSIR framework applied to the society vision for tourism in 2030 in European coastal lagoons

M Dolbeth, AI Lillebø, P Stålnacke P, GD Gooch, L Sousa, FL Alves, J Soares, C Bello, A Marin, V Khokhlov, Y Tuchkovenko, M Bielecka, G Różyński, A Reda and B Chubarenko

Summary – We applied the DPSIR (Drivers-Pressures-State-Impacts-Response) framework to four European lagoons, covering a wide geographical distribution. We took their present/reference condition as well as a desirable scenario/vision for 2030 for each lagoon into account, with regard to the Driver 'Population, Tourism and Related Activities'. Our goal was to identify possible management recommendations for the selected Driver for all lagoons, taking into account the views of end-users. As such, the present and future DPSIR's were applied by combining different scientific disciplines in a multidisciplinary approach. The lagoons' present condition was defined through quantitative-qualitative information from current scientific knowledge and from knowledge collected from the local population. The considered possible vision for 2030 for each lagoon was underpinned by mathematical modelling, from the catchment to the coast, Eurostat data and expert knowledge, and defined by the lagoon's end-users through a participatory approach. We proposed a 'backwards' DPSIR framework to identify the State change to be achieved by 2030, taking into account both the desirable and undesirable Impacts and potential Pressures. We also evaluated if the Responses proposed in the present/reference conditions will enable achieving the desirable scenario. Overall, the application of the DPSIR framework seems to be a very useful tool to propose recommendations for the management of coastal lagoons at the European level, with sustainable tourism considered as a major goal to achieve.

21. Recommendations and strategies – Pan-European view for coastal lagoons

P Stålnacke, AI Lillebø and GD Gooch

Summary – This final chapter of this book first summarizes and discusses the main findings from the four case study lagoons: the Ria de Aveiro Lagoon in Atlantic Ocean (Portugal); the Mar Menor in the Mediterranean Sea (Spain); the Vistula Lagoon in the Baltic Sea (Poland/Russia); and the

Tylygulskiy Liman Lagoon on the Black Sea (Ukraine). The lessons learnt in the project and the recommendations deriving from it are presented in an overall pan-European perspective. Particular emphasis is placed on assessing the current management status in the lagoons and identifying the specific problems occurring in the lagoons and upstream drainage basins. This identification is based on the results of the interactions between LAGOONS scientists and local/regional stakeholders, and the challenges include water governance; water quantity and quality, i.e., ecological status; lagoon usage; stakeholder participation and access to information. It is shown that coastal lagoon management is hampered by several short-comings, particularly those related to suboptimal coordination between sectors and a lack of easy access to basic knowledge and data. It is shown that there is a need to create an integrated vision for all European coastal areas including drainage areas. More specifically there is a need for the better coordination of transboundary waters and for a single coordinating unit for coastal zones management. Easier access to data and information sharing is also needed in order to include citizens and stakeholders into the management of the lagoons. The science-policy interface should be improved and it is also necessary for better recognition of the connectivity from land, streams, rivers, lagoons and coastal zones.

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Annex — From IWA catalog**Environment****Coastal Lagoons in Europe***Integrated Water Resource Strategies*

Authors: Ana Lillebo, Per Stalnacke and
Geoffrey D. Gooch



Lagoons represent nearly 13% of the shoreline globally and around 5% in Europe. Coastal lagoons are shallow water bodies separated from the ocean by a barrier (e.g., narrow spit), connected at least intermittently to the ocean by one or more restricted inlets, and usually geographically oriented parallel to the shore-

line. Coastal lagoons are flexible and usually able to cope with environmental change, yet nowadays they are under threat. This is partly due to climate change impacts (for example, sea-level rise and hydro-meteorological extreme events) but also due to more direct human activities and pressures.

The book focuses on addressing these challenges through integrated management strategies seen in a land-sea and science-stakeholder-policy perspective. Pan-European management challenges are seen from the context of the perspectives of Policy, Environment and Modelling. Four case study lagoons in different geographical locations in Europe provide examples of some of the practical experiences and results around these challenges. Possible impacts on drainage basins and lagoons are introduced through integrated scenarios which were developed through a multi-science and land-lagoon science perspective combined with interactions and contributions from stakeholders and citizens.

Issues around climate change impacts on environmental conditions in both drainage basins and lagoons are also included.

The book derives from a collaborative EC-funded project entitled Integrated Water Resources and Coastal Zone Management in European Lagoons in the Context of Climate Change comprising nine partner institutes with a wide diversity in the scientific disciplines covered.