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BOOK REVIEW

Understanding where land meets sea: spatial analysis of coastal environments

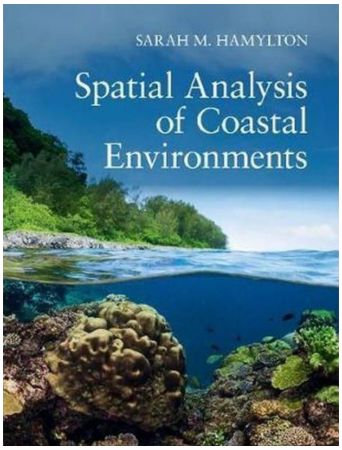
Spatial Analysis of Coastal Environments by Sarah M. Hamylton

2017, Cambridge University Press, 306 pp., ISBN: 1107070473, www.cambridge.org

The importance of coastal areas and the pressures they are facing is now widely recognized. This has brought a renewed interest in the study of the spatiotemporal dynamics at play in coastal systems, which has produced new knowledge that is often directly integrated into management and conservation plans and efforts. Traditionally, studies of the coastline have not necessarily been integrative, i.e., they have often only looked at what was above (e.g., dunes formation) or below (e.g., coral reefs extent) the waterline. There is now an increased awareness of the need to integrate those two worlds to gain a more comprehensive understanding of the patterns and processes that are present in coastal environments. Hamylton's *Spatial Analysis of Coastal Environments* covers the necessary tools and approaches to facilitate such analyses, and it offers a broad overview of how spatial analysis can help in the study of coastal environments.

Hamylton establishes the foundations of the book by defining what spatial analysis is and why it is important, and by explaining what spatial data are and how they are different from non-spatial data. She then takes the reader on a journey throughout the workflow of spatial analysis. The author first covers data collection; then shows how to manipulate and analyze the data (i.e., through basic geographical analysis, mapping, and monitoring), and thereafter treats more complex analyses (i.e., geostatistical analysis, modeling). Finally, she addresses elements regarding the use of results (i.e., uncertainty and error analysis, communication). I found that the book has a natural separation; Chapters 4 and 5 serve as a transition between the relatively basic first half of the book (Chapters 1 to 3), which lays the groundwork for the second, more complex half (Chapters 6 to 9).

This book is impressively succinct given its breadth. For example, many books will either only cover optical remote sensing or acoustic remote sensing as a data collection approach. Hamylton, however, covers in Chapter 5 field-based approaches to mapping, optical remote sensing – including LiDAR – and acoustic remote sensing, and appropriately introduces the different platforms that can be used to collect those different types of data. She managed to do so while remaining concise, clear, and efficient. The text is accessible and well-written, and the chapters are well-structured. The chapters usually start by defining the concepts that are being introduced before diving into a more complex integration of those concepts into a spatial analysis workflow. Most chapters end with a real case study that demonstrates the practical application of the theoretical concepts introduced in that chapter and with a very effective bulleted summary of the chapter's key points.



A comprehensive study of coastal environments requires a multidisciplinary perspective, which Hamylton successfully showcases in her book. The author defines concepts from geography, geomorphology, and ecology; and provides relevant examples using spatial analysis as the cornerstone that links and integrates all the different concepts together. It would have been interesting, however, to read a bit more about how spatial analysis can facilitate the integration of the social, cultural and economic factors of coastal environments with the geomorphological and ecological elements. This could perhaps have been possible in the last chapter, and it would have strengthened the book's multidisciplinary perspective. Hamylton also made sure to provide examples that covered different types of coastal environments, for instance, estuaries, mangroves, seagrass beds, and coral reefs.

The case studies included at the end of the chapters meet their objective to demonstrate how the learned concepts are applicable to real problems. In addition, the datasets and instructions to recreate the examples are available online as exercises, which is definitely an asset of this book, particularly if it is being used as a textbook. However, I was left with the impression that most examples and exercises were a bit too simple. While I understand the utility of the given exercises for a beginner readership, I think that a set of more complex exercises could have been added, perhaps as an appendix. Another element that I found disappointing about the examples and exercises is the use of ArcGIS as the go-to software to perform the analyses and complete the exercises. While I agree that ArcGIS is probably one of the most utilized GIS software, there is increasingly more open source software (e.g., Quantum GIS, GRASS GIS) or libraries and modules in programming languages

(e.g., R, Python) that can perform spatial analyses. In fact, an increasing number of books in ecology now provide their examples and exercises in open-source software/languages. It would have been interesting to display more diversity in the software or languages used for the exercises; as written, the book limits its readers to only learning ArcGIS. I admit that not everyone may be familiar with R or Python; yet, such exercises could have been made available in an appendix or online, while keeping the ArcGIS examples in the book for those who are more familiar with it.

I believe that the strongest selling point of this book is that Hamylton covers critical concepts (e.g., in Chapters 8 and 9) that are all too often disregarded in other publications. The author does not present spatial analysis as a panacea and acknowledges the limitations of the approaches that are presented. For instance, the importance of considering errors and uncertainty is highlighted in the chapters on mapping and monitoring, and an entire chapter is dedicated to it (Chapter 8). Hamylton also warns that it is impossible to assure that models include all relevant variables and calls for a redefinition of modeling as an activity that incrementally advances scientific knowledge rather than an end in itself. As she wrote on page 191: "This knowledge, or theory, may represent the best available account for the time being, paving the way for new hypotheses and experiments that provide even more stringent tests of the model." The last chapter, which discusses communication of results and the use of maps for this purpose, is one of the main elements that distinguish this book from other textbooks. Spatial analyses results are often used by different stakeholders to inform decision-making in contexts like conservation and management. Dedicating an entire chapter on how to properly use maps as a means of communication was an excellent idea; for that alone I would recommend this book.

This book is best suited for a non-expert audience; it is not adequate for readers looking for a deep, comprehensive, and conceptual review of concepts of spatial analysis. Experts in spatial analysis will not likely enjoy reading the first five chapters reviewing basic concepts set in a coastal analysis context. Nevertheless, this volume will be of interest for scientists across a range of disciplines (e.g., ecologists, geomorphologists, geographers) that are not experts in either spatial analysis or coastal environments. It is suitable for an undergraduate audience or for being used as textbook in introductory courses; the accompanying online practical exercises constitute a good resource for such courses.

In conclusion, I would recommend *Spatial Analysis of Coastal Environment* for its scope and breadth (i.e., basic geographical analyses, mapping, monitoring, and explanatory and predictive modeling), well-defined terminology, multidisciplinary perspective, and treatment of concepts like spatial scale, data quality, and communication.

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