

substantially higher net social benefits to the broader society. The various strands of analyses from previous chapters relating to recreation, timber values, carbon sequestration and agriculture are synthesized and overlaid using GIS value maps. These maps illustrate that there is large spatial variation in net present values (NPV), which would not have been evident if a global NPV had been produced for the entire study area as in traditional CBA techniques. Both the market and social-environmental assessments are presented and, as can be predicted, the results demonstrate sensitivity to whether the analyses are restricted to market prices or extended to include the various non-market values. In addition to the spatial factors, the choice of discount rate, choice of woodland tree species to be planted, and other policy variables also impact the sensitivity of the results.

The final chapter (Chapter 10) summarizes the research findings, identifies some of the limitations of the analysis, and highlights the omission of certain critical non-market values (such as biodiversity and habitat values of woodlands) from the overall CBA.

Readers who are familiar with GIS methodologies and with expectations of substantial advancement and innovation in the application of GIS to applied economic analysis might be slightly disappointed, given the title of this book. While the overall application of an integrated environmental and economic CBA in this study is very sound and provides some interesting results, GIS is largely used only as a supporting tool to integrate multiple data layers for the economic analyses. A natural next step would be to build upon the book's current approach and use GIS as a scenario building tool to examine the potential levels of land use change under the different policy options, and to map their resulting social, economic and environmental consequences.

Nonetheless, the authors have provided extremely useful insights into some of the capabilities of this tool, and their comprehensive documentation of the study methodology allows for this approach to be readily adapted to other regions and contexts when considering land use change options at a regional scale, whether for development or conservation objectives. The authors should be lauded for their very strong, creative and expansive efforts.

**Maps and the Internet**, with CD insert  
 Edited by Michael P. Peterson  
 Oxford, United Kingdom: Elsevier, 2003.  
 ISBN 0-08-044201-3

*Reviewed by Daniel G. Cole*  
*Geographic Information Systems Coordinator*  
*Smithsonian Institution*

This multi-authored work, which was published three years before this review, addresses the issues and developments of internet-focused cartography at the start of the 21<sup>st</sup> century. Books of this type are often out-of-date relatively soon after going to print. While that can certainly be said for portions of this book, this reviewer can state at the start that this or a newer edition should still be on the shelf of most cartographers. The book is divided into four parts with 28 chapters written by 35 authors. The organization is logical, and, while some of the chapters could have been combined, the book is well-indexed, and progresses with the individual chapters usually able to stand on their own.

Part One (six chapters) provides the introduction and covers contemporary issues. The age of the book becomes evident with Peterson's introductory discussion on the historical background of maps on the web and their associated file types (PDF and JPEG). Had the book been published more recently, the JPEG2000 format would have certainly been included. He notes the University of Texas website as being popular, but now he would have to promote David Rumsey's website as well. His discussion of the popularity of MapQuest would now likely have been supplanted by Google Maps with Google Earth.

The second chapter [Krygier, Peoples] on geographic literacy addresses "the issue of map education in a world transformed by the WWW" (p. 17). The web enables students "to engage in diverse, active mapping" but "requires more than teaching about the latest WWW mapping sites" (p. 18). Indeed, since maps are often viewed uncritically, whether on paper or over the web, getting students and others to question what they see when maps are displayed is of prominent importance. Krygier routinely has his students check out the static historical map sites such as the Library of Congress and the University of Texas map collection sites, as well as five commercial websites. Krygier and Peoples bemoan that maps and graphics are rarely properly cited, and that a standard bibliographic guide for digital images and maps did not exist (although one can now check the Library of Congress for such a guide: <http://memory.loc.gov/learn/start/cite#maps>). The authors promote the Census Bureau's American Factfinder site as being very good for learning to use and produce choropleth techniques, classing systems, and map design. They also voice worries

about post 9/11 access problems to property records, photos and databases.

Chapter three [Cartwright] focuses on designing web maps since they require a different design and production approach as compared to paper maps, Cartwright points out the considerations that must be taken regarding not only web design, but also concerning the device upon which the maps will appear. As he states, maps on the web are sometimes constrained by the old rules suited to printed maps. Writing today, he might have discussed maps destined to appear on an iPod or Blackberry. Obviously, contrast becomes a primary design component for tiny screens, and compression becomes imperative as well in order to illustrate most map details. He discusses currently available mapping services such as National Geographic's Map Machine, the Alexandria Digital Library Project, downloadable data from USGS, and web atlases including the National Atlas of Canada.

The fourth chapter [van Elzakker, Ormerling, Kobben, Cusi] deals with dissemination of census data with examples from the Netherlands and the Philippines. The four authors built a five-page table of website functionalities for 126 UN countries (expanded to 187 on their updated website). Most allow retrieval of static maps, charts, text and tables, and some allow users to customize individual maps without needing any installation or knowledge of GIS software. Household data is normally withheld, but block data was found to be more than adequate for studying geographic/ethnic/gender/age/income spatial data. One complaint about this chapter concerns the poor figure reproduction of the Philippine website (p.69).

Chapter five [Richmond, Keller] covers internet cartography and official tourism sites. This chapter had copy editing problems. For example, Richmond and Keller state that they examined a sample of 181 maps from 40 official national tourism destination websites, but only list 30 destinations on p. 81. Further, the list is broken down into two tables of 20 and 10 locales with the title of the first table stating 30 rather than 20. The second table repeats the entry id number 2 twice so that a reader not paying close attention might assume that this table contains only nine, rather than ten, sites. Nonetheless, the authors do a good job critiquing the various static and interactive tourist websites and thus how well the sites guide prospective tourists to planned vacation spots. This reviewer wonders if any of these critiques were delivered back to the respective tourist boards.

The sixth chapter [Monmonier] addresses cartographic surveillance and locational privacy. Monmonier notes the concerns regarding location based services: mapping for commercial purposes versus ex-offender mapping during probationary periods, and from the tracking of children and pets to moni-

toring non-criminals through cell phone use. Traffic mapping, crime mapping and on-line cadastres allow for planning by local governments, while at the same time permit individuals to actively participate in community affairs.

Part Two (ten chapters) deals with technical developments in the field. In chapter seven, Herzog investigates developing cartographic applets. He complains that most maps on the internet "concentrate only on location and routing" (p. 117). His objective was "(1) to make the method of thematic cartography more popular; and (2) to bring specific content - maps of the spatial distributions of socio-economic phenomena - to a broader audience" (p. 118). Speaking of a broader audience, chapter eight's authors [Andrienko, Andrienko, Voss] discuss the CommonGIS Project, a cartographic expert system designed to provide GIS for everyone. That goal, the authors admit, requires an intelligent (knowledge-based) graphic user interface and functionality. They profess success by stating that "First, it assists users to represent data on maps and other graphical displays in accord with principles of cartography and graphic design. Second, it suggests exploratory instruments suitable to the goals of analysis. Third, it assists in utilizing these instruments by context-specific instructions about how to operate them" (p. 145).

The ninth chapter [Jiang] gives a critical methodological discussion of serving GIS internet functionality. Jiang divides the topic into surveys of a server/client model, a peer-to-peer model (P2P), and mobile agents. Chapter ten [Li] presents P2P sharing of cartographic data and software where there is no client or server; rather, everyone is a client *and* server with dynamic IP addresses. Li writes about issues surrounding data sharing and acquisition. While he expresses frustration in dealing with the Federal Geographic Data Committee (FGDC), an appreciation of the data downloads available from various government and commercial sources is made, especially the Geography Network, although neither the FGDC Clearinghouse nor the Geography Network "are easily accessible to individuals who want to publish their data (p. 163)." Li finishes with a discussion of a prototype P2P system.

Chapter 11 [Zaslavsky] is concerned with online cartography using eXtensible Markup Language (XML). Zaslavsky covers the emerging XML standard for encoding spatial data, XML-based languages for 2D rendering, and the use of XML for managing, browsing and harvesting cartographic metadata. The author discusses Geographic Markup Language (GML) and other XML vocabularies, and delves into an extensive treatment of AxioMap, which is an application of XML for interactive online mapping.

The 12<sup>th</sup> chapter [Neumann, Winter] outlines the

use of scalable vector graphics (SVG). Neumann and Winter express the importance and constraints of the SVG open-source standard that allows integration of text, 2D vector and raster files, scripting interactivity, animation, and other special effects. They wisely remind us that “vectors are fully scalable, to the point where [they] can reveal shortcomings in the data (after all, the cartographic data is only scalable within a certain scale range)” (p.199).

Chapter 13 [Lehto] reviews the standards-based architecture for multi-purpose and multi-channel geodata publishing. Lehto addresses a four-tiered architecture encompassing spatial data, information, portal, and mobile terminal services, along with the access interfaces and data encoding between the tiers. Chapter 14 [Tsou] covers the development of intelligent software agent architecture for distributing databases and mapping services. Tsou points out that combining layers from different sources is easy, but making sure that intelligent cartographic design gets implemented is the challenge for cartographers. As a result, he gives three goals: “the ability to search, carry and apply cartographic rules for web mapping applications”; to “provide a dynamic framework to combine different cartographic rules for different mapping tasks”; and to “facilitate the establishment of distributed cartographic knowledge bases (CKB) which can help map users to access/distribute/exchange different cartographic rules, map symbols, color schemes, design layouts, via the Internet” (p.233).

The 15<sup>th</sup> chapter [Ottoson] deals with 3D visualization through Georeferenced Virtual Reality Modeling Language (GeoVRML). Ottoson reviews the basics of 3D visualization, rendering, and virtual reality, and discusses the current and future trends regarding GML, SVG, X3D, Java 3D, and Mpeg-4 and -7. Chapter 16 [Fuhrmann] concerns supporting wayfinding in desktop geovirtual environments. Fuhrmann describes active tracking through the internet from the observer’s position and orientation, noting the relatively easy possibility of getting ‘lost’ in a virtual environment. He also discusses the development of a prototype; detailing the drawbacks such as lack of realistic rendering, narrow field-of-view, poor spatial resolution and optical distortion.

Part Three (nine chapters) deals with applications and user issues. Chapter 17 [Mooney, Winstanley] is concerned with public transportation information systems and journey planning. Mooney and Winstanley state that while route planning over the internet can be easily and quickly achieved, “producing maps of the same quality as that of human expert mapmakers is still an unsolved task in the area of computer-aided cartography” (p. 291). They further note that building a journey planner, based on public transport (bus, subway and train) can be a daunting task. They

provide a critical comparison of public transit websites from Chicago, New York, and Dublin, and two from London.

Chapter 18 [Torguson, Blinnikov] covers an Atlas of Russia created by and for college students as an active learning tool. Combining Russian studies with cartography, Torguson and Blinnikov provided an active learning tool that was flexible, timely, and cost efficient. Chapter 19 [Giordano] concerns an historical geoinformation project in New Bedford, Massachusetts. The author points out that the licensing and permitting process for protecting waterway environments and private property has been in place in Massachusetts since 1866. From this long-term database, Giordano was able, in what is referred to as a ‘Chapter 91 Pilot Project’, to compile shoreline changes over time while integrating traditional GIS and cartographic tools with multimedia for public education. In the 20<sup>th</sup> chapter, Hu describes a web-based multimedia GIS project with a case study in the Florida Everglades. He discusses the use of a web server, map server, and data server in a multimedia environment involving digital video, sound, text, and graphics.

Chapter 21 [Caquard] deals with the contemporary possibilities of internet maps and public participation. Caquard argues that thematic maps have traditionally been “designed by experts for the use by experts in centralized top-down management systems” (p.345). He expresses the possibility of the internet offsetting the above statement; indeed, over the past decade a flurry of papers and projects have appeared in forums ranging from NCGIA to URISA promoting public participation GIS. The author warns about three deficiencies in thematic cartography: first, map data may be difficult to understand by the non-expert public; second, map information may not meet the needs of the stakeholders; and third, the appearance of the map as “objective, neutral and precise” (p.348) may, in fact, hide embedded biases. For his study, 12 types of map were analyzed against 12 criteria, examining the differences between static maps (which, like paper, do not invite participation), dynamic GIS maps (where a somewhat partial potential of public participation exists at the end where GIS becomes both the medium and the message), and dynamic maps without a specific relation to a GIS (where spatial communication is more dynamic and interactive, but less analytical). Caquard stresses the importance of qualitative data versus quantitative data for increasing the public participation of internet users accessing raw data to make their own maps suited to their needs. Lastly, Caquard poses the following query: “how can the combination of public participation and the Internet be used to fundamentally be used to rethink thematic cartography?” (p.355)

Chapter 22 [Cammack] is concerned with inte-

grating abstract models of the environment via the internet. In his text, Cammack promotes developing public awareness of environmental issues by integrating abstract map models within virtual reality. He conducted a case study of the Little Sac River basin in southwest Missouri using Quick Time Virtual Reality (QTVR) (Apple) together with ArcIMS using hyperlinks between the two. More research was deemed to be needed. Chapter 23 [Schwertley] deals with QTVR maps for the web. As a pilot study, Schwertley made virtual landscapes of Magnolia, Iowa. He also critiqued existing virtual reality/map combinations of Yellowstone Park, University of Oregon campus, and the Island of Porquerolles, France.

Chapter 24 [Gartner] addresses the concept of telecartography for the mobile internet: "the distribution of cartographic presentation forms via wireless air data transfer interfaces and mobile devices" (p. 386). Gartner predicts that this will be a leapfrog technology, as graphics-capable cell phones, PDAs, PocketPCs, and now Blackberries, become ubiquitous. Chapter 25 [authors] describes the use of PDAs with TeleAtlas. Screen resolution, menus, font issues, and overall readability are reviewed.

Part Four (three chapters) concludes with theoretical developments. Taylor, in Chapter 26, covers the concept of cybercartography as a multisensory/multimedia interactive format. But he cautions that "we do not know whether or not a multimedia, multisensory approach is more effective for communication, teaching and learning"...indeed..."merely presenting the same information in several modes does not necessarily facilitate learning" (p.409). Cybercartography is apparently still in its infancy since both the cyberatlases that he cites (Latin America and Antarctica) are still under construction. In chapter 27, Brodersen discusses modeling the visualization of internet maps as a form of cartographic communication. Peterson's Chapter 28 finishes the book by setting the foundations for present and future research in internet cartography. As he notes, the vast majority of maps are now distributed over the internet, and he complains that current research is mostly devoted to the technology. Researchers, largely, are not relying on theory to guide research but are instead chasing technical developments. Like most of the authors in the book, he sees that much work is needed; but at the same time he sees a promising future for the discipline.

The accompanying CD is a mixed bag. Some authors merely reproduce the figures and some internet links from their text. Others more generously provide scripts, bibliographies, slide shows, class notes and exercises, and additional internet resources not noted in the manuscripts. As to be expected after three years, a scattering of sites are no longer active: notably, none of the links worked with Chapter 24. Ideally, the entire

text of this book could have been produced on a CD with numerous maps, graphics, videos, and links, and this reviewer would encourage that avenue (moving up to a DVD if necessary) for any future ventures of this type.