Lecture Notes in Geoinformation and Cartography

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Landscape Analysis and Visualisation

Spatial Models for Natural Resource Management and Planning

Springer

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Preface

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Landscapes, like cities, cut across disciplines and professions. This makes it especially difficult to provide an overall sense of how landscapes should be studied and researched. Ecology, aesthetics, economy and sociology combine with physiognomy and deep physical structure to confuse our understanding and the way we should react to the problems and potentials of landscapes.

Nowhere are these dilemmas and paradoxes so clearly highlighted as in Australia — where landscapes dominate and their relationship to cities is so fragile, yet so important to the sustainability of an entire nation, if not planet. This book presents a unique collection and synthesis of many of these perspectives — perhaps it could only be produced in a land urbanised in the tiniest of pockets, and yet so daunting with respect to the way non-populated landscapes dwarf its cities. Many travel to Australia to its cities and never see the landscapes — but it is these that give the country its power and imagery. It is the landscapes that so impress on us the need to consider how our intervention, through activities ranging from resource exploitation and settled agriculture to climate change, poses one of the greatest crises facing the modern world. In this sense, Australia and its landscape provide a mirror through which we can glimpse the extent to which our intervention in the world threatens its very existence.

The team of editors have assembled an intriguing and far-reaching set of contributions which largely emanate from the study of landscape as it affects south-eastern, western and coastal Australia. They display this on a canvas that is at least as large as any which has been used hitherto to attempt a synthesis of landscape problems and the way we might approach them. Most of the chapters deal with large scale landscapes, although this does not mean that the editors or the authors are unaware of scale. In fact, the manner in which scale weaves its way through the various contribu-

tions, and the way different approaches are affected by scale is something that an astute reader can easily recognise.

Although these contributions were originally presented under the badge of the 'Place and Purpose' conference (which focused on spatial models for natural resource management and planning), as the title of this book implies, its key focus is on the analysis of landscapes and their visualisation. The contributions follow a classic organisation into sections on natural resources, land cover, ecology, and social infrastructure linked through questions of planning and management. Visualisation weaves its way through the manner in which landscapes are represented and analysed, the final section dealing explicitly with new ways of characterising and disseminating what we know about landscape through computers and the World Wide Web.

In fact representation and management are twin themes that dominate all the chapters presented here, with systems analysis and decision analysis linking the diverse contributions together. Although modelling which is accepted as being computational and statistical, is central to many of the papers, the presentation of formal models is rather low key in that the focus is much more on digital representation and ways of using associated software, typically GIS (geographic information systems), to generate landscape analysis in a media that is both visual and communicable using the latest information technologies. Modelling per se is very much subsumed here in terms of representation on the one hand and decision analysis on the other, while the management of landscape features strongly in many contributions, consistent with our increasing concern for sustainability of resources in the face of climate change and capital exploitation.

There is both an implicit and explicit sense in this book that landscapes need to be captured digitally and represented in some neutral manner prior to analysis and management. There is recognition too that science is not the only vehicle that will allow best management, but that the diversity of communities who have vested interests and views about landscapes must be included in the processes whereby such landscapes might be best managed. This of course is public participation by any other name but it is wider than this. The confluence of physical analysis concerning the sustainability of landscapes with social infrastructure, which in turn sustains their exploitation and management, must be set against the increasing challenges which link rural to urban and first world to third, thus complicating this nexus in ways that we are only beginning to realise. The contributions here present a marvellous array of this complexity, while the organisation of the book and the dedication of the contributing scholars and practitioners show just how important it is to provide a synthetic sense of what sustainable landscapes are all about. The range of models, from catchment

hydrology through to decision analysis, indicate just how difficult a real synthesis of the problems of Australian landscapes in particular, and landscapes in general, really are. Themes that are captured and drive the contributions include: the evidence base, questions of uncertainty, adaptive management, the role of community in the process of landscape change, and the management and looming problem of climate change. Readers of this book, however, will need to reflect on these themes for they are manifested in a diversity of contributions which means that the arguments made here need to be understood on many levels. The pages that follow thus offer continued insights.

Digital representation and visualisation is central to these ideas and provide a useful synthesis of representation with dissemination. Since the rise of the World Wide Web (the visual interface to the Internet), desktop representation which became visual with the advent of the microcomputer, has moved quickly into a form that is widely available to anyone who has access to the Internet. These technologies are currently being refashioned in an even more interactive manner so that users can now generate their own interpretations and manipulate digital content directly through the World Wide Web by interacting with others. These technologies are increasingly referred to as Web 2.0, and in the last part of this book, exciting developments in the representation and communication of ideas about landscape are presented that inform us just how far these technologies have developed. Digital globes and games are beginning to dominate the way we can visualise spatial representations, providing us with new ways of interacting with one another through these media. Important contributions are presented by some of the key people making advances in this area, and it is fitting that the cutting edge of landscape digital representations are focussed on research and practice in Australia rather than in other parts of the world. This book provides a real sense of what is being contributed to the study of landscape from this continent using these new forms of synthesis.

A preface to a book should in one sense point the way and inform the reader how to navigate what is inevitably difficult but exciting terrain. To do this, I will select some striking themes that I urge readers to grapple with in the chapters that follow. The editors do, of course, guide readers in a more focussed way at the beginning of the book, but it is worth noting important contributions that follow.

In the first section on resource management, the focus is very much on physical representation but also on key issues of generating sustainable landscapes through the use of tools that help to bridge the gap between expert professionals and those charged with decision making. Adaptation, the use of evidence-based policy and the diversity of views about landscapes

by different communities of interest are linked together through the use of tools such as catchment analysis, multi-criteria analysis and common representational infrastructures, thus impressing on the reader how landscapes always need to be analysed in ways that link science to policy.

The second part of the book deals with analytical techniques and models, mainly focusing on land cover and land use but with a strong emphasis on using models to generate alternative futures. Techniques such as cellular development of landscapes, and the way uncertainty is captured in these models are introduced, while the notion of generating an array of scenarios defining the decision or policy space in which landscape can develop is broached directly — again impressing the theme that good representation and analysis must be linked to policy through modelling and simulation.

The third part of the book then deals with ecological modelling, in particular animal habitats and vegetation, again in the context of development scenarios for the design and management of different futures. The chapter on genetic markers and the evolution of landscapes, for example, is typical of how ideas in this book make us think about the correctness of the scales that we are dealing with and the way in which different scales imply different aspects of the complexities that make up landscapes.

Social and economic conditions that interact with the physical and visual form of the landscape are presented in the fourth part. These too show another aspect of this complexity that needs to be handled where explicit techniques involving the community and experts can be used in understanding how the physical and the social interact.

All of this culminates in the last section which is about how landscapes can be represented digitally and communicated using new computer and communications technologies. This is a fitting conclusion to the book for it impresses on the reader just how extensive the study of landscape is and just how important it is to bring different interests together in communicating how they can be managed. In this, globes, games and virtual worlds have a key part to play.

There is much excitement in the pages that follow and the book can be read on many levels. The editors and the contributors have done us all a great service in providing as integrated a set of ideas as one might find in the study and management of landscape. This is a fitting contribution to a generation of research and practice fashioned in a context that provides many exemplars for others to follow.

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Abbreviations

ABS	Australian Bureau of Statistics
AHP	Analytical Hierarchy Process
CAT	Catchment Analysis Tool
CMA	Catchment Management Authority
CMF	Catchment Management Framework
CRC	Cooperative Research Centre
CRCSI	Cooperative Research Centre for Spatial Information
CSDL	Corporate Spatial Data Library
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAS	Decision Aiding System
DEM	Digital Elevation Model
DPI	Department of Primary Industries, Victoria
DSE	Department of Sustainability and Environment, Victoria
DSS	Decision Support System
ESRI	Environmental Systems Research Institute
GFS	Groundwater Flow Systems
GIS	Geographical Information System
GPS	Geographical Positioning System
GUI	Graphical User Interface
IPCC	Intergovernmental Panel on Climate Change
KML	Keyhole Markup Language
KMZ	Keyhole Markup Zipped
LiDAR	Light Detection and Ranging
LGA	Local Government Authority
LUIM	Land Use Impact Model
MCA	Multi-Criteria Analysis
MCAS-S	Multi-Criteria Analysis Shell for Spatial Decision Support