The role of public participation, spatial information and GIS in natural resource management of the dry tropical coast, northern Australia

Volume 1

Thesis submitted by
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in January 2010

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STATEMENT on the CONTRIBUTION of OTHERS

Research Funding:

Australian Postgraduate Award Graduate Research

Graduate Research School, James Cook University

School of Earth and Environmental Sciences, James Cook University

In-kind Research Support:

Australian Institute of Marine Science (AIMS)

Burdekin Dry Tropics NRM (BDTNRM)

Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC)

Marine and Tropical Sciences Research Facility (MTSRF)

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Mr Stuart Kininmoth, Australian Institute of Marine Science
(External support)

Dr Alex Smaigl, CSIRO
(External support)

Editorial Support:

Dr David King

Dr Alison Cottrell

Dr James Moloney

Dr Stephen Sutton

Mr Simon Woodley

Ms Melonie Thomas

Acknowledgments

This thesis was made possible only because of the extraordinary help and encouragement I received from many people. As a friend said in his own thesis, “Doing a PhD may be a challenge in its own right. Doing a PhD in a different country, culture and language was a rewarding experience. Many people contributed to make study and life “down under” worthwhile”. I totally agree with him. Innumerable people have contributed to the achievement of this research. It is not possible to name them all in this short page; yet I am sure they know about my deepest gratitude for their support along these years.

Firstly, I will be forever grateful to my husband Felipe for his her unconditional support and love. I will be forever in debt with you. He has always been a loving and supportive husband, and none of this would have been without him. Felipe, you are my inspiration, and your love and commitment leave me speechless.

I am sincerely grateful to my supervisory committee: David King, Alison Cottrell, James Moloney, Stephen Sutton, Stuart Kininmonth, and Alex Smajgl for your belief and encouragement and for being accessible and willing to help throughout my candidature. Most of all, I thank David and Alison for your trust, confidence, and unfailing encouragement for developing a social and qualitative research; thank you for giving me the freedom to pursue my interests. Thanks Stephen and James for your insightful thoughts and comments throughout the entire research project. I also would like to express my gratitude to Stuart and Alex for your feedback and generosity with your time.

I am grateful to many other people at the School of Earth and Environmental Sciences of James Cook University, especially the administrative and IT staff who have assisted me immensely during the course of this work. I am especially indebted to Peter Valentine for his support since the first day I arrived at JCU. My sincere thanks also go to all academic staff and postgraduate fellows in SEES for providing an extremely friendly and supportive atmosphere over the years. Special thanks to Alana Grech, Mariana Fuentes, Kamala Gurung, Vanessa Valdez, Dipani Sutaria, Milena Kim, Fernanda Faria, and Agung Firdaus.

My thesis would not have been possible without generous financial support from SEES and Graduate Research School, and the in-kind support of the Australian Institute of Marine Science, Burdekin Dry Tropics NRM, and Queensland Primary Industries and Fisheries. My thanks to Ian Dight, Tom Mc Shane and Graeme Porter for providing me support and a unique opportunity to work with farmers and graziers of the Burdekin region. I am also indebted to

Burdekin Bowen Integrated Floodplain Management Advisory Committee and Capricorn Reef Monitoring Program for your valuable assistance with my fieldwork. I also gratefully acknowledge the support of Elodie Lédée and Owen Li for your assistance in digitizing hundreds of recreational fishing polygons. I also would like to extend a sincere thank you to all the participants who take part in this research. Thank you for your time, for sharing you knowledge and opinions which made possible the development of my thesis.

To my entire family and friends (Brazilians, Australians and many other nationalities) whose encouragement and support have remained constant. I gratefully acknowledge the support of the Mendes de Gusmão family (Neusa, Márcio, Maíra e Yara) for all your advice and love. I extend the deepest gratitude to my friends Alessandra Mantovanelli, Eduardo Teixeira da Silva, Pedro Fidelman, Roberta Bonaldo, João Paulo Krajewski, Yara Tibiriçá, Aline Pizani, Kithara family, Michelle Pinto, Renata Furlan, Gabriel Padilla, and all my little friends born during the development of this thesis. Thank you all for your friendship, solidarity, and the nice moments shared.

Finally, my research would not have been possible without the unconditional love and support of my mother and brother, Noemi and Anderson. I gratefully thank your faith on me. You both have been the pillar of my strength during this time. Thank you from the deepest of my heart. To my father, wherever he is, thanks for taking care of me and our family throughout this journey.

This thesis is dedicated to Luiz Felipe

Thesis Abstract

Public participation is undergoing worldwide recognition as an indispensable component of natural resource planning and management. Nevertheless, effective engagement and communication between resource users and managers is considered the main challenge towards achieving participatory decision-making processes. Spatial information and geographic information systems have been increasingly used as means of engaging and communicating natural resource issues with grassroots groups. The public participation geographical information system has emerged as a promising approach to facilitate visualisation, availability and dissemination of information. It also provides a complementary alternative to traditional participation techniques. However, a meaningful public participation depends on the relevance of the issues involved, the perspectives and interests of participants, the existing cultural, political and organisational contexts, and the level of public participation aimed at being achieved.

The overall purpose of this research was to investigate and document the extent to which public participation processes and geospatial tools have been developed in practice. Three case studies located at the Queensland tropical coast (North Queensland, Australia) were used to illustrate issues, problems and opportunities of integrating public participation, spatial information and related technologies in natural resource management. The tropical coast of the Great Barrier Reef was selected because of the diversity of stakeholder groups that is users of information, resource-use exploiters and information providers. The region also displays a complexity of natural resources decision making processes, an increasing number of public participation initiatives, and current and emergent needs for spatial information and GIS. Three research objectives were addressed to achieve this purpose: (1) analysis of public participation strategies and tools used to communicate with and engage key stakeholder groups in natural resource management; (2) assessment of the extent to which spatial information and GIS technology have been used to furnish access to information and to support participation in decision making processes; (3) development of a conceptual model identifying the key drivers, needs and barriers in terms of participation and use of spatial information and GIS in the management context of the tropical coast.

Data collection involved a combination of qualitative and quantitative techniques including semi-structured interviews, self-completion questionnaires, participant observations, and document analyses. Case studies were selected from both catchment and coastal water systems in the tropical coast of the Great Barrier Reef. The selected case studies provide realistic

decision making situations at distinct management scales to investigate the socio-institutional and technical dimensions of the spatial management changes by comprehending how different users understand and make use of spatial information and geographic information tools. Qualitative and quantitative techniques were used to analyse the datasets of the three case studies. Qualitative data composed of document summaries, interviews transcriptions and observation notes were expanded, reviewed and coded. Quantitative data from the surveys were analysed using exploratory and descriptive statistical techniques. Geographic information technology and advanced spatial analysis tools were employed to analyse mapped data.

Regardless of the differences inherent to each case study, findings indicated that many stakeholders are highly motivated and committed to influence decisions on natural resource management. There is also an increasing demand for geographic information technology in land and water management, including real time environmental data to assist with the land and water management process. However, the existing mechanisms, that is the main sources of spatial information and communication tools, the ways geospatial data are developed and acquired, and strategies that people use are not fully supportive of PPGIS initiatives. The public participation processes and the provision of spatial data and use of geographic tools are not fully tailored to the immediate needs of the stakeholders. The current strategies for spatial data acquisition, access and dissemination are mainly driven by government and research institutions. Consequently, most of the immediate public interests do not overlap with the GIS technology and the spatial data provided. The most common factors found in the three case studies investigated were uncertainty about data sources, inappropriateness of the information provided, lack of technical skills and spatial expertise, and inadequate infrastructure.

The research found that despite the limitations found in the three case studies, results of this study provided important and valuable data to support the development of more appropriate ways of interacting, communicating and learning with spatially-referenced data. The conceptual model linked and synthesized the social and technological frames across the case studies providing a coherent framework that integrates the findings of three real natural resource management situations that is catchment, coast and marine systems catchment, coast and marine systems. To enhance support for PPGIS initiatives, users' interests need to be intersected by GIS technology and the spatial data provided. To achieve that, this research recommends that four major strategies need to be addressed: (1) trust between government and resource management agencies with resource users needs to be urgently strengthened; (2) parameters to be measure by geospatial technologies, such as the sensor networks, have to be better linked to a specific management problem, so a more purposive collection and use of data can be designed; (3) investment in collaborative joint initiatives in the use of existing structures and established

community-based networks may possibly strengthen efforts, within and across interested stakeholder partners, facilitating the management, storage, access and acquisition of spatial data and geographic information technology, and (4) effective participation and the meaningful use of GIS and spatial information needs to be adopted as a continuous process, instead of as an end, and as tool to fulfill legal requirements.

The conceptual framework developed and the results achieved in this thesis contribute to general development in the field of geographical research, particularly PPGIS theory and GIScience. Findings of this research provided relevant information on the social, technological and institutional elements that shape and influence public participation and the context-dependent use of spatial information and GIS tools in natural resource management. This thesis touched different management contexts (from water quality of coastal resources to rezoning of marine protected areas and innovative spatial sensor technology), several stakeholder groups (recreational fishers, coastal managers, government agencies, industry, landholders, science providers, and community-based organisations), and a myriad of issues involving public participation and the use of spatial information and GIS. Future research should be directed at investigating the multiple contexts (cultural, social, political and technological) of coupled public participation and geographic information; differential access to geographic information and technology, and public perceptions of space and understanding of the spatial aspects of decision problems.

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Abbreviations and Acronyms

ACTFR	Australian Centre for Tropical Freshwater Research
AIMS	Australian Institute of Marine Science
BDT(NRM)	Burdekin Dry Tropics (Natural Resource Management)
BBIFMAC	Burdekin Bowen Integrated Floodplain Management Advisory Committee
BSES	Bureau of Sugar Experiment Station
BPS	Burdekin Productivity Services
BWQIP	Burdekin Water Quality Improvement Plan
CCI	Coastal Catchments Initiative
CSR	CSR Sugar Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVA	Conservation Volunteers Australia
DEH	Department of Environment and Heritage
DPI & F	Department of Primary Industries and Fisheries
EPA	Environmental Protection Agency
EVs	Environmental Values
CESNNQ	Coastal Environmental Sensor Networks in Northeast Queensland
GA	Geoscience Australia
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
GIS	Geographic Information System(s)
HRIC	Herbert Resource Information Centre
JCU	James Cook University
NCGIA	National Center for Geographic Information and Analysis
NHT	Natural Heritage Trust
MNP	Marine National Park
MPA	Marine Protected Area
NRM	Natural Resource Management
P-GIS	Participatory GIS
PPGIS	Public Participation GIS
RWQIP	Reef Water Quality Protection Plan
WCED	World Commission on Environment and Development
WQBMP	Water Quality Burdekin Management Plan
WQIP(s)	Water Quality Protection Plan(s)
WQO	Water Quality Objectives
WWW	World Wide Web

Publications Associated with this Thesis

Information from this thesis has been published or is currently in preparation to be submitted to peer-reviewed journals.

Publications

McCook, L.J., Ayling, T., Cappo, M., Choat, H. **De Freitas, D.M.** *et al*., (2010). Adaptive management of the Great Barrier Reef marine reserve network: a globally significant case study in marine conservation. *Proceedings of the National Academy of Sciences (PNAS) – Marine Reserves special issue.* doi: 10.1073/pnas.0909335107 (Chapter 5).

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