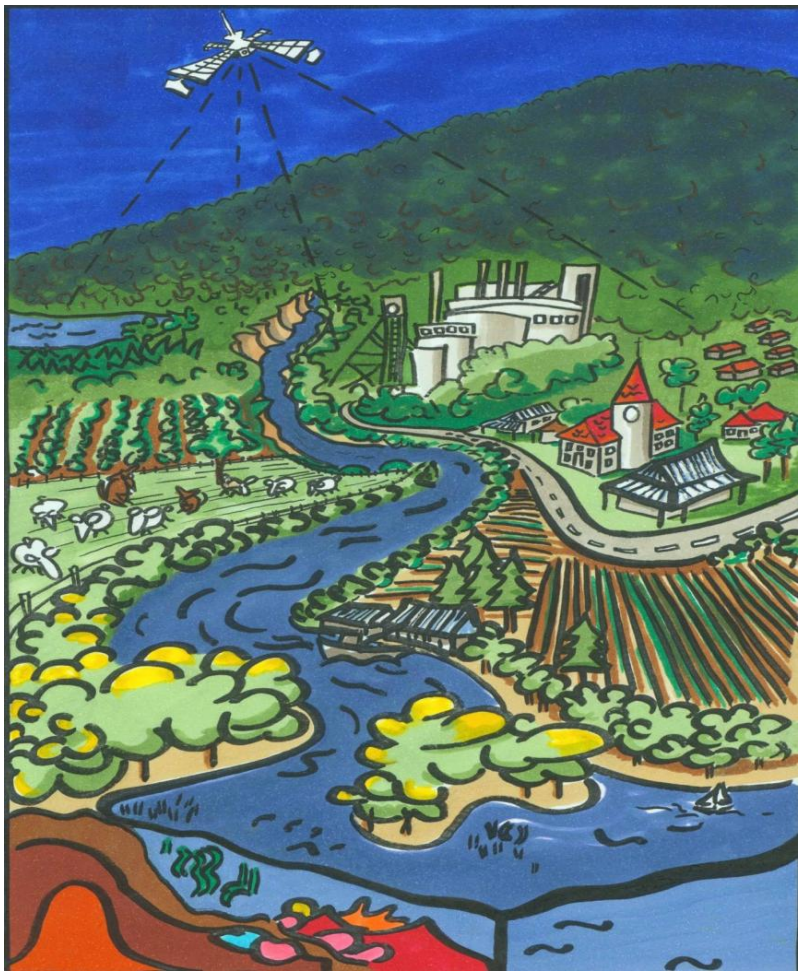
‘Sea-Change’ and Landscape Change:

A spatial examination of trend and alternative landscape futures for the Northern Rivers Region of New South Wales, Australia



Philip Morley,
B.Sc (UniSA), M.Env.St (Adelaide)

Institute for Rural Futures
UNESCO Centre for Bioregional Resource Management

A thesis submitted for the degree of Doctor of Philosophy,
University of New England, Armidale, Australia.
July 2009

Frontispiece:

Artwork by John Grant and David Brunckhorst 1999. Used with permission.

All other photographs used in this thesis are the work and copyright of the author.

ACKNOWLEDGEMENTS AND DEDICATION

The Institute for Rural Futures provided significant material, financial and moral support for the duration of this thesis, and my deepest thanks go to Professor David Brunkhorst for always believing in me as my PhD meandered throughout its long journey in what seemed like an endless process. My thanks must also go to all the other IRF staff both past and current, who have made the Institute one of the best places to work.

Funding for this thesis was also generously provided by the University of New England through a UNERA scholarship and my gratitude goes to the University and in particular to Thea Harris, who was always supportive and understanding.

Spatial data was provided by the NSW National Parks and Wildlife Service, the NSW Department of Planning, NSW Department of Lands and the Australian Bureau of Statistics. Without their support in this way, this thesis would not have been possible.

Finally, I cannot adequately express in words, my most sincere and deepest gratitude to my family, who were always patient, supportive, understanding and ready with a joke whenever it was needed.

Nurture your mind with great thoughts, for you will never go any higher than you think. Benjamin Disraeli

ABSTRACT

Past policies and landscape changes influence future directions. Human society tooled with powerful machines since the industrial revolution have become the major altering force on landscapes and regions. The affluence of some recent generations in developed countries adds further social expectations for change, particularly urban development in naturally aesthetic places. Internal migration to a comfortable beach side lifestyle or "hobby farm" puts enormous pressure on local government to make land available and provide services to meet these expectations. Pro-development policies and planning has therefore created landscape changes that include the loss of agricultural land, vegetation communities, and an increased demand on ecosystem services.

Rapid large scale change is affecting many rural coastal regions of Australia. Faced with enormous "*Sea Change*" migration induced development, urbanisation and consequent land use, many of these regions are heading towards landscapes of 'concrete jungles', less productive land and degraded ecosystems. The enormous challenge is how to balance these social drivers with ecological sustainability and agricultural production needs in the long term. Are we stuck, with no escape, on an out of control railway train heading straight for the concrete jungle, reduced resilience and future collapse (Diamond 2005)? Perhaps however, there are other directions. Are there other visions or

designs of alternative futures that are plausible to implement and provide for more adaptive sustainable pathways?

The Alternative Landscape Futures approach presented here contributes new tools, knowledge and options to guide long-term policy and planning of regions. Building on Carl Steinitz (1990, 1993) methodology and integrating past-trend future trajectory analysis with landscape ecology and design principles, a multi-scaled hybrid approach applicable to landscapes of very large regions was developed. A case study of Northern Rivers region of the state of New South Wales, Australia was used to test and demonstrate these methods. Spatial modeling of the essential elements of a very complex debate about regional development and sustainability is used to produce a number of future scenarios that geographically represent potential and plausible changes that might occur or be applied (through planned design) to regional landscapes in the medium to long term. The outcomes of visual and quantitative analysis and assessment provide a clear understanding of the future consequences of present day decisions for communities, planners and policy makers.

In all, 28 future scenario models were produced through a cellular automata algorithm and geographical information system. The main landscape design elements in these scenarios were four population levels and associated urban growth with various agricultural and environmental

restrictions to development. These elements were incorporated into the following models.

- Future trajectory – A 'business as usual' approach based on the continuation of the past trends of urban development.
- Environmental Priority – Future urban growth with restrictions for key habitats, landscape corridors, riparian vegetation and acid-sulphate soils.
- Agricultural Priority – Incorporating protection from urban development of the most productive and historically valuable agricultural land within the region.
- Agricultural and Environmental Priority – With two scenario variations of future urban growth encompassing the constraints of both agricultural and environmental priority.
- Coastal Protection – With two scenario variations of modeling a concerted shift of new urban development further inland and into southern parts of the region.

The future consequences of the continuation of past trends or 'business as usual' urban development models are also quantitatively and geographically defined. While there is no panacea, it is very clear that, either through decisive, adaptive action, or by inaction, society is deciding today where we are headed in the future.

The design and evolution of alternative landscape future scenarios for "places", even large regions undergoing high population growth pressures

can better inform choices and decisions and help understand their consequences. By "scaling-up" McHarg's (1967, 1992 reprint) vision to "Design by Nature" mindful of the future, the development and application of alternative future landscapes contribute to long term sustainability of broad regional landscapes.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES