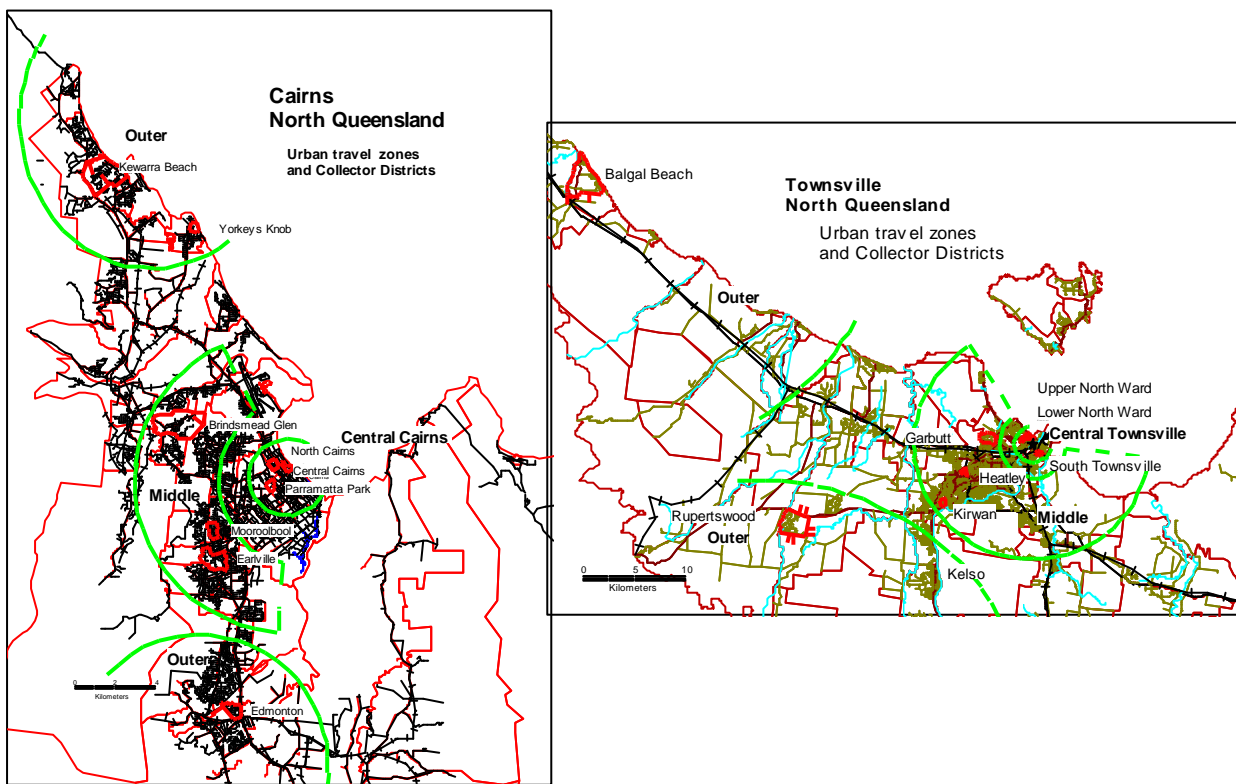




Thesis
Toward Sustainable Urban Travel
North Queensland
Cairns and Townsville, 1996 - 2000.



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**Toward sustainable urban travel –
A zonal study of current and future urban
travel behaviour, values and preferences of
Cairns and Townsville householders.**

**Thesis submitted by
Douglas GOUDIE MSc. (JCU)
in November 2000**

**for the degree of Doctor of Philosophy
in the School of Tropical Environment Studies and Geography
Faculty of Science and Engineering
James Cook University**

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Abstract

This project evolved from Honours and Master of Science research focussed on sustainable urban electricity supply, use and attitudes. Researchers, planning practitioners and Australian governments' policies of ecologically sustainable development helped shape the household questionnaire on urban travel. The main research instrument of this thesis, the survey of 400 households considered prior urban travel research and resource constraints, along with social and environment perspectives.

The public research instrument and the survey stratification of sample household's distance from the Central Business District were used to test 12 hypotheses. The hypotheses centred on relationships of home location distance from the CBD and household travel distances, fuel costs as an influence on urban travel patterns, and possible links between environmental concern and urban travel behaviour. Attitudes toward all alternative modes of urban travel were tested, while questions on easy ways to reduce car use tested hypothesis on publicly acceptable car-reduction strategies. The thesis was developed within the philosophical and practical framework of Ecologically Sustainable Urban Development.

Urban car use consumes much petroleum, facilitates car dependent urban growth and is enjoyed by nearly everyone. Cars are ubiquitous, convenient and generally the preferred mode of travel, although their negative impacts are well understood. Impending petroleum depletion will trigger a defining time of change in urban travel behaviour, structures and landuse. The North Queensland research has shown that people are essentially aware of a future need to reduce car use, but are in no hurry to sacrifice the convenience of car use until something as good or better comes along, or they are forced to alternatives because of increased car costs.

The research defines current urban travel in Townsville and Cairns, along with values and beliefs about future urban travel. Cairns and Townsville are ideal study sites, isolated microcosms easily representing larger, more complex transport systems. The survey was stratified to three zones; central, middle and outer, in order to test hypotheses based on choice of home location and consequent travel. Every third house

in three randomly selected Collector Districts from each zone received one of 216 questionnaires. A return of 406 forms, about 60%, included written input to 20 open-ended questions and logged 28,000 Km of travel data from 1,068 residents for one Friday of urban travelling. This thesis documents 3,500 urban trips and analyses how householders believe they may easily reduce current car use.

This substantial data set showed that cars were used for 80% of trips, covering 90% of the distance travelled. Non-motorised trips accounted for only 3.5% of the 28,000 Km travelled. Outer residents travelled about the same number of trips as other residents but averaged two to three times the distance per trip. Urban distance travelled is very dependent on home location choices and residents are very self-aware of car dependence. The main reason for central living was proximity to householder's usual destinations, also true for the middle zones, along with property prices. Outer zone residents usually chose their homes because of natural features or a large block of land.

While recognising it to be very car dependent, people were generally satisfied with their current urban travel. There was widespread belief that better public transport and better planning of trips would reduce car use. Walking and cycling were seen as healthy exercise, but dangerous. There was a uniformly high level of environmental awareness and concern. Overall, people generally understand sustainability issues and were often quite sophisticated in that understanding.

A simple theoretical model was developed inductively to help link internal and external space with price signals and changed urban travel behaviour. Price signals underlie choices of home location and urban travel options. Although environmental issues associated with unconstrained car use are understood by the public, their sheer convenience means cars will dominate urban travel until other modes become safer and more attractive. The main long-term deterrent to overwhelming car dependence will only be impending and major rises in the price of fuel.

Twenty-two surveyed urban travel or energy experts identified cheap, easy ways to help reduce car use by such means as making walking or cycling along more continuous and well defined paths feels safe, and by clarifying bus movements at bus stops. I hope this work makes some lasting contribution to long-term urban settlement.

Acknowledgments

I appreciate the unflagging and patient support of my supervisor throughout, Dr. David King, Dr Alison Cotrell, and the steady technical and administration staff within our School of Tropical Environment Studies and Geography, James Cook University. Queensland Transport provided \$20,000 funding for 6 months of the analysis and reporting, thanks to David Welsby, Regional Manager (Integrated Transport Planning), Far North Queensland. I thank the 408 main householders and 1,074 travel diary participants for their time, thoughts and care, and deeply appreciate the input of the 22 experts.

Douglas Goudie 28.11.2000

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STATEMENT OF SOURCES

DECLARATION

I declare that this thesis is my own work and has not been submitted in any other form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Signature

Date

Introduction: Toward sustainable urban travel

This introduction describes the research context, leading to an outline of the thesis structure and the rationale and scope of the research. This thesis documents urban travel and compares residents' values and beliefs of more sustainable urban travel with current policy and theory, identifying acceptable changes in mobility and access to services likely to result from anticipated petroleum scarcity. The consensus of opinion was developed into recommendations to reduce car use. Also, a theoretical model was developed, clarifying the process of developing more sustainable urban travel.

Cairns and Townsville are small but growing cities, currently very car dependent in structure and behaviour. They are dynamic, isolated microcosms, easily representing an excised portion of larger, more complex sets of travel inclinations, needs, nodes and networks. With three roads in or out, they are essentially closed urban systems with well-defined boundaries. For these reasons, they are ideal sites to study urban travel.

The research was undertaken because of widespread concern over environmental impacts and planning conflicts caused by endemic car use. In addition, cars burn depleting petroleum reserves, which cannot indefinitely maintain levels of car use, currently contributing 14% of all greenhouse gas emissions in Australia, about 12 tonne average per Australian car per year.

The research is fully developed within the principles and philosophy of Ecologically Sustainable Development (ESD), with its emphasis on the values of ecological protection, social justice and intergenerational equity. ESD also requires dealing cautiously with uncertainty and public participation in planning.

Prior to this work there was little feedback from residents about current or preferred urban travel, so results were eagerly sought by Queensland Transport in 1999 to help with strategic planning, substantiating the practical value of the research. This thesis affirms the value of structured public input to planning for a less car dependent future.

Chapter 1 provides a literature review of perceived problems generated by the current and increasing levels of urban car use, before considering planning theory, policy and practice, with an emphasis on more sustainable urban mobility. As described in Chapter 1, the increased desires to use the historically recent benefits of electricity and petroleum have triggered global concern about unsustainable urban travel, derived from our explosive ability to create and adapt.

Because planning is carried out within a context of social and administrative values and beliefs, Chapter 1 elucidates theoretical frameworks provided by Human Geography and Psychology. Of particular interest is an understanding of people's 'internal space', including paradigms (worldviews) and theoretical models attempting to explain human behaviour within an environmental context. A "Model for sustainable travel change", derived inductively from the research is presented in this chapter and provides the structure for the final chapter. The last section of Chapter 1 develops the detailed theoretical and policy rationale for the structure of the research methodology and goals.

Chapter Two affirms the research rationale, details the hypotheses, linking the survey instrument to other urban travel studies and the wider planning literature. The methodology and detail of the research methods are provided. An original survey methodology was tested as part of the theoretical content of the research.

Three zones were chosen to test some spatial hypotheses detailed in Chapter 2, three being the simplest and most meaningful number to differentiate 'pre-automobile' inner urban form, generally new outer, 'fringe' growth areas, and the established middle suburbs in between. The zones could have been defined by the general age of buildings, but were delineated into inner and outer, allowing a buffer between those two zones and the middle zone, based on distance from the CBD, mapped in Chapter 2.

Chapters three and four give detailed results from Cairns and Townsville respectively, with slightly different formats to show differences in the sample populations of the two cities. Chapter 5 synthesises and analyses the full data set, noting the strong similarities of data from the two centres, and exploring differences between zones through relational database queries, factor and hierarchical analysis and other statistical tests. The final section of Chapter 5 provides the results of a survey sent to 40 planning

or energy experts regionally, in the Asia Pacific, North America and Europe in June 2000.

Chapter 6 provides a general discussion of results, using the “Model for sustainable travel change” as a presentation frame, linking survey data to theory and policy, producing conclusions and recommendations. Discussion of the outcomes of the ‘Expert survey’ is also provided in Chapter 6. An extensive Appendix, including the survey instrument and considerable analysis results follows a full reference list. A Compact Disc (CD) of the full text, SPSS files and Microsoft Access database is provided in a sleeve at the rear of this thesis.

The philosophical motivation for this research is to contribute to values of sustainability, particularly energy and travel sustainability in the urban setting. Suburbia contains massive embodied energy, while sustainability requires, ultimately, that energy consumption be matched regionally by renewable energy provision – a great and worthy challenge in demand-side management, urban planning and behaviour. Sustainable urban travel is a key element of sustainable human settlement.

Chapter 1 shows that much of the necessary theory and policy to reduce car use is in place. However, there is great tension caused by the gap between public perceptions, theory and policy on the one side, and the overwhelming 'old paradigm' planning practice on the other. Much of the paradigm shift has occurred from 1995 to 2000, the period covered by this thesis. The sustainable infrastructure, price signals and behaviour draw tantalisingly close, but are still elusive. The theoretical and practical purpose of this thesis is to clarify how to help close the gap between policy and practice, to engender policy implementation. Closing this gap was ranked fifth of 55 statements on urban planning by 22 surveyed planning experts.