PROJECT OUTLINE

POWERED-TWO-WHEEL VEHICLES
AS PART OF A SAFE, SUSTAINABLE TRANSPORT SYSTEM

INTRODUCTION

There is increasing interest in sustainable mobility due to rising concerns over congestion, injury and loss of life from road crashes, local air quality, climate change, energy availability and security. Those challenges arise because of the rapid growth in both the ownership and use of motorcars in urban areas [1] however the opportunities and challenges associated with other types of vehicles, specifically motor scooters and motor cycles, have received limited attention. The term Powered-Two-Wheeler (P2W) refers to vehicles such as power-assisted bicycles, mopeds (low powered motorbikes), motor scooters and motorcycles. The use of these vehicles in Australian cities has grown and they continue to be over-represented in noise infringements and road crash statistics [2]. While traditionally viewed as a road safety problem, awareness is growing of the potential that P2Ws have for reducing congestion and greenhouse gas emissions while enhancing accessibility [3]. The challenge for policy makers and road system managers is therefore to manage use of P2Ws in the context of a safe, sustainable transport system.

The management of P2W use can be classified as a ‘wicked’ policy problem meaning it is difficult to solve because of incomplete, contradictory or changing requirements and because addressing one aspect may create other problems [4]. Wicked problems have been identified as a particular challenge in Australia [5]. In developing an approach to address wicked problems, a distinction is drawn between systematic thinking, where a linear, step-by-step approach is employed, and systemic thinking, where the emphasis is on grasping the big picture, including the interrelationships between the full range of causal factors and policy objectives [6]. A systemic modelling approach, combined with effective engagement between the researchers and practitioners active in the policy development process, has been demonstrated to be an effective methodology in addressing wicked problems [6,7].

Research Objective and Aims

The objective of this research is to deliver an evidence base to underpin effective management of the economic, social and environmental outcomes associated with the use of P2Ws.

The specific research aims of this project are to:

A1. Formulate a systemic model relating a range of causal factors to the use of P2Ws and the resulting key transport outcomes,
A2. Quantify the relationships and interactions in the systemic model to enable it to be used as a policy simulator, and
A3. Use the model to explore the broad effects of key external factors and policy options to enhance management of the use of P2Ws.

APPROACH

The discussion of approach is framed in relation to each of the project aims identified in the previous section.

A1: Formulate a systemic model relating a range of causal factors to the use of P2Ws and the resulting key transport outcomes
The initial model shown in Figure 1 reflects the essential elements of Manheim’s seminal ‘Transportation Systems Analysis’ model [8] in which the activity system (A) and technology (T) interact through equilibration of demand and supply to produce flows (which can be interpreted as indicating the level of use or exposure) and a range of impacts. As identified in Figure 1, a range of potential travel related decisions by P2W riders ultimately determine the mobility, safety and environmental impacts of these vehicles. The impacts arising from P2W use feed back into the activity and technology components of the system. The systemic model will be refined through insight from the initial literature review and interaction with the project partners. Further development of the model will be informed from the data collection and analysis to be undertaken in the subsequent stages of the project.

![Initial systemic model of P2W use](image)

**Figure 1: Initial systemic model of P2W use**

A2: Quantify the relationships and interactions in the systemic model to enable it to be used as a policy simulator

An action research methodology of planning, acting, observing and reflecting will be used to develop deeper, quantitative understanding of the interactions inherent in the systemic model by:

- Developing insight into the factors influencing the demand for P2W use.
- Developing insight into the mobility benefits of P2W use in urban Australia
- Benchmarking the relative safety/risk of P2W use by purpose, location, time of day and vehicle type (e.g. moped versus motor scooter versus motorcycle versus alternatives)
- Assessing energy consumption and environmental impacts (emissions) from P2W use.

The methodology to be employed includes:

- Drawing on the literature to quantify key interactions in the systemic model.
- Analysing existing data sources to identify emerging issues/trends and to build component models to aid understanding.
- Developing understanding of the variables influencing behaviour and impacts by calibrating a range of models. Initial qualitative data, obtained through focus groups.
and/or semi-structured interviews involving P2W users, will be used in the framing more detailed subsequent surveys. Discrete choice models will provide insight into the role of a range of explanatory variables. The development of those models requires additional data from revealed and stated preference surveys. This project will use a GPS based approach to build understanding of P2W route choice decisions and quantify their exposure. A related survey of on-road fuel consumption will be undertaken to rather reliable local data on which to develop fuel consumption/emissions models.

A3: Use the model to explore the broad effects of key external factors and policy options to enhance management of the use of P2Ws.

A range of scenarios will be constructed to span the zone of uncertainty about the future for factors such as fuel prices and vehicle costs. Against those scenarios, the systemic model will be used to explore the implications of alternative approaches for managing P2W use, such as changing pricing, imposing tighter regulations or revising parking policies. The intention here is not to predict the future (which is impossible given the level of uncertainty) but rather to employ the model to identify risks and opportunities to progress key transport outcomes through either individual policy measures, or packages of policy measures directed at P2W. The model will provide a basis for exploring sensitivities to changes and assessing tradeoffs across outcomes.

TIMING
This project involves a three-year program of research beginning in late 2010.

CONTACT
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REFERENCES