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Level of Sustainable Activity: Moving Visitor Simulation from Description to Management

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Introduction

Visitor pattern of use simulations are an effective tool for describing and quantifying the distribution, density, speed, and flow patterns of human movement in a variety of environments from wilderness back-country settings to highly urbanised high use settings (Cole 2005). The technical development of special purpose simulators for recreation environments continues using simulation paradigms including discrete-event simulation, cellular automata and multi-agent simulation. However, regardless of the methodology used to simulate visitor pattern of use, the outputs are always the same – a quantitative description of movement patterns. Whereas the quantitative analysis of visitor flows is fundamental to a better understanding of the complex interactions of human use, the impacts of these patterns on the quality of experience and behaviour can only be discovered through social science methods that elicit responses from users about their expectations, experiences, attitudes, preferences and behavioural responses to visitor densities, queuing times, flow rates, the distribution of destinations, and the capacity of facilities. Only by linking the social and environmental implications to the flow patterns generated by human pattern of use simulations can we begin to manage the quality of experience for visitors.

This issue is at the heart of a complex management problem in Melbourne, Victoria Australia. The Melbourne Waterways Committee commissioned a study to determine the traffic capacity of the Maribyrnong and Yarra Rivers (see figure 1) to develop a traffic management plan on the basis of the current level of river traffic and the projected traffic for the next 5 and 10 year periods. The urgency for this study is prompted by existing conflicts between commercial passenger ferries and rowing and canoeing, and the increasing commercial and recreational traffic in the shipping zone. On top of this is the impending Melbourne Docklands development, which will create marinas for 700 to 1000 new private and public berths in the heart of the study area.

Earlier consultancies had established projected growth rates for commercial and recreational traffic, however a defensible method for determining river capacity for the various forms of traffic had not been determined. The underlying assumption had been that some single metric like “maximum number of vessels per hectare” could be established to determine the overall capacity of the river system. This definition, however does not recognize the very different physical operating characteristics of a rowing skull compared to a passenger ferry, or the quality of experience required for passive recreation versus competitive training. It is clear a robust defensible way of defining river capacity that takes into account river characteristics, competing users, vessel types, and physical infrastructure had to be developed.

Level of Sustainable Activity

The Level of Sustainable Activity (LSA) concept is a generalisation of the Level of Service concept developed by the Transportation Research Board (2000). River capacity is different for each user group and varies in relation to river geometry, the provision of facilities, and the interaction with oth-

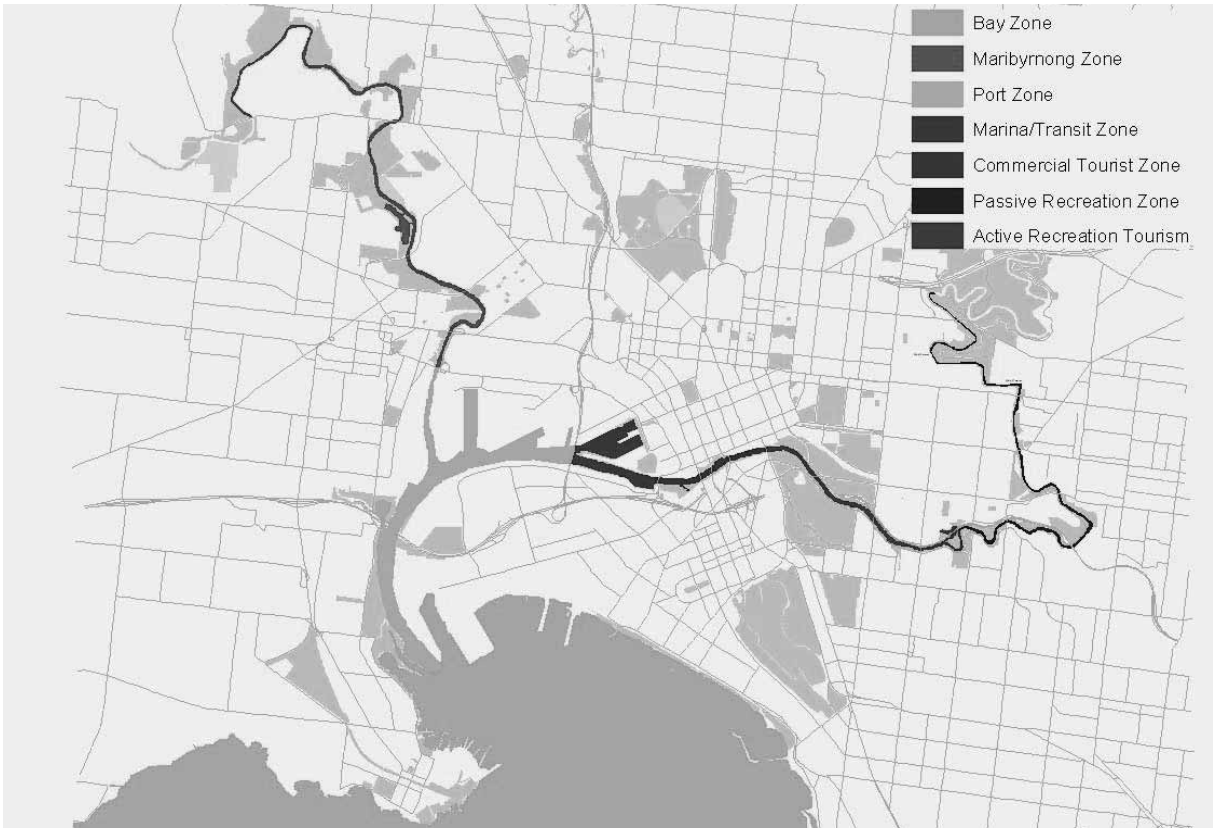

Figure 1: The "2 Rivers" study area – Port Phillip Bay to the south and the 7 river management zones.

er users. River traffic management must therefore be based on a comprehensive framework that integrates all the relevant factors in a format that is easy for users and decision makers to understand and that can be adapted to a wide range of environments and travel modes.

LSA can be thought of as a scale of end-user experience. Each river zone will have a range of service levels defined for each vessel type ranging from very low levels of use, with minimal environmental and social impacts to high-density use with high levels of user interaction, higher levels of potential environmental and social impacts, and more intensive facility and management requirements (see Table 1).

The LSA concept integrates:

- Physical characteristics of the river, including navigable depth, width, and bank erosion potential.
- Physical characteristics of different vessel types, their stopping distance and safe passing distance and speed.
- User preferences for levels of use for specific activities in specific river zones.

Table 1: Level of Sustainable Activity vessel density definitions for Rowers/Canoeists and Motorised vessels. LSA level A is the lowest density and the highest quality of service. LSA level E is the highest density and lowest quality of service. This table allows the manager or analyst to link outputs from the river traffic simulation to quality of experience or river users.

Level of Sustainable Activity	*Rowers/Paddlers*		*Motorised Commercial and Recreational*		*Quality of Service*
	Area/Boat	*Boats/Ha*	*Area/Boat*	*Boats/Ha*	
A	10,000 m^2	1	10,000 m^2	1	Highest
B	5,000 m^2	2	5,000 m^2	2	
C	2,500 m^2	4	2,500 m^2	4	
D	769 m^2	13	1,250 m^2	8	
E	625 m^2	16	714 m^2	14	Lowest

- User attitudes toward competing traffic Safety, Environmental and Social risk factors relating to increasing use densities.
- Suggestions from users on management options for dealing with the above risks.

Each river user-type (rowers, commercial tour operators, water taxis, and ships) has different requirements in terms of safety, ability to perform their intended activity, and level of satisfaction based on the mix and density of vessels sharing the river zone. In the LSA framework two types of service are addressed:

- activity within a single user group (e.g. rowers in relationship to rowers or commercial vessels in relationship to other commercial vessels) and
- aevel Sustainable Activity between different users (e.g. rowers in relationship to commercial vessels).

The presentation will discuss the use of focus groups and river traffic simulations using RBSim (Itami et al. 2004) of the LSA levels to generate river capacity definitions and management options for each river zone.

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