AN EXPLANATION OF THE APPLICATION OF THE RETAIL GRAVITY MODEL IN RECENT LOCAL COMMERCIAL STRATEGIES

BACKGROUND

Resulting from a meeting between officers of the City of Melville, the Department for Planning and Infrastructure, Planwest and Belingwe (Paul Bashall and Tim Auret) it was agreed that further explanation on the application of the retail gravity model in the City of Melville Local Commercial Strategy should be provided.

The Guidelines for the Preparation of Local Commercial Strategies (1991) states that floor area requirements can be calculated by two methods, namely by the application of per capita floor area ratios or the application of spending/turnover ratios. Implicit in this is that the application of either method should yield similar, if not identical outcomes, in calculations of shopping floorspace (NLA) requirements. These two methods have been applied to retail modelling.

Whereas the Metropolitan Centres Policy (2000) gives guidelines for per capita ratios (based on metropolitan averages) it offers no guidelines for the application of spending/turnover ratios, nor has any relation between the two been offered. Consequently consultants using the latter approach have been constrained only by having to show economic viability and acceptable impacts. It should be noted that the per capita ratio guidelines are unchanged since the Metropolitan Centres Policy (1991).

The 1991 commercial survey shows that in the Metropolitan Inner and Middle sectors, the per capita ratios were substantially higher than the Metropolitan Centres Policy (2000) guidelines. If these guidelines had been applied there should have been no new centres or expansion of centres since then. Yet the 2002 Commercial survey shows that since 1991 there has been over 100,000m^2 of new Regional and District floorspace built with the approval of the Western Australian Planning Commission in these centres.

All of this new development was justified on methodologies based on spending/turnover - in other words on economic viability rather than per capita Policy. The conclusion to be drawn is that the higher per capita ratios that have resulted from the application of these methodologies are also economically viable and, presumably, justifiable.

In fact this is obvious from the ongoing sustainability of higher per capita ratios in the Inner and Middle Sectors revealed by all the commercial surveys.

APPLICATION OF THE TWO METHODOLOGIES TO RETAIL MODELLING

It seems that a difficulty in accepting the above proposition by the development control process is that the former (per capita) calculation is more transparent and directly comparable to the Metropolitan Centres Policy (2000) Guidelines, whereas the latter is not.

The basic statement of the model algorithm is

$$Pij = \frac{A^{\alpha}j/Dij^{\beta}}{\sum_{J=1}^{n} A^{\alpha}j/Dij^{\beta}}$$

x (Pop (i) x PCR) = NLA(i) Method (1)

x (Pop (i) x Spending (i)/VTO(j)) = NLA(i) Method (2)

Where

Pij = the probability of any person living in zone i using centre j.

Aj = a measure of attraction of centre j (usually related to floor areas or number or types of shops).

Dij	= a measure of the impedance or inconvenience of getting from zone i to centre j (usually measured in distance or travel time).
α	=. an exponent used to enhance or reduce the attraction factor.
β	=. an exponent used to enhance or reduce the impedance/inconvenience factor.
Pop(i)	= The population or projected population of residential zone i.
PCR	= Per capita ratio.
Spending(i)	= The retail spending potential in residential zone i (this can be as a whole or for sub groups of retail spending eg food and non-food).
VTO(j)	= The viable turnover per square metre at centre j (usually measured as annual turnover per square metre. This can be for all shops as an average, or for sub groups of shops or even for individual shops).
NLA(ij)	= The retail NLA potential from residential zone (i) that will accrue to shopping centre j.

The model repeats the above calculation for each residential zone to each centre. The total retail potential for any centre is the sum of all the potential from each residential zone in the study area to each centre.

We have applied the first method (1) -the per capita method - to all our Local Commercial Strategies. In the City of Stirling for example, we found that the application of this approach did not result in an expansion potential for existing Regional (and Strategic Regional) Centres, that are over represented in Stirling and Bayswater. Shrapnel Urban Planning uses the second method (2) - spending potential/turnover - for his work. In both cases the 'gravity' part of the algorithm is the same.

DELINEATING THE MAIN TRADE AREA

The model calculates the distance from each residential zone to each centre. It also calculates the proportion of the trade to a centre that comes from each residential zone. By ordering this data from the model with increasing distance from a centre and calculating progressive trade share by residential zone as distance increases any percentile of trade to a centre can be mapped using ArcView. The residential zones within the 80% percentile is the main trade area.

This method, while arithmetically correct, must be balanced with professional judgement about distortions to this methodology which could arise through any number of trade area or shopping centre characteristics.