APPENDIX B

Assessment balance charts and performance indicators

Assessment Balance Charts

What is an Assessment Balance Chart?

An assessment balance chart (ABC) presents information for a wide range of performance indicators and for different stakeholders . Where information cannot be computed in monetary terms, it is provided in non-monetary quantitative terms, described, recorded as estimates or rankings, or listed as unknown.

The different stakeholders for a project involving environmental adaptation could be grouped as follows:

- road users directly affected
- road and non-road users directly affected
- non-road users directly affected
- those concerned with the quality of the environment
- public authorities.

How to construct an Assessment Balance Chart

There may be a need for two charts: one to compare alternative proposals and another to compare a project before and after completion. The same performance indicators can be used, but the unit of measurement differs. For comparing alternative proposals, estimates or rankings may be sufficient, but observations and other data are the main form of measurement for comparing the situation before and after completion.

Table B-1 provides information for constructing both types of ABC. The first column shows the performance indicators by stakeholder group. The second column is used for comparing alternative proposals; the third column for comparing projects before and after completion. The table shows, for each performance indicator, what to observe, measure, estimate or rank. For the proposal assessment, observation of the existing situation is combined with professional judgement and stakeholder assessment (where appropriate) of the alternatives.

There will always be a planning impact, but the form this takes depends on the nature of the project and should be part of an area planning study (see Part 3)

Road users directly affected

Accidents

Information is needed on *vehicle-pedestrian accidents vehicle/vehicle accidents* and *vehicle/obstacle accidents*. For comparing safety performance before and after completion of the project, data are required for the traffic flow and the 85 percentile vehicle speed in peak pedestrian activity hours and in traffic peak hours, the number and type of accidents, location (core zone, transition zone), type of crossing (legal, illegal), time, and severity. There is a need for data covering a longer period than one year (preferably three years) to eliminate the small number of accidents.

For comparing road safety performance of alternative proposals, all accident types are combined and represented by a severity index. The severity index is based on a weight of 3.0 to fatal accidents, 1.8 to serious injury accidents, 1.3. to other injury accidents, and 1.0 to non-injury accidents (RTA, 1992). For instance, 1 fatal, 1 serious injury, 3 other injury and 5 non-injury accidents are calculated by the index 3.0 x 1 + 1.8 x 1 + 1.3 x 3 + 1.0 x 5 = 18.7.

The expected changes in the severity index, I_a, is estimated by

$$I_a = A_b\ q\%$$

where A_b represents the severity index before the project, q% is the proportional change (expected or measured) of vehicle traffic after completion of the project. A negative

q% indicates a traffic reduction and a positive q% indicates traffic increase.

This simplified approach is based on the assumption that accident reduction is proportional to the reduction in vehicular traffic flow (Department of Transport, UK, 1977). However, there is evidence that vehicle speed, traffic exposure level, and accidents are correlated. Accident risk to pedestrians crossing main roads and local streets in Sydney has been investigated by Song (et al, 1993) using a behavioural probabilistic model based on Bayer's law

$$P(B / A) \quad (q.S^2.t_c)$$

where the conditional event B/A is that the pedestrian crosses a road given that the vehicular headway chosen is actually smaller than the pedestrian's critical gap; q = vehicles per hour; S = mean speed of vehicles; and t_c = pedestrian crossing time in seconds.

For main roads in Sydney

$$P(B / A) \quad 3.8(q.S^2.t_c)^{0.642} x10^{-7}$$

where

P(B/A) = pedestrian accident risk per million person-years.

Pedestrian crossability

Pedestrian Mean Delay, W, may be estimated from well established traffic models for various crossing points: e.g. at mid-blocks also known as random points (anywhere and no facilities), signalised intersections, pedestrian refuges, Pelican and Zebra crossings. Mean delay, W, at various facilities for different traffic volumes can be read off from Figure B-1. This figure is also provided in the UK Manual for road appraisal (UK Department of Transport, 1983).

Recent research suggests that the mean delay to pedestrians crossing at random points shown in Figure B-1 is underestimated when there is bunched traffic flow, which occurs downstream of signalised intersections (Guo, et al, 1998).

Qualitative changes in the *convenience* for pedestrians, both in terms of crossing streets and walking on footpaths, are assessed through questionnaire surveys. The content of the survey should address a range of issues such as adequacy of pedestrian access within the area and to other areas (including parking), crossability, adequacy of access to public transport, and visual pleasantness of the Main Street or sub-arterial road environment.

Changes in the *perceived safety* by pedestrians can be measured by comparing the proportion of jayrunning to jaywalking pedestrians before and after completion of the project in both the core and transition zones. Information on perceived safety can also be obtained through the questionnaire survey.

Vehicle speed

Three periods are recommended in comparing vehicle speed in core zones of vehicle-pedestrian conflict. These are pedestrian activity peak hour, vehicle peak hour and vehicle traffic off-peak. The actual times are suggested in Table B-2, although local characteristics should be taken into account.

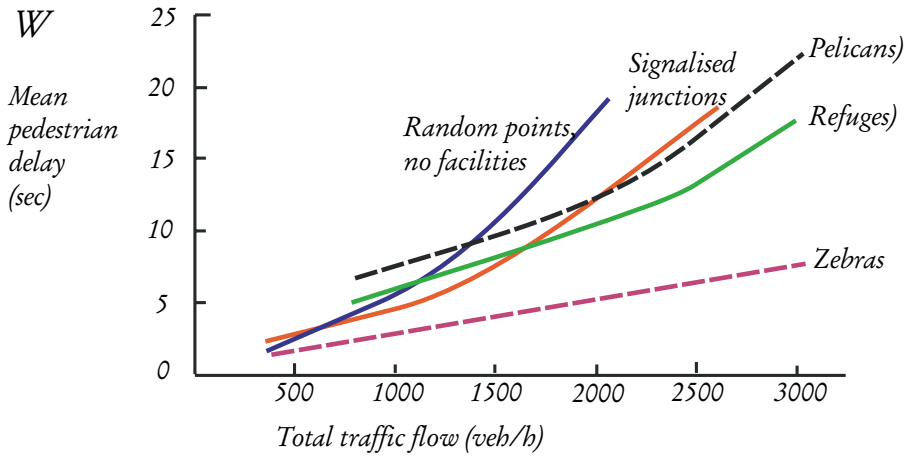

Figure B-1 Mean pedestrian delays associated with different road crossing situations

Table B-1: Information for constructing assessment balance charts

PERFORMANCE INDICATOR	PROPOSAL ASSESSMENT (Including "do nothing")	ASSESSMENT AFTER COMPLETION Comparing before and after situation
Road users directly affected		
Accidents		
vehicle/pedestrian	Rank (statistics)	Number during the past 3 years, by type and location
vehicle/cyclist	Rank (statistics)	Number during the past 3 years, by type and location
vehicle/vehicle	Rank (statistics)	Number during the past 3 years, by type and location
vehicle/obstacle	Rank (statistics)	Number during the past 3 years, by type and location
Pedestrian		
delay	Rank	Pedestrians delayed in pedestrian peak hour (mean delay)
convenience	Rank	Before and after questionnaires
perceived safety	Rank	Proportion of jay running/jay walking, and before and after questionnaires
Cyclists safety	Rank	Before and after questionnaires
Vehicle speed		
in core/ped peak	Estimates (observation)	V85 km/h (survey)
in core/ peak	Estimates (observation)	V85 km/h (survey)
in core/off peak	Estimates (observation)	V85 km/h (survey)
speed profile	Estimates (observation)	Survey
Vehicle traffic		
% through traffic	Estimates (observation)	Survey
number of heavy vehicles	Estimates (observation)	Survey
flows at ped. peak	Estimates (observation)	Survey
flows at veh. peak	Estimates (observation)	Survey
Vehicle operation		
travel time	Estimates (observation)	Comparison in $ (NPV)
operating costs	Estimates	Comparison in $ (NPV)
Road and non-road users directly affected		
Noise		
at footpath (core)	Estimates of levels	Changes in levels and length
at facade	Estimates of levels	Changes in levels and length
at sensitive sites	Estimates of levels	Changes in spot levels
On-street parking		
spaces in/near core	Estimates (observation)	Changes in number of spaces (survey)
layout	Description	Description
utilisation	Estimates (observation)	Changes in turnover during pedestrian peak hour
Site access	Ranking (observation)	Changes in properties without side/rear access

Table B-1 (Continued)

Non-road users directly affected		
Land use		
pedestrian orientation	Number of sites outside core (observation)	Number of establishments outside core (survey)
vehicle orientation	Number of sites inside core and transition zone (observation)	Number of sites inside core and transition zone (survey)
Retail floor space		
core	Ranking of prospects	Measure (see Part 5 for monitoring)
transition zone	Ranking of prospects	Measure (see Part 5 for monitoring)
Business activity		
business activity	Rank expected gain	Business survey reports % gain and % loss
passing trade core	Rank expected gain	Business survey reports % gain and % loss
changing occupancy	Not applicable	Descriptive
vacant shops core	Not applicable	Number
vacant in transition zone	Not applicable	Number
Accessibility		
pedestrians in core	Estimates (observation)	Changes in volumes - 2 hour period (1200 - 1400)
access to parking	Ranking (observation)	Changes in mean distance to core
access to public transport	Ranking (observation)	Changes in use of public transport
delivery and pick up	Rank expected gain	% of establishments reporting gain/loss
Those with an interest in the quality of the road environment		
Pedestrian space		
total space in core	Rank expected gain/loss	Measure change
footpath width	Rank expected gain/loss	Measure change
weather protection	Rank expected gain/loss	Percentage with overhead cover
pavement activity	Rank expected gain/loss	Outdoor frontage-related pavement activity (metres)
Urban character and design		
heritage value	Ranking (observation)	Description
social spaces	Ranking (observation)	Description
landscape elements	Ranking (observation)	Description
townscape elements	Ranking (observation)	Description
Social environment	Rank expected gain/loss	Survey report on perceived change of centre as a social space
Public Authorities		
Capital expenditure		
local authority	Estimated costs	Actual costs
RTA	Estimated costs	Actual costs
service authorities	Estimated costs	Actual costs
Maintenance expenditure		
local authority	Estimated costs	Actual costs
RTA	Estimated costs	Actual costs
service authorities	Estimated costs	Actual costs

Table B-2: Typical Peak and Off-Peak Hours* for Selected Land-Uses along Main Streets/Sub-arterial Roads.

Traffic peak	1700 - 1800
Pedestrian Peak	1230 - 1330
Off-Peak	1000 - 1100

* hours may vary depending on local conditions

For reasons of simplicity, vehicle speed is measured by spot speeds for each direction of flow. Both should be measured in the core and transition zones. For traffic control facility design, the 85th percentile speed is important. Mean vehicle speeds and their variances are also recommended for the analysis of before and after situations.

Vehicular traffic

The proportion of non-stopping *through traffic* requires an Origin and Destination (O&D) sampling survey at a cordon around the centre (see Part 1). It should be undertaken at least during a typical vehicle peak hour, but a longer period including the pedestrian peak hour is recommended. Information on the proportion of *heavy vehicles* may be obtained from the O&D survey or from roadside observation.

Data on *traffic flow* during vehicle and pedestrian peak hours can be obtained from field measurements or from hard copies of the output of automatic traffic counters.

For comparing alternative proposals, estimates of likely changes are made and ranked.

Vehicle operations

Two aspects are included in this indicator: travel time saving (or increase) and operating cost saving (or increase).

The *travel time* saving, Ct, mainly refers to the time saving for vehicle drivers and their passengers. It can be determined by:

$$C_t \quad (T_a \quad T_b)(v_v \quad v_p)$$

where T_a and T_b represent the total vehicle travel time after and before the project. v_v is the average value of travel time weighted to four vehicle types (private cars, business cars, light commercial vehicles and heavy vehicles); v_p is the time value for occupancies in vehicles.

State road authorities provide manuals for the economic evaluation of road proposals and the current monetary values of travel time are provided. The equivalent changes in travel times to pedestrians crossing the road should be costed for inclusiveness.

The total saving (or increase) in *vehicle operating cost*, C_o, can be determined by

$$C_o \quad (T_a \quad T_b)v_o$$

where v_o represents unit vehicle operating cost weighted to all vehicle types. Again, economic evaluation manuals should be consulted for these unit rates.

Road and non-road users directly affected

Noise

Traffic noise can be measured in the field with instruments. In centres where traffic volumes exceed 12,000, traffic noise should be measured at the footpath in the core zone. As there are many factors that influence the noise level, it is desirable to record traffic volumes, vehicle speeds and the proportion of heavy vehicles. The geometry of the site must be measured. Alternatively, the noise level at a specific point in relation to the road may be calculated from the CORTN method providing all of the necessary traffic and geometric conditions are known (Black, et al, 1997)

The ability to carry on a reasonable conversation on the footpath in a centre requires that the traffic noise level on the footpath should not exceed 65 dB(A), with 68 dB(A) being an upper limit.

On-Street Parking

Existing *parking spaces within 200 metres of the core* zone are determined from field surveys and estimates of future spaces are based on plans. Changes in *parking layout* in the Main Street/sub-arterial are described. Changes in *parking utilisation* in the core and transition zones during trading peak periods can be estimated by using Table B-3 or from surveys in the Main Street/centre:

Site access

Field surveys and maps provide information on the number of properties without side/rear access before and after completion of a project. For the purpose of comparing alternative proposals, estimates are made of the likely changes and the performance of the alternatives is ranked.

Table B-3: Traffic Generation of Parking Spaces during Peak Trading Periods*

Parking duration & type	Parking turnover vph
10 minute spaces	10
1 hour spaces	5
2 hour spaces	2
Loading zones	8
Disabled parking spaces	1

* Assumes that traffic flow permits parking and un-parking movements.

(Source: Beard and Holland, 1991)

Non-road users directly affected

Land use

There are two indicators of land use: frontage orientation and retail floorspace.

Frontage orientation (separately for pedestrian orientation, vehicle orientation and combined pedestrian/ vehicle orientation - for definitions, see Part 1), is expressed in the number of sites or establishments. Information can be obtained from field surveys before and after completion of the project and should cover both the core and transition zones.

Any impact may be long term, requiring a long time scale for comparative assessment. Estimates are made for comparing alternative proposals.

Retail floor space in the core and transition zones is measured in gross floorspace. Estimates are made of the likely prospects for each of the alternatives and these are ranked.

Business activity

Three indicators are used to illustrate business activities which may be impacted by the proposed project: business activity, passing trade, type of business and vacancy rate.

Comparison of *business activity* before and after implementation is measured by survey of reported % gain and % loss. Comparison between alternative proposals is based on expected gain and ranked. Similarly, reported estimates of the proportion of *passing trade* are used for comparing before and after implementation, and ranking for comparing alternative proposals. Changes in the *type of business* may also be significant (e.g. from shops to restaurants). The incidence of *vacant shops* (both in the core and transition zones) is measured by field survey; comparison between alternative proposals does not apply here. It is important to ensure that any reported changes are attributed to environmental adaptation and not to changes in general economic activity.

Accessibility

Performance indicators for accessibility are: the number of pedestrians on the footpath in both the core and transition zones, access to parking, and delivery and pick up provision.

The number of *pedestrians on the footpath* in the core zone are observed

for a 12 hour period (7 am -7 pm) in areas of high activity, such as major centres along sub-arterial roads, but this period can be reduced for smaller centres. Spot checks should be made of the number of pedestrians in the transition zones. Estimates are made for comparing alternative proposals.

Access to parking lots is measured by the mean distance of parking areas to the core. Estimates are made for comparing alternative proposals.

Delivery and pick up provision is measured by survey of business establishments reporting gain/loss. Ranking of the expected gain is used for comparing alternative proposals.

There are other indicators of accessibility, not addressed here, but discussed in Cities for Tomorrow (Austroads, 1998)

Those with an interest in the quality of the road environment

Footpath in core zone

There are three indicators: footpath width, weather protection, and pavement activity.

Changes in the *footpath width* are measured before and after completion. Ranking of the expected gain is used for comparing alternative proposals.

If required, an indicator of the level of service (LOS) for pedestrian movement can be used. Computations are based on peak 15-min. pedestrian counts (both directions) Vp15. The pedestrian flow, v, is expressed in pedestrians per minute per metre:

$$v = Vp15/15We$$

in which We represents the effective width (i.e. total width less any obstructions). A reasonable LOS is obtained if $v = < 45$ pedestrians per minute per metre.

Weather protection, in the form of verandahs or awnings, is measured by the percentage of frontages with overhead cover. Ranking of the expected gain is used for comparing alternative proposals.

Pavement activity can be assessed by a survey of pavement cafe's and stalls and expressed in the length (metres) of outdoor frontage-related activity in the core zone. Ranking of the expected gain is used for comparing alternative proposals.

Urban character and design

There are four indicators here: *heritage value*, *social spaces*, *landscape elements*, and *townscape* elements. All of these elements can best be captured by description and ranking.

Sociability

The term sociability is used to describe the Main Street or sub-arterial centre as social space. The pedestrian survey can provide information on how pedestrians view the social quality of the space (e.g. place to meet, place to hold functions). Ranking of the expected gain is used for comparing alternative proposals.

Public authorities

Capital expenditure

Costs need to be compared for the local authority, Roads and Traffic Authority and service authorities separately. For comparing before and after completion, actual costs are used; comparison of alternative proposals is made on the basis of estimated costs. In all cases the costs should be expressed in Net Present Cost.

Maintenance expenditure

Similar information is obtained for maintenance expenditure.