APPRAISAL FRAMEWORKS FOR DEVELOPMENTAL TRANSPORT INTERVENTIONS

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ABSTRACT

Worldwide, governments, transport professionals and civil society groups are engaged in studies and the development of methodologies to assess the contribution that transport systems and associated interventions are making towards sustainable development, embracing environmental, economic and social objectives.

A key motivation is the perceived inadequacy of mainstream planning and appraisal practices, especially when dealing with the need to plan and assess overtly developmental or sustainability-enhancing interventions

The proposed appraisal framework discussed in the paper is strongly based on the British New Approach to Transport Appraisal (NATA), but with a stronger emphasis on:

- *developmental factors* relevant in the South African context such as poverty reduction and empowerment;
- the underlying *means-ends logic* (i.e. why it can be reasonably expected that particular interventions will lead to particular outcomes).
- the *critical success factors and/or uncertainties* which might affect the attainability of the outcomes.

The main source for the extensions and elaborations is the Logical Framework Approach (LFA), which – despite many criticisms – is an extensively tried and tested methodology for the planning, assessment and monitoring of projects or programmes with significant "'wider"' development outcomes. Other sources are the Strategic Choice Approach (SCA) – first developed in the late 1960's to clarify different types of "strategic uncertainties" and the Balanced Scorecard (BSC) approach.

1. INTRODUCTION

Worldwide, governments, transport professionals and civil society groups are engaged in policy studies, debates and the development of methodologies to enhance the developmental impacts and sustainability of transport systems.

One of the main motivations is the need to justify the contribution that transport systems and associated interventions are making towards sustainable development, embracing environmental, economic and social objectives.

Another is the perceived inadequacy of mainstream planning and appraisal practices, especially when dealing with the need to plan and assess overtly developmental or sustainability-enhancing interventions. These include:

- Development corridors and other integrated urban, rural or regional development initiatives that include one or more *transport anchor projects* (such as a new or upgraded port, a new road connection or a multi-modal transport interchange).
- Specifically targeted, pro-poor transport interventions – such as the promotion of non-motorised transport (NMT) and other affordable means of transport and travel.
- Transport demand management (TDM) strategies aimed at promoting more sustainable travel and land use patterns.
- Policy interventions such as the phasing out of long-distance transport subsidies, aimed at combating urban sprawl and encouraging more compact and sustainable urban settlement patterns (Naude, 1986).

One of the criticisms of conventional planning and appraisal practices is the reliance on quantitative, model-based predictions of user demands, cost-benefit analysis (CBA) and the associated tendency "to predict and provide" – focussing mainly on the demands of those that are "willing to pay". Sefton (2000) notes that inequity is, arguably, built into practice of CBA, where 'Willingness To Pay' (WTP) is the primary basis for measuring economic worth. WTP is partly a matter of 'ability-to-pay', so it effectively gives more weight to the preferences of the better-off (Sefton ibid). By implication, it then places relatively less weight on the preferences of the poor, or on 'peripheral' environmental sustainability requirements (i.e. those that do not really concern core economic sectors or that are 'out-of-sight' for the better-off).

1.2 International examples of broadened assessment frameworks and requirements

A fairly obvious solution to this is to extend the range of project or programme evaluation criteria to, for example, include specific consideration of the impacts of transport projects and other interventions on the accessibility of the poor, and/or persons with disabilities. Many governments as well as international development agencies – in particular the World Bank – have recently instituted such extended appraisal systems or requirements.

A good example is the UK, where – as part of its New Approach to Transport Appraisal (NATA) – the Government now requires that a multi-objective Appraisal Summary Table (AST) be constructed for all new or proposed transport schemes (UK DoT, 2004). Besides the need to provide information about the cost-benefit ratios of schemes, reporting in terms of the AST also requires summary statements about the impacts of such schemes on *accessibility* (which is sometimes broadly defined to include attention to social exclusion issues), the *environment,* the *economy* and *safety*. Moreover, it has to be explicitly indicated to what extent a scheme contributes to *integration* – in this case referring to its alignment with the UK Government's integrated transport policy and other interrelated policies or systems.

In developed countries, a main impetus has been the World Bank's promotion of reporting mechanisms (referred to as Poverty Reduction Strategy Papers – PRSPs) and associated guidelines for assessing the *poverty reduction impacts* of development strategies and programmes (World Bank, 2003).

1.3 Appraisal framework for South Africa and similar middle-income countries

Against this background, the CSIR has been undertaking research into guiding frameworks for the appraisal of developmental transport interventions1 - focusing particularly on the typical South African context, but also considering experiences and practices in other middle-income countries typified by disparity in income groups.

The proposed appraisal framework – which has been developed mainly by drawing on past experience and desktop research (still to be tested empirically), is largely based on the British NATA, but with a stronger emphasis on:

- *developmental factors* relevant in the South African context such as poverty reduction and empowerment;
- the underlying *means-ends logic* (i.e. why it can be reasonably expected that particular interventions will lead to particular outcomes).
- the *critical success factors and/or uncertainties* which might affect the attainability of the outcomes.

One of the main sources for the above extensions and elaborations has been the Logical Framework Approach (LFA), which – despite many criticisms (Hubbard, 2000; Gasper, 2001) – is an extensively tried and tested methodology for the planning, assessment and monitoring of projects or programmes with significant "'wider"' development outcomes. Other sources are the Strategic Choice Approach (SCA) – first developed in the late 1960's (Friend and Jessop, 1969) to clarify different types of "strategic uncertainties" and the Balanced Scorecard (BSC) approach (Kaplan and Norton, 1992).

2. TYPES OF CONTEXTS, INTERVENTIONS AND ASSESSMENT ISSUES

Developmental transport interventions are particularly relevant in South Africa and other middle-income or transition countries such as Brazil. Typical characteristics include: vast inequalities; large numbers of urban poor, as well as vast rural communities with low mobility and poor access to basic services; significant pockets of inaccessible rural areas with under-utilised economic potential; as well as strongly emerging abilities and desires to compete more effectively as part of the global economic-logistical system

Seen from this perspective, there are a number of apparent win-win outcomes, as illustrated by Figure 1. There is, however, also a downside, as indicated on the right of the diagram. Seen particularly within the context of South Africa's apartheid legacy, the issue of transport-induced urban restructuring is very relevant, but also controversial.

[1] Sustainability-enhancing interventions are, by implication, included.

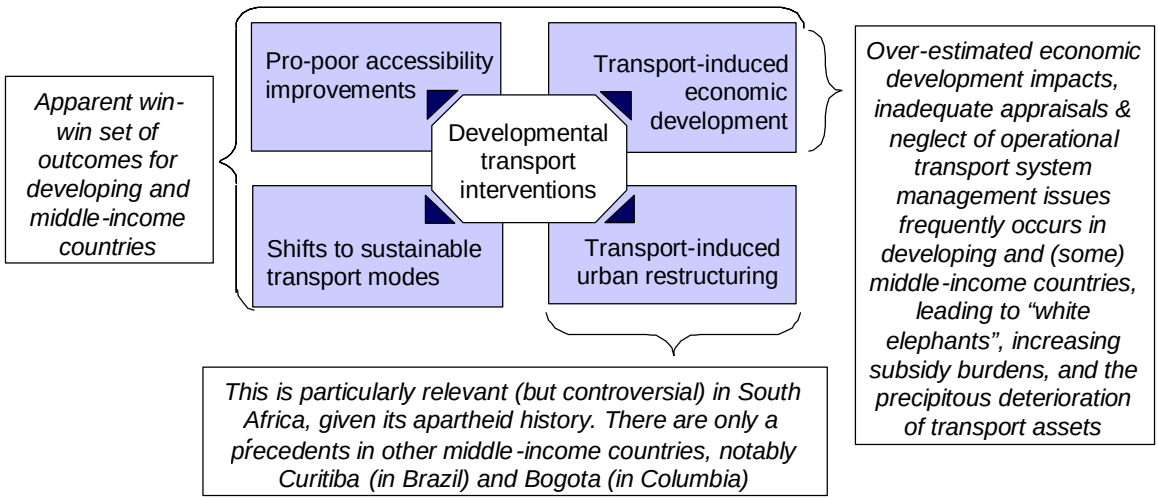

Figure 1: Developmental transport interventions: key outcomes and issues

Against this background, there are two pivotal issues:

The first is the inadequacy of mainstream transportation planning and appraisal practice – characterised by reliance on quantitative, model-based predictions of user demands, cost-benefit analysis (CBA) and the tendency "to predict and provide" – when dealing with the appraisal of developmental transport interventions. .

The *second* – especially when CBA methods are replaced by less quantitative assessment methods – is the tendency to *over-estimate the cost-effectiveness* of developmental interventions. A major reason is political pressures to use these as motivations for expanded transport investment budgets, or to get approval for major transport "anchor projects". Another reason is that there is often an *under-estimation of the inter-sectoral alignment or integration requirements.*

This often leads to "white elephants"; or other adverse, unintended consequences. One of these is that major new, politically attractive transport projects consume a disproportionate part of budgets, leaving inadequate funds for routine but critical activities such as asset maintenance.

3. THE NEW APPROACH TO TRANSPORT APPRAISAL (NATA)

The New Approach to Appraisal (NATA) encompasses a set of guidelines developed by the UK's Department of Environment, Transport and the Regions (DETR), aimed at improving the consistency and transparency with which decisions on all transport investment projects are made. It does this by presenting the key economic, environmental and social impacts of projects in a clear, consistent and balanced way using a one-page Appraisal Summary Table (AST) – see Table 1 – and associated worksheets.

Table 1: The UK's Appraisal Summary Table for Transport Schemes

Option	Description	Problems[2]	Present Value of Costs to Public Accounts £m

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ENVIRONMENT	Noise			net properties win / lose
	Local Air Quality			Concs wtd for exposure
	Greenhouse Gases			tonnes of CO_2
	Landscape			Score
	Townscape			Score
	Heritage of Historic Resources			Score
	Biodiversity			Score
	Water Environment			Score
	Physical Fitness			Score
	Journey Ambience			Score
SAFETY	Accidents			PVB £m
	Security			Score
ECONOMY	Public Accounts		Central Govt PVC, Local Govt PVC	PVC £m
	Business Users & Providers		Users PVB, Providers PVB, Other PVB	PVB £m
	Consumer Users			PVB £m
	Reliability			Score
	Wider Economic Impacts			Score
ACCESSIBILITY	Option values			PVB £m
	Severance			Score
	Access to the Transport System			Score
INTEGRATION	Transport Interchange			Score
	Land-Use Policy			Score
	Other Government Policies			Score

[2] These should be seen as the core problems addressed by the scheme, such as traffic congestion, or delays at interchanges.

Impacts are assessed against the UK Government's five objectives for transport, namely

- **environmental impact** - to protect the built and natural environment;
- **safety** - to improve safety;
- **economy** - to support sustainable economic activity and get good value for money;
- **accessibility** - to improve access to facilities for those without a car and to reduce severance; and
- **integration** - to ensure integration within and between different types of transport; integration with land-use planning, and integration with policies for education, health and wealth creation.

Table 1 shows that the AST provides for qualitative as well as quantitative impact descriptions, and a combination of monetary values and "scores". Although the format is quite clear and simple, this should not be seen to apply also to the underlying estimation models or techniques, because these can be quite sophisticated.

One of the disadvantages of the AST is that *direct user impacts* – such as economic benefits to Business Users and Providers – are not clearly differentiated from *non-user impacts* (e.g. Heritage of Historic Resources) or *indirect and wider impacts* (e.g. Wider Economic Impacts). Neither is there any attempt to reflect the underlying "process logic" – how the direct results of the transport service delivery process (such as travel time savings) might lead to wider societal outcomes (such as greater economic competitiveness, business growth and creation of employment opportunities).

4. A SOUTH AFRICAN EXAMPLE

As an example of how the NATA framework could be applied in the South African context, one of the authors (Naudé, 2004) used the five main "NATA objectives" as a guiding framework during a recent multi-criteria decision analysis of road routing and upgrading alternatives in the Southern Overberg Area.

The study comprised of four alternative routes between Gansbaai and Bredasdorp to be evaluated. As specific attention had to be given to socio-economic and other developmental needs (i.e. factors that are not always reflected by conventional CBA-type benefit estimates), a multi-criteria decision analysis, encompassing a cost-effectiveness analysis, has been conducted.

Figure 2 gives an overview of the criteria that were used, and how they relate to the five main "NATA objectives". Four of the criteria are shown to relate to the *economy* objective. As savings in accident costs were combined with other user cost savings, the *safety* objective (shown in dotted lines) was only considered indirectly. All of the other objectives were considered separately.

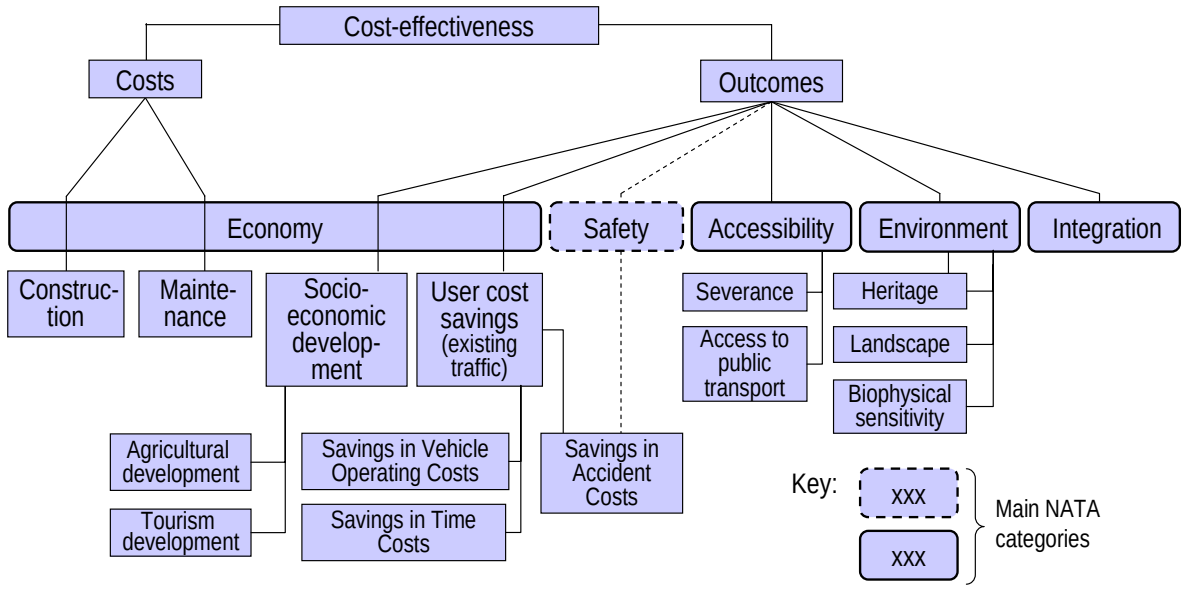

Figure 2: Objectives for assessing the road routing and upgrading options in the Southern Overberg Area

Table 2 gives the results of the multi-criteria decision analysis. A variety of methods were used to score the alternatives in terms of each criterion (see last column in Table 2):

- *Calculated* means that the scores were derived from the calculated costs and benefits associated with each alternative;
- *Estimated* means that a variety of quantitative sources (including trends and previously estimated quantitative relationships) were used;
- *Rated* means that the alternatives were directly rated in terms of a 10 point scale (using benchmark values), based on visual assessments, a map-based analysis, and a collaborative process involving key stakeholders.

To ensure comparability, the calculated and estimated scores were also normalised in terms of a 10 point scale. The final step was to set and apply the criteria weights as shown in Table 2.

Table 2: Multi-criteria decision analysis:
Road routing and upgrading options in the Southern Overberg

Criteria	Weights		Scores				Method
			Route 1	Route 2	Route 3	Route 4	
Cost	**25%**						
Construction costs		24.50%	2	6	7	1	Calculated
Road maintenance costs		0.50%	2	2	2	2	Calculated
User benefits	**25%**						
Vehicle operating costs		11.87%	6	2	1	3	Calculated
Accident costs		6.56%	8	4	4	5	Calculated
Time costs		6.56%	8	6	5	7	Calculated
Socio-econ development	**20%**						
- Agriculture growth (sensitive products)		15.00%	10	6	2	6	Estimated
- Tourism, spin-off effects		5.00%	6	5	2	7	Estimated
Accessibility:	**7%**						
- Community severance		1.40%	2	3	8	2	Rated
- Public transport/access to facilities		5.60%	9	8	3	5	Calculated
Environmental impacts	**13%**		6	7	2	2	Rated
Integration with IDP etc.	**10%**		10	8	2	5	Rated
WEIGHTED SCORE			**6.37**	**5.72**	**3.57**	**3.72**	
Rank			**1**	**2**	**4**	**3**	

5. THE LOGICAL FRAMEWORK APPROACH

Conceived about thirty years ago by USAID, the logical framework technique has progressively become the preferred methodological tool of development project planners. Gasper (2000) notes that it is now used by nearly all aid funding agencies and the World Bank, and therefore by thousands of client organisations around the world. In most cases its use is obligatory.

A Logical Framework or LogFrame is, in essence, a matrix-type summary of a project or programme, structured in terms of a *logical means-ends hierarchy*, also referred to as a (*logical) intervention strategy* or *programme logic model*. There are different specific approaches and terms for describing this – a common sequence would consist of: 1) inputs; 2) delivery activities; 3) outputs (including coverage or "reach" across target groups), 4) project purpose and related direct outcomes (utilisation of delivery outputs by target groups), and 5) the overall goal or long-term/ wider impact that the project is expected to contribute towards (but not itself achieve or be solely accountable for).

LogFrames are used both for *ex ante* or *formative evaluation* – which occurs during the design of the intervention strategy – and for *ex post evaluation*, undertaken during and after implementation. The typical matrix, shown by Table 3, has four columns and four rows. Columns 1 and 4 are most important during the design or formative stage. Column 1 is essentially the means-ends hierarchy, listed from the bottom upwards. Column 4 contains assumptions and risks[3] relating to factors that are generally outside the control of

[3] An assumption is a positive statement of a condition that must be met in order for project objectives to be achieved. A risk is a statement of what might prevent objectives being achieved.

project manager(s), but that are necessary for effective achievement of the stated results at the next level in the hierarchy.

Table 3: European Comission's Version of the LogFrame Project Matrix
(Source: Gasper, 2000)

INVENTION STRATEGY	OBJECTIVELY VERIFIABLY INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS/RISKS
5. DEVELOPMENTAL GOAL: The longer-term benefits to (target-group) beneficiaries and wider benefits to other groups.	INDICATORS: Measures (direct or indirect) to verify to what extent the *overall objective* is fulfilled.	Data sources for indicators for overall objective	[This cell is empty in the EC version but some versions put here]: Important events, conditions or decisions necessary for sustaining objectives in the long run
4. PROJECT PURPOSE Benefits to be received by the project beneficiaries or target group	INDICATORS Measures (direct or indirect) to verify to what extent the *project purpose* is fulfilled.	Data sources for indicators for project purpose	1. ASSUMPTIONS Important events, conditions or decisions outside the control of the project which must prevail for the overall *developmental goal* to be attained.
3. RESULTS/ OUTPUTS Services to be delivered to the intended beneficiaries or target group.	INDICATORS Measures (direct or indirect) to verify to what extent the *results* are produced.	Data sources for indicators of results	2. ASSUMPTIONS Important events, conditions or decisions outside the control of the project management, necessary for the achievement of the *project purpose*.
2. ACTIVITIES The activities that have to be undertaken by the project in order to produce the outputs.	1. INPUTS Goods and services necessary to undertake the *activities*		3. ASSUMPTIONS Important events, conditions or decisions outside the control of the project management, necessary for the production of the *results or outputs*.

Figure 3 provides a diagrammatic illustration of the causal linkages between different levels or rows in the LogFrame matrix – also referred to as its *vertical logic.* In this case the middle two columns have been omitted, showing how the assumptions (and related external conditions) in Column 4 of the LogFrame links to the means-end hierarchy specified in Column 1. The diagram (which has been broadly modelled on the EU version of the LogFrame) also shows where project beneficiaries fit into the overall intervention logic.

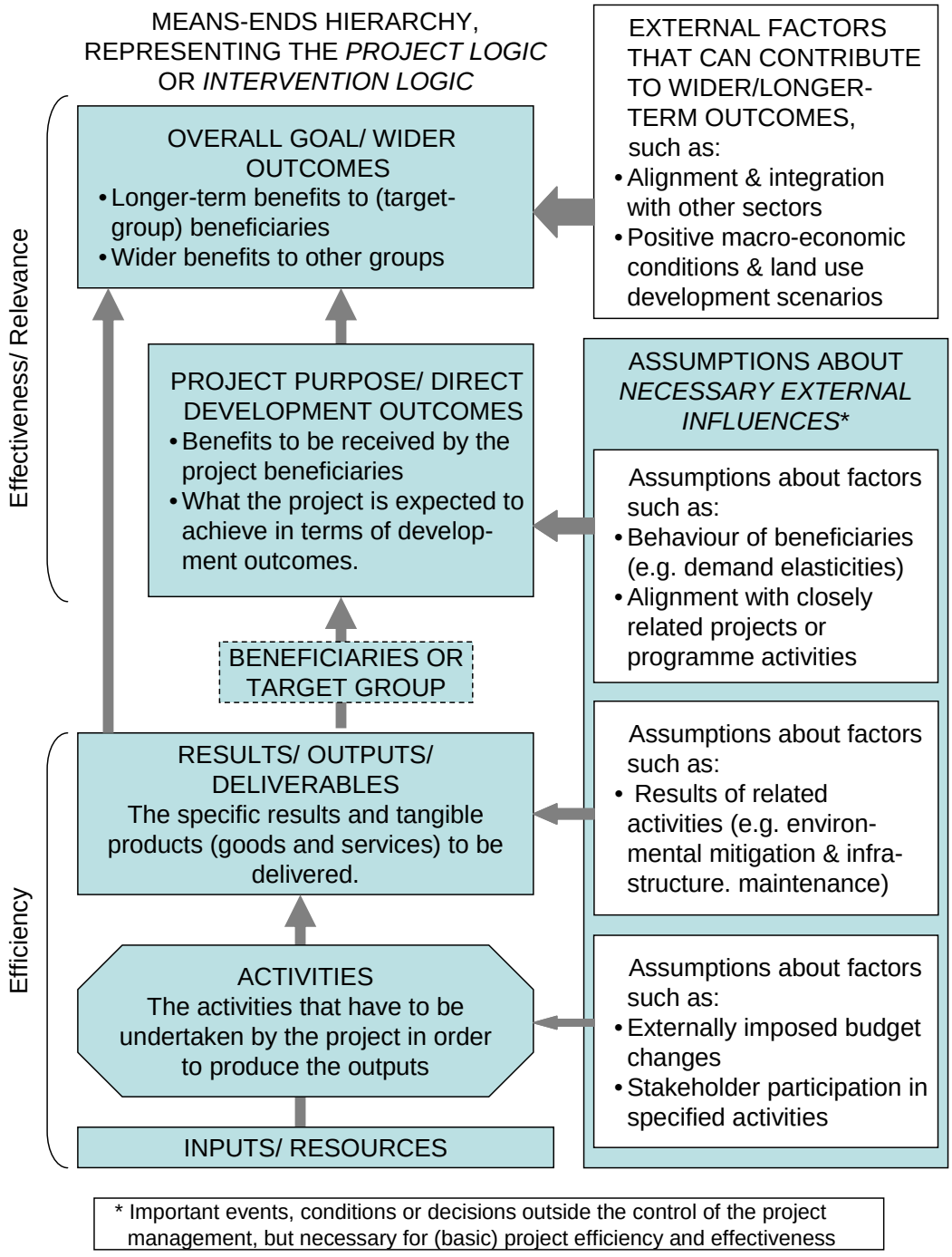

Figure 3: Causal linkages between different rows in the LogFrame matrix

By structuring the information about a project, programme or other type of intervention in terms of the this format, it is relatively easy to review and, if necessary, question why and under what conditions it can be reasonably expected that the planned direct as well as wider results will be achieved. At the same time, it provides a basis for strategic uncertainty or risk assessments.

Moreover, by specifying verifiable indicators and means to verify progress (which is the information required to complete the middle two columns of the LogFrame) planners are reminded to think about how they will monitor and evaluate the project right from the start. By implication, the tool can then also be used for ongoing evaluation and monitoring.

6. STRATEGIC APPROACH TO UNCERTAINTIES

Whilst the conventional LFA only requires assumptions or uncertainties to be explicitly specified, the Strategic Choice Approach (Friend and Jessop, 1969) provides guidance on *different types* of uncertainties and how each type can best be managed. These are:

- ***UE*** - Uncertainties in the operating ***E****nvironment*, calling for a response in the form of further data collection, modelling and other investigations of circumstances or trends (i.e. more information and/or analysis);
- ***UV*** - Uncertainties about guiding ***V****alues*, calling for a response in the form of some kind of consultation with policy makers or stakeholders (i.e. clearer objectives or criteria weights).
- ***UR*** - Uncertainties about choices on other ***R****elated agendas*, calling for a response in the form of negotiation or collaboration with other decision makers (i.e. more coordination);

Important points of departure are that decisions are interrelated and that uncertainties must be managed by answering demands for more information, clearer objectives and more coordination (Friend & Hickling 1987).

7. BALANCED SCORECARDS

The development and use of a Balanced Scorecard (BSC) is a response to the inadequacy of traditional accounting methods for assessing organisational performance. Kaplan and Norton (1992) introduced four different perspectives from which a company's activity can be evaluated: a) the *financia*l perspective; b) the *customer* perspective c) the (internal) *process* perspective; and d) the *learning and innovation* perspective.

The process of setting up a BSC starts with the organisation's vision and strategies and proceeds towards the formulation of critical success factors (CSFs) and performance measures from each of the different perspectives.

8. COMBINED APPROACH

As noted in the introduction, the appraisal approach and framework developed by CSIR (Naude and Schutte, 2003; and Naudé, 2004) is essentially a combination of the British NATA, LogFrame, Strategic Choice and Balanced Scorecard approaches. Components, concepts and/or perspectives from each of these were selected and adapted with the purpose of guiding and supporting the appraisal of developmental transport interventions in the typical South African or "transition country" context.

8.1 Premises about the relationship between transport and development

Given that it has a specific transport and development focus, the approach is also firmly based on certain general premises about the relationship between transport and economic development (see box below).

"**Transport is necessary but not sufficient"**

- While investment in strategic transport systems is a necessary condition for economic and social development, it is not sufficient for that purpose.
- Transport can induce economic development only if an economic base exists or a potential economic base can be developed, and if the infrastructure investment is part of a coherent package of development initiatives.
- The appropriate package of development initiatives must overcome certain critical development thresholds before a self-sustaining development process is set in motion.

8.2 Critical success factors subject to significant uncertainties

Consistent with the general premise that transport is necessary but not sufficient, a strong emphasis is placed on *critical success factors that are outside the direct control of transport service providers* – and thus subject to significant UR-type uncertainties. This emphasis is consistent with the LogFrame and Strategic Choice approaches. Moreover, by referring to these as *critical success factors* and allowing for different perspectives (see below) there are also strong affinities with the Balanced Scorecard Approach.

8.3 Six sets of criteria and three main perspectives

Table 4 shows that the proposed framework – referred to as a "Logical Scorecard" – contains six sets of criteria. These can, in turn, be grouped into three broad perspectives (represented by the three main columns), namely:

- An economic/ value for money perspective (1 and 2);
- An equity/ empowerment perspective; (3 and 4) and
- Environmental, integration and safety perspectives (5 and 6).

Table 4: Logical Scorecard for Developmental Transport Interventions*

(The example weights and scores refer to a hypothetical project portfolio such as would be outlined in the Integrated Transport Plan [ITP] for a typical South African metropolitan area)

Impacts *(results that depend partly on user reactions, other decision makers and "wider processes")*							
Max	100	**2: Economic benefits**	40	**4: Accessibility & equity**	30	**6: Environment & safety**	30
Total	60	Sub-total	28	Sub-total	17	Sub-total	15
UA tot	*41*	Uncertainty adjusted sub-total	*19.6*	Uncertainty adjusted sub-total	*11.3*	Uncertainty adjusted sub-total	*10.1*
c. Wide area/ indirect impacts		**2 c)** Cumulative economic growth & development impacts *CSF 1:* Supporting economic infra-structure investment *CSF 2:* Utilisation of travel time savings for productive activities	10 7 .5 *3.5*	**4 c)** Cumulative pro-poor accessibility and poverty reduction impacts *CSF 1:* Alignment with public works programmes *CSF 2:* Good spatial coverage of basic facilities (e.g. schools & clinics)	10 6 .5 *3*	**6 c)** Shifts to more sustainable transport modes & more compact spatial development patterns *CSF 1:* Reduced cultural bias against NMT & public tpt *CSF 2:* Effective land use/ growth management	10 4 .5 *2*
b. Impacts on NMT & directly affected non-users		**2 b)** Directly induced economic activity (specific enterprises, sub-sectors & localities) *CSF:* Hard evidence about significant transport constraints	10 7 .7 *4.9*	**4 b)** Reduced severance; improved accessibility for pedestrians, cyclists & other NMT users *CSF:* Knowledge of NMT movements & requirements	10 5 .7 *3.5*	**6 b)** Minimisation of direct environ-mental impacts (noise, air quality & environmental/ visual quality) *CSF:* Enforcement of vehicle emission standards	10 5 .7 *3.5*
Present value of direct benefits (incl. user time/cost savings) – R mill							
a. Impacts on transport user groups (excl. pedes-trians & NMT users)		**2 a)** Time and VOC savings for "main-stream" commuters, freight operators, & business travellers *CSF:* Effective road space & incident management (incl. congestion charging).	20 14 .8 *11.2*	**4 a)** Improved accessibility & user benefits for disadvantaged user groups (incl. persons with disabilities) *CSF:* Ability to target & subsidise disadvantaged users	10 6 .8 *4.8*	**6 a)** Improved safety & security, (reduced accidents costs and criminal incidents) *CSF 1:* Agreed road access policies *CSF 2:* Effective law enforcement & road safety training	10 6.5 .7 *4.6*

Outputs *(results that are largely under the control of road & transport service providers)*							
Present value of lifetime construction, operating & maintenance costs – R mill							
Max	100	**1. Technical efficiency & appropriateness** Optimised/ least cost choice of technology & infrastructure designs, good use of local materials.	40 30	**3. Empowerment & delivery sustainability** Employment & empowerment of PDIs; future delivery capacity & sustainability	40 25	**5. Participation & integration** Stakeholder partici-pation; alignment with relevant plans/ policies; multi-modal & land use-transport integration	20 15
Total	**70**						

Key to Impact Scores	x	Maximum possible score (adjustable if "weights" are changed)
	x	Score of particular project or programme
	x	Uncertainty discount factor (ranging from 0.1 [high]to 1 [none])
	x	*Uncertainty adjusted scores*

Whilst the first two perspectives might be fairly obvious, it is necessary to explain the logic behind the grouping of environmental, integration and safety aspects as part of one general category of perspectives. The main reason is that a high percentage of road and

rail accidents (especially pedestrian and crossing-related accidents) and crime incidents are essentially a function of how roads, rail lines and other transport facilities are interfaced (i.e. connected and/or separated) with immediate land uses or human activity environments. The related logic is that the management of these interfaces is typically a shared responsibility requiring close integration between transport and land use planners, as well as with the agencies responsible for enforcing land use controls, traffic regulations and crime prevention measures.

8.4 Vertical logic and associated distinctions

All of the NATA objectives are accommodated in terms of the six sets of criteria in the framework, but some are subdivided whilst others have been grouped together. The main reason for splitting or differentiating some of the categories is the need to incorporate something akin to the LogFrame “vertical logic”, and thus distinguish clearly between:

i) *Outputs*: results that are largely under the control of road and transport service providers; and

ii) *Impacts:* results that depend partly on user reactions, other decision-makers and “wider processes”.

In accordance with many transport planning and evaluation practices, the impacts are further subdivided as follows:

a) Impacts on transport user groups (excluding pedestrians and NMT users);

b) Impacts on NMT (pedestrian movements, cycling and other forms of non-motorised transport) and directly affected non-users;

c) Wide area, cumulative and/or indirect impacts.

In general, the *impacts* are much less manageable and predictable than the *outputs* and the c-type impacts are less manageable and predictable than the a and b-type impacts.

By implication, the higher levels of criteria towards the top of the framework are thus subject to greater degrees of UE, UV, and/or UR-type uncertainties than those towards the bottom.

8.5 Criteria importance weights and uncertainty discounts

The framework allows for separate calculations of multi-criteria scores: 100 points for outputs and 100 points for impacts. The different criteria within each group are then weighted by the assigned sub-totals (which should be fractions of a 100, and thus total up to a 100 in each case) In the case of the impacts, provision is also made for adding “uncertainty discounts”. This, in turn, should be informed by a strategic assessment of relevant critical success factors and associated uncertainties.

8.6 Incorporation of conventional costs and benefits calculations

One of the dangers of multi-criteria decision analysis and related assessment tools is that it could easily lead to the opposite of the problem earlier ascribed to cost-benefit analysis, i.e. that instead of focussing only or mainly on the demands of those that are “willing to pay”, these are ignored altogether, or relegated to only one of a multitude of criteria.

To avoid this, relatively higher weights could be given to criteria such as 2a): *Time and VOC savings for "main-stream" commuters, freight operators, & business travellers;* and 4a): *Improved accessibility & user benefits for disadvantaged user groups (including persons with disabilities).*

Alternatively, the results of conventional cost and benefit calculations can be documented as part of the scorecard (see Table 4), and considered together with the output and impact scores.

8.7 Application and interpretation

Whilst it is quite feasible to automate the calculation of scores and thus transform the Logical Scorecard shown in Table 4 into a spreadsheet or small computer program, it should be stressed that such a tool should not be seen to replace the transport demand estimation, costing and other models that are normally used to quantify the relevant impact magnitudes.

The example that was chosen to illustrate the scoring in terms of the Logical Scorecard is a hypothetical project portfolio such as would be contained by the Integrated Transport Plan [ITP] for a typical South African metropolitan area. As in the case of NATA, which was designed for assessing transport schemes rather than individual projects, the Logical Scorecard is best used for assessing a portfolio of projects. Hence, it should be particularly useful as a general reference framework for the design and assessment of integrated transport plans.

In cases where there might be a more narrow focus, certain of the impact criteria would be irrelevant, and then the weights could be adjusted accordingly.

If one were to assume that the example scores in Table 4 are indeed a good approximation of the likely performance of a typical South African metropolitan ITP, three important implications can be highlighted:

- The first is that generally higher scores on *outputs* (70 points in this case) than *impacts* (60 points) can be expected;
- Secondly, because of the typically many uncertainties and interdependencies, a substantial difference between the unadjusted impact score (60 points) and the *uncertainty adjusted impact scores* (40.6 points) can materialise. Broadly speaking, this represents the risk of producing white elephants and other unintended consequences;
- The third implication follows directly from the second. Careful examination and management of the CSFs could significantly reduce the above risk factors and result in dramatically improved impact performance.

9. CONCLUSION

The general conclusion from this paper is simply that *broadened objective statements and assessment frameworks are not enough.* Actual and sustained realisation of wider developmental, equity and environmental goals require that attention also be given to the strategic assessment and management of critical success factors and associated uncertainties. It also requires that more rigorous distinctions be made between service delivery *outputs* and their *impacts,* and that it should be easier to trace, question and

improve the underlying *means-ends logic* (i.e. why it can be reasonably expected that particular outputs will lead to particular impacts).

We conclude with the following quote from a recent book on Megaprojects and Risk:

Where facts are uncertain, decision stakes are high, and values in dispute, risk assessment must be at the heart of decision making. We believe that risk may be acknowledged more explicitly and managed a great deal better, with more accountability, than is typically the case today. (Flyvbjerg et.al., 2003, p. 6)

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