

Issue 30 February 24th 2000

Life Cycle Modelling at Work

Three examples of life cycle modelling in use are presented: (a) to allocate road grants (b) to allocate school grants and (c) to plan future spending on maintenance and capital in complex water and hydro installations.

Allocating Road Grants, pp 26-28 for asset preservation

A study commissioned by the Victorian Grants Commission has recommended that road grants to the States (approximately 20% of local government road funding) be by way of average life cycle costs. The report prepared by ARRB (Australian Road Research Board) Transport Research Limited and NIEIR (National Institute of Economic and Industry Research P/L is discussed here.

- Principle of Effort Neutrality to avoid grant manipulation, p.26
- Life Cycle Modelling involving demand and supply aspects, p.26

Allocating School Grants, pp 29-30 for efficient asset management

The principles of the road study methodology are equally applicable to other areas. Here it is demonstrated how average life cycle costing can be used to allocate school grants.

- Going beyond 'effort neutrality' towards positive encouragement for good practice, p.28
- A suggested two scale, 3 level performance indicator, p.29

Planning Future Spending p 31-32 on Maintenance and Capital

This model, designed by BC Hydro, Vancouver, Canada, is the first entry in the "Best New Product" category in this year's International Asset Management Competitions. If selected in the top six 'best new products', it will be demonstrated at the Competition Finals in Melbourne, December 7-8th 2000.

Features include:

- Complete audit trail back to the original studies that give rise to the assumptions included in the model, p.
- Capacity for applying the new 'triple bottom line' approach to choosing projects and their timing (on the basis of economic, social and environmental considerations)

And see **"Mesmerised by Cash Costs" p.32**

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Allocating Road Grants for asset preservation

Aim: Asset Preservation

All State Grants Commissions are required to distribute road grants so as to give consideration to relative need and 'preservation of the asset'. It was considered that the previous funding model, based essentially on road length and some council weighting factors, did not adequately address the preservation of the asset.

Allocation according to road condition?

It had been argued by some councils, especially after the release of "Facing the Renewal Challenge" (described in earlier issues of this newsletter) that road grants should take road condition into account. The shortcoming of this approach, as well expressed in the Study Report by ARRB (the Australian Road Research Board) and NIEIR (the National Institute of Economic and Industry Research P/L), is 'that councils which receive grants because of the poor condition of their roads may have an incentive to keep their roads in poor condition in order to continue to attract grants. They can do this by shifting their own funds to other uses, or by reducing the rate, to compensate for grants received' (p.10)

Effort Neutrality

This raises the issue of "effort neutrality". Grants are considered to be effort-neutral when no indicators are used over which the recipient council has any control. This allows decisions to be made at the local level without being influenced positively or negatively by the level of grant.

Effort neutrality is really a second-best solution. A 'first-best' solution would be to develop an allocation process that actively provided incentives for good asset management and disincentives for poor management. In the schools example that follows such an incentive process has been introduced. If, however, this cannot be done without becoming too complex and administratively expensive, which the roads grants report believed to be the case for road grants, then effort neutrality is a desirable alternative.

The Model

The model for grant allocation recommended in this study is a balanced one taking into account both demand indicators and supply (asset preservation/cost disability) indicators.

Demand Indicators

'Demand indicators seek to measure factors which relate to the value people derive from the local road system. They can be considered as the drivers of road needs. This value can come from several sources, many of which will relate to road usage (by people or freight), but not all.

Values related to road usage will probably be the easiest to reflect in indicators (e.g. of traffic volumes) but it should not be forgotten that local roads perform many roles, some of which are not traffic related and some of which may be negatively related to traffic, such as when residential amenity and/or road safety decreases with increasing traffic levels. All indicators which relate to the value people derive from local roads are considered demand indicators in this report.'

These values, for simplicity, are classified as **economic** (factors relating to traffic on the road, eg tourism, freight); **social** factors which reflect broad social concerns (traffic calming, noise, fumes); **environmental** factors which reflect the impact that the road has on the environment and **safety** factors. These indicators were decided between the consultants and a study advisory committee and measures developed which were subsequently discussed in workshops with councils. They included

- Population/traffic volume
- Tonnage of freight generated or attracted
- Strategic route kilometres on local roads

Supply Indicators: Using the Pavement Network Life Cycle Costing Model

'Supply side, or asset preservation/cost disability indicators, used in the study, relate to the expenditure requirements for the local road network to

meet specific performance standards (esp. roughness levels). To produce such estimates, an understanding of pavement life cycles is important, together with cost data relevant to each stage of the road's life cycle.'

The study used a network pavement life-cycle costing (PLCC) model that has been developed over a number of years to apply to local road networks.

Each road category is defined by: its road and lane length, an average state of road roughness, pavement age, pavement/sub-grade strength value, an average level of daily traffic and the percentage of heavy vehicles in the mix. Major rehabilitations are triggered when various roughness standards are breached, these standards depending on traffic volume and road location (urban or rural).

Condition Based Needs Assessment – and Effort Neutrality

'Condition based methods are increasingly being used to develop maintenance works programs and could also provide one basis for comparing asset preservation expenditure needs across municipalities. However ... road asset condition reflects maintenance policies as well as normal deterioration. Networks that have been under-maintained

will exhibit poorer condition, and consequent greater condition based needs, than networks which have been optimally maintained. Hence a condition based grant allocation would contravene the principle of effort neutrality.'

Average Annual Life Cycle Cost Option

'Under this option, typical life cycle cost streams by road type (urban/rural) and traffic volume range would be converted into average annual agency life cycle costs for optimal maintenance practices, under average Victorian conditions and typical Victorian intervention practices. The main data required from councils to implement such an approach is road length classified by traffic volume range.' (The model can also be used to estimate costs in the next few years (e.g. – 5 years), which is essentially a variant of the condition-based assessment method, because of the link between road network age and condition.'

Cost Disabilities

Life cycle costs are adjusted for cost disabilities, for example, heavier than average freight loading, an unfavourable climate, lack of road building materials in the vicinity and aggressive sub-grades. All of these can be measured .

So the overall model looks like this:

Average Annual Life Cycle Costs for Hypothetical Network (from Appendix C, Table C.3 in Review of Distribution Arrangements for Local Roads Funding in Victoria: Final Report)						
Road Type	Volume Range	Average (Base Case) \$/km	Overall Cost Factor	Modified \$/km	Road Length (km)	Network Cost (\$,000)
Rural	Natural Surface	300	0.84	252	150	37.8
	<100	1500	1.02	1530	300	459.0
	100-500	4800	0.92	4416	400	1766.4
Urban	<500	1000	1.05	1050	80	84.0
	500-1000	2660	0.94	2500	150	375.0
	1000-5000	4290	0.97		5	20.8
Bridges (Based on total concrete deck area of 3,800 sq.m. (at \$5/sq.m.) and total timber deck area of 8,000 sq.m. (at \$10/sq.m.)						99.0
					Total	2842.0
See explanation of table on page 28						

Explanation:

(example of rural road type with less than 100 vehicles a day—bolded in the table)

Using this category of rural roads, the average annual cost of \$1500 is modified by the Council's overall cost factor for this category of 1.02. This reflects the differences between the costs faced by this council and the Victorian average, due to freight traffic, climate, materials availability, reactive sub-grades and strategic routes. This produces a 'modified' cost of \$1530 per km.

The length of roads in that category (300 kilometres) is then multiplied by this 'modified' cost to produce a total life-cycle cost for roads in that category of \$459,000 per annum. This process is repeated for each other category and an allowance is made for costs associated with the council's bridges.

This produces a total life cycle cost for this council's local road network of \$2,842m per annum.

The council's share of the aggregate average annual life-cycle cost for all Victorian councils will determine the share of the Victoria Grants Commission's local roads grants pool that council receives.

If, for example, the aggregate annual life cycle cost for all Victorian councils is \$300m, the Council described above would receive 0.95% of the total pool. With a pool of, say, \$80 m, this would equate to a grant of \$760,000.

Suggested Follow up:

Read the entire report "Review of Distribution Arrangements for Local Roads Funding in Victoria: Final Report" and the background papers. The Victorian Grants Commission can be reached on 61-(0) 3 9655 6666 This study reads well and would be valuable for both road and non-road bodies, for the ideas discussed have wider applicability.

Allocation of School Grants for improved asset management

An idea for further development

Grants to schools for the maintenance, renewal and modernisation of school facilities can be dealt with by a similar methodology to the roads grant allocations. Here is an example of how good asset management could be stimulated by appropriate average life cycle cost based funding

Active encouragement for sound asset management

In the roads grant allocation methodology no account was taken of under- or over-capacity utilisation, nor of the condition of the asset. To do so was considered by the consultants to be too administratively complex and costly. However, this may not be true of schools.

Recent moves to greater responsibility at the school level, and the capacity to measure change in the condition and suitability of school facilities at a corporate level may provide scope to move beyond the 'effort neutrality' of the roads grants methodology.

For schools it may be possible to *actively stimulate positive asset management behaviour through the way in which grants to schools are managed.*

Funding on an Average Life Cycle Cost Basis for Space Entitlements

The key is to fund schools on an average life cycle cost basis according to the space to which they are entitled, rather than the space that they actually have. That is, schools are not funded for condition and they are not funded for available space. Instead condition and space become part of the measure of how well they are managing their allocation.

There are three significant issues in the management of school facilities; these are capacity, condition, and suitability. The average life cycle cost funding based on entitlements helps to address all three of these significant issues.

Capacity (Sufficiency)

Capacity is an ‘efficiency’ issue. This is one of the important issues for school grants as population movements have left some schools with surplus space and others, mostly those at the newly developing fringe areas, with insufficient space. Some schools are able to free up surplus space, particularly if it has transportable buildings, but others, with mostly fixed solid buildings may find rationalisation a more difficult task, and perhaps a less rewarding one. Nevertheless with under-utilisation averaging, in Australian schools, from about 30-40% (and the same in the UK) this is a serious efficiency issue that needs addressing at both a policy (i.e. granting) level and at the school level.

Moving beyond ‘effort neutrality’, It is possible to make grants available to schools *for the amount of space to which they are entitled by virtue of the number of students enrolled, not by the space that they happen to have*. Schools may choose to retain excess space but will have to pay for its upkeep themselves.

As schools actively engage in asset management new opportunities for school improvement will become apparent and schools will see advantages for themselves in handing back assets that are not providing benefits commensurate with their costs, thus freeing up resources to improve themselves in other ways.

Condition

Condition is also an ‘efficiency’ issue. In the past, a number of jurisdictions have provided funding for schools based on their backlog maintenance. This has created an unhealthy interest in trying to get the backlog figures as high as possible to secure a continuing source of funding. (cf the roads grants comment).

When funding is dependent on backlog, the incentive for a school is to increase the amount of recorded backlog rather than to try, by innovative means, to reduce it. This incentive is reversed in a positive asset management model. With schools

With the average life cycle cost model of fund-

ing, condition is still measured, but now the change in condition is a measure of how well schools are managing their allocations. (Note, it is better to measure a change in condition rather than absolute condition, since school councils inherit their facilities; it is what they do with their inheritance that determines whether their asset management is good or poor.)

Suitability

Unlike Capacity and Condition, *Suitability* is an “effectiveness” issue.

It is easy to see why the focus, in the past, has been on capacity and condition for the costs of capacity show up in clearly visible excess space (and associated asset related costs such as maintenance, utilities, etc). Similarly the costs of condition show up in the recorded backlog maintenance figures.

Failure to address the suitability issue also has costs, high costs, but they do not show up in any very clear way as costs attributed to assets. They show up in a failure to generate the high standard of learning that today’s students require to survive in a highly technological world. And they show up in teacher stress levels.

As Education Departments develop output measures that take the quality of learning into account, it may be possible to develop asset related measures for lack of suitability. In the meantime, improving student learning should be the focus of all educational activity including that of asset management.

A Suggested Asset Management Indicator

Funding for schools entitlement on an average life cycle basis can be accompanied by a simple, transparent and easy to operate site performance measure.

Schools that perform well can get a priority loading for the allocation of capital modernisation (upgrade) capital.

This simple measurement consists of two scales only, one for ‘suitability’ and one for ‘condition’.

Condition Measures

Condition can be determined by measures usually recorded by the public works departments in most states in terms of backlog maintenance. There are three condition ratings: Condition either 'stays the same', 'gets better', or 'gets worse'. This is a rather robust measure that can tolerate a wide range of inaccuracies in measurement.

For example, depending on the accuracy of the recording, a change in the BLM of less than 5% can be regarded to be 'stays the same'. Then only changes greater than 5% are regarded as improvements or worsening of condition. (The figure could be, say, 10% if measures were thought to be less reliable.)

Gets better = a
Stays the same = b
Gets worse = c

Suitability Measures

Suitability is a measure of how the facilities are meeting the needs of students and staff. (see the Asset Management Planning work of the UK Education Department referenced in the last issue of the newsletter). Most Departments of Education have a range of suitability indicators that could be used. Again there are only 3 rankings: "stays the same", "gets better", "gets worse".

Gets better = A
Stays the same = B
Gets worse = C

A simple goal and a simple numerical scale

The overall aim of a site is Aa ("double a")

The combined suitability-condition performance scale yields 9 outcomes as follows:

Aa = 9
Ab = 8
Ac = 7
Ba = 6
Bb = 5
Bc = 4
Ca = 3
Cb = 2
Cc = 1

In this way, each school would be given a ranking which would influence the likelihood that it

will get funding for its modernisation program (detailed in its asset management plan).

Allocation of Modernisation (Upgrade) Capital Funding according to Good Asset Management Also Favours Schools who start with poor quality facilities

Since it is always easier to improve when starting from really poor condition or suitability, schools that start with these 'disadvantages' will find that they can relatively easily get high rankings. So the 'good asset management' ranking will likely coincide well with those schools that may be determined as having been disadvantaged to start with – thus justifying funding for modernisation on two scores, need and ability.

Effort Neutrality Superseded

In this way, asset preservation and enhancement, can be supported with an active program of encouragement for good asset management and "effort neutrality" is not required. Indeed it is superseded.

Explanatory notes for the numerical scale

1. *In the numeric scale, suitability takes precedence over condition for the reason that suitability is related to "effectiveness" whereas condition is related to "efficiency". However, both are important. It may be possible to allow condition to run down in the short term. Indeed, it may be inevitable that condition will run down in the short term, especially if starting from "as new" condition (say after a major redevelopment).*
2. *Schools could be allowed to choose their own condition level, with the proviso that elements requiring urgent repair for reasons of occupational health and safety or legal compliance shall be tagged by the inspector and must be attended to in the next budget period. (The inspector may also issue 'warnings' of impending problems.)*
3. *Failure to maintain or repair that results in structural damage and thus loss of value to the owner may also be tagged for mandatory compliance in the next budget period.*

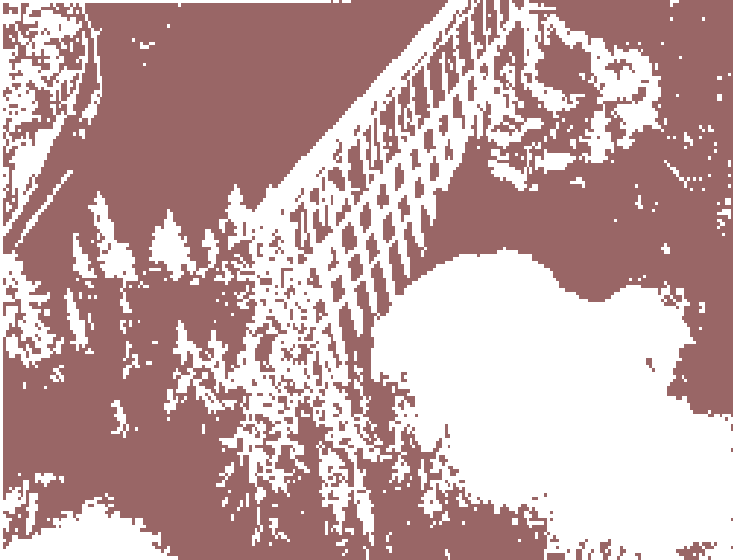
Follow Up:

If you would like to follow up these ideas, write to me at <info@amqi.com>

Penny Burns

The Asset Planner

Managing the life cycle of a production asset through effective decision support



BC Hydro International Limited of Vancouver, British Columbia is the first to enter the new “Best Product” category of the International Asset Management Competitions.

Their product is an integrated planning tool that takes a value driven approach to plant maintenance and capital investments. It is especially suitable for complex hydro and water businesses.

The strategy that BC Hydro has adopted is market based and focuses on the long term commercial value derived from its fleet of generation assets.

Annual Budget Support

TAP (The Asset Planner) provides several features that assist with the annual budgeting process.

- A data storage platform that is client server oriented enabling multiple users to input and access data.
- Ability to segment spending by investment portfolio to enable review of how dollars are being spent.
- Ability to sort and group budget data in a variety of ways defined by the user.
- Reporting capability that enables projects to be ranked based on user defined ranking criteria (I.e. based on benefit:cost ratios, net present values, economic value added, etc.)

Ongoing Decision Support

- A means of ensuring that all projects seeking approval are evaluated in a consistent manner—Project Analysis Statement (PA) using internationally recognised business decision criteria.
- The ability to customize TAP to include mechanisms for evaluating projects that provide significant non-financial benefits

Credible Input/Output

TAP has been developed in response to the increased focus on and requirements of managing assets effectively. TAP has been designed to interact with various levels of management from various groups within an organisation. To achieve success, output must be viewed as credible. To ensure output is considered credible, input must be credible. TAP supporting processes request that users seek the most credible source for data inputs:

- Production asset forecast spending requirements from engineering based condition surveys, risk assessments and performance assessments.
- Performance volumes from the groups who manage the production facilities and understand the operating constraints.
- Market prices from the closest commodity market, industry forecast or some other reputable source.
- Economic assumptions from municipal, provincial, state, federal and international providers as appropriate.

What I like about The Asset Planner

- It fully integrates the technical and the financial.
- It provides a complete audit trail—you can track back any assumption in the model to its origin, making technical audits readily possible.
- The output of The Asset Planner, because of both of these aspects, is a fully credible future cash flow statement.

This makes “The Asset Planner” the best support I have so far seen for applying “Condition Based Depreciation” to agencies within the water industry.

Follow Up: If you would like more information on The Asset Planner you can contact BC Hydro International at 6911 Southpoint Drive (A01) Burnaby, British Columbia, Canada, V3N 4X8

Tel: 1 604 528 3031
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 Web Site: www.bchil.com

And, if this is selected as one of the top 6 new products/services submitted to the Year 2000 Competitions you will also get the opportunity to see this system demonstrated at the Competition Finals in Melbourne, Dec 7-8th 2000.

If you have a good product/service that is valuable for asset managers, you could be this year’s “Best New Product” winner—but only if you enter! So do!

Information on the “Best New Product” and other Competition categories can be found on the asset management website: www.amqi.com

If you are thinking of entering, let me know, and I will keep you up to date on any extra information or assistance.

If you are using a good product, or know of one, then why not do yourself and your supplier a favour and tell them about the competitions.

“A workman is only as good as his tools”

Asset managers thus need to encourage the development of new technology to help us do our job better!

Footnote: Mesmerised by Cash Costs.

Seems that the private sector is just as susceptible to poor asset management practices as is the public sector, despite rhetoric to the contrary. In fact, sections of the private sector may now be realising what the public sector has been coming to grips with over the last several years – there is a cost to capital! The following was reported in the Australian May 6 1999, p.25

‘The resource industry was overcapitalised, suffering chronic overcapacity and fixated with cash costs, North managing director Malcolm Broomhead said yesterday. Speaking in Sydney at a Securities Institute of Australia lunch, Mr Broomhead said the industry was ‘mesmerised’ by cash costs.

“Ninety percent of mining chief executives claim their business is in the lowest quartile of cash operating costs and will pay capital in order to get there. People go up the total cost curve in order to go down the cash one.”

With decent life cycle costing this will not happen to you!