

3<sup>rd</sup> International Conference

**APT'08**

## Workshop # 3:

A logical framework approach to the evaluation of benefits derived from Accelerated Pavement Testing (APT) studies

Louw du Plessis  
30 September 2008

**CSIR**  
our future through science

## Programme

- Background
- Identification of key elements, issues, methods
- Presentation by Jolanda Prozzi
- Group discussions
- Summarize collective findings / solutions
- Redistribute summary to all

## Background

Due to the high cost of APT studies and in the light of increasing pressure on research budgets for roads, it has become essential to define and quantify the benefits arising from APT investigations.

Up to now only a limited amount of work has been done on identifying methodologies for measuring the impact of APT studies.

## Background

During *APT'08* we hope to clarify the issues and lay down an universally accepted platform by which APT studies can rationally be evaluated in terms of quantifiable and non-quantifiable benefits.

## APT benefit pavement engineering in 3 different impact categories:

- Optimized materials and pavement design, which lead to reduced construction costs.
- More reliable design and maintenance practices, which reduces the likelihood of costly early failures.
- More cost effective materials and pavement design, which optimizes the time between interventions and reduces pavement life cycle costs.

## Different types of benefits

- Direct (“Delivery”) benefits  
Those benefits that rely primarily on the technical outcomes of technology development projects. In the context of road technology development projects, these benefits arise because of improved technology which leads to more effective design and construction processes, which in turn reduces agency and road user costs.

These benefits can to some extent be quantified in economic terms by means of indicators such as benefit-cost ratios.

## Direct benefits are divided into two groups

- Quantifiable  
Those benefits that can be measured in economic terms, such as \$ saving per lane-mile, Saving in traffic delay, reduction in air pollution, improved safety, etc
- Non quantifiable (Process benefits)  
Arise because of the development process. These benefits largely concern human resource development and the development of better understanding of the problems facing a particular development area.

Process benefits are not readily quantified into economic terms, and are best monitored and evaluated through indicators and trend analysis.

## Indirect benefits

- Human capital development
- High tech spin offs (i.e. instrumentation)
- International Alliances
- Improvement in Science and Technology Excellence
- Creation of employment and career growth opportunities

## Issues relating to direct benefits

- Time-related separation between project findings and benefit realization
- Benefits often result from several contributing projects and processes.

It is thus essential to ensure that contributions that precede technology development projects, as well as contributions required to refine and implement are taken into account in the benefit assessment process

- In order to arrive at the assumptions needed to complete an economic assessment of benefits, a significant amount of subjective input is needed. The subjective element of the assessment process impacts negatively on the credibility of the assessment.

## Basic structure for the determination of direct benefits

Select the Best Performing Projects for Benefit Quantification Earlier investigations found that it may be more effective to identify and then focus on the best performing projects within a research program, as opposed to trying to evaluate the entire research programme over a long term.

- Identify Impacts and Benefits Through Interviews with Technology Development Workers

This approach quickly identifies the impacts resulting from technology development work, and helps to identify links between purely technical outcomes and downstream benefits.

- Collect Evidence From The Users Of The System

Whilst technology development workers are interviewed to identify impacts and potential benefits, estimates of the actual benefits are obtained through interviews with the more impartial system users (e.g. client body representatives and practitioners). This ensures transparency and credibility.

• Acknowledge Other Contributions

A technology typically has to develop through several stages before its benefits are realized through changes in policy, design methods or specifications. To realize such benefits, contributions from other role players are needed. The benefit assessment process should acknowledge such contributions, and a contribution ratio should be assigned to technology development projects when calculating benefits.

• Use Confidence Intervals To Assess Benefits

The expected benefits of a research programme can seldom be known with any certainty and are typically obtained through subjective estimates that are highly uncertain. The credibility of benefit assessment can be increased if the analysis provides some measurement of the randomness of the estimated benefit. It may therefore be more useful to use a range or interval rather than a point estimate of economic benefits.

## Finally, issues on the table

- The identification of potential benefits from APT investigations
- How to quantify non-economic benefits arising from APT research
- The determination of quantifiable benefits, such as:
  - cost-savings, and
  - cost avoidance
- A methodology for the determination of benefits before full-scale implementation
- Dealing with assumptions

## Issues on the table (continue..)

- Up scaling benefit to network level
- Benefits often result from several contributing projects and processes (not only APT studies)
- Life span of benefit
- Dealing with difficult benefits such as a reduction in:
  - Traffic delays
  - Noise
  - Pollution
  - Accidents

## Key elements

- The situation *with* and *without* the benefit of APT testing should be assessed;
- The uncertainty in assumptions and outcomes is accommodated by assigning a probability to outcomes;
- The cost of each outcome is calculated and adjusted by application of a probability factor;
- The benefit of the R&D project is determined by subtracting the total effective cost of all options *without* the benefit of APT testing from the total effective cost of all options *with* the benefit of APT testing, and
- The calculated benefit divided by the cost is then the benefit/cost ratio.

# Jolanda Presentation



