

ASSESSMENT OF GAUTRANS HVS PROGRAMME BENEFITS

Pilot Study: Approach and
Findings

In This Presentation..

- Overview
- General Concepts & Approach
- G1 Base Pavements
- General Aspects
- Discussion

Background:

Objectives/Approach

- To clarify the key elements of benefit assessment;
- To develop a general approach for benefit assessment;
- To implement & evaluate the approach by focussing on G1 Base and Foamed Bitumen pavements
- To refine and document a framework for the assessment of other (past or future) HVS technology development projects.

Overview: Project Report Contents

1. Introduction

2. Benefit Assessment: Concepts and Approach

3. General Aspects Related To **Direct Benefit** Assessment

4. **Direct Economic Benefits:** A General Assessment

5. **Direct Economic Benefits:** Specific Projects


6. **Indirect Benefits**

7. Framework for Benefit Assessment

8. Summary and Conclusions

9. References

Direct Benefit
Related
(Quantifiable in
Economic
Terms)



Project Report

1. Introduction

2. Benefit Assessment: Concepts and Approach

3. General Aspects Related To **Direct Benefit** Assessment

4. **Direct Economic Benefits:** A General Assessment

5. **Direct Economic Benefits:** Specific Projects

6. **Indirect Benefits**

7. Framework for Benefit Assessment

8. Summary and Conclusions

9. References

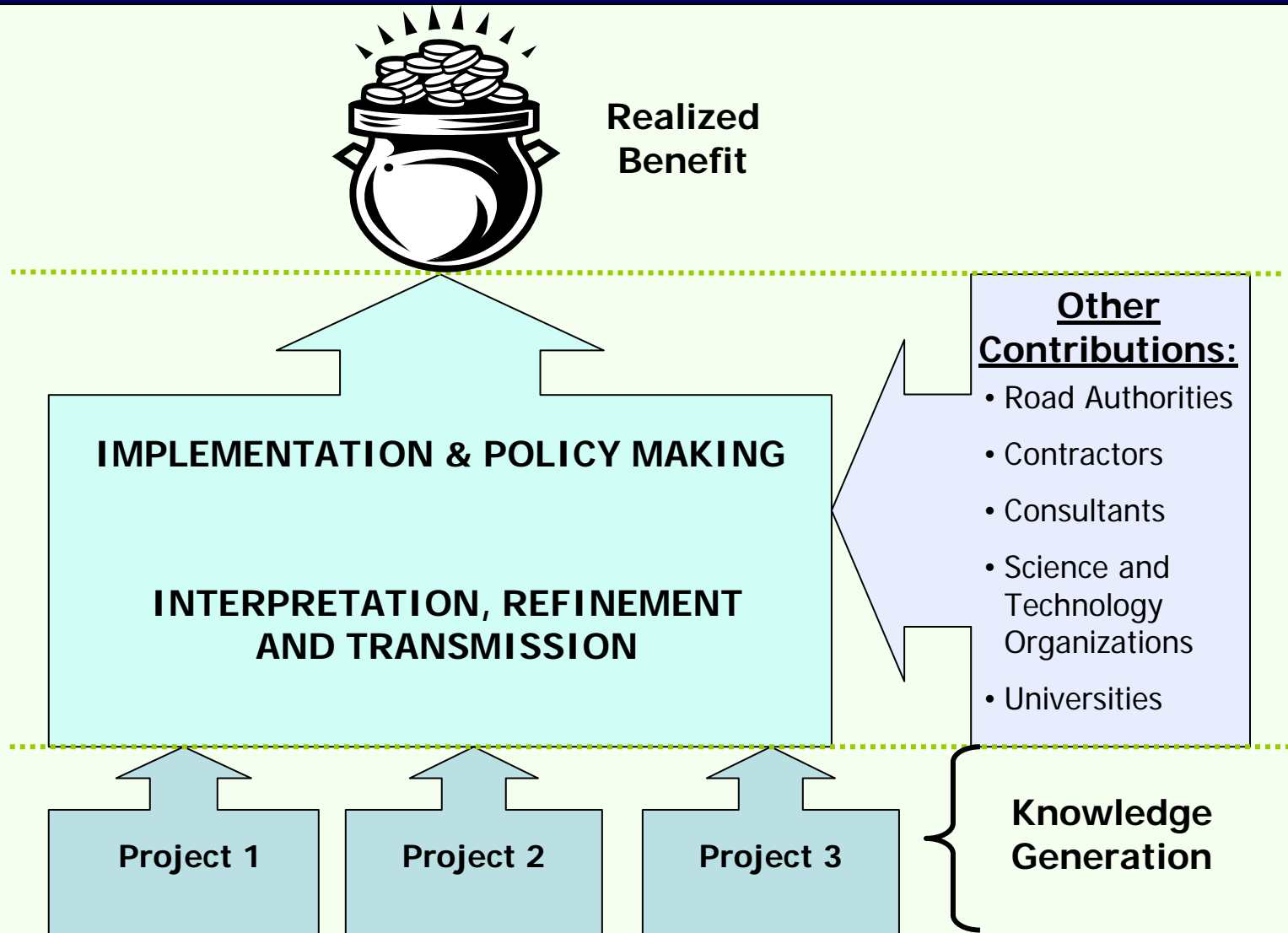
We are here...



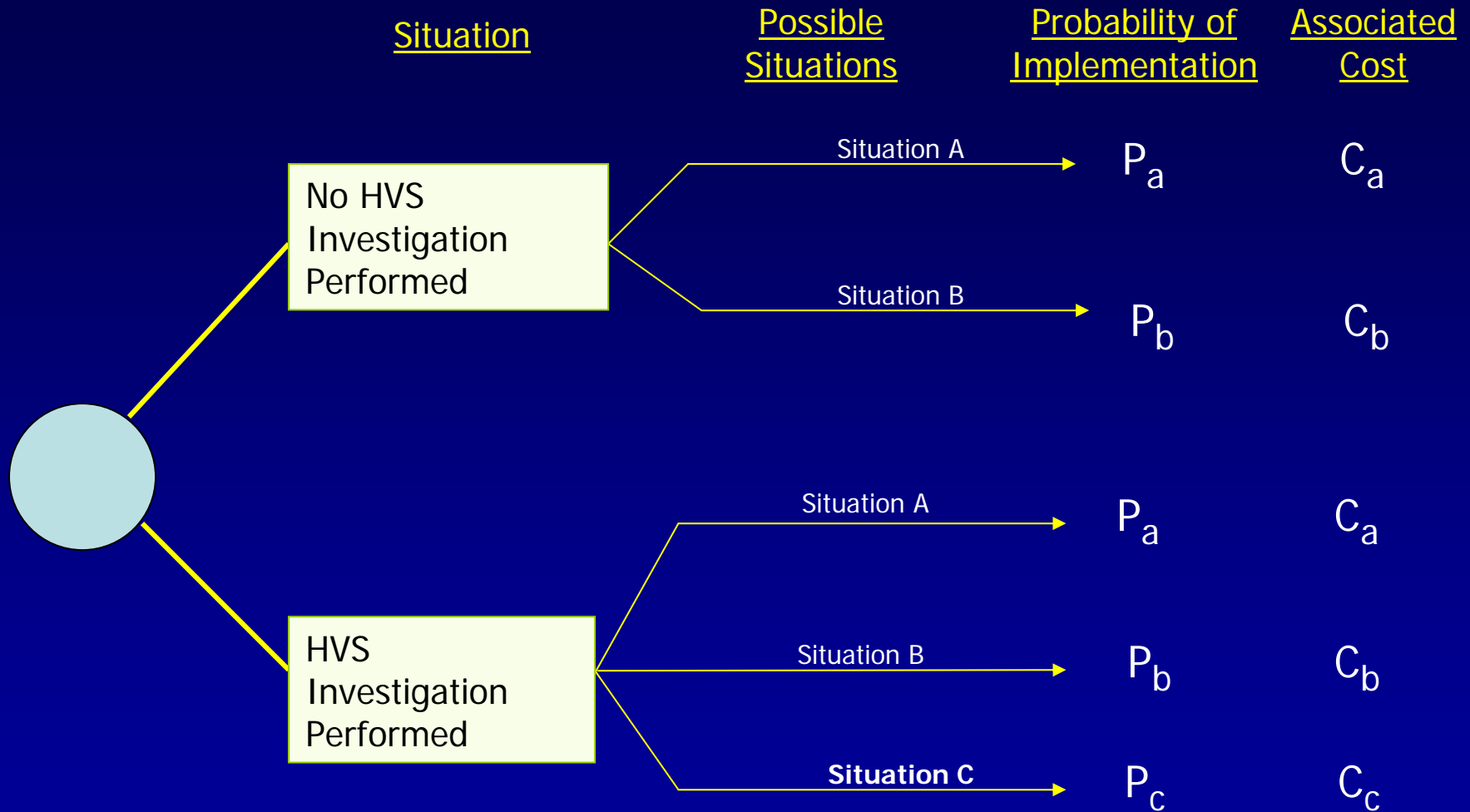
General Concepts: Key Challenges

- Conceptual & Time Related Separation Between Project Impacts and Realized Benefits
- Several projects and processes contribute to Realized Benefits
- Subjective Estimates are Needed to Quantify Benefits

Separation Between Impacts and Realized Benefits



The Need For Subjective Data



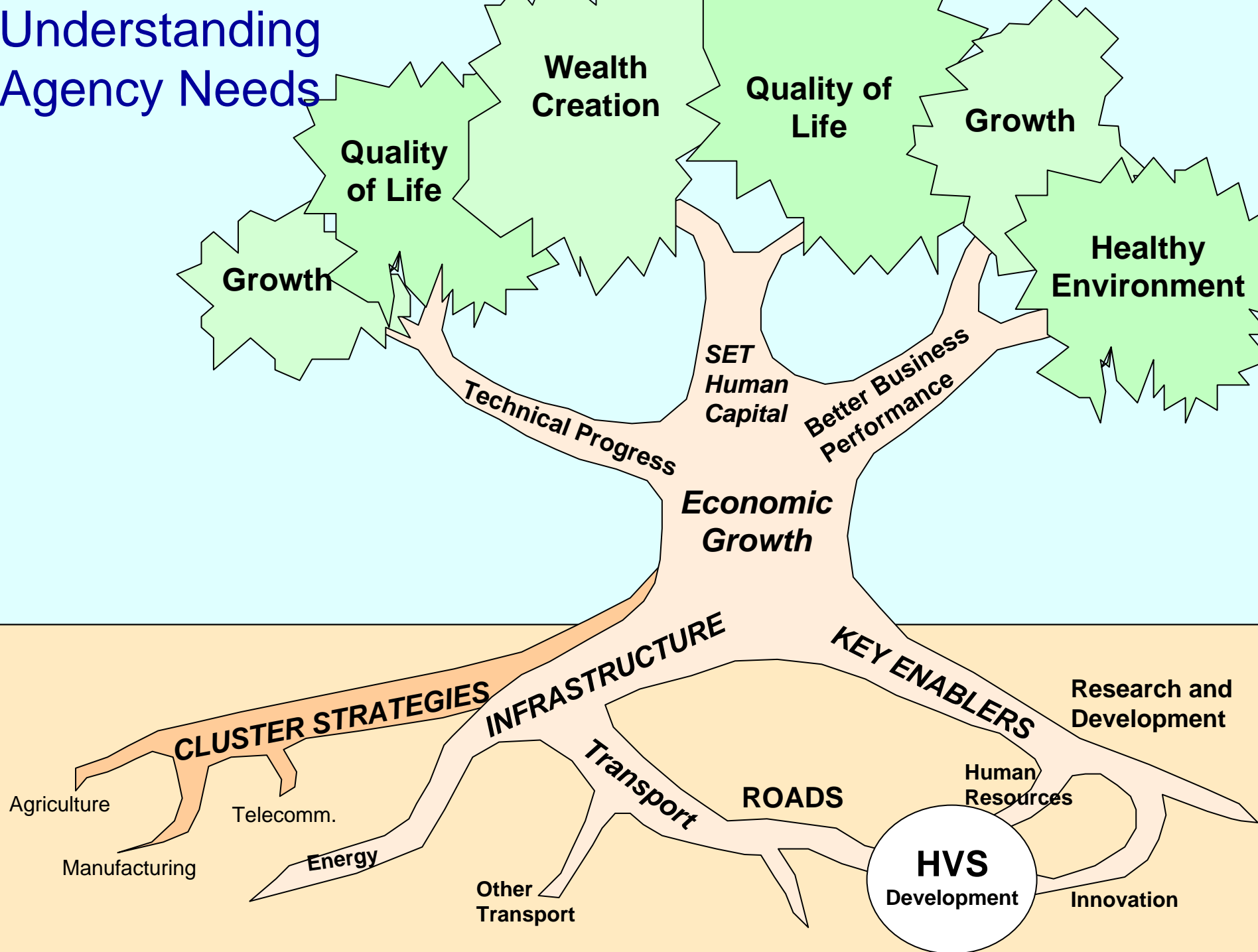
Effective cost for situation i is: $(P_i) \times (C_i)$

General Concepts:

Best Practice Elements

- Understand the Needs & Objectives of the Funding Agency
- Distinguish Between Direct and Indirect Benefits
- Gather Subjective Data by Surveying Users of the System (i.e. Users of Project Outcomes)
- Framework for Benefit Assessment Outlined (tested on G1 Pavements)

Understanding Agency Needs



Project Report

1. Introduction

2. Benefit Assessment: Concepts and Approach

3. General Aspects Related To **Direct Benefit** Assessment

4. **Direct Economic Benefits:** A General Assessment

5. **Direct Economic Benefits:** Specific Projects (**G1 Projects**)

6. **Indirect Benefits**

7. Framework for Benefit Assessment

8. Summary and Conclusions

9. References

We are here...



We are here...



G1 Projects: HVS Context (after Horak et al)

Process:

Discover, organize and apply knowledge on crushed stone layers

Develop & refine specifications, construction process and analytical design method for G1 materials

Formal, designed HVS experiments to validate performance and behaviour models

Outcomes

Increased use of G1 base pavements

Improved construction practices

Design method for unbound materials

Improved understanding of crushed stone behaviour

Increased S&T Excellence and Human Resources

Early TRD Developments, Maree MSc.

HVS Investigations on G1 Base Pavements

1960

1970

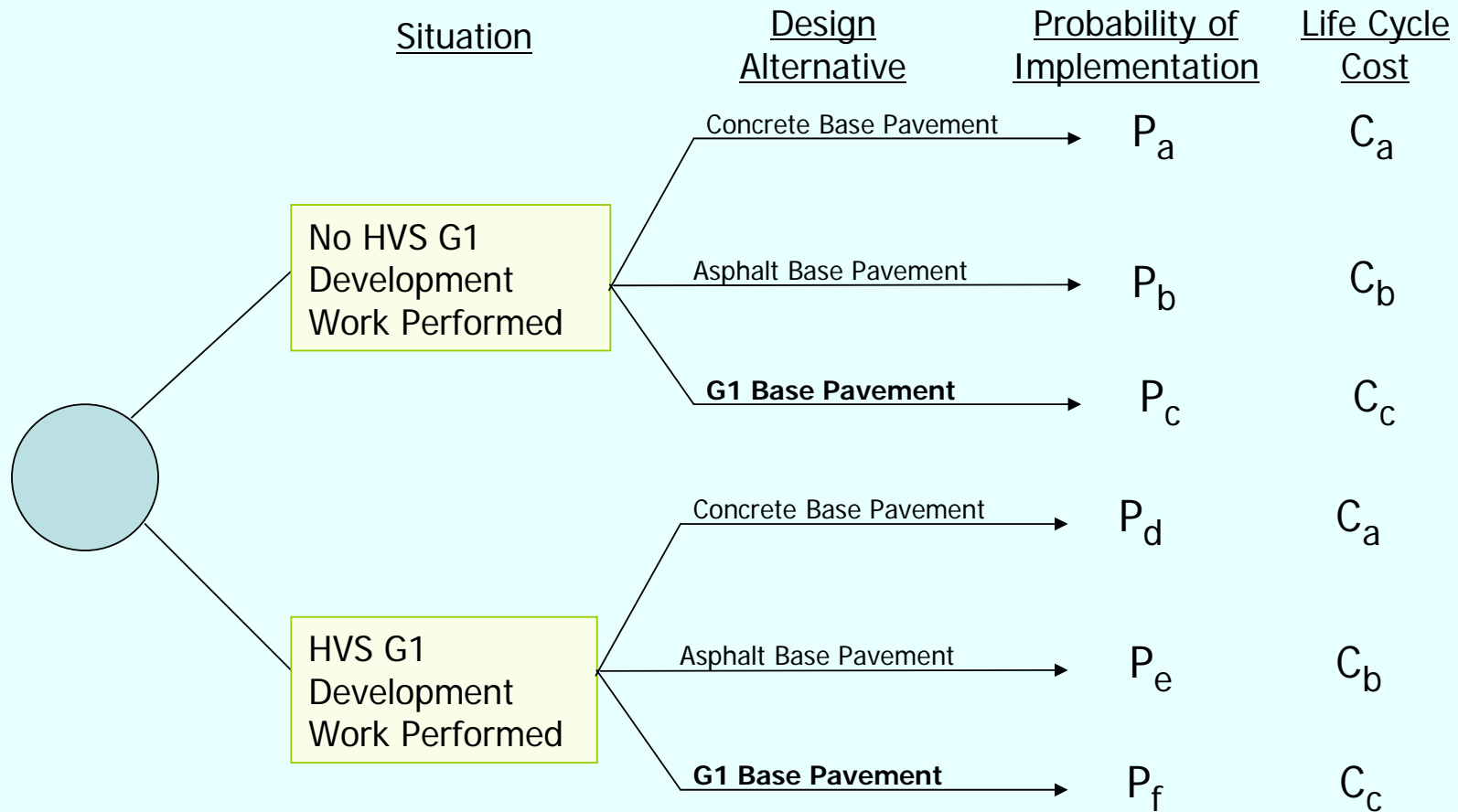
1978

1985

Economic Benefit Assessment: Three Main Benefits

1. Increased use of G1 versus Concrete or Asphalt
2. Increased use of 150 mm instead of 200 mm
3. Better construction and maintenance practices (reduced risk of early failure)

Quantification Methodology



Notation:

P_i = Probability that option i would be implemented

C_i = Discounted life cycle cost for alternative i

Effective cost for alternative i is: $(P_i) \times (C_i)$

Ensuring Credibility

- Interviews to validate impacts and findings
- Details in Appendix D
- Basie Nothnagel
- Emile Horak
- Pieter Strauss
- Dennis Rossmann
- Hoffie Maree
- Gawie Jordaan
- Louw Kannemeyer

Improved Maintenance & Construction

- Savings are in 1985 Terms
- Section 6 : Assumptions Stated Page 34

Life Cycle Costs
Appendix E

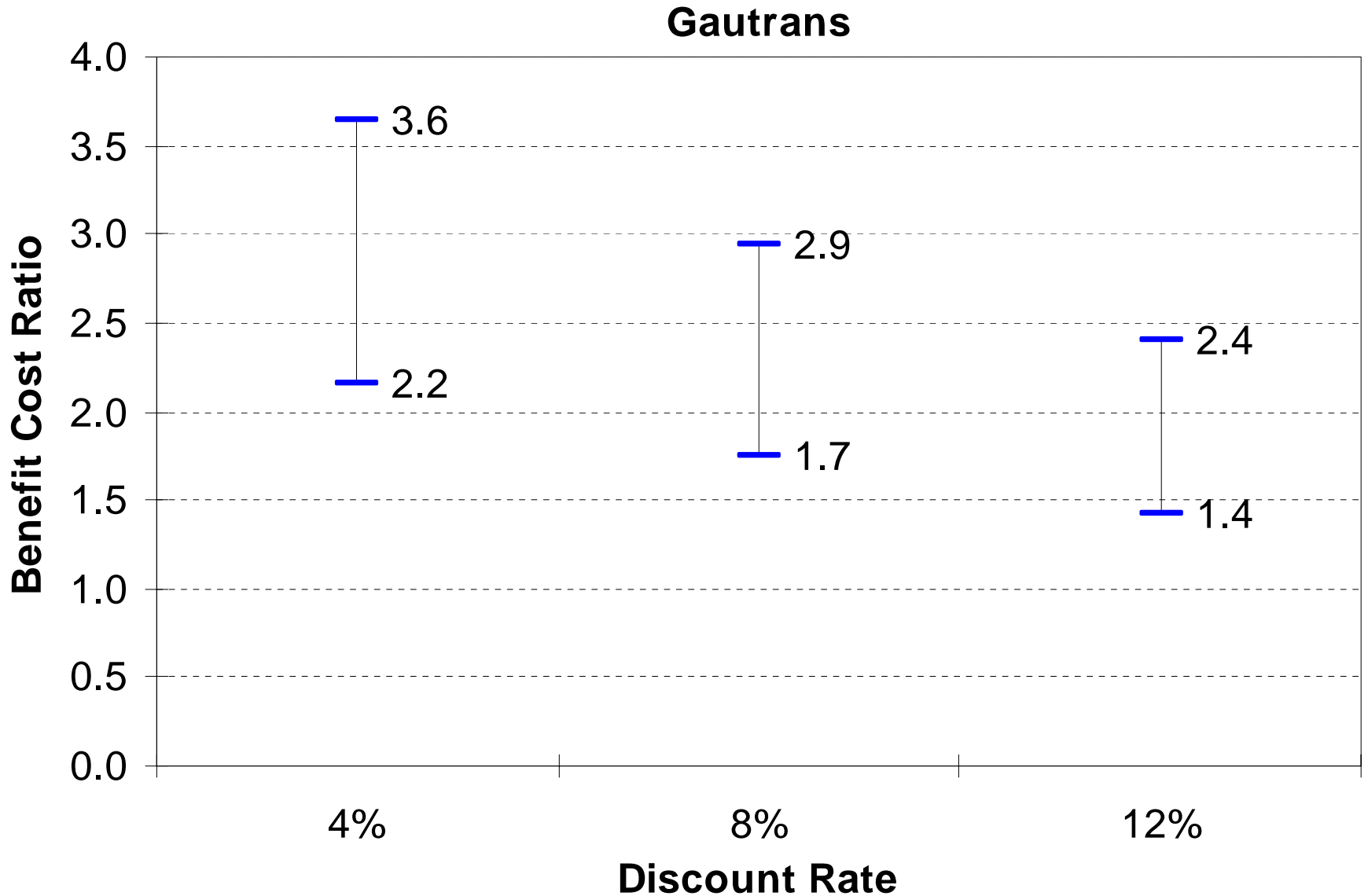
| Roads with > 3 MESA Design Traffic | | | | | | |
|------------------------------------|--------------------------|--------------------------|------------------------------|---------------|---------------------|--|
| Situation | Performance Alternatives | Probability of Realizing | Life Cycle Cost | Adjusted Cost | Total Adjusted Cost | |
| Without HVS Test Programme | Typical | 0.6 | R 18.97 | R 11.38 | | |
| | Delayed Maintenance | 0.3 | R 20.91 | R 6.27 | R 20.34 | |
| | Poor Construction | 0.1 | R 26.88 | R 2.69 | | |
| With HVS Test Programme | Typical | 0.8 | R 18.97 | R 15.18 | | |
| | Delayed Maintenance | 0.15 | R 20.91 | R 3.14 | R 19.66 | |
| | Poor Construction | 0.05 | R 26.88 | R 1.34 | | |
| Savings | R | 0.69 | per square metre | | | |
| | R | 2.67 | per metre of 3.9 m wide lane | | | |
| | R | 2,674.18 | per Km of 3.9 m wide lane | | | |
| Cost Scaling: | Owner | Km | Saving | | | |
| | GAUTRANS | 301 | R 804,928 | | | |
| | SANRAL | 1077 | R 2,880,090 | | | |
| Total Aggregated Saving Estimate = | | | R 3,685,018 | | | |

Scaling Quantities
Appendix C

COST OF DEVELOPMENT

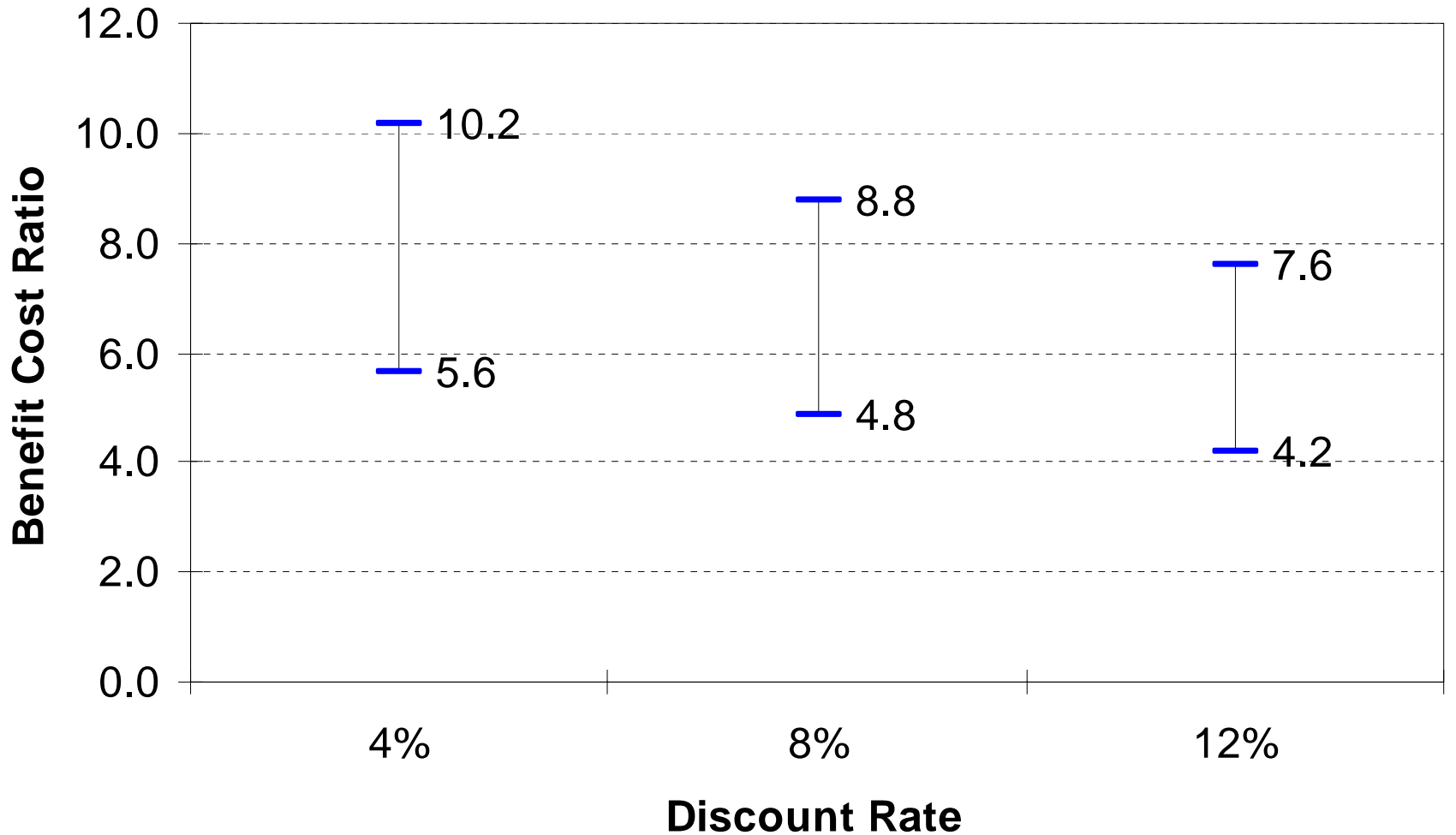
1. Gautrans (TRD) experiments: costs obtained from HVS Operational Budget
2. NDOT experiment: costs estimated on basis of Cost per E80 repetition
3. 20% Additional cost was added for analysis and documentation

Summary: Gautrans

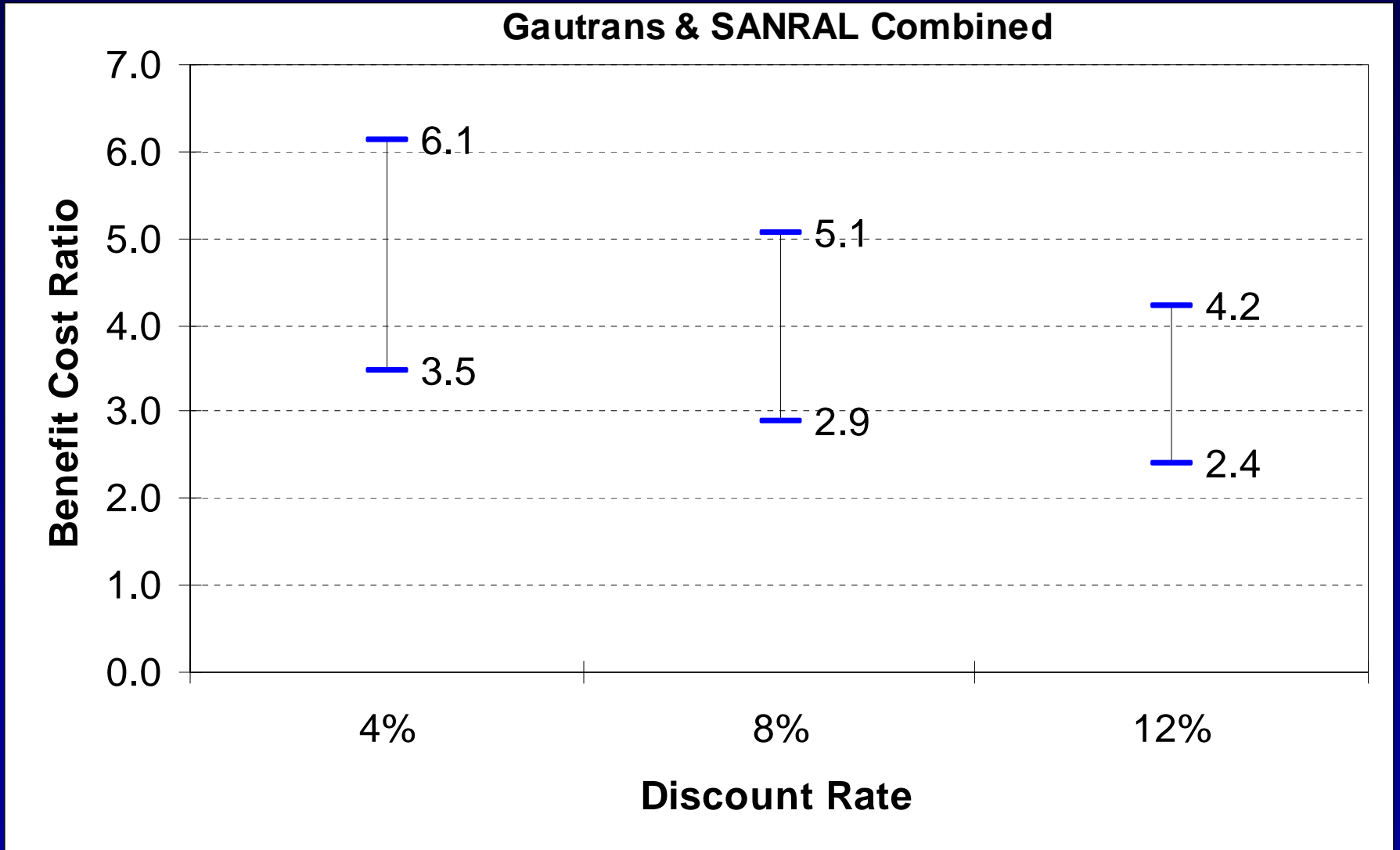


Summary: SANRAL

SANRAL



Summary: Combined



Project Report

1. Introduction

2. Benefit Assessment: Concepts and Approach

3. General Aspects Related To **Direct Benefit** Assessment

4. **Direct Economic Benefits:** A General Assessment

5. **Direct Economic Benefits:** Specific Projects

6. **Indirect Benefits**

7. Framework for Benefit Assessment

8. Summary and Conclusions

9. References

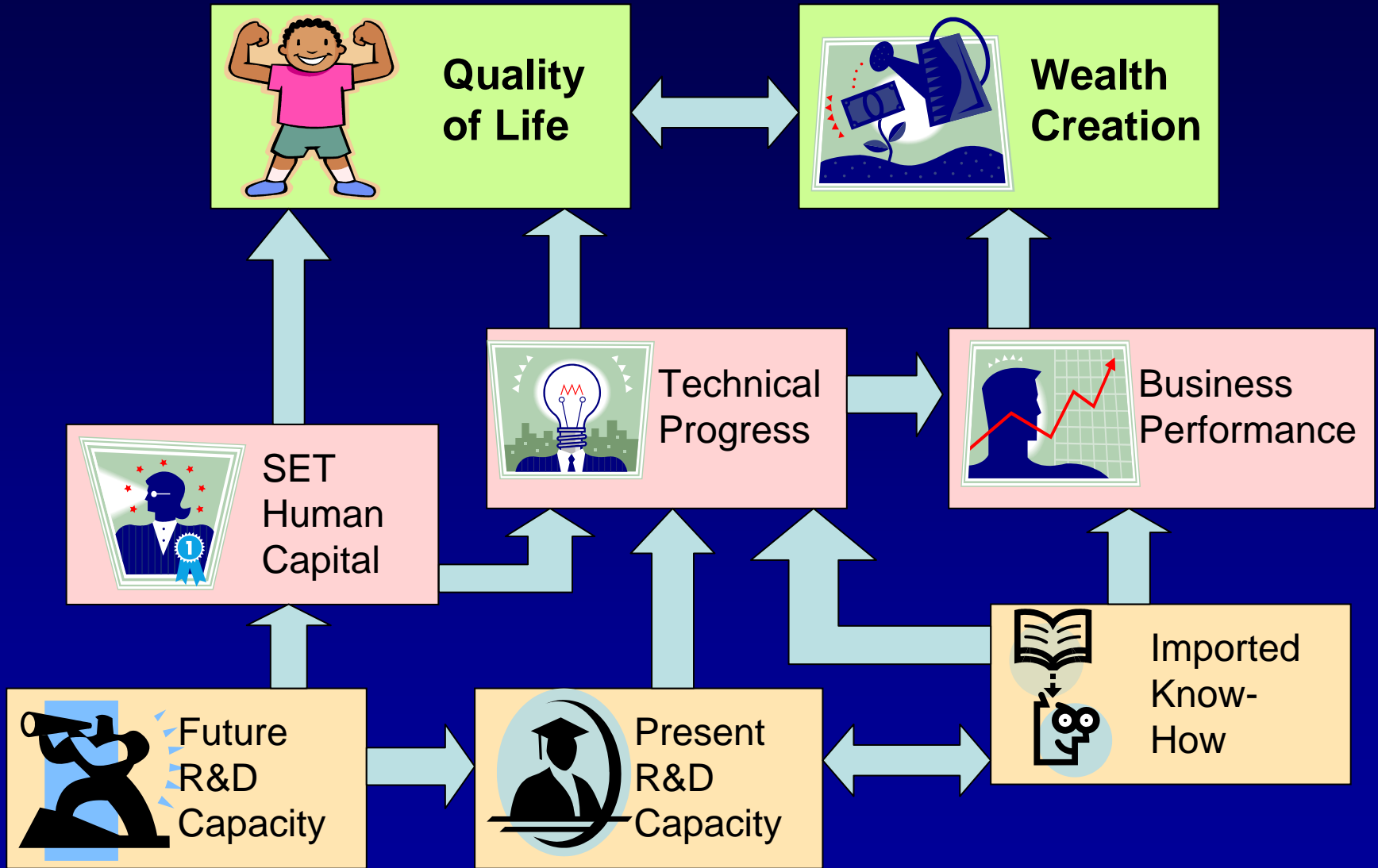
We are here...



INDIRECT BENEFITS

- Overview of Links between R&D and Economic Growth and Quality of Life
- Summary and Discussion of:
 1. Technical Publications
 2. International Alliances Formed
 3. International Exposure Achieved
 4. High Tech Developments and Exports
 5. SET Human Capital

INDIRECT BENEFITS



Project Report

1. Introduction

2. Benefit Assessment: Concepts and Approach

3. General Aspects Related To **Direct Benefit** Assessment

4. **Direct Economic Benefits:** A General Assessment

5. **Direct Economic Benefits:** Specific Projects

6. **Indirect Benefits**

7. Framework for Benefit Assessment

8. Summary and Conclusions

9. References

We are here...



Framework for Benefit Assessment

Qualification of Technical Findings
(by researchers)

- Technical impacts of knowledge gained
- Potential outcomes with and without the project
- "Other" benefits (degrees supported, jobs sustained, specifications affected, etc.)

Identify Main Impacts and Formulate Benefit Assessment Strategy
(benefit assessor)

- Isolate and define key impacts and outcomes with and without knowledge gained
- Estimate contribution ratio of the selected project to the final impact
- Gather information needed for life-cycle cost assessment

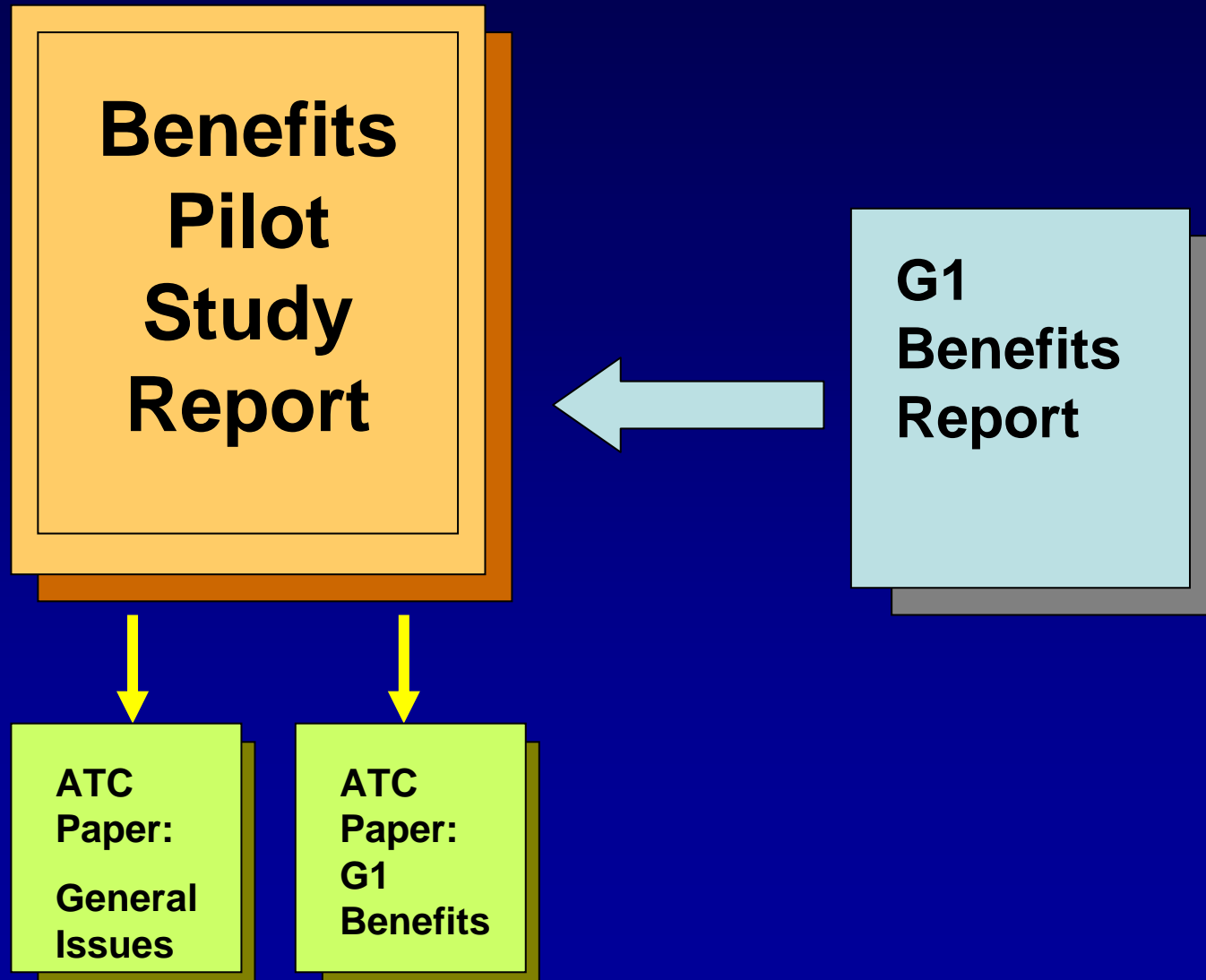
Survey System Users
(benefit assessor)

- Identify users to survey
- Validate identified impacts
- Validate assigned contribution ratios

Quantification of Economic Benefits
(benefit assessor)

- Analysis of pavement life cycle cost for different impacts
- Summarize in terms of economic indicators such as the benefit-cost ratio

Final Deliverables



IMPLEMENTATION OF FINDINGS

- ✓ Guidelines for Work Proposals
- Marketing of Benefits and Concepts
- Improve Indirect Benefit Assessment
- Wider Implementation of Framework (other projects)

Acknowledgements

- E Sadzik (Initiation and Guidance)
- All Interview Respondents
- M de Beer, E Kleyn
- F Long, H Theyse
- Louw du Plessis