

CSIC Asset Management Workshop

28 September 2015

Agenda

- 10:00 Welcome and introduction
- 10:20 Value-based Asset Management
- 10:55 Infrastructure futureproofing
- 11:25 *Coffee*
- 11:40 Asset Information Management
- 12:10 Information Futureproofing
- 12:40 BIM and Condition Monitoring
- 12:50 BIM for existing infrastructure
- 13:00 *Lunch*

Agenda [looking ahead...]

- 13:45 Introduction to CSIC-2
- 14:00 International perspective of AM challenges
- 14:20 Breakout session – 1 (Identifying & Prioritising opportunities)
- 14:50 *Coffee*
- 15:10 Breakout session – 2 (Defining opportunities)
- 16:15 Wrap up and Next steps
- 16:30 *Close*

CSIC Asset Management Projects

Improve the effectiveness of infrastructure asset management

Asset Management
(Challenges of today)

Future proofing
(Challenges of tomorrow)

**Value based decision
making**

**Information
requirements**

**Information future
proofing**

**Infrastructure future
proofing**

Value-based Asset Management

Raj Srinivasan, Ajith Parlikad

CSIC Asset Management Projects

Improve the effectiveness of infrastructure asset management

Asset Management
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**Value based decision
making**

**Information
requirements**

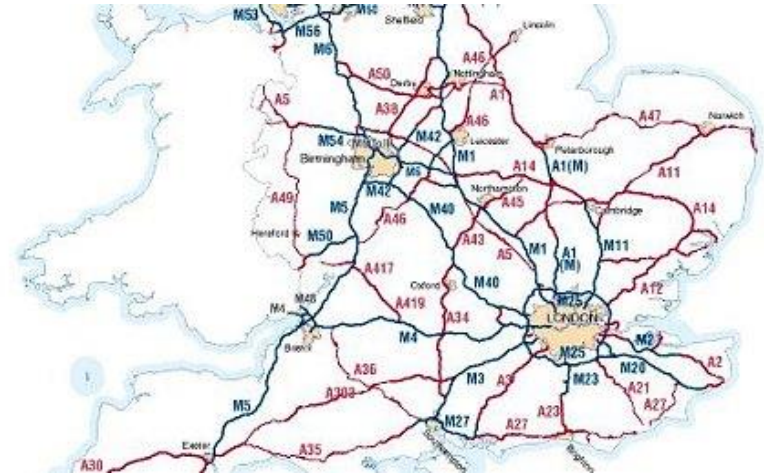
**Information future
proofing**

**Infrastructure future
proofing**

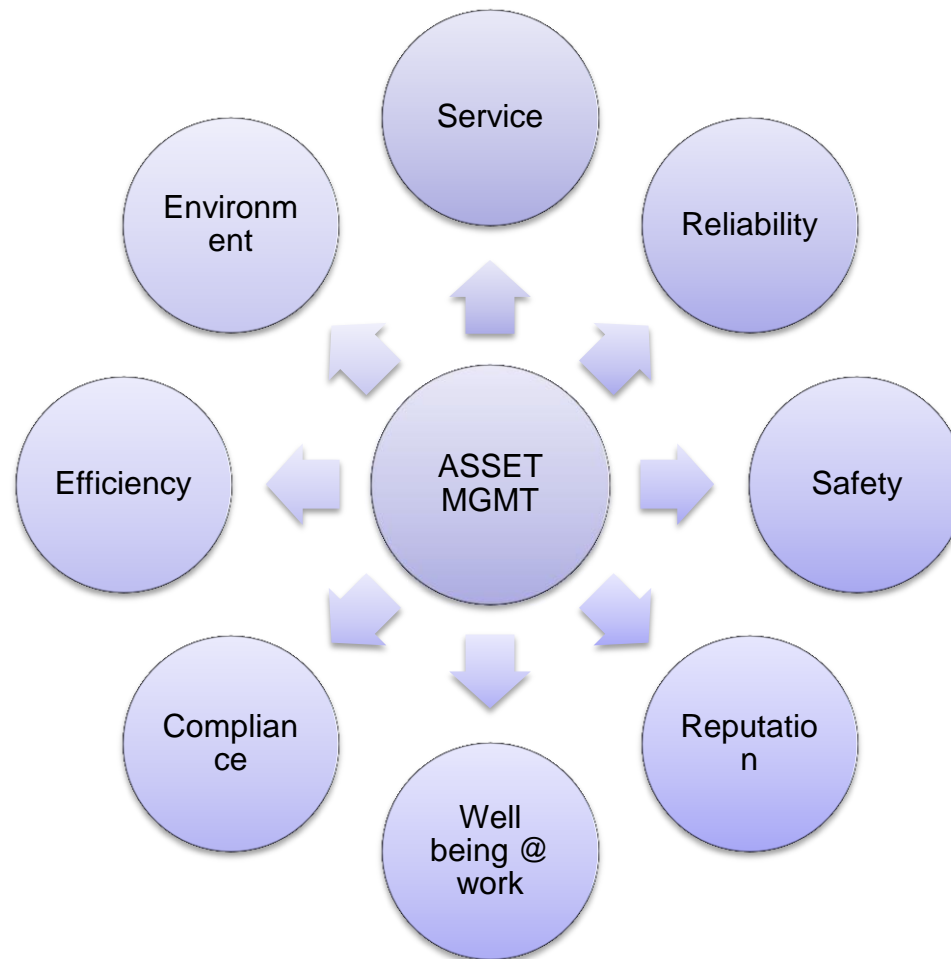
What does “value” mean for infrastructure?

- The infrastructure provides value if it continues to perform its function
 - at the required quality
 - at an acceptable level of risk
 - incurring an acceptable level of expense

- Note 1: Individual assets seldom provide value by themselves
- Note 2: Assets can affect value through their interaction with other assets in the system
- Note 3: “Value” can mean different things to different people



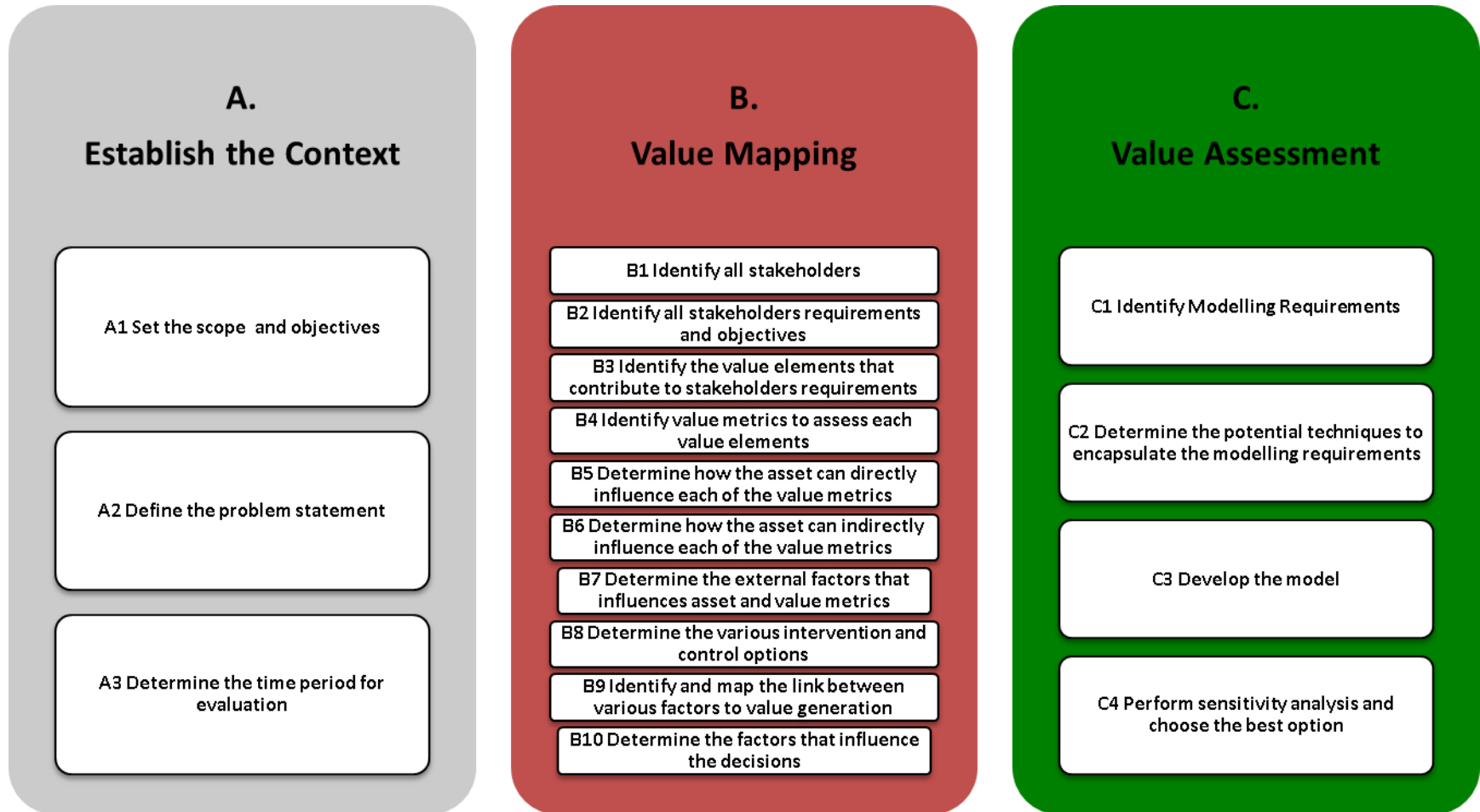
How does asset management generate value?



How is a value-based approach different?

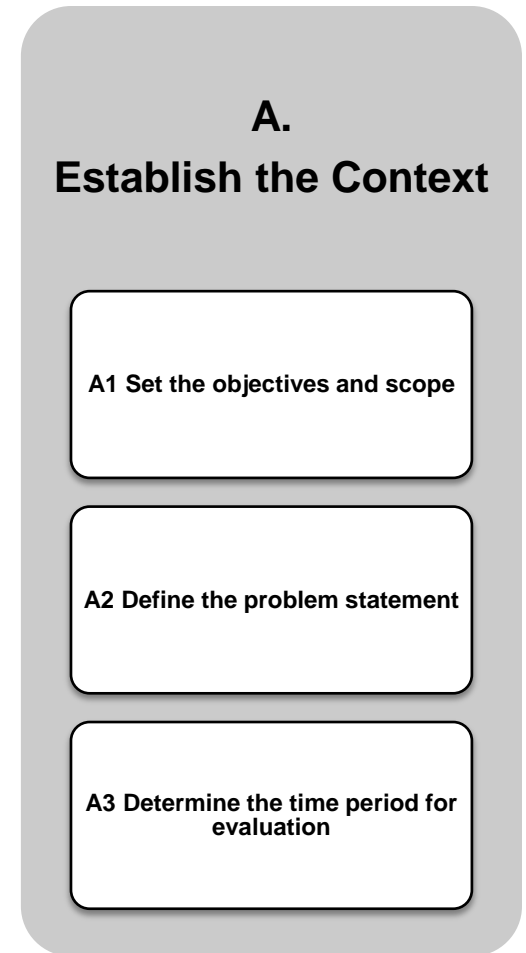
	Cost-based (traditional)	Value-based (recommended)
Core focus	Cost	Cost, Risk, Performance
Unit of analysis	Generally focusses on asset specific issues	Focusses on system level dependencies and business value
Management philosophy	Minimize expenditure while maintaining satisfying performance requirements	Maximize performance and minimise risk while satisfying budgetary constraints
Stakeholder focus	Decision maker	All stakeholders of the asset (e.g., owner, operator, user, regulator)
Impact on service	Maintain minimum service levels	Explore innovative approaches to improve service levels
Difficulty	Well established body of knowledge	Concepts not well understood in theory and practice

Systematic approach for value based decision making



A. Establish the Context

- The main objectives of this stage are:
 - To clearly identify the objectives and scope
 - To define the problem
 - To determine the time period for evaluation



B. Value Mapping

- Main stage of the process
- Captures the value generation process
- Produces a value map as an output depicting
 - How the value is created
 - What influences or affects this value
 - How to control this value

B. Value Mapping

B1 Identify the stakeholders

B2 Identify stakeholders requirements and objectives

B3 Identify the value drivers that contribute to stakeholders requirements

B4 Identify the value metrics to assess each value driver

B5 Determine how the asset can directly influence each of the value metrics

B6 Determine how the asset can indirectly influence each of the value metrics

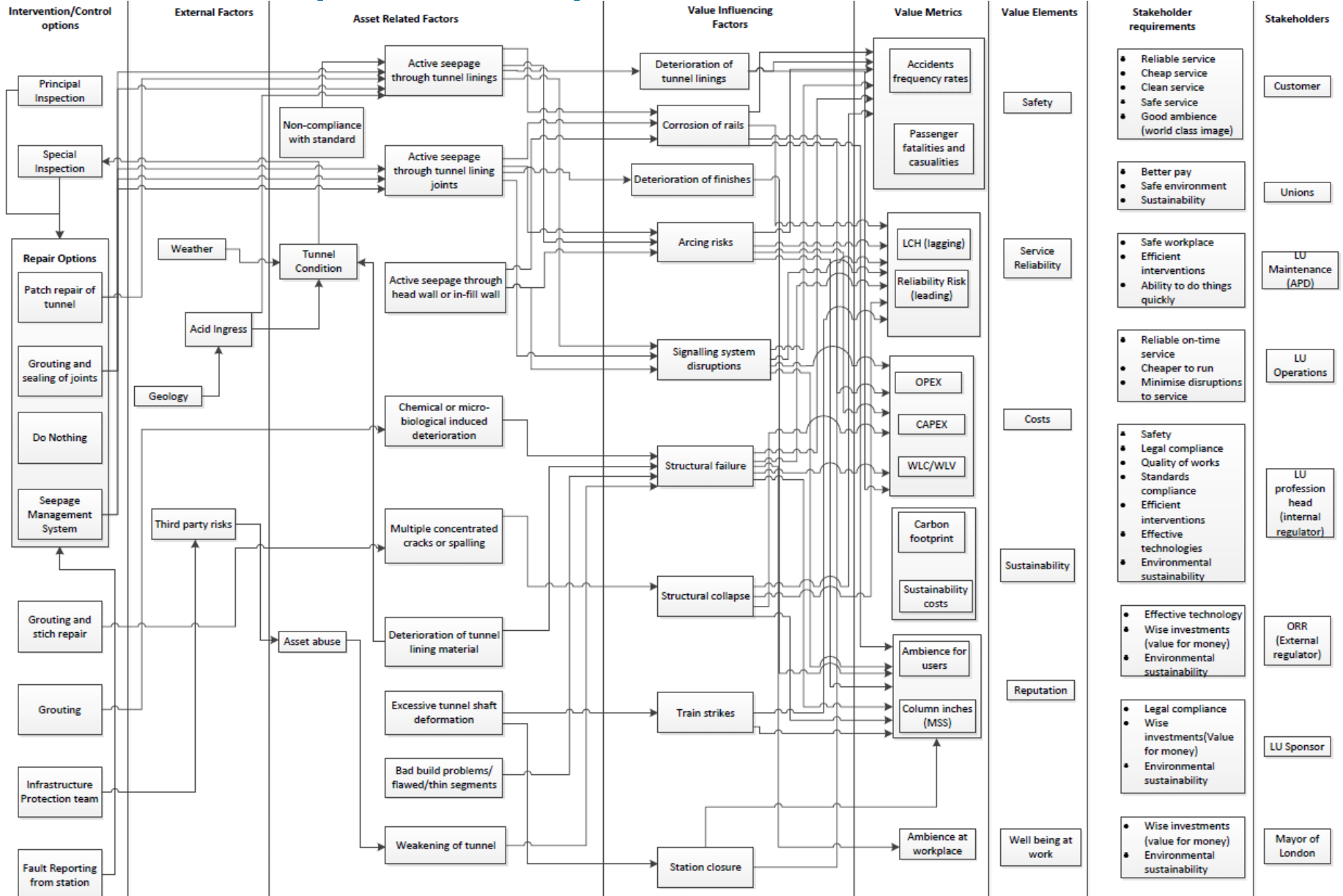
B7 Determine the external factors that influences asset and value metrics

B8 Determine the intervention and control options

B9 Identify and map the link between various factors to value generation

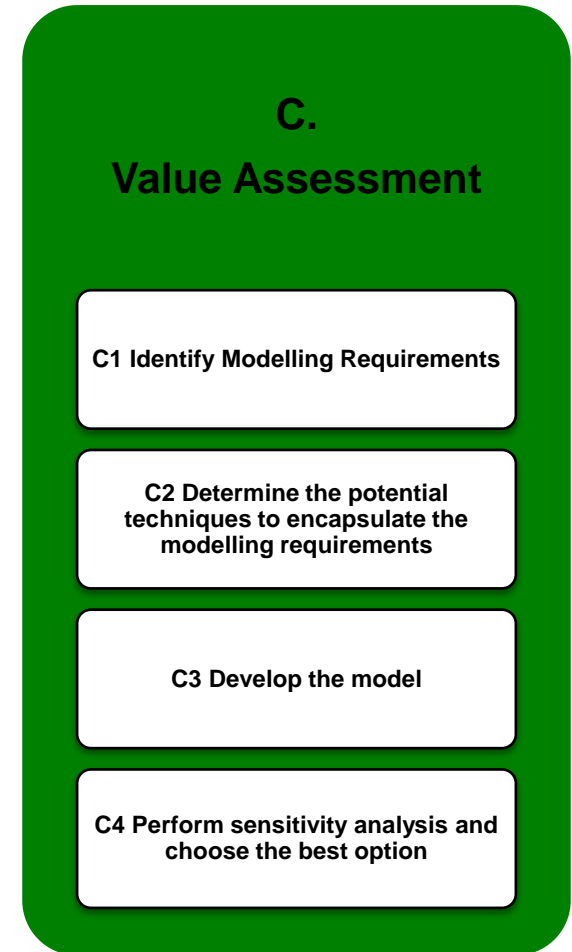
B10 Determine the factors that influence the decisions

Value Map for Deep Tube Tunnels



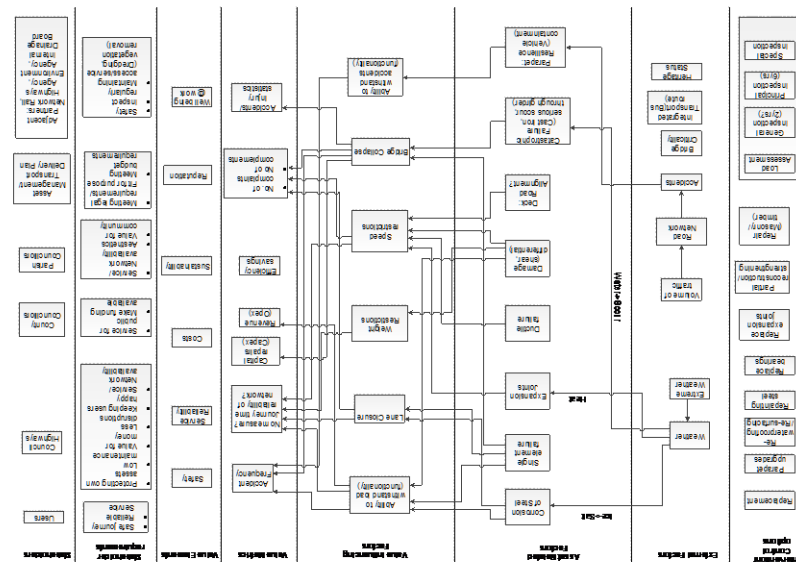
C. Value Assessment

- The main objectives of this stage are:
 - Using value map, to identify the key modelling requirements for the identified problem
 - To determine potential techniques to model
 - To develop the model
 - To perform sensitivity analysis
 - To choose the best option

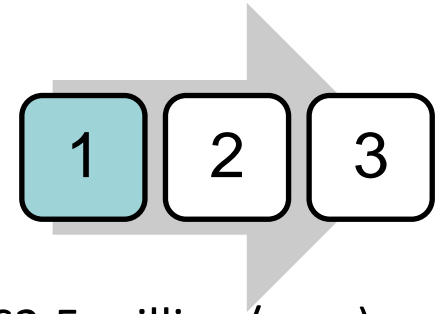


Case Study 1: Cambridgeshire County Council

- Problem: The council has to maintain around 1500 bridges. Budget constraints limit the amount of maintenance work that can be performed each year.
- Approach: Developed spreadsheet prioritisation tool based on value and criticality of different bridges.
- Benefits:
 - Confidence to justify expenditure and maintenance programming of the structures
 - Target limited resources to the benefit of the local communities

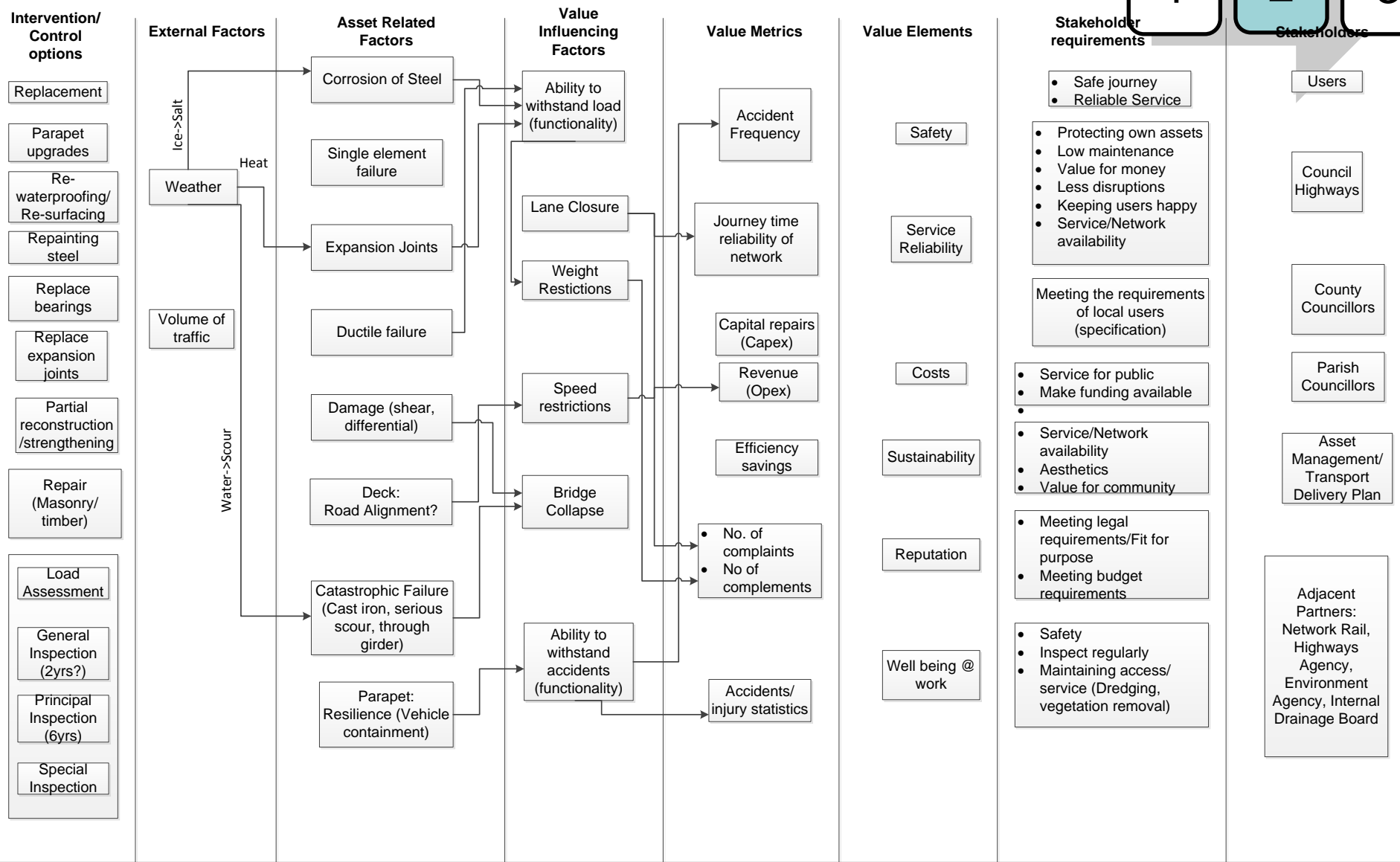


1. Establish context



- There are 1500 bridges and there is a budget constraint (£2.5 million/year)
- To allocate the OPEX for the bridge works, only a percentage of jobs can be selected
- Current method of prioritisation fails to differentiate between a low value bridge and a high value bridge
- Key question: How to identify the value of a bridge and how can this be used to prioritise the jobs for different bridges?

Value Map for a bridge



Decision Influencing Factors

Integrated Transport(Bus route)

Heritage Status

Road Network

Value assessment output



Value of bridge

Bridge	Impact to Network	Road Classification	Traffic Volume	Integrated Transport	Heritage Status	VALUE SCORE	Classification
Huntingdon River Bridge	Minor impact on network	B road	>1000 HGVs & >12500 veh/day	Bus route or strategically important	Listed or heritage structure	80	High
Alconbury Bridge	Minor impact on network	Unclassified (U)	0-10 HGVs & <200 veh/day	Bus route or strategically important	Listed or heritage structure	50	Medium
Whittlesford Railway Bridge	Major impact on network	A road/Strategic A road	501-1000 HGVs & 7001-12500 veh/day	Bus route or strategically important	No heritage or local interest	80	High
Split Drove Junction	No impact on network	Unclassified (U)	0-10 HGVs & <200 veh/day	No bus route and or not strategically important	No heritage or local interest	20	Low
Milebrook Bridge	No impact on network	Unclassified (U)	0-10 HGVs & <200 veh/day	Bus route or strategically important	No heritage or local interest	30	Low
New Bedford River Bridge	Minor impact on network	Unclassified (U)	0-10 HGVs & <200 veh/day	No bus route and or not strategically important	No heritage or local interest	30	Low



Prioritisation of works

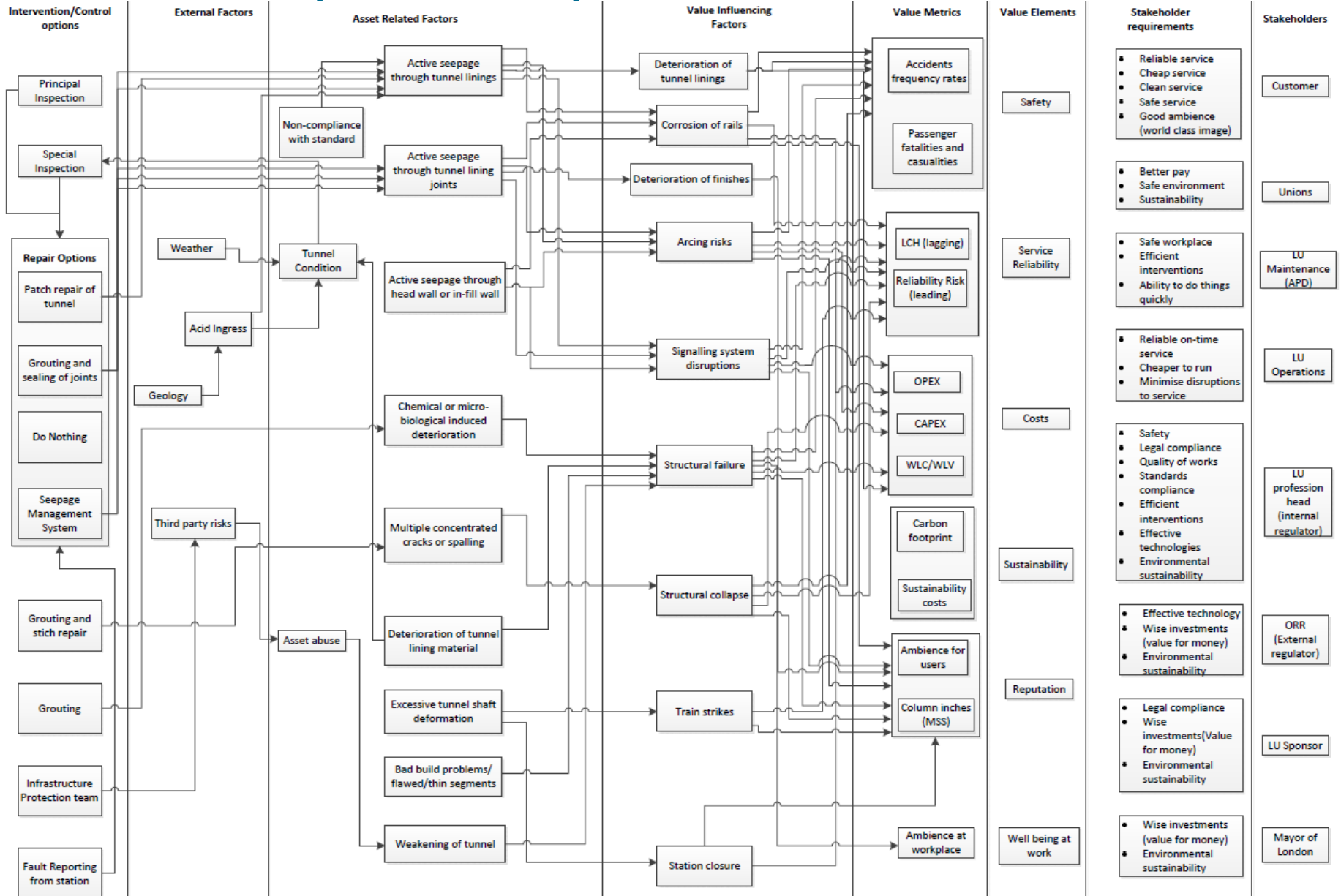
Bridge	Before (If work is not carried out)			After (If work is carried out)			Change in Risk	Classification	Impact of work and value of bridge	Cost	Cost Score	Final Impact
	Fatigue	Safety	Service	Risk Score (before)	Safety	Service						
Huntingdon River Bridge	Frc	Minor Safety Problem	Major impact on service	80	No impact on safety	No service disruption	0	80 High	100	> 2M	50	150
Alconbury Bridge		Minor Safety Problem	Major impact on service	80	No impact on safety	Less impact on service	20	60 Medium	60	0.1M < 0.5M	90	150
Whittlesford Railway Bridge		Minor Safety Problem	Minor impact on service	60	Minor Safety Problem	No service disruption	30	30 Low	60	0.5M > < 1M	80	140

Case Study 2: London Underground Tunnels

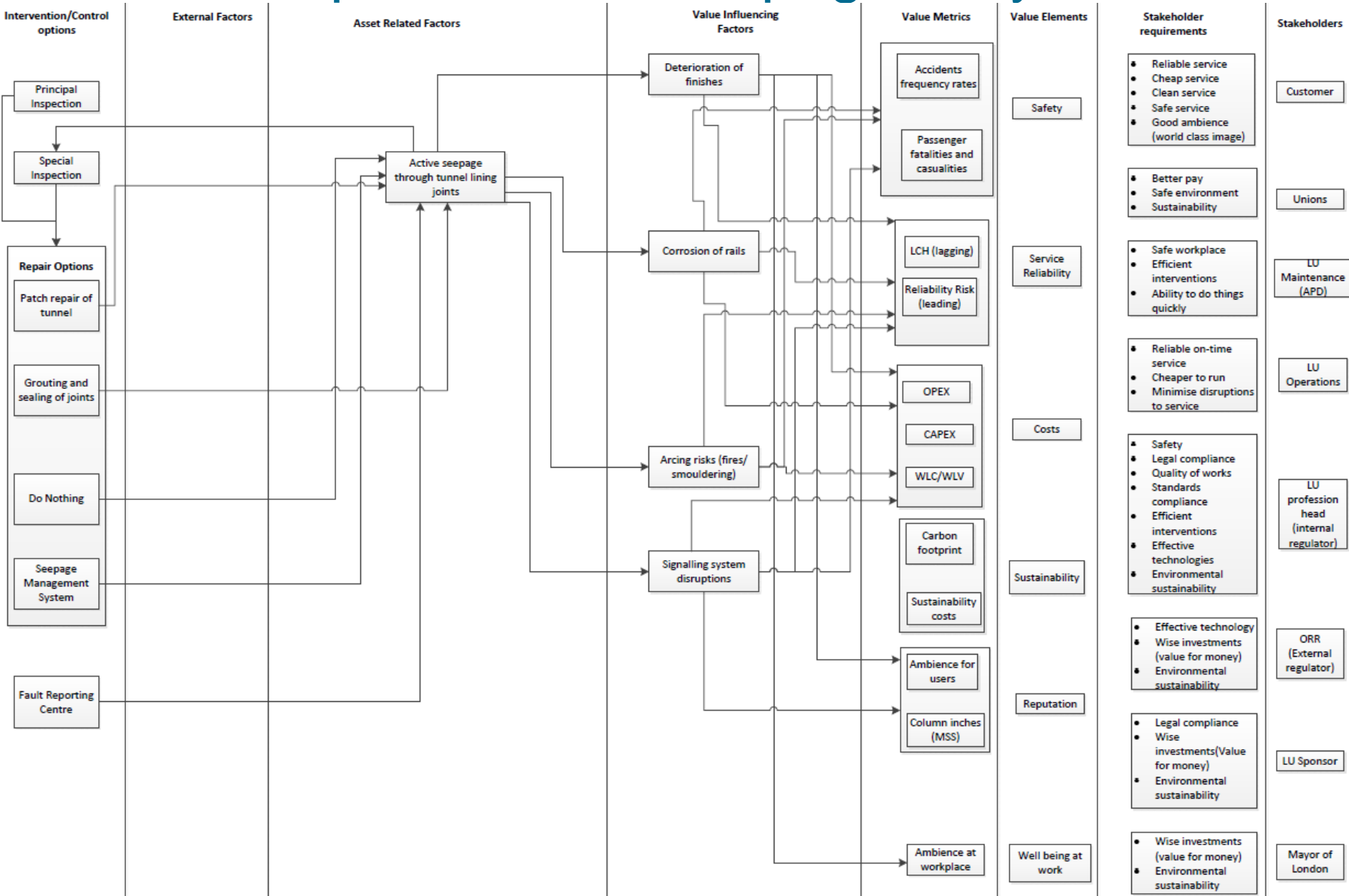
- Problem: Seepages have occurred in several areas on the London Underground Bakerloo Line. Significant maintenance effort is required to prevent these issues affecting the reliability of the service.
- Approach: Use a value-based approach for choosing the best possible repair solution that provides the best value to stakeholders over 30 years
- Benefits:
 - improve the ability to make good investment decisions and achieve maximum value benefits from a given level of investment.
 - provides a standardised approach for making decisions throughout LU



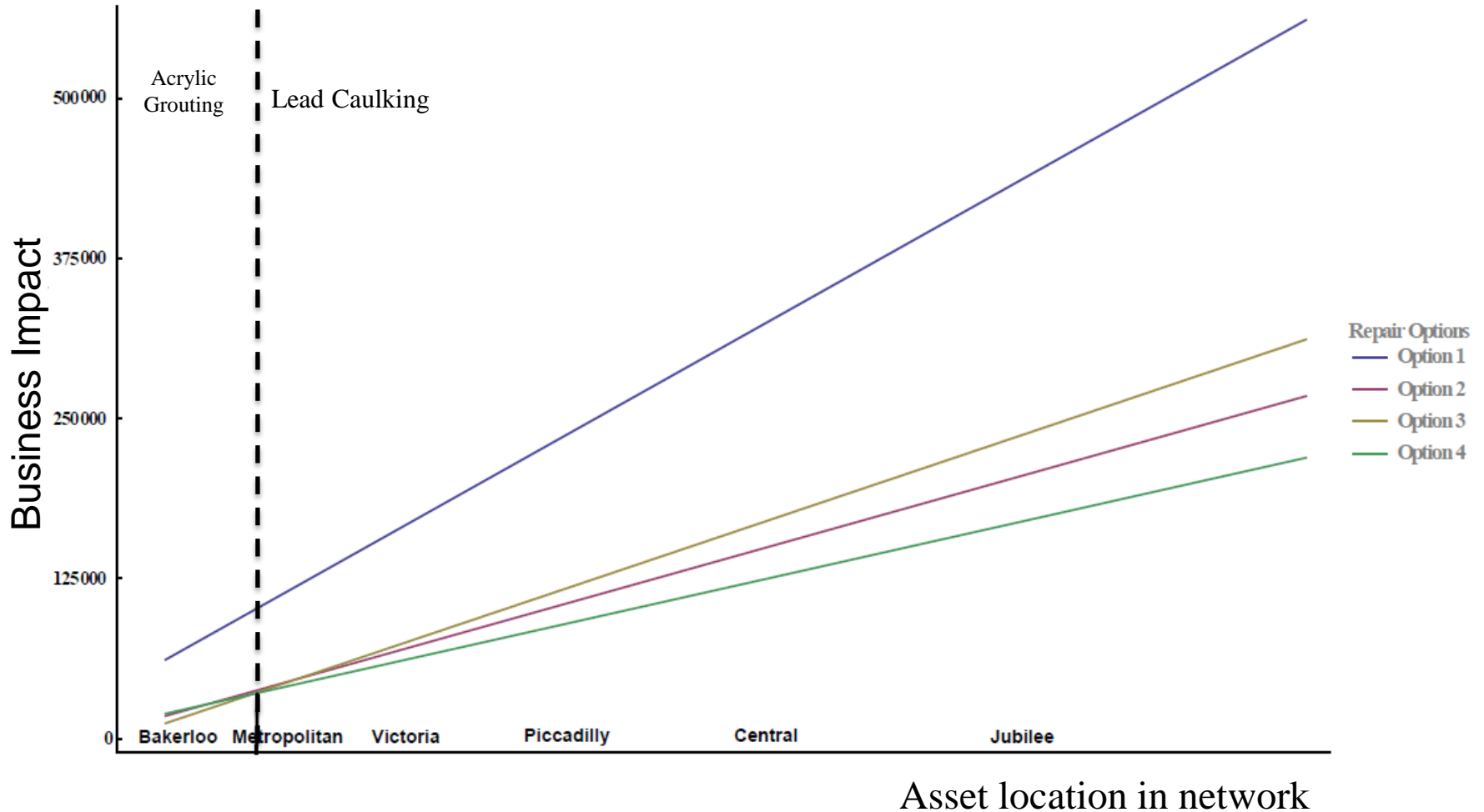
Value Map for Deep Tube Tunnels



Value Map for Active Seepage Only



Value assessment output

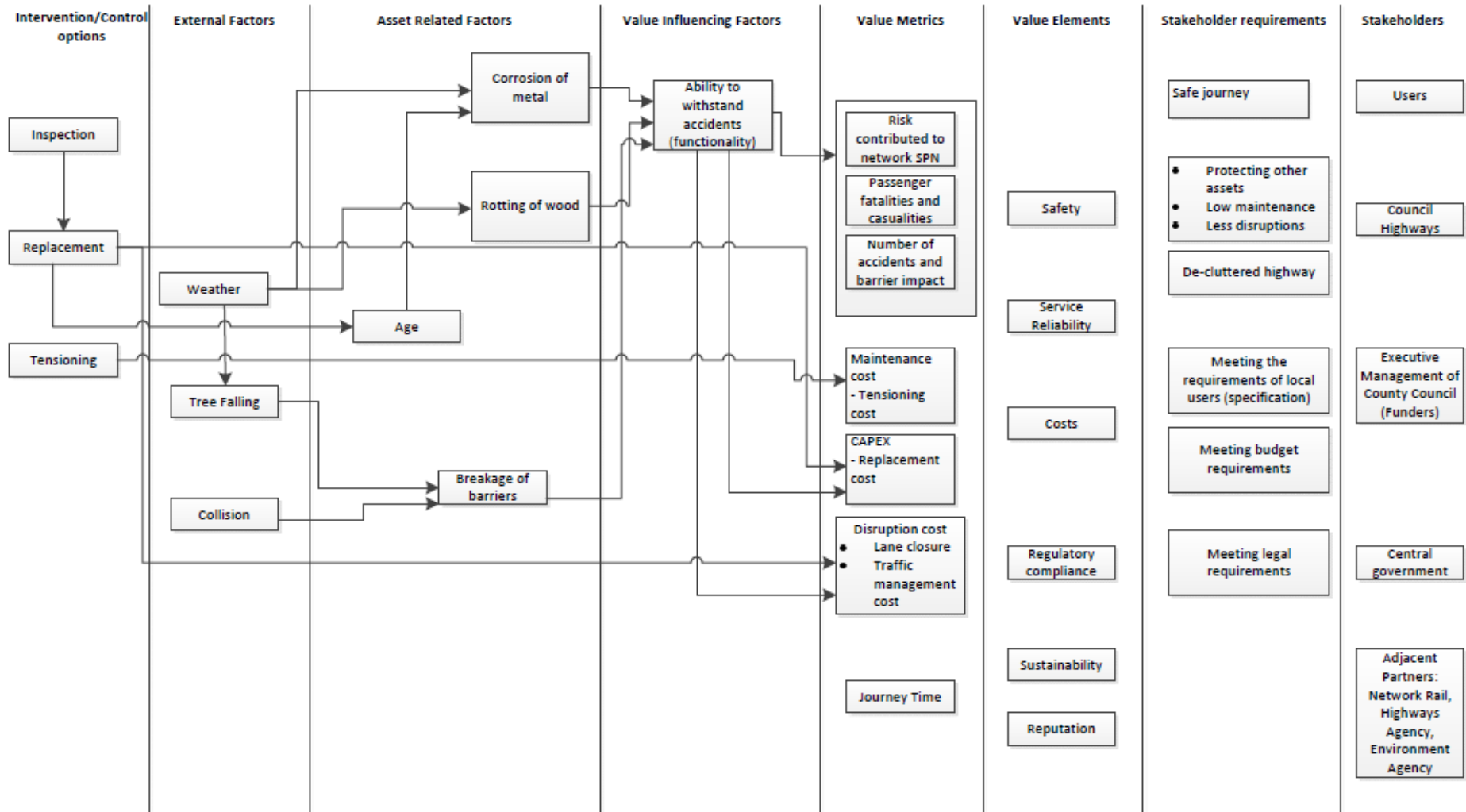


Case Study 3: Surrey County Council

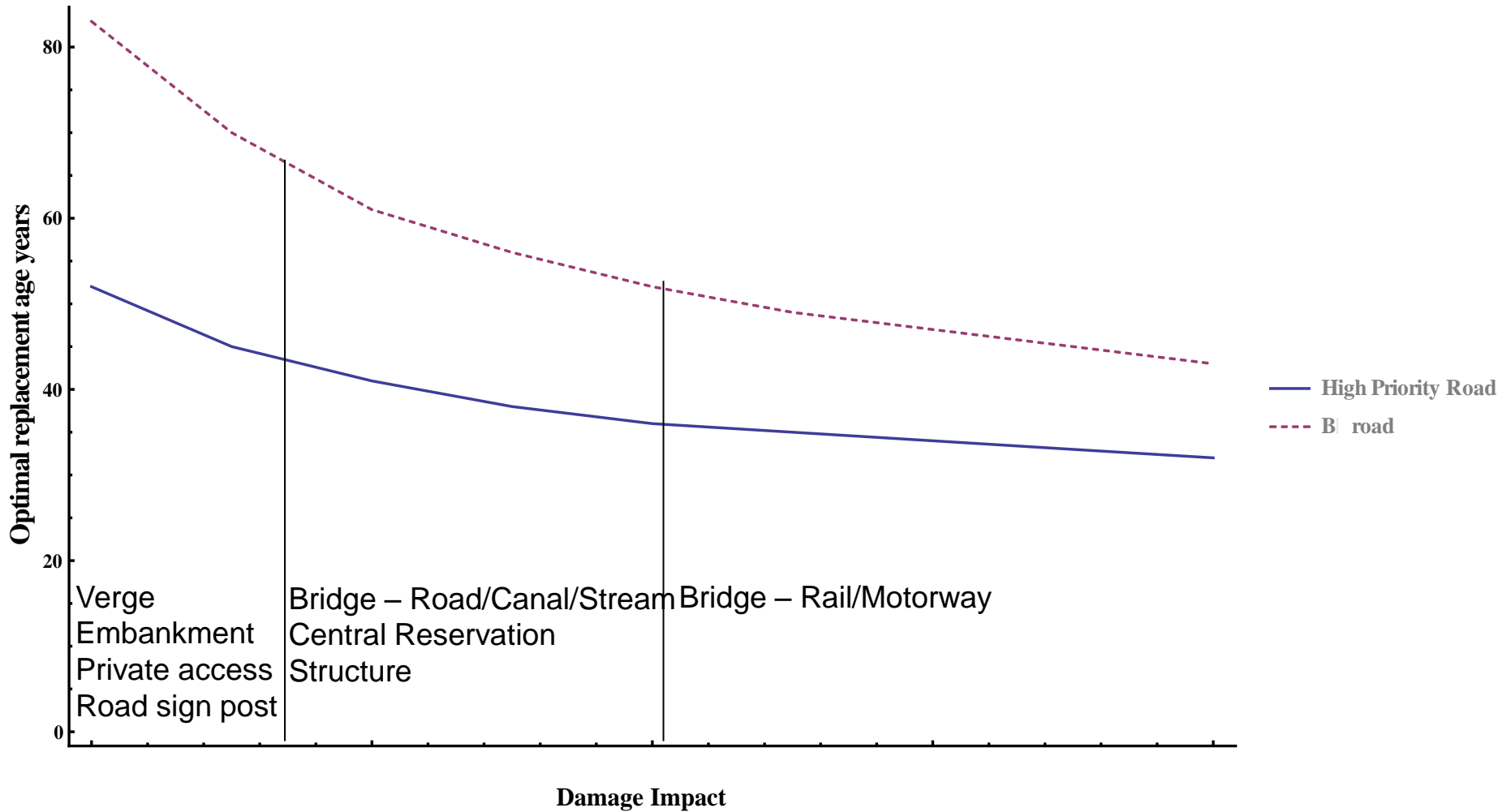
- Problem: A large number of highway safety barriers have been in use beyond their intended life. Justifying investment in replacing them is challenging due to their perceived low-value.
- Approach: Used the value-map to calculate the value of safety barriers at different locations optimised replacement timing.
- Benefits:
 - Enables a clear business case to be made to the Council for safety barrier replacement.
 - Provides a standardised value-based approach for making decisions throughout the Council



Value Map for Safety Barriers



Value assessment output



What's next?

- Guidance document to be published by ICE
- 2 Journal papers in preparation
- Consultancy via IfM ECS
- Further research proposals (e.g. EPSRC, Innovate UK, Industry funded)

Guidance document

To be published by ICE
Final draft Stage
Expected Completion: October 2015

1. Introduction
 1. Purpose
 2. Scope
 3. Audience
 4. Structure
2. Value Driven Asset management
 1. Overview
 2. Why value?
 3. What is value?
 4. Benefits
3. Whole life value process
4. Stage A: Establish Context
 1. Set scope and objectives
 2. Define the problem
 3. Determine time period
5. Stage B: Value Mapping
 1. Identify Stakeholders
 2. Identify Stakeholders requirements
 3. Identify value elements
 4. Identify value metrics
 5. Determine the direct factors that influence value
 6. Determine the indirect factors that influence value
 7. Determine the external factors
 8. Determine the various intervention and control options
 9. Identify and map the links
 10. Determine the decision influencing factors
6. Stage C: Value Assessment
 1. Identify modelling requirements
 2. Determine solutions to represent value
 3. Develop the model
 4. Sensitivity Analysis
7. Case Study
 1. London Underground Tunnels
 2. Surrey County Council Safety Barriers
8. Conclusions and Recommendations

Concluding remarks

- The process
 - ...provides a systematic methodology to make decisions based on WLV
 - ...provides clarity regarding the concept of asset value and how the value needs to be managed
- The value map
 - ...has the potential to become the cornerstone of infrastructure asset management strategy and planning when developed at the portfolio, system and asset levels
 - ...is an effective communication tool across the organisation to highlight the value generation process and value management options
 - ...enables the identification of information required to support AM
- **We are only scratching the surface of value-based asset management!**