



Circular Economy in Road COnstruction and Maintenance

Aims and Results

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Research Driven Solutions

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CERCOM - Circular Economy in Road Construction and Maintenance



Best practice

An inventory of the systems / approaches appropriate at different stages of the journey towards circularity



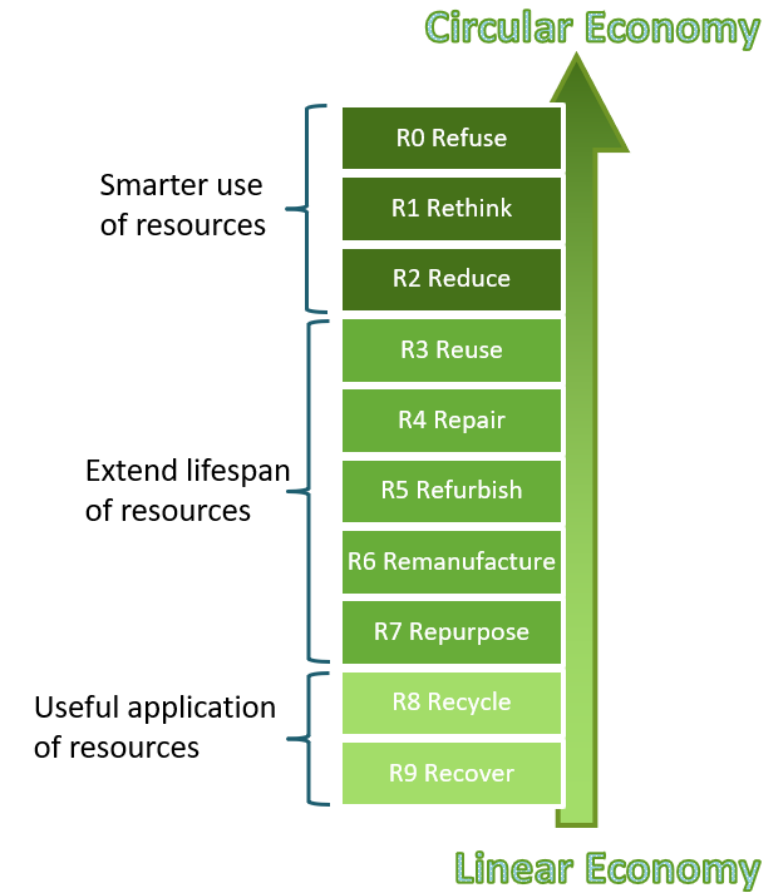
Risk based analysis framework

A framework and suitable KPIs supporting the lifecycle assessment of resource use and impacts



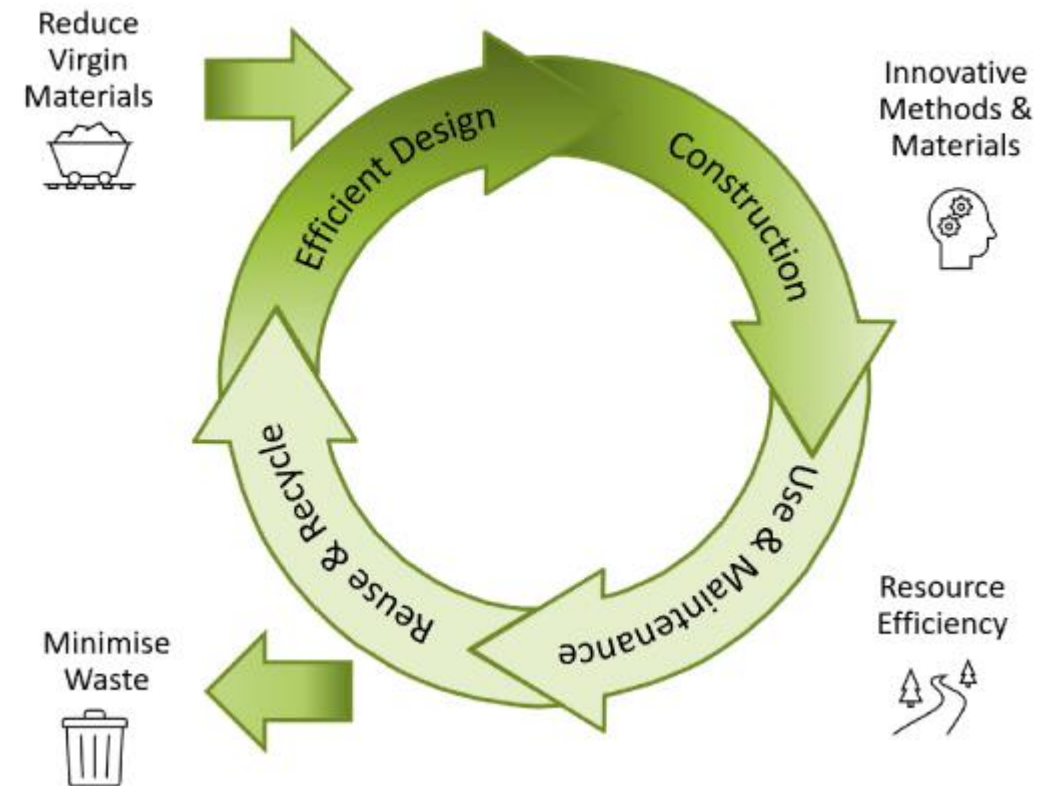
Resource and training

Guidance, training seminars and on-line materials for managers and practitioners



Circular Economy and Resource Efficiency means, by design:

- *Minimising consumption of natural resources*
- *Designing out waste and keeping resources in use and at their highest level of utility*
- *Optimising the value obtained within each lifecycle*
- *Improving environmental performance and contributing to societal development*

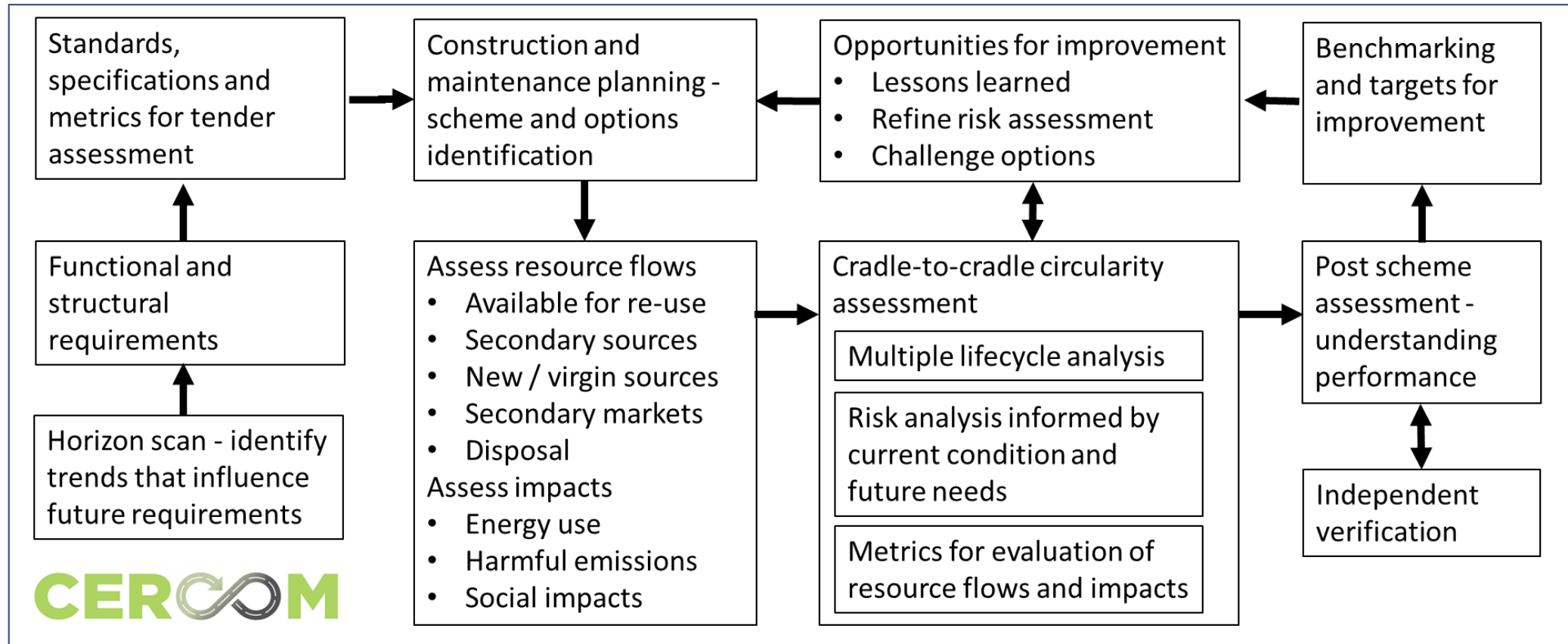


Maturity Matrix

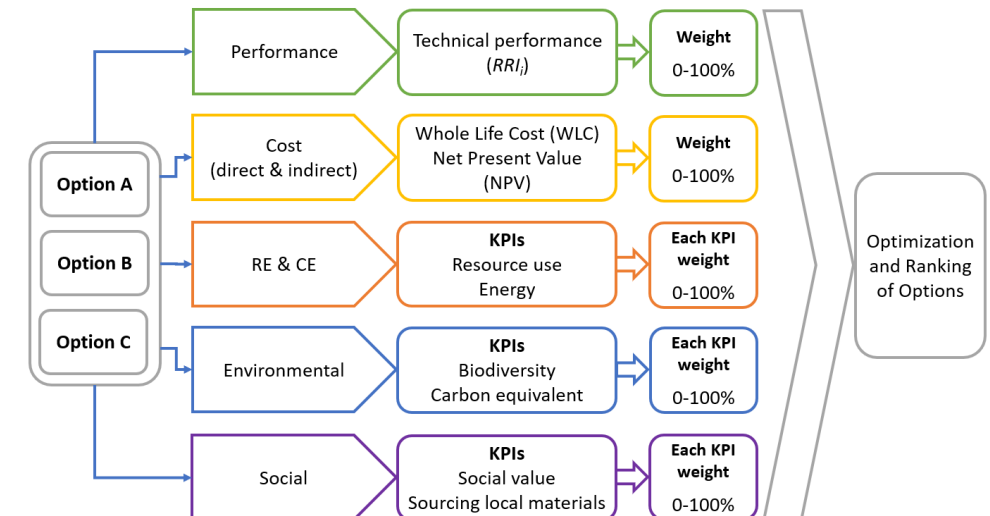
Maturity level	Engaging in transition to RECE (Stage 3 extract)	Early stages of practising RECE (Stage 6 extract)	Active deployment of RECE (Stage 9 extract)
CE ambition	NRA has committed to a transition to CE and a definition for what CE means in practice is in place	Policy to transition to CE has been published. Targets for RE and CE elements, some developed & others under development	Strategic plan for transition & route map with timeline in place and embedded in the NRA. Targets for RE and CE, monitoring systems to track progress are developed.
Embedding CE	Moderate staff awareness of CE and how it affects their roles. Ad-hoc initiatives to support innovation to deliver CE.	Clear communication, internally & externally, on commitment to CE. Corporate commitment to innovation initiatives to deliver CE. Champions in project teams are beginning to drive through change. Supporting instruments, tools and staff training are being developed and implemented.	Staff are fully engaged with CE. Significant investment in innovation in RE and CE with forward plan to continue commitment. Visible leadership at senior level, with accountability assigned to key leadership roles, supported by champions. Supporting instruments, tools and staff training are fully developed, implemented, and embedded. Business and personal objectives are set for delivery of RE and CE. CE principles are embedded in process as 'business as usual', and subject to continuous improvement.

Process framework for circularity in highway construction and maintenance

- Minimising consumption of natural resources
- Designing out waste and keeping resources in use and at their highest level of utility
- Optimising the value obtained within each lifecycle
- Minimising negative environmental and social impacts



Risk Based Analysis Framework and Software Tool



Risk Based Analysis Framework and Software Tool

Risk Based Analysis Framework
(Version V6.0)

This software tool can be used to quantify and assess the risks and other economic, social, environmental factors associated with moving from a linear to a circular economy. Using the tool, it is possible to assess the "Do minimum" option as well as 3 possible alternative schemes. For users with low maturity and a limited amount of data, it is possible to use pre-set scales to input information based on empirical evidence. Higher maturity can choose to input more specific and accurate information for the scheme and maintenance options in question and use the inputs from LCA/CCCA to assess multi-life cycle factors.

Instructions

1. Enable Macros
2. User input - Insert data into 'WHITE BOXES' with black border in "Input Data" worksheet. All white boxes require an input. Grey boxes indicate that user input is optional.
3. The number of scheme options being considered is selected. This can be between 1 and 3. Note: The "Do Minimum" option is a requirement of the analysis for reference purposes.
4. Some input boxes require numerical input, data or text and others require user to select from a drop down menu.
5. For each construction/maintenance option - the sum of the weights selected for KPIs must equal to 1.0. If the sum of weights is not equal to 1, an error message will be displayed and values should be reviewed.
6. Pre-set PF values for the calculation of risk are based on two inputs selected by the user from a drop down menu, one related to the performance characteristics of the construction/ maintenance option and the other related to the level of uncertainty the user has in relation to the performance characteristics. This references a matrix of values for the determination of PF value.
7. KPI calculation using Ranked Interpolation - The user can choose to input data to calculate KPIs or select pre-set values from a drop down menu. When the user chooses Numerical Input, the number of ranks, the unit of measurement for the data considered, the least favourable and most favourable threshold values must be entered, as well as a data value for each proposed construction/maintenance scheme option. When 2 ranks are chosen, a KPI value of 0 is assigned to the least favourable rank and a KPI value of 1.0 is assigned to the most favourable rank. A value for each scheme option is entered between these thresholds and linear interpolation is carried out to determine the KPI value. It is possible to select up to 4 ranks and use multi-linear interpolation, with a different slope between each rank. In this case, numerical values must be entered to quantify each rank using a data input value and a corresponding KPI value between 0 and 1. **Note: least favourable and most favourable threshold values must be entered before**

8. When the user chooses to select KPIs using a pre-set scale, the following options are available:
 0.00 - No commitment to KPI ambition
 0.10 - Below minimum industry practice
 0.25 - Minimum industry practice
 0.50 - Exceed industry practice
 0.75 - Far exceeds industry practice

Project Name

Project Number

Date

User Initials

Number of Scheme Options to be considered

3

Description

Value

Unit

Length of road

km

Type of Road

Budget available

Euro

Duration of assessment period

years

Name of Scheme

Option 1

Option 2

Option 3

Click to Clear User Inputs for Worksheet

Input Categories and KPIs

(Input Criteria name or KPI name as text in "name" column and select input type in drop down menu for the number of options)

Category	Name	Do	Option 1	Option 2	Option 3
Performance					
Cost					
CE					
Environment					
Social					

Option A

Option B

Option C

Performance

Technical performance (RR)

Weight 0-100%

Cost (direct & indirect)

Whole Life Cost (WLC)

Net Present Value (NPV)

Weight 0-100%

RE & CE

KPIs

Resource use

Energy

Each KPI weight 0-100%

Environmental

KPIs

Biodiversity

Carbon equivalent

Each KPI weight 0-100%

Social

KPIs

Social value

Sourcing local materials

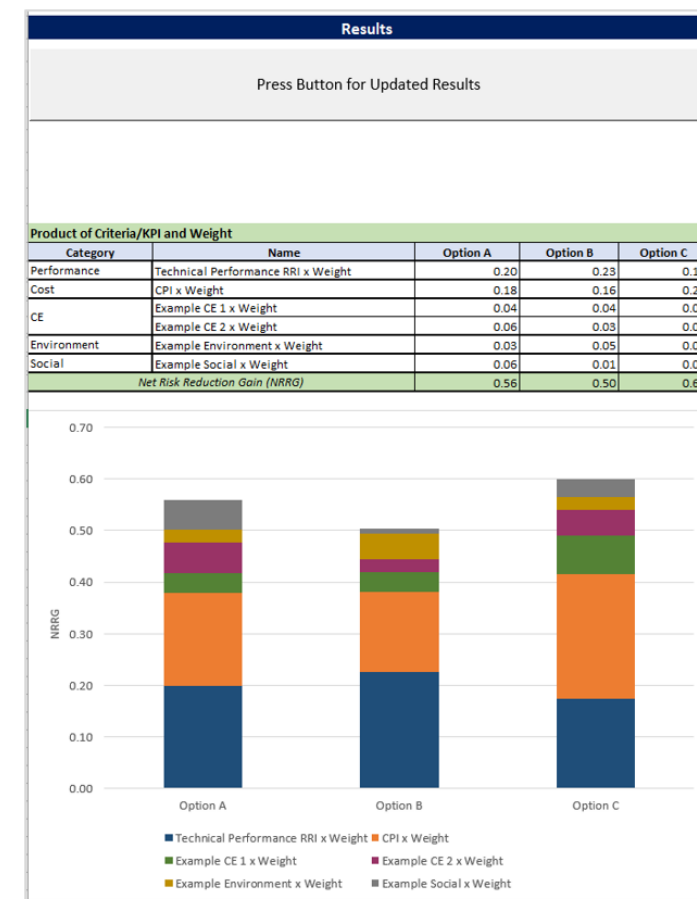
Each KPI weight 0-100%

Optimization and Ranking of Options

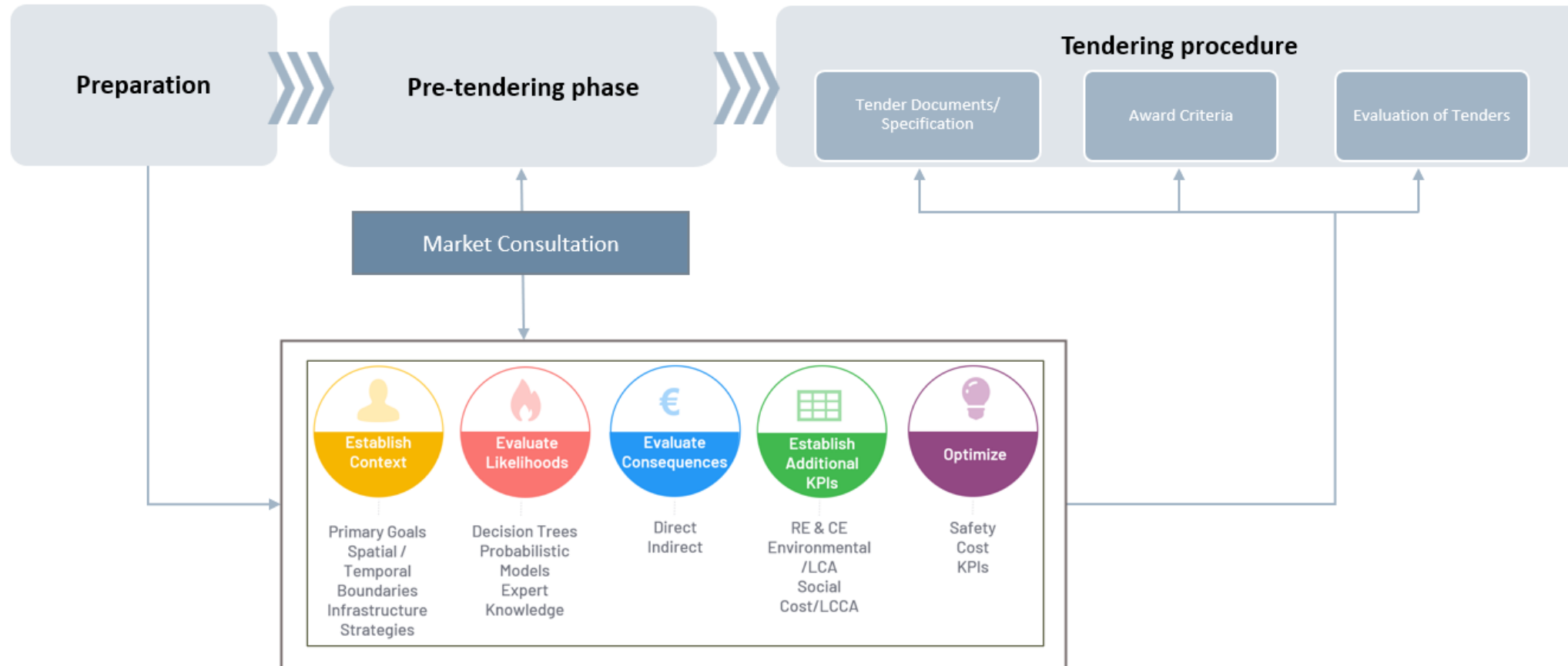
Input Values for Performance and Risk

(Risk = Probability of Failure x Consequences)

Risk	Probability of Failure	Do	Option 1	Option 2	Option 3	Consequences (unit of currency)			
Name	Input	Minimum	Option 1	Option 2	Option 3	Minimum	Option 1	Option 2	Option 3
Performance									
User - Numerical Input (Between 0 and 1)									
Performance									
User - Numerical Input (Between 0 and 1)									
Performance									
User - Numerical Input (Between 0 and 1)									
Performance									
User - Numerical Input (Between 0 and 1)									
Performance									
User - Numerical Input (Between 0 and 1)									



Integration into Procurement Practices



Validation – Case Studies

Case study	Type of application	Project	Country	Circularity level
Maintenance options for asphalt pavements	Asphalt	In-situ rejuvenation of ZOAB	Netherlands (NL)	Extend lifespan of pavements (R4)
		Refurbishing milled asphalt into new bound layers - BSM technology	Denmark (DK)	Reuse existing pavement to create new pavement with addition of limited materials (R5 or R6)
Recycling concrete technologies	Concrete	Processing technologies for aggregate recycling	Netherlands (NL)	Recycle (R8)

Resources and Training



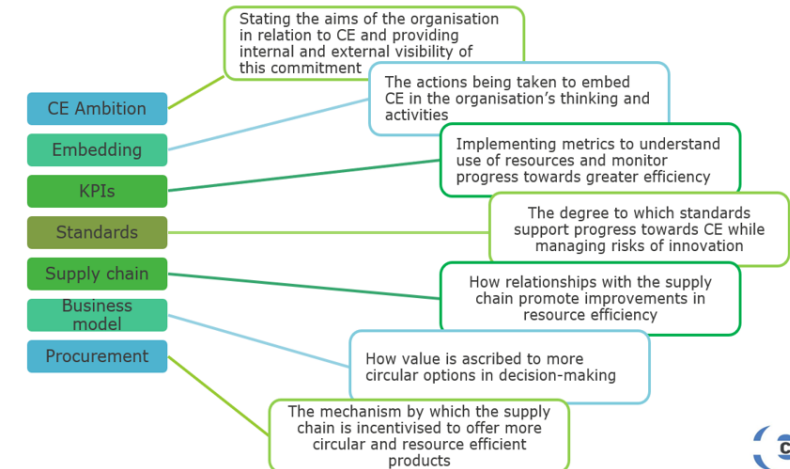
Resources for road authorities

The following information resources have been developed during the CERCOM project to help road authorities identify and adopt strategies that lead to greater resource efficiency. Watch our introduction to circularity and resource efficiency for road authorities [here >](#)

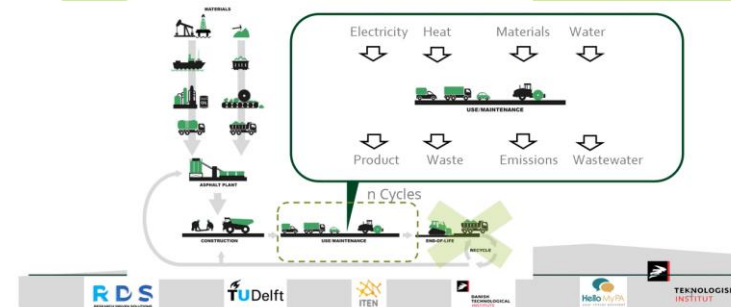
Developing organisational capability

-  Good practice and case studies in improving circularity and resource efficiency. [Download PDF here >](#)
-  Framework for assessing progress in transitioning to circular economy. [Watch our presentation here >](#)
-  Interactive framework for assessing progress in transitioning to circular economy. [Download here >](#)

[Introduction to KPIs and data for monitoring resource efficiency](#)



Asphalt life cycle



Resources and Training



CERCOM

<https://cercom.project.cedr.eu>