
CEDR Transnational Road Research Programme Call 2020: Resource Efficiency and the Circular Economy

Funded by: Denmark, Ireland, Netherlands, Norway,
Sweden, Switzerland and the United Kingdom



CERCOM Circular Economy in Road COstruction and Maintenance

Resource Pack to Support NRAs Embed RE & CE Principles

Deliverable No. D5.1
August 2023

Research Driven Solutions Ltd. (RDS), Ireland
Delft University of Technology (TUD), Netherlands
ITEN, United Kingdom
Danish Technological Institute (DTI), Denmark
Hello My PA, United Kingdom



CEDR Call 2021: Transnational Road Research Programme

CERCOM Circular Economy in Road CONstruction and Maintenance

Resource Pack to Support NRAs Embed RE & CE Principles

Due date of deliverable: 30/06/2023
Actual submission date: 30/06/2023

Start date of project: 01/09/2021

End date of project: 31/08/2023

Author(s) this deliverable:

Dr. Helen Viner, ITEN, United Kingdom

Dr. Vijay Ramdas, ITEN, United Kingdom

Martin Lamb, Maple-ITEN, United Kingdom

Dr. Helen Bailey, ITEN, United Kingdom

Dr. Emma Sheils, Research Driven Solutions, Ireland

Lorcan Connolly, Research Driven Solutions, Ireland

Prof. Alan O' Connor, Research Driven Solutions, Ireland

Daniel Berman, Danish Technological Institute, Denmark

Dr. Avishreshth Singh, Delft University of Technology, The Netherlands

Dr A. (Katerina) Varveri, Delft University of Technology, The Netherlands

Version: V2, R1

Table of contents

Executive summaryi

1 Introduction 2

2 Scope..... 3

3 Resource Pack Contents..... 4

 3.1 Contents..... 4

 3.2 Access 4

4 Conclusion 5

Annex A 6

Annex B 8

Executive summary

This report provides a detailed description of the Resource Pack developed as part of CERCOM Work Package 5 and Deliverable D5.1. The aim of the Resource Pack is to support NRAs in using the tools and resources developed as part of the CERCOM project for the adoption of RE & CE principles.

1 Introduction

This aim of this document is to provide an overview of the developed material and to outline how and where the material can be accessed. The Resource Pack encompasses the developments and advances of the CERCOM project and provides resources that NRAs can use to implement the necessary changes towards the adoption of circular economy practices in road construction and maintenance.

Specific content to be included in the Resource Pack has been tailored to suit feedback gained as part of CERCOM workshops conducted with various NRAs on 20th April 2023 and 25th April 2023. These online workshops facilitated consultation using a combination of presentations by the CERCOM consortium and intermittent Mentimeter questions to encourage interaction from participants.

The Resource Pack will be hosted online to provide NRAs and their supply chain with a 'go to' range of materials to assist them in putting circularity principles into practice. The resources are divided into sections, offering materials with varying complexity, format and length to accommodate NRAs at different stages of the 'journey' to circularity. This ensures that different audiences can readily find relevant material.

2 Scope

The scope of Deliverable 5.1 is the development of a suite of training resources to be provided to NRAs to facilitate a progression of RE & CE principles within procurement procedures. As part of Milestone M5.1, additional seminars and training will be provided to each NRA. This document provides a detailed outline of the content created for the Resource Pack. It also describes how the information can currently be accessed by the CEDR PEB for review and how the content will be available through the CERCOM website following CEDR PEB approval.

3 Resource Pack Contents

3.1 Contents

Detailed contents with links to training material is provided in Annex A and Annex B. The resources are presented in a logical structure to provide an intuitive easy to follow range of resources.

Annex A details resource pack contents and learning objectives which have been mapped against a published framework, namely Bloom's Taxonomy, for categorising educational goals. This framework is regularly used by college and university instructors and professors for their learning, teaching and assessment and uses "action words" to describe the cognitive processes by which thinkers encounter and work with knowledge^[1]. Learning objectives for the resource packs have been carefully considered and crafted to ensure that learning is scaffolded and covers levels one to three of Bloom's Taxonomy, ensuring there is scope to enhance to further levels as work on this topic continues to mature.

Along with an introduction video, the training material is organised in the form of modules for training purposes and are provided under three sections:

- Developing organisational capability
- KPIs and data for monitoring resources efficiency
- Risk based assessment framework (RBAF) for evaluating circular maintenance.

Although most resources can be viewed independently, it is recommended that users follow the proposed order for maximum benefit, especially within a particular section. This is particularly relevant in relation to the *RBAF Software Demonstration*, where it is strongly advised to review the *Principles and Functionality of the RBAF* video or the *User Manual* before attempting to use the software.

3.2 Access

All Resource Pack videos are currently saved as unlisted files on YouTube, and can only be accessed using the links provided in the PDF document in Annex B.

[1] <https://bloomstaxonomy.net/>

4 Conclusion

The Resource Pack detailed provides NRAs with the tools and materials required to enhance maturity regarding circular economy and resource efficiency. The content of the Resource Pack is targeted at NRA needs and the training needs of various personnel across the organisations. The Resource Pack provides definitions and guidance on tools and methodologies in the form of online learning materials. The knowledge transferred will enable NRAs to adopt circular procurement in their specifications, delivery and down-stream operations of road infrastructure maintenance and management.

Annex A

Resource Pack Contents and Learning Outcomes	Content Available
Introduction to Circularity	
<p>Introduction to circularity and resource efficiency for road authorities.</p> <ul style="list-style-type: none"> Understand the difference between linear and circular processes, the synergy with net zero and how this can be defined for highway authorities 	Video content (link in Annex B)
Developing organisational capability	
<p>Good practice and case studies in improving circularity and resource efficiency.</p> <ul style="list-style-type: none"> Identify the range of approaches already being taken by national road authorities, which can act as inspiration for change 	Interactive pdf (link in Annex B)
<p>Framework for assessing progress in transitioning to a circular economy.</p> <ul style="list-style-type: none"> Identify and communicate the seven important aspects of an organisation's approach to implementing the principles of circular economy Describe the CERCOM framework for assessing progress in these aspects and capability required to apply this approach within an organisation. 	<p>Video content (link in Annex B)</p> <p>Macro-enabled spreadsheet (link in Annex B)</p>
KPIs and data for monitoring resource efficiency	
<p>KPIs, LCA and data for monitoring resource efficiency</p> <ul style="list-style-type: none"> Recognise the application of LCA for assessing climate change and other environmental impacts, including how flows of materials contribute to these impact categories. Role of LCA in the RBAF (see below) and KPIs used. Discuss the data needed as the maturity of the assessment increases. 	Video content (link in Annex B)

Resource Pack Contents and Learning Outcomes	Content Available
Risk based assessment framework (RBAF) for evaluating circular maintenance options	
<p>Introduction to the risk-based assessment framework (RBAF) for evaluating circular maintenance options.</p> <ul style="list-style-type: none"> Understand the concept for combining considerations of circular economy, social and environmental performance, cost and technical risk in procurement of circular maintenance options 	Video content (link in Annex B)
<p>Principles and functionality of the RBAF software.</p> <ul style="list-style-type: none"> Understand the principles and functionality of the RBAF, sufficiently to progress to using the software. 	<p>Technical guide video (link in Annex B)</p> <p>PDF of presentation slides (link in Annex B)</p>
<p>RBAF software</p> <ul style="list-style-type: none"> In conjunction with other training resources, apply the RBAF software to a user defined situation to perform optimisation of various maintenance options, at a level of detail that is appropriate to the data available to the organisation 	Macro-enabled spreadsheet (link in Annex B)
<p>RBAF user manual</p> <ul style="list-style-type: none"> Follow reference material to assist users in applying the RBAF software 	PDF of user manual (link in Annex B)
<p>Demonstration of the RBAF software</p> <ul style="list-style-type: none"> Apply the RBAF software to a user defined situation and interpret the results 	<p>Software demonstration video (link in Annex B)</p> <p>PDF with copy of the input data (link in Annex B)</p> <p>Example macro-enabled spreadsheet (link in Annex B)</p>
<p>Case studies in the application of the RBAF</p> <ul style="list-style-type: none"> Understand the applicability of risk-based analysis framework for assessing circularity and sustainability of pavement construction/maintenance methods through a case study. Select key performance indicators and perceiving the influence of weights on net risk reduction gain. Apply a value-based indicator for computing the circularity levels of different pavement construction / maintenance activities. 	Video content (link in Annex B)

Annex B

Please see attached file below.

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



Watch our presentation [here >](#)

Risk based assessment framework (RBAF) for evaluating circular maintenance options



Introduction to the RBAF. [Watch our presentation here >](#)



Principles and functionality of the RBAF. [Watch our presentation here >](#)
[Download the presentation slides here >](#)



RBAF software [Download here >](#)



User manual. [Download here >](#)



Demonstration of the RBAF software . [Watch our video here >](#)
[Download input data here >](#) [Download example here >](#)



Case studies in applying the RBAF. [Watch our presentation here >](#)