

MAIN LINE

MAINLINE Final Workshop Demonstration of the LCAT Paris, France 30 September 2014



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George Sotiropoulos, Jacobs/SKM

Agenda Thursday 11 September

09:00 *Welcome/coffee*

09:30 Welcome and Introduction

Jean-Pierre Loubinoux, *UIC*
Björn Paulsson, *UIC/Trafikverket*

09:45 Summary of management – lessons learnt

Adeline Paul, *ARTTIC*

10:00 The role of LCAT in asset management

David Castlo, *Network Rail*

10:30 Asset degradation & intervention strategies

Marios Chryssanthopoulos,
University of Surrey

11:00 *Break*

11:30 Methods to extend life of assets

Lennart Elfgren,
Luleå University of Technology

12:00 Replacement of assets

Britta Schewe DB and Carlos Saborido,
COMSA

12:30 *Lunch*

13:30 Degradation monitoring: gaps & opportunities

Ujjwal Bharadwaj, *TWI*

14:00 Demonstration of the LCAT

George Sotiropoulos, *SKM*

15:00 *Break*

15:30 Reduction of economic and environmental impact using MAINLINE results

Björn Paulsson,
UIC/Trafikverket

16:15 Questions & Answers

16:45 Summary and conclusions

Björn Paulsson,
UIC/Trafikverket

17:00 *End of workshop*

Contents

- Introduction
- Overview
- LCAT demonstration

Contents

- **Introduction**
- Overview
- LCAT demonstration

Introduction

- Life Cycle Assessment Tool (LCAT):
 - *“is a decision support tool that attempts to quantify the costs (financial, operational and environmental) and the risks associated with different intervention strategies”.*
 - *“attempts to mimic the life of an asset based on a whole life cycle evaluation”.*

Introduction

- Three separate models:
 - Metallic Bridges
 - Plain Line Track
 - Soil Cuttings



Introduction

- Models are built in Excel
- One file per asset type
- A single asset calculation
- Content of each model is aligned with other MAINLINE WPs

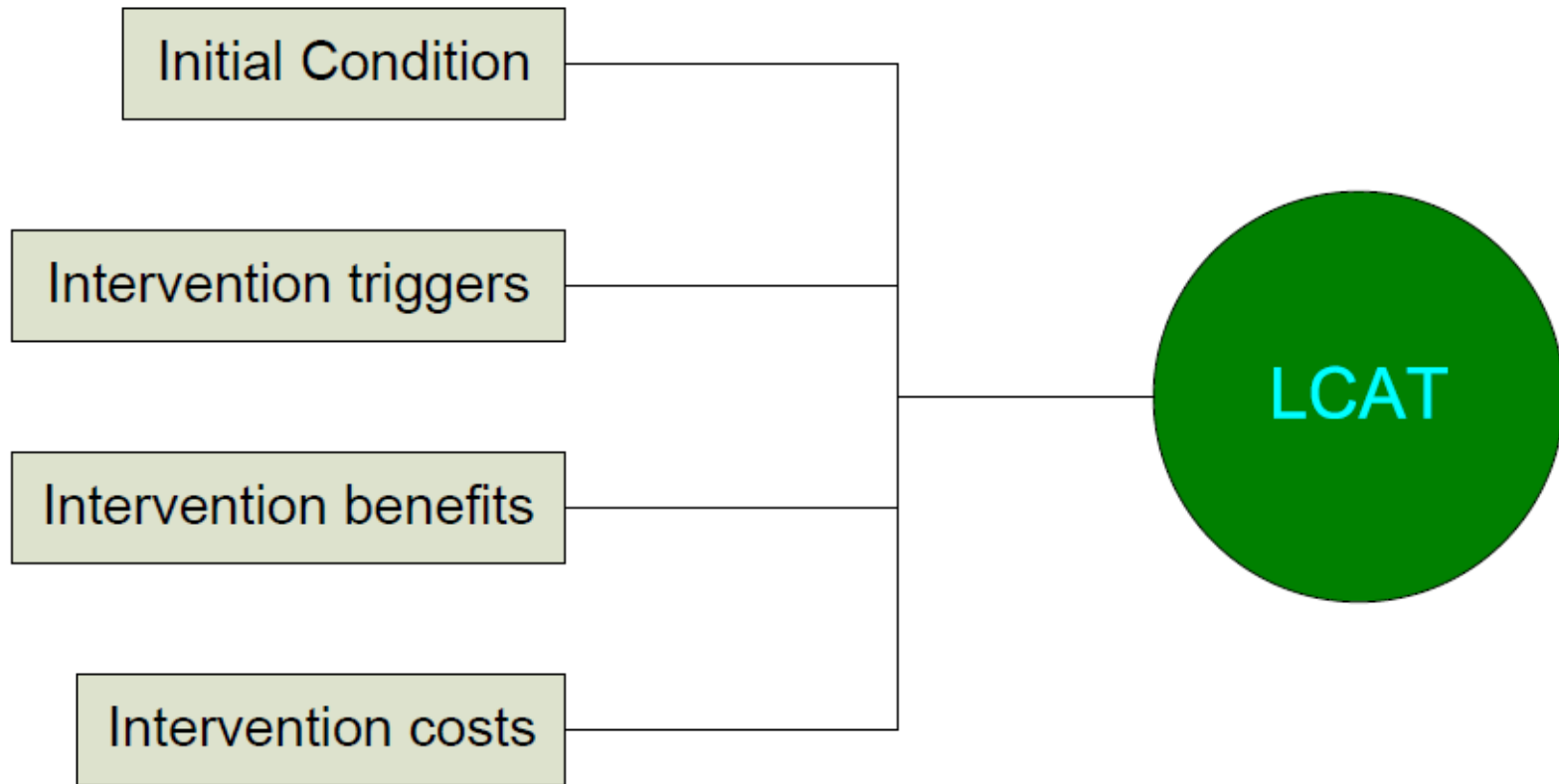
Introduction

- Like all mathematical models, LCAT features:
 - Inputs
 - Calculations
 - Outputs

Introduction

- Data inputs:
 - Asset starting condition
 - Operating environment
 - Intervention rules/strategies
 - Interventions benefits
 - Intervention characteristics:
 - Costs
 - Operational impacts
 - Environmental impacts

Introduction

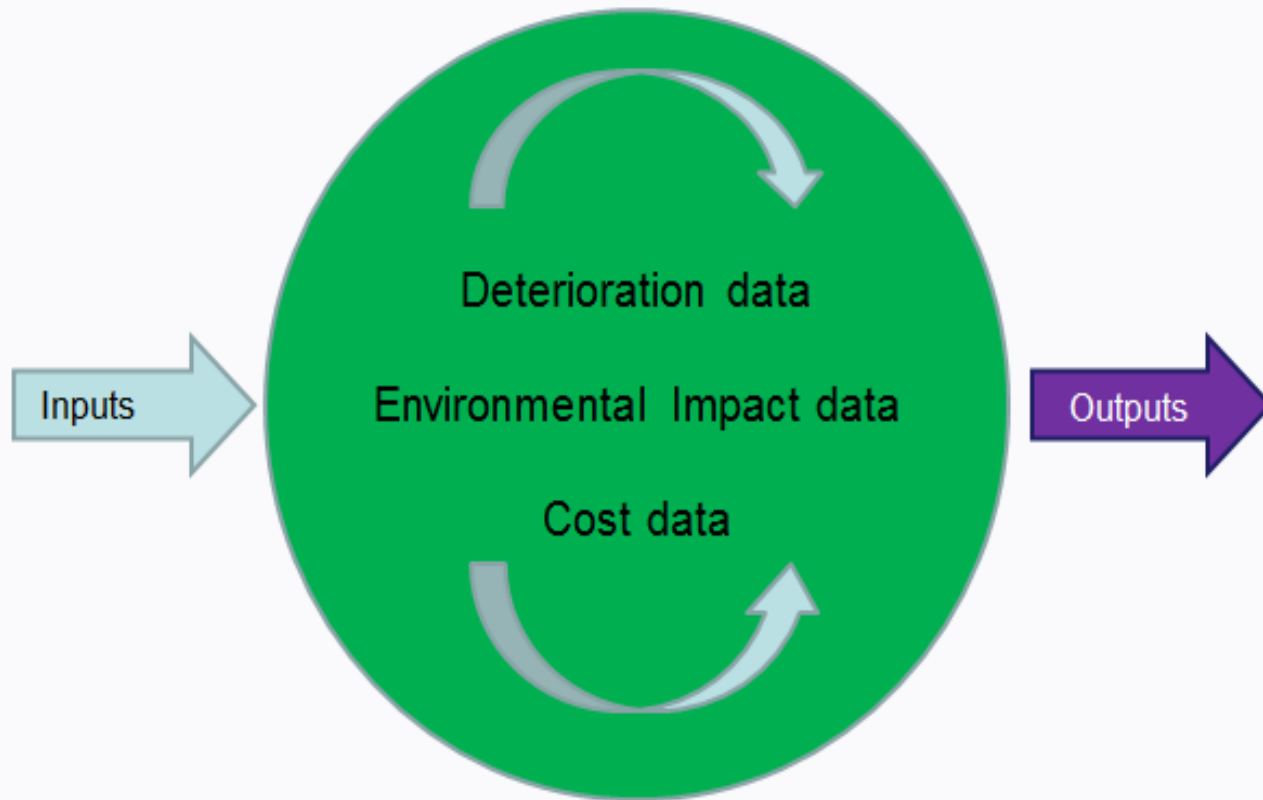


Introduction

Track LCAT inputs sheet:

Initial Track Condition Input of data which describes the status and condition of the track at the start of the assessment.		
Operational Speed <input checked="" type="radio"/> up to 130 kmph	<i>Data is currently only available for up to 130 kph.</i>	
Ballast hardness <input type="radio"/> Hard <input checked="" type="radio"/> Medium <input type="radio"/> Soft	<i>Basalt, high-quality granite, siliceous material</i> <i>LA < 16</i> <i>Granite, diabase, dolomite</i> <i>16 < LA < 23</i> <i>Limestone</i> <i>LA > 23</i>	
Traffic Loading [t/d] <input type="radio"/> < 15,000 <input type="radio"/> 15,000 - 30,000 <input type="radio"/> 30,000 - 45,000 <input checked="" type="radio"/> 45,000 - 65,000 <input type="radio"/> 65,000 - 100,000	Minimum radius [m] <input checked="" type="radio"/> > 600 <input type="radio"/> 400 < R < 600 <input type="radio"/> 300 < R < 400 <input type="radio"/> < 300	Sleepers <input checked="" type="radio"/> Concrete <input type="radio"/> Concrete with Under Sleeper Pads <input type="radio"/> Wooden
Drainage condition <input checked="" type="radio"/> Good <input type="radio"/> Poor	Sublayer condition <input checked="" type="radio"/> Good <input type="radio"/> Poor	

Introduction



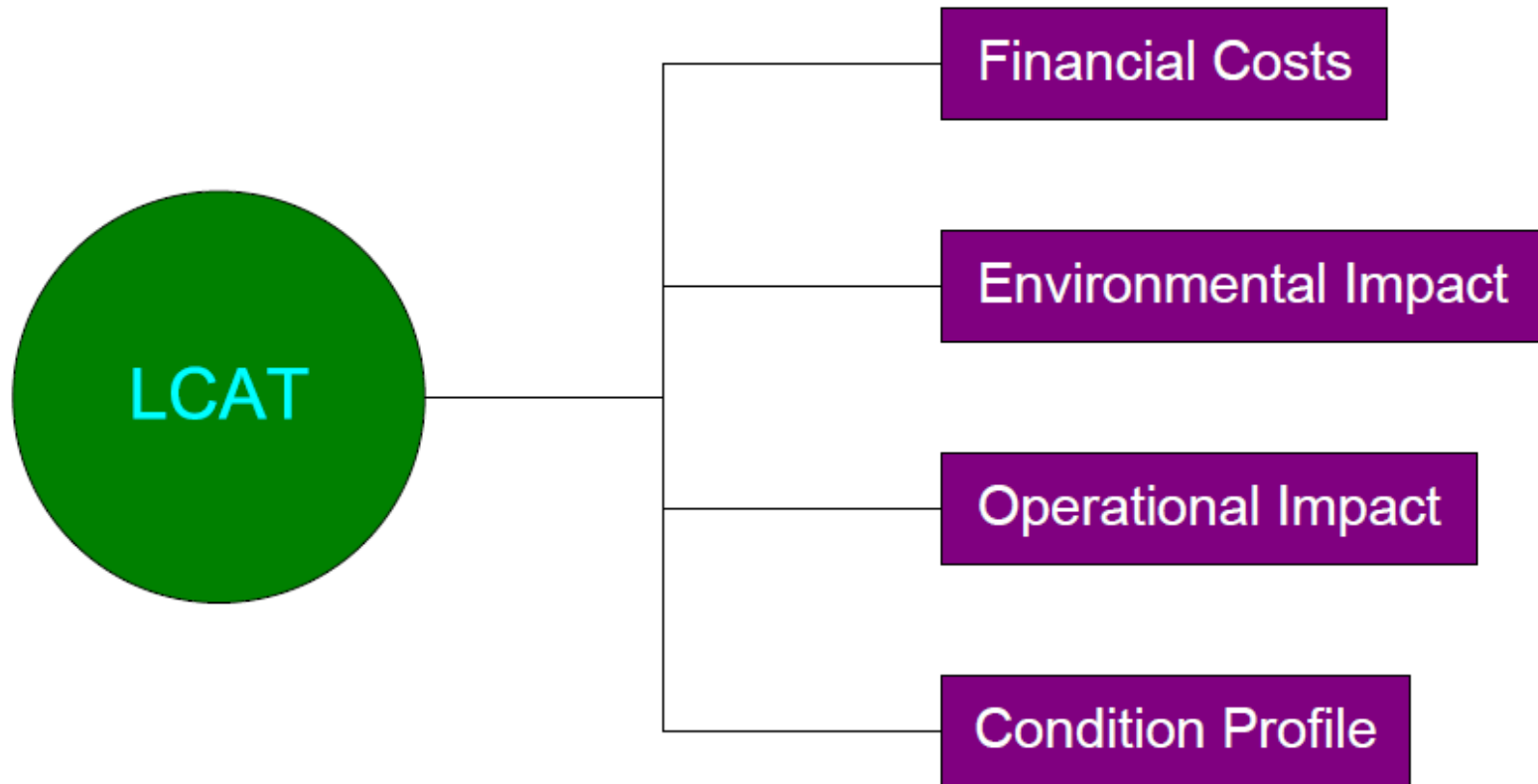
Introduction

- Calculations:
 - These are specific for each asset type
 - Models are deterministic, time step
 - They include a series of deterioration modelling techniques and intervention operations

Introduction

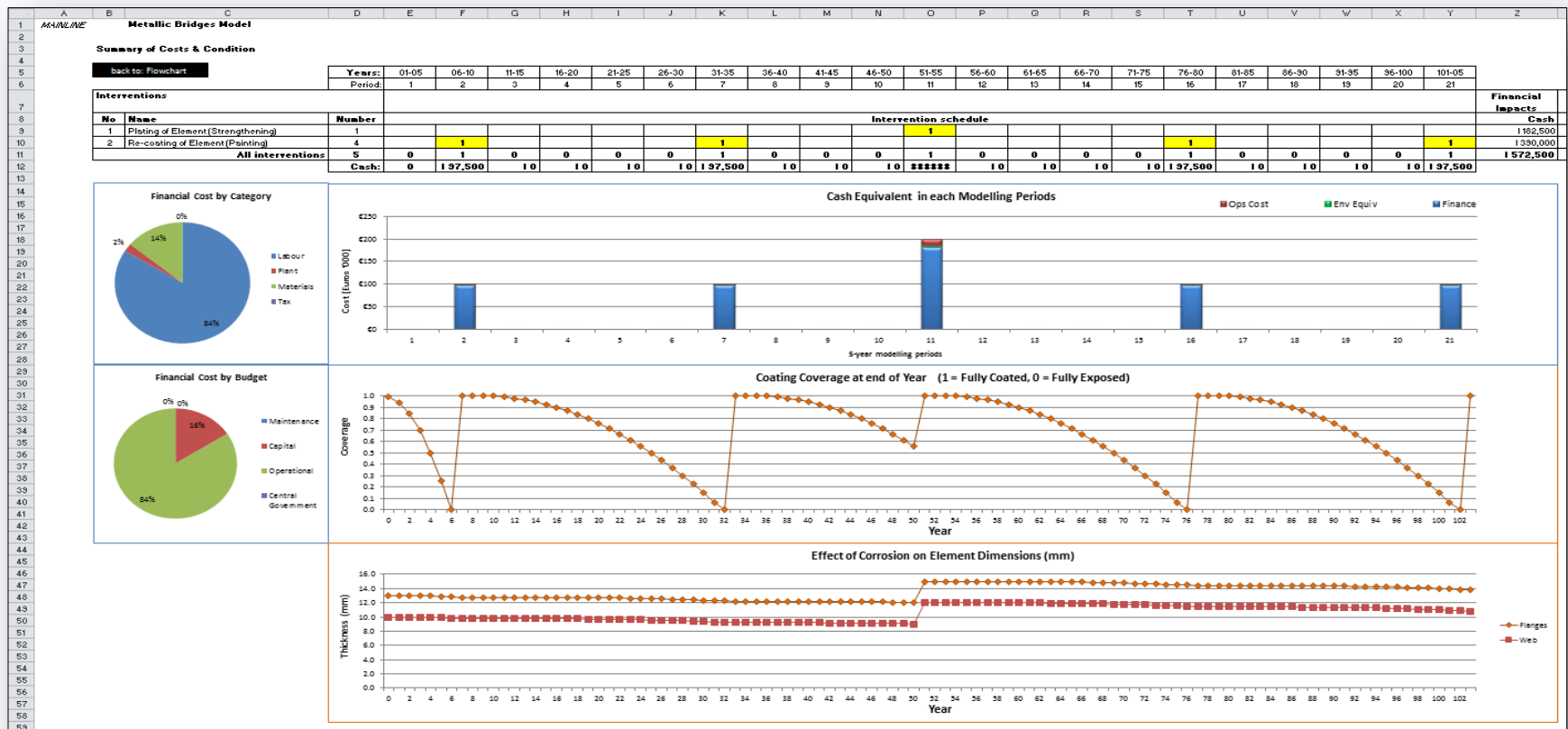
- Outputs:
 - Interventions over time
 - Cost over time (also discounted NPV)
 - Environmental impacts over time
 - Operational impacts over time
 - Condition (performance) over time

Introduction



Introduction

Bridges LCAT outputs sheet:



Contents

- Introduction
- **Overview**
- LCATs Walkthrough

Overview

- Some more information, before we look at the actual files:
 - Colour-coding and naming conventions
 - Structure of the LCAT files
 - Detailed information regarding function

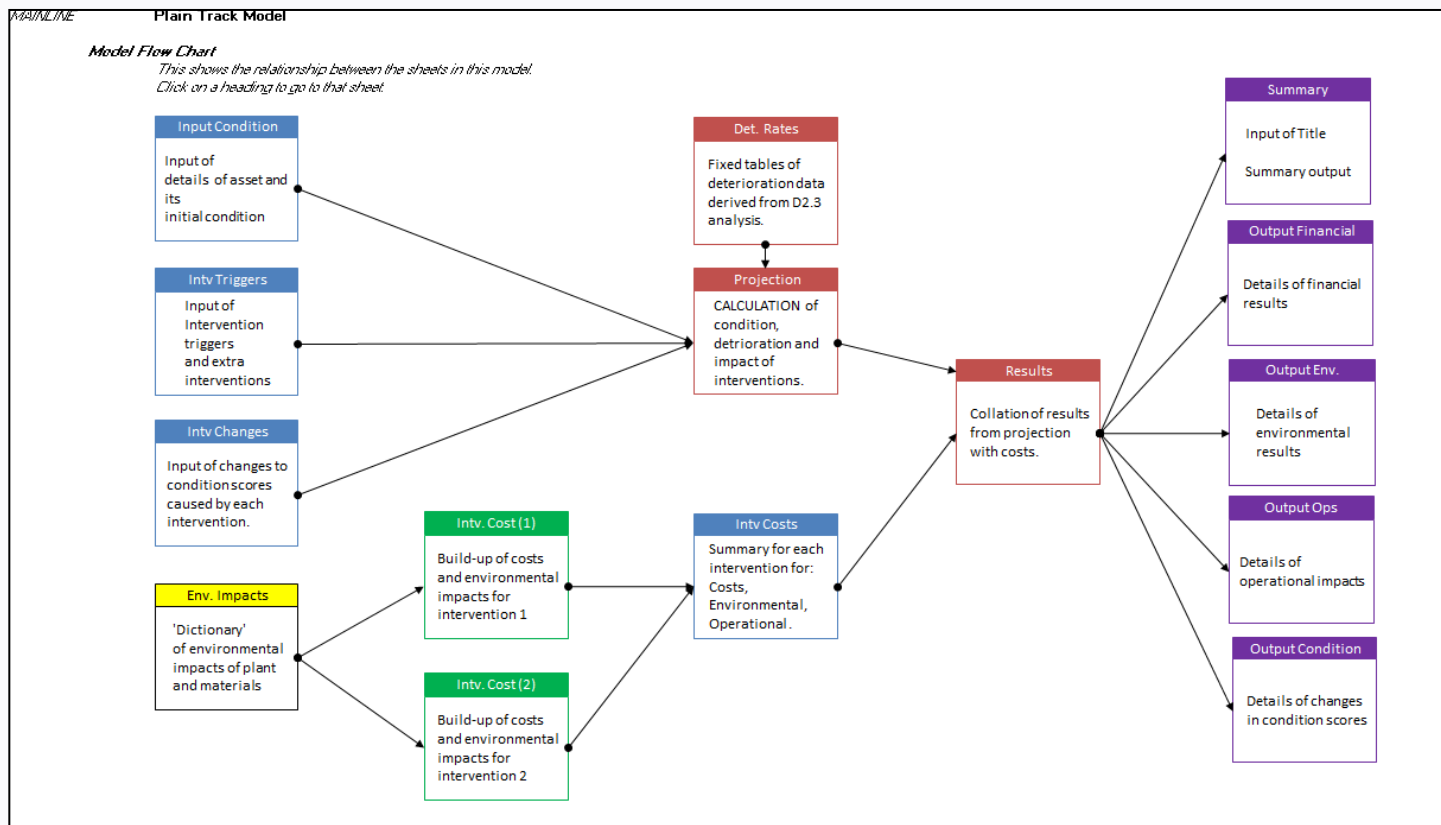
Overview

- Colour-coding and naming conventions

NOTES	Black tabs sheets are general instructions and information about the model
INPUT	Blue tabs are sheets for data input
OUTPUT	Purple tabs are output sheets
INTV COST	Green tabs are sheets for the user to calculate costs and environmental impacts of interventions
ENV REFS	Yellow tab is a sheet of environmental reference data
<i>CALCULATION</i>	Red tabs are calculation sheets, which the user can see but does not need to change

Overview

- Structure of the LCAT files



Overview`

- Detailed information regarding function:

LCAT model	Modelled Unit	Modelled Parameters	Interventions	Time step
Metallic Bridges	One bridge element	Coating coverage	Re-coating (Painting)	Annual
		Corrosion Depth	Plating (Strengthening)	
			Replacement	
Track	A length of Track	Track Quality 'Q'	Tamping	Annual
			Renewal	
Soil Cuttings	A length of Cutting	Generalised Risk Score (MAINLINE Algorithm)	Any - up to 15 types (can be defined by the user)	5 Yearly

Overview

- The LCAT model files all look very similar (they are all formatted in a similar way)
- But – many elements are different across the different asset types:
 - Coverage / focus
 - Modelling processes
 - Calculations
 - Application

Overview

- The tools are ***Prototypes***
- They are meant to demonstrate a concept
- At the moment they cover very specific circumstances (certain deterioration mechanisms and certain intervention types)

Contents

- Introduction
- Overview
- **LCAT demonstration**

LCAT demonstration

- Excel file...
 - ML_D5.5_MetallicBridgesModel_v09.00.xlsm

Thank you !