

# 13<sup>th</sup> UIC Sustainability Conference



Rail Carbon Tool for UK Railways

**ATKINS**

Developing low carbon infrastructure

*Jon Casey*



12, 13, 14 October 2016

# The UK Rail Carbon Tool



- Carbon calculation and analysis tool for development of low carbon infrastructure:
  - forecast carbon performance of new infrastructure
  - identify carbon 'hot spots'
  - drive identification of alternative low carbon options
  - compare alternative options
  - identify best low carbon solutions
  - monitor performance / compare design with as-built





# Rail Carbon Tool

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## Project Tree

Name	Qty	Units	kgCO <sub>2</sub> e		
			Single	Total	Project
📁 Rail Project - Training Example					
▼ 📁 Overhead Line Electrification design and construction			57,987,103	57,987,103	57,987,103
▼ 📁 OLE			38,206,837	38,206,837	38,206,837
▶ 📁 Power Supply			2,762,546	2,762,546	2,762,546
▶ 📁 Structures			28,787,724	28,787,724	28,787,724
▼ 📁 Wires			6,656,568	6,656,568	6,656,568
▼ 🧶 Wires	435	km	12,092	5,259,941	5,259,941
▼ 🧶 Catenary	1	km	2,620	2,620	1,139,795
📁 Copper			2,412	2,412	1,049,036
📁 Bronze			209	209	90,758
▶ 🧶 Contact	1	km	4,015	4,015	1,746,693
▶ 🧶 Return Conductor	1	km	5,456	5,456	2,373,453
▶ 🧶 Droppers	6,000	Spans	4.5	26,979	26,979
▶ 🧶 Wire Transportation	887	Freight Tonnes	61	53,801	53,801
▶ 🧶 Wire Installation	254	Tension Lengths	5,181	1,315,847	1,315,847
▶ 📁 Route Clearance			19,780,265	19,780,265	19,780,265

## Properties

## Custom Fields

## Validation

## Library Details

## Library

### Name: Copper

Name	Value
Carbon Factor	Copper - EU Tube & Sheet - Virgin
Source	Bath ICE (2.0) ⓘ
Region	Europe ⓘ
Lifecycle	Partial process ⓘ
Carbon Factor Value	3.81 kgCO <sub>2</sub> e/kg
Property Calculation	633 kg
Calculation	Cuboid: length * x-section area mm <sup>2</sup> with % composition Length_m * (Area_sq_mm / 1000000) * (Percentage_Composition / 100) * Density_kg_cu_m * CF
% Composition	92 %
Area	Inherited ( 80 mm <sup>2</sup> )
Density	Copper - General - 8,600 kg/m <sup>3</sup>
Length	Inherited ( 1,000 m)

Version: 1.1.1.9

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# Rail Carbon Tool: History



- Created using Atkins in-house carbon modelling software tool: Carbon Knowledgebase
- Carbon Knowledgebase software licensed to RSSB as the Rail Carbon Tool
- Rail Carbon Tool is hosted by Atkins for the entire UK rail industry



# Rail Carbon Tool: Purpose



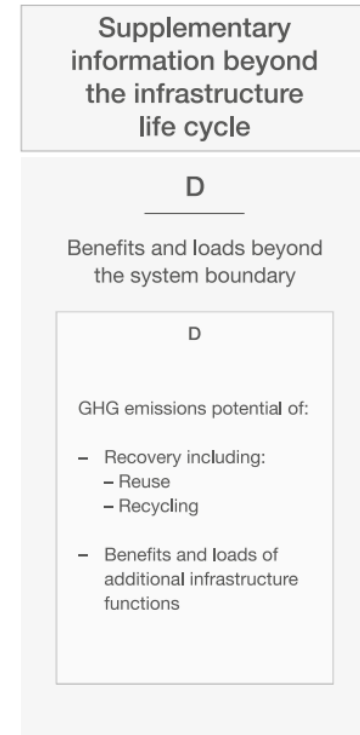
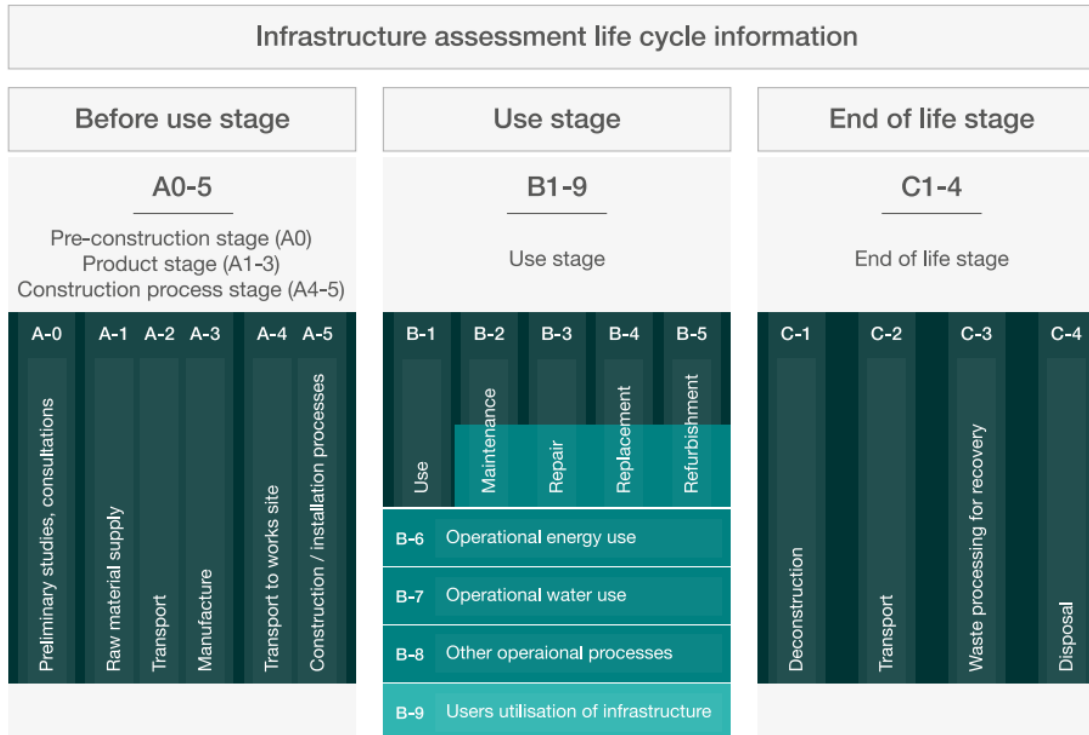
- Provide accessible, easy to use, central and consistent tool for carbon footprint calculation and analysis to facilitate development of low carbon rail infrastructure
  - free to use
  - web based
  - intuitive and flexible format
  - enables identification on low carbon options
  - enables direct knowledge sharing



# Rail Carbon Tool: Scope



- All lifecycle stages
- PAS 2080 / BS EN 15978





# Rail Carbon Tool: Data



- Directly uses existing design, construction and operation data
  - materials, transportation, construction, operation, and maintenance
- All data can be directly shared

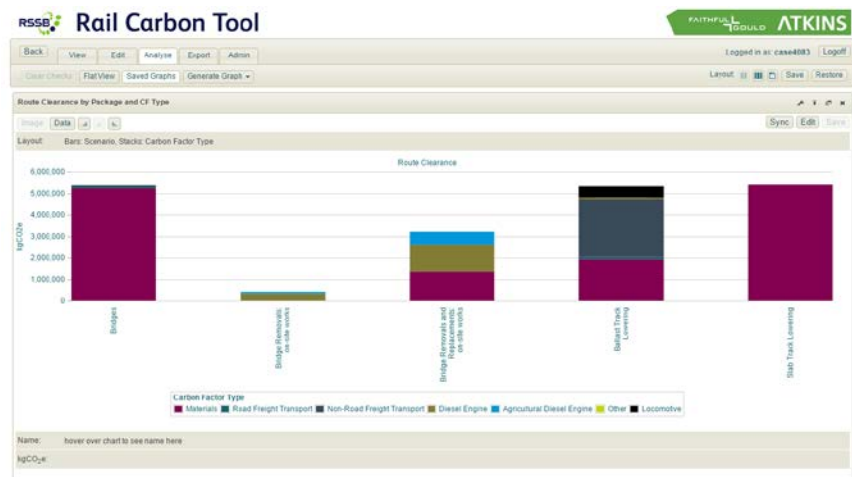
▶ Mast: 203dc	3,901	Nr	Property	578 kg
▶ Grabbed side bearing foundation: 203u	780	Nr	Calculation	
▼ Steel Foundation	3,121	Nr	Calculation	Pipe: circular
▶ Pile			$\text{Length\_m} * \text{PI} * (\text{Power}((\text{External\_Diameter\_m}/2),2) - \text{Power}((\text{Internal\_Diameter\_m}/2),2)) * \text{Density\_kg\_cu\_m} * \text{CF}$	
▶ 305dc Masts and Foundations			Density	Steel - General - 7,800 kg/m3
▶ 305dc Portals and Foundations			External Diameter	0.61 m
▶ 356 UC SSA Masts and Foundations			Internal Diameter	0.594 m
▶ 381 TTC Portals and Foundation			Length	4.9 m



# Rail Carbon Tool: Outputs



- On-screen data and graphs for low carbon innovation
- Reporting
  - PDF outputs for auditing / formal reporting
- Spreadsheet outputs
  - Off-line data analysis





# Rail Carbon Tool: Applications



- All infrastructure
- Design: value engineering, design development, options selection
- Construction performance monitoring and management
- Operation and maintenance performance planning and management



# Live Demonstration



## RSSB Rail Carbon Tool

FAITHFUL+GOULD ATKINS

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