The Institute of Asphalt Technology
Irish Branch

Facilitating optimal use of road material resources

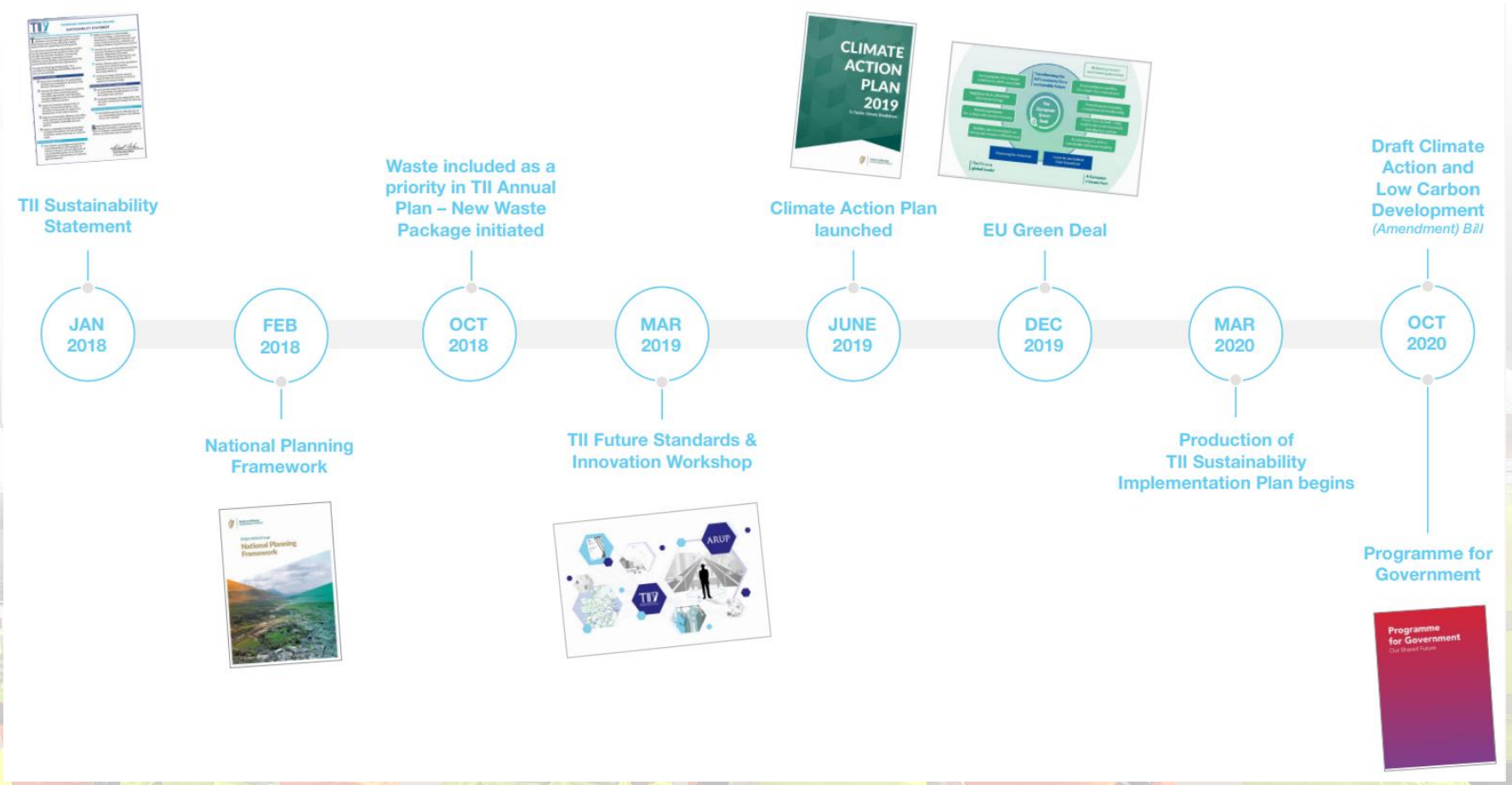
Updates to CC-SPW-00800 Road Pavements – Unbound and Hydraulically Bound Mixtures

Overview of this Presentation

- Background to the updates
- Objective of updates
- Updating CC-SPW-00800

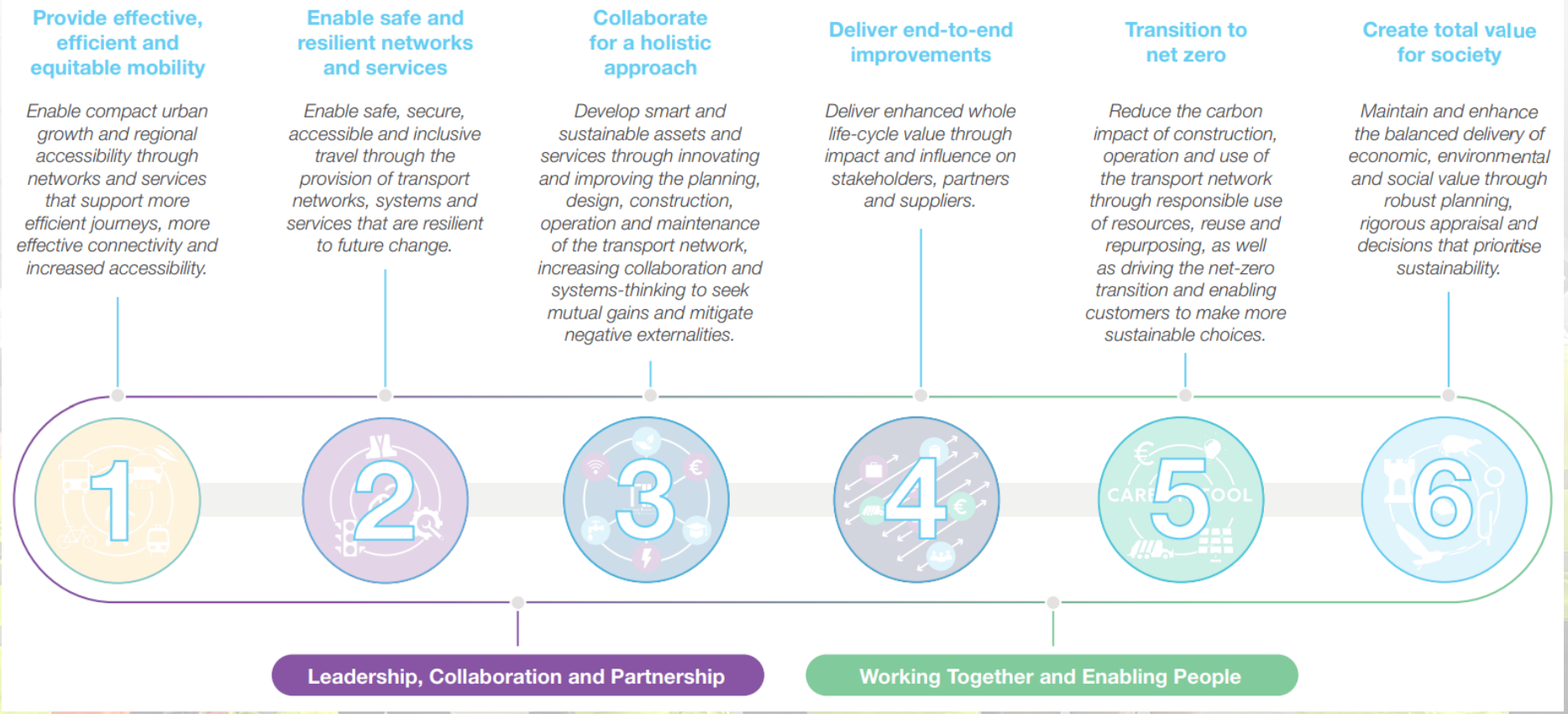
Research and development group

TII's Sustainability Implementation Plan



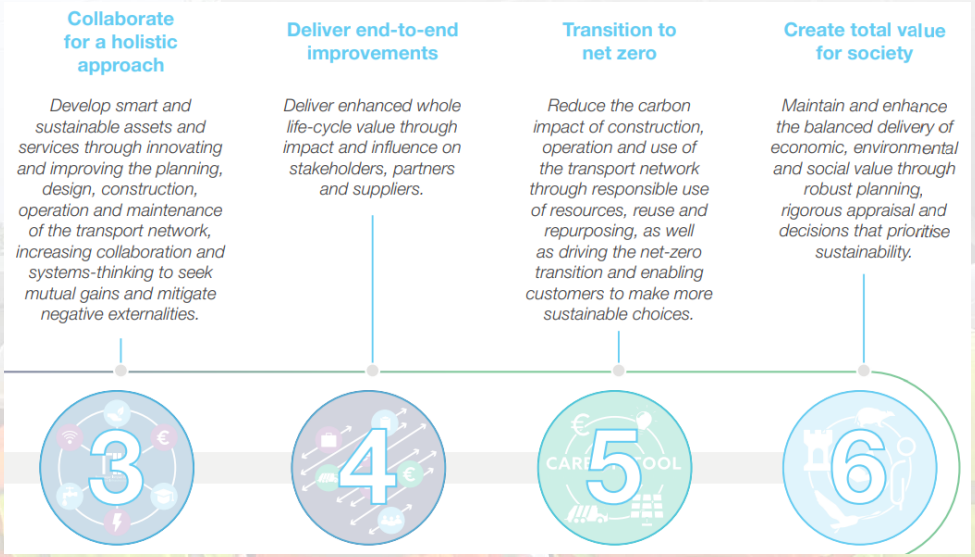
TII's Sustainability Implementation Plan

- 6 core principles



SIP and TII Pavements

- How can SIP principles be implemented at project level



- Principles 3, 4, 5 and 6

- Lifecycle Approach
  - Design to Asset Disposal

Design

- Optimal material usage
- In-situ material characterisation
- Wider range of materials
- Life Cycle Analysis / Assessment

Procure

- Alternative designs
- Promote new technologies
- Green scorecard / LCCA / LCA

Construct

- Improved quality control
- Performance based specification

Operate / Maintain

- Optimised rehabilitation design / material usage
- Wider range of materials
- Digital design records to support asset management

End-of-life

- Digital records
- Support material reuse/recycling at EoL

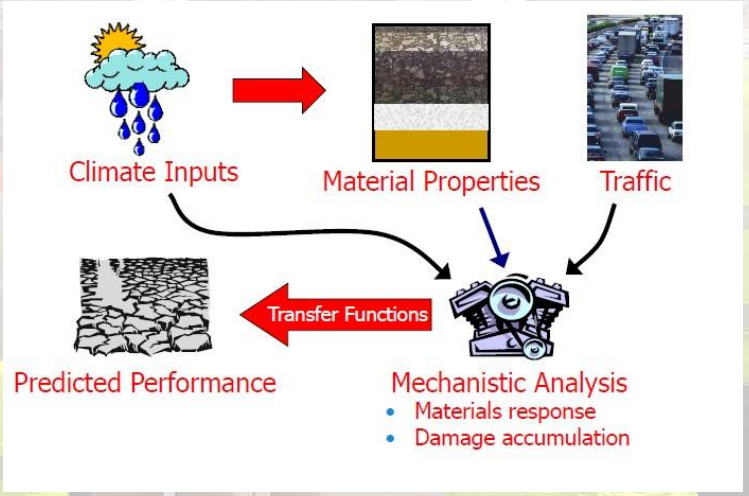
- DN-PAV-03021 / IAPDM
- LCCA + LCA+ EPDs
- CC-SPW's

CC-SPW-00800 (Aug 2022)

- Road Pavements – Unbound and Hydraulically Bound Mixtures
- Defines how materials should be produced and layers constructed
- Ensure constructability
- Achieve expected long-term performance - design

SIP Principles and CC-SPW-00800

- Facilitate Material Re-use and Recycling
  - Not just backfill
- Optimisation of material use
  - Performance characterisation
  - Linked to design performance



Updates to CC-SPW-00800

- Re-categorisation of material types
- Changes to constituent and mixture requirements
- Reclaimed aggregate
- Performance based specifications
  - Linked to the IAPDM

New Material Categories

- Simplification
- Linked to DN-PAV-03021
- Unbound Granular Material (UGM)
  - UGM A
  - UGM B
- Hydraulically Bound Material (HBM)
  - HBM A
  - HBM B
- ‘A’ higher quality, ‘tighter’ specification
- ‘B’ more relaxed specification, wider range of materials
- ‘A’ > ‘B’ i.t.o long term performance as defined in DN-PAV-03021

UGM – Constituent Materials

UGM A / Ac / Am:

i. Crushed rock aggregate
ii. Limited content of reclaimed aggregates

UGM B / Bc / Bm: Crushed rock aggregate

i. Crushed natural gravels
ii. Reclaimed aggregates

UGM – Constituent Requirements

Property			Mixture						Test Method
			2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	
			UGM A	UGM Ac	UGM Am	UGM B	UGM Bc	UGM Bm	
Chemical	Water-soluble sulfate content in mg SO_4 per litre		NR[1]	≤1500	≤300	NR[1]	≤1500	≤300	I.S. EN 1744-1
	Oxidisable sulfides content as SO_4		NR[1]	≤0.30%	≤0.06%	NR[1]	≤0.30%	≤0.06%	Refer 2.2.1.1
Geometric	Crushed or broken and totally rounded particles		$C_{90/3}$			C_{NR}			I.S. EN 933-5
	Shape of coarse aggregate - Flakiness Index		FI_{35}			FI_{50}			I.S. EN 933-3
	Fines Quality		Liquid Limit ≤ 20 (Limestone) Liquid Limit ≤ 21 (Non-limestone)						BS 1377-2
Physical	Resistance to fragmentation - Los Angeles test		LA_{30}			LA_{50}			I.S. EN 1097-2
Durability	Resistance to freezing and thawing	Water Absorption	$WA_{24}2$						I.S. EN 1097-6, Annex B
		Magnesium Sulfate Soundness[2]	MS_{25}						I.S. EN 1367-2
All other IS EN 13242 aggregate requirements			NR[1]						

[1] NR = No Requirement

[2] Magnesium sulphate soundness test is only required where water absorption requirements are not met.

IS EN 13242:2002

UGM – Mixture Requirements

Property	Mixture Type		Test Method
	UGM A / Ac / Am	UGM B / Bc / Bm	
Mixture Designation	0/31,5	0/31,5	-
Fines Content	UF_7	UF_9	IS EN 933-1
Oversize	OC_{80}	OC_{80}	IS EN 933-1
General Grading Curve	G_A	G_B	IS EN 933-1
Laboratory dry density and optimum water content	To be recorded		I.S. EN 13286-4 (Vibrating Hammer)
Frost Heave	No frost heave within 350mm of surface, BS 812-124		

IS EN 13285:2018

Reclaimed Aggregates

UGM RA Content limits

UGM A / Ac / Am	UGM B / Bc / Bm
% by mass	% by mass
≤ 30	No Limit

RA Composition

Constituents	UGM A / Ac / Am	UGM B / Bc / Bm
	% by mass	% by mass
Rc - Concrete, concrete products, mortar Concrete masonry units	No limit	No limit
Ru - Unbound aggregate, natural stone Hydraulically bound aggregate	No limit	No limit
Ra - Bituminous materials	≤ 30	No limit
Rg - Glass	≤ 1	≤ 5
Rb - Clay masonry units (i.e. bricks and tiles) Calcium silicate masonry units Aerated non-floating concrete	≤ 1	≤ 2
X - Cohesive (i.e. clay and soil) Miscellaneous: metals (ferrous and nonferrous), non-floating wood, plastic and rubber Gypsum plaster	≤ 1	≤ 2
FL - Floating material	≤ 1	≤ 1

Works Performance

Compaction Requirements (DL1 + DL2)

Parameter	Test Method	Test Frequency	Requirements	
Relative Compaction	Nuclear Density Gauge	Minimum of 5 locations within each 1000 m2 or part thereof laid each day	Average	≥ 97% MDD
			Single location	≥ 92% MDD

Works Performance Requirements (DL2 only)

Characteristic	Test Method	FWD Test Spacing	Requirements		
			IAPDM Performance Category	Surface Modulus (MPa)	
				Rolling Average*	Minimum
Layer Stiffness	FWD	Seating drop + 3 drops at 25m station spacing in the left wheel path of each lane	S1	≥ 100	≥ 70
			S2	≥ 200	≥ 120
			S3	≥ 300	≥ 175

HBM – Constituent Materials

HBM A shall comprise of one or a combination of the following materials:

i. Crushed rock aggregate

ii. Limited content of reclaimed aggregates

HBM B shall comprise of one or a combination of the following materials:

i. Crushed rock aggregate

ii. Crushed natural gravels

iii. Reclaimed aggregates

HBM – Constituent Requirements

Property		Mixture		Test Method
		HBM A	HBM B	
		3.1.1	3.1.2	
Geometrical	Crushed or broken and totally rounded particles	$C_{90/3}$	C_{NR}	I.S. EN 933-5
	Shape of course aggregate - Flakiness Index	FI_{50}	FI_{NR}	I.S. EN 933-3
Physical	Resistance to fragmentation - Los Angeles test	LA_{50}	LA_{NR}	I.S. EN 1097-2
Chemical	Acid-soluble sulfate content	$AS_{0.2}$		I.S. EN 1744-1
	Water-soluble sulfate (WS) content in mg SO_4 per litre	≤ 1500		
	Oxidisable sulfides (OS) content as SO_4	≤ 0.3%		Refer to 2.2.1.1

IS EN 13242:2002

HBM – Mixture Requirements

Property	Mixture Type		Test Method
	HBM A	HBM B	
Aggregate Size	0/20	0/20	I.S. EN 933-1
Grading Envelope	G1	G2	I.S. EN 933-1
Water Content	Mix design to meet performance with minimum binder limits		
Binder Content			
Strength after Immersion	I_{80}		Refer to 3.3.5.1

IS EN 14227-1:2013

Reclaimed Aggregates

HBM RA Content limits

HBM A	HBM B
% by mass	% by mass
≤ 50	No Limit

RA Composition

Constituents	HBM A	HBM B
	% by mass	% by mass
Rc - Concrete, concrete products, mortar Concrete masonry units	No limit	No limit
Ru - Unbound aggregate, natural stone Hydraulically bound aggregate	No limit	No limit
Ra - Bituminous materials	≤ 50	No limit
Rg - Glass	≤ 1	≤ 5
Rb - Clay masonry units (i.e. bricks and tiles) Calcium silicate masonry units Aerated non-floating concrete	≤ 1	≤ 2
X - Cohesive (i.e. clay and soil) Miscellaneous: metals (ferrous and nonferrous), non-floating wood, plastic and rubber Gypsum plaster	≤ 1	≤ 2
FL - Floating material	≤ 1	≤ 1

Works Performance

Works Performance Requirements (DL1)

Characteristic	Test Method	Requirements	
		IAPDM Performance Category	Minimum
Compressive Strength (R_c)	IS EN 13286-41	C8/10	10 MPa
		C12/15	15 MPa
		C16/20	20 MPa

Works Performance Requirements (DL2)

Characteristic	Test Method	Requirements	
		IAPDM Performance Category	Minimum
Modulus of Elasticity in Compression (E_c)	IS EN 13286-43	S1	20 GPa
		S2	28 GPa
		S3	33 GPa
Indirect Tensile Strength (R_{it})	IS EN 13286-42	F1	1.2 MPa
		F2	1.8 MPa
		F3	2.4 MPa

Research behind updates

- Selected road projects

- Material sampling and laboratory testing of materials

- Works performance testing
  - Deflection surveys
  - Density
  - Lab characterisation

Future Development

- Identify and correct errors
  - Reclaimed aggregates
- Industry feedback
  - Practicality
- EPA alignment – RA composition
- Works Performance feedback
  - Pavement Asset Management
  - Long-Term Pavement Performance monitoring sites