Proposed Carriageway Capital Programme 2022/23 - Budget and Carbon Consumption Dashboard

An assessment of the scope 3 emissions of the proposed carriageway capital programme for 2022/23 has been undertaken and this Dashboard aims to set out in one place an overview of the carriageway capital programme, in terms of capital budgets, carbon consumpation and savings made. It aims to contextualise these savings, where they have been made and provide the information and evidence required to guide future savings and efficiencies.
Measures implemented such as the use of warm mix asphalt on the majority of resurfacing and reconstruction schemes and the continued development and use of in-situ and ex-situ recycling are projected to save approximately 150 tonnes of CO_2e

Total Programme Carbon Consumption and Savings

332 tonne carbon saving is equivalent to the greenhous gas emissions from:

143 gasoline-powered passenger vehicles driven for one year

1,648,184 miles driven by an average gasoline-powered passenger vehicle

$kgCO_2e$ consumption per £ spent	$kgCO_2e$ consumption per m2 treated
0.18	2.98

	Average $kgCO_2e$ consumed per m^2 treated	Average cost per m^2 treated
Surface Dressing	1.42	£7.35
Resurfacing	4.72	£27.00
Reconstruction	9.65	£48.52
Ex-situ Recycling	8.14	£64.17
In-situ Recycling	TBC	TBC

Total capital programme budget expenditure	Total m^2 of carriageway to be treated
£10,182,484	628,679

Warmix Asphalt (A)

Through the addition of additives to the asphalt mix it enables the heating temperature of the mixture to be reduced by 40°C. This means less fuel is required in production of the asphalt which reduces the CO_2e consumption. Reasearch has indicated that the lower mixer temperatures reduce the aging process of the bitumen that occures when heat is applied, this should result in the visco-elastic properties of the asphalt being maitained for a longer duration and therefore increased service life, reducing whole life CO_2e.

The use of warmix asphalt is estimated to contribute 133 tonnes of CO_2e savings.

Typical Ex-situ Recycling Mobile Plant (B)
The ex-situ recycling process is a cold mix process that involves removal of the existing road pavement. It is then transported to a specialist plant where it is crushed and graded, from there it is loaded into a batching plant where foamed bitumen, cement and other fillers are added. This produces a material with a high level of quality control that behaves as a traditional hot mix asphalt. It is a cold process that can include upto 95% recycled content, including asphalt containing coal tar.

The use ex-situ recycling is estimated to contribute 17 tonnes of CO_2e savings

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Surface Drressing (L)
Surface dressing is an in-situ process where a layer of bitumen emulsion is sprayed onto a road surface, followed by a single layer of chippings, or on more heavily trafficked sites a second layer of smaller chippings to give full chipping coverage over the bitumen emulsion. Surface dressing is a cold process and uses resources efficiently as it uses 25% less hardstone aggregate than resurfacing, reducing resource consumption and the number of vehicle movements.

In-situ recycling (R)
In-situ recyling pulverises the existing road pavment, mixes them with cement, pfa and water to produce a stiff, impermable new material. The process requires no heat, typically involves the use of all site won materials, eliminating numerous vehicle movements. The only new material required is a surface dressing or surface course that laid on top.

Statistics

Budget Expenditure	Ex-situ Recycling	In-Situ Recycling	Reconstruction	Resurfacing	Surface Dressing	Sub-total
ABC	£147,728	£260,696	£443,280	£644,369	£951,351	£2,447,424
Urban Unclassified	£746,145	£0	£1,962,062	£1,381,112	£1,797,769	£5,887,088
Rural Unclassified	£580,988	£0	£486,252	£176,398	£604,334	£1,847,972
Sub-total	£1,474,861	£260,696	£2,891,594	£2,201,879	£3,353,454	£10,182,484

Treatment Area (m^2)	Ex-situ Recycling	In-Situ Recycling	Reconstruction	Resurfacing	Surface Dressing	Sub-total
ABC	1480	8019	12313	28763	132976	183,551
Urban Unclassified	8953	0	37605	43886	231368	321,812
Rural Unclassified	12550	0	9673	8917	92176	123,316
Sub-total	22983	8019	59591	81566	456520	628,679

CO_2e (tonnes) - non-reduced	Ex-situ Recycling	In-Situ Recycling	Reconstruction	Resurfacing	Surface Dressing	Sub-total
ABC	18	199	132	147	164	660
Urban Unclassified	103	0	420	247	352	1,122
Rural Unclassified	141	0	104	46	133	424
Sub-total	262	199	656	440	649	2,206

CO_2e (tonnes) - reduced	Ex-situ Recycling	In-Situ Recycling	Reconstruction	Resurfacing	Surface Dressing	Sub-total
ABC	11	78	114	124	164	491
Urban Unclassified	76	0	368	221	352	1,017
Rural Unclassified	100	0	93	40	133	366
Sub-total	187	78	575	385	649	1,874

CO_2e (tonnes) - savings	Ex-situ Recycling	In-Situ Recycling	Reconstruction	Resurfacing	Surface Dressing	Sub-total
ABC	7	121	18	23	0	169
Urban Unclassified	27	0	52	26	0	105
Rural Unclassified	41	0	11	6	0	58
Sub-total	75	121	81	55	0	332

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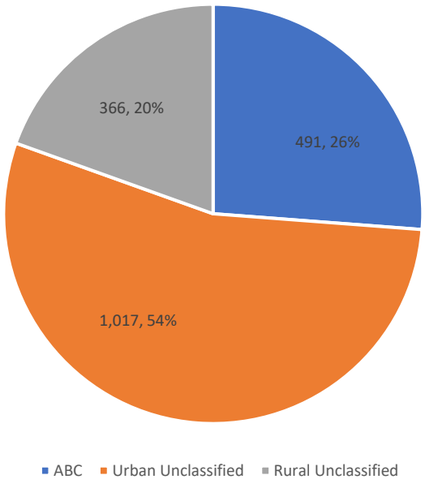
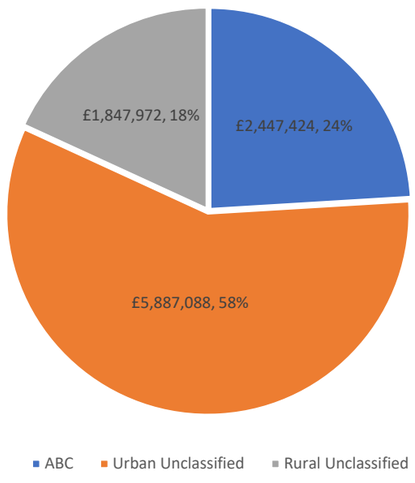
Carbon Footprint and Capital Expenditure by Programme and Treatment

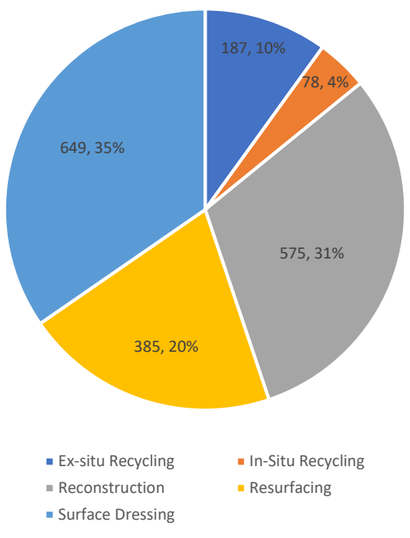
Carbon Consumption (tonnes CO_2e) by Programme



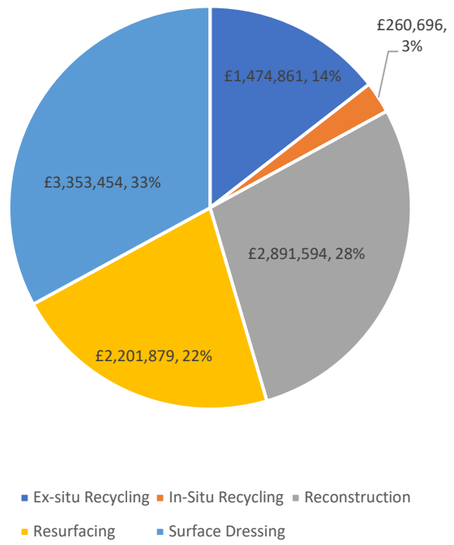
Forecast Budget Expenditure by Programme



Carbon Consumption (tonnes CO_2e) by Treatment



Budget Expenditure by Treatment



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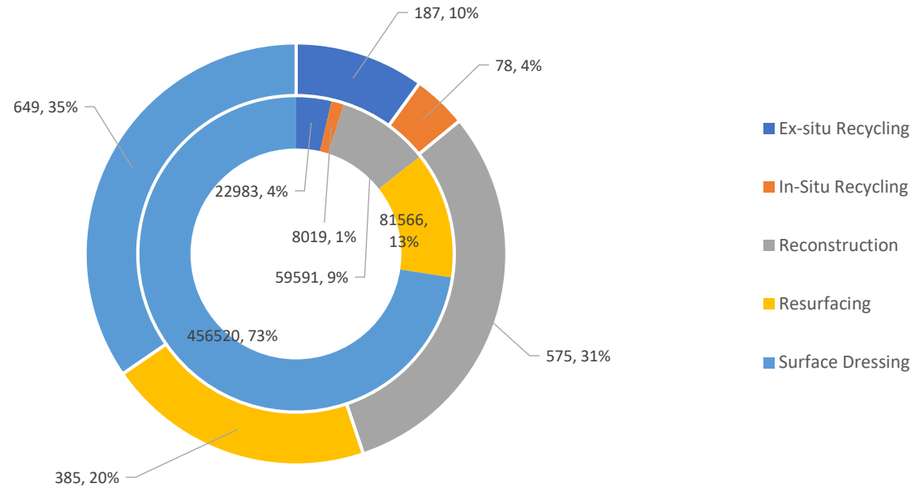
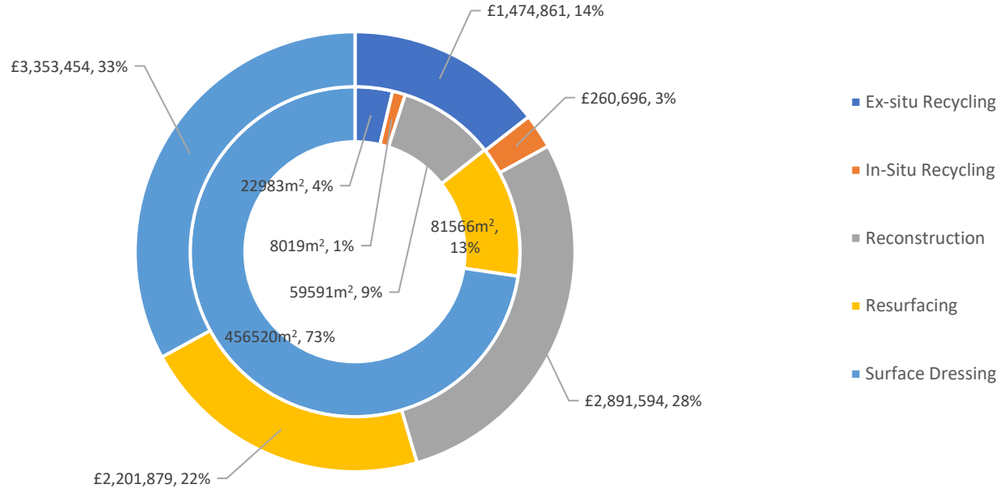
Capital Expenditure and Carbon Footprint vs Area Treated

Carbon Consumption and Area Treated by Treatment Type



This figure shows that surface dressing represents 78% of the proposed works programme by area but just 40% by CO_2e emissions, conversely reconstruction works account for 11% of the proposed works programme by area but 39% of the CO2e footprint. As such surface dressing treatments result in the lowest CO_2e footprint per m^2, with the CO_2e footprint of surface dressing being approximately just over a quarter of that of resurfacing, while nearly less than a seventh of reconstruction.

Budget Expenditure and Area Treated by Treatment Type



This figure shows that surface dressing represents 78% of the proposed works programme by area but just 40% by buuget, conversely reconstruction works account for 11% of the proposed works programme by area but 37% of the budget. This bears out a near linear relationship between carbon footprint and cost - the higher the cost the higher carbon footprint. The goes to further reinforace the TAMP princiiples of prevenatitive maintenace being not only the most efficinet use in budget but also having the lowest carbon footprint and most efficient use of reasources.