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Somerset Winter Service Optimisation

Delivering Net Zero Through Collaborative Innovation



Project Background

- Initiated through the LIVELABS2 Wessex Partnership: Net Zero Corridors.
- Focus: decarbonising highways maintenance activities.
- Applied the ‘Highways Doughnut Toolkit’ to the Somerset Winter Service.
- Identified a series of opportunities to optimise and decarbonise the service.

DOUGHNUT ECONOMICS FOR HIGHWAY MAINTENANCE



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Department for Transport · LIVELABS2 Decarbonising Local Roads · Cornwall Council · Hampshire County Council · Somerset Council · Net Zero Roads Wessex Live Lab

The Winter Service in Somerset: Project Context

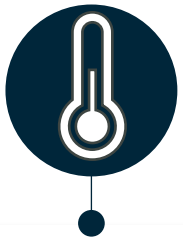


Scale

Large rural county with dispersed market size towns

6765km of road approx.

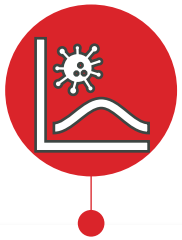
21% or 1450km approx. is part the precautionary salting network



Climate

Varied Topography (Exmoor, Blackdown Hills, Somerset Levels)

Varied climate influence (Coastal, Elevated areas)



Domain based approach

Precautionary salting network divided in 4 geographical domains

Each domain contains between 4 and 8 routes

23 routes

1 weather forecast per domain (4 forecasts)



Delegated Service

Service delegated to Kier

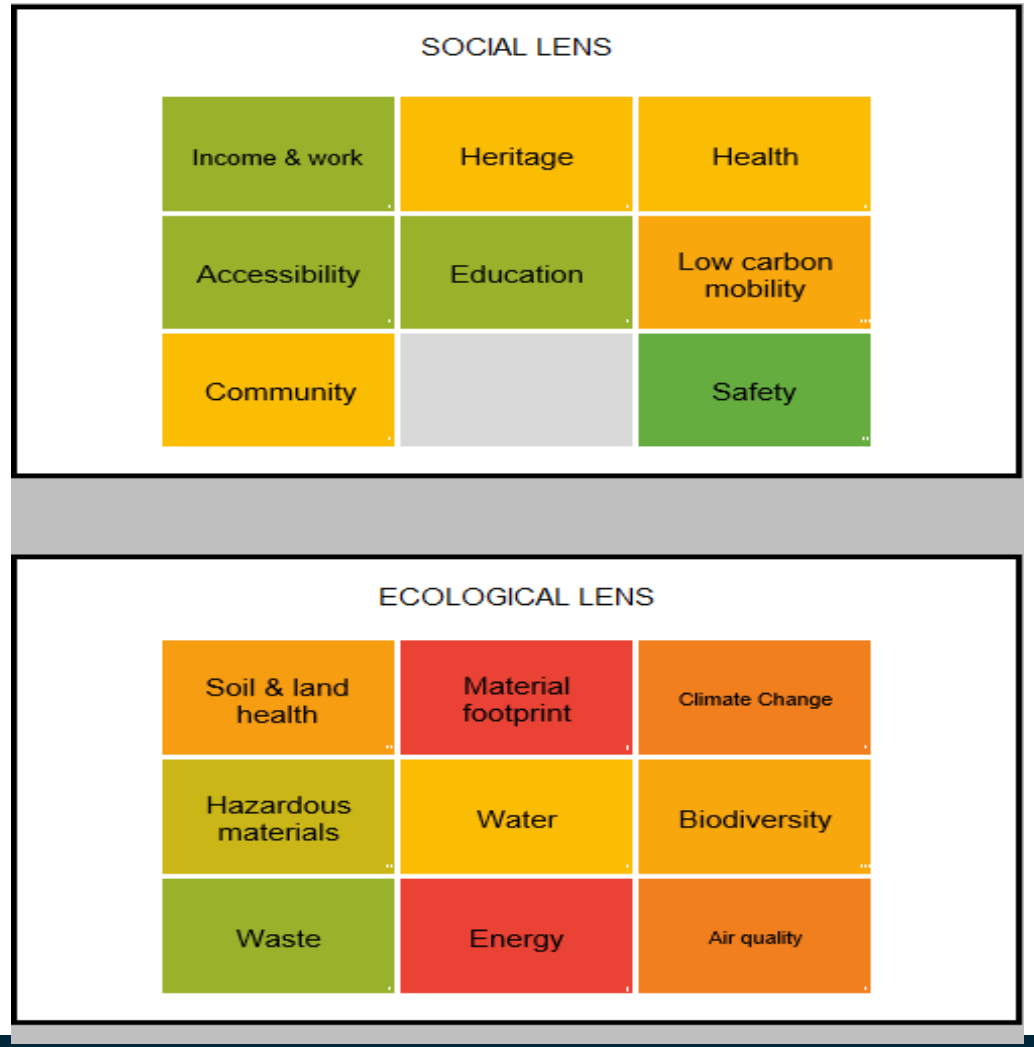
Winter Weather Bureau Service

Weather Stations Management and Maintenance

Winter Decisions Operations

Doughnut Assessment

- Opportunities for Improvement



Project Objectives

Reduce carbon emissions by minimising energy/fuel consumption and the use of salt.

Reduce the depletion of natural resources by minimising the use and wastage of salt.

Reduce the environmental impacts to soil and land health by minimising de-icing material being applied to roadside verges and entering surface water run offs.

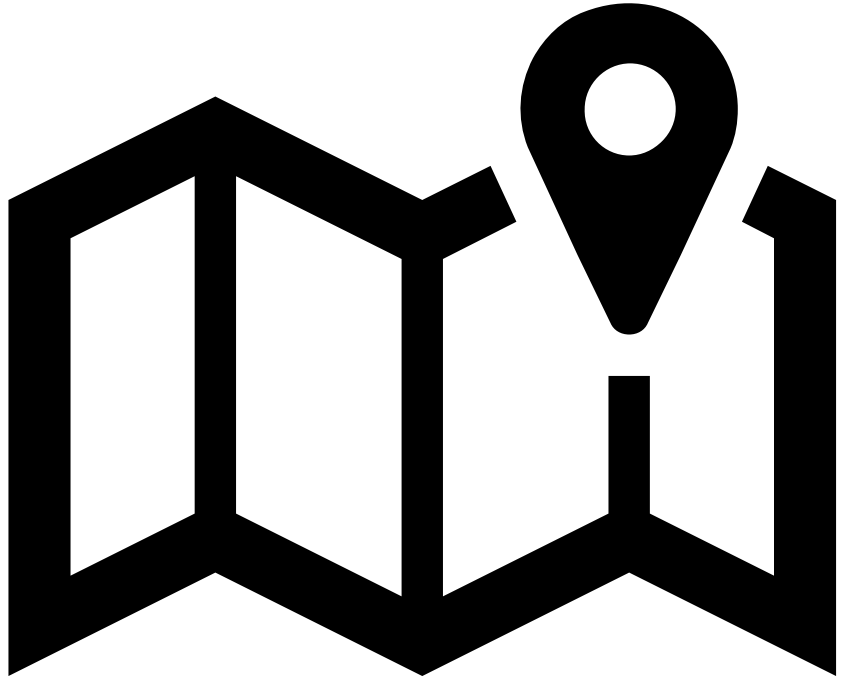
Contribute to improved air quality levels in Somerset by minimising gas and particulate emissions from the winter fleet.

All while maintaining the existing Somerset winter resilient network.

Optimisation Activities

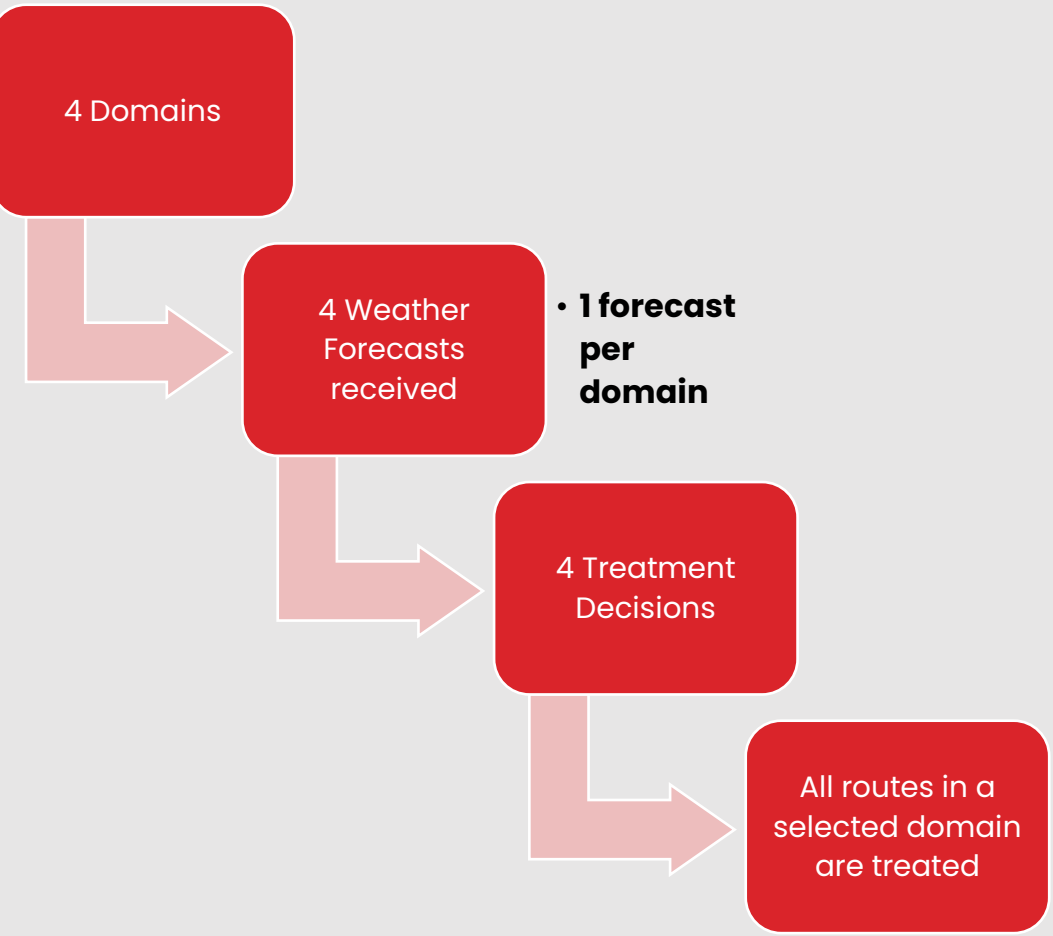
2 main areas of optimisation opportunities identified:

- **Route planning optimisation**: reduce 'non-gritting' travel and the number of routes while treating the same network.
- **Moving from Domain to Route-based forecasting and decision making**: Shift from 4 domains to 23 route-specific forecasts and decisions allowing targeted winter treatment actions.

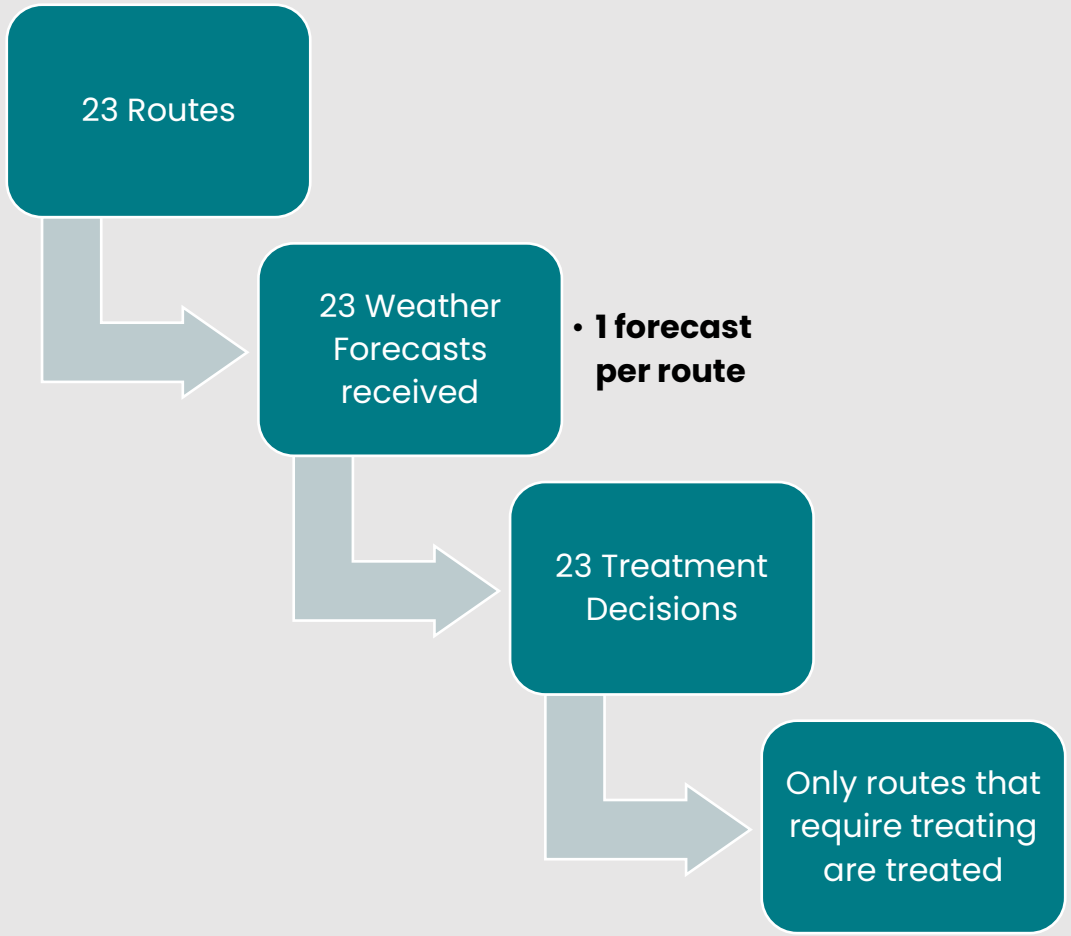


From Domain to Route-based Forecast & Treatment Decision

Domain-based Forecasting and Decision Making



Route-based Forecasting and Decision Making

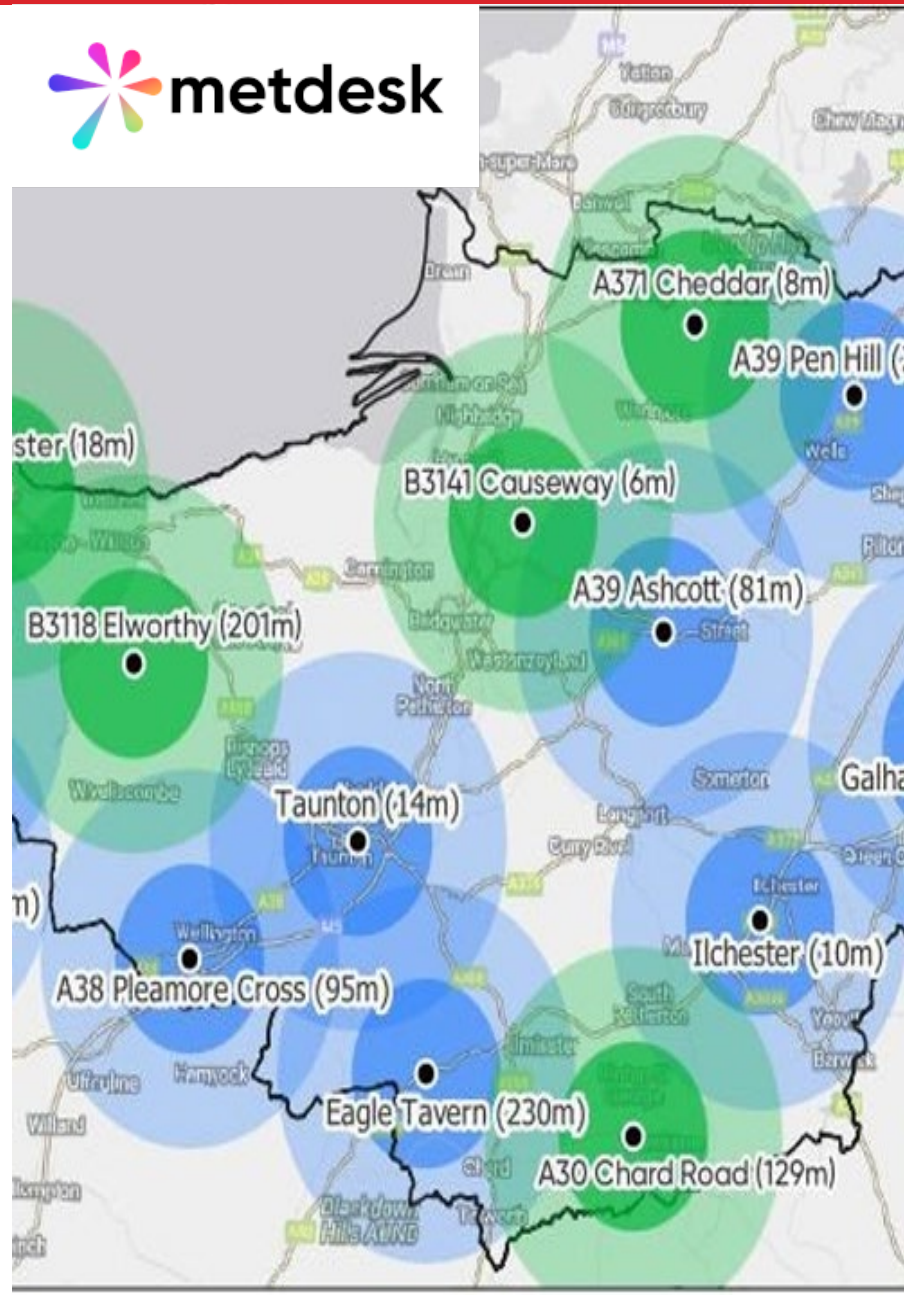


Challenges and Operational Impacts

- Moving from 4 to 23 decisions: increased decision volume and therefore more time and resources required.
- Update of the Somerset Council Winter Plan required to capture all the changes associated with moving to route–based forecasting.
- **Managing stakeholder and expectations** regarding perceived reduction in service whereas the project delivers a smarter and more targeted service while treating the same network.

Risk Mitigation and Management

- **Gap Analysis:** working closely with the winter bureau service provider **MetDesk**
  - To ensure enough weather data is available for route-based forecasting
  - Use of additional exiting weather data to complement / produce the route-based forecast.
- **Conservative Decision Making** adopted initially to build confidence and while extent of available data is increased.
- **Additional Sensors Deployment** programme to complement the set of available data and increase the robustness of the decision making.
- **Extended Forecast Horizon** from 24 to 36 hours to provide route-level intelligence as much in advance as possible for better operational planning.
- **Increased Operational Capacity & Training:** Kier increased resources and trained more decision makers to share workload and ensure operational resilience.



Project Results: Year 1

YEAR 1 • DOMAIN-BASED SIMULATION → ROUTE-BASED DELIVERY



29%

FEWER RUNS / ACTIONS

1,874 → 1,314

560 treatments avoided in Year 1

All values shown as domain-based → route-based

29%	29%	29%	21%	29%
RUNS / ACTIONS	**SALT TONNAGE**	**ROUTE LENGTH**	**GRITTER EMISSIONS**	**SALT EMISSIONS**
1,874 → 1,314	**7,464.3 → 5,249.0 t**	**211,101 → 149,056 km**	**259,468 → 204,109**	**52,250 → 36,743**
560 fewer	2,215 t saved	62,045 km avoided	55,360 $kgCO_2e$ lower	15,507 $kgCO_2e$ lower

Reduction vs domain-based simulation • Emissions in $kgCO_2e$

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Project Benefits



Improved Efficiency & Sustainability Outcomes

Route-based forecasting and decisions reduce unnecessary treatment actions, replacing broad triggers with targeted decisions for efficiency.

Fewer treatment actions lower salt use and reduce fuel consumption, decreasing carbon emissions and environmental runoff.



Improved Operational Resilience:

Less drivers required each night providing relief and wider operational resilience during long periods of extreme weather.

Reduction in the numbers of drivers that are on rest the next following working day.



Closer Collaboration

Increased collaboration and closer working relationship between Somerset Council and Kier.

Closer collaboration between data providers, forecasters, decision makers, and operational teams.

Next Steps

Additional Sensors Deployment

Installing 4 new Vaisala weather sensors to improve route-level data accuracy, support risk management and bring additional efficiencies.

Weather Data Platform Integration

Integration of weather data to ensure consistent data handling and faster decision-making access.

Monitoring Programme

Three years of detailed monitoring to track carbon benefits and operational efficiencies indicators.

Future Optimisation

Explore further opportunities for efficiencies: segmenting routes for partial treatment, dynamic and automated decision making, connected and dynamic weather data capture.



Vaisala Xweather Horizon dashboard (demo image from Vaisala website)

Vaisala TempCast sensor (right)

Vaisala GroundCast sensor (bottom)





Images- credit to Vaisala Group

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Thank you

