

# Local Authority Fleet Strategy to Decarbonisation

Annex 1: Avoid-Shift-Improve - case studies

June 2023

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# Introduction:

## Avoid-Shift-Improve approach - case studies

To assist in the decarbonisation process for the local authority (LA) fleet, the Avoid – Shift – Improve (A-S-I) model is encouraged as a holistic and longer-term tactic. This annex comprises a range of case study examples that are applying A-S-I strategies to support their fleet decarbonisation processes. These case

studies are explored in detail individually further below and are summarised on the following table. LAs seeking to explore these cases further should contact the E&M CARO directly for the appropriate contact details.

	Intervention	Local Authority	Expected outcome
Avoid	Working from home	N/A	Achieve Govt target 40% WFH
Shift	Mobility Hub	Dun Laoghaire County Council	Evidence of Modal Shift in LA Activity
Improve (Operations)	Fleet Management	Donegal County Council	Value of a structure approach to cost and CO <sub>2</sub> reduction in Transport
	Eco-driving	Donegal County Council	Eco-driving Implementation
Improve (vehicles)	Electric Chargers	Cork City Council	Home parking
			Data collection
			Reporting
Alternative Fuels	Alternative Fuels Hydro-treated Vegetable Oil	Tipperary County Council	Costs, certificates and learnings

The CCMA Reimagining Transport in Local Government Working Group would like to acknowledge and thank the local authorities who contributed to this annex.

# SHIFT:

## Moving staff from internal combustion engines (ICE) to electric vehicles (EV) & electric bikes (e-bikes) - DLR Mobility Hub

In 2019 Dun Laoghaire Rathdown (DLR), in conjunction with South Dublin, Fingal and Dublin City Councils, Smart Dublin and Enterprise Ireland, launched a Small Business Innovation Research (SBIR<sup>1</sup>) challenge to address the issue of sustainable travel within the local authorities (LA). The outcome of this process for DLR was the creation of the MyMobilityHub travel planning platform.

The MyMobilityHub platform, developed by AECOM, currently contains seven electric cars for Council staff to use for work purposes, spread between County Hall and the depot in Ballyogan.

The aim of the platform is to encourage staff to use EVs rather than petrol or diesel vehicles when out of the office on Council business. There are plans to expand the platform in phase two of the project to include 24 e-bikes at various DLR depots around the county.

The modular MyMobilityHub platform includes data about in-house and external transport options and presents the outcome to the user to make an informed choice.

A journey planning element and an electric car booking engine make up the MyMobilityHub offering. The travel planning function allows users to enter their proposed destination and the system will then offer the most suitable form of transport for the journey.

The user can then follow on to the next step and book an electric car (and in future e-bike) from a selection available. Once the EV has been chosen through the online platform the user can then collect the car keys from a central collection area at the DLR Civic Hub, in County Hall.

The available options allow the user to select sustainable forms of transport when moving about the county on council business and also adds a layer of gamification to the choice by awarding points to the user based on the mode of transport chosen.

The MyMobilityHub platform allows the user to make informed choices regarding their method of travel while also centralising the management of the DLR resources in terms of e-cars, and soon, e-bikes and bikes. Encouraging staff to adopt more sustainable travel modes also assists DLR in achieving its climate action targets.

An internal study carried out in March 2022 gathered the views of staff on their travel habits and feedback on MyMobilityHub. 318 staff responded and the overall sentiment was very positive with the majority in favour of adding e-bikes to the platform (already underway). These responses indicate there is potential to expand the user base of the platform and to increase the frequency of low-carbon journeys taken by staff for work purposes.

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<sup>1</sup> Small Business Innovation Research is a pre-procurement process that allows public bodies trial and test innovative technology solutions to try and solve existing challenges within an organisation

Below are sample screens from DLR.

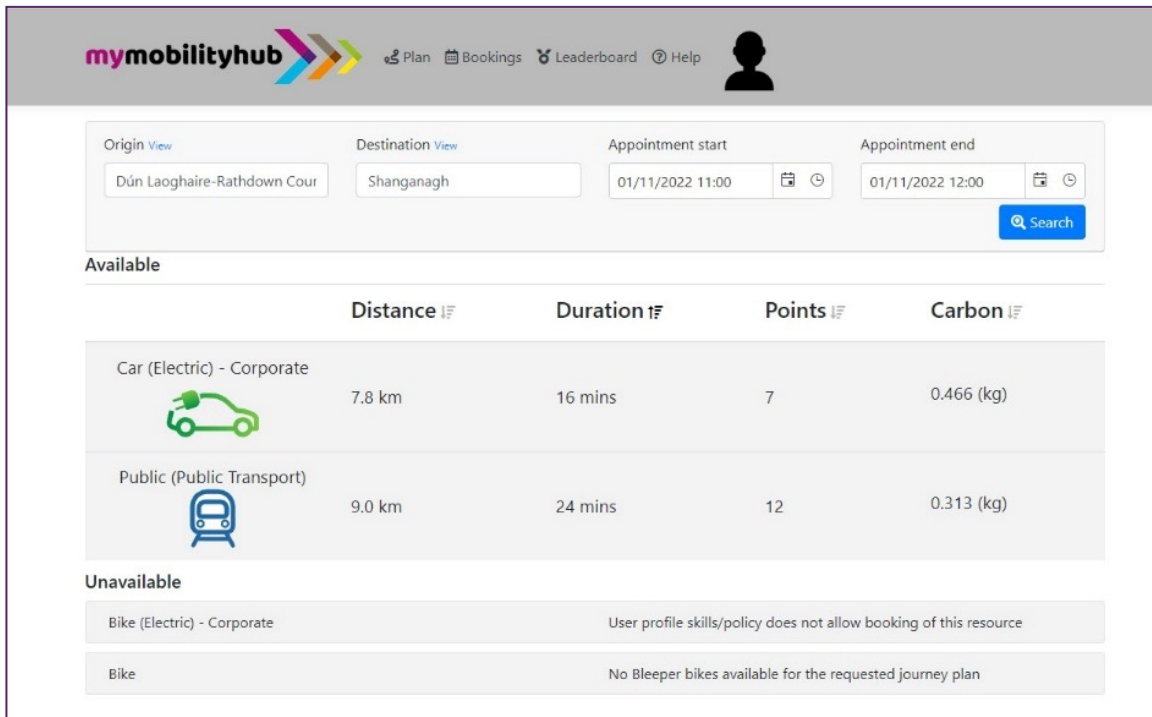


Figure 1: Sample journey planning home screen

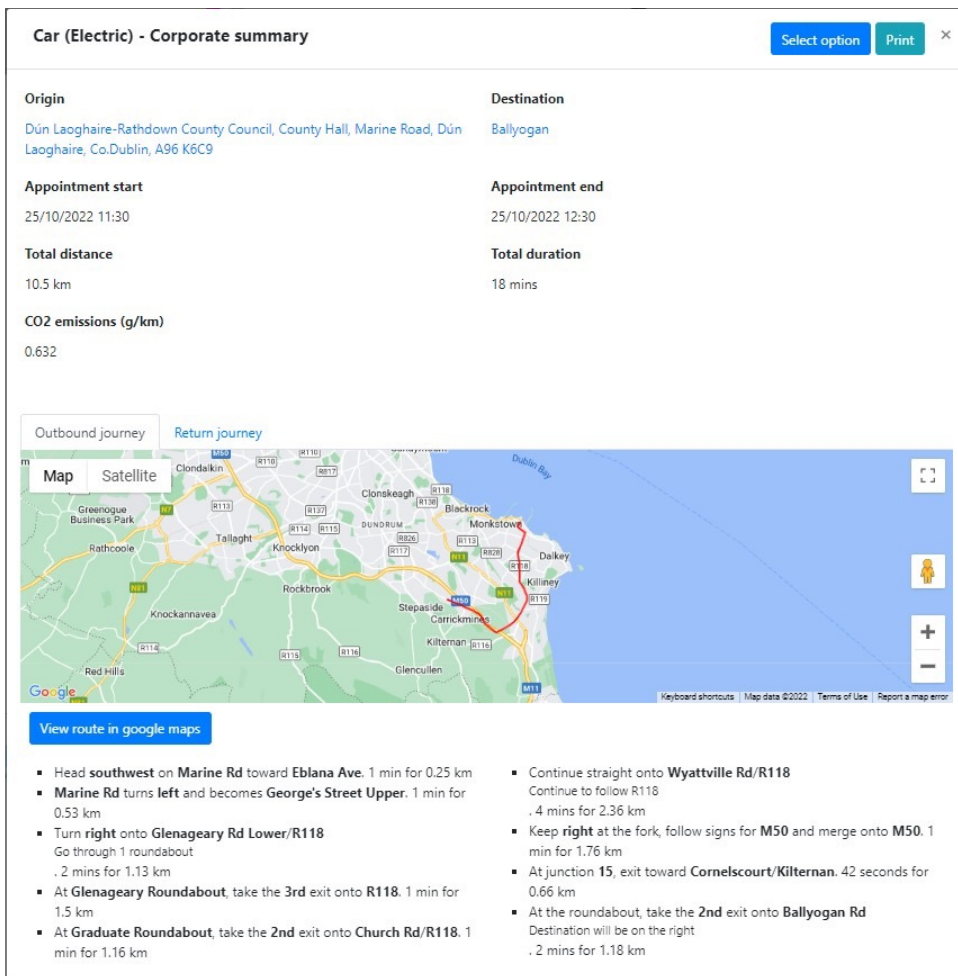


Figure 2: Sample journey details home screen

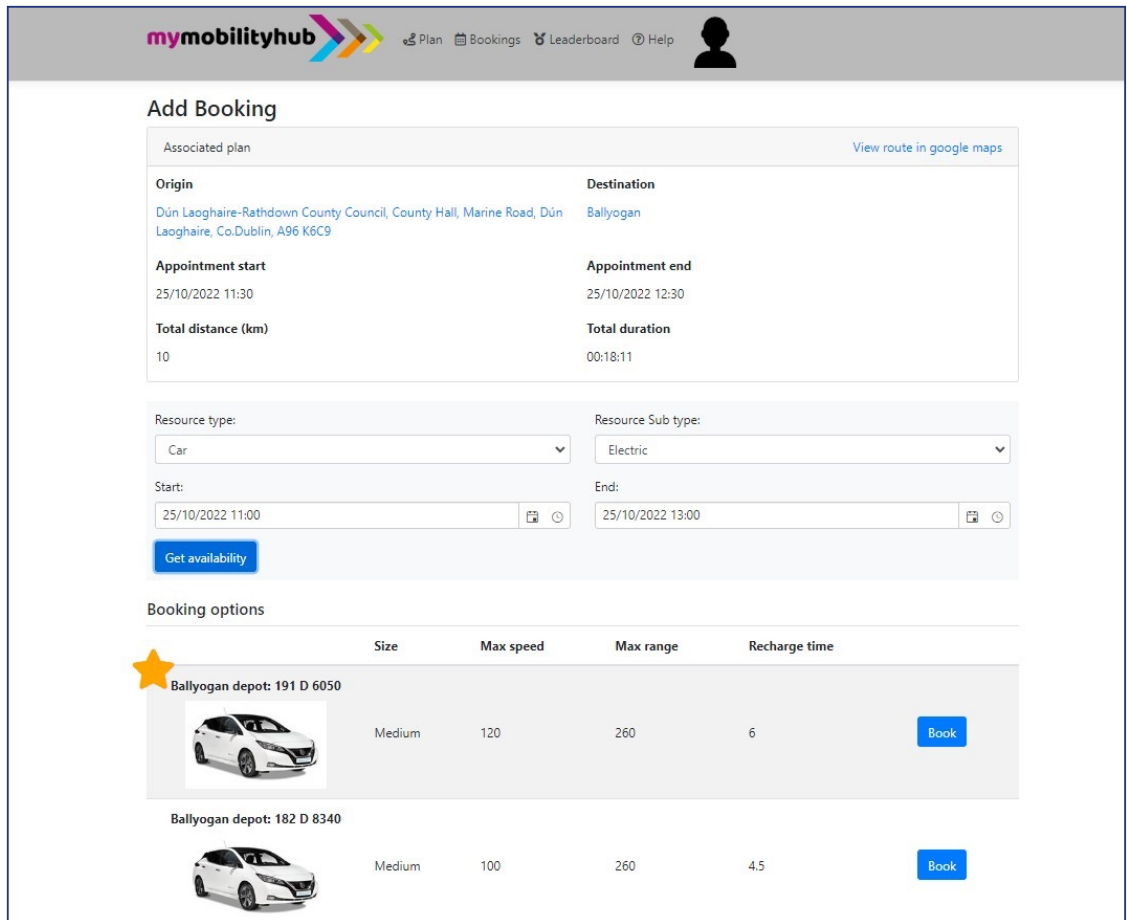


Figure 3: Sample booking home screen

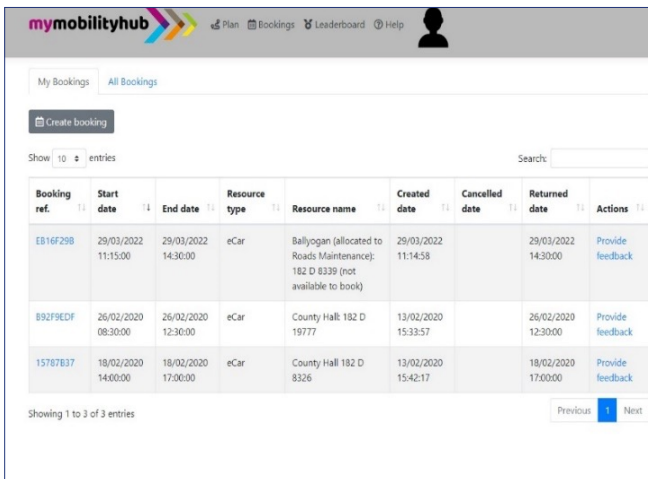


Figure 4: Sample booking history home screen

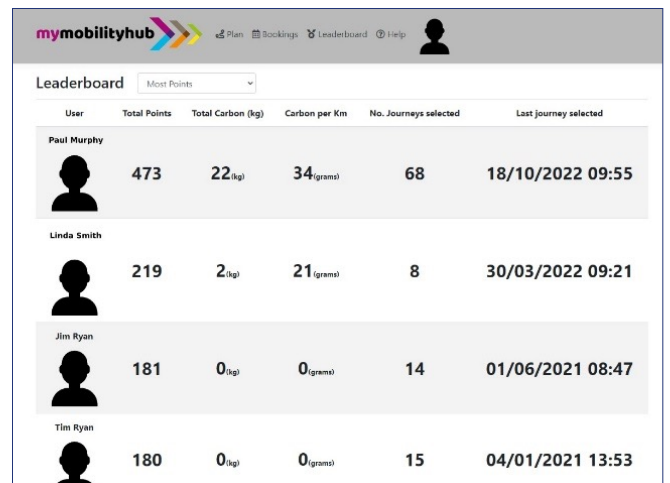


Figure 5: Sample booking history home screen

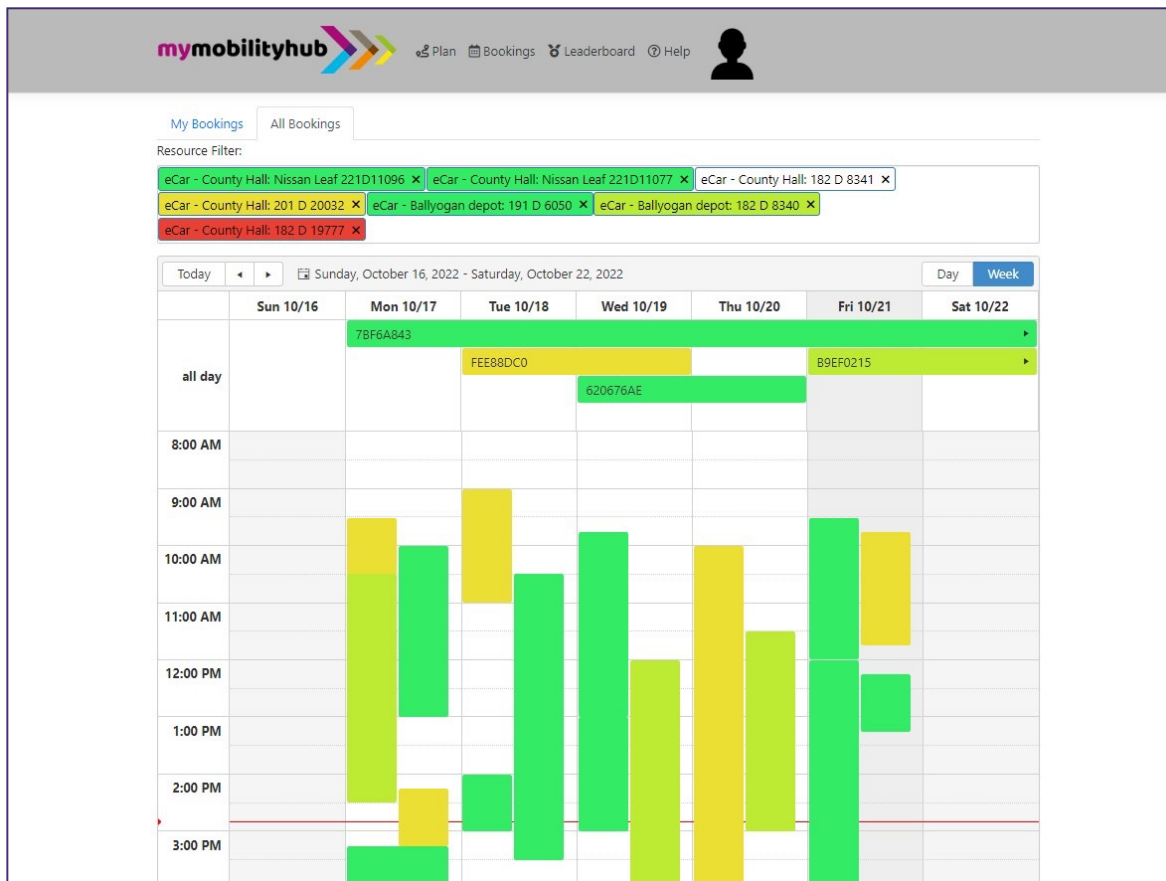


Figure 6: Sample all booking home screen

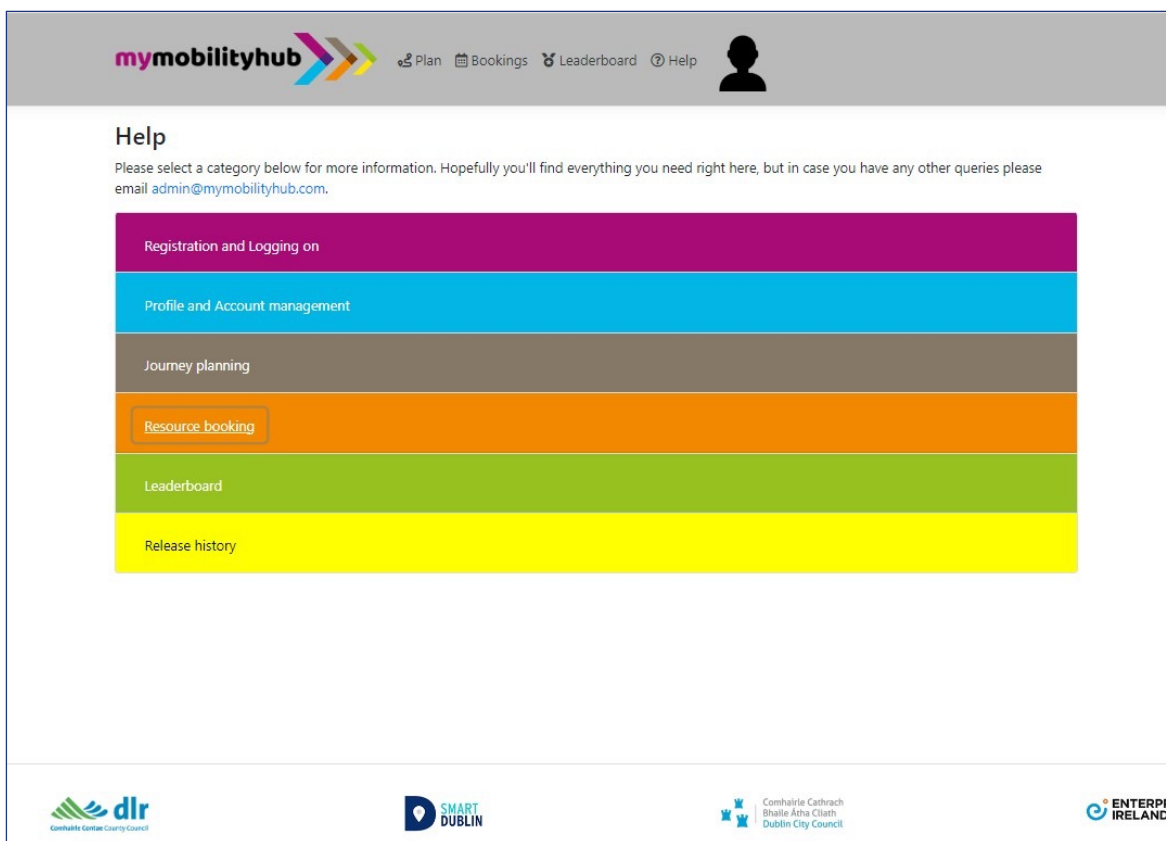


Figure 7: Sample help section home screen



# IMPROVE (operations):

## Fleet management - Donegal County Council

To comply with requirements of the National Energy Efficiency Action Plan (NEEAP), in 2016, Donegal County Council (DCC) developed an energy performance management system (EnMS) in order to become certified under ISO 50001. The standard is based upon the Plan-Do-Check-Act management system.

ISO 50001 provides a framework of requirements for organisations to:

- Develop a policy for more efficient use of energy
- Fix targets and objectives to meet the policy
- Use data to better understand and make decisions about energy use
- Measure, report and present the results
- Review how well the policy works
- Continually improve (simplify) the energy management system (EnMS).

ISO 50001 was used as a force for change across the council and transport section, in particular by focusing the fleet management / transport team to formalise their fuel management and spread the workload in delivering measurable savings.

### Cost

The development of the EnMS and initial certification to ISO 50001 required inputs approximating to six person-months for a Senior Executive Engineer and Executive Engineer, as well as approximately two person-months for a Clerical Officer. Ongoing inputs associated with the administration of the EnMS are estimated at one day per month for a Technician, 0.5 days per month for an Executive Engineer and 0.25 – 0.5 days per month for a Senior Executive Engineer.

The following additional initiatives have been rolled out either as part of the EnMS or complementary to the EnMS:

- Eco-Driver training for 20 no. non-professional drivers at an approximate cost of €3,000
- Installation of GPS tracking units to collect data on vehicle fuel consumption and driver performance amongst other parameters with approximate installation costs of €1,100 per heavy goods vehicle (HGV) and annual subscription costs of €200 per vehicle
- Development of a Top Tips Driver Awareness Campaign at an approximate cost of €2,000

### Performance indicators

The performance of the Council's HGV vehicles are monitored and reported on within the EnMS, with monitoring of fuel consumption and vehicle idling performance carried out by the Council's telematics software, which is subsequently manually checked and validated against fuel card purchases and journeys made. These details are collated and measured against predefined performance indicators within the EnMS reporting dashboard. A sample of the typical reporting data is provided in the figure below.

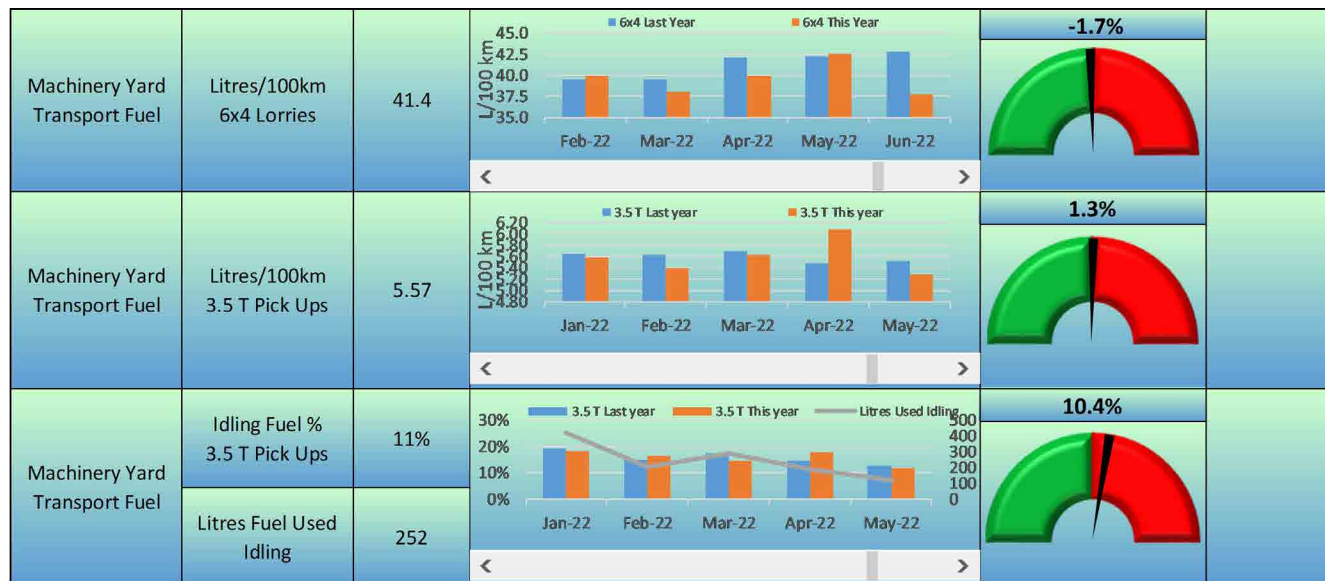


Figure 8: EnMS reporting dashboard

### Other benefits of implementing ISO 50001

Significant improvement can be achieved by improving general culture and behaviour.

- Council staff (and those engaged by Council) were asked to:
  - o Contribute to improved energy housekeeping and behaviour – what can be switched off, turned down, improved and so on without causing too many issues?
  - o Make suggestions and proposals for improvements in energy consumption, however simple.
  - o Co-operate with and contribute to energy awareness campaigns
  - o Embrace new technologies and practices

#### Key steps to having a system that works:

- Commitment from the Council’s Senior Management
- Identification of Significant Energy Users (SEUs)
- Setting of Energy Performance Indicators (EnPIs)
- Operational controls
- Opportunities for improvement - register

### Review

The Council has completed these steps and continues to promote energy management and deliver energy efficiencies:

- 2016 – DCC’s Energy Management System and Energy Team was established
- 2016 – ISO 50001:2011 Certification Obtained
- 2019 – ISO 50001:2011 Re-Certified
- 2021 – ISO 50001:2018 Transition Certification Process compliance audit

## Telematics and driver training

In support of the EnMS, the Council provided Eco-Driver training to 20 non-professional drivers, which included amongst other objectives the aim of improving driver performance with regards to fuel efficiency (see separate case study for additional details). The non-professional drivers that took part in the course were selected from a variety of Directorates and Municipal Districts. In support of the Eco-Driver training, the Council installed “Light Bars” (also known as a “Driver Behaviour Modules”) within fleet vehicles as a self-help aid to vehicle operatives to manage their driving efficiency and to reinforce the eco driving message being delivered by Council.

The modules are linked to the Council’s telematics service and provide drivers with real time feedback on their driving performance in the cab, empowering them to improve their performance and allowing managers to focus on exceptions to trends rather than on every trip or incident of poor performance.

## Operation and maintenance

Complementary to the EnMS, Donegal County Council introduced Microsoft Dynamics Customer Relationship Management (CRM) software, to manage fleet maintenance in a more systematic manner. One of the benefits of this system is ensuring that vehicles are maintained regularly so that the vehicles are operating as efficiently as possible.

Dynamics CRM automatically generates service requests for vehicles at prescheduled intervals e.g. at three monthly intervals or ahead of upcoming roadworthiness tests. Ad hoc maintenance requests are also generated via Dynamics CRM through the use of Daily Driver Check application developed for the Council; this application is used by drivers to complete their daily walkaround checks with maintenance requests generated automatically within Dynamics CRM for any defects that are noted in the walkaround checks.

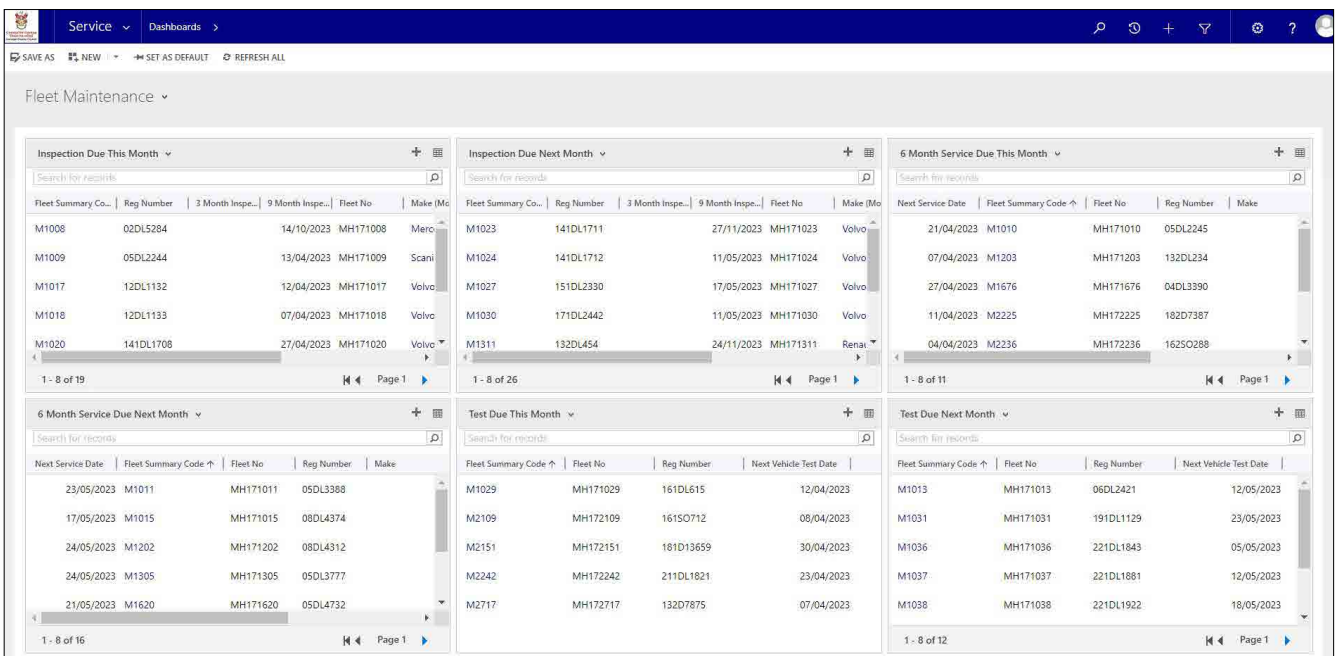


Figure 9: Scheduled fleet maintenance activities

The inspection and maintenance requests that are generated within Dynamics CRM are also actioned within the same software, with predefined inspection reports used by the

Council’s staff to complete the checks, and to record details of inspection findings and any maintenance that has been completed.

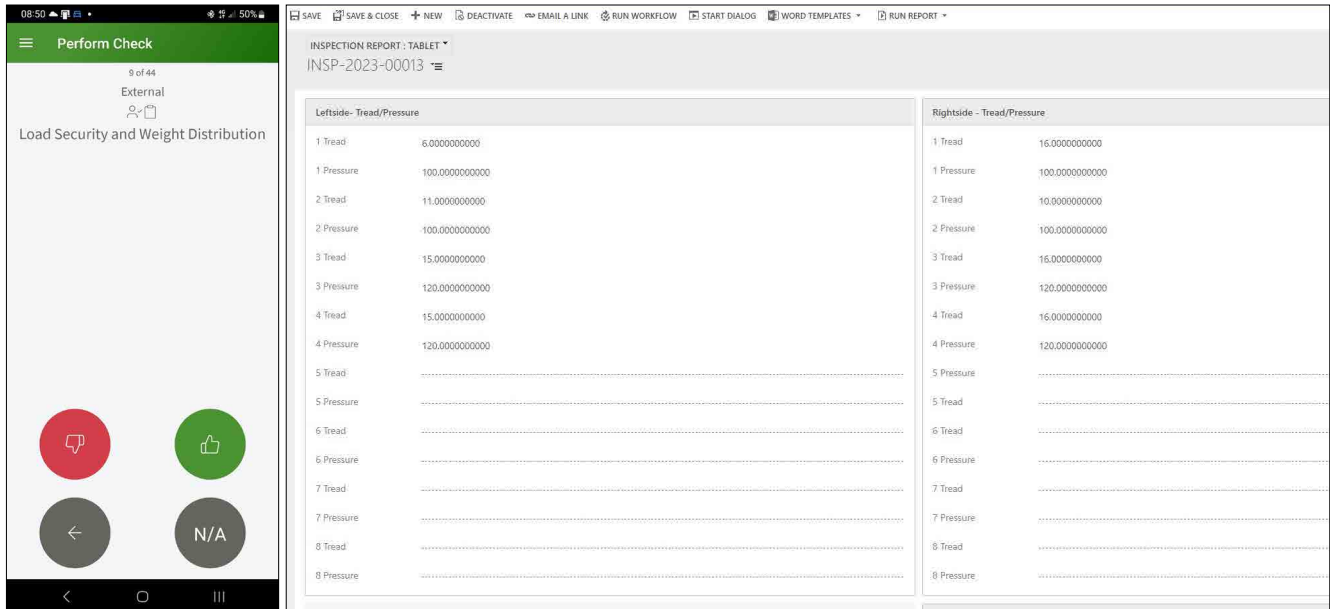


Figure 10: DCC Driver Check App (Left), Sample Inspection Report in CRM (Right)

## Procurement

The rollout of the EnMS has helped in focussing on significant energy users within the fleet, such as 6x4 lorries. This has helped to inform the procurement strategy when purchasing replacement vehicles with updates made to the specification of vehicles to include fuel efficient measures, such as the use of automatic gear boxes, high fuel energy efficiency classes for tyres and the provision of tyre pressure monitoring system. Additionally, updates have also been made to the award criteria so that the fuel efficiency and whole life costs of vehicles is considered when identifying the preferred tender.

## Suppliers / key actors

- Facilities Management Section of Donegal County Council lead the development of the EnMS and introduction of ISO 50001.
- Information Systems Section of Donegal County Council for the development of the customised Dynamics CRM portal.
- SendMode.com for the development of the Daily Driver Check application.

# IMPROVE (operations):

## ECO-driving - Donegal County Council

In 2018, an eco-driving training course trial was procured by Donegal County Council. The training was provided to 20 non-professional drivers, which included a 2hr overview seminar that encouraged drivers to ask questions and challenge the instructor on the topics. The training course also included a 2hr individual one-on-one driving lesson incorporating:

- 45 min drive
- Review of driving style and advice to driver
- 45 min re-drive

### **Objectives of course**

- Raise awareness of the dangers associated with occupational driving.
- Introduce drivers to Advanced & Fuel-Efficient Driving and how it is adopted by occupational drivers.
- Introduce drivers to the Council's Driver Handbook.
- Assess each person's driving to identify the aspects that require improvement and provide Advanced & Fuel-Efficient Driving tuition.

### **Measuring effectiveness of training**

Detailed driver style reports were set up within the Council's telematics software to assess driver's performance in advance of attending the training. These reports assessed the driver's performance against the following parameters:

- Excessive acceleration
- Excessive braking
- Excessive speed
- Hard cornering
- Over-revving of vehicles.

The performance under each of the above parameters was then combined and the driver's overall driving style was given a rating of either Red, Amber or Green.

Subsequent reports assessing the same parameters were prepared immediately post the training, and at set periods thereafter. A summary of the report results is given below.

No.	Driver Section	Vehicle Type	Comments on monitoring performance	Pre training Report	Immediate post training Report	Report	Report	Report	Report	Report
				Oct-18	Oct-18	Jan-21	Jun-21	Dec-21	Jan-22	Apr-22
1	Housing Letterkenny	Vans Small	Vehicle tracker reporting issues experienced at times	AMBER	AMBER					
2	Housing Letterkenny	Large Van	Vehicle tracker reporting issues experienced at times	RED	RED		GREEN		GREEN	GREEN
3	Roads Stranorlar - Lifford	Pick-up 3.5T	Vehicle type changes over period to Pick-up 7.5T	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN
4	Roads Stranorlar - Glenmore	Pick-up 3.5T	Vehicle tracker reporting issues experienced at times	AMBER	GREEN					
5	Roads Stranorlar - Drumkeen	Pick-up 3.5T	Vehicle tracker reporting issues experienced at times	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN	
6	Letterkenny - Parks & Open Spaces	Pick-Ups	Driver ceased vehicle duties at some point since training	GREEN	GREEN					
7	Letterkenny - Parks & Open Spaces	Pick-Ups		GREEN	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN

Figure 11: Sample of driver style rating pre and post EcoDriver Training

### Key learnings

- Behavioural change is challenging
- Persist with efforts
- There is lots of information on the internet you can use
- Training is not expensive and provides positive reinforcement to message
- Same story in different ways – leaflets, poster campaign, toolbox talks, seminars, one to one sessions
- Direct ongoing monthly messaging
- Technology to “prove” outcomes may be unreliable
- Drivers are the key.

### Cost

The approximate cost for the course was €3,000 for the 20 no. drivers.

### Other benefits

Drivers reported that they found the course to be particularly beneficial with a good mix between the theory and practice of improving driving performance.

### Suppliers / key actors

The training was provided by a local company named Swilly Group.



Figure 12: DCC Staff Promoting Eco Driving Initiatives

Donegal County Council Diver awareness posters

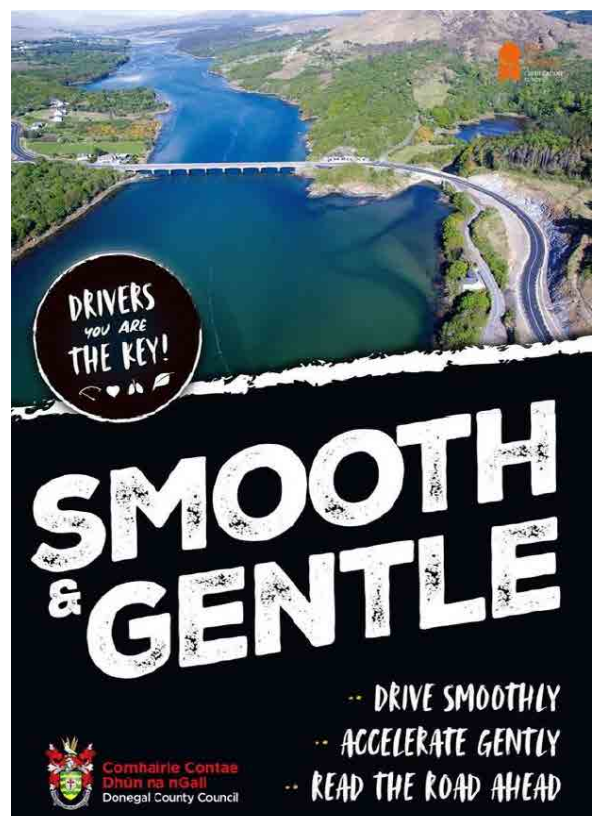
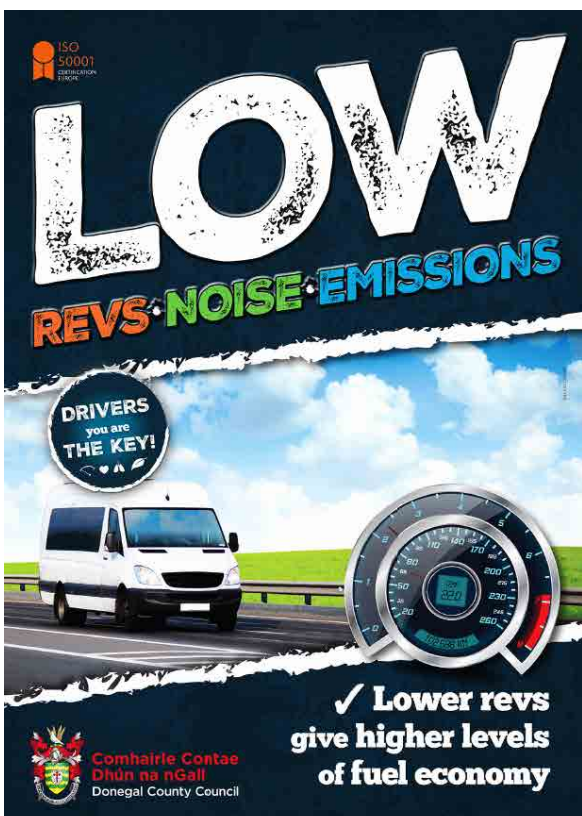
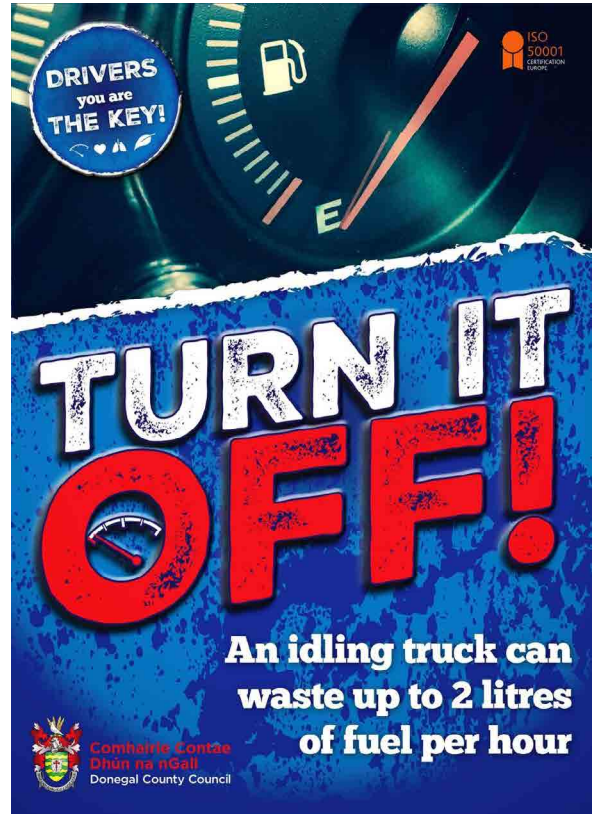
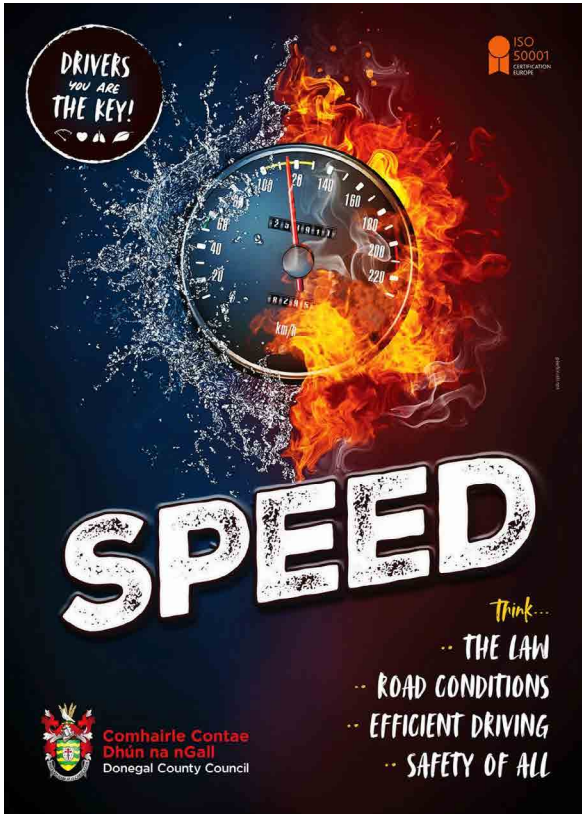


Figure 13: DCC Eco Driving Initiatives Posters

# IMPROVE (vehicles):

## Electric vehicles - Cork City Council

From consuming over half a million litres of diesel per year to less than 350,000 litres per year, Cork City Council has managed to reduce its CO<sub>2</sub> emissions year on year from 2014 to 2021, inclusive of a major boundary change in 2019 (which extended their area fivefold and increased population served by 90,000).

Cork City Council is unique in that it leases its entire fleet through the plant and machinery

yard. Approximately 215 pieces of plant and transport vehicles were under the old contract ending 2019, the new contract covers over 250 pieces of plant to service the expanded area.

Cork City is a compact city with most vehicles not travelling more than 50km per day. The leased fleet required no capital funding for the EV roll-out

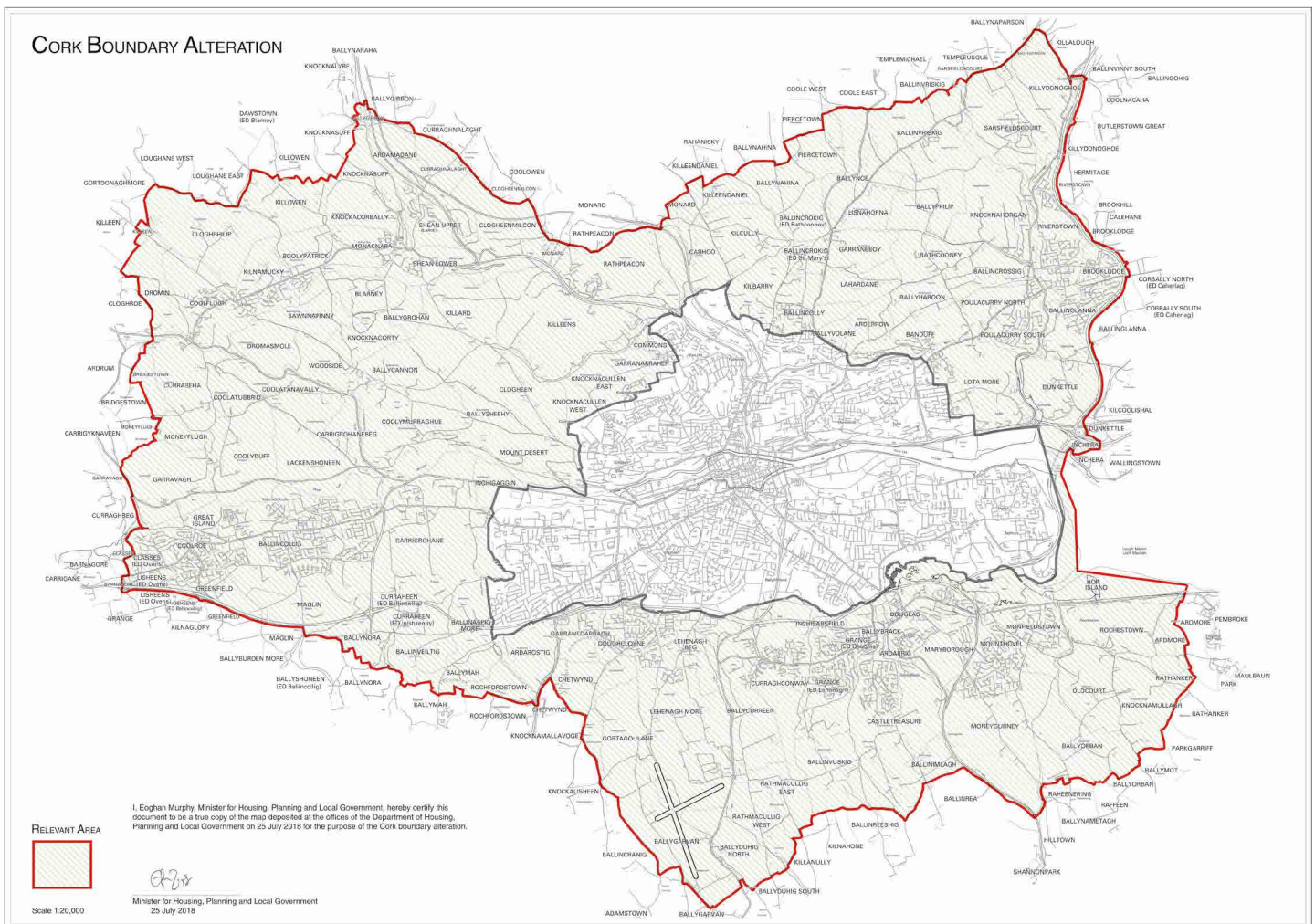


Figure 14: Cork City Council boundary extension 2019



Year	Diesel Qty ltr	Yr on Yr reduction	% reduction		
2013	505,167				
2014	467,053	38,114	8%		
2015	463,582	3,470	1%		
2016	432,229	31,352	7%	} <b>Baseline</b> (avg 2016-18)	<b>Litres</b> 402,682
2017	391,890	40,338	9%		
2018	383,927	7,963	2%		
2019	414,936	-31,009	-8%	Boundary Extension	
2020	388,095	26,841	6%	76 EV added to fleet	
2021	333,078	<u>55,017</u>	14%		<b>333,078</b>
				Litres saved vs SEAI PSMR baseline	<b>69,604</b>
				Percentage of 51% to 2030 already achieved to YE 2021	17%

Figure 15: Cork City Council fleet reductions 2014-21

These savings were achieved through a combination of **updating fleet with newer vehicles, installation and use of GPS units' data and more robust fuel logging**. Note the telematics system reports charging activity as well as fuelling. The contract renewal was awarded in September 2019 allowing the EV rollout in 2020.

The increase in 2019 is due to the **five fold increase in area** from the boundary extension, which increased population served by 90,000 and an additional 550km of road, thus additional vehicles were added to fleet.

The replacement of 76 diesel vehicles to battery EV on a lease basis in December 2019 and February 2020 returned the savings slope to a downward trend – these were leased from local dealer Keary's with backing from LeasePlan.

The investment in charging infrastructure was €71,000, with c.€10,000 of energy saving credits (ESC under EEOS) sold to Bord Gais.



Figure 16: Cork City Council EV

### CO<sub>2</sub> savings

CARO analysis using AA Ireland data shows savings as follows based on market prices and SEAI CO<sub>2</sub> factors.

Year	AA Avg €/L for year	Litres saved x Avg Price	CO <sub>2</sub> /kWh/Year (from SEAI)	Litres (saved to kWh @10.169kWh/L)	Total kg CO <sub>2</sub> (what unit? kg?)
2013	€1.5017	Base	0.2556		
2014	€1.4495	€55,247	0.2544	387,586	98,606
2015	€1.2618	€4,379	0.2543	35,296	8,977
2016	€1.1418	€35,797	0.2561	318,827	81,656
2017	€1.2413	€50,074	0.2524	410,205	103,529
2018	€1.3333	€10,618	0.2532	80,979	20,503
2019	€1.3268	-€41,142	0.2505	-315,337	-78,990
2020	€1.1997	€32,200	0.2490	272,948	67,973
2021	€1.4186	€78,046	0.2477	559,468	138,553
	Litres	€225,220			440,806
				tonne CO <sub>2</sub>	441

Figure 17: CO<sub>2</sub> calculations from Cork City Council data



Figure 18: Cork City Council vehicle performances (loaded)

### Individual vehicle’s performances examples

Above are performance figures from the dashboard trip computers from fully loaded vehicles. When comparing fuel use, remember to add c.10% for charging losses between the meter and the vehicle, which will vary with weather and type of charger.

### Additional benefits

**Two EV pooled vehicles** are based at City Hall for use by staff instead of their own ICE vehicles, this gives staff freedom of choice as to how they get to work as they do not have to bring a car just in case of a meeting (modal shift).

These two pooled vehicles have proved extremely popular with a booking rate of 90%. As a result, senior management agreed to double the pooled vehicles to four.

Description / registration number	Number of journeys	Distance (km)	Driving time (hh:mm)	Driving time (minutes)	Days driven	% days driven
201C5158	99	638.217	28:10:00	1690	17	81%
201C4935	95	565.172	25:27:00	1527	19	90%
<b>Fleet Totals</b>	194	1203.389	53:37:00	3217		

Figure 19: Pooled vehicle use (90%) example from Cork City Council May/22

### Home charging

Home charging was also introduced with union engagement i.e. vehicles can be parked at a driver’s home and charged at lower cost overnight rates, to the benefit of Cork City Council and the driver who can now drive directly to that day’s work.

The home chargers report kWh charged to the vehicle, i.e. inclusive of any losses, to Cork City Council and the employee is reimbursed at an agreed rate.

### Telematics

Transpoco provide a single reporting solution for diesel ICE and battery EVs, greatly simplifying management.

Charging activity is also visible reducing risks of downtime when drivers forget to charge – this is really important in the first few weeks, but nonetheless provides driver and management with facts-based reporting for reimbursement and state of charge.

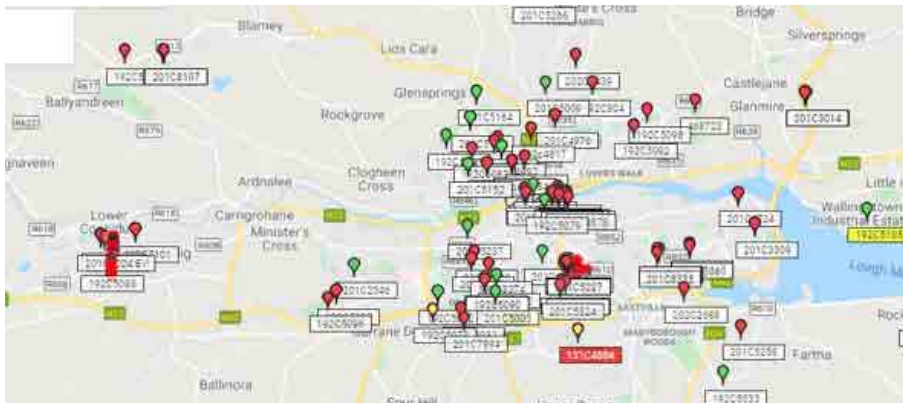


Figure 20: Sample Transpoco home screen from Cork City Council

Vehicle Group		Alerts Report			
All Groups		Date	Start Time	Stop Time	Duration
Vehicles		<b>[201C5164] 201C5164</b>			
Reports		Nissan Leaf Charging			
Alerts		Tue 16th Feb 21	09:05	09:06	00:00:37 [Salt Barn]
Alerts		Tue 16th Feb 21	12:53	14:29	01:36:09 [Salt Barn]
Alerts		<b>[201C5249] 201C5249</b>			
Alerts		Nissan Leaf Charging			
Alerts		Tue 16th Feb 21	08:04	09:28	01:23:54 [City Hall La]
Alerts		<b>[201C5154] 201C5154</b>			
Alerts		Nissan Leaf Charging			

Figure 21: Sample of charging activity reporting in Transpoco reports

# Alternative fuels:

## Hydro-treated Vegetable Oil (B100) pilot - Tipperary County Council

In March 2022, Tipperary County Council commenced a trial using a biodiesel called Hydro-treated Vegetable Oil (HVO) in approximately 5% of their fleet. Biodiesel can be blended and used in many different concentrations. The most common are B7 (up to 7% biodiesel) and B20 (up to 20% biodiesel). B100 (pure biodiesel) is typically used as a blend stock to produce lower blends. The LA's intention was to assess the data collected from the trial and to expand the use of HVO to approximately 20% of the total local authority fleet over the following 12 months.

### Cost / budget

HVO costs 60c/Litre above the cost of standard diesel at Sep'22 prices<sup>2</sup>. This equates to an additional €28,000 per annum for this subset of 10 diverse vehicles in the Tipperary County Council fleet. No capital expenditure was incurred and no additional operational costs or storage issues were required due to the existing infrastructure being in place.



Figure 22: Sample HVO fuelled vehicles from TCC

Comments from Tipperary County Council:

- ”• **There were no capital costs involved as we already had a spare pump and storage tank.**
- **There was some contaminated fuel in the storage tank that we proposed to use. We had to get this removed and the tank cleaned out at a cost of approximately €2,500.**
- **There were no other changeover issues other than getting the HVO set up on our Jigsaw Fuel Management System. The cost involved here was minimal.”**

<sup>2</sup> Industry suggested 40c/L premium on top of diesel price for planning purposes. Price range has been reported via FTAI Alt Fuels group as zero premium (pilot), 20c/L up to the same 60c/L premium cost. The latest supplier (Certa/DCC) is suggesting a 10-15% price premium on diesel long term, however certificates of savings should come from within the EU.

## Savings

Raw data from Tipperary County Council

### Diesel/HVO – sourced from Tipperary County Council Sep’22

		Baseline 12mths of 2021 (365days)			Reporting Mar-Aug 2022 (182 days)		
Make	Type	L Diesel	Km	L/100km	L of HVO	Km	L/100km
Daf	Johnston 650 Sweeper	4,870	12,121	40.18	2,477	6,601	37.53
Johnston	Compact Sweeper	4,710	8,865	53.14	2,219	3,631	61.13
Volvo FE	6x4 Tipper	6,119	15,119	40.48	5,100	12,060	42.29
Isuzu	7.5t Patcher	5,311	24,576	21.61	2,493	13,218	18.87
Citroen	Van	985	11,331	8.70	518	6,120	8.47
Daf	8x4 Tipper	13,326	37,246	35.78	6,949	20,823	33.38
Ford Transit	Van	1,220	12,936	9.44	699	6,607	11.59
LDV	Van	1,725	17,690	9.75	816	9,166	8.90
Isuzu	7.5t Pick-up	2,998	18,968	15.81	1,181	8,214	14.37
Renault	3.5t Pick-up	1,435	8,423	17.05	921	4,981	18.49
		<b>42,699</b>	<b>167,275</b>	<b>25.53</b>	<b>23,373</b>	<b>91,421</b>	<b>25.57</b>

Figure 23: Fuel consumption data from Tipperary County Council HVO Trial

## Calculations

1. Price and availability of HVO is extremely volatile 20c/l (An Post) in Jan’22 to 60c/l in Sep’22 (Tipperary County Council).
2. The CO<sub>2</sub> savings are calculated using Sustainable Energy Authority of Ireland (SEAI) emission factors, as they should be from the SEAI gap to target (GtT) spreadsheet. Using manufacturers supplied HVO CO<sub>2</sub> savings certificates (see fig 3) it is likely to reduce CO<sub>2</sub> savings to 90% in real terms. It should be noted current M&R specification records CO<sub>2</sub> savings at 100%.

**Diesel/HVO - from Tipperary Co.Co. Sep'22**

			Baseline 12mths of 2021 (365days)		
Vehicle Make	Type	Date Range	Litres of Diesel	Km Travelled	L/100km
Daf	Johnston 650 Sweeper	01/01/2021-31/12/2021	4,870	12,121	40.18
Johnston	Compact Sweeper	01/01/2021-31/12/2021	4,710	8,865	53.14
Volvo FE	6x4 Tipper	01/01/2021-31/12/2021	6,119	15,119	40.48
Isuzu	7.5 T Patching Unit	01/01/2021-31/12/2021	5,311	24,576	21.61
Citroen Relay	Van	01/01/2021-31/12/2021	985	11,331	8.70
Daf	8x4 Tipper	01/01/2021-31/12/2021	13,326	37,246	35.78
Ford Transit	Van	01/01/2021-31/12/2021	1,220	12,936	9.44
LDV	Van	01/01/2021-31/12/2021	1,725	17,690	9.75
Isuzu	7.5 t Pick-up	01/01/2021-31/12/2021	2,998	18,968	15.81
Renault Master	3.5 T Pick-up	01/01/2021-31/12/2021	1,435	8,423	17.05
			<b>42,699</b>	<b>167,275</b>	<b>25.53</b>

Vehicle Make	Type	Date Range	Litres of HVO	Km Travelled	L/100km
Daf	Johnston 650 Sweeper	01/03/2022-31/08/22	2,477	6,601	37.53
Johnston	Compact Sweeper	01/03/2022-31/08/22	2,219	3,631	61.13
Volvo FE	6x4 Tipper	01/03/2022-31/08/22	5,100	12,060	42.29
Isuzu	7.5 T Patching Unit	01/03/2022-31/08/22	2,493	13,218	18.87
Citroen Relay	Van	01/03/2022-31/08/22	518	6,120	8.47
Daf	8x4 Tipper	01/03/2022-31/08/22	6,949	20,823	33.38
Ford Transit	Van	01/03/2022-31/08/22	699	6,607	11.59
LDV	Van	01/03/2022-31/08/22	816	9,166	8.90
Isuzu	7.5 t Pick-up	01/03/2022-31/08/22	1,181	8,214	14.37
Renault Master	3.5 T Pick-up	01/03/2022-31/08/22	921	4,981	18.49
			<b>23,373</b>	<b>91,421</b>	<b>25.57</b>

Workings	Conversion Factor	kWh (diesel)				
Energy Use	10.0983 kWh/L	431,188		9.1094 kWh/L	212,913.08	kWh
SEAI Factor	.2639 kg CO <sub>2</sub> /kWh	113,791	kg CO <sub>2</sub>	0.0000 kg CO <sub>2</sub> /kWh	0.00	kg CO <sub>2</sub>
		114	t CO <sub>2</sub>		0.00	t CO <sub>2</sub>
<b>CO<sub>2</sub> saving per SEAI factors (see batch certificate for actual savings to EU / BOS criteria)</b>					<b>-57</b>	<b>t CO<sub>2</sub></b>
<b>Additional cost of intervention for pilot at 60c/Litre</b>					€ 14,024	
<b>Adjustments / losses</b>	Energy efficiency			-0.1571%	Loss in energy efficiency (based on 182 days sample)	
<b>Normalise totals for full year</b>		<b>42,699</b>	<b>167,275</b>	<b>25.53</b>	<b>46,874</b>	<b>183,344</b>
<b>Additional Costs per annum</b>		<b>60c/Litre</b>			<b>€28,125.00</b>	
<b>CO<sub>2</sub> savings</b>					114	t CO <sub>2</sub>
<b>Comparative cost per tonne of CO<sub>2</sub> avoided based on figures supplied at Sep'22</b>					<b>€ 247</b>	<b>per t CO<sub>2</sub> avoided</b>

Figure 24: Tables showing cost Per CO<sub>2</sub> avoided calculations



### Contribution to overall LA carbon reduction

TCC local authority total CO <sub>2</sub> annual contribution from this project per year	7,771,710kg	2,371,194kg	31.0%	Transport (2021)
	7,772 t	2,371.19 t	4.8%	Contribution (5% of vehicles) to Tpt
	<b>This project alone to overall</b>	<b>1.5%</b>	<b>Reduction in CO<sub>2</sub></b>	<b>3217</b>

Figure 25: Impact of LA annual CO<sub>2</sub> reduction

€247/tonne of CO<sub>2</sub> reduced across a mix of 10 heavy and light vehicles and 180 days. **90+% CO<sub>2</sub> reduction for 0.2% reduction in performance, and 60c/Litre premium on diesel (20% INCREASE)**

- Some manufacturers recommended B100 HVO instead hence Tipperary County Council pursued the B100 trial - Volvo and DAF suggested and supported use of B100 instead i.e. 100% HVO

### Additional benefits

- Comments or feedback from drivers so far: whilst drivers have not been engaged with directly, it was noted that channels exist to feedback and that no negative feedback was obtained is an indicator in itself.
- One of the aims was to see if low speed vehicles would benefit from a cleaner burning synthetic fuel (which HVO effectively is):
  - potentially there is data to support the diesel particulate filter lasting longer, but further analysis will need to be carried out before this can be confirmed. Example: An 8x8 truck was having issues with diesel knock and needed regular flushing with a manufacturer provided cleaner, running on HVO has eliminated the diesel knock so far.
  - Original request for warranty using B20 turned down by all manufacturers.

Other manufacturers contacted were Volvo, DAF, Mercedes, Renault and Isuzu; all except one manufacturer supported B100.



