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Transport Research Partners

SEUPB Interreg VA Programmes - Sustainable Transport Impact Evaluation

Annual Report

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Content

1. Executive Summary 4
2. Literature Review 5
    2.1 Overview 5
    2.2 Programme goals and outcomes 7
        2.2.1 North West Multi Modal Transport Hub (NWH) 9
        2.2.2 North West Greenways (NWG) 10
        2.2.3 Ulster Canal Greenway (UCG) 11
        2.2.4 Carlingford Lough Greenway (CLG) 12
    2.3 Analysis of project documentation 13
        2.3.1 Geographical coverage and spatial definition 13
        2.3.2 Terminology and interpretation 14
    2.4 Statement of baseline statistics and target 15
3. Survey Development and Baseline Data 16
    3.1 Data input 16
    3.2 Data requirements 17
    3.3 Data collection 18
4. Project Contributions to Programme Objectives 18
    4.1 Programme objectives 18
    4.1.1 Measurement of Commuter Numbers 19
    4.1.2 Measurement of Emissions Impacts 19
    4.2 Project review 20
        4.2.1 NWH contribution to programme outputs 20
        4.2.2 NWG contribution to programme outputs 22
        4.2.3 UCG contribution to programme outputs 23
        4.2.4 CLG contribution to programme outputs 24
5. Programme outputs and result indicators 25
    5.1 Review of result indicators 25
    5.2 Progress toward programme results indicators 26
6. Review of the change in EV support 27
    6.1 EV Definitions 27
    6.2 Primary Measurements 28
    6.3 EV Ownership review 28
        6.3.1 Republic of Ireland 29
        6.3.2 Northern Ireland 33
        6.3.3 Cross-Border Region 33
    6.4 Review of Interreg VA stated target outcomes - EVs 34
    6.5 Impact assessment, support reallocation 35

6.6 Programme outcome comparison 36
6.6.1 CO2 reduction - Greenways 36
6.6.2 CO2 reduction - EV infrastructure 38
7. Synthesis 41

Tables and charts

Table 1: programme-specific results indicators 8
Chart 1: NWH Application steps and stated measurement / methodologies 9
Chart 2: NWG Application steps and stated measurement / methodologies 10
Chart 3: UCG Application steps and stated measurement / methodologies 11
Chart 4: CLG Application steps and stated measurement / methodologies 12
Chart 5: Baseline statistics and targets 16
Table 2: Programme-specific result indicators 19
Table 3: Programme-specific output indicators 19
Table 4: Environmental indicators by project 20
Table 5: Individuals required to make commuting journeys to achieve target - NWH 21
Table 6: Individuals required to make commuting journeys to achieve target - NWG 23
Table 7: Individuals required to make commuting journeys to achieve target - UCG 24
Table 8: Individuals required to make commuting journeys to achieve target - CLG 25
Table 9: Physical output indicators 26
Map 1: Cross-border region: Authority areas in Ireland and Northern Ireland 29
Table 10: Republic of Ireland Number of Full Electric / BEV vehicles 30
Table 11: Republic of Ireland Number of Petrol / Plug In Hybrid Electric vehicles 31
Table 12: BEV Private Cars (CO2 band A0) by Licensing Authority (ROI cross-border) 32
Table 13: PHEV Private Cars (CO2 band A1) by Licensing Authority (ROI cross-border) 32
Table 14: EV count estimates, cross-border region counties (ROI) 33
Table 15: EV count, Northern Ireland 33
Table 16: EV count, Cross-Border region on the Island of Ireland 34
Graph 1: Growth in EV ownership, Cross-Border region 34
Table 17: Greenway projects defined outputs for key indicators 36
Table 18: Estimated CO2 savings 37
Table 19: Adjusted emissions rate to include transmission and charging losses 39
Table 20: CO2 emissions saving with implementation of Interreg EV projects. 39
Table 21: CO2 emissions saving Interreg EV projects minus natural growth 40

1. Executive Summary

Transport Research Partners (TRP) has been engaged by the Special EU Projects Body (SEUPB) to undertake an evaluation of the Interreg VA priority 3 programme in the border counties of Ireland and Northern Ireland (the programme) and the projects supported under the programme.

In this report we set out a review of our analyses and findings of our work over the past 12 months. The report makes reference to tasks undertaken in accordance with the key activity Work Packages (WPs) and documents submitted in the course of the analysis to date, referenced by document title/number. For the avoidance of confusion we define the **'programme'** to refer to the Interreg VA programmes Axis 3 - Sustainable Transport, managed by the SEUPB. '**Project(s)'** to refer to the projects having received funding under the programme, and the **'study'** to refer to our own analysis and evaluation of the programme and its projects.

This report was updated in line with comments made by the evaluation steering committee, including the addition of a detailed technical review of Electric Vehicle (EV) impacts. The development of EV infrastructure was included as an integral part of the original programme. An absence of EV project applications to the original programme resulted in a change in programme design, with support originally intended for EV projects diverted to Greenway projects, as set out in our study specification, and requiring a separate review of the impact of the programme change on its intended outcomes. We had originally provided a separate EV impact technical report, which we since updated and summarised in this document. On the basis of our EV analysis we conclude that the reallocation of support from EV projects to Greenways projects **has not** achieved the same level of sustainable transport benefit that would have been achieved by the support of EV infrastructure as a separate programme objective.

<u>Project Submission and Review Process</u>

Four projects have been successful in their application to the SEUPB for support under the Sustainable Transport Priority of Interreg (the programme), of which three deliver new greenway infrastructure, the fourth focused on the development of a multimodal transport hub serving the north west. The projects contribute individually to the delivery of cross-border infrastructure development across the programme, and collectively to a change in travel behaviour, measured in relation to the percentage modal split for regular commuting journeys made by a) cycling and walking, and b) bus and rail, defined by project focus. Project applications underwent a detailed review process prior to their commencement, including a two stage application process and the specification of project outcomes set out in a Letter of Offer sent to each.

<u>Planned outputs / Likely deliverables</u>

In our first year evaluation we have undertaken a detailed review of the application and approval process, including the evaluation of intended and stated outcomes, both of the

projects and the programme. As infrastructure is still in the process of design and delivery, our task was focused on the definitions of outputs, including our initial assessment of the ability of the projects to deliver against their objectives. This is a dynamic process that is influenced by constraints and new opportunities that occur during the development of project infrastructure and its operation over time. Constraints include, but are not limited to: increased use following regional growth or project popularity; and unforeseen limitations and barriers may also exist including, but not limited to: the effect of Brexit, including uncertainty in the lead up to Brexit.

We conclude that the vast majority of physical outputs are likely to be achieved, with a small reduction in the total number of greenway route kilometres, delivering 78.4 kms of new greenway, as compared to a total of 80 kms originally envisioned, effectively achieving the desired outcome to within a realistic margin. Programme results indicators, in contrast, may prove challenging, and appear to deviate between all of: intended, stated, and likely outcomes. The extent of such deviation mainly arising from different interpretations of terms used in the submission and review processes, which we have reviewed in detail and out below.

2. Literature Review

2.1 Overview

The first substantive task of the study was a review of programme documentation, publications, project proposals and reports, to provide an overview of the intent, approach and potential outcomes of the programme and projects. The review would then provide a basis upon which project baselines may be established and progress measured over the life of the study.

Liaison with the SEUPB in February 2018 established a range of documents for review which include:

- European Commission documents associated with the programme (referenced individually);
- Project applications;
- Project Business plans;
- SEUPB review, admissibility and assessment documentation, including meeting minutes;
- Additional supporting documentation provided by the projects; and
- Letters of offer by project.

On the basis of the documents provided a programme overview and individual project reviews have been completed and are listed with reference number: North West Hub review, document 18053002JC; North West Greenway review document 18041206JC; Ulster Canal Greenway review document 18041603JC; and Carlingford Lough Greenway review document 18051003JC. A project by project overview of the documentation reviewed and basic assumptions made in each application and review are provided as charts (1-4) for each of the projects listed in sections 2.2.1 - 2.2.4.

Despite each project presenting a series of stated outputs in line with the **output indicators** and **results indicators** defined by the programme, it became apparent that significant variations existed between the programme aims and the stated outputs by project. These include differences in the methods used to identify and measure baseline statistics, which may in turn have led to differences between: the stated outcomes for each project as contained in the letters of offer; likely outputs by project; and the global goals set for the programme.

A range of issues arise from differences and diverging interpretations between the programme, project application and review documents and letters of offer that include differences in the interpretations of:

- Baseline trip number,
- Calculation methods, including definitions of trip frequency and modal share, and
- Results Indicators

The lack of a consistent approach in the calculation of outputs appears to follow primarily as a result of differences in the interpretation of modal split. Such differences are visible across projects and within individual project documents and relate to the definitions of:

- Modal Split,
- Modal Shift,
- Modal Share, and
- Modal Growth

While this may, at first, appear to be an issue of semantics, the adoption of one methodology over another will result in a differing calculation. The terms are, effectively, **not** interchangeable. We have therefore set out a review of both the terms used by project and stage, in the subsequent text. A more detailed review including illustrations of the differences in results was included in the material provided for the Dungannon seminar.

In a similar way, the definitions applied to trip frequency, which also impact on the calculation of outputs, differ in the various projects and stages of application. Differences are visible between project documents in the use of:

- Daily trips,
- Regular trips[1], and
- Annual trips

The unintended divergence of programme and project goals was not always identified in the review process leading to a reinforcement of the divergence between the programme intent and deliverables defined by project.

[1] The 2011 census uses the term ‘usual’ [travel to work, school or college] which has been interpreted without further definition as referring to ‘regular’ trips in some of the review documentation.

2.2 Programme goals and outcomes

The programme documents set out three areas of measurement to be achieved against a current situation (baseline), which in turn fall into one of two categories: Output Indicators and Results Indicators. Global programme goals are defined in the Territorial Cooperation Programme (TCP) document[2], and are interpreted by the programme for each project in line with global and local goals. These are summarised to include:

- Physical infrastructure (Outputs Indicator);
- Greenway infrastructure (Outputs indicator); and
- Modal split (Results Indicator).

A number of further deliverables were defined by project, including reductions in carbon emissions, discussed in subsequent sections of this report.

Both physical buildings and greenway infrastructure (kms new greenway) are easily identified as each relates to a visible product. Modal split outputs, in contrast, require a measurement of trips made and validation against survey or similar analysis of trip purpose, described below. Additional project goals related to the social and behavioral impacts of the programme are also discussed in terms of extent and measurement, relating to survey responses rather than a physical 'product'. A further aim of the Interreg programme - to develop EV charging infrastructure, did not receive any project applications, with support funding being diverted to other project priorities, discussed in subsequent sections of this report.

Programme Output Indicators are defined in the TCP (p70) as:

- 1 x Cross-border multimodal public transport hub encompassing cross-border integrated services;
- 80kms New cross-border greenways to facilitate mobility; and
- 73 x New and existing upgraded rapid chargers to facilitate creation of cross-border electric vehicle network to connect to the existing TEN-T EV network

Programme Result Indicators are defined *(ibid)* as set out in table 1, below, in relation to:

- The percentage of cross-border commuters who use bus or train as their usual method of travel;
- The percentage of cross-border commuters who use walking or cycling as their usual method of travel; and
- Number of EV registrations across the region

[2] CCI Reference: 2014TC16RFCB047, EC decision date: 10-March-2016 (Territorial Cooperation Programme - TCP document)

Table 1: programme-specific results indicators

Specific Objective		SO3.1 - Promote cross-border intermodal and sustainable mobility in the cross-border region				
ID	Indicator	Measurement unit	Baseline Value	Baseline year	Target Value (2023)	Source of data
3.1.3	Number of EV registrations across the region	Number of EV registrations	186	2014	2000	Departments of Transport, DVLA
3.1 A	The percentage of cross-border commuters who use bus or train as their usual method of travel	%	8.80	2014	25.00	The 2011 Census
3.1 B	The percentage of cross-border commuters who use walking or cycling as their usual method of travel	%	2.70	2014	10.00	The 2011 Census

Source: European Commission, 2016

The wording of the programme result indicators set out in the commission document, referenced above, is specific to a percentage of all cross-border commuter journeys made by sustainable transport modes, see table 1. The term ‘usual method of travel’ is interpreted as a frequency of use, without specific definition, and replaces a previous reference to daily journeys. The table states both a baseline and a target value to be achieved across the programme, related to **% modal split** in each instance. In the instance of cross-border commuting use, the TCP specifically relates to percentage values, and indicates a source of data, the 2011 Census, though this has been interpreted in a number of ways during the process of application and approval.

The TCP applies the term *modal split* to relate to the percentage of the total trip number that each mode carries; thus public transport (train and bus) is shown as 8.8% of the total number of regular cross-border commuter trips in the baseline year of 2014; cycling & walking shown as 2.7%. A programme objective is then set (as a Results Indicator) to effect an increase in the modal split to 25% and 10% respectively. This increase is detailed, in some of the programme documentation, as a *shift* from non-sustainable to sustainable modes of transport, giving rise in some applications to the calculation of **% modal shift**, which is **not** the same as modal split. See section 2.3.2 of this document, for a more detailed discussion of the technical differences between these two definitions.

Some differences also exist in the interpretation of the terms ‘usual method’ [of travel] and ‘regular’ cross border journeys. The terms referring to an indicator of the frequency of a cross-border commuting trip. In some documents this is interpreted to mean daily trips, while other project documents refer to annual trips, though neither daily nor annual trips would appear to match the concept of a ‘usual method’ of commuting travel. Sections 2.2.1-2.2.4, below, reviews the objectives, stated by project, as set out in the application process.

2.2.1 North West Multi Modal Transport Hub (NWH)[3]

The NWH will be a newly constructed integrated multi-modal transport hub focused on a new station building located immediately adjacent to and replacing the existing Derry/ Londonderry railway station[4]. The hub will provide improved access to the Derry - Coleraine rail service - which in turn is in the process of improvement; access to integrated public transport facilities; and a series of additional sustainable transport facilities such as cycle parking, greenway access etc. Chart 1 sets out the progressive stages of the application and approval process, including a review of the primary assumptions and stated measurements applied in each.

Chart 1: NWH Application steps and stated measurement / methodologies

	Calculation Methodology				Trip frequency units			
Document	**Modal Split***	**Modal Shift**	**Modal Share**	**Other / not defined**	**Daily**	**Regular***	**Annual**	**Not defined / multiple**
Stage 1 Application	✓			✓ (1)				✓
Stage 1 Review	✓							✓
Stage 2 Application	✓						✓	
Stage 2 Review				✓		✓		
Letter of Offer				✓	✓			

Notes:

* Highlighted cells indicated intended methodologies and measurement units

(1) Stage 1 application uses the terminology *'an increased number of daily passenger journeys (up to 25%)'…'current baseline value is 8.8%'*, (application section B1) which can, but need not necessarily, be interpreted as a Modal Split calculation.

In the Letter of Offer, the SEUPB summarises two objectives supported by the programme and a range of additional benefits:

1. Construction of a multi-modal cross-border transport hub with integrated services; and
2. An increase in cross-border **daily** public transport commuter numbers to 1,665 by 2023.

The objectives included in the Letter of Offer appear broadly consistent with both the project proposal and the aims of the project, though differences are visible in all of: the initial and second stage funding applications made by the project; the review and evaluation of those applications; and the letter of offer. The primary differences are summarised[5]:

- The stage 2 application defining the increase in journeys to be measurable on an **annual** basis for **any** additional commuting journey;
- The stage 2 review documents define the increase to relate to **regular** commuting journeys; and
- The Letter of Offer relates to a **daily** increase in commuting journeys.

[3] The acronym NWH (North West Hub) is applied through this document to refer to the North West Multi Modal Transport Hub
[4] AKA: Waterside Station
[5] It should be noted that each of these definitions will result in a different target measurement, including a significantly differing target in the case of an annual increase. An illustration of these differences is set out in table 5, section 4.2.1.

The letter of offer also refers to an increase without being specific to the mode of travel cross-border, leading to the question as to whether trips that cross the border by private car to commence a railway journey at the NWH will count toward the target increase.

Following discussions with both the NWH team and the programme body, it was concluded that the target should reflect a percentage of all regular commuting trips, rather than daily (or annual) trips. Cross-border journeys including bus or train travel that may have accessed the hub by another means were also considered valid for inclusion. In later sections of this document we set out a review of outcomes intended and an assessment of their likely delivery.

It is also important to note that the 2011 census, from which commuter trips numbers are taken, relates to a regional global total, reflecting the relative levels of data disaggregation[6]. In the case of the NWH this relates to the entirety of the Donegal / Northern Ireland border rather than the subset of locations most likely to benefit from the hub itself. This in turn results in a higher estimate of the regular commuting benefits that may arise from the development of the hub than that that would be measured on a more granular data basis.

The same observation is likely to have resulted in excessively optimistic results indicators for all projects and may be particularly acute for greenways. At the time of the revision of this document, we are in the process of completing a detailed technical paper (19021420JC) measuring the impacts that the different spatial definitions have on the projects' deliverables.

2.2.2 North West Greenways (NWG)

The NWG will be a network of connected cycleway / walkway facilities located in the North West and connecting to a series of existing greenways in and around: Derry, Strabane, and Lifford.

Chart 2: NWG Application steps and stated measurement / methodologies

	Calculation Methodology				Trip frequency units			
Document	**Modal Split**	**Modal Shift**	**Modal Share**	**Other / not defined**	**Daily**	**Regular**	**Annual**	**Not defined/ multiple**
Stage 1 Application	✓	✓			✓			
Stage 1 Review				✓ (2)				✓
Stage 2 Application		✓					✓	
Stage 2 Review		✓						✓
Letter of Offer		✓ (1)			✓			

Notes:

(1) See section 4.2.2 for description of references to methodologies and their intent

(2) Refers to a cumulative increase per year of 2% without defining methodology

[6] Census data can be disaggregated down to county / administrative area level -the smallest spatial level at which data can be obtained consistently

The Letter of Offer summarises outputs to include:

1. 46.5kms of new greenway;
2. An increase in cross-border **daily** cycling and walking commuters from 130 to 500;
3. The connection of the NWG to existing urban greenway network;
4. A strategic Network connection into planned transport interchanges (including the NWH); and
5. The creation of a branded identity for the North West Greenway Network

As with the NWH, a number of differing interpretations can be drawn from the differing documents associated with the project, focused on the terminologies associated with Modal Split and Modal Shift.

In discussion with the project body if was concluded the stated target figures actually represent a change in Modal Split rather than modal shift. See later sections of this document for a review of outcomes intended and an assessment of their likely delivery.

2.2.3 Ulster Canal Greenway (UCG)

The UCG is a strategic cycleway / walkway connecting existing and planned infrastructure along the route of the Ulster Canal.

Chart 3: UCG Application steps and stated measurement / methodologies

	Calculation Methodology				Trip frequency units			
Document	**Modal Split**	**Modal Shift**	**Modal Share**	**Other / not defined**	**Daily**	**Regular**	**Annual**	**Not defined/ multiple**
Stage 1 Application			✓		✓			
Stage 1 Review		✓			✓			
Stage 2 Application		✓		✓	✓			
Stage 2 Review			✓				✓	
Letter of Offer		✓						✓

The Letter of Offer summarises outputs as being:

1. Construction of 22kms new greenway;
2. A change in transport use equivalent to a minimum of a 4.5% **modal shift** by cross-border commuters from cars to walking / cycling by 2023;
3. Active promotion to effect behavioural change through targeted community engagement programmes; and
4. A reduction of 3.17 tones CO2 per annum by 2023

The definition of a target percentage of cross-border commuters using walking or cycling as their usual method of travel, in the Letter of Offer, appears at odds with some of the statements included in the application documents. The application documents include all of

the terms: modal shift, modal split, modal growth and modal share, applying a mix of interpretations of each.

The UCG stage 1 application, uses both of the terms *Modal Shift* and *Modal Share.* In both instances these appear to refer to the concept of *Modal Split,* rather than modal shift. In particular the term Modal Shift appears to relate to a growth rate applied to total modal split.

The stage 2 application document also uses the term *Modal shift*, though in this instance it appears to refer to a modal shift of 4.5%, as opposed to a 4.5% change in modal split. This use appears to be inconsistent with a further statement in the stage 2 application, in section 10, which refers to both **Modal Split** and **Modal Growth.**

The use of the term **modal shift** in the stage 2 application document is replicated in the letter of offer.

Further discussions with both the programme body and the project team have confirmed that the intended outcome refers to modal split, see later sections of this document for a review of outcomes intended and an assessment of their likely delivery.

2.2.4 Carlingford Lough Greenway (CLG)

The CLG is a strategic cycleway / walkway connecting existing and planned infrastructure along the banks of the Carlingford Lough, connecting Newry with Carlingford town.

Chart 4: CLG Application steps and stated measurement / methodologies

	Calculation Methodology				Trip frequency units			
Document	**Modal Split**	**Modal Shift**	**Modal Share**	**Other / not defined**	**Daily**	**Regular**	**Annual**	**Not defined**
Stage 1 Application	✓						✓	
Stage 1 Review	✓				✓	✓		
Stage 2 Application		✓				✓		
Stage 2 Review	✓			✓	✓	✓		
Letter of Offer				✓	✓	✓		

The greenway will fully integrate with an existing greenway route to provide through access from the Newry Basin to Carlingford, and longer term access to further strategic greenway and cycleway infrastructure not included in the programme. A letter of offer was sent dated 6th December 2016. The letter summarises outputs to include:

1. Construction of 10.1kms of new greenways;
2. Involvement of 10 businesses with a cross-border workforce to support CLG;

3. 150 people using the greenway to commute cross-border to work / education on a **regular** basis;
4. Equivalent of 30 people using the greenway to commute cross border on a **daily** basis;
5. Engagement of local primary and post primary schools from both jurisdictions;
6. Recording up to 60,000 visits / users of the greenway crossing the border in either direction in year 1, rising in subsequent years;
7. Establishment of a Friends of Carlingford Greenway committee;
8. Delivery of a Greenway activity programme; and
9. Recording of 1,500 participants involved in activities delivered through the greenway activity programme in year 1, increasing in subsequent years.

The CLG letter of offer differs in a number of key aspects from the other greenway projects in that it states modal choice outcomes in both daily and regular commuter terms, with a detailed review of the differences between the two measurements included in the project's application review process. The letter of offer is also unique in defining a 'participant count' outcome, which differs from other projects in that it relates to a defined count of all users involved in activity programs rather than commuting journeys as a measurement of modal choice.

2.3 Analysis of project documentation

In our initial review of documents, described above, it appears likely that the programme will achieve its primary output indicators related to physical infrastructure[7]. It is noted, in contrast, that distinct differences exist between the stated Result Indicators defined for the programme and those likely to be delivered by the projects. In short, even where the projects fully deliver on their stated aims, not all of the results indicators will be fully met. This shortfall is partly due to the geographical coverage of the projects themselves, discussed below, but also due in part to the differences in measurement/interpretation outlined above.

2.3.1 Geographical coverage and spatial definition

In the initial programme documentation, the TCP, a modal choice target was defined as a percentage of trips, being[8]:

- An increase in the number of cross-border commuters using bus and rail as their usual method of travel from 8.8% to 25%; and
- An increase in the number of cross-border commuters using walking or cycling as their usual method of travel from 2.7% to 10%.

The baseline values, quoted as percentages in the TCP, relate to a historic measurement of modal split for ALL COMMUTER trips that cross the border at any crossing points. Thus the baseline of 8.8% bus and rail cross-border commuters is a mean value drawn from all commuter trips between Northern Ireland and the Republic.

[7] With the exception of EV infrastructure, discussed further in this document.
[8] Source: European Commission Cooperation Programme document, see table 1, page 6 of this document for further details

The baseline percentage values given (bus/rail = 8.8%; walking/cycling = 2.7%) may well diverge from the actual percentage rates visible in the locations of the projects. Thus an individual project may have a differing modal split percentage 'starting point' from that of the programme.

The spatial disaggregation at which data is available is also likely to impact on the measurement of achievable outcomes and results indicators, set out in more detail in our technical review of Results Indicators (19021420JC).

2.3.2 Terminology and interpretation

In the preceding sections we have noted that terms used and resulting measures differ between the interpretations associated with Modal Split and with Modal Shift. **Modal Split** refers to a comparative measurement of the proportion of the total trips being made by any one mode expressed as a percentage of all trips by all modes. In contrast: **Modal Shift** refers to a measure of the transfer of trips from one mode to another expressed as a percentage of trips made by the first mode.

Differences also exist in the definition of time periods over which impacts must be shown that will also impact on the measurement of outcomes.

Baseline journey counts used in the programme and project documentation (table 1) represent a normal commuting travel mode choice, typically trips made on a regular basis. It is significant to note that while commuting journeys are regular and frequent, they do not occur on a daily basis. Full time work based commuting is likely on the basis of 5 days per week (or fewer) with a further reduction necessary in the calculation of total numbers reflecting time off, holidays and sickness. The programme recognising this in the 2016 update to the TCP, replacing references to a 'share of **daily** cross-border journeys' with '**regular**' (not daily) journeys.

It is also important to note that each cross-border commuting journey is likely to equate to two one-way trips, as each commute to work is matched by a commute home. While the concept of regular journeys is generally applied throughout the project submissions it is not consistent to all, with three differing interpretations, being:

- Baseline trips and target requirements stated as daily journeys,
- regular journeys, and
- annual journeys

The Letter of Offer to UCG avoids using any of the alternatives (daily / regular / annual journeys) but rather defines the objective as an increase in percentage journey share without time delimiter.

In the case of the NWG offer, both a percentage increase and absolute numbers are included, without stating whether these relate to daily, regular or annual journeys. This is somewhat further complicated by the statement that the percentage change applies to

Modal Shift rather than Modal Split, and the that the baseline (and target) journeys relate to Commuting **and Utility** journeys rather than commuting alone, although there is no definition as to what defines a 'utility' journey.

The CLG Letter of Offer state targets in terms of **regular** journeys, which appears consistent with the intent defined in the March 2016 programme revision, but this is somewhat complicated in the case of the CLG submission by the additional inclusion of a required **daily** journey number, in addition to the regular commuter journey number.

In the case of the NWH differences exist in all of: the application, assessment, and letter of offer. The stage 2 application refers to **annual** journey counts defining the baseline of 634 cross-border trips per year without further identifying these to be cross-border commuting trips, though this trip purpose is implicit in other sections of the stage 2 application. The disparity between annual and regular journeys was identified in the NWH stage 2 assessment report which stated that the figure quoted was to be based on **regular** cross-border journeys. Despite this clarification a later Joint Secretariat paper[9], dated 3rd July 2017, which reviewed the Department For Infrastructure survey[10], continued to refer to **annual** journey counts. The Letter of Offer, dated 6th August 2017, introduced a further interpretation stating that the baseline and target journey counts should be applied to **daily** commuter numbers.

Discussion with the project body has since confirmed that journey count measurement should be based on a definition of regular cross-border commuting journey counts rather than any other metric. This has an impact on some of the targets defined by project and the impact of this difference is discussed below.

2.4 Statement of baseline statistics and target

Following the identification of differences in terminology and interpretation, the study team undertook a series of interviews with individual projects, culminating in a workshop held in Dungannon in August 2018. The structured interviews and workshop allowed for the discussion of baseline and target modal split values, see chart 5. The workshop also presented a series of support tools intended to promote surveys by project, see section 3, below.

[9] Joint Secretariat: Cross Border Multi Modal Hub Paper dated: 3rd July 2017
[10] Department for Infrastructure / NISRA 2017: Cross Border Passenger Survey 2017, issue 1 dated 5th June 2017

Chart 5: Baseline statistics and targets[11]

Regular cross-border commuting journey counts	Programme wide	North West		Newry / Louth		Armagh / Monaghan	
Measure	**Baseline count**	**Baseline count**	**Target count**	**Baseline count**	**Target count**	**Baseline count**	**Target count**
Cross-border Bus / Train commuters	1,286	**North West Hub**		220	624	72	355
		Baseline	Target				
		634 (2)(3)	1,665 (4)(5)				
Cross-border cycling / walking commuters	398	**North West Greenway**		**Carlingford Lough Greenway**		**Ulster Canal Greenway**	
		Baseline	Target	Baseline	Target	Baseline	Target
		130 (6)	666 (11)	49	250 (11)	28	142(11)*
Cross-border commuters total of all modes	14,687	6,660	6,660	2,497 (7)	2,497	1,419 (9,12)	1,419

Sources:
(1) Figure quoted from NWG submission, part 2 application, p11
(2) The stage 2 assessment of the NWH identified the baseline figure of 634 as relating to annual cross border journeys made by public transport in the North West region which differs significantly from other interpretations, see below.
(3) Value of 634 (being 8.54% of the total number of cross border commuters in the NW) is marginally below the programme-wide figure of 9.52%.
(4) Figure of 1665 is based on 25% of 6,550
(5) Baseline public transport represents a 9.5% modal split the North West, ie: is higher than the programme wide mean.
(6) As per note 1
(7) Figure quoted from the CLG stage 2 assessment report, page 9
(8) Calculation based on the stated objective of 150 new regular cross-border commuting trips by cycling and walking plus the baseline figure of 49 regular journeys on parallel routes.
(9) Figure derived from 2011 Census
(10) Figure is based on a modal shift of 4.5% from 910 cars
(11) Figure from SEUP subject to review in subsequent sections
(12) Figure excludes 64 responses detailed as ‘working away from home’ / ‘not stated’

3. Survey Development and Baseline Data

3.1 Data input

Having established the underlying structures, project design and intended purpose, the study team were tasked to identify a consistent survey and data framework that would support the measurement of a baseline and a longitudinal assessment over time. The team developed a survey that would inform the measurement of a modal split calculation for commuting journeys, and the observation of changes in other activities that would allow for conclusions in respect of leisure activities and social impacts, discussed below. Data thus collected was also intended to be compatible with observations and survey results collected by each of the projects, allowing for the assessment of impacts both at a programme level and by project.

[11] Census data relates to county / Local Government District rather than being project specific. Values are specific to usual commuting modes, interpreted by the TCOP as regular mode choices

A number of discussions were held with the project teams on the extent and nature of the study surveys, and on the design of survey work that was or could be completed by the projects individually. This culminated in the presentation of a survey workshop as part of the meeting held in Dungannon, and with the development, by the study team, of individual project survey designs.

A further survey exercise proposed as an independent review of baseline by the University of Hertfordshire, and is in the process of development. The Hertfordshire work is timetabled to be undertaken in February / March 2019. The study team have contributed to the design of the Hertfordshire study to maximize the potential benefit that the additional study would provide, and will incorporate resulting additional data into our future reviews.

3.2 Data requirements

The key intention of both baseline and ongoing data collection exercises relates to the effective measurement of modal choice for cross border commuter journeys. Additional metrics include the extent to which individual projects have impacted on cross-border travel behaviours, that include the social impacts of any such change. Two primary surveys contribute to this measure: Public Choice Surveys completed on both sides of the border, and Observation Surveys specific to travel volumes specific to each project (project catchment area).

The public survey provides:

- Journey purpose, frequency and mode of transport
- Commuting trip origin and destination (wide area)
- Commuting journey Mode(s) of transport used
- Grocery shopping origin and destination, mode of transport and frequency
- Clothes / Household items shopping origin and destination, mode of transport and frequency;
- Daytime leisure activity origin and destination, mode of transport and frequency;
- Evening / night time activity origin and destination, mode of transport and frequency; and
- Visiting friends and relations journeys, origin and destination, mode of transport and frequency

Additional demographic information collected included:

- Access to car;
- Household size, composition, education and employment status; and
- Respondent age and sex

Observation surveys provide:

- Vehicle count by location using manual capture techniques
- Mode and frequency
- Time of journey
- Observed utilisation

Initial attempts to use camera based observation techniques were concluded to be inappropriate given local sensitivities in some locations, and therefore not used. Alternative trip pattern surveys have been developed that include manual trip counts, to be incorporated prior to project launches.

3.3 Data collection

The study team undertook a public survey in the period August - September using an on-line methodology distributed using the Google Survey platform. A total of 1250 survey requests were distributed, resulting in a total of 402 responses, a response rate of 32%. Responses included journey patterns from both Northern Ireland and the Republic of Ireland. The response level is considered to be good in respect of a public survey, partly reflecting the targeted nature of the survey. The study team, is also working with the University of Hertfordshire team to ensure that any additional data is comparable and consistent with that collected to date.

A project specific survey was also developed and distributed at the Dungannon meeting, to be run by the projects themselves, though no responses to the project specific surveys have been received at the time of writing.

4. Project Contributions to Programme Objectives

4.1 Programme objectives

The stated objectives Interreg VA priority axis 3, Sustainable Transport programme are set out in the Cooperation Programmes under the European territorial cooperation goal[12] and relate to the promotion of cross-border, intermodal and sustainable mobility in the cross-border region. Programme objectives are stated in terms of Result Indicators, table 2; and output indicators, see table 3. Additional programme aims include the reduction of greenhouse gas emissions and the creation of a cross-border EV network.

We address the measurement and potential reduction of emissions in detail in section 4.1.2. The development of a cross-border EV network, which included 73 new/upgraded rapid chargers, was not initially achieved, as no EV specific project proposals were received in the application process.

[12] Interreg V-A - United Kingdom-Ireland (Ireland-Northern Ireland-Scotland) Territorial co-operation Programme description, document CCI: 2014TC16RFCB047, updated March 2016

Table 2: Programme-specific result indicators

Inidcator	Baseline Value	Target Value (2023)
The percentage of cross-border commuters who use bus or train as their usual method of travel	8.8%	25%
The percentage of cross-border commuters who use walking or cycling as their usual method of travel	2.7%	10%

Adapted from: Cooperation Programmes under the European territorial cooperation goal, table 3 p70

Table 3: Programme-specific output indicators

Inidcator	Number / metric
Cross border, multi-modal public transport hub encompassing integrated services;	1 of
New cross-border greenways	80kms

Source: Cooperation Programmes under the European territorial cooperation goal, table 4 p76

We understand that a subsequent round has resulted in the submission of an EV project which will be reflected in our future analyses.

4.1.1 Measurement of Commuter Numbers

The TCP defines baseline trip count numbers in relation to the census data from 2011. This is included in all of the project submissions and is quoted as a commuter trip value using the county level counts from the census. Some differences in the interpretation of the trip count unit exists **horizontally** across projects, and **vertically** within the assessment processes of each. This has resulted in a number of differing interpretations of the numbers of trips, but no actual review of the spatial basis upon which the values are derived. This has resulted in a number of differing interpretations of baseline and trip counts applied to the Results Indicators, which we address separately in our technical review.

4.1.2 Measurement of Emissions Impacts

The Letters of Offer sent to some, but not all, of the Greenway projects included a specification relating to CO2 reductions. Theses specifications were, in turn, generally based on the original submissions of the project teams and are summarised in table 4.

Table 4: Environmental indicators by project

Greenway Scheme	Environmental Indicator - Emissions	
	As stated in Letter of Offer	**As stated in other documentation**
North West Greenways	Reduce carbon emissions by an estimated 319 metric tonnes per annum.	
Ulster Canal Greenway	A minimum reduction of 3.17 tones of CO2 annually from private car emissions (2)	
Carlingford Lough Greenway	*Not specified*	Reducing carbon emissions by 5,050 grammes per daily car journey (3)
North West Multi Modal Transport Hub	*Not specified*	Project will reduce greenhouse gas emissions from transport (4)

Sources:

(1) Letter of offer dated 31st August 2017 p2

(2) Letter of offer, dated 6th December 2016 p2

(3) Carlingford Lough Greenway business plan, 22 April 2016, p4

(4) North West Multi Modal Transport Hub application document dated 22/08/2016, p32

As no single consistent measure is defined in relation to CO2 reduction we have developed an indicative measurement based on the numbers of trips made in the target year of 2023, multiplied by an assumed 212 days cycling to/from work, and a regular trip length of 7.5 kms in each direction, allowing the calculation of a reduction in carbon emissions of approximately 476 tonnes attributable to Interreg VA projects, see table 10.

4.2 Project review

With the exception of the EV objective, each of the projects make a direct contribution to both the outputs and result indicators described above. These are summarised, by project, below.

4.2.1 NWH contribution to programme outputs

The North West Multi-Modal Transport Hub contributes directly to the programme objectives:

- (1 of) Multi-modal public transport hub; and
- 25% increase in the number of passenger journeys utilising cross-border public transport services by 2023

Successful development of the NWH will satisfy the first of these requirements, but is likely to contribute to a lesser extent to the second, mainly as a result of differences in the interpretation of trip frequencies. The NWH application also stated a number of additional outputs, listed below; the measurement of which will follow from the completion and opening of the new facility. These outputs are stated as:

- Improved transport connections, including a liveried bus connection shuttle from the Hub to the Foyle Street bus station,
- Increased use of public transport and active travel,
- Improved cultural participation,
- Increased use of shared space, and
- Increased economic opportunities for deprived communities

Review
A significant difference exists in the wording related to deliverables in all of: the project proposal, the proposal review and the letter of offer, discussed in section 2.2.1 (above), and summarised here. These differences have the potential to significantly impact on the ability of the project to deliver the extent of modal split envisioned for the programme.

The stage 2 application makes reference to both daily and annual journey counts, concluding that the programme result indicator required '…an increased number of **daily** passenger journeys…'. However the same document references a baseline of '634 **annual** journeys…', giving rise to the conclusion that the project would contribute to an increase of 1,031 **annual** cross-border public transport journeys; though we believe this should, in fact, refer to the number of **regular** journeys.

The Interreg stage 2 assessment report picked up on this difference, stating the '[increase] should be regarded as regular cross-border journeys…', in effect that the NWH should increase the number of '…cross-border journeys by 1,031 on a regular basis rather than on an annual basis.' This is further confused, however, by the Letter of Offer which states the measurement as daily commuters, rather than regular commuters, in effect reverting to the initial unit of measurement. The impact of these differences on the actual numbers of trips is set out in table 5, with the DFI concluding that the figure of 1,031 - increase in public transport users constituted an annual increase[13].

Table 5: Individuals required to make commuting journeys to achieve target - NWH

		Frequency of travel days / week, additional journeys			
Target rate of increase		**3**	**4**	**5**	**7**
1,031	**Daily journeys**	2,406	1,804	1,443	1,031
1,031	**Regular journeys**	1,718	1,289	1,031	736
1,031	**Annual journeys**	7	5	4	3

The DFI conclusion suggest that an additional 4 individuals would be required to make a regular commuting trip 5 days per week in order to achieve an annual increase of 1,031 journeys, differing significantly from the figure of 1,031 daily journeys as stated in the letter of offer.

While it may appear unlikely that it was an intended outcome of the programme to support the lowest (annual journey) figures, there is some evidence, from its application, that this was the intent of the project. Both the Cross Border Multi-Modal Hub paper, date 3rd July

[13] Email conversation with Timothy Wier, DFI dated 26 July 2018

2017; and accompanying review of a 'Contribution to Result Indicator' highlighting two statistics: firstly, a calculation based on an an AECOM report of October 2015 suggesting that the increase 'could be in the region of 10 additional persons[14]…' making a regular cross-border rail journey; and, secondly, that the same document states that the increase 'equates to around 5 additional persons making a daily journey'.

The extent of these differences and, in particular, the measurement unit applied, indicate a concern that has not been fully resolved in the application and approval process. It being likely that the expectations of the programme and the intent of the project differ. It is our view, however, that the observed differences in unit may, in fact, disguise a more fundamental issue in the spatial definitions applied. This is addressed in detail in our technical review document.

4.2.2 NWG contribution to programme outputs

The North West Greenways contribute:
- 46.5kms of new greenway in the North West, with direct connections to existing greenways in Derry and Strabane; and
- An increase in the number of walking and cycling trips from 130 to 500 regular journeys by 2023.

Successful development of the NWG is likely to achieve both of the stated outcomes. The greenways will also provide:

- Reduction in carbon dioxide emissions of 319 tonnes by 2023,
- Behavioural and attitudinal change,
- Investment in the wider economic and social infrastructure across the border region,
- Partnership and collaboration including links with other agencies and regions

Review
Although far less of a divergence than seen for the NWH, the same types of differences are visible between the interpretations of objectives in the NWG project application and the stated objectives of the programme. Differences relate to the measurement of modal shift, as opposed to modal split, initially reviewed above; with the further observation that both the baseline and target mode split values (expressed as percentages) and apply locally to the North West, differ from the programme values, which apply, in aggregate, across the entire region.

The letter of offer makes reference to a 'baseline increase from 2% to 7.5% in a modal shift from carbon based transport to carbon free sustainable transport' which introduces the term modal shift, but follows this with a calculation of modal split, allowing the conclusion that the term modal shift relates to the activity rather than its measurement.

The Letter of Offer also attributes the increase in modal split to both commuting and utility journeys, though it is not clear from the letter what is meant by utility journeys, as the term

[14] Figure applies to all trip purposes and does not isolate commuting trips

does not appear elsewhere in the programme. We have therefore sought and gained clarification that the baseline and target figures relate to cross-border commuting journeys made on a regular basis, which result in the targets set out in table 6.

Table 6: Individuals required to make commuting journeys to achieve target - NWG

Baseline	130 regular cross border cycling and walking commuter journeys
Target	500 regular cross border cycling and walking commuter journeys

On the basis of information provided to the study team we would conclude that the North West Greenway is likely to deliver on all of the required output indicators.

4.2.3 UCG contribution to programme outputs

The Ulster Canal Greenway contributes:
- 21.8 kms of new Greenway along the alignment of the Ulster Canal;
- An increase in the number of waking and cycling trips from 28 to 69 regular journeys by 2023;
- 6 x Park & cycle facilities at key locations; and
- Bicycle parking

Successful development of the UCG is likely to achieve both construction and use of the stated outcomes. The greenway will also provide:

- Community engagement initiatives;
- Behavioural change initiatives;
- Greenway Signage; and
- CO2 savings

Review

Some potential for different interpretations exists in the application, review and letter of offer. The latter, letter of offer, differs from other projects in that it does not include absolute trip numbers, with only limited references to journey numbers contained in other application and review documents, making a direct measurement of achievement somewhat complex. It is also noted that differences also arise from the use of modal shift, as opposed to modal split, and time period statements that appear to refer to both annual and regular trips without clarification.

A consistent measurement is derived from section 3 of the stage 2 application business plan (Need and Demand), which states a total demand (by all modes) of 'approximately 1,300 two-way commuter trips per day', of which 910 are car trips. A modal shift would result in the following calculation (summarised in table 7):

> *Baseline cycling and walking on parallel routes = 28 PLUS*
> *Modal shift of 4.5% from 910 cars = 41+28 = 69 regular cross-border walking and cycling journeys*

Table 7: Individuals required to make commuting journeys to achieve target - UCG

Baseline	28 regular cross border walking and cycling journeys
Target	69 regular cross border walking and cycling journeys

As noted in our previous reporting (document 18082803JC), the calculation of 69 regular journeys (4.5% modal shift) is reasonably consistent with the estimated change stated in the SYSTRA report and repeated in the Letter of Offer, and is therefore adopted in this analysis.

In our analyses it appears possible, but not certain, that the UCG will achieve the target outcome of 69 regular commuting cross border walking and cycling journey. Our concern arises from the frequency of differing interpretations, rather than any unwillingness or inability on the part of the greenway project team to meet these goals.

4.2.4 CLG contribution to programme outputs

The Carlingford Lough Greenway contributes:
- 10.1kms of new Greenway linking the Newry Basin to Carlingford town; and
- An increase in the number of waking and cycling trips from 49 to 199 regular journeys by 2023

Successful development of the CLG will also provide the following wider outcomes:
- Reducing carbon emissions by 5,050 grammes per daily car journey;
- To deliver a comprehensive greenway activity programme impacting on behavioural change;
- Recruitment of 10 businesses which have a significant cross-border commuting workers to utilise the greenway for commuting to work;
- Engagement of local primary and post-primary schools from both jurisdictions in utilisation of the greenway for commuting to school and additional educational activities;
- Recording of up to 60,000 visitors/users of the greenway crossing the border in either direction in year 1, rising to 100,000 users by year 3;
- Establishment of a Friends of the Carlingford Lough greenway committee to promote modal shift and utilisation of the greenway;
- Delivery of a greenway activity programme to encourage cross-border commuting and usage; and
- Recording of 1,500 participants involved in activities through the greenway activity programme in year 1, increasing by 10% in each of years 2 and 3.

<u>Review</u>
Differences exist in both the terminology, timeframe and figures used in the application and its review. It is also noted that the stage 2 application includes a truncation of the route from its original terminus of Greenore, to Carlingford town, while also providing a more robust review of trip numbers than contained in the original stage 1 application. A total contribution of 150 cross-border '**regular**' walking/cycling commuter journeys, from a baseline of zero trips along the greenway is cited in the business plan, producing an increase of from a regional baseline of 49 to 199 such journeys, though this does differ from the originally stated objective of 10%, which would have resulted in the figure of 248 trips.

A different calculation, related to daily trips, is also included in both the stage 2 business plan and its review suggesting that cross border commuting by cycling and walking defined as trips made on a **daily** basis would equate 30 additional trips. The difference was repeated in the Interreg letter of offer, but defined as both a **daily** increase of 30, and a **regular** user increase of 150. The study team have adopted the regular journey count as being the closest to the stated programme objectives, summarised in table 8.

Table 8: Individuals required to make commuting journeys to achieve target - CLG

Baseline	49 regular cross border walking and cycling journeys
Target	199 regular cross border walking and cycling journeys

In our analyses it appears possible, but not certain, that the CLG will achieve the target outcome of 199 regular commuting cross border walking and cycling journeys. Issues arise both in respect of the actual definition of outcome numbers, discussed above, and the likelihood of commuting use of the greenway, as opposed to leisure and other uses. Non-Commuting uses being recognized in the wider outcomes, but do not, in themselves, contribute to the core objectives of the programme, discussed below.

5. Programme outputs and result indicators

5.1 Review of result indicators

The Interreg VA priority axis 3, sustainable transport programme, is charged with delivering support to achieve the following objectives, outputs and result indicators:

Objective:
- To promote cross-border, intermodal and sustainable mobility in the region

Outputs:
- Creation of one cross border, multi-modal public transport hub encompassing integrated services;
- Creation of 80 kms of new cross-border greenways; and
- *Creation of a cross-border EV network including 73 new/upgraded rapid chargers*

Results Indicators
- 25% increase in the number of passenger journeys utilising cross-border public transport services by 2023;
- 10% increase in the number of cross-border journeys made by walking or cycling by 2023; and
- *2,000 EV registrations by 2023*

Each of the projects described above make a direct contribution to both the outputs and result indicators described above, supporting and contributing to the programme delivery of the stated result indicators. The target indicator related to EV registrations differs both in

methodology and the fact that no applications were received in the first round of support. The potential and impact of these are considered in more detail in section 6, below.

5.2 Progress toward programme results indicators

Two potential interpretations are possible in terms of delivery of programme results indicators, the first related to measurement across the entirety of the border region, in other words all commuting trips between Northern Ireland and the Republic of Ireland; the second measured in term of the specific locations in which projects have been established. In our analysis we consider that the intent should, in fact, relate to the latter measurement, being the measurement of impacts in the locations of the projects themselves, though some of the terminology in the programme document may support the former interpretation; in particular where individual projects are stated to 'contribute to', rather than fully deliver on the results indicators defined.

A further element is introduced by the term 'up to', originally used in programme documentation and applied to the numbers of regular cross-border commuter journeys - removed with effect from the 2016 updates to the TCP, in effect defining a maximum output rather than an expected minimum, and potentially allowing each or any project to deliver any outcome below this figure. We also highlight the use of regular cross-border journeys as the metric applied, as many greenway journeys relate to non-commuting trips, thus complicating both the measurement of trip numbers and the ability of the projects to deliver a sustainable increase to a defined and (relatively) small sub-group of all users.

Physical infrastructure is more readily measured, as set out in table 9, as each project is clearly measured in terms of defined route or building infrastructure.

Table 9: Physical output indicators

Infrastructure by project	Objective Kms new greenway	Delivered Kms new greenway	Objective Building Infrastructure	Delivered Building Infrastructure
NWH contributions			1 hub	1 Hub
NWG contributions		46.5		
UCG contributions		21.8		
CLG contributions		10.1		
Intended Total	80.0		1 hub	
Actual Total		78.4		1 Hub
Delivery percentage		98%		1.0

On the basis of stated delivery, measured prior to completion of infrastructure development, it is likely that the programme will come close to, but not fully, achieve its original target of 80kms of new greenway. The delivery of a North West Multimodal transport hub is likely to fully satisfy the infrastructure element of that project.

The projects will also deliver a proportion of the programme modal split objective, measured in terms of journey numbers, though the study team has a number of concerns over the actual ability of some of the projects to achieve the outcomes originally envisaged.

6. Review of the change in EV support

In this portion of the document we are focused on the impacts of a change in programme support for EV projects. The programme specific indicators had originally included the objective to increase the number of new EV registrations from a baseline value of 186 in 2014 to a target of 2000 by 2023, though this was updated by the programme board in light of a lack of applications, *"A decision was made to transfer the corresponding budget to greenways".*

This in turn created a task, within this study, to assess the impacts arising from a lack of EV projects that include both the dis-benefits from a reduced EV infrastructure against the benefits that may arise from the allocation of funds to other programme areas.

Since the initial development of this assessment, it is understood that the Interreg VA programme has issued a further call for EV infrastructure that is likely, at the time of writing, to result in the funding of one or more EV infrastructure projects. Although this may affect the total impact of the programme it does not, in our view, negate or limit the necessity of the following analysis which offers a methodology that allows for a comprehensive and consistent review of all three Interreg project types, being: Greenway, NWHub and EV projects.

6.1 EV Definitions

EVs form a part of a wider vehicle group - **Ultra Low Emissions Vehicles (ULEVs)**, which are currently defined by the UK Department for Transport as *'vehicles with significantly lower levels of tailpipe emissions than conventional vehicles.'…'vehicles with fully electric power or with tail-pipe emissions below 75 g/km of CO2…',* with similar definitions applying in the Republic of Ireland (Sustainable Energy Authority of Ireland (SEAI)), and its equivalents in other EU states. EVs may broadly be split into three categories, being:

- **Battery Electric Vehicle (BEV),** derives all of its motive power from an electric motor, often described as a pure plug-in electric vehicle. A BEV can only derive its energy from an onboard battery or similar energy cell;
- **Hybrid Electric (HEV)** derives some motive power from an electric motor but will also derive power from internal combustion engines (petrol or diesel powered); and
- **Plug-In Hybrid Electric Vehicle (PHEV)** which allow external charging of the Hybrid Electric EV

It Is noted that although the majority of ULEVs are also EVs, not all rely on electric traction alone. Moreover not all EVs rely on or even benefit from EV charging points.

6.2 Primary Measurements

The calculation of the impact of diverting support from EV infrastructure to greenway alternatives is based on a comparison of net benefits that arise, or would have arisen, from the differing project alternatives, defined as alternative scenarios. The calculation necessitates the identification and quantification of benefits in both scenarios (with and without EV project support) to include:

- Net EV Ownership impacts;
- Net Environmental impacts; and
- Net Social Benefits

This is somewhat more complex than at first apparent, particularly in terms of the measurement of environmental impacts, as EVs are **not** free of emissions, though many of these are displaced away from the point of use. This gives rise to the question whether emissions are measured solely at the point of use or so as to include emissions the point of energy generation.

There is also a difference between a stated **result indicator**, defined in the TCP as an increase in the number of EV registrations[15] from a baseline of 186 to a target of 2000; and the **output indicator** - specifically an increase in the numbers of second generation charging points (also known as new wave chargers). The territorial cooperation document[16] stating a need to further develop *'a cross-cross-jurisdictional network of charging points and associated infrastructure…'* in order to *'…promote the increased use of electric vehicles, with their corresponding beneficial impact on carbon emissions.'* The SEUPB defines the related output indicator as 73 new and existing upgraded rapid chargers.

While the two measures (results and output indicators) need not be mutually incompatible, and follow distinctions between physical infrastructure and use seen in other projects, their measurement is made more complex by the continuing parallel development of the market that has and continues to occur in the absence of Interreg supported projects in both physical infrastructure and its use.

6.3 EV Ownership review

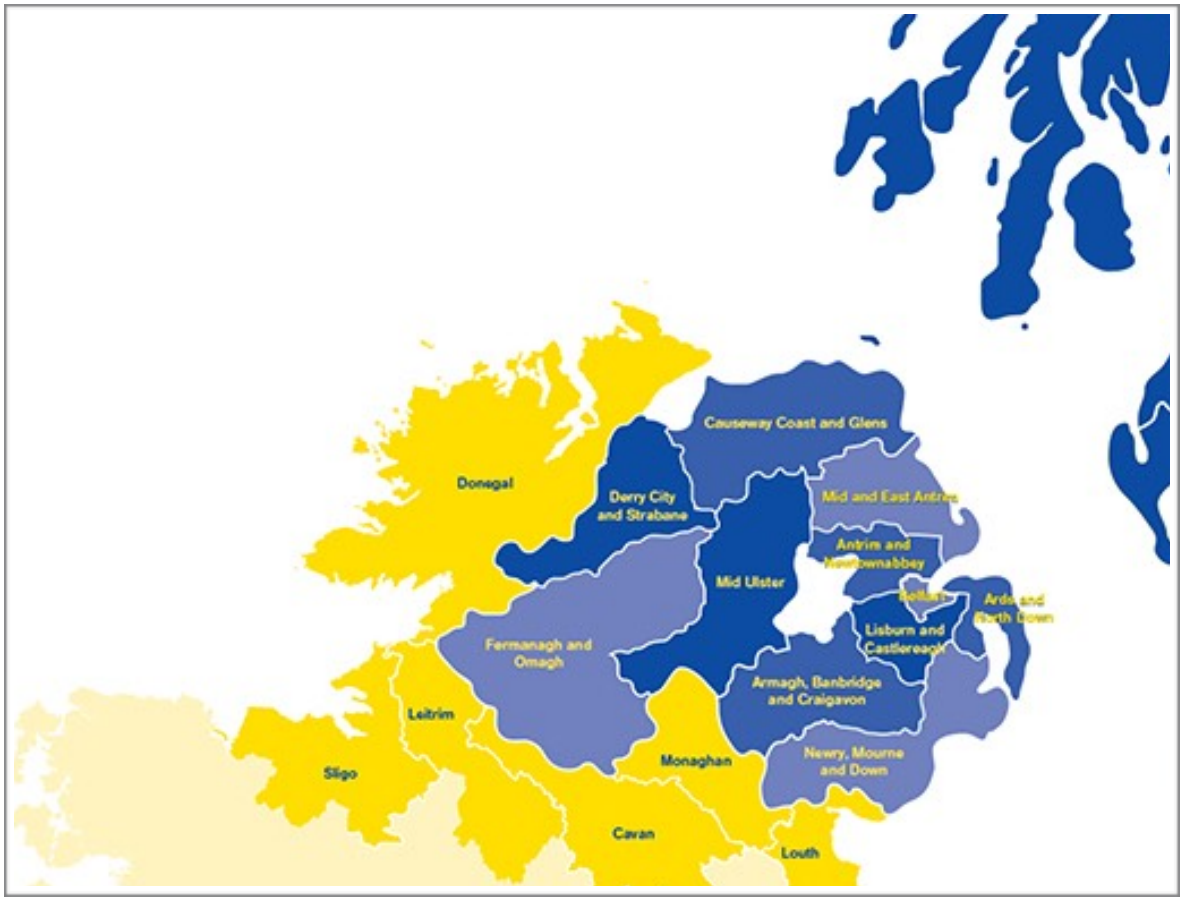
It is noted that differences exist in relation to the definition of EV type, see section 6.1. Differences also exist in the spatial disaggregation in which ownership is reported, similar in nature to the disaggregation issues identified in relation to census data set out in preceding sections of this report. Further distinctions may also be appropriate in that only **BEV** and **PHEV** vehicles benefit from the presence of EV charging infrastructure. Indeed some of the most common HEV types, of which the Toyota Prius is a widely quoted example, do not

[15] It is not directly apparent whether the term EV registrations refers to annual new EV registrations, or to the total number of EVs registered at any one time across the cross-border region. These differences are discussed below.
[16] https://www.seupb.eu/sites/default/files/styles/file_entity_browser_thumbnail/public/INTERREG%20Content%20Type/IVA_AdoptionByEC_28-01-2015_Version2.pdf

support plug-in charging, and would thus **not** benefit from the Interreg programme were it to support EV infrastructure development.

It is also important to ensure that the measurement compares like with like. The territorial cooperation goal defines programme specific result indicators as the number of EV registrations across the region. The indicator is specific to the cross-border region stating (TCP, p69) that the *'share of electric vehicles was very low.'* The team has therefore sought to identify measurements focused on the activity entirely within the cross-border region, see map 1, below.

Map 1: Cross-border region: Authority areas in Ireland and Northern Ireland



Source: SEUPB

6.3.1 Republic of Ireland

The Department of Transport, Tourism and Sport (DTTaS) produces an annual compendium of vehicle statistics from which we have derived an overall picture of the EV market in the Republic of Ireland, illustrated in tables 10 and 11; and of the cross-border region, tables 12 - 14.

It is noticeable that the number of EVs registered in the Republic of Ireland has grown steadily demonstrating an approximate 10 fold increase in the number of fully electric

vehicles in the period from 2011 - 2017. The significant majority of this growth can be attributed to an increase in fully electric private car use in ROI, which has grown from 81 vehicles 2011 to 2,718 measured on the 31st December 2017, across the entire jurisdiction. Other vehicles likely to use fixed public charging points include Electric Motorcycles, and, to a lesser extent, Taxis, see table 10.

Table 10: Republic of Ireland Number of Full Electric / BEV vehicles

Republic of Ireland Count of BEV by vehicle type	Year to 31st Dec						
	2011	2012	2013	2014	2015	2016	2017
Private cars*	81	230	251	529	1,083	1,659	2,718
Goods Vehicles	35	54	63	68	69	78	100
Tractors	4	2	4	4	4	4	3
Motorcycles*	61	62	53	49	43	28	31
Small Public Service Vehicles (Taxis)*	0	1	1	1	4	6	9
Exempt Vehicles	15	18	18	22	22	25	28
Vintage Vehicles	2	2	3	2	2	2	2
Motor Caravans	0	0	0	0	0	0	0
Large Public Service Vehicles	1	0	0	0	0	0	0
Mobile Machines	1	2	3	2	2	2	2
Excavators	0	0	0	0	0	0	0
Small Dumpers	27	27	23	23	21	18	17
General Haulage Tractor	2	1	1	1	1	1	1
Schoolbuses	0	0	0	0	0	0	0
Hearses	0	0	0	0	0	0	0
Youth Community Buses	0	0	0	0	0	0	0
Island Vehicles*	9	9	0	0	0	2	2
Off Rad Dumpers	0	0	0	0	0	0	0
TOTAL	238	408	420	701	1,251	1,825	2,913
Factor (all vehicles as percentage of private cars)	293.8%	177.4%	167.3%	132.5%	115.5%	110.0%	107.2%

Source: DTTAS Irish Bulletins of Vehicle and Driver Statistics (Table 13)

Note: Vehicle categories illustrated with an asterisk (*) are most likely to make use of public charging infrastructure.

The same statistics also record Plug-In Hybrid vehicles as a separate category from 2017, see table 11, bringing the total fleet that can plug-in to 3,784, of which 3,580 vehicles are registered as private cars.

Table 11: Republic of Ireland Number of Petrol / Plug In Hybrid Electric vehicles

Republic of Ireland PHEV	Year to 31st Dec					
						2017
Private cars	PHEV reported as separate class from 2017					862
Goods Vehicles						4
Tractors						0
Motorcycles						2
Small Public Service Vehicles (Taxis)						0
Exempt Vehicles						3
Vintage Vehicles						0
Motor Caravans						0
Large Public Service Vehicles						0
Mobile Machines						0
Excavators						0
Small Dumpers						0
General Haulage Tractor						0
Schoolbuses						0
Hearses						0
Youth Community Buses						0
Island Vehicles						0
Off Rad Dumpers						0
TOTAL						871

Source: DTTAS Irish Bulletins of Vehicle and Driver Statistics (Table 13)

While useful to establish a pattern of growth in the use of EVs, both of the preceding tables relate to ownership across the entirety of the Republic of Ireland, and do not allow for disaggregation to county level, and are not directly applicable to measurement of change within the cross-border region affected by the Interreg VA programme.

In order to estimate county based growth in EV ownership we have applied a separate assessment based on the registration and tax classes, which are reported at county level in the DTTaS bulletin. Table 12 sets out the numbers of private cars reported by county in emissions band A0, and in emissions band A1, table 13. These bands representing zero emissions vehicles (A0), and vehicles with an emission rate of less than 80g CO2/km, which broadly correspond with the UK definition of ULEVs (<75 g CO2/km), and allows the estimate of total EV numbers at a county level.

Table 12: BEV Private Cars (CO2 band A0) by Licensing Authority (ROI cross-border)

Private Cars, CO2 emissions band A0	Year to 31st Dec						
	2011	2012	2013	2014	2015	2016	2017
Cavan	A0 not reported <2013		2	2	4	5	20
Donegal			1	3	10	16	29
Leitrim			0	0	3	7	9
Louth			2	4	17	30	50
Monaghan			1	3	8	9	152
Sligo			3	3	3	8	13
TOTALS			9	15	45	75	273
Other vehicle factor from Table 2			1.67	1.33	1.16	1.10	1.07
Adjusted Totals, all vehicle types			15	20	52	83	293

Source: DTTAS Irish Bulletins of Vehicle and Driver Statistics (Table 5a)

Table 13: PHEV Private Cars (CO2 band A1) by Licensing Authority (ROI cross-border)

Private Cars, CO2 emissions band A1	Year to 31st Dec						
	2011	2012	2013	2014	2015	2016	2017
Cavan	A1 not reported <2013		1	4	13	36	57
Donegal			1	7	31	59	98
Leitrim			0	1	4	12	16
Louth			0	1	36	62	100
Monaghan			0	2	9	13	177
Sligo			1	3	16	42	68
TOTALS			3	18	109	224	516
Other vehicle factor from Table 2			1.67	1.33	1.16	1.10	1.07
Adjusted Totals, all vehicle types			5	24	126	246	553

Source: DTTAS Irish Bulletins of Vehicle and Driver Statistics (Table 5a)

As county level data derived from the DTTaS bulletin refers to private cars alone we have applied a factor reflecting the broad rate of all vehicles as a percentage of private cars, to the county level measure. This allows an estimate of the total number of EVs, as set out in table 14, below.

Table 14: EV count estimates, cross-border region counties (ROI)

Republic of Ireland Cross-border region counties EV count	Year to 31st Dec					
		2013	2014	2015	2016	2017
Estimated total Private Cars	Band A was not disaggregated <2013	12	33	154	299	789
Estimated total all vehicles		20	44	178	329	846

6.3.2 Northern Ireland

Vehicle data for Northern Ireland is sourced from the DOE and its successor department, the Department For Infrastructure (DFI), statistical compendium: Northern Ireland Transport Statistics, Chapter 1, Vehicle Registrations. As the entirety of Northern Ireland falls within the Interreg Cross-Border Region there is no need to further break these figures down to county or authority level. A count of Electric Vehicles is derived from Table 1.3 of the DOE/ DFI statistics (*ibid*) on the basis of taxation classes 19 (Electric Motorcycle) and 79 (Electric vehicle), summarised in table 15, below.

Table 15: EV count, Northern Ireland

Northern Ireland EV count	Year to 31st Dec						
	2011	2012	2013	2014	2015	2016	2017
Taxation class 19	5	8	7	5	3	4	N/A
Taxation Class 79	39	77	150	343	569	724	N/A
Estimated total all vehicles	44	85	157	348	572	728	N/A

It should be noted that vehicle registration functions in Northern Ireland were transferred in June 2014 from the DOE agency Driver and Vehicle Licensing Northern Ireland (DVLNI) to the UK Department for Transport (DfT) Driver and Vehicle Licensing Agency (DVLA) in June of 2014; though this did not prevent the continuation of DFI statistical tabulations, with totals for the period post transfer being provided to the DFI by the DVLA.

6.3.3 Cross-Border Region

The combination of data from the Republic of Ireland (section 3.1.1), and Northern Ireland (Section 3.1.2), allow for the calculation of a cross-border region total from both sides of the border, tabulated in table 16, below. As not all years are available the table illustrates those years where consistent data is available from both jurisdictions.

Table 16: EV count, Cross-Border region on the Island of Ireland

Island of Ireland, Cross-Border Region EV count	Year to 31st Dec						
	2011	2012	2013	2014	2015	2016	2017
Republic of Ireland			20	44	178	329	
Northern Ireland			157	348	572	728	
Estimated total all vehicles			177	392	750	1,057	

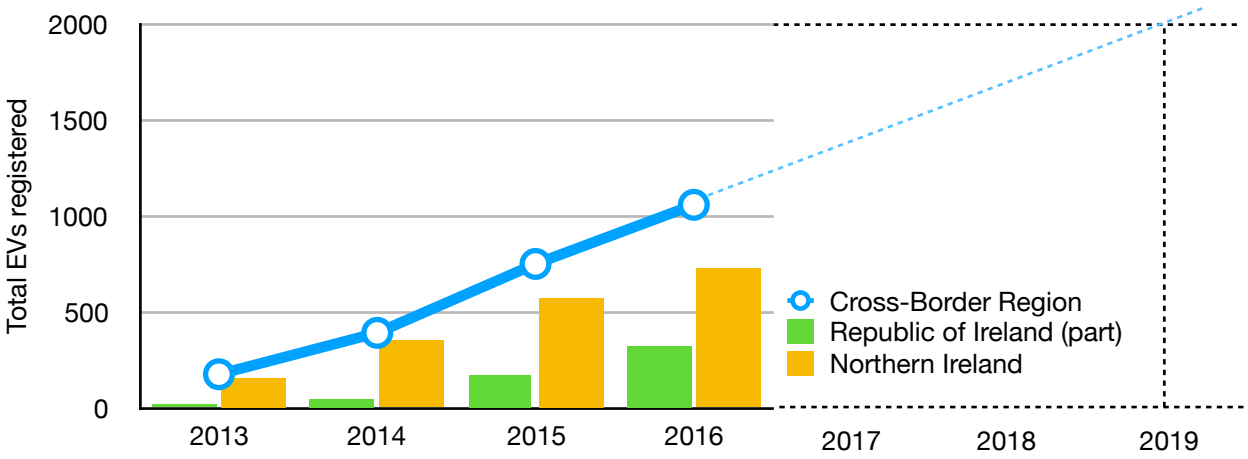
An estimated total of 177 EVs were recorded in 2013, rising to 392 by the end of 2014, and 1,057 by the end of 2016. It is noted that, although we have not been able to recreate the exact baseline value of 186 EVs (which is likely to reflect the point of time at which a measurement is taken during the year), we believe the figure of 186 EVs represents a reasonable summation of ROI and NI EVs at an intermediate point in 2014.

6.4 Review of Interreg VA stated target outcomes - EVs

The TCP defines two indicators specific to the EV element of the programme: a physical output indicator: the installation or update of 73 rapid charging points; and an impact result indicator based on the increase in EV ownership from the baseline of 186 vehicles, discussed in the preceding sections, to a target rate of 2,000 such vehicles in the region by 2023.

While the initial indicator, 73 new rapid charging points, may be seen as a pass/fail criterion; the latter, increased use, is more opaque, and may, in reality, be achieved to a large extent as a result of other market factors. Indeed the increase in ownership from 177 at the end of 2013 to 1,057 at the end of 2016 suggest that the result indicator may, in fact, be achieved in 2019 on the basis of current rates in growth, see graph 1, below.

Graph 1: Growth in EV ownership, Cross-Border region



It is also noted that the measurement of EV vehicle numbers does not, in its own right, allow for a full comparison of impacts arising from the change in Interreg programme outcomes.

The change in programme led to an increase in the level of support provided to greenways resulting in a reduction in traditional car trips, in turn leading to a reduction in the emissions that would have been associated to trips had they been made by car. This providing a common measure against which potential impacts of EV infrastructure can be compared.

6.5 Impact assessment, support reallocation

The reallocation of support led to an increased level of funding for greenway projects, in place of the planned investment in EV infrastructure. The direct physical impact of this change being the reduction in EV charging points (infrastructure development) - one of the TCP output indicators. The impact on sustainable transport, in contrast, may be better assessed in relation to the carbon impacts of the reallocation. A number of additional factors need also be considered, not least that EV use has continued to grow despite the reallocation of Interreg funds. This in turn raising the question as to the extent of additional benefit that would have resulted from the original programme.

From the perspective of infrastructure development this appears a relatively simple measure based on the observation of new charging points and their funding. The question arises whether the 73 new charging points are counted as part of or in addition to those already in development, or that have since been installed. It is our view that should be interpreted as 73 new charging points that would have been created as a result of the programme in addition to any that would be developed in the absence of programme support.

The same can not be said in respect of numbers of EVs. The measurement of EV registrations is clearly defined in the TCP in terms of **total** numbers of EVs within the cross-border region. As that number has been growing both naturally and as a result of other incentives, it is likely that the target number of EVs may be reached in advance of the original Interreg target date, without its intervention. In other words, the measurement of impacts associated with the number of vehicles may, in fact relate to one of:

- Zero additional EV registrations, as the total result indicator number has already been achieved;
- A small number of EV registrations, measured on the time period between the original intended launch of Interreg support and the point at which the 2,000 EV count is obtained; or
- The full impact as originally envisioned (additional to rather than part of natural growth)

In the first two scenarios the effect of the Interreg project is diminished to a minor part of the growth in EVs, or no part, as the growth may be achieved without the programme. Both having an impact on any reduction in carbon emissions that may be attributed to the programme. In reality, however, we feel that the impact goes beyond the first review of target vehicle numbers. It being reasonable to suggest that EV projects would have (still

will)[17] contributed to the growth in EVs over and above the natural growth in the market. In other words that the project(s) would have / will create an additional growth in use of (2,000 - 186 = 1,814) EVs.

6.6 Programme outcome comparison

The comparison of programme outcomes relates to the effective impacts that arise as a result of reallocation of support from EV projects to greenway projects. Greenway indicators are discussed in detail in the first part of this report and may be summarised as:

- Output indicators expressed in terms of number of kms new greenway, and
- Result Indicators expressed in terms of increased numbers of regular cross-border commuter journeys made by cycling and walking.
- CO2 reduction (defined for some, but not all, projects)

6.6.1 CO2 reduction - Greenways

The Letters of Offer sent to some, but not all, Greenway projects specified targets for CO2 reductions. These specifications were, in turn, generally based on the original submissions of the project teams and are summarised in table 17, below.

Table 17: Greenway projects defined outputs for key indicators

Greenway Scheme	Output indicator	Result Indicator	Environmental Indicator
	Kms new greenway	Regular Commuter Journeys (cycling/walking)	CO2 reduction (tonnes)
North West Greenways	46.5	370	319 tonnes
Ulster Canal Greenway	21.8	41	3.17 tonnes annually
Carlingford Lough Greenway	10.1	150	*Reducing carbon emissions by 5,050 grammes per daily car journey*
TOTALS	78.4	561	

As no single consistent measure is defined in relation to CO2 reduction we have developed an indicative measurement based on the numbers of trips made from opening to the target year of 2023. The calculation uses an assumed 212 days cycling to/from work, and a regular trip length of 7.5 kms in each direction, allowing the calculation of a reduction in carbon emissions of approximately 476 tonnes attributable to Interreg VA projects, see table 16. It should be noted that the actual emissions rates of vehicles continue to improve, which we include in the calculation (table 18, line 1) to reflect greater vehicle efficiencies and new legislated standards over time. A more detailed review of this calculation is given in our EV technical report 18112301JC.

[17] Given the continued recruitment of new projects under the EV element, at the time of writing, it is anticipated that the original growth in EV number may still be a reasonable expectation of the programme.

Table 18: Estimated CO_2 savings

ALL GREENWAYS	2018	2019	2020	2021	2022	2023	ALL	Source
CO2 Emissions rate - CO2 g/km	130	124.2	118.4	112.6	106.8	101		EU
Mean distance / journey (= 2x 7.5kms trip) - kms	15	15	15	15	15	15		
Days Travelled per year	212	212	212	212	212	212		
Beneficiaries	N/A	0	140	280	420	561		
TOTAL Reduction in CO2 / km (tonnes)	Not open		53	100	143	180	476	
NORTH WEST GREENWAY							CO2 reduction (tonnes)	
Beneficiaries			92	185	277	370		
Project Reduction in CO2 / km (tonnes)			35	66	94	119	314	
ULSTER CANAL GREENWAY							CO2 reduction (tonnes)	
Beneficiaries			10	20	31	41		
Project Reduction in CO2 / km (tonnes)			4	7	10	13	35	
CARLINGFORD LOUGH GREENWAY							CO2 reduction (tonnes)	
Beneficiaries			37	75	112	150		
Project Reduction in CO2 / km (tonnes)			14	27	38	48	127	

It is inevitable that actual performance may differ from the assumed rates set out above, and may fluctuate on the basis of weather as well as availability. The rates, however, do appear to coincide with the calculations of CO2 reduction impacts in the case of the North West Greenways, which stated a total reduction of 319 tonnes CO2 by 2023, compared with the 314 tonnes calculated using the above methodology. In contrast, the stated carbon reduction for the Carlingford Lough greenway, of 5,050 grammes per daily car journey[18], appears less likely as this would require a vehicle to travel 39kms using the 2018 emissions value of 130g/km CO2, and even further as vehicle efficiency increased over time.

Using a common emissions and trip length values it is possible to suggest a CO2 saving of 35 tonnes arising from the Ulster Canal Greenway; and 127 tonnes from the Carlingford Lough greenway, to result in a total saving over all greenway projects of 476 tonnes CO2 by 2023.

[18] Carlingford Lough Business Plan, table on page 4

6.6.2 CO2 reduction - EV infrastructure

The measurement of environmental impacts arising from EV projects follows the same concept - CO2 reduction - as defined for greenways.

The development of new EV infrastructure encourages the replacement of Internal Combustion Engine (ICE) vehicle types (traditional petrol and diesel vehicles) with EVs which in turn results in a measurable reduction in CO2.

The measurement is complicated, however, by the inclusion of emissions at point of electricity generation, that may be produced by a number of alternative fuel types with differing emissions characteristics. Power generation, in Ireland, includes both CO2 emitting and non-emitting sources, which we address on the basis of a mean emissions rate as described in the next section below.

Other factors need be considered including the balance between full-electric (BEVs) in the fleet, for which emissions relate to use of electricity alone, and plug-in hybrid vehicles (PHEVs) which continue to employ on-board combustion for a portion of their motive power, and thus create, a limited amount of, carbon emissions at the point of use.

UK analysis undertaken by next greencar suggests that only 23% of all plug-in EVs are pure-electric vehicles. 77% of the plug-in fleet comprise hybrid/range extender EVs necessitating both the calculation of differing rates for BEV and PHEV, and their relative mix in the fleet. Vehicle make and model will also influence the actual consumption / emission calculation, though this is likely to change over time. We have therefore used BEV and PHEV mean values in the calculations which are set out in detail in the EV technical report.

Emissions at source - Electricity Generation

To establish emissions rates attributable from generation (CO2 / KwH) we need to distinguish between **draw** and **load** patterns. The load applies to a rate of kWh consumption required for vehicle operation, while draw relates to the KwH power taken from the electricity grid at point of charging[19]. Additional consumption is also added to the amount drawn from the grid at point of battery charging to reflect charging and transmission losses estimated at 10% and 8% respectively[20] [21] for both Ireland and the United Kingdom, illustrated in table 19.

[19] US National Renewable Energy Laboratory
[20] Data provided by ABB systems, available at: https://library.e.abb.com/public/9ca79754548047018ec687c4a5a25785/EPM%20EV%20CO2%20emissions%20blog_9AKK107045A1527_170519.pdf
[21] Data from World Bank, available at: https://data.worldbank.org/indicator/EG.ELC.LOSS.ZS

Table 19: Adjusted emissions rate to include transmission and charging losses[22]

BEV (Nissan)	gCO2eq/kWh	Sub Total	Adjusted
Mean Value / kWh at point of production	440	440	
Transmission Loss @ 8%	35.2	475.2	
Charging Loss @ 10%	47.52	522.72	
Nissan Leaf load	30kWh / 187.45 kms	0.16 kWh / 1 km	
BEV (Nissan Leaf) emissions / km		70.41 gCO2 / km	83.66 gCO2 / km
PHEV Experimental data (KATO)			**Estimated**
Tavel Distance	197826	Kms	
Gasoline consumption	4858	litres	
Commercial power consumption	12567	kWh	
PHEV CO2 emissions / km	16511	kg	83.46 gCO2 / km

Calculation and application to Interreg programme

Having established the comparative CO2 values by EV type, we are then able to calculate the net impact of programme having diverted support from EV infrastructure to greenways.

Table 20: CO2 emissions saving with implementation of Interreg EV projects.

	2018	2019	2020	2021	2022	2023	Total
Per vehicle kms / year	17,901	17,668	17,439	17,212	16,988	16,767	
Vehicle EV replacement resulting from project	0	363	726	1,088	1,451	1,814	
Percentage of EV fleet BEV	23%	23%	23%	23%	23%	23%	
Percentage of EV fleet PHEV	77%	77%	77%	77%	77%	77%	
Base rate BEV Emissions rate g/km CO2	83.66	83.66	83.66	83.66	83.66	83.66	
Base rate PHEV Emissions rate g/km CO2	83.46	83.46	83.46	83.46	83.46	83.46	
BEV Emissions x percentage BEV	19.24	19.24	19.24	19.24	19.24	19.24	
PHEV Emissions x percentage PHEV	64.26	64.26	64.26	64.26	64.26	64.26	
ICE vehicle emissions rate g/km CO2	130	124.2	118.4	112.6	106.8	101	
Net vehicle emissions saving g/km CO2	46.5	40.7	34.9	29.1	23.3	17.5	
Emissions savings (tonnes) / vehicle	0.83	0.72	0.61	0.50	0.40	0.29	
Effective CO2 savings (tonnes)	0	261	442	545	574	532	2,354
Net saving per EV vehicle / year Tonnes CO2		0.72	0.61	0.50	0.40	0.29	

On the basis of the values shown in table 18, it would not appear possible for the diversion of funds to greenway schemes to replicate, savings that may have been achieved by EV projects. The total emissions savings attributable to greenways is calculated at 476 tonnes

[22] See Technical Report 18112301JC for full details of the calculations set out in table 17

CO2 saved over the full period to 2023 compared to a total of 2,354 tonnes CO2 saved from the take up in EVs.

A more complex picture arises, however as a result of the actual levels of EV take up compared to the baseline and target values as defined in the territorial agreement.

While the programme makes reference to an increase from 186 EVs at baseline to 2,000 by the original 2023 target date, It is likely that this target will already have been achieved by the end of 2019 as a result of growth in EV use achieved without Interreg intervention. In effect, any Interreg supported project would only require a very small number of new vehicles to enter the market in order to deliver the original objective, if any.

In this instance, the actual contribution of the Interreg EV project to achieving the defined target of 2,000 is estimated at 250 vehicles, being the difference between the natural growth rate at an estimated original going live date, and the estimated actual number of EVs in the market at the same time. In this scenario the number of EVs attributable to the project would have been 250 from the end of the first year to the target date, see table 21, below.

Table 21: CO2 emissions saving Interreg EV projects minus natural growth

	2018	2019	2020	2021	2022	2023	Total
Per vehicle kms / year	17,901	17,668	17,439	17,212	16,988	16,767	
Vehicle EV replacement resulting from project	0	250	250	250	250	250	
Percentage BEV	23%	23%	23%	23%	23%	23%	
Percentage PHEV	77%	77%	77%	77%	77%	77%	
BEV Emissions rate g/km CO2	19.24	19.24	19.24	19.24	19.24	19.24	
PHEV Emissions rate g/km CO2	64.3	64.3	64.3	64.3	64.3	64.3	
ICE vehicle emissions rate g/km CO2	130	124.2	118.4	112.6	106.8	101	
Net vehicle emissions saving g/km CO2	46.5	40.7	34.9	29.1	23.3	17.5	
Emissions savings (tonnes) / vehicle	0.83	0.72	0.61	0.50	0.40	0.29	
Effective CO2 savings (tonnes)	0	180	152	125	99	73	629
Net contribution per EV vehicle / year Tonnes CO2		0.72	0.61	0.50	0.40	0.29	

Even with the update, the total emissions reduction achieved by the EV schemes, 629 tonnes CO2, exceeds the total attributable to the greenways. We would therefore conclude, for both scenarios, the diversion of support from EV projects to Greenway projects does not achieve the same benefits that would have been possible with the development of the EV projects.

7. Synthesis

While the initial intent and objectives of the Interreg programme appear to be clearly defined, the processes of project application and review have introduced a number of differences in the interpretations and measurements of those objectives that may have an impact on the ability of the project to fully deliver across all of the results indicators defined in the programme documentation.

Physical outputs are likely to be achieved to a significant degree, with a small reduction in the total number of greenway route miles, delivering 78.4 kms of new greenway, as compared to a total of 80kms originally envisioned.

Programme results indicators are likely to prove more challenging, however, with particular deviations visible, mainly arising from different interpretations of terms used in the submission and review processes, as well as differences in the spatial definition of baseline data. Differences are particularly notable in the use of modal split and modal shift terminology, which differ in the baseline figure used in calculation, and, more significantly, a different interpretation of the time periods over which increases in sustainable transport use should be measured, being the (differing) use of daily, regular and annual user counts. The latter is particularly noticeable in the case of the North West Multimodal Hub application and review, though the same issue is repeated to a lesser extent in other project documents. Notable also is the repetition of differing interpretation into the Letters of Offer sent to the individual projects.

On the basis of our analysis reviewed in this, and associated, documents, it is our current view that the programme may not be able to deliver across all of the results indicators to the extent set out in its initial documentation.

Analysis of the impacts of changes in the programme, specifically the diversion of support from EV infrastructure to greenway, suggests that the changes are likely to result in a reduced benefit when compared to the originally designed EV parts of the programme.

At the time of writing of this document, and its update, it is also observed that a significant level of market uncertainty is visible as a direct impact of Brexit. The level of uncertainty has significantly increased over the life of the study, though we anticipate this will plateau with the conclusion of discussions around future relationships between the United Kingdom and other countries in the European Union.

The uncertainty contributing to changing behaviour to a greater level than may follow from an outcome of the negotiations, almost irrespective of the actual outcome. The impacts of the changing market, including any issues associated with Brexit, will form a central part of the 1st study conference intended for late summer 2019.