Rural Mobility in Transition: Evaluating Public Transport Expansion and Car dependency in Roscommon, Ireland

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Summary (and what we modelled)

- Provision of better public transport network services improves accessibility!

- Transport modelling *illustrates* areas with most improvement in an independent way, (if it were needed)

    - Provisional indications of –1.2% (reduction) in private car-person-kilometres travelled per weekday (2016-2018 kms subtracted from 2022 kms, as modelled).

    - (trip) Demand and population grew from 2016 → 2022
    - Car ownership grew 2016 → 2022
    - Same model, trip rates, etc. → no post-Covid changes in behaviour were *modelled*

    - Connecting Ireland network improvements modelled as of 2022

- This is a work-in-progress, so no big “conclusions” as such.

Inspiration for this research

- "Forced car ownership" as reported by Carroll, Benevenuto and Caulfield in 2021

IdentifyingHotspotsTrans... × + Create Sign

Convert E-Sign Find text or tools

4. RESULTS

The Hot Spot analysis shown in Figure 3 indicates a presence of large clusters of EDs with low HP scores, particularly concentrated in counties in the west and north-west of the country, such as Donegal, Mayo, Roscommon, Leitrim, Cavan. Clusters of affluent areas, which are shown in blue, are primarily found around the three largest cities of Dublin, Cork and Galway, which was expected given that there are greater levels of access to opportunities in these more urbanised areas.

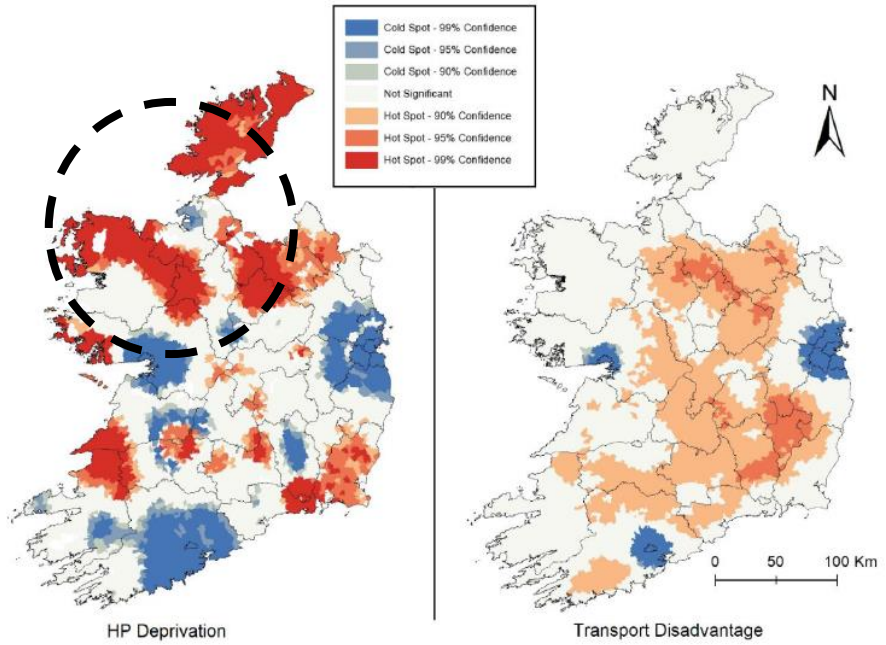
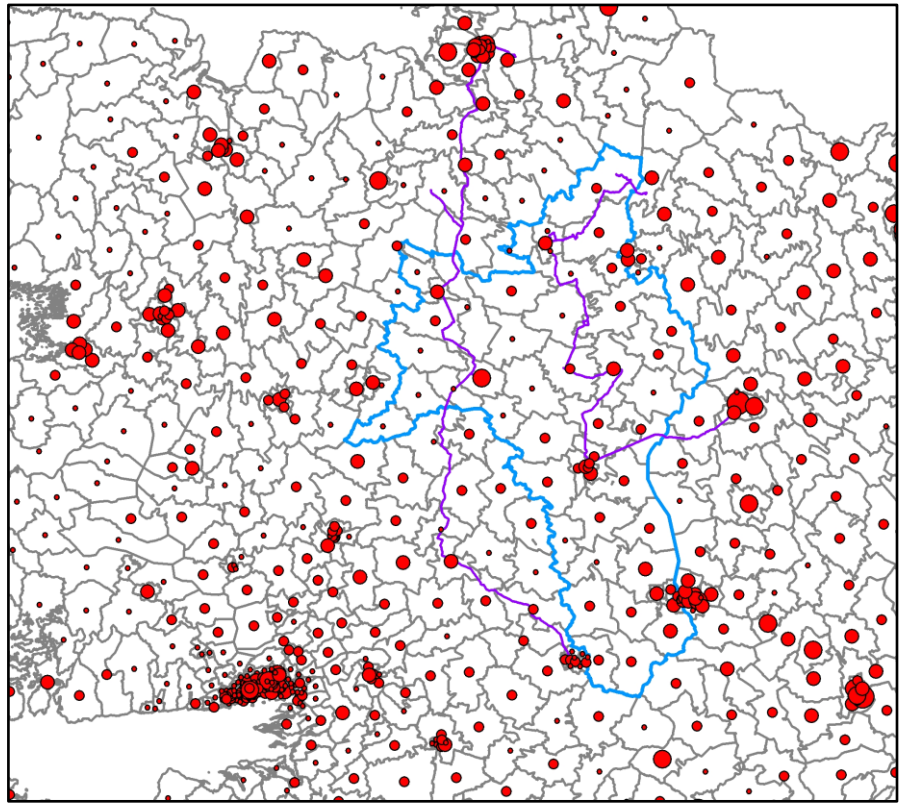


Figure 6: Hotspot analysis of social (left) and transport (right) disadvantage

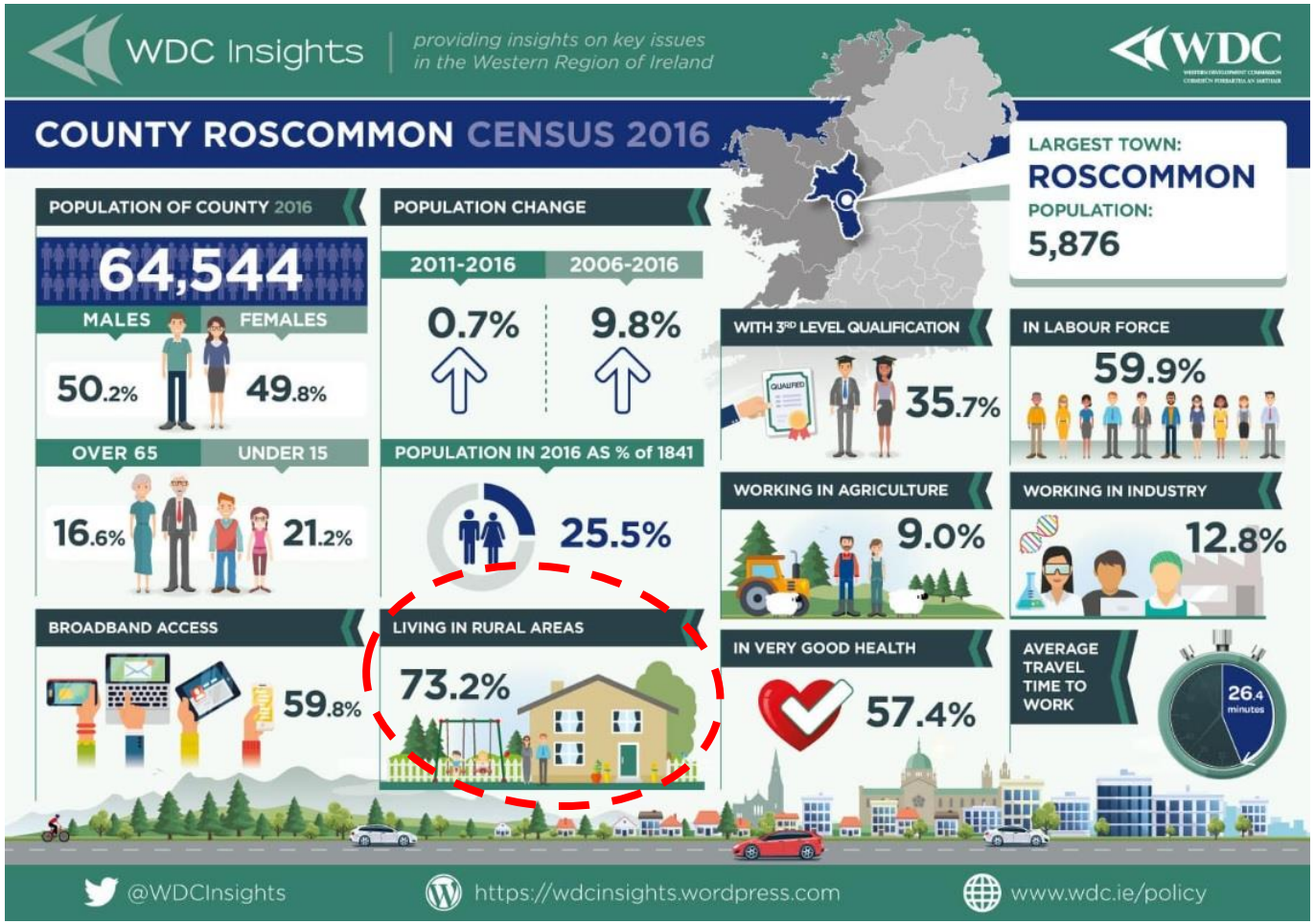


Red dots indicate 24-hour trip attractions into each WRM model zone as per 2016 NTA models.

Purple lines denote combined Local bus services

Roscommon county vital statistics (Western Development Commission, Deirdre Frost and Dr. Helen McHenry)

- https://westerndevelopment.ie/insights/improving-transport-links-in-the-western-region-a-new-rail-plan-and-ongoing-roads-programme/



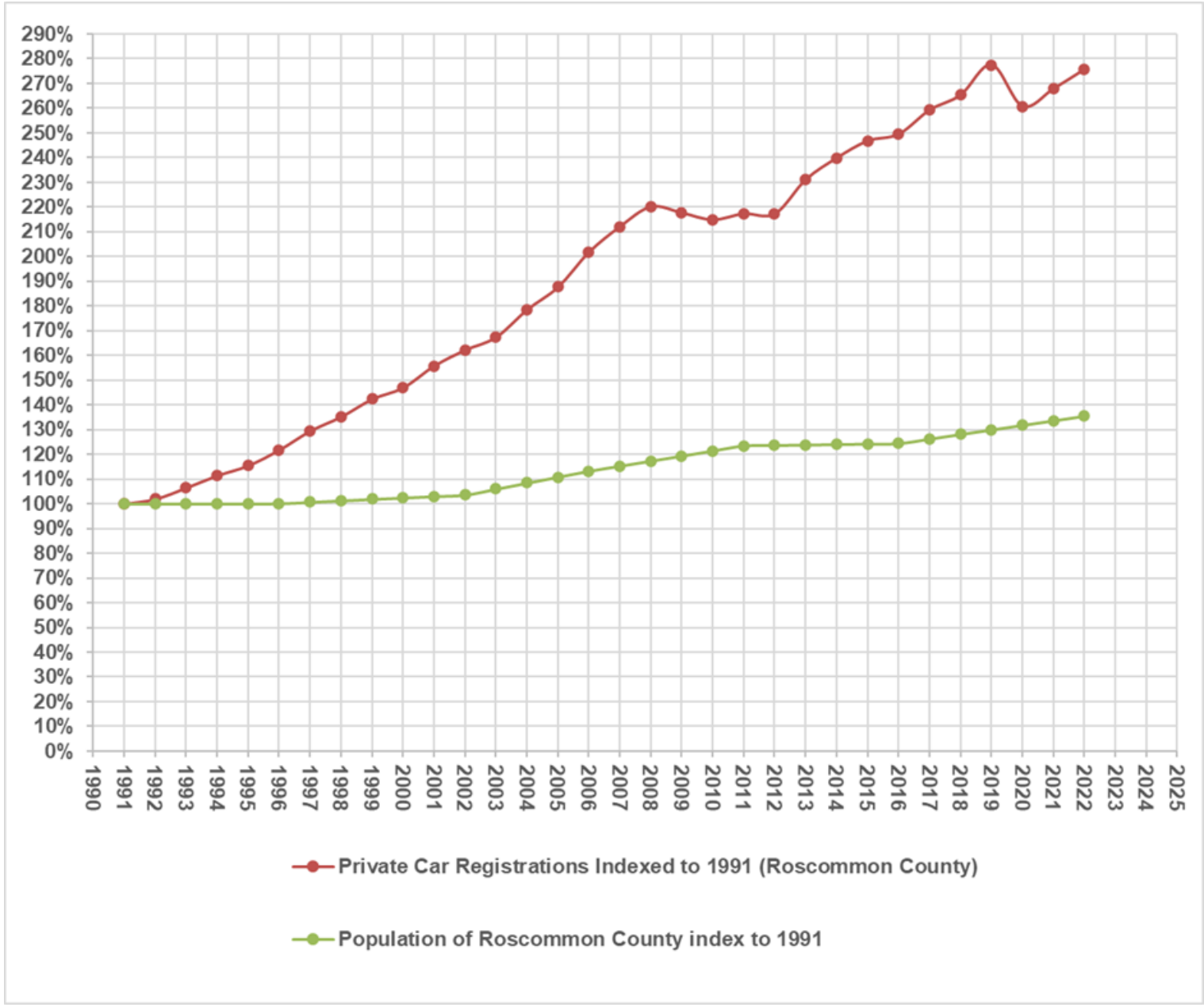
Main Built Up Areas in Roscommon* (2022)	Population per town 2022
Roscommon town	6,555
Boyle	2,915
Ballaghaderreen	2,387
Castlerea	2,348
Strokestown	850
Roosky, Counties Leitrim & Roscommon	787
Elphin	715
Termonbarry, Co Roscommon	699

- Difficult to service rural areas
- Hard to compete with private car, once purchased

Why Roscommon?

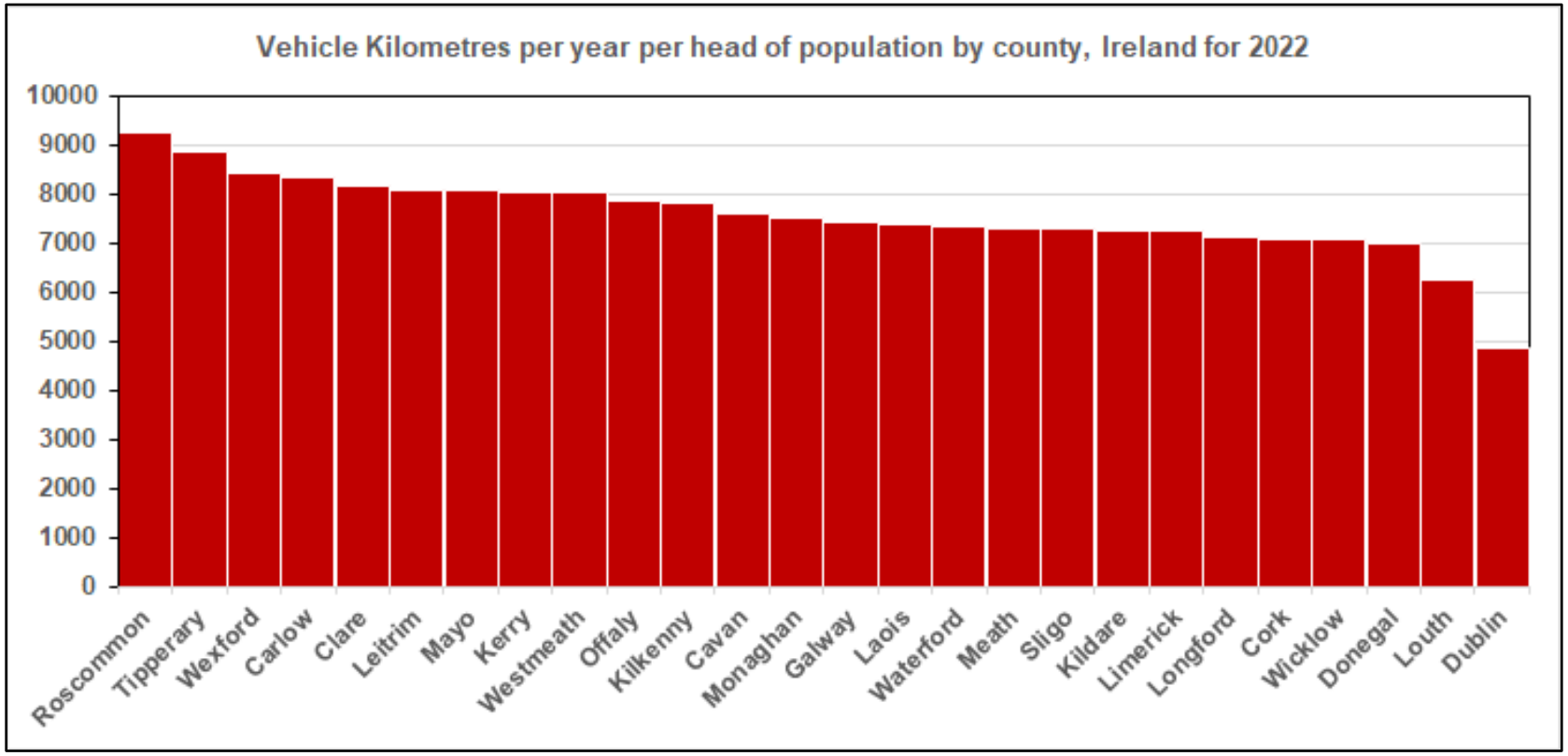
Private Car Reg data in general growing at faster rate than population, both nationally, but predominantly in rural counties.

Data direct from Dept. of Transport and CSO for population.



Why Roscommon?

- Transport CO_2 emissions and Climate Action

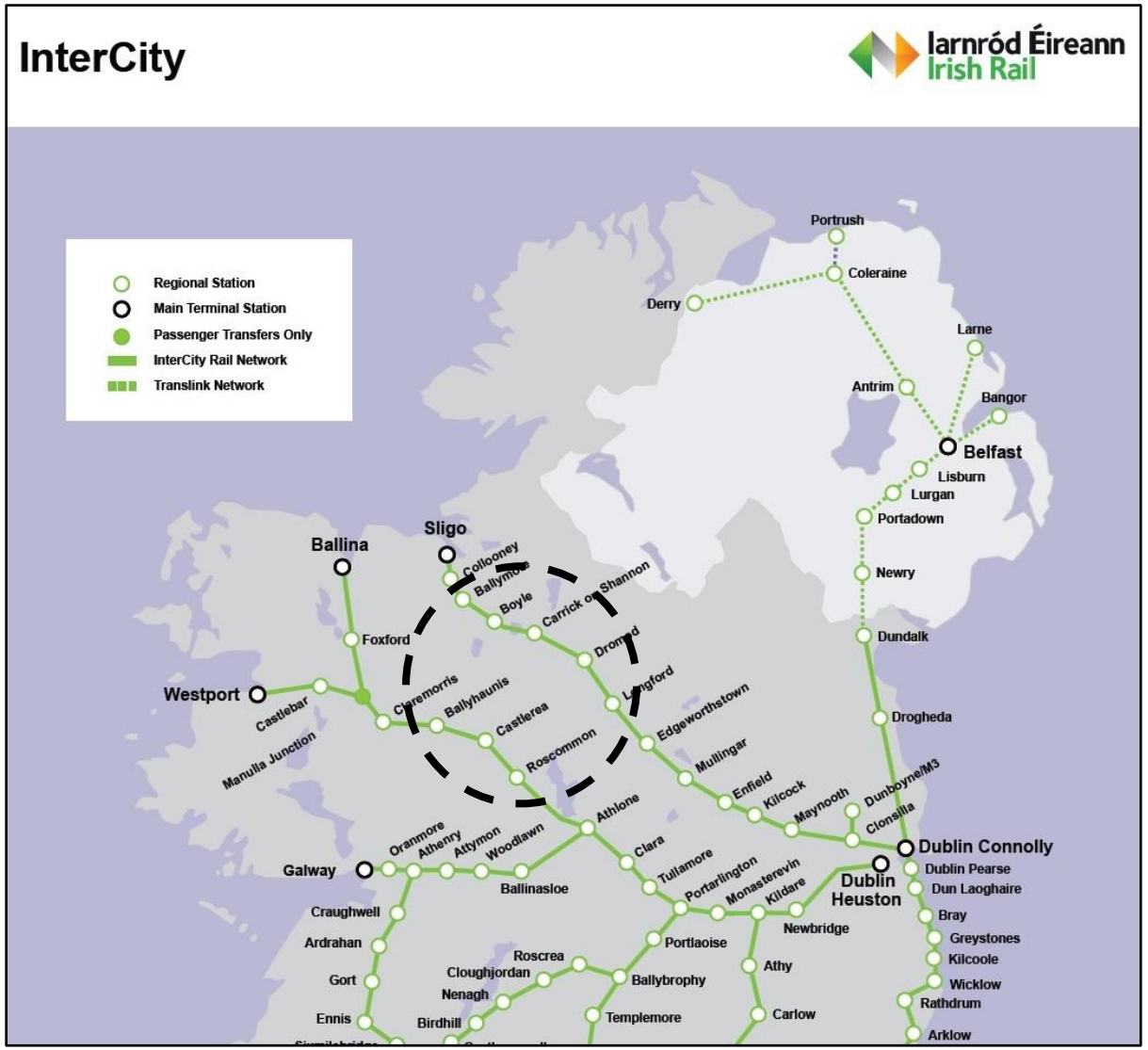


Data sources:

- Private Car Vehicle Kilometres from Odometer data from Dept. of Transport.
- Published and curated by the Central Statistics Office.
- Then *simplistic* division by population of each county.

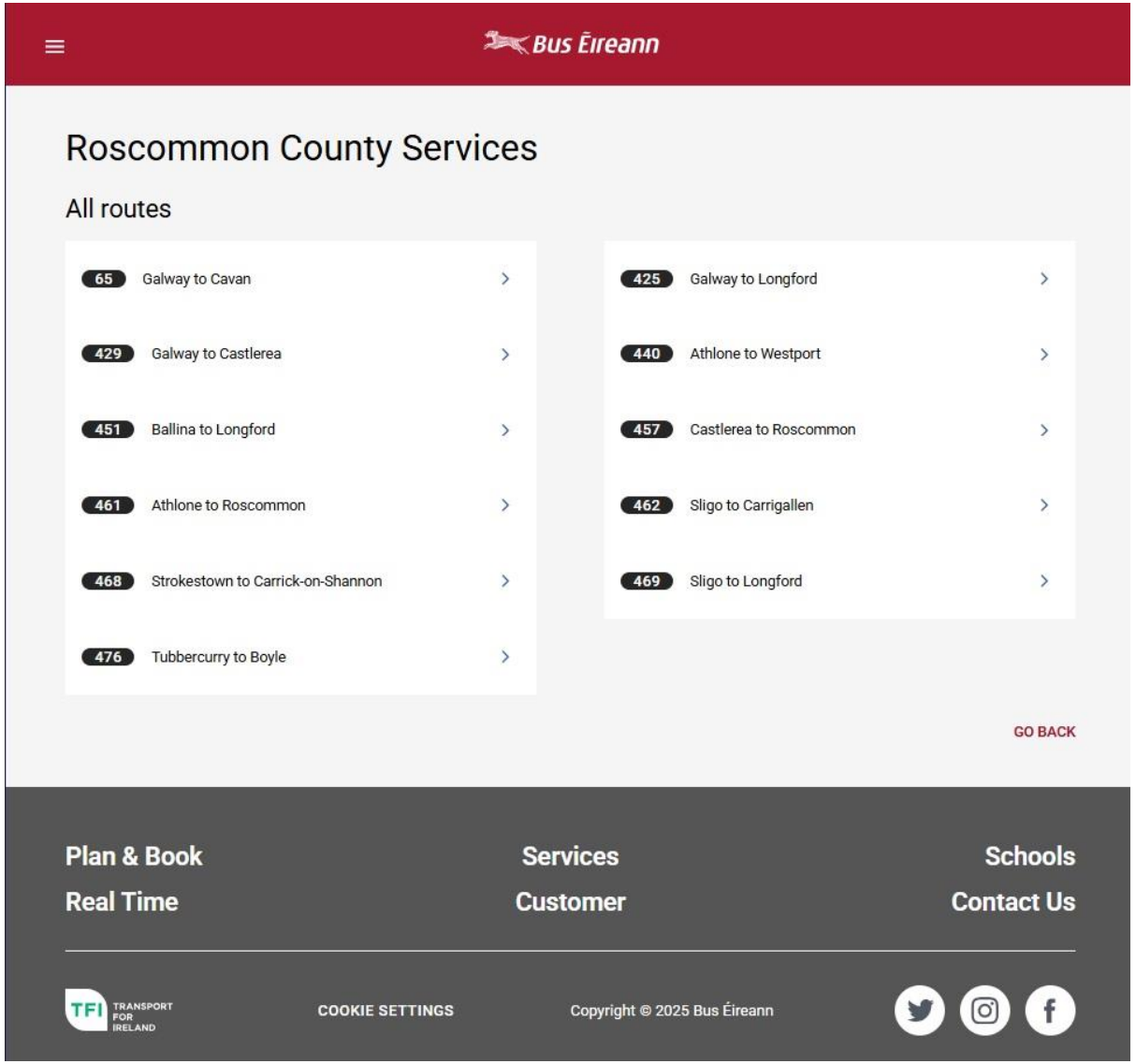
Pre-Existing (2016 - 2018) and evolving (2022) public transport around Roscommon

- Roscommon quite well served by rail:
- Two lines and ~4 – 5 stations:
- Roscommon town + Castlerea on Westport / Castlebar line
- Ballinasloe (co. Galway)
- Boyle, Carrick-on-Shannon and Dromod (co. Leitrim) on Sligo line



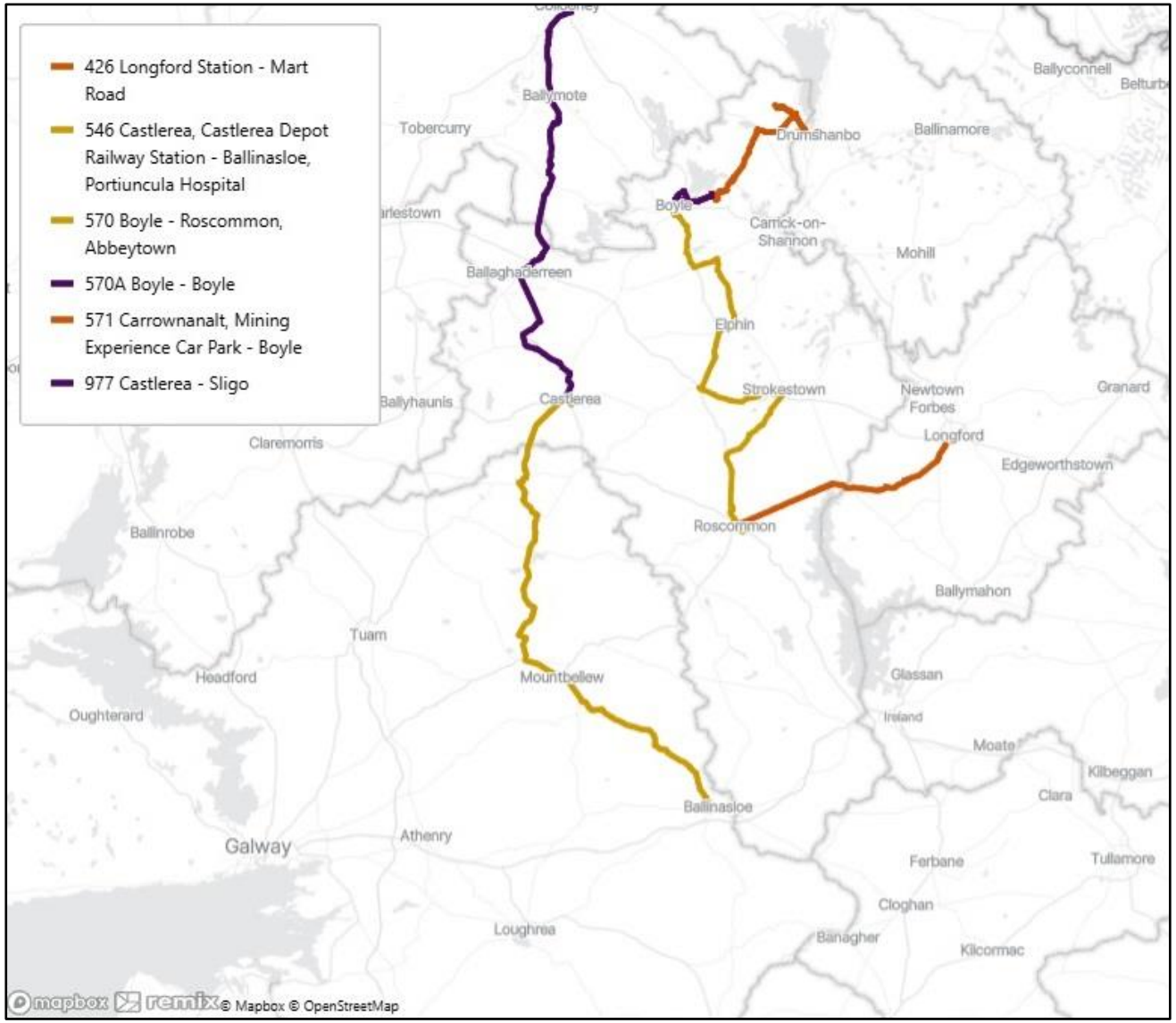
Pre-Existing (2016 - 2018) and evolving (2022) public transport around Roscommon

- Plus typical Bus Éireann PSO provincial bus services, e.g.,
- And commercial services too.



Pre-Existing (2016 - 2018) and evolving (2022) public transport around Roscommon

- Plus evolving TFI Local Link services as part of Connecting Ireland additions, e.g.,



TFI TRANSPORT FOR IRELAND

Connecting Ireland Rural Mobility Plan

What we have modelled

- Scenario AAA: West Regional Model, 2016 Base, “WRM2016”,
- including some TFI Local Link services (the PT supply network more like 2018)

- Scenario AAB: WRM, but demography for 2022 and PT Supply corresponding to 2022, including Connecting Ireland services to that date (but not to 2023 or 2024).

- Connecting Ireland entails:
  - Rail service improvements (more frequent)
  - Town Services launched or improved (Athlone, Sligo, Letterkenny, etc.)
  - TFI Local Link services
  - RRS = Regular Rural Services

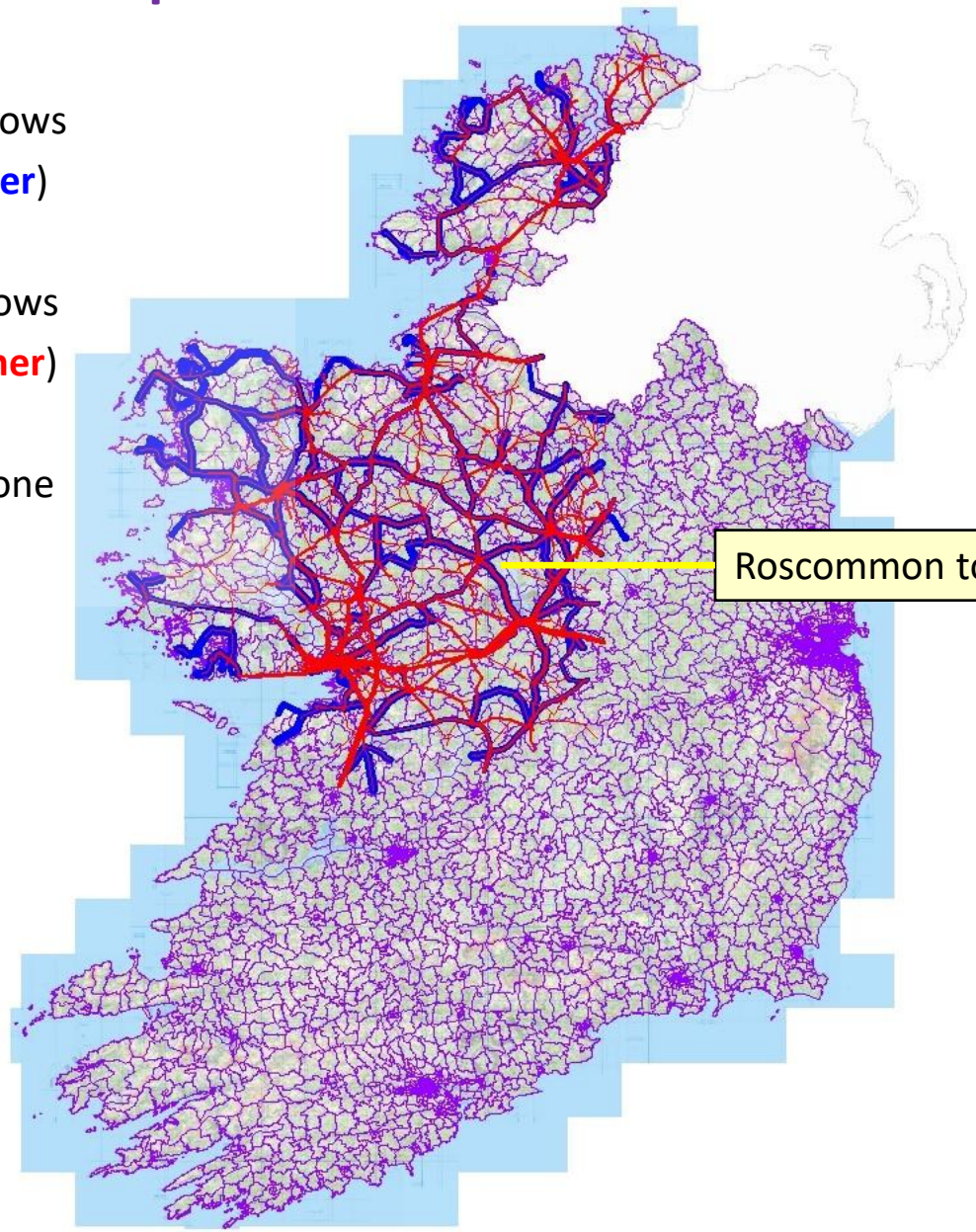
  - DRT = Demand Responsive Transport (book ahead).....NOT modelled by us here.

Sample Model Outputs WRM2016:

24-hour bus flows
(**thicker = fewer**)

24-hour car flows
(**thicker = higher**)

2016 model zone boundaries

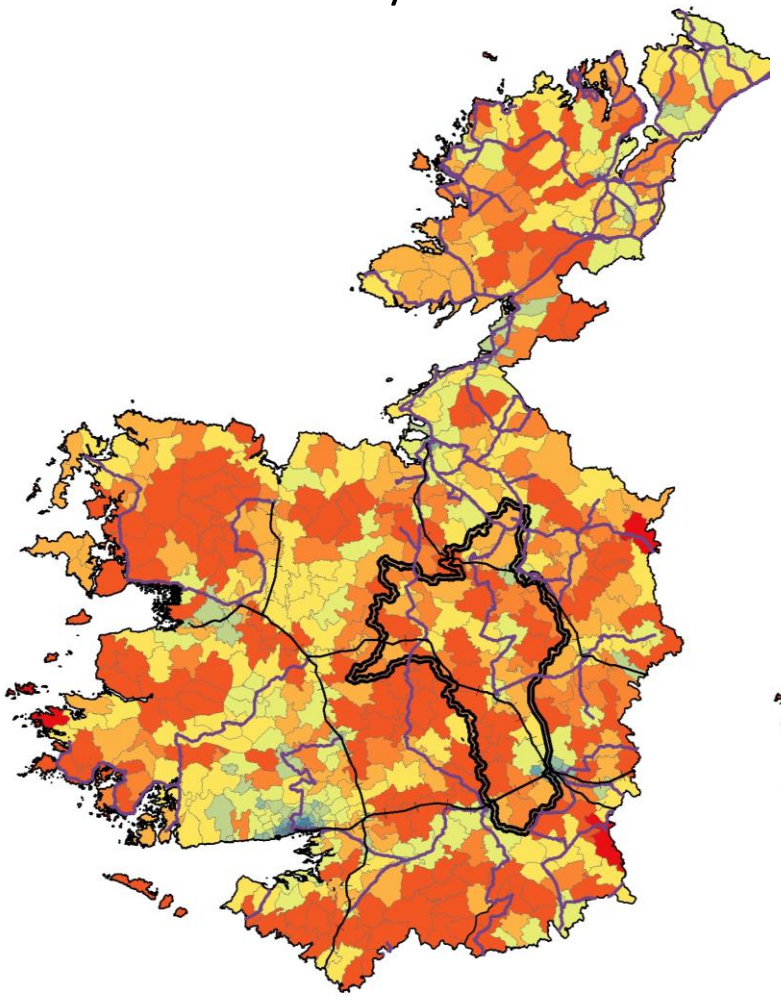


Roscommon town

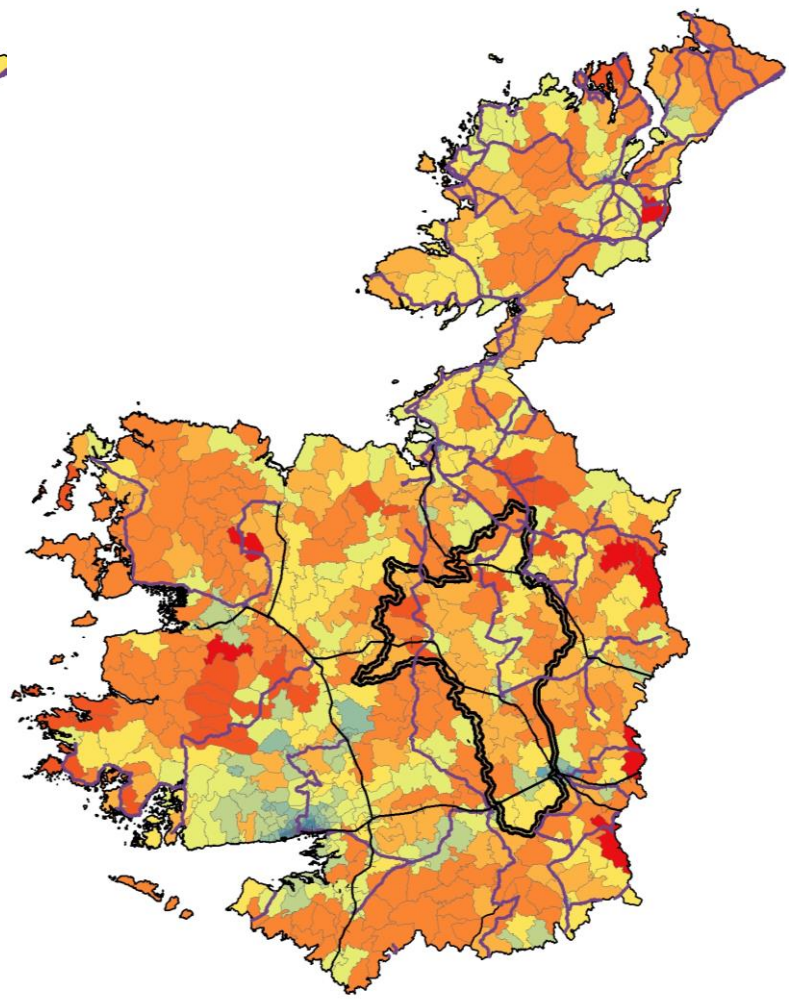
PT Accessibility CHANGES from 2016 (2018 PT network) → 2022

- estimated using the PT Logsum (not yet finalised!)

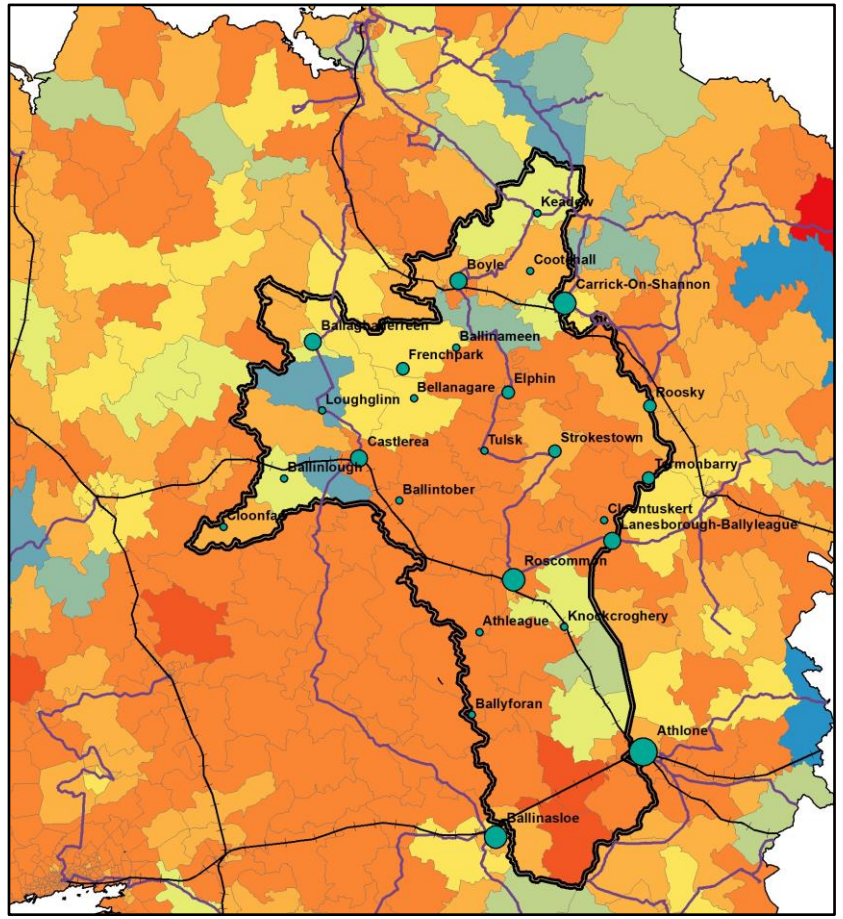
Scen A: 2016 / 2018



Scen B: 2022



Direct Subtraction: 2022 - 2016



PT Logsum

- See textbook by Kenneth Train; the logsum = "consumer surplus" by direct subtraction

The main "choice model" is called multinomial logit (MNL) choice, where "logit" is a mathematical function. There is a two step calculation. Firstly we calculate the non-dimensional (dis)utility or Generalised Time of travel from each Origin zone:

Define Vmd = – Disutility of travel (in minutes) by a given mode, m, and to destination, d. Note that the disutility is negative because, in general, longer distances or longer journey times are – in economic theory – chosen with lower probability than nearby options or opportunities.

Then, we calculate the MNL as:

Pmd = exp{ Vmd / Sum{ exp{ Vmd } }

Where Pmd denotes the probability of using mode m to travel from origin to destination d. The sum in the denominator is over all modes m and destinations d.

LogsumPT = – log{ Sum{ exp{ Vmd } }

Where the sum is over the destinations, d and the mode in the right hand side is ONLY the PT mode.

Train then goes further to explain that the change in "consumer surplus", Δ_{CS} is given by direct subtraction:

Δ_{CS} = (LogsumPT_After – LogSumPT_Before) / alpha_money_cost

Marginal Utility of income [in the PT costs]

.....analysis not yet finished!

Before & After analysis using NHTS 2017 and NHTS2022 (NTA's National Household Travel Surveys)

- County to county and within-county PT mode shares (beware of small samples)

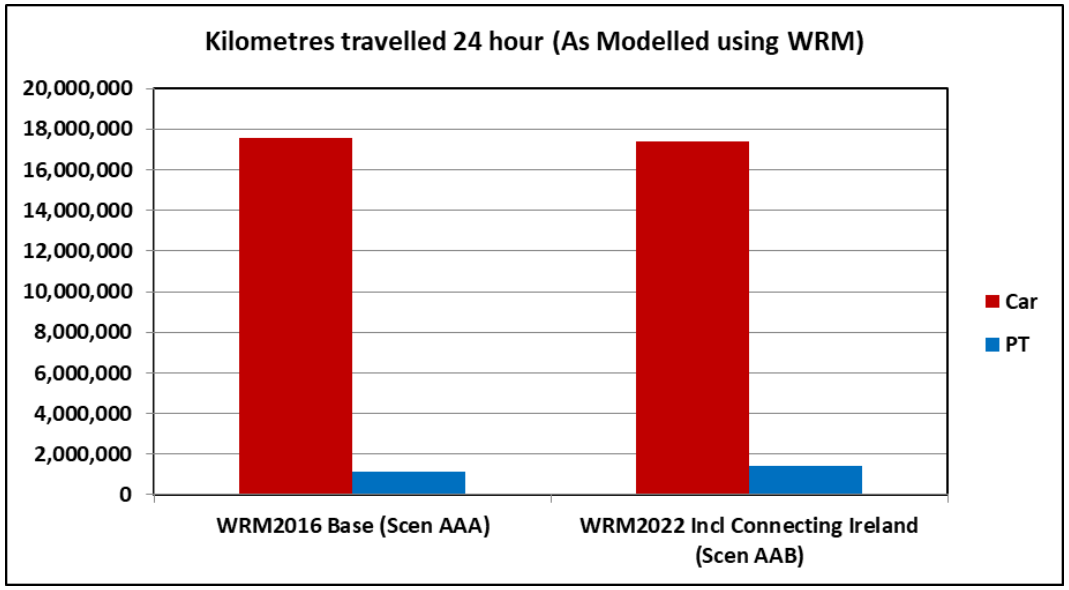
NHTS2017		Destination	Counties			
PT mode share	Longford	Westmeath	**Roscommon**	Leitrim	Mayo	Sligo
Longford	**9.1%**	13.9%	0.0%	32.0%	0.0%	0.0%
Westmeath	0.0%	**4.7%**	6.2%	0.0%	0.0%	79.2%
Roscommon	0.0%	6.2%	**2.3%**	8.1%	14.6%	6.7%
Leitrim	35.4%	0.0%	3.8%	**6.3%**	0.0%	0.0%
Mayo	0.0%	49.4%	22.8%	0.0%	**6.5%**	30.2%
Sligo	0.0%	79.2%	6.7%	0.0%	30.6%	**8.6%**

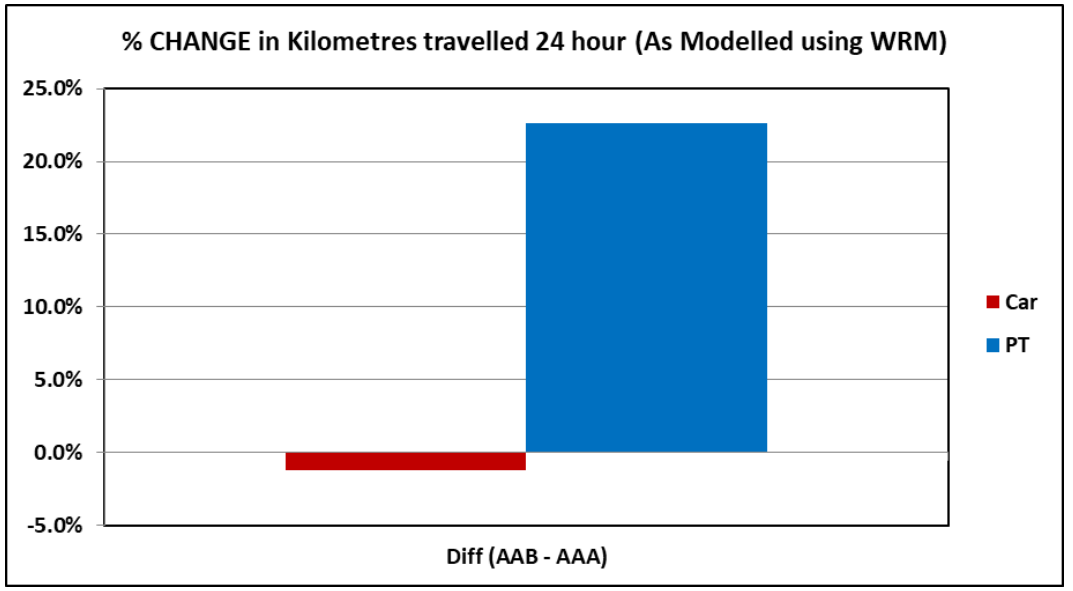
NHTS2022		Destination	Counties			
PT mode share	Longford	Westmeath	**Roscommon**	Leitrim	Mayo	Sligo
Longford	**13.4%**	10.1%	7.7%	31.7%	0.0%	24.3%
Westmeath	13.7%	**11.0%**	18.1%	0.0%	60.4%	0.0%
Roscommon	7.4%	19.5%	**16.9%**	25.6%	14.5%	19.8%
Leitrim	34.1%	0.0%	23.0%	**4.1%**	15.8%	9.0%
Mayo	0.0%	100.0%	22.6%	18.4%	**11.3%**	8.8%
Sligo	0.0%	0.0%	22.3%	12.8%	13.4%	**9.3%**

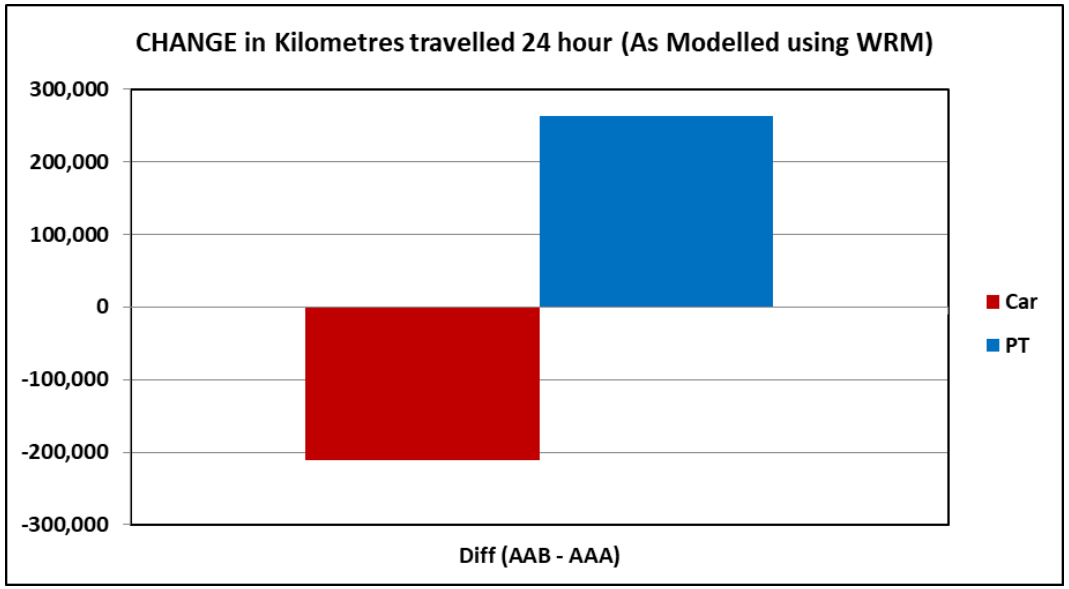
	Trips within	each county
PT mode share	**NHTS2017**	**NHTS2022**
Longford	9.1%	13.4%
Westmeath	4.7%	11.0%
Roscommon	**2.3%**	**16.9%**
Leitrim	6.3%	4.1%
Mayo	6.5%	11.3%
Sligo	8.6%	9.3%

- Subject to checking and confirmation it seems as if the PT mode share has increased and especially in Roscommon county.....?

Private Car-person-kilometres Before & After (Scen AAB – Scen AAA), all of WRM region

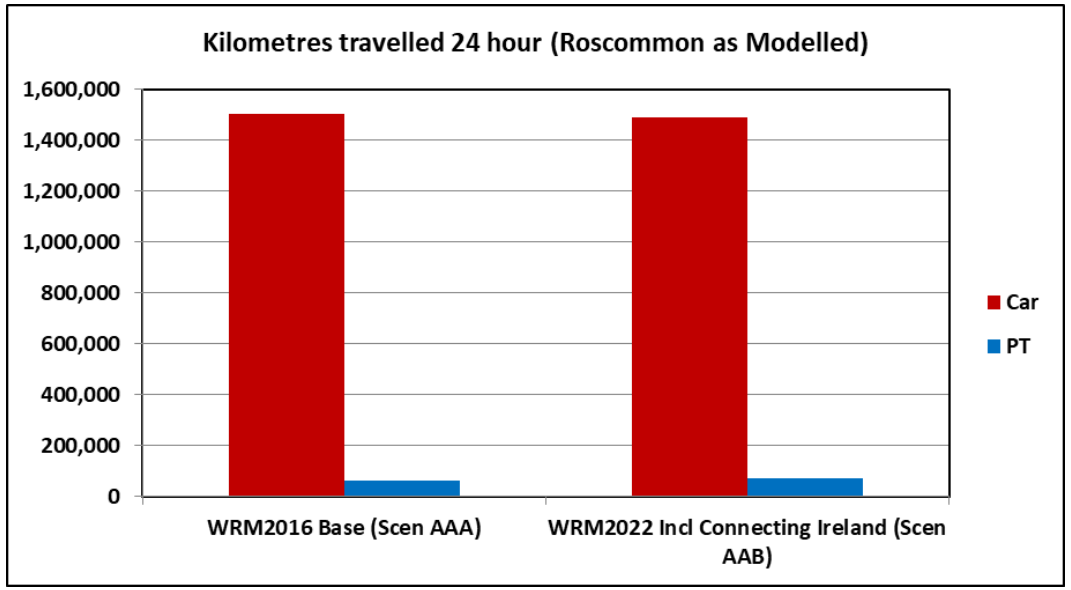


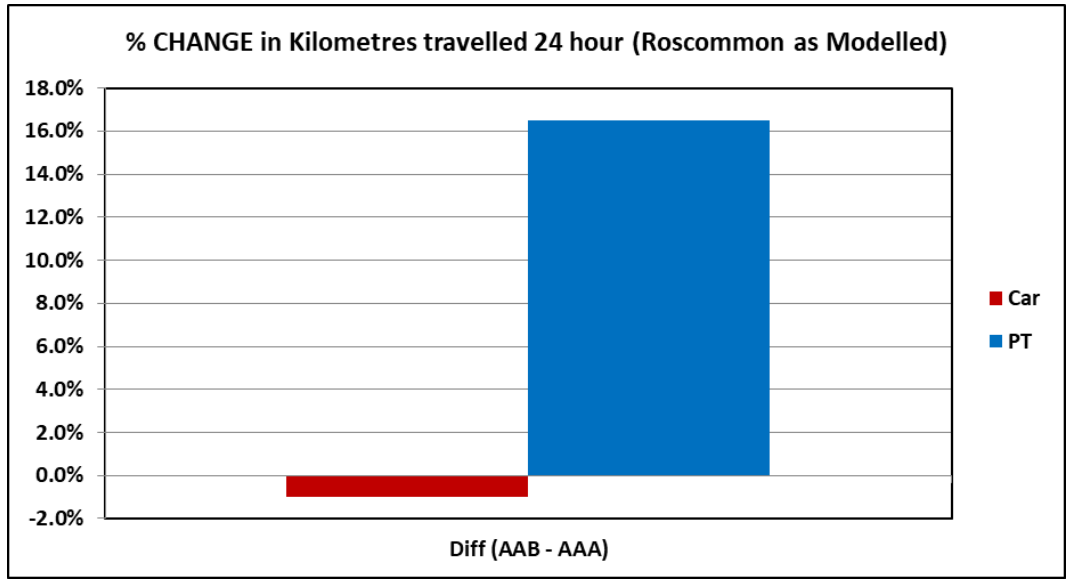


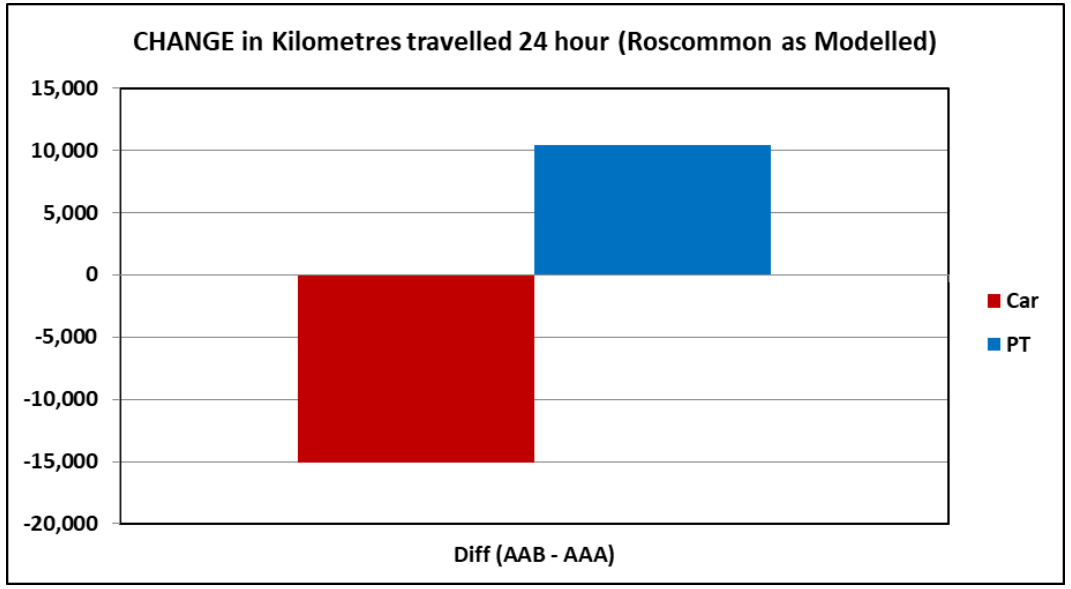


- Subject to checking and confirmation it seems as if the car person-kilometres are reducing (with growing population).

Private Car-person-kilometres Before & After (Scen AAB – Scen AAA), Roscommon County



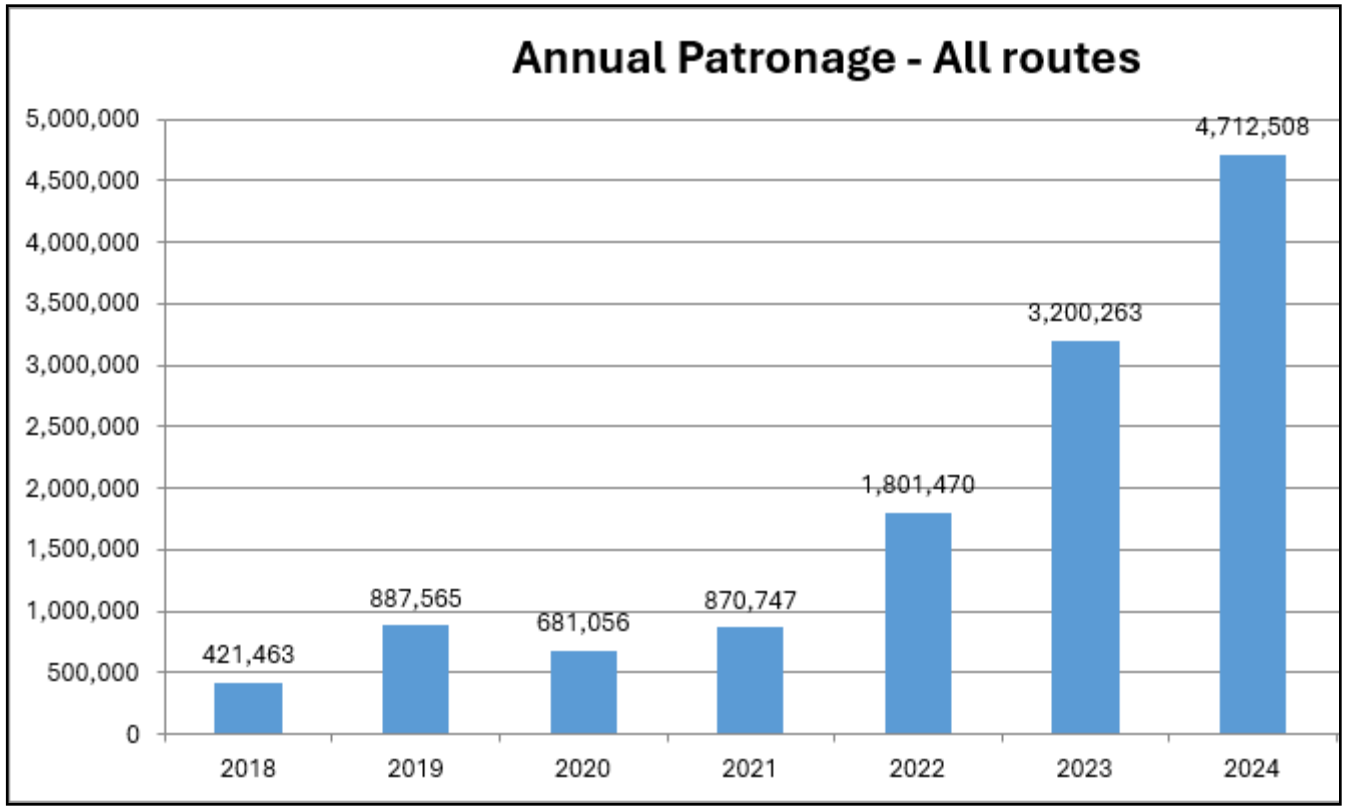




- Subject to checking and confirmation it seems as if the car person-kilometres are reducing (with growing population).

Conclusion

- Provision of better public transport network services improves accessibility!



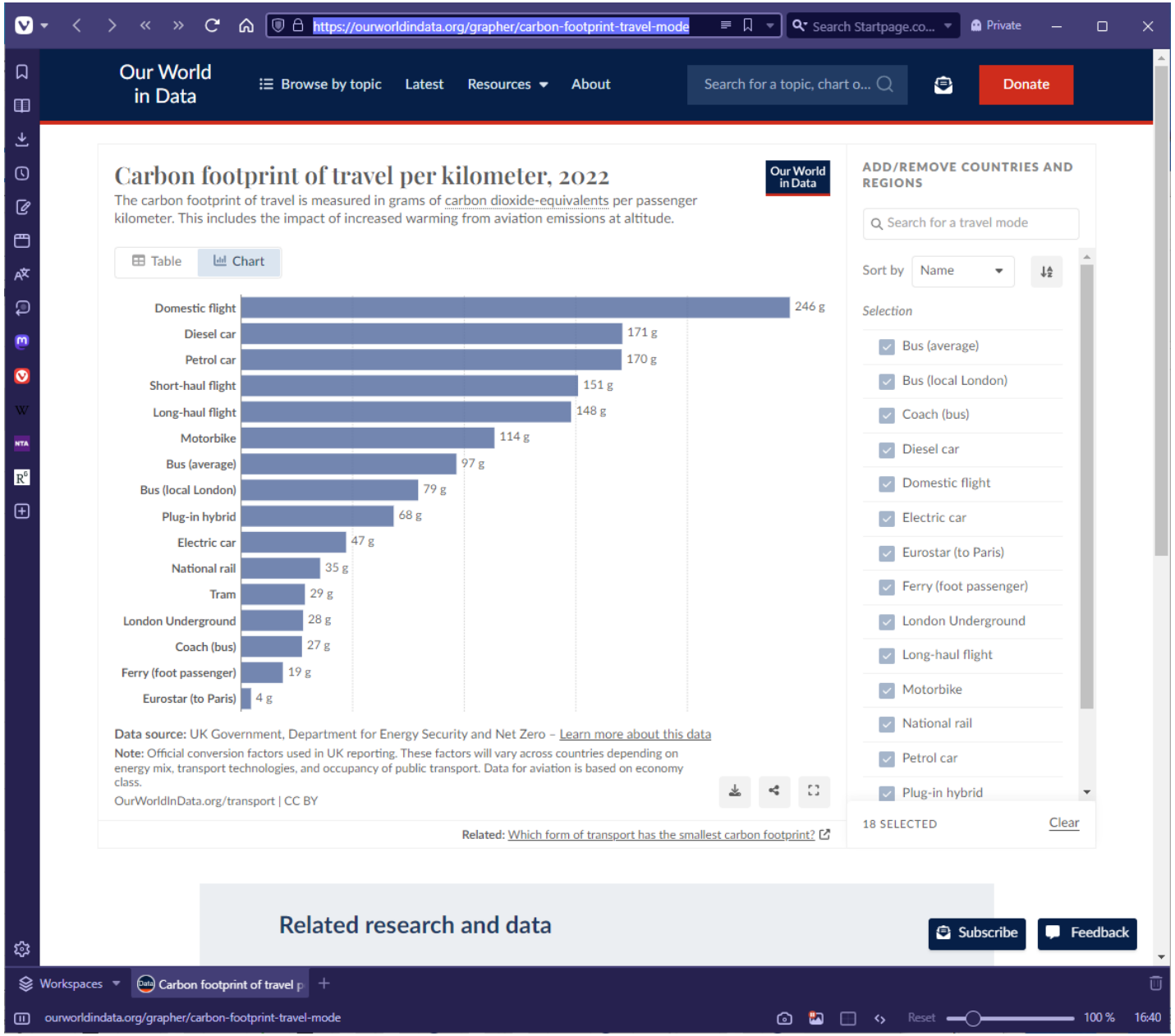
Connecting Ireland
Rural Mobility Plan

Abstract

This study examines rural transport provision in Roscommon County, Ireland from 2016 to 2024 from the perspective of accessibility and service coverage. Using a combination of empirical data and the NTA's transport models, the study sheds light on gaps in the models of public transport via the lens of the Connecting Ireland programme and associated TFI Local Link services. The analysis considers both regular rural scheduled/timetabled and demand-responsive services. We also relate to private car vehicle kilometres as reported in CSO data, deprivation data and the NTA's National Household Travel Surveys.

Roscommon county (population approximately 70,000) which is west of the river Shannon has a higher level of "forced car ownership" as reported by Carroll, Benevenuto and Caulfield in 2021. The county is predominantly rural and has higher levels of deprivation, historically lower levels of investment in public transport but has been receiving good levels of such investment in the recent years since 2022 (post Covid-19). Although it is premature to accurately gauge the success of recent investment in rural public transport we present some preliminary analysis of available data. The historical dispersed settlement patterns of farming communities makes it challenging to service their transport needs without private car ownership and use, and hence the resulting CO2 emissions. This research contributes to the need to explore rural mobility challenges and highlights the need for continued investment to address issues of transport disadvantage in rural Ireland.

Carbon footprints by mode of transport



Atmoshperic CO_2 and the Keeling Curve