National Transport Authority

Alternative Future Scenario for Travel Demand

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1 Introduction

The future is uncertain. In transport planning and in particular the development of major transport investment projects it is necessary to project demand for travel up to 30 years into the future. On-going changes in technology, social norms and public policy mean that projecting travel demand is difficult.

In general, the impact of changes in technology, social norms and or public policy can take a long time to materialise. At a regional or national level year on year change in travel demand associated with new infrastructure or a new policy can be almost imperceptible but over the medium or long term, the aggregate impact is clearer.

One way to accommodate uncertainty and reflect potential changes in demand for travel is to use scenario planning. This involves making evidence-informed projections about changes to key variables such as:

- Employment composition and location;
- Population composition and location;
- Trip rates and frequencies:
- Travel preferences; and,
- Mode choice.

Rather than considering these changes in isolation, scenario planning varies them together to assess how changes in different variables interact and to develop an alternative future scenario for travel demand.

In addition, scenario planning provides a framework to consider "shock waves" that occur from time to time. These "shock waves" can lead to an acceleration in the natural rate of change in society. The Covid-19 pandemic is an example of such shockwaves.

This note sets out the approach adopted by NTA to assess the potential legacy that the Covid-19 pandemic will have on travel demand and travel patterns into the future.

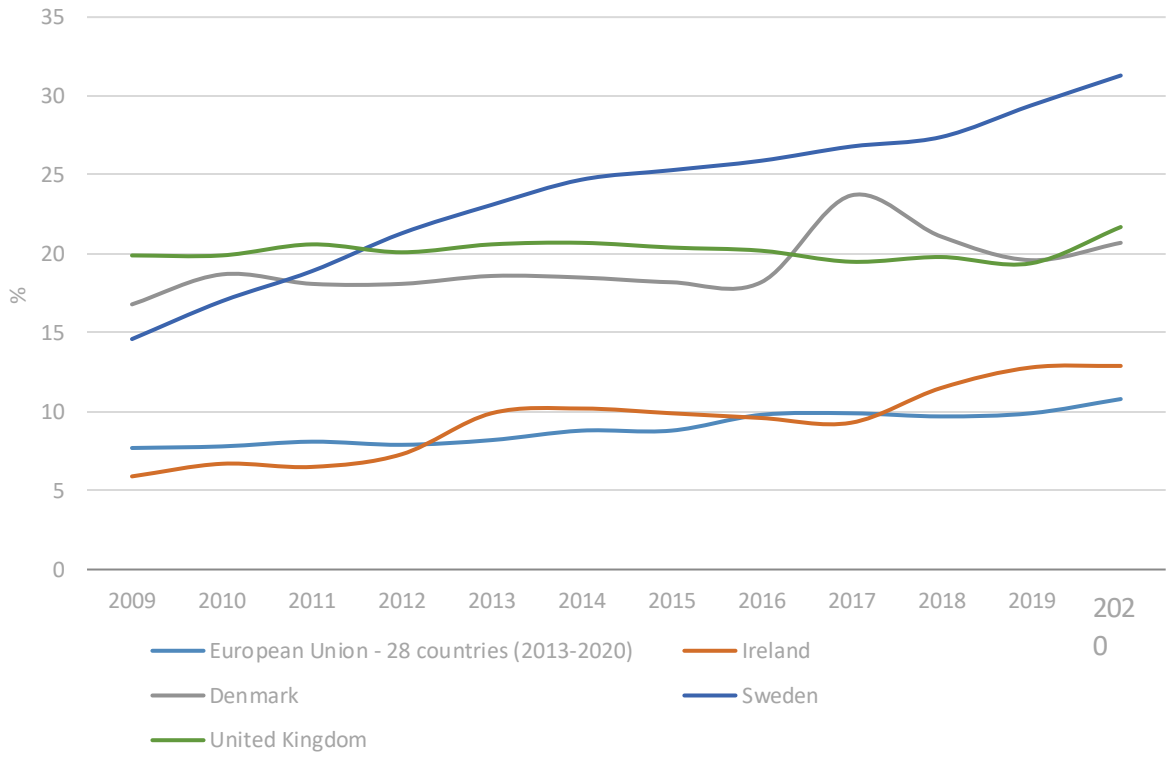
2 Current Trends on working from home

Teleworking refers to workers performing their tasks and duties from their own homes via email, phone or the internet. Teleworking can also refer to those workers performing their duties and tasks from a shared workspace or hub, located away from their organisation's main offices. The practice of teleworking has become increasingly popular in recent years with workers within certain professions as improvements in internet infrastructure and communication technologies, particularly video conferencing, have proliferated.

Alongside these improvements in technology and infrastructure, there have been positive shifts in attitudes towards teleworking and increased levels of flexibility being offered by employers in terms of work practices. These improvements are reflected in the growing numbers of Irish workers engaging in teleworking at least some of the time. In the ten years between 2009 and 2019, the

proportion of Irish employees who reported working from their home increased from 6.9% to 12.7% (Eurostat, 2020). While this increase is consistent with the broader international trends, it is worth noting that members of the Irish workforce were significantly less likely to telework than some of their European peers. Countries such as Denmark, the Netherlands, Sweden and the UK all reported higher proportions of their workforces engaging in teleworking at least some of the time as highlighted in Figure 2.1 (Eurostat, 2020).

Figure 2.1: Percentage of Workforce that Engages in Teleworking at Least Some of the Time



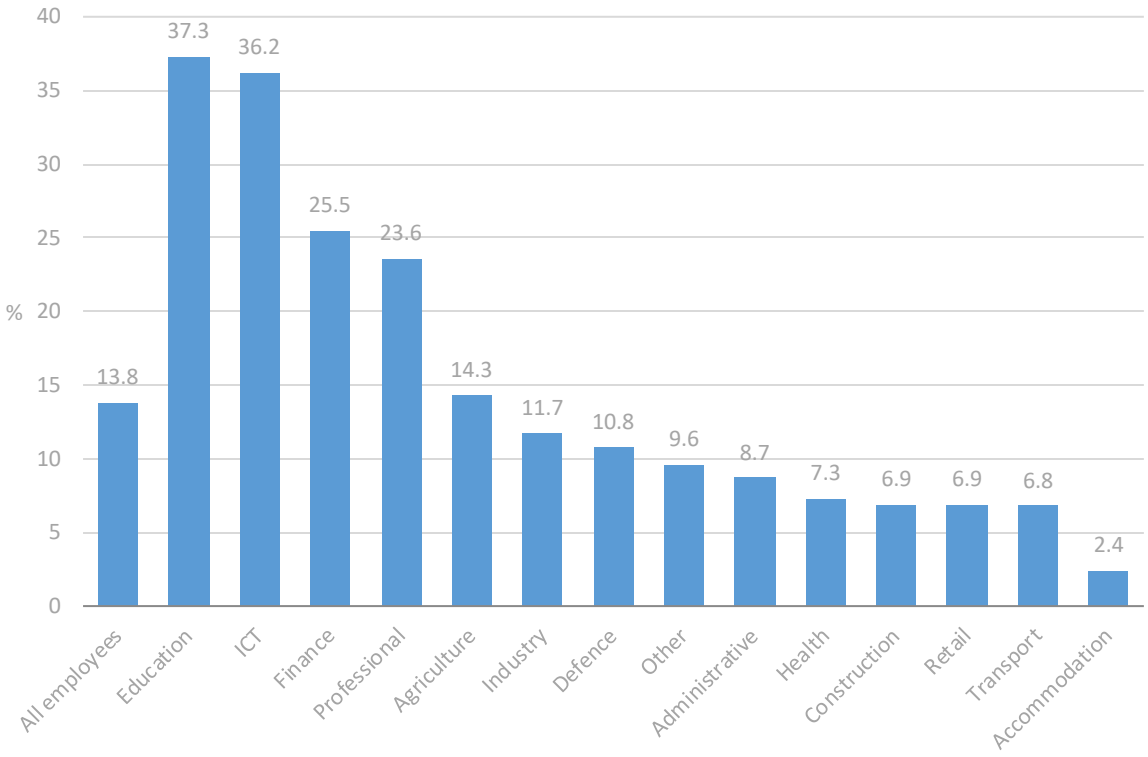
Source: Eurostat (2020)

However, the onset of the CoVID-19 pandemic and the resultant public health protocols which included restrictions on "non-essential" travel has seen a large increase in the number of workers engaging in teleworking regularly. This sudden shift in working practices has resulted in the risks and barriers to Working from Home perceived by employers and employees being addressed. As a result, it is likely that attitudes of workers could change accelerating the pre-Covid trend of increased utilisation of teleworking which in turn would have implications for both travel demand and travel patterns.

In order to understand the potential impacts of increased levels of teleworking on transport demand and travel patterns, it is important to identify the potential beneficiaries and users of teleworking. Most available data on the subject of teleworking indicates that teleworking as a mode or method of working is primarily enjoyed by those currently employed in 'non-essential' jobs, including industries such as finance, professional services, and ICT. Conversely, the opportunity to engage in and the overall use of teleworking are significantly lower among those employed in service industries such as accommodation, food and retail. Economic and Social Research Institute (ESRI) analysis published in May 2020 indicates that these trends are broadly replicable in Ireland with workers in 'non-essential' sectors having higher reported rates of teleworking compared to their counterparts in 'essential'

service sectors. It is, therefore, reasonable to expect that increased levels of teleworking will largely be among those employed in the 'non-essential' sectors while those employed in sectors such as construction and retail will still largely be restricted to physically travelling to their place of work. As such, local employment shares by sector are likely to have a significant impact on travel patterns and behaviours in a particular area.

Figure 2.2: Teleworking Rates by Occupational Sector



Source: ESRI (2020)

3 Projecting future demand for travel

The NTA currently has a suite of modelling tools, the Regional Modelling System (RMS), which is used to project future travel demand and understand user choice for trip making. The RMS allows for the impact of changes in demand to be assessed. The changes in demand can occur due to supply-side interventions, e.g. the provision of new infrastructure etc., or demand-side interventions, e.g. behavioural change programmes, policy interventions, land use policy etc. The RMS is therefore a suitable tool to assess the impact of alternative future scenarios.

The NTA has undertaken an exercise to identify a plausible alternative future scenario to be used in the Regional Modelling System (RMS). This note sets out this plausible future transportation scenario, taking into account the behavioural changes expected to apply to travel in the Greater Dublin Area based on our understanding of the how changes in travel behaviour during the Covid-19 pandemic may influence future travel demand and patterns. The scenario assumes that the economy rebounds quickly and grows back with economic trends and factors, such as unemployment remaining unchanged.

There are three modelling characteristics which have been considered as follows:

- Trip Rate;
- Trip Length/Distribution; and
- Special Zones.

With regard to trip rates, it is proposed to amend the trip rates for certain transport user classes and these are discussed in this note.

For the purposes of developing an alternative demand scenario, no change has been made to the trip distribution and length inputs. Some adjustment may be warranted; however, at this stage, there is insufficient data available to make an informed determination of alternate travel patterns.

For special zones, e.g. Dublin Airport and Port, reductions have been made to international travel assumptions.

Within the RMS, adjustments have been applied to the National Demand Forecasting Model (NDFM). The NDFM is an application that generates national trip demand at a Census Small Area (CSA) level for input into the RMS, as well as generating national travel matrices.

The NDFM consists of five interoperating components:

- Planning Data Adjustment Tool (PDAT)
- Car Ownership / Car Competition Models (COCMP)
- National Trip End Model (NTEM)
- Long Distance Model (LDM)
- Regional Model System Integration Tool (RMSIT)

The NTEM is considered to be the most suitable model for applying the proposed trip rate changes to and details of the process are contained in Appendix A – Modelling Methodology.

Each transport user class from the model is examined separately to set out clearly what trip inputs are being considered and to what extent that they are being amended. Inputs to the mode choice of a car being available are not affected.

4 Alternative Trip Rates

The adjustment to trip rates for each user class is set out in the following sections.

4.1 Commute to Work Journeys:

These trip rates are split into two sub-categories as follows:

Blue-Collar Workers – For this category of employees, there is a lower inclination or flexibility to work from home. Whilst it is recognised that shift patterns may change, it is assumed that on a typical mid-week day, there is no change to the trip rate.

White-Collar Workers – Significant changes to the ability and preference for working remotely for this category of employee has been recorded. It is expected that for regular and multi-modal longer distance commuting trips (i.e. those requiring mode changes as part of the journey both to and from work), there will be a tendency for higher levels of working from home in these cases.

When employees have shorter commutes, especially those taken by sustainable modes/micro-mobility, they are considered to have a lower propensity to work remotely. To simplify the analysis, the basis that up to 50% of workers may commute to the office 2-3 days a week, an assumption of a 25% lower trip rate due to home working has been determined.

4.2 Journeys to Education: (Includes Escorted Journeys)

Primary Level – At primary school level, it is assumed that there is no change to trip rates.

Secondary Level – With the potential to increase the number of activities online or move towards 4 or 4.5 days a week schedules, a conservative assumption of a 10% reduction has been used.

Tertiary Level – The greatest change to trip rates for education is at third level and above. With a move to increasing the number of lectures online, full-time attendance is not required. Although the social element of trips for students are important, it is assumed that a 25% lower trip rate would apply to trips from home to campus.

4.3 Shopping – Food

Local convenience shopping has increased with an increase in local trips and a reduction in longer journeys for food shopping. With an increase in the number of people working from home, a 10% increase in convenience shopping trips is advocated.

4.4 Shopping – Non-Food

There is a substantial move away from physical non-food shopping to online purchases. Taking into account the levels of resultant home deliveries, a decrease in 20% of physical shopping trips due to a sustained increased level of online shopping is assumed.

4.5 Leisure and Social

Research suggests that increased home working is linked with an increase in other trips (DoT – Background Paper 14). Employees working from home have no commuting time so therefore, they have an increased opportunity to make local leisure or social trips close to their homes. An increase of 10% in these trips is assumed.

4.6 Business Trips (White-collar)

Given an increase in working from home, less commuting and more flexibility in workplace attendance, it is suggested that there would be a 20% reduction in business trips, between workplaces, to reflect increased online collaboration.

4.7 Goods and Freight

The effect of increased demand for e-commerce would be to increase the number of deliveries and the resultant kilometres travelled by light good and heavy good vehicles. It is unclear if the demand for trips will result in more localised distribution i.e. consumers travelling short distances to collect goods or a continuation of deliveries (and collections for returns) to residences.

It is considered prudent to retain similar trip rates.

4.8 Special Zones

The demand for air travel has fallen catastrophically due to the Covid public health protocols. As part of the scenario planning process, two options were considered. The first option assumes that travel demand returns to 80% of its pre-Covid levels and then grows in line with forecasts into the future. The second option assumes that leisure travel will return to pre-Covid levels but business travel will decline as a result of the same trends seen for Working from Home. While both options were

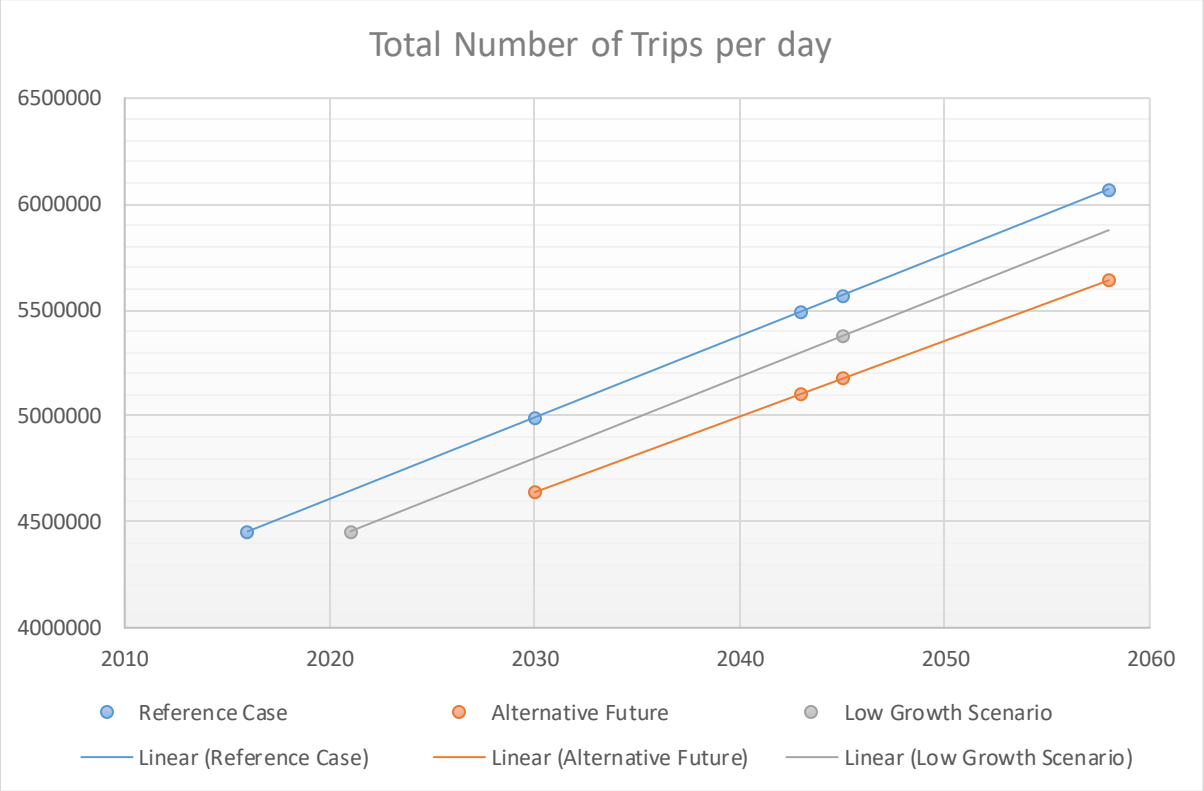
modelled, the second option was considered to be more consistent with the changes proposed to daily travel and Ireland's geographical situation.

5 Conclusion

An alternative scenario for future travel demand has been developed which considers the medium to long-term impacts associated with an accelerated transition to remote working, education and associated changes for a proportion of the population.

The trip rates assigned with the NTA National Demand Forecasting Model have been adjusted to reflect the impact of greater working from home on different cohorts of the population considering employment type and trip type.

As shown in the figure below, the results of the alternative scenario indicate that there is a significant reduction in the total number be trips on the transport network, approximately 8% lower than previous projections.



6 Next Steps

The alternative demand scenario will be modelled as part of the appraisal for major transport schemes being developed by NTA.

Appendix A – Modelling Methodology

General Assumption

The version of NDFM used for these tests is v40a. For these tests, the following assumptions within NDFM remain unaltered.

Input:

- Planning data in PDAT
- Adjustment file (forecast growth definition) in COCMP

Parameters:

- Escort Proportion, Car availability probabilities, Return proportions, Non-Home based (NHB) factors, Home-based other data, Blue-Collar/White-Collar attractions splits used in NTEM
- LDM and RMSIT (please note that structure in LDM and RMSIT remain the same, the result will change due to the changes made in NTEM)

Outputs:

- Car Competition data in COCMP

Modelling Methodology

The National Trip End Model (NTEM) is a component of the NDFM suite which provides information on the numbers of trips which are made on a typical weekday from and to each Census Small Area (CSA) in Ireland.

The NTEM application calculates trip ends in 2 stages:

- Stage 1 – Production and Attraction calculations: The purpose of this stage is to calculate total home-based productions/attractions by trip purpose.
- Stage 2 – Tours and Non-Home Based (NHB) trips modelling: The purpose of this stage is to split tours into simple tours/complex tours and then calculate NHB trips associated with those.

Revisions have been made to trip rates for trip productions in Stage 1 for each relevant trip category. Total trip attractions are balanced to the revised total trip productions.

Stage 2 retains the same structure with only values of productions/attractions changing (by step 1).

Commute to Work Journeys:

Reduce Home Based Work (HBW) White-Collar Trip rate by 25%

In the current NDFM structure, the trip rate is not separately defined for blue-collar (BC) and white-collar (WC) workers as the regression analysis revealed that there is no significant difference in the level of trip making between these two demand segments.

To model the changes to the trip productions of blue-collar and white-collar workers, trip rates were separated for these two categories. The values for blue-collar and white-collar are the same initially and then a reduction of 25% is applied on white-collar trip rate using the following equation:

HBW $= \sum_{i=1}^{n} \text{Population} * \%\text{Genderi} * \%\text{Employmenti} * \%\text{AgeGroupi} * \text{Trip Ratei}$

$= \text{Population} * \%\text{Gender}_i * \%\text{Employment}_i * \%\text{AgeGroup}_i * \%\text{SEG}_i * \text{Trip Rate}_i$

where: i is trip rate category

$\%\text{Gender}_i$ is the percentage of male or female dependent on category i

$\%\text{Employment}_i$ is the percentage of Full time or Part time dependent on category i

$\%\text{AgeGroup}_i$ is the percentage of each age category (15-19/20-24/45-49/60-64) dependenton category i

$\%\text{SEG}_i$ is the percentage of blue-collar or white-collar dependent on category i

The following table shows the revised HBW trip rates. Column "SEG" is a variable introduced for differentiating blue-collar and white-collar trip rate changes. It can be seen that white-collar trip rates are reduced by 25% compared to blue-collar trip rate within the same social-demographic category.

Gender	Employment	Age Group	SEG	Trip Rate (Urban)	Trip Rate (Rural)
Male	Full-time	15-19	Blue-Collar	0.736	0.736
Female	Full-time	15-19	Blue-Collar	0.482	0.482
Male	Part-time	15-19	Blue-Collar	0.665	0.665
Female	Part-time	15-19	Blue-Collar	0.435	0.435
Male	Full-time	20-44	Blue-Collar	0.708	0.708
Female	Full-time	20-44	Blue-Collar	0.463	0.463
Male	Part-time	20-44	Blue-Collar	0.560	0.560
Female	Part-time	20-44	Blue-Collar	0.367	0.367
Male	Full-time	45-59	Blue-Collar	0.831	0.831
Female	Full-time	45-59	Blue-Collar	0.544	0.544
Male	Part-time	45-59	Blue-Collar	0.750	0.750
Female	Part-time	45-59	Blue-Collar	0.491	0.491
Male	Full-time	60-64	Blue-Collar	0.799	0.799
Female	Full-time	60-64	Blue-Collar	0.523	0.523
Male	Full-time	15-19	White- Collar	0.552	0.552

Female	Full-time	15-19	White-Collar	0.361	0.361
Male	Part-time	15-19	White-Collar	0.498	0.498
Female	Part-time	15-19	White-Collar	0.326	0.326
Male	Full-time	20-44	White-Collar	0.531	0.531
Female	Full-time	20-44	White-Collar	0.347	0.347
Male	Part-time	20-44	White-Collar	0.420	0.420
Female	Part-time	20-44	White-Collar	0.275	0.275
Male	Full-time	45-59	White-Collar	0.623	0.623
Female	Full-time	45-59	White-Collar	0.408	0.408
Male	Part-time	45-59	White-Collar	0.563	0.563
Female	Part-time	45-59	White-Collar	0.368	0.368
Male	Full-time	60-64	White-Collar	0.599	0.599
Female	Full-time	60-64	White-Collar	0.392	0.392

Journeys to Education (Includes Escorted Journeys)

Reduce Home Based (HBEd) Secondary Level Education Trip rate by 10%; Reduce (HBEd) Tertiary/Older Level Education Trip rate by 25%

Trip rates for HBEd productions are categorised by school level (Primary/Secondary/Tertiary/Older), and each has been revised accordingly. Productions of HBEsc trips are calculated by applying Escort proportions by Education level to HBEd productions and therefore the relevant change will apply to HBEsc productions as well.

HBEd = $\sum_{i=1}^{n} \text{Population in School Level}_i * \%\text{Car Ownership}_i * \text{Trip Rate}_i$

where i is trip rate category

% Population in School Level$_i$ is population dependent on category i

% Car Ownership$_i$ is the percentage of car ownership dependent on category i

The following table shows the revised HBEd trip rates.

School Level	Car Ownership	Trip Rate (Urban)	Trip Rate (Rural)
Primary	Some	0.741	0.684
Secondary	Some	0.953	0.879
Tertiary	Some	0.547	0.504
Older	Some	0.434	0.401
Primary	None	0.741	0.684
Secondary	None	0.953	0.879
Tertiary	None	0.547	0.504
Older	None	0.434	0.401

Shopping – Food:

Increase Home Based Food Shopping HBFS Trip rate by 10%

Trip rates for HBFS Productions were globally increased by 10% to model the increase in local convenience shopping trips.

$$HBFS = \sum_{i=1}^{n} Population * \%Genderi * \%AgeGroupi * \%EmpStatusi * Trip\ Ratei$$

where i is trip rate category

$\%Gender_i$ is the percentage of male or female dependent on category i

$\%AgeGroup_i$ is the percentage of each age category dependent on category i

$\%EmpStatus_i$ is the percentage of each employment status category (FT/PT/Retired/Student/Unemployed/Home_Other) dependent on category i

The following table shows the revised HBFS trip rates.

Gender	Age Group	Emp. Status	Trip Rate
Male	15_19	FT_Emp	0.108
Female	15_19	FT_Emp	0.129
Male	15_19	Retired	0.331
Female	15_19	Retired	0.397
Male	15_19	PT_Emp	0.180
Female	15_19	PT_Emp	0.215
Male	15_19	Home_Other	0.288
Female	15_19	Home_Other	0.345
Male	15_19	Student	0.094
Female	15_19	Student	0.113
Male	15_19	Unemployed	0.361
Female	15_19	Unemployed	0.433
Male	20_44	FT_Emp	0.087
Female	20_44	FT_Emp	0.104
Male	20_44	Retired	0.267
Female	20_44	Retired	0.320
Male	20_44	PT_Emp	0.145
Female	20_44	PT_Emp	0.174
Male	20_44	Home_Other	0.232
Female	20_44	Home_Other	0.278
Male	20_44	Student	0.076
Female	20_44	Student	0.091
Male	20_44	Unemployed	0.291
Female	20_44	Unemployed	0.349

Gender	Age Group	Emp. Status	Trip Rate
Male	45_59	FT_Emp	0.048
Female	45_59	FT_Emp	0.057
Male	45_59	Retired	0.147
Female	45_59	Retired	0.176
Male	45_59	PT_Emp	0.080
Female	45_59	PT_Emp	0.095
Male	45_59	Home_Other	0.127
Female	45_59	Home_Other	0.153
Male	45_59	Student	0.042
Female	45_59	Student	0.050
Male	45_59	Unemployed	0.160
Female	45_59	Unemployed	0.192
Male	60_64	FT_Emp	0.073
Female	60_64	FT_Emp	0.088
Male	60_64	PT_Emp	0.122
Female	60_64	PT_Emp	0.147
Male	60_64	Home_Other	0.196
Female	60_64	Home_Other	0.235
Male	60_64	Student	0.064
Female	60_64	Student	0.077
Male	60_64	Unemployed	0.246
Female	60_64	Unemployed	0.295
Male	65_plus	Retired	0.025
Female	65_plus	Retired	0.030

Shopping – Non-Food/Leisure and Social:

Calculate Non-Food Shopping Trip Proportion in Home Based Other (HBO) Trip and reduce that portion of HBO Trip rate by 20%

Calculate Leisure Trip Proportion in Home Based Other (HBO) Trip and increase that portion of HBO Trip rate by 10%; Increase Home Based Visit (HBV) Trip Rate by 10%

Both Leisure and Non-food shopping trips are within the category of HBO trips in NDFM. The following table shows the HBO data used for regression analysis. Non-food Shopping accounts for 17.1% of the total HBO trips and Leisure Trips accounts for 48.9% of total HBO trips.

The new HBO trip rate is calculated based on the following formula:

New HBO Trip rate

= %Non-Food Shopping * old HBO trip rate + % Leisure * old HBO trip rate + % (1- Non-Food Shopping - Leisure) * old HBO trip rate

= %Non-Food Shopping* (1-20%) * old HBO trip rate + % Leisure* (1+10%) * old HBO trip rate + % (1- Non-Food Shopping - Leisure) * old HBO trip rate

The combined effect of the change in Non-Food Shopping and Leisure Trips is that HBO trip rates were increased by 1.5%. Trip rates for HBV Productions were globally increased by 10% to model the increase of social visit trips.

Other Trips - Category	Count	%	Category
Shopping - non food	1185	17.1%	Shopping Non-food
Accompanying or giving lift a to another person (not school or work)	623	9.0%	
Use services or personal business (bank, hairdresser, library etc.)	667	9.6%	
Health or medical visit	509	7.3%	
Social (Entertainment or recreation or participate in sport pub or restaurant)	2581	37.2%	Leisure
Worship or religious observance	414	6.0%	
Round trip - walk cycle drive for enjoyment	811	11.7%	Leisure
Unpaid or voluntary work	92	1.3%	
Tourism or sightseeing	31	0.4%	
Staying at hotel (other temporary accommodation)	29	0.4%	

The following tables show the revised HBV trip rates.

Gender	Emp. Status	Car Comp	Trip Rate (Urban)	Trip Rate (Rural)
Male	Full-time Emp.	Fewer cars	0.031	0.031
Male	Full-time Emp.	Parity	0.031	0.031
Male	Full-time Emp.	No cars	0.031	0.031
Female	Full-time Emp.	Fewer cars	0.039	0.039

Gender	Emp. Status	Car Comp	Trip Rate (Urban)	Trip Rate (Rural)
Female	Full-time Emp.	Parity	0.039	0.039
Female	Full-time Emp.	No cars	0.039	0.039
Male	Retired	Fewer cars	0.077	0.077
Male	Retired	Parity	0.077	0.077
Male	Retired	No cars	0.077	0.077
Female	Retired	Fewer cars	0.095	0.095
Female	Retired	Parity	0.095	0.095
Female	Retired	No cars	0.095	0.095
Male	Part-time Emp.	Fewer cars	0.041	0.041
Male	Part-time Emp.	Parity	0.041	0.041
Male	Part-time Emp.	No cars	0.041	0.041
Female	Part-time Emp.	Fewer cars	0.051	0.051
Female	Part-time Emp.	Parity	0.051	0.051
Female	Part-time Emp.	No cars	0.051	0.051
Male	Home D. & Other	Fewer cars	0.117	0.117
Male	Home D. & Other	Parity	0.117	0.117
Male	Home D. & Other	No cars	0.117	0.117
Female	Home D. & Other	Fewer cars	0.145	0.145
Female	Home D. & Other	Parity	0.145	0.145
Female	Home D. & Other	No cars	0.145	0.145
Male	Student	Fewer cars	0.058	0.058
Male	Student	Parity	0.058	0.058
Male	Student	No cars	0.058	0.058
Female	Student	Fewer cars	0.072	0.072
Female	Student	Parity	0.072	0.072
Female	Student	No cars	0.072	0.072
Male	Unemployed	Fewer cars	0.125	0.125
Male	Unemployed	Parity	0.125	0.125
Male	Unemployed	No cars	0.125	0.125
Female	Unemployed	Fewer cars	0.155	0.155
Female	Unemployed	Parity	0.155	0.155
Female	Unemployed	No cars	0.155	0.155

The following table shows the revised HBO trip rates.

Gender	Emp. Status	Car Comp	Trip Rate (Urban)	Trip Rate (Rural)
Male	Full-time Emp.	No cars	0.028	0.034
Female	Full-time Emp.	No cars	0.035	0.042
Male	Full-time Emp.	Fewer cars	0.031	0.038
Female	Full-time Emp.	Fewer cars	0.039	0.048
Male	Full-time Emp.	Parity	0.044	0.053
Female	Full-time Emp.	Parity	0.055	0.067
Male	Home D. & Other	No cars	0.073	0.089
Female	Home D. & Other	No cars	0.092	0.112
Male	Home D. & Other	Fewer cars	0.083	0.102
Female	Home D. & Other	Fewer cars	0.104	0.127
Male	Home D. & Other	Parity	0.116	0.142
Female	Home D. & Other	Parity	0.146	0.177
Male	Part-time Emp.	No cars	0.037	0.045
Female	Part-time Emp.	No cars	0.046	0.056
Male	Part-time Emp.	Fewer cars	0.042	0.051
Female	Part-time Emp.	Fewer cars	0.053	0.064
Male	Part-time Emp.	Parity	0.059	0.071
Female	Part-time Emp.	Parity	0.073	0.089
Male	Retired	No cars	0.095	0.115
Female	Retired	No cars	0.119	0.145
Male	Retired	Fewer cars	0.108	0.132
Female	Retired	Fewer cars	0.135	0.165
Male	Retired	Parity	0.151	0.183
Female	Retired	Parity	0.189	0.230
Male	Student	No cars	0.053	0.065
Female	Student	No cars	0.067	0.081
Male	Student	Fewer cars	0.061	0.074
Female	Student	Fewer cars	0.076	0.093
Male	Student	Parity	0.085	0.103
Female	Student	Parity	0.106	0.129
Male	Unemployed	No cars	0.110	0.134
Female	Unemployed	No cars	0.138	0.168
Male	Unemployed	Fewer cars	0.126	0.153
Female	Unemployed	Fewer cars	0.157	0.192
Male	Unemployed	Parity	0.175	0.213
Female	Unemployed	Parity	0.220	0.267

Business Trips (White-collar):

Reduce HBEB White-Collar Trip rate by 20%

Trip rates are defined separately for blue and white-collar for HBEB productions.

$$\text{HBEB} = \sum_{i=1}^{n} \text{Population} * \%\text{Genderi} * \%\text{AgeGroupi} * \%\text{SEGi} * \%\text{Car Compi} * \text{Trip Ratei}$$

where:

i is trip rate category

$\%\text{Gender}_i$ is the percentage of male or female dependent on category i

$\%\text{AgeGroup}_i$ is the percentage of each age category dependent on category i

$\%\text{SEG}_i$ is the percentage of blue-collar or white-collar dependent on category i

$\%\text{Car Comp}_i$ is the percentage of car competition category dependent on category i

The following tables show the revised HBEB trip rates.

Gender	Age Group	SEG	Car Comp	Trip Rate (Urban)	Trip Rate (Rural)
Female	45_59	Blue-Collar	Parity	0.00713	0.00970
Female	60_64	Blue-Collar	Parity	0.02041	0.02777
Female	20_44	Blue-Collar	Parity	0.04112	0.05594
Female	15_19	Blue-Collar	Parity	0.03822	0.05200
Female	45_59	Blue-Collar	Fewer cars	0.02548	0.03467
Female	60_64	Blue-Collar	Fewer cars	0.07293	0.09922
Female	20_44	Blue-Collar	Fewer cars	0.14693	0.19991
Female	15_19	Blue-Collar	Fewer cars	0.13659	0.18584
Female	45_59	Blue-Collar	No cars	0.00396	0.00539
Female	60_64	Blue-Collar	No cars	0.01134	0.01543
Female	20_44	Blue-Collar	No cars	0.02285	0.03109
Female	15_19	Blue-Collar	No cars	0.02124	0.02890
Male	45_59	Blue-Collar	Parity	0.01552	0.02112
Male	60_64	Blue-Collar	Parity	0.04443	0.06045
Male	20_44	Blue-Collar	Parity	0.08952	0.12179
Male	15_19	Blue-Collar	Parity	0.08321	0.11322
Male	45_59	Blue-Collar	Fewer cars	0.05548	0.07548
Male	60_64	Blue-Collar	Fewer cars	0.15877	0.21601
Male	20_44	Blue-Collar	Fewer cars	0.31988	0.43522
Male	15_19	Blue-Collar	Fewer cars	0.29736	0.40458
Male	45_59	Blue-Collar	No cars	0.00863	0.01174
Male	60_64	Blue-Collar	No cars	0.02469	0.03359
Male	20_44	Blue-Collar	No cars	0.04974	0.06768

Gender	Age Group	SEG	Car Comp	Trip Rate (Urban)	Trip Rate (Rural)
Male	15_19	Blue-Collar	No cars	0.04624	0.06291
Female	45_59	White-Collar	Parity	0.00570	0.00776
Female	60_64	White-Collar	Parity	0.01633	0.02221
Female	20_44	White-Collar	Parity	0.03289	0.04475
Female	15_19	White-Collar	Parity	0.03058	0.04160
Female	45_59	White-Collar	Fewer cars	0.02039	0.02774
Female	60_64	White-Collar	Fewer cars	0.05834	0.07938
Female	20_44	White-Collar	Fewer cars	0.11755	0.15993
Female	15_19	White-Collar	Fewer cars	0.10927	0.14867
Female	45_59	White-Collar	No cars	0.00317	0.00431
Female	60_64	White-Collar	No cars	0.00907	0.01234
Female	20_44	White-Collar	No cars	0.01828	0.02487
Female	15_19	White-Collar	No cars	0.01699	0.02312
Male	45_59	White-Collar	Parity	0.01242	0.01690
Male	60_64	White-Collar	Parity	0.03554	0.04836
Male	20_44	White-Collar	Parity	0.07161	0.09743
Male	15_19	White-Collar	Parity	0.06657	0.09057
Male	45_59	White-Collar	Fewer cars	0.04438	0.06039
Male	60_64	White-Collar	Fewer cars	0.12701	0.17281
Male	20_44	White-Collar	Fewer cars	0.25591	0.34818
Male	15_19	White-Collar	Fewer cars	0.23789	0.32366
Male	45_59	White-Collar	No cars	0.00690	0.00939
Male	60_64	White-Collar	No cars	0.01975	0.02687
Male	20_44	White-Collar	No cars	0.03980	0.05414
Male	15_19	White-Collar	No cars	0.03699	0.05033

Air Travel

Request Reduce airport travel demand

Airports and ports are modelled in the Special Zones model in LDM. The purpose of this model is to establish the total passenger demand for each Special Zone and then to estimate the trip distribution of passenger demand.

Two scenarios were considered for alternative scenario testing:

- Scenario 1: Reduce airport total demand by 20%
- Scenario 2: Reduce airport business travel demand by 25%

In Scenario 1, the new airport total demand is calculated as follows:

New total demand = (1- 20%) * old total demand

The current version of RMS is not capable of demand segmentation at special zones. To model the impact on business travel in Scenario 2, it is suggested to calculate the new airport total demand based on the following formula:

New total demand = ((1-%Business) + %Business * (1-25%)) * old total demand

Where %Business is the percentage of business travel demand in total airport demand

NTA Passenger Transport Surveys at Dublin, Cork and Shannon Airports 2016 report shows that 20% of the trips for Irish Residents are business travel (see table below for a breakdown of trip purpose).

Trip Purpose	Percentage
Business	20%
Holiday	51%
Other	2%
To Emigrate	1%
Visit Relatives	26%

Therefore, the new total airport demand is calculated as (the reduction rate has been applied to total airport demand):

New total demand = (1-%Business + %Business * 75%) * old total demand

= 95% * old total demand

It is assumed that business travel would be most impacted in the long term setting and therefore Scenario 2 (reduce business travel) was brought forward for testing.