Enhanced Demand Forecasting & Digitalization

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**Abstract.** Ireland’s National Transport Authority (NTA) has a responsibility for the update and maintenance of the multi-modal National Transport Model which is used in the assessment and analysis of major transport schemes and interventions across the country. Central to the model functionality is the requirement for accurate and consistent land use data inputs, notably in terms of travel demand. To provide a comprehensive demand dataset, in 2023 the NTA undertook a nationwide project to reassess the base year and future year datasets for population and employment. This enhanced forecasting methodology utilized web-based technology to facilitate a collaborative project directly involving all 31 Irish Local Authorities. As part of this project, the NTA assessed how various existing datasets could be utilized together to forecast population and employment variables more accurately. This project worked to improve the consistency and accuracy of data across numerous different organizations and ensured that the data was deliverable at all relevant policy scales, from national and regional to a small area level. Central to this project was the delivery of a new digitized approach, which allowed the coordination of various datasets, firstly to facilitate the use of input data that can improve decision making processes, but also in terms of how the data was collected and controlled for accuracy and consistency. Developing this methodology and working closely with Local Authorities to collate information in an accurate and coordinated manner at a local level, has ensured that the NTA, local authorities and other agencies have robust and consistent base year and future year datasets, which can facilitate evidence-based decisions on Strategic Planning issues and assist in the realization of key sustainable development goals.

**Keywords:** Connectivity; Sustainable Transport; Web based Assessment; Public Realm; Local Transport Plans.

1. Introduction
	1. Overview

The accuracy of the National Transport Authority’s (NTA) national transport models is critical for supporting robust decision-making processes for appraisals of transport projects and the development of transport strategies. Central to the functionality of an effective transport model is the input of accurate and consistent land use data, typically made up of numerous variables which are key determinants for travel demand. In 2023, the NTA with assistance from KPMG Future Analytics, initiated a major project to enhance forecast year datasets for the NTA National Transport Model through an in-depth review of existing planning sheet data, a comprehensive research programme and a consultation process that involves every Local Authority across the country. This review is focusing on future population, employment and education growth at Census Small Area level with the objective of enhancing the data sets used to forecast growth levels to 2040 and beyond. As a result of this process, the NTA and other state bodies will have a more accurate understanding of likely future travel patterns and as such be better placed to provide the necessary policy, infrastructure and services to cater for future travel demand in a sustainable manner.

This paper will provide an overview of this major project including its key objectives; the methodology used; the primary findings from the research and policy analysis phase and the innovations and improvements this project seeks to bring about.

* 1. Requirement for the Project

Transport modelling, used for a wide range of transport planning processes, is reliant on a comprehensive and accurate set of data that is made up of numerous variables. The NTA has a comprehensive set of transport models including the National Demand Forecasting Model (NDFM) and five Regional Models [4]. The NDFM estimates the overall travel demand on a national scale, while the regional models estimate mode and destination choice, as well as undertaken assignment for road, public transport, walking, and cycling networks. Each of these models are used to make informed decisions and are central to the primary transport planning roles of the NTA including strategic planning, service planning and infrastructure appraisal. Accurate forecasting of population growth as well as growth in other key sectors such as employment and education is critical in ensuring organizations such as the NTA can sustainably plan to provide an adequate level of transport service.

To date, where information has not been made available, the NTA has relied on a standard distribution method for distributing national and regional growth numbers, obtained from the National Planning Framework[[1]](#footnote-2) (NPF) and respective Regional Spatial and Economic Strategies[[2]](#footnote-3), at a sub-settlement level. This approach, whilst useful, is limited in that it assumes areas will consistently grow in the same patterns as before, thereby not factoring in policy objectives, population targets, known development proposals and likely population fluctuations as a result of changing demographics. In this regard the primary aspect of this project involved considerable consultation with local authorities across the country to gain a more informed understanding of how population, employment and education are likely to grow in particular settlements and small areas in each county. By identifying how national and regional growth targets are likely to be distributed at the settlement and small area level, the NTA can undertake more refined and robust analysis of likely future travel demand, with confidence that the approach is evidence based and in line with national policy targets.

In addition to the above, it was considered that as a result of new trends in recent years such as remote working and learning, digitalization and changing employment sectors, as well as the emergence of new data sources, the data variables used for the NTA model to derive travel demand were in need of review.

1. Project Methodology

The carefully considered process that is being followed for this project is set out below. Two primary project phases were established: an initial research phase and a second phase for a comprehensive consultation programme with local authorities.

* 1. Phase 1 - Research and comparative analysis

A number of research topics were identified that were of interest to the NTA with a view to improving the established approach to data collection and the range of data variables used in the planning sheet. The NTA in collaboration with KPMG Future Analytics undertook a comprehensive programme of research with a view to establishing a list of short-, medium- and long-term actions that could improve the NTA’s process for data collection, input and application. A summary of some of the research carried out under each strand is set out below.

### Existing NTA Planning Data

The review of the existing NTA planning data (NTA ‘Planning Sheet’), comprising 54 variables, noted a number of established weaknesses including the use of base year data to distribute future population growth, when future year growth information was not available. Another major limitation was the difficulty in accurately reflecting the growth data in interim years between census periods. It was noted that through the use of additional data sources that are published on a more regular basis ongoing updates could be made to variables to provide more up to date and reliable forecasts.

### Policy

The policy review undertaken as part of the research element of this project was primarily focused on understanding existing and future public sector policy that could potentially materially influence the allocation of future employment and education places. This included a review of policy related to the trends of remote working and learning, and decarbonisation of the economy given the potential impact these trends could have on travel patterns. The review found that whilst there are no quantitative job creation targets for specific employment sectors, there is potential for diverging trends between sectors. It was noted that Government departments and the ESRI are currently developing enhanced analytical capacity to model the macroeconomic implications of Ireland’s enhanced climate governance framework and that there is potential to use this macroeconomic model to inform the development of alternative employment allocation scenario(s) in the NTA Planning Sheet [3].

### Employment

Employment forecasting has traditionally been challenging to accurately project, given the range of macro-economic variables, as well as the range of land use development options for employment zoned land. Notably, the NTA were interested in considering how to forecast labor force participation at a county and settlement level by age and employment sector as well as considering how employment rates differ at a county level. The research recommended that a structural economic model could help to predict future changes in participation rates for these cohorts and that settlement-level employment ratios are incorporated from the NPF into the NTA planning sheet as a high-level reference for practitioners using NTA models.

This facet of the research also recommended consideration of remote and mobile workers who are not adequately considered as part of the current NTA planning sheet and recommended that these should be accounted for in the updated planning sheet using Census 2022 labor force figures at the county level.

Education

To understand potential alternatives for how educational places could be reconciled against National, Regional and Local scales, research was undertaken to assess potential new methods and data sets that could be used in the NTA planning sheet. The NTA’s current method of allocating and projecting school places closely follows population growth and does not account for any future demographic change. It also assumes a consistent ratio of students in primary and post primary level education whereas the Department of Education and Skills publishes projections of full-time enrolment in primary and secondary schools at State and regional level that are based on CSO population forecasts that incorporate regional assumptions on migration, fertility and mortality.

* 1. Phase 2 – Consultation Programme with Local Authorities

The primary task of this project, to update the NTA planning sheet at settlement and small area level, involved an initial consultation phase taking place over a three-month period with every local authority in the country. As part of this process, each Local Authority was asked to review the distribution of population and employment growth for their areas under the established NTA standard distribution method. It is envisaged that this task is primarily undertaken by the planning teams in each local authority and that their input will be primarily based on relevant local planning policy, local authority objectives, knowledge of planned development and the availability of appropriate sites for development.

To facilitate the collection and transfer of this data, a data hub was developed by Compass Informatics on behalf of the NTA, which acted as a central portal for the sharing of data between the NTA and local authorities. This approach facilitated the smooth transfer of data and allowed existing and future growth distributions to be assessed visually through a GIS platform embedded in the portal.

Following completion of the initial consultation, a follow up consultation phase will take place with each local authority. This will consider revised National Forecast figures being developed at National Government level in light of the publication of the final Census 2022 results [1]. This second stage review will allow further refinement and ensure that the final distributions are in line with national policy.

As part of the consultation process, the NTA also regularly engaged with the three Regional Assemblies who assisted in the process and were apart of the overall project steering group that also included the Department of Housing, Heritage and Local Government.

1. Innovations
	1. Data Hub

The use of a ‘Data Hub’ accommodated a digitized approach to engagement with Local Authorities and other key stakeholders as part of this collaborative project. This approach allowed for the coordination of various datasets and enabled Local Authorities to review proposed growth distributions on a map-based digital platform that ensured a user-friendly, accurate and consistent method for collecting data. It also allowed for significant time savings from the NTA’s perspective in terms of reviewing proposed distribution rates and sharing data with the steering committee. Now that the ‘Data Hub’ is established, this digital platform can also be used by the NTA in further engagement processes with Local Authorities, enabling closer cooperation on various projects and reducing the amount of time required for inputting data manually. It is envisaged that this platform will enable the NTA to collect planning sheet data on a more regular and consistent basis, thereby improving the overall quality of NTA models.

* 1. Digitization of Planning Sheet

In addition to the production of a Data Hub, the project has also sought to automate data workflows, improve data quality and streamline data exchange between internal and external systems relating to the planning sheet primarily utilizing FME (feature manipulation engine) and SQL database. This has facilitated the automation of the current planning sheet process, replacing the current manual approach. It is considered that this will greatly enhance the way in which data is validated and the overall approach to quality control.

1. Conclusion

Effective and robust transport modeling is based on the input of accurate and consistent land use data, typically made up of numerous variables which are key determinants for travel demand. This paper has detailed the nationwide project undertaken by the NTA to reassess the base year and future year datasets for population, employment and education variables in Ireland based on a collaborative approach with a range of stakeholders. Developing this methodology and working closely with Local Authorities to collate information in an accurate and coordinated manner at a local level, has ensured that the NTA, local authorities and other agencies have robust and consistent base year and future year datasets, which can facilitate evidence-based decisions on Strategic Planning issues and assist in the realization of key sustainable development goals.

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1. The National Planning Framework, published in 2018 by the Department of Housing, Local Government and Heritage, is Ireland’s national strategic plan that seeks to guide development in the country to 2040. Included in the plan are population and employment targets for each region [2]. [↑](#footnote-ref-2)
2. The three Regional Spatial and Economic Strategies, prepared by the respective Regional Assemblies, function as the key implementation frameworks for overarching national development objectives that are set out in the NPF. Included in each strategy are population projections at a county level to 2031. [↑](#footnote-ref-3)