Sustainable Road Freight in Port Cities – Aberdeen and CIVITAS PORTIS

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Abstract

The CIVITAS PORTIS (**PORT**-cities: **I**nnovation for **S**ustainability) Project is a Horizon 2020 initiative concerned with the design, demonstration and evaluation of integrated packages of sustainable mobility measures in five major port cities in Europe. The intended purpose of the project is to demonstrate that both function and social cohesion between city centres and ports can be increased through sustainable mobility. Within the context of the PORTIS project, Aberdeen City Council ("ACC") in partnership with Aberdeen Harbour Board, Aberdeenshire Council and Nestrans (the Regional Transport Partnership) will seek to implement a number of measures designed to improve the efficiency of urban freight transport.

A key aspect of the project regards the ways in which emerging digital technology can help cities realise efficiency gains and environmental benefits in relation to freight movement. The impact of smart city infrastructure is still to be felt in many respects (e.g. participatory democracy, digital planning, building condition monitoring), yet had already been implemented by both the public and private sectors in Aberdeen.

The current use of sensor technology to extend the signal timings on key freight corridors has already seen a decrease in journey times for HGV traffic along routes but further consideration will be given to how best to assist with freight movements whilst the network is congested at peak times. That large freight vehicles are less compelled to stop and accelerate at controlled junctions also means that there are benefits in terms of air pollution, fuel efficiency and emissions.

Local authority-led freight routeing and support are proven to be effective, as evidenced by previous work undertaken in the city. The extent to which the planned initiatives will contribute to the goals of PORTIS will require monitoring, evaluation, and an ability to demonstrate a genuine connection between plans and action within the city and wider region.

1. Introduction

Aberdeen's role as a major centre in supporting the offshore oil and gas industry results in freight playing a critical function in both Aberdeen City and the wider Aberdeenshire area. How policy makers want freight to move in and around the region is the subject of ongoing review and decision makers are mindful of the need to consider wider policy objectives while not seeking to disadvantage the freight industry in a disproportionate manner (Nestrans 2018b pp. 18-19).

Building on participation in previous European initiatives, Aberdeen City Council (**ACC**) and local partners are involved in the four-year funded CIVITAS PORTIS (**PORTIS**) EU Horizon 2020 initiative involving the five European cities of Aberdeen, Antwerp, Constanta, Klaipeda and Trieste:

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Figure 1: Map of participants in CIVITAS PORTIS (Civitas Initiative 2016).

The intended purpose of the project is to demonstrate that both function and social cohesion between city centre and ports can be increased through sustainable mobility (Civitas Initiative 2016). It is anticipated that the project will: (i) improve governance for enhanced cooperation between ports and cities; (ii) create more sustainable and healthier city-port environments; (iii) shape more integrated transport infrastructure and mobility systems; and, (iv) improve the efficiency of urban freight transport (Civitas Initiative 2016).

Commencing in September 2016 and concluding in September 2020, PORTIS coincides with significant change in transportation in Aberdeen and the surrounding North East of Scotland. With the completion of the Aberdeen Western Peripheral Route (**AWPR**) in early 2019, the route will see traffic directed away from the city centre (see Figure 2 for route information).

As part of PORTIS, a review of the city's Roads Hierarchy, which seeks to remove unnecessary vehicular traffic from the city centre, and the potential implementation of a Low Emission Zone in Aberdeen are both policy instruments that have the capacity to affect how freight interacts with the city and surrounding area.

The role of PORTIS in assisting the transformation of the city in a one focussed on more sustainable transportation modes is pivotal. European programmes such as PORTIS are a "vital mechanism" in the promotion of a sustainable transport agenda in the absence of coherent funding structures and this has particular significance due to the restrictions in infrastructure investments and historic limitations on Council Tax rises in Scotland (Tait, Laing and Gray 2014). Therefore, PORTIS presents a unique opportunity for the city region to trial and implement complementary sustainable transport policies that will ensure the benefits of the AWPR are "locked in" (see further Nestrans 2008).

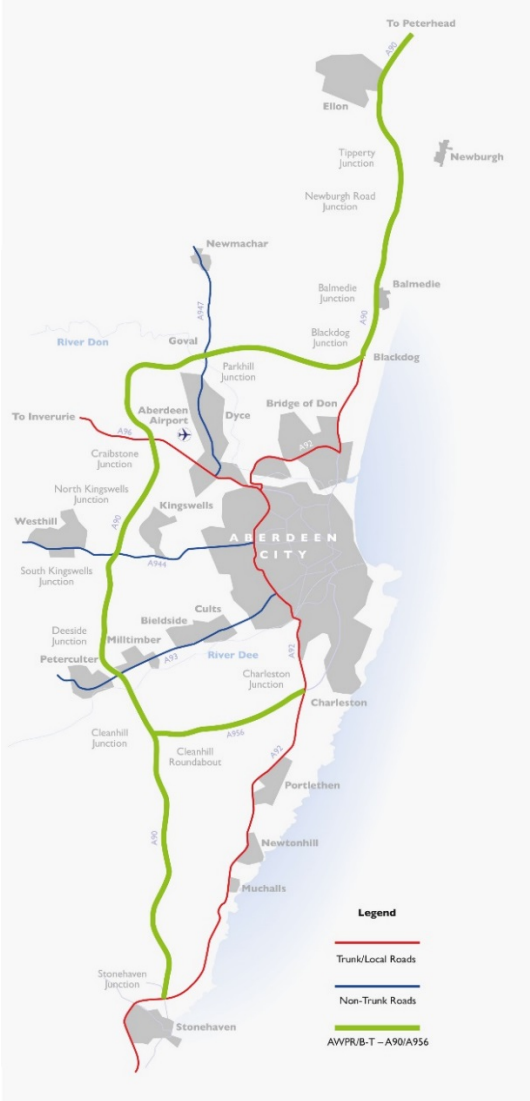

Figure 2: Aberdeen Western Peripheral Route (Image credit: Transport Scotland).

For freight, interventions already demonstrating results include the use of prioritised traffic flow, thus reducing both fuel consumption and emissions of freight traffic moving through the city. This can connect with associated initiatives along the AWPR itself, and is utilising emerging technology associated with the wider aspirations of Aberdeen

regarding digital transformation of city services. The purpose of this paper is to discuss these interventions and the potential for PORTIS to enhance and expand the work already undertaken by the local authority and partners in the region to both improve freight efficiencies but also harness the associated environmental benefits.

2. Freight and PORTIS

Nestrans (the Regional Transport Partnership) lead the freight-related work in Aberdeen as part of PORTIS. The package of measures Nestrans is seeking to implement within the project aims to take advantage of the infrastructure improvements offered by the AWPR, to build on previous freight priority initiatives and to improve both the walkability and cyclability of the city by reducing the number of heavy goods vehicles (**HGVs**) moving through the city's core. The objectives are to:

- Create updated mapping of preferred freight routes incorporating links to the airport, harbours, TEN-T road network, industrial areas and other relevant locations;
- Review effective freight traffic management within the city;
- Appraise the utility of fixed plate and variable message signposting for freight; and,
- Develop and implement recommendations for the use of improved freight corridors and expansion of the HGV priority measures already implemented on the main HGV route to the south of the city.

All of these objectives require the support and cooperation of local hauliers if they are to succeed. An important step in ensuring effective collaboration has been the appointment of a Freight Advisor by Nestrans to operate as a liaison between local authority/public sector and private sector within PORTIS. The engagement of the Freight Advisor has ensured good communication about the stated aims and objectives but has also ensured that an understanding of what is important to the freight operators is incorporated into the project.

3. Freight and air quality

In Europe, transport is responsible for more than half of all NOx emissions and contributes significantly to the total emissions of the other pollutants such as particulate matter (EEA 2018). While air quality in the UK is reported as having improved in the UK since 2010, road transport constitutes 80% of NOx concentrations at the roadside (Department for Transport 2019, 2.7). In common with many urban areas, the main pollutants of concern in Aberdeen City are nitrogen dioxide and particulate matter (PM_{10}), related to road traffic emissions (Aberdeen City Council 2018) and freight movements in the city contribute towards these emissions. It has been identified that freight and buses cause 80% of the air quality issues within the city but represent some 20% of total traffic within the city centre (Aberdeen City Council 2019).

Improvements to both air quality and perceived safety of pedestrians and cyclists also contribute to the wider sustainability and active travel agenda promoted in other areas of PORTIS, therefore the measures to improve freight efficiencies are integral to the success of the broader PORTIS objectives. In particular, enhancements to the environment such as improved cycling and walking infrastructure in addition to improved air quality all contribute to an urban environment that supports active and sustainable modes of transport.

Figure 3: A956 Wellington Road (Photo credit: Nestrans)

The density of road freight is notable in the city, with some routes comprising 15% HGVs and the city's Wellington Road (A956) recording levels of HGVs accounting for over 20% of all vehicles on the route (Nestrans 2018b). The existence of an Air Quality Management Area covering Wellington Road (A956) means that careful consideration is required as to the number of these freight movements which are necessary to access the city centre or port, and which could divert away from the city particularly given the existence of a new bypass (Nestrans 2018b).

In addition to the core Wellington Road (A956) route, Market Street (A956) is adjacent to Aberdeen Harbour and has a high proportion of HGVs travelling between the north east of Scotland, the Harbour and locations south of Aberdeen. The proximity of the Harbour to Market Street (A956) means the operations of the Harbour impact upon air quality in the area (for further information, see Aberdeen City Council 2018). This is also a section of the city that is the subject of an Air Quality Management Area.

The Scottish Government's commitment to introduce low emission zones (LEZ) into Scotland's four biggest cities also has the potential to affect the relationship between freight and air quality in the city. At present, ACC is undertaking a Detailed Assessment following on from an earlier Scoping Assessment, and the following options are being considered in detail:

- A bus LEZ covered the city centre Air Quality Management Area or all routes within Aberdeen City; and
- A HGV LEZ covering Market Street (A956) and Virginia Street (A956)

The LEZ remains only one aspect of demand management that is required to support the improvement of air quality in the city and a concurrent reassessment of the Roads Hierarchy is underway.

4. Freight movements in City and Shire

In order to gain an insight from a wide variety of hauliers and companies associated with the freight industry, a large number of organisations were contacted in 2018 inviting them to respond to a survey and to join the North East Freight Forum (Nestrans 2018a). As a result of the survey, which received 28 replies from 27 companies, Nestrans was able to identify patterns and draw initial conclusions on routeing preferences and the decision making processes surrounding routeing. The information will be used to track progress during the course of the PORTIS project, with the intention of conducting a follow-up survey at the conclusion of the project.

a. Route maps and routeing decisions

Following participation in the Interreg IVB StratMoS project, Nestrans produced bespoke freight maps for both Aberdeen and Aberdeenshire. These maps included information on principal freight routes; height, width and weight restrictions; lorry parking locations; and, industrial estates, to assist drivers. As mentioned above, participation in the PORTIS initiative has coincided with the construction of significant new road infrastructure for the region and therefore Nestrans planned an update of the freight maps in collaboration with local hauliers, as part of the project.

To facilitate improvements in air quality within the region, it is proposed that a routeing strategy that ensures freight vehicles are not unnecessarily travelling through Aberdeen or other towns in the region is required (Nestrans 2018b). Three infrastructure aspects will be key to the implementation of a successful routeing strategy that will reduce HGV presence: (i) the Roads Hierarchy; (ii) HGV usage of the AWPR; and (iii) proposals to dual the A96 currently being developed by Transport Scotland and partners (see further Nestrans 2018b). However, the efficiency of such routes and associated economic considerations calculated into route selection by hauliers, are both critical components that

need to be considered and will remain a core aspect of the work Nestrans are undertaking.

Analysis undertaken of responses to the abovementioned survey provides an insight into the decision making processes surrounding routeing choices when moving freight around Aberdeen and Aberdeenshire. As a result, Nestrans identified the decision-making process around route selection, specifically who makes the decision, as being key to future engagement on the subject. Indeed, this "has the potential to create some extra barriers in relations with operators and creating new routes for Aberdeen and Aberdeenshire" (2018a p. 19) and, "if it is the drivers who do ultimately make the decisions regarding routeing, then this will need to be considered in future engagement." (*ibid* pp. 19-20). Therefore, the survey represents only the start of an engagement process with hauliers who remain vital to the success, or indeed failure, or any amendments to routeing strategies.

b. AWPR and re-routeing

To enable the benefits of the AWPR to be maximised, the new Roads Hierarchy will need to ensure that drivers are directed to the most appropriate route based upon their point of origin and final destination. A clear signage strategy will require to be deployed as part of the Roads Hierarchy work that is being undertaken to ensure that the potential gains offered by the AWPR (e.g. reduction in city centre traffic, air quality improvements, improved conditions for vulnerable road users) are not lost.

The risk of induced demand because of improvements to network capacity in NE Scotland remains a concern. Evidence reviewed in a recent study conducted on behalf of the Department for Transport concludes that induced traffic demand exist, although size and significance will be context dependent and more research is required (Department for Transport 2018). Therefore, to ensure that the benefits of the AWPR are "locked in" (Nestrans 2008), the removal of freight from the City Centre where appropriate through adherence to freight routes and investment in ITS to reduce the effect of stop/start on air quality will remain key to an effective transport strategy for the region.

c. A956 Wellington Road

As noted above, Wellington Road (A956) is recognised as a key freight corridor for both Aberdeen and the surrounding region. Heading south, the route is uphill with two signal-controlled junctions that cause HGVs to make a standing start on a gradient. From both an efficiency and environmental perspective, this resulted in the local authority seeking a mechanism through which to improve freight flows in the area.

Figure 4: Traffic lights on A956 Wellington Road (Photo credit: Nestrans).

In order to tackle the issues surrounding stop/start of HGVs on Wellington Road, ACC implemented a signals project in 2011 to detect HGVs on the approach to the two junctions and to enable an extension to the green time to reduce the proportion of HGVs having to stop. This "green wave" system is operation during off-peak periods to enable the smooth transition of freight along the route.

The corridor remains a key route for freight and in 2017, ACC commissioned AECOM to undertake a STAG Part 1 appraisal and to define and assess options for improving strategic transport connections and active travel along the Wellington Road corridor (see further AECOM 2018). At present, AECOM is conducting the STAG 2 work on behalf of ACC and six Transport Planning Objectives (TPOs) are being examined as part of this process,

including the efficient movement of freight along the route.

Although the AWPR offers the benefit of routeing freight around the city, the study highlights the potential for an increase in HGV traffic along the corridor, associated with vehicles accessing both the existing and new Nigg Bay Harbour developments (*ibid*). Further monitoring will be required to ensure the STAG 2 process delivers the desired changes wanted in the study area, factoring in the need to improve both strategic transport connections and active travel in the area.

5. Effective freight management

ITS has been identified as a key tool in realising improvements to air quality, lowered noise levels and reductions in the adverse effects associated with heavy traffic and congestion (Transport Scotland 2017 p. 29). For example, ITS can be utilised to provide live traffic data to enable both the accurate planning but also the accurate operation of freight routes by local hauliers. However, freight traffic has a different set of operational conditions to general traffic from an ITS perspective, particularly in relation to route restrictions, permissible driving hours, maximum speed, braking distances and taking longer to build up speed from a standing start (Transport Scotland 2017 p. 64). These additional needs require to be factored into the planning and design of any proposed solutions for the effective management of freight in the city.

As part of the work being undertaken within PORTIS, an appraisal of the utility of fixed plate and variable message signs (VMS) for freight will also be undertaken. From an ITS perspective, consideration will be given to whether technology can be used to disseminate information to enable informed decision making – for example, directing road users to avoid congestion hotspots or road closures. Reactive use of VMS could play an important role in the future role of the local authority in active, real-time management of the road network and freight routeing within the city.

Innovations in mobility can also be harnessed to maximise limited road space, thereby reducing congestion. For freight, this could be achieved through use of consolidation hubs or freight brokerage platforms matching vehicle space with goods (Department for Transport 2019, p. 45). Within PORTIS, work has been undertaken by Nestrans to consider what the key focus should be for freight consolidation in the region and to gauge whether there is a commercial appetite for such an initiative (see further Nestrans 2018c).

Other innovations in mobility, such as low or zero emission vehicles are also capable of positively contributing to improvements in air quality in the city. Trials of zero emission vans in partnership with the private sector will form an important strand of the work undertaken by ACC and partners within PORTIS. A review of the operation of such vehicles in the commercial market will be undertaken to enable better understanding of how such new technologies are successfully incorporated into general commercial activities and the wider freight environment.

6. Development and implementation of recommendations

Along with the historic improvements to freight movements already discussed above, Nestrans and ACC are seeking to further develop and implement recommendations with respect to HGV priority measures. This could potentially relate to the further extension of the measures already introduced in the Wellington Road area of the city but also in respect to identifying and improving other defined freight corridors. As demonstrated, ITS can play a key role in tackling congestion, thereby creating a more efficient network for all modes of transportation. Technology is already being used to maximise capacity of the existing road network – for example using Split Cycle Offset Optimisation Technology (SCOOT) utilising data from vehicle detectors to optimise traffic signal settings, reducing vehicle delays and stop/start movements. The Department for Transport has recently emphasised the potential for new technologies to contribute to reduction in congestion; for

example, trials of electric cargo bikes have demonstrated the potential to increase speeds in congested areas as well as reducing emissions, costs and delivery time when compared to van-based last mile delivery services (Department for Transport 2019, 4.22).

A key element of this work will be recognising that there is not a one-size-fits-all approach and that appropriate solutions for Aberdeen must be identified. Acceptance of these solutions by the freight industry is also a fundamental consideration and the engagement of a designated Freight Advisor by Nestrans has been an important element in engaging with hauliers in the city.

7. Conclusions and outlook

Local authority-led freight routeing interventions are proven to be effective, as evidenced by the Wellington Road (A956) initiative that has resulted in improvements to freight journey times but also improvements to air quality in the Wellington Road area over time as stop/start movements of HGVs have been reduced.

For a large-scale roads building programme such as the AWPR's effects to be viewed within the wider context of environmental impact, it will require the implementation of a range of specific measures to encourage freight away from city centre routes, thereby allowing road space to be allocated for safer cycling and walking routes. Both the Roads Hierarchy and updates to Freight Maps need to ensure that there is a match between the proposed routes and the actual road usage by freight. The ITS interventions already causing decreases in fuel consumption and emissions through the reduction in stop/start of HGVs within the city limits can connect with other initiatives utilising emerging technology associated with the city's wider aspirations regarding digital transformation. ITS and smart mobility solutions are also capable of supporting reduced levels of HGVs within the city's core.

The extent to which the planned initiatives will contribute to the goals of PORTIS will require monitoring, evaluation, and an ability to demonstrate a genuine connection between plans and action within the city and wider region. The benefits of successful interventions hold the potential to have both commercial benefits (through reduced and more predictable journey times) and tangible benefits for the lives of those who live and work in the city, as a more walkable and cyclable urban environment is created.

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