

## **PORT CENTRIC LOGISTICS, DRY PORTS AND OFFSHORE LOGISTICS HUBS – STRATEGIES TO OVERCOME DOUBLE PERIPHERALITY?**

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### **Abstract**

Scotland's low accessibility is reflected in the limited share of Scottish unitised freight traffic coming through Scottish ports. This paper will discuss site development strategies to overcome Scotland's double peripherality (i.e. both physically and institutionally) by restructuring transport chains of large shippers through new corridors.

Three competing logistics concepts will be discussed, beginning with the existing load centre terminal that provides direct access to the distant main ports. Secondly, port-centric logistics based at Scottish ports, and finally, offshore port-centric logistics utilising maritime links to a port-based distribution centre in Zeebrugge.

The paper has two interlinked aims. Firstly, to provide a firm theoretical grounding for recent maritime transport geography concepts, which has been lacking in the literature. This will be achieved by examining peripherality and responses to this by states at different scales, thus exploring how the three concepts in this paper can be viewed as attempts at spatial fixes of mobile capital. The second aim develops out of the first, and will explore how the perspective of space is treated in maritime geography as compared with other areas of geography. As a result, the paper pursues a cross-disciplinary approach by utilising theory from economic geography and political geography.

**Keywords:** transport geography, peripherality, ports, logistics, spatial, institutions

## 1. Introduction

Peripheral regions and nations within the EU require a range of transport options for access to the economic centre of the European continent [1]. Yet for market access Scotland relies heavily on maritime services via remote southern seaports, with the result that the majority of Scotland's trade travels overland through England.

Peripherality invites additional technical, financial and market discontinuities which further challenge accessibility. Peripherality is not simply a status – it is a process of becoming peripheral [2]. The evidence suggests that Scotland does not suffer poor direct maritime access with the Continent due solely to geographic or economic reasons. Lagging infrastructure development as well as a lack of sufficient government initiatives to promote direct links have also been cited as key reasons. [3, 4].

There are double periphery impacts in place. Political-institutional factors in respect of the southern pull of British central government have generated a lack of appropriate maritime transport policy and provision which does not well serve a region with an extensive coastline and a significant small island composition [4]. The peripherality of the region has been accentuated by the failure to maximise the benefits of Scotland's maritime highways with the consequence that discontinuities have developed in Scotland's access to modern maritime technology and associated maritime infrastructure [3].

Over the last 30 years, a variety of factors have caused a shift in UK trade from using local ports to using the large south-eastern ports [5, 6]. Scotland's low accessibility in the international perspective is reflected in the limited share of total Scottish unitised freight traffic coming through Scottish ports. This paper will consider site development strategies to overcome this double peripherality by restructuring transport chains of large shippers through new corridors. Wilmsmeier et al. [7] developed Taaffe et al.'s [8] theory of artificial priority corridors that can influence forward and backward linkages between ports and hinterlands, highlighting the difficulty of matching risks and benefits from a welfare perspective, particularly in relation to public risks and private benefits. This paper will develop this research agenda by comparing specific site development strategies that each affect transport corridors in their own ways, and each of which will attract different risk types and levels, and also attract different kinds of public and private investment interest.

Reasons behind current logistics strategies, other than supply and demand, need to be addressed. Supply chains may be forced into sub-optimal paths which are then exacerbated by issues of path dependency decreasing the visibility of alternative options. Similarly, the notion of transport solely as a derived demand has been challenged and reformulated as an

integrated demand [9, 10, 11]. As such, intra-regional flows and spatial development are in fact impeded by networks of nodes and hubs that may not perform their key functions adequately. Thus the (current and proposed) functions of these nodes need to be understood properly in order to incorporate their effects into an economic geography of freight transport.

Agglomeration is now being questioned because it leads to congestion and many disbenefits to peripheral regions, but if transport geography is moving beyond agglomeration, which institutional factors will influence this transition? What is the next paradigm and how can developments in maritime geography contribute to this theoretical development? Transport geography has tended to be less theoretical than economic geography [12], but institutional theories have started to gain some ground in studies of maritime transport. An institutional economics approach has been used to explore different methods of coordinating hinterland transport chains (e.g. [13, 14, 15]) while institutional geography has been used to examine how these structures vary across spaces and scales (e.g. [16]).

Terms such as dry ports, port centric logistics and logistics hubs have been used rather loosely as concepts over the last decade but they have not been given sufficient theoretical grounding. One way to do this is by tying them to theories of industrial location such as Weber, Christaller, etc., however location theory is not the focus of this paper. Another way to provide this grounding is by tying these concepts to attempts by states at different scales to fix mobile flows of global capital in particular spaces. In this paper it is argued that each of these concepts represents an attempt to create temporary spatial fixes for global container flows, as a proxy for global flows of capital.

The paper therefore has two interlinked aims. Firstly, to provide a firm theoretical grounding for recent maritime geography concepts, which has been lacking in the literature. This will be achieved by examining peripherality and responses to this by states at different scales, thus exploring how the three concepts in this paper can be viewed as attempts at spatial fixes of mobile capital. The second aim develops out of the first, and will explore how the perspective of space is treated in maritime geography as compared with other areas of geography. As a result, the paper pursues a cross-disciplinary approach by utilising theory from economic geography and political geography.

Space limitations preclude a full institutional analysis in this paper. The aim is to demonstrate how these concepts represent spatial fixes and therefore must be analysed in that way. The results in this paper serve to aid differentiation of the three concepts, both to advance conceptual discussions and to support practical planning and decision making by institutional bodies. By exploring the perspective of space in this cross-disciplinary fashion,

the paper aims to demonstrate the relevance of developments in the maritime sector to the wider discipline of geography, as issues of peripherality and path dependence influence and are influenced by maritime trade flows.

The maritime transport geography literature provides only limited support in this endeavour, therefore in the first two sections literature from political and economic geography will be examined in order to find the necessary theoretical approaches. The aim of these sections is to demonstrate that, just as this body of theory is needed to study issues in maritime transport, the results from this kind of analysis can feed back into mainstream geography.

The paper begins with a discussion on how recent work in economic and political geography provides a theoretical underpinning to discussions in maritime transport geography. An overview of the Scottish freight network is then presented, before treating each of the three concepts in turn, based on the literature and then the Scottish case. The relative merits of each case are outlined separately, before being drawn together in a discussion of national policy, and it is argued that assessment of each node development strategy is to a large extent an institutional issue. Resulting from these discussions is a research agenda whereby new developments in maritime transport geography can both learn from and contribute to current discussions within geography, which is particularly relevant in the context of recent calls for a more qualitative, interdisciplinary and higher profile transport geography [17].

## **2. Theorising the state under rescaling**

Ng and Pallis [16] discussed the asymmetric implementation that can result from applying a generic governance structure under different institutional frameworks, suggesting that these issues need to be studied across other spaces. Indeed, Martin [18] noted that ‘if institutional path dependence matters, it matters in different ways in different places: institutional-economic path dependence is itself place-dependent’ (p. 80). Nevertheless, in his argument for an evolutionary economic geography Martin [19] cautions that ‘the prevailing model of path dependence overstates the degree of inertia in political and social institutions’ (p. 13).

States at all levels are under increasing pressure to provide an attractive entrepreneurial culture to draw increasingly mobile global capital flows, but scales are becoming important because ‘the capital-labour nexus was nationally regulated but the circulation of capital spiralled out to encompass ever-larger spatial scales’ ([20]; p69). In light of the decreasing

role of the national state, local and regional authorities attempt to secure these flows through strategies of clustering and agglomeration.

Brenner [21] proposed a contradiction between fixity and motion in the circulation of capital, ‘between capital’s necessary dependence on territory or place and its space-annihilating tendencies’ (p. 459). Therefore any spatial fix must be temporary. Brenner’s definition of this process is worth quoting at length:

The forms of territorialization for capital are always scaled within historically specific, multitiered territorial-organizational arrangements. The resultant scale-configurations, or ‘scalar fixes’ [22], simultaneously circumscribe the social relations of capital within determinate, if intensely contested, geographical boundaries and hierarchize them within relatively structured, if highly uneven and asymmetrical, patterns of sociospatial interdependence (p. 464).

Brenner notes that each temporary scalar fix must be approached in terms of its formation, stabilisation and eventual rupture. However the role of the state is to attempt to maintain these equilibria, and to this end it ‘deploys a wide range of geographically specific policies oriented differentially towards cities, industrial districts, regions, growth poles, peripheries, “underdeveloped” zones, rural areas, and so forth’ (p. 470).

Therefore what Brenner calls temporary scalar fixes are instantiated in political formulations across scales such as countries, regions and cities, [23] which, as will be shown in the next section, are based on temporary spatial fixes whose fluid boundaries and thus authority are derived from both territorial and relational aspects. However the attempts by states at any scale to harness global capital flows through the proxy of container flows result in spatial fixes such as ports and intermodal terminals. These physical spaces then exert a decades-long legacy impact on the structure of logistics and transport systems, while the temporary scalar and spatial fixes just described change around them.

The state’s aim is to harness the power of capital to achieve its own aims through various combinations of privatisation, public-private partnerships, deregulation, subsidies, etc., however ‘the state is denied the power to control the flow of those resources which are nevertheless indispensable for the exercise of state power’ ([24], p. 120). A number of theoretical approaches to such state attempts at harnessing capital flows for economic development have been developed in the economic geography literature, and it is argued here that maritime transport geography must make use of such theoretical insights as they are

relevant to the development of major infrastructure projects such as ports and intermodal terminals.

Amin and Thrift [25] proposed a concept of ‘institutional thickness’, having four elements: strong institutional presence, high level of interaction amongst these institutions, well-defined structures of domination, coalition building and networking, emergence of a common sense of purpose and shared agenda. MacLeod [26, 27] highlighted resonances between institutional thickness and other concepts such as Lipietz’s [28] ‘regional armature’, Cooke and Morgan’s [29] ‘institutions of innovation’ and Storper’s [30] ‘institutions of the learning economy’. He wrote that, ‘as Amin outlines, attempts to achieve collaboration between entrepreneurs and institutions through policy dictate and “overnight institution building” can be deeply problematic’ ([26]; p. 308). MacLeod noted that this institutional thickness has not helped Scotland retain transnational capital, nor develop new Scottish-controlled industry, leading him to conclude that one must be careful when de-emphasizing the role of the nation-state. Indeed, MacLeod and Goodwin [31] state that ‘regimes, partnerships, networks, coalitions and institutional thicknesses have to be constructed, managed and maintained – and at present a critical part in this is played by the national state’ (p. 522).

MacLeod insists on a multiscalar perspective on the state, ‘so as to reveal which particular regulatory practices and elements of an “institutional thickness” are scaled at which particular level. . . . These spatial and scalar selectivities [32] can occur through state-run policies like defence or through targeted urban and regional policies’ (p. 1159). Furthermore, such scaling represents an ongoing process, therefore it cannot be accepted uncritically as an input into an institutional analysis: ‘far from being existentially given, geographical demarcations such as cities and regions are politically constructed stakes in a perpetual sociospatial struggle over capitalist relations and regulatory capacities’ (p. 1159).

The devolution of transport governance from the UK to Scotland provides a supplementary lens through which to examine policy failure, but it is important not to accept devolution uncritically as an actual devolving of power or agency from the central government. Peck [33] writes that devolution can be ‘a signifier for a wide array of inter-scalar shifts – in resources, personnel, institutional capacities, delivery systems, governance arrangements and so forth. These may, or may not, add up to a “real” transfer of (national) state power’ (p. 452). The state is being qualitatively transformed rather than dismantled [34]. Goodwin et al. [35] note that ‘devolution represents a geographically uneven “filling-in” of the state’s institutional and scalar matrix, which is leading to an increasingly complex spatial

division of the state. This appears to be creating uneven capacities to act' (p. 421). Furthermore, 'The very process of "filling in" is geographically constituted and spatially constructed – in contrast to "hollowing out", which can imply an abstract sense of restructuring away from one level only (the national)' (p. 425).

Therefore understanding policy failures with regard to Scottish port development requires an analysis of the impact of different spaces and scales on transport governance capacity. Ports policy is devolved to Scotland whereas shipping policy is determined at a UK level, and indeed TEN-T applications can only be submitted by a member state, which in this case refers to the UK [4]. Therefore these issues of scalar distortions in transport governance provide an excellent arena for the testing and developing of theory with relevance for the wider discipline of geography. Recent research in geography (see [36]) has focused on the effects of the decentralisation of the state in the context of a retreat from Keynesian direction of economic activity to a post-Keynesian facilitator [34], and this direction should also be applied to the subject of maritime transport. Indeed, a key challenge of transport geography is how to deal with changing notions of infrastructure provision brought about by changing roles of the public and private sectors [12]. Again, maritime transport geography has much to contribute to, as well as learn from, mainstream geography.

### **3. The territorial and relational aspects of spatial and scalar fixes**

*'local advocacy . . . must be increasingly about exercising nodal power and aligning networks at large in one's own interest, rather than about exercising territorial power'. [37]; p36)*

Jessop [38] argued that the institutional turn in geography needs greater contextualisation, and suggested that this is possible through the adoption of what he calls a strategic-relational approach. However this approach is not a specific model that must be followed but rather an attempt to highlight the limitations of overly dualistic approaches in favour of 'genuine recursive-reflexive dialectical analyses' (p. 1226). For Shaw and MacKinnon [39], Jessop's model 'represents a major advance on structuration theory [40], which has been criticised for its conflation of structure and agency [41], leaving little scope for empirical research on their interaction [42]' (p. 6).

Jessop asserted that the state 'is merely an institutional ensemble; it has only a set of institutional capacities and liabilities which mediate that power; the power of the state is the

power of the social forces acting in and through the state' ([43], pp. 269-270). This formulation draws attention to the role of the actors that pursue various strategies.

Brenner [34] developed a framework which aimed to add a spatial dimension to Jessop's strategic-relational conceptualisation of the state form, by analysing the ways in which the state attempts to influence the temporary spatial fixes of capital accumulation, e.g. targeting of specific forms of urban development, channelling investment to certain areas, etc. Brenner's key contribution, according to MacKinnon and Shaw [44], is to highlight the importance of temporal development and historical accretion of previous institutional ensembles (see also [45]) that move forward along path-dependent channels: 'the process of state spatial restructuring must be conceived as a path-dependent interaction of inherited regulatory arrangements with emergent political strategies' ([34], p. 115).

The rescaling of the state under devolution leads to processes of hollowing out and filling in which creates an asymmetrically scaled structure of transport governance across the UK and within Scotland. For instance, within Scotland (population of 5 million) there exist three levels of transport governance (local, regional and national), in addition to the national Scottish government's own transport administration department. This arrangement then has to work within the UK context.

While these new structures are ostensibly linked to territorial spaces, their legitimacy and agency are very much relationally constructed, through the power of regional elites and industry players. Therefore research is required to outline the organisational and institutional structure of the governance set-up in Scotland, and assess the relative power of institutional restraints on action. MacKinnon and Shaw [44] analysed the construction and resulting agency (or lack thereof) of regional transport bodies in Scotland, and their approach could be developed into an analysis of transport governance in Scotland and the UK as it affects the development of freight nodes. This analysis would entail drawing connections between scalar fixes of governance with spatial fixes of freight nodes. The aim of this paper is to set out the units of assessment and terms of reference for such an analysis, the full execution of which is beyond the scope of this paper.

#### **4. Background to the Scottish situation**

The Scottish situation was discussed in detail by Baird et al. [46]. From an estimated external unitised trade of approximately 1.7m TEU, maritime trade to Scotland in 2009 was 239,315 TEU (feeder or RoRo from European ports) and 116,274 TEU (feeder from English ports). Rail direct from English ports was about 73,000 TEU, while rail traffic with England



was estimated at approximately 115,000 TEU. The rest travelled by road, some to/from Europe through English ferry ports or the channel tunnel, but mostly to/from English ports via RDCs in England. This modal split persists despite the fact that, for example, feeder shipping from Felixstowe to Grangemouth is cheaper than rail and far cheaper than road.

It is the structure of UK logistics chains that consolidates traffic via these RDCs that breaks the transport chain between English ports and Scotland and reduces opportunities for feeder or rail services (see figure 1). Moreover, constraints to the rail infrastructure in the south of England exacerbate these problems. Because of path dependency however, it remains difficult to entice shippers to break from these habits, as alternative options lack visibility.

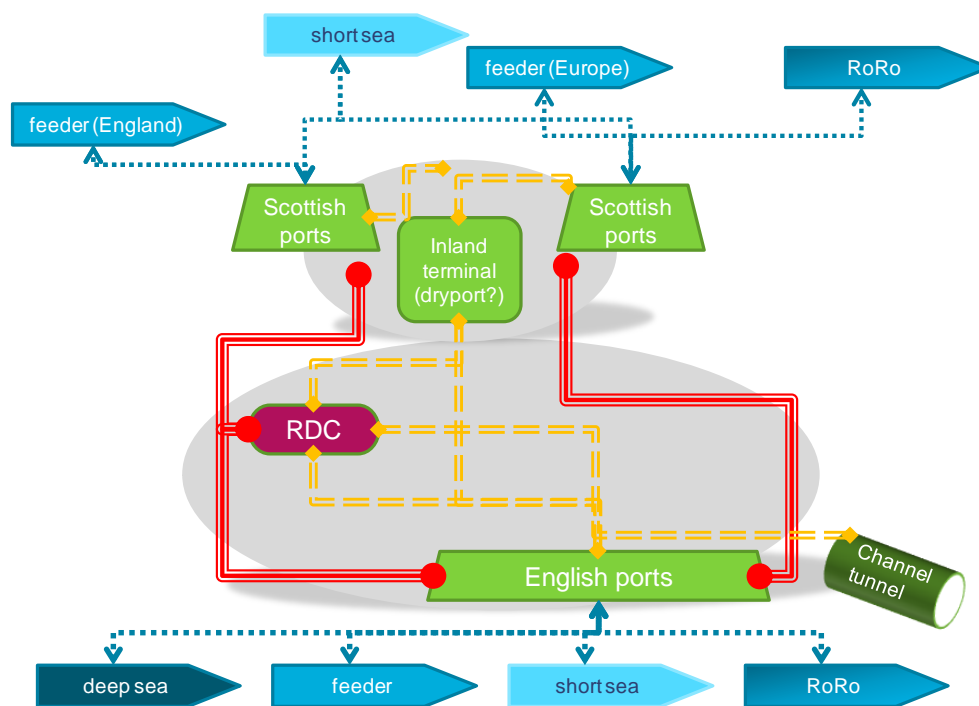


Figure 1. Schematic of Scotland's external trade.

A number of issues for Scottish shippers were identified by Baird et al. [46]. The added cost of repositioning, shortages of boxes caused by lines holding minimal stock in Scotland and the unavailability of correct equipment. Choice of transport provider and appropriate frequency of feeder services are also restricted. A key cause of the equipment imbalance is that retail imports come overland in trailers while whisky exports go by water or rail/water in maritime containers. The logistics strategies of large retailers are therefore of increasing importance to Scotland's trade imbalances, particularly in relation to their use of RDCs in

England. This has the effect of reducing direct maritime imports to Scotland which exacerbates the container imbalance as well as making modal shift away from road transport less feasible.

Figure 2 presents the three logistics chain strategies for overcoming Scotland’s double peripherality. Each of these will be discussed in turn.

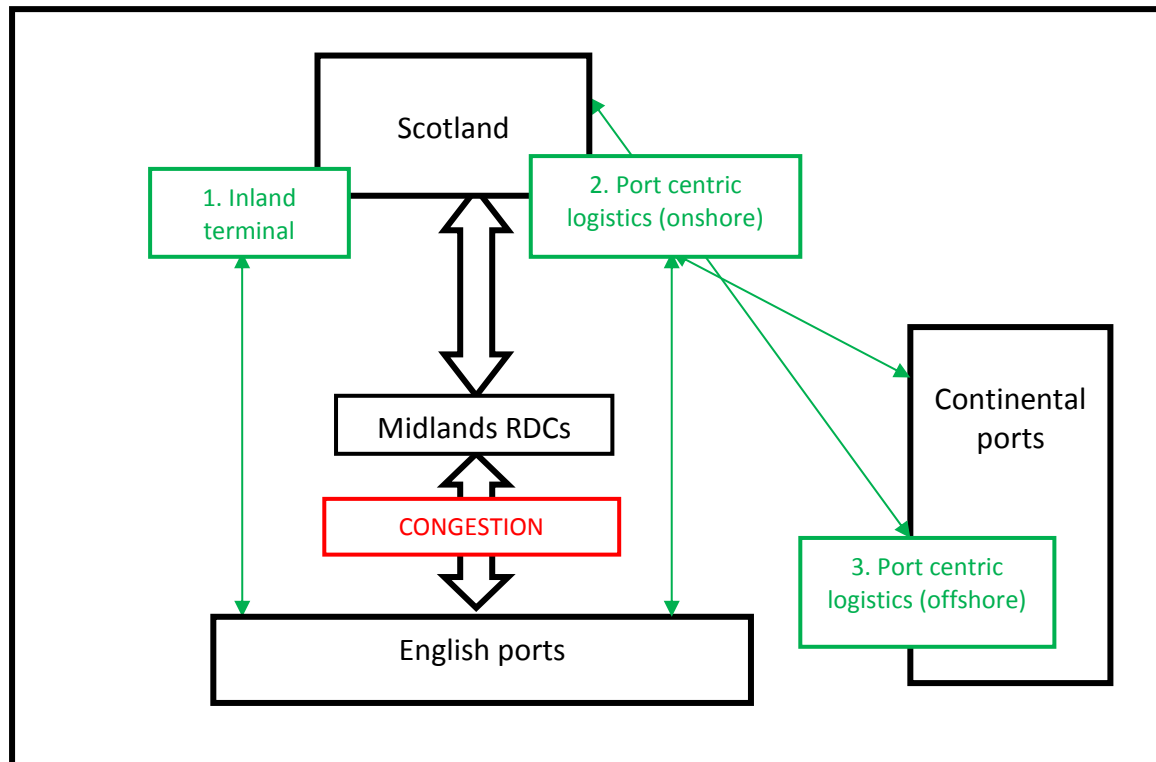


Figure 2. Diagram of Scotland’s external freight flows indicating three terminal concepts. 1: Inland terminal or load centre terminal at Coatbridge. 2: Port centric logistics (onshore) at the port of Grangemouth. 3: Port centric logistics (offshore) at Zeebrugge

### 5. Inland ports, dry ports and intermodal terminals: a node by any other name?

There exists a large literature on intermodality and hinterland access, which remains beyond the scope of this paper. Readers are referred to Wilmsmeier et al. [7], in which a detailed literature review charts the progress of research themes from ports to hinterland access to intermodality, then to the focus on port terminals and finally to the increasing interest in inland terminals as active nodes in shaping the transport chain (see also [47]). Other key concepts of integration between ports and inland terminals include hinterland access regimes [13], extended gates [48, 49, 50] and the use of ports and inland terminals as stock buffers in optimised supply chains [49]. Similarly, Ng and Gujar [51] discuss centrality and intermediacy (developed from Fleming & Hayuth [52]) as determining concepts of inland

nodes and how they can be affected by government policy. The new role of the port as one element in a logistics chain has been discussed by Robinson [53] amongst others, and Robinson [54] conceptualises these power shifts in terms of the concept of value migration, stating that ports should develop landside logistics strategies proactively, focusing on development rather than merely coping with problems as they occur.

As inland intermodal terminals have become more prominent in the literature, new terminology has developed such as inland ports and dry ports. While the term dry port was originally used either interchangeably with Inland Clearance Depot or in particular to refer to an inland terminal acting as a port for a landlocked country (see [55, 56]), the term is now being used in industry simply as a marketing term, with no clear definition. Roso et al. [57] proposed that the term should indicate an inland terminal that is highly integrated with the port (e.g. with rail services operated by a port actor), while Monios [58] showed that the term has been used inconsistently and suggested that ‘dry port’ be retained for landlocked countries while the existing term ‘extended gate’ is a more accurate signifier for integrated port-inland systems. Rodrigue et al. [59] prefer the term inland port, and draw useful distinctions between the transport functions of different sites into satellite terminals, transmodal centres and load centres. This approach allows a research agenda to be developed along the lines of the purpose and usage of these nodes in the transport chains that they shape, with the ‘co-location’ of distribution or logistics activities as a separate element in any conceptualisation framework. In this paper the ‘dry port’ term is used provocatively to highlight the ‘landlocked’ nature of Scotland, following the discussion of Arvis et al. [60] in which countries can become ‘de facto landlocked’ due to poor access to global trade routes.

#### *Case: Load centre terminal at Coatbridge*

Despite its extensive maritime geography, Scotland’s main maritime access points are the four English ports Felixstowe, Southampton, Tilbury and Liverpool. As was noted above, the majority of Scotland’s containers come indirectly via road due to path-dependent logistics chains in which road-based RDCs are embedded. In 2009 approximately 65,000 TEU was moved by rail between these ports and the Freightliner container terminal at Coatbridge (east of Glasgow).

The intermodal terminal at Coatbridge would be classified as a load centre using the terminology of Rodrigue et al. [59], as it supports the central belt of Scotland, including the major conurbations of Glasgow and Edinburgh. However the site can also be considered a ‘dry port’ serving a ‘landlocked’ Scotland, i.e. being used as Scotland’s maritime gateway,

providing access to gateway ports in England. While the authors generally prefer the term ‘intermodal terminal’ (see Monios [58]), the term ‘dry port’ is used provocatively here with the intention of highlighting the institutional aspects of freight node development, in which due to poor access to global trade routes Scotland is viewed as ‘landlocked’. Borrowing the ‘island formation’ concept from Notteboom & Rodrigue [47], the Coatbridge ‘dry port’ can be seen as an ‘island’ within the natural hinterland of Scottish port Grangemouth, as per figure 3.

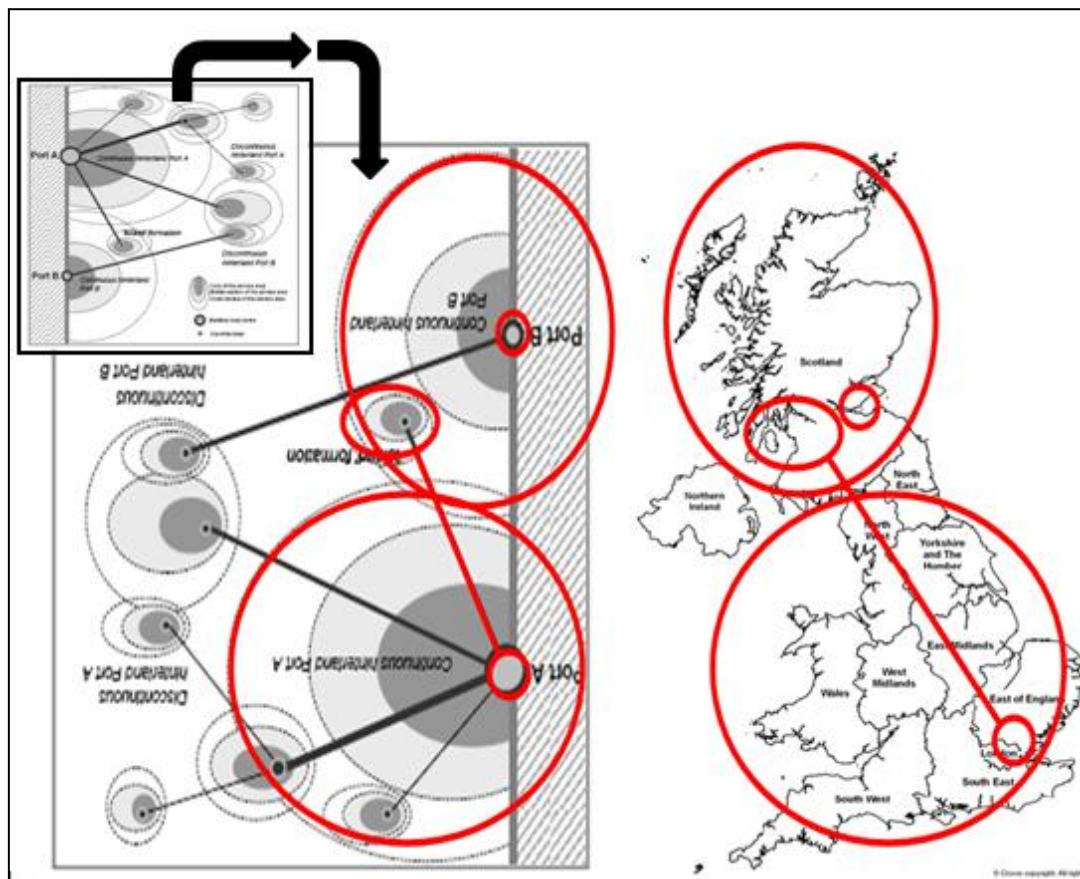


Figure 3. Representation of Coatbridge as a ‘dry port’ or ‘island formation’, based on the port regionalisation concept of Notteboom & Rodrigue [47]. The original diagram has been inverted to illustrate how the concept maps onto the UK

From a UK perspective, it makes no difference which UK ports serves the Scottish hinterland, but from a Scottish perspective, local shippers have less control over their supply chains, resulting in higher costs and lower service quality (e.g. reduced services, repositioning costs, etc.).

In terms of serving the central belt, the current strategy of using Coatbridge works well [61], and could be developed further to handle a larger percentage of Scotland’s unitised external trade. Large retailers would be the main likely sources of growth. Furthermore,

smaller terminals nearby such as Deanside and Elderslie (both near Glasgow) can be incorporated into a network, as well as larger sites at Mossend (which has spare capacity and an adjoining freight village) and Grangemouth (which has port access nearby). There is little likelihood of developing these central belt terminals as hubs for freight coming through Grangemouth as the distance is generally too short to rail it from Grangemouth to Coatbridge and then send it back to e.g. Edinburgh by lorry. But if a road movement is not required then rail from the port can be feasible, and a short distance container service is currently operated between Grangemouth and Elderslie by DRS.

Moreover, an understanding of the wider UK distribution network is important. Direct container train services from UK ports to the midlands have grown over the last decade while direct services from UK ports to Scotland (i.e. Coatbridge) have fallen [62]. This finding represents the integration of Scottish trade flows into UK-wide distribution networks centred on key sites in the midlands and to a lesser extent north England. Furthermore, while Coatbridge focuses on port flows, a high proportion of rail-hauled retail imports into Scotland from English DCs such as Daventry are received at the rail terminal at the port of Grangemouth.

The Coatbridge site can handle approximately 120,000 TEU annually, and had been getting close to that limit before the recession. However the gantry cranes are reaching the end of their lifespan. Furthermore, to increase capacity the site would need to be redeveloped. This could be done without additional land space but the issue is money – current government funding would not apply to such development, and as a profit-making company Freightliner would be expected to fund the work themselves.

The problem behind modal shift is the need to have demand in place, rather than simply building or extending facilities on a speculative basis. If large shippers such as supermarkets can be persuaded to restructure their logistics chains around intermodal nodes, then the concept can work. But building a site and railhead is to no purpose if no one is going to use it. Interestingly, in 1994 McKinnon [63] questioned whether the (then proposed) Mossend site would be fully utilised. He also predicted the use of offshore RDCs for UK cargo, although he was thinking of rail links through the channel tunnel rather than utilising maritime linkages: ‘Some foreign manufacturers currently holding stock in the UK, often at warehouses in southeast England or the Midlands, are likely to centralise their inventory in northern France or the Low Countries and distribute their products from there to the UK market via regional transshipment depots’. (p. 79) Returning to the same subject fifteen years later, McKinnon [64] suggested that this (by now existing) trend of UK retailers making use

of offshore warehousing in Europe would continue, mostly driven by large retailers, who also disproportionately determine logistics chains and DC development in the UK: ‘Since 2004, roughly 60% of the demand for large DCs has come from retailers’ (p. S295).

## **6. Port centric logistics**

The buzzword of port centric (or port-based, port-located, etc.) logistics is beginning to be used in the industry [65, 66]. Mangan et al. (2008) define port centric logistics as ‘the provision of distribution and other value-adding logistics services at a port’ (p. 36). Being critical, one could say that the new term describes little other than the standard practice of providing warehousing services at ports. However in the context of the recent increase in research on the importance of inland terminals, perhaps a renewed focus on the potential of the port as a logistics hub is warranted. Revisiting the potential of port-based versus inland-based logistics can even be viewed as another name for optimising the primary and secondary legs of the supply chain, challenging the inertia of supply chains that were constructed in different contexts.

From a port’s point of view, this allows them not only to secure cargo throughput, but to earn additional revenue from these activities on their land [66]. Whether this presents an attractive option to a port depends on how much land is available and the quality of the hinterland connections. Mangan et al. [65] also draw on the choice of supply chain taxonomy developed by Christopher et al. [67]: lean, agile and the hybrid leagile (leanness and agility were also applied to port operations by Paixão and Marlow [68]). Relevant for the offshore DC concept developed in this paper is the choice of where to store the goods: at the exporter’s warehouse, the importer’s warehouse, the port of export or the port of import.

Monios [58] identified an emerging conflict of strategy between inland intermodal terminals and port centric logistics. When using an inland intermodal terminal, containers are transloaded from rail to truck then taken to RDCs for stripping, then trucked empty back to the depot at the inland terminal (or maybe another depot). Or if the customer is located within warehousing/logistics areas adjacent to the terminal, the container can be stripped and the empty returned immediately to the onsite depot. How quickly the container must be returned to the port will depend to a large degree on whether the shipper has selected carrier or merchant haulage.

If utilising a model of port centric logistics, import containers are offloaded from ships, shunted to the warehouse, stripped, and the empty then returned for repositioning. The load will then be reconfigured for inland movement. Potential efficiencies arise as this movement

may be direct from the port-based DC to the final store or shipper, thus removing the inland DC from the chain, which also raises the possibility (depending on rail connections) of using rail on a single long movement rather than two shorter links. However this model is not without criticism. Firstly, it may seem to reduce the value of intermodal transport if the unitised load is stripped at a node rather than completing a seamless door-to-door journey. Secondly, leaving import containers at ports reduces inland container availability for exporters.

The inland strategy is attractive to the port if they are experiencing congestion and therefore by moving non-essential activities inland they can retain customers. Based on the product lifecycle theory and following Schaeztl [69], Cullinane and Wilmsmeier [70] argued for ‘location splitting’ (standortspaltung) as a means to extend the port life cycle when limitations in feasible rationalisation, investment and access are reached. Such creation of a subsidiary in the hinterland provides a potential solution that avoids an inevitable decline, invoked either through the inappropriateness of the actual port location or a newly emergent regime of competition.

The port could take a financial stake in the inland node in order to recoup revenues lost from storage or logistics activities, but even without actually investing in the site, it enables the port to retain (or attract) customers, therefore the port may lose some storage revenue but gain revenue from additional throughput, which is the core business. But if the port has plenty of room for storage and other activities, then the port authority would prefer customers to perform these tasks onsite and thus bring additional revenue streams to the port.

Port centric logistics is of particular relevance to the UK because the logistics paradigm is changing. The current paradigm revolves around the ‘golden triangle’ of distribution centres in the midlands. This system is based around the motorway network and was developed in the 1980s when most products and materials were sourced from within the UK therefore centralised distribution made sense. Now that the majority of products come through ports, it may not be efficient to haul containers to a central location then send the contents outward again. As leases on these warehouses come up for renewal over the next few years, it will be interesting to note whether they are renewed or whether certain market sectors relocate to locations nearer the major ports, or even at offshore ports. This decision will depend on the requirements of the shippers, based on their market sector, time limitations and mix of foreign- or locally-sourced goods. In order to make such decisions, shippers and 3PLs need to find a balance between the cost and time of primary and secondary distribution legs. This optimisation of distribution legs can be related back to Weber’s conceptualisation of weight-

gaining and -losing industries. Heavy containers can be kept off the road network, used on primary legs from ports to inland intermodal terminals, then into trailers only for the secondary haul. Alternatively, containers can be emptied in ports and their contents stored onsite; stock can then be picked and put on trailers direct to stores rather than via a diversion to a central DC.

Many medium-sized ports in the UK are pursuing port centric logistics as a way of competing with larger ports. This can be seen as one way to approach what has been called ‘the challenge of the periphery’ [71, 72]. Indeed, even large ports like Felixstowe are using this strategy where possible and the new development at London Gateway is designed as a port centric operation.

One question to be considered when comparing these strategies is which is better for the repositioning of empties, which is a pressing concern in many countries with an imbalance of flows, including Scotland. Moreover, which system is better for traffic flows? Are loads broken down into trailer shipments or reconsolidated into larger flows suitable for inward movement by rail? How do these considerations affect likelihood of government support for such projects?

*Case: Port centric logistics (onshore)*

Warehousing developments at the port of Grangemouth have received government funding in the past, indicating government support for a strategy of port centric logistics by which the port authority is aiming to develop retail business at the site. Similarly, the national government has funded various improvements to road and rail access to the port, hoping to overcome congestion issues. But such strategies for future growth at the site need to be considered in the context of where this demand will be sourced and what logistics requirements these flows will have. Are future increases likely to be containers or trailers?

The port of Grangemouth is lock-restricted and has limited water depth, and will struggle to compete with other ports that can adapt to larger ship sizes. Its current capacity is 300,000 TEU, and while speculative development plans have been drawn up to increase capacity, without additional berthing space and given lock restrictions, such developments are unlikely to achieve large increases in throughput. The prime factor in Grangemouth’s favour is that it is on the south shore of the Forth estuary, thus close to the central belt of Scotland. Judging by recent grant success, Grangemouth is the location favoured by central government for port development. The question is whether any other site can offer a practical alternative.



A good example of port centric logistics is the development of large logistics areas by major retailers ASDA and Tesco in the port of Teesport in England. The use of the first mover advantage will have potential effects for the northern UK, including Scotland. Figure 4 shows the position of the Scottish sites, relative to the two main conurbations Edinburgh and Glasgow. One question is whether port-based distribution is better than inland-based distribution as a general paradigm for the UK. But the secondary question is, even if correct, how would this affect Scotland? If large English DCs moved to English ports rather than their current locations in the midlands, how would that affect the way Scotland's unitised trade moves? Will it be more likely to come via road, rail or sea? Are port-based developments required in Scotland or will the main nodes, warehousing and VAL of Scottish trade remain in England? Thus the proactive development of port centric logistics at English ports such as Teesport will exert a strong influence on future directions for logistics in Scotland.

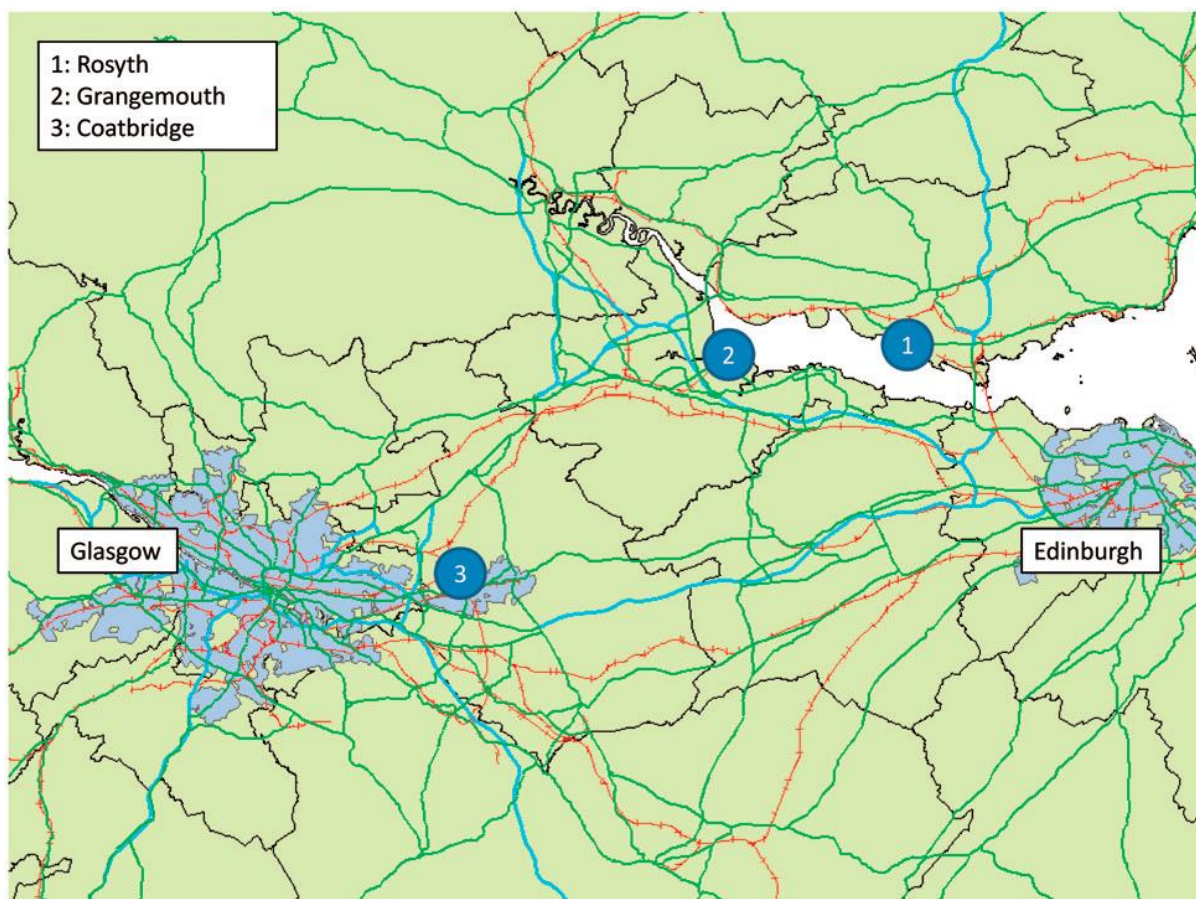


Figure 4. Map showing location of sites under discussion.

Source: Authors. Contains Ordnance Survey Data. Crown copyright and database right 2012.

#### *Case: Port centric logistics (offshore)*

In contrast to port centric logistics at a Scottish port (Grangemouth), there exists the possibility of port centric logistics at an offshore port, accessing the site through maritime

linkages. Scotland's peripherality means that land-based RDCs bring their own difficulties (e.g. congested roads, infrequent rail services), therefore using natural maritime highways to access offshore DCs can be a potential solution. The port of Zeebrugge is not the only potential choice, but it is used here because it is already a large distribution centre for Europe, and it has the only direct RoRo service with Scotland (Rosyth on the north shore of the Forth).

An order picked at a Zeebrugge DC at 14.00 on day one can be in Glasgow at 15.00 on day two. What is required for a successful application of this concept is a new transport chain incorporating inventory management at each node. Supply chains are now being used actively to manage inventory levels in such a way as to minimise storage costs [49], and these would therefore be a major factor in the above analysis. Large shippers with purpose-built warehouses at an offshore DC can achieve lower storage costs at the same time as managing their flows better, for example storing generic products and only customising them (e.g. adding labels) for foreign markets before shipment. From an institutional perspective, one must remain cognisant of the transference of jobs overseas that would result from this model, thus institutional pressure in Scotland and the UK would militate against this choice, even if it were proved to be more efficient from a transport, logistics or even environmental perspective.

As well as the current ferry berth (owned and operated by Forth Ports), Rosyth has an adjoining site (owned by Babcocks) that is proposed to be developed into a container terminal, thus introducing competition into the Forth estuary. However as Rosyth is on the north shore of the Forth, distribution would be more difficult than from Grangemouth. On the other hand, it would provide empty containers to whisky exporters on the correct (north) side of the water. In terms of the equipment imbalance mentioned earlier, it may be that a ConRo vessel is required on this route, which would also help achieve economies of scale on the route to make it more attractive to operators.

As in all three cases, a strategy of 'standortspaltung' can only be successful if the transport link between the port and its subsidiary locations is of significant quality that it allows for a sufficient level of throughput [70] and integration of operations. However maintaining this spatial fix of a regular continental access point at Rosyth is proving difficult. Public agencies are attempting to shore up the service through research on local demand and relationship building with industry, but fragmented institutional responsibilities and the role of this route and its assigned vessels in the wider RoRo network remain challenges. A problem with sourcing backloads from Scotland to the continent needs to be addressed, and

changing schedules can cause Scottish road hauliers to drive to English ferry ports to access the continent (as well as trucks using landbridge routes from Ireland via west coast Scottish ports). Despite a great deal of work to establish the route [4] and money from the Scottish government (more an incentive grant than an operating subsidy), the Rosyth-Zeebrugge ferry service has been through three operators in as many years, thus a number of economic, operational and institutional difficulties need to be overcome.

## **7. Port development, policy failure and peripherality**

In the Scottish government's 2009 National Planning Framework fourteen 'national developments' were identified, two of which are relevant here: 'Grangemouth freight hub' and 'Additional container freight capacity on the Forth' [73]. However the document itself is vague on what it actually means to be designated a national development, other than the nebulous promise that 'planning authorities are required to take the Framework into account' (p. 1) in other development decisions by regional and local authorities, but the document states that 'this is not a spending document' (p. 2).

The Coatbridge intermodal terminal is not mentioned, indicating that government assistance would be unlikely. The private operator Freightliner would be required to fund the site development.

In order to assess the most suitable strategy that will contribute towards overcoming Scotland's double peripherality, a detailed analysis of several factors will be required. The policy and funding environment has been touched on here and discussed in more detail elsewhere [74]. The economics of each development will obviously be the major factor, but these costings will depend on other decisions such as the potential design of shipping networks, capacity and frequency, ship size, vessel type (e.g. ConRo), and relations to other ports. For example, if large supermarkets ASDA and Tesco will use feeder ships from their DCs at Teesport, what effect will this have on potential developments in Scotland? What if they use overland modes instead? Will more lorries be used? Will new rail shuttles be established, requiring terminal sites in new locations?

Obstacles to these developments include a lack of information in the public domain, preventing modal shift and making intermodal freight appear complicated and unattractive for shippers. Greater cooperation is needed so that 3PLs and other transport providers cooperate where it makes sense (i.e. on large infrastructure projects or sharing space on intermodal services) and compete for customers. Greater effort needs to be focused on coordinating terminal capacity in the central belt and developing mixed-use rail shuttles. The

UK Office of Rail Regulation is currently investigating whether retaining ownership of unused intermodal terminal sites (including some in the central belt of Scotland) by some rail operators represents anti-competitive behaviour [75].

In terms of attracting more robust government support, the measurement of environmental factors and potential subsidy schemes will be important. Which option will result in the lowest transport distance, particularly but not exclusively road miles? Will port centric logistics result in fewer empty movements? Will it help to improve Scottish shippers' access to empty boxes for export?

A question remains that was not asked earlier. Why does Scotland have a load centre terminal? Such inland gateways, inland ports or 'dry ports' are normally used by countries that are landlocked or otherwise suffer from poor port access. A country that has its own ports would normally conduct the majority of external trade through these gateways. Coastal feeder from Felixstowe to Grangemouth is cheaper than rail and far cheaper than road, yet road remains the dominant mode due to strategies of centralisation and agglomeration. A lack of maritime policy for Scotland has led to development failure [4] and these historic reasons have led to a dependence on English ports, both by road and via the Coatbridge inland terminal.

Scottish ports are now attempting to attract flows by maritime linkages, predominantly through port centric logistics strategies, but one question to be asked is why these strategies were not in place thirty years ago. The answer is that the institutional framework has imposed constraints on available options. A UK government favouring external gateways in southern England, and a policy of full privatisation (as opposed to the landlord model) removed government influence on port development. This institutional structure resulted in path dependency and influenced subsequent actions, further embedding the secondary role of Scottish ports and limiting their development as gateways. Now that Scottish ports are attempting these strategies, they are already being challenged by developments at Teesport. This English port has used the first mover advantage and this decision will have repercussions for Scottish external trade flows in potentially unexpected directions.

When Coatbridge was built, transport governance was scaled at a UK level, and the rail network was owned and operated by the state, but rail infrastructure and operations were vertically separated and privatised before transport governance was devolved to Scotland. Similarly, most UK ports were privatised before transport governance was devolved to Scotland. Zeebrugge clearly does not come under Scottish governance but as the location of Scotland's only ferry link with the Continent, it is of crucial importance to Scotland's

accessibility, a goal of governments at all scales. Now that transport governance has been rescaled and responsibilities spread across the UK, Scotland and the Scottish regions, attempting to achieve the best result from the current freight nodes is difficult, especially as they are owned and operated by private companies. Responsibility for developing these spaces or implementing new ones is fragmented across a multi-scaled planning system.

Clearly the best result for shippers is a variety of options across all modes. What needs to be determined is whether the multiple scalar fixes of the different levels of transport governance, which are themselves based on political spatial fixes whose boundaries and authority do not always align territorially and relationally (e.g. Scottish regions), are able to align freight flows across spatial fixes represented by a system of freight nodes. Container ports, inland intermodal terminals and RoRo links to offshore hubs all need to be coordinated in tandem with the provision of well-located and well-connected warehousing, distribution and logistics facilities. Therefore analysing the policy, planning and operational contexts of these spatial fixes from the perspective of the ‘wide range of geographically specific policies oriented differentially towards cities, industrial districts, regions, growth poles [and] peripheries’ [21] can reveal reasons behind their success or failure rather than the simple indicator of regional demand, which may be diverted through artificial priority corridors related to (often unconscious) political designs.

This paper has aimed to develop understanding of the relationship between the function of transport nodes, the likely drivers of development and the role of government policy and planning in linking the two. The natural evolution of transport nodes can be distorted by governance issues resulting from peripherality. But whose role should it be to create incentives for this cargo to break path-dependence? How can it be done? In particular, one must remain cognisant of the difficulty of predicting the effect of government investment [10]. Therefore an understanding of how these processes work is central to analyses of freight infrastructure development.

A number of studies have been performed over the years for the Scottish government, providing data on freight flows and potential port and inland terminal locations or development strategies (e.g. [76, 77, 78]). Yet, despite locations being promoted in government policy publications, these do not result in action. In each of the developments proposed above, both public and private benefits can be obtained, and both government agencies and private stakeholders aim to pursue a strategy whereby they can achieve maximum benefit for minimum risk. In evaluating such complex situations, an appreciation of the political and institutional relations will be required. The shifting territorial and

relational construction of political scalar and spatial fixes (i.e. UK, Scotland, Scottish regions) must be aligned with the spatial fixes represented by freight nodes that are often planned or given financial support without an appreciation of the system-wide perspective. These sites then exert a decades-long legacy impact on the structure of logistics and transport systems, while the temporary political scalar and spatial fixes change around them.

## **8. Conclusion**

Exploring how the perspective of space is treated in maritime geography as compared with other areas of geography has contributed to providing a firm theoretical grounding for recent maritime transport geography concepts, which in the opinion of the authors has been lacking in the literature.

As noted earlier, a full institutional analysis is beyond the scope of this paper, and will be performed in a future paper by the authors. The aim here has been to make the case for such a cross-disciplinary approach. The discussion of peripherality and responses to this by states at different scales has revealed how the three freight node concepts can be viewed as examples of issues prevalent in other areas of geography, namely how these concepts represent attempts at spatial fixes and thus must be analysed in that way.

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