GOVERNANCE FRAMEWORK

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GreCOR WP4 project report

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## Contents

1. Introduction .................................................................................................................................................. 2
2. Definition and previous applications of governance ................................................................................. 4
3. Port governance ........................................................................................................................................... 5
4. Governance of intermodal terminals ........................................................................................................ 7
5. Governance in logistics ............................................................................................................................... 9
6. Issues impacting on governance at intermodal terminals and logistics platforms ......................... 11
   6.1 Overview ................................................................................................................................................ 11
   6.2 Terminology .......................................................................................................................................... 12
   6.3 The development process ..................................................................................................................... 13
   6.4 Selling or leasing the site to an operator .............................................................................................. 15
   6.5 Relationship between the intermodal terminal and the logistics platform ........................................ 16
   6.6 Function of the site and operation model .............................................................................................. 17
7. Developing the typology ..... ......................................................................................................................... 20
   7.1 Development and ownership ................................................................................................................. 20
   7.2 Relation between owner and operator .................................................................................................. 20
   7.3 Internal operation model ...................................................................................................................... 21
   7.4 External operation model ...................................................................................................................... 21
   7.5 The typology ......................................................................................................................................... 21
8. Discussion ................................................................................................................................................... 23
9. Conclusion and research agenda ................................................................................................................ 24
References ...................................................................................................................................................... 25
1. Introduction

Against a policy background in which governments seek to promote intermodal transport, intermodal terminals, logistics platforms and intermodal service developments have received significant public funding, particularly in Europe. Difficulties in securing traffic have been noted in the literature, and one way to address this has been the location of intermodal terminals and logistics platforms either near each other or as part of an integrated site. However, research has shown that this does not necessarily result in increased modal shift to rail. The motivation for this research is the need to understand the relation between the intermodal terminal and the logistics platform. This will be done through the application of governance theory, which examines different ways of managing resources and relationships in order to achieve a desired outcome.

Port governance has been treated comprehensively in the literature; however, despite an extensive literature on the development and operation of intermodal terminals and logistics platforms, governance has rarely been addressed directly, although it has been touched upon as part of other discussions. This could be partly because discussions on classification of inland terminals have focused on the terminology to describe the overall site, such as dry port, inland port, freight village, etc. Yet, regardless of which overall term is adopted, various models of site ownership and operation are in evidence. Another reason could be because these sites tend to be smaller concerns than ports, with simpler ownership and operational structures. As transport and logistics become more integrated and simultaneously more complex, relations between intermodal terminals and their often-related logistics platforms or freight villages need to be addressed.

A node may be defined simply as a location or a point in space; in the case of transport this would represent an origin or destination of a linkage. Nodes can also be defined as points of articulation, interfaces between spatial systems (Rodrigue, 2004), particularly different levels (e.g. local and regional) and types (e.g. intermodal connections). The articulation concept can also include joining different categories of activity, for instance joining the transport activity with processing or storage, all activities within the wider logistics system (Hesse & Rodrigue, 2004). Classification of freight nodes remains difficult; Notteboom and Rodrigue (2009) stated that “Each inland port remains the outcome of the considerations of a transport geography pertaining to modal availability and efficiency, market function and intensity as well as the regulatory framework and governance” (p.2).
The goal of this report is to develop a typology of governance encompassing intermodal terminals and logistics platforms, which will be used in the analysis of cases in GreCOR WP4. It is argued that previous work on governance that addressed the relationship between the owner and operator must be extended to include the operational model, as the potential success of intermodal transport services relies on the logistics model of the clients and the relations with transport actors such as rail operators and port terminal operators.

An inductive methodology is used to derive the governance typology from an analysis of the literature, including previous work by the author. While cases extant in the literature are discussed in this report, the typology cannot be induced solely from a direct analysis of such cases, as many of the necessary features are not recorded in the case study analyses. Rather, they have been raised indirectly in discussion of issues relating to successful intermodal transport. Yet, as shown in the supply chain literature, it is not simply who owns or operates the site but the internal and external relations between actors that need to be understood. As with analyses of supply chain integration, it is not solely the attributes of each actor but the characteristics of their relationship that determine the features of the collaboration model and its success. Thus, in addition to the governance literature and the transport and logistics literature, the supply chain management literature, with its greater detail on governance and process integration, will prove particularly useful in this endeavour.

While port governance has traditionally focused on the relation between the owner and the operator, this view of governance will be extended through the analysis of three key relationships; first, between the logistics platform and the site tenants (therefore encouraging consolidation and efficiencies that can boost rail services at the site); second, between the terminal operator and rail service provision (which can aid service planning and keeping trains full); and third, between the inland site (either terminal, logistics platform or both) and port(s), (thus enabling better planning and efficiency of port rail shuttles).

The report begins with a review of the literature on governance, before addressing applications of governance in ports, intermodal terminals and logistics. As governance theory has rarely been applied directly to intermodal terminals and logistics platforms, the large literature on intermodal transport and logistics will then be reviewed to establish the key topics with relevance for governance. Different models of collaboration and integration are discussed via examples from the literature. In section seven a governance typology is derived from these topics, based on four elements: development and ownership, operational governance, internal operation model and external operation model. The typology is then discussed before considering the implications of these models for policy aims to encourage
modal shift to intermodal transport. Section nine concludes with suggestions on how to take these findings forward in new research, which is the goal of GreCOR WP4.

2. Definition and previous applications of governance

In the simplest terms, governance refers to an act or process of governing. While in the past it has often been used interchangeably with government, in the last two decades governance rather than government has become the preferred term. As power is devolved from governments to other bodies and representation of other interests is increased, official government institutions become only one part of the totality of the governance process (Jordan et al., 2005). Governance then becomes a broader process of distributing authority and allocating resources, of managing relationships, behaviour or processes to achieve a desired outcome.

An understanding of governance cannot be separated from an appreciation of the role of institutions, although a full analysis of this topic lies beyond the scope of this report. Institutions can be social and cultural norms or any of the “rules of the game” (North, 1990) or “shared beliefs” (Aoki, 2007) under which organisations act. Key elements of institutional analysis include a potential conflict between an organisation’s legitimacy and its efficiency or agency (Meyer and Rowan, 1977; Monios & Lambert, 2013), difficulties in transferring a governance structure from one institutional setting to another (Meyer and Rowan, 1977; Ng and Pallis, 2010), the constant changing and re-making of institutions (Jessop, 2001), scale issues leading to complications through confused sovereignty, multiple authorities and funding sources (Meyer and Scott, 1983; Scott and Meyer, 1983), and the path-dependent trajectory of institutional development (David, 1985; Arthur, 1994; Martin, 2000). One must also recognise not only formal but informal institutions (González and Healey, 2005). Under this new regime, the state becomes “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” (Jessop, 1990; pp. 269-270). The state is elsewhere described as a “polymorphic institutional mosaic” (Brenner, 1999; p.53), and spatial scales are “perpetually redefined, contested and restructured in terms of their extent, content, relative importance and interrelations” (Swyngedouw, 1997; p141), “a series of open, discontinuous spaces constituted by the social relationships which stretch across them in a variety of ways” (Allen et al., 1998; p. 5).

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1 See Rodríguez-Pose (2013) for a recent overview of the institutional literature.
In moving away from territorial political boundaries, an essential component of governance becomes its relational element. While political structures are ostensibly linked to territorial spaces (e.g. physical boundaries), their legitimacy and agency are relationally constructed, through the power of regional elites and industry players (MacLeod, 1997; Allen & Cochrane, 2007; Monios & Wilmsmeier, 2012b). Thus governance becomes increasingly about working across boundaries, between government organisations, non-government organisations and individuals, as well as incorporating multiple scales of government (Marks, 1993; Hooghe & Marks, 2003). This process is linked partly to recent trends towards decentralisation and devolution (Peck, 2001; Rodríguez-Pose & Gill, 2003), which nonetheless are not necessarily an actual transfer of power but more of a qualitative restructuring (Brenner, 2004), characterised as uneven processes of hollowing out (Rhodes, 1994) and filling in (Jones et al., 2005; Goodwin et al., 2005) that can result in asymmetrical acting capacity.

As well as the changing role of political institutions, much governance literature is about process, asking questions about how power should be exercised, performance measured and outcomes regulated. This focus relates to the core of the difference between governance and government. It is not necessarily about the location of official responsibility but how a process is governed and an outcome achieved. These outcomes could include areas such as climate change, resource management, transport provision, accessibility and social inclusion. Effective governance can limit damage and protect social rights by regulating access to an environment, whether that be regulating access of mining companies to protect water quality or regulating car use to reduce local air pollution. Any political outcome can be debated in terms of which governance model will best achieve it, but the outcome itself must also be considered. Effective governance is not always measured by, for example, a measured reduction in an undesirable outcome such as pollution. Increasing representation of minority stakeholders can be a goal, as well as improved transparency and accountability. In the field of (non-freight) transport, governance and institutional approaches have been applied predominantly to transport provision and its regulation by government organisations (Stough & Rietveld, 1997; Pemberton, 2000; Gifford & Stalebrink, 2002; Geerlings & Stead, 2003; Marsden & Rye, 2010; Curtis & Lowe, 2012; Legacy et al., 2012).

3. Port governance

Similar discussions can be had in freight transport, for example assessing the result of policy enactment through funding schemes or planning decisions for an intermodal terminal,
limiting emissions or allowing market entry. One well-known application is the role of multi-level governance in the regulation of shipping policy, involving actors at international, supranational, national, regional and local levels (Pallis, 2006; Roe, 2007, 2009; Verhoeven, 2009).

The major application of governance theory to freight transport has been to port governance. As major engines for driving economies, control of ports is a significant lever for governments to manage trade and its attendant economic benefits. Over recent decades, a general trend has been observed for port management to move from the public to the private sector. Numerous studies have examined different models of port governance (e.g. Everett & Robinson, 1998; Baird, 2000, 2002; Hoffman, 2001; Baltazar & Brooks, 2001; Cullinane & Song, 2002; Brooks, 2004; Brooks & Cullinane, 2007; Pallis & Syriopoulos, 2007; Brooks & Pallis, 2008; Ferrari & Musso, 2011; Verhoeven & Vanoutrive, 2012). The World Bank (2001, 2007) identified four models: the public service port, the private port, the tool port (a mixed model where private sector operators perform some of the operations but under the direction of public sector managers) and the landlord port (the public sector retains ownership while the terminal management and operations are leased to private sector operators). While the landlord model has become increasingly common across the globe, and indeed encouraged by the World Bank and others, implementation of port devolution policies has been observed to vary according to local conditions (e.g. Baird, 2002; Wang & Slack, 2004; Wang et al., 2004; Ng & Pallis, 2010).

It is not simply the initial devolution process that is relevant but the ongoing reform of port governance, entailing a focus on the specifics of various processes in which a port actor might engage. For example, the influence of shipping networks (Wilmsmeier & Notteboom, 2011), the role of the port authority in the cluster of associated businesses and services agglomerated around a port (Hall, 2003; de Langen, 2004; Bichou & Gray, 2005; Hall & Jacobs, 2010), the development of new competencies such as hinterland investment (Notteboom et al., 2013), port competition (Jacobs, 2007; Ng & Pallis, 2010; Sanchez & Wilmsmeier, 2010; Jacobs & Notteboom, 2011; Wang et al., 2012) or the devolution of port governance from one level of government to another rather than from the public to the private sector (Debrie et al., 2007).

Advantages of greater private sector involvement in ports include increased efficiency and reduced cost to the public sector, while negative impacts include the loss or increased ambiguity of state control as well as the difficulties and risks involved in managing the tender process and subsequent monitoring (Baird, 2002). However, it has been found that
governance decisions are not always related to port performance (Brooks & Pallis, 2008). Debrée et al. (2013) pursued a deeper contextualisation of port governance models, adding a spatial element by combining the institutional context (relationship between public and private actors and relative decision-making powers) with characteristics of the local market and societal and cultural factors impacting on motivations for public intervention. Such contextualisation is essential because applying a generic governance model in different local settings can lead to asymmetric results (Ng & Pallis, 2010). Bichou & Gray (2005) asserted that simple taxonomies are difficult because of the diversity of port functions (see also Beresford et al., 2004; Sanchez & Wilmsmeier, 2010), and suggested that three elements are generally included: the role of public and private actors, the governance model and the scope of facilities, assets and services. This approach will underpin the current report’s attempt to expand simple terminal governance models with a strong operational component.

4. Governance of intermodal terminals

Operational issues arise from the nature of intermodal transport, as well as being derived from the development models and main functions of the site. Much literature\(^2\) has addressed the economic difficulties of developing rail shuttles, the roles of the main actors and the importance of aligning cargo requirements with intermodal service requirements (e.g. Van Schijndel and Dinwoodie, 2000; Ballis & Goliad, 2002; Woodburn, 2003; Arnold et al., 2004; Runhaar & van der Heijden, 2005; Janic, 2007; Slack & Vogt, 2007; Kreutzberger, 2008; Van der Horst & de Langen, 2008; Kim & Wee, 2011; Woodburn, 2011; Eng-Larsson & Kohn, 2012). The institutional constraints on the intermodal freight system in general and site development in particular have also been addressed (Hesse & Rodrigue, 2004; Notteboom & Rodrigue, 2005; Rodrigue, 2006; Roso, 2008; Rodrigue & Notteboom, 2009; Rodrigue & Notteboom, 2010; Rodrigue et al., 2010; Flämig & Hesse, 2011; Ng & Cetin, 2011; Wilmsmeier et al., 2011; Monios & Wilmsmeier, 2012b; Padilha & Ng, 2012; Ng et al., 2013).

Consolidating traffic to support intermodal corridors is essential, leading to the increasing focus of logistics platforms being considered as part of the transport designation. In the past, intermodal terminals have been the main focus of the literature, with logistics platforms being addressed separately in the logistics literature (see next section). Confusingly, in the transport

\(^2\) While intermodal transport includes container movements by both rail and barge, rail transport is by far the most common topic in the literature, e.g. Choong et al., 2002; Triep & Bontekoning, 2002; Groothedde et al., 2005; Konings, 2007; Konings et al., 2013) tends to focus on operations rather than terminal development and governance issues.
literature in recent years, both functions have been covered interchangeably, without addressing the governance issue and how the two functions and physical spaces relate to each other. This problem forms the motivation for the typology developed in this report.

While the last five years have seen an explosion of papers on intermodal transport and intermodal terminals, governance has rarely been addressed directly. This is partly because inland freight nodes tend to be smaller concerns than ports, with simpler governance structures and less government involvement. While landlord models are in evidence, government involvement is more likely in the start-up phase using public money to attract a private operator into the market, after which it is assumed that the site will be run by private operators with no further government involvement (although there are exceptions, as discussed in this report).

Beresford et al. (2012) applied the World Bank port governance model (public, tool, landlord, private) to dry ports, a useful approach for examining the relationship between the owner and operator. Beresford et al. (2012) also drew on the ESCAP (2006) concentric model (Figure 1), beginning with the container yard and container freight station, expanding out to an ICD for customs processing, then logistics and finally to related processing and industrial activities on the periphery of the area.

Figure 1. Potential expansion of functions at an inland intermodal facility
(Source: UN-ESCAP, 2006)
Similarly, in the model of Rodrigue et al. (2010), the intermodal terminal is at the centre of the activity, and a larger ring includes any logistics activities that may or may not be part of the same site, and finally a third level for any wider retail and manufacturing activities in the hinterland that may be loosely related to the site (Figure 2).

![Functional relations between inland ports and their hinterland](Source: Rodrigue et al., 2010)

Thus the intermodal terminal and the logistics platform as well as any wider activities are all encompassed within their broad three-level typology.

Concentric representations can be misleading, as such a formulation suggests that the intermodal terminal is situated at the heart of a unified logistics platform. In reality, the terminal will be found at the edge of the site and will primarily serve customers external to the logistics platform. Moreover, in most cases the terminal(s) are separate to the logistics platform, perhaps placed next door to a large logistics platform (but still requiring entry and exit via a separate gate entailing appropriate security operations), a few miles away (thus requiring an additional road haul), or otherwise located in an area with several logistics operations of varying sizes, types and specialisations, which may or may not have requirements suitable for intermodal transport.

5. Governance in logistics

Analysis of governance in the logistics literature derives from supply chain integration, a subset of which is logistics integration. Motivations for supply chain integration include cost
Governance framework

reduction through efficiency advances, resource complementarity, customer requirements, technology adoption, changes in supply chain partners and structure and competitive pressures, while potential challenges are lack of top management support, misaligned incentives, lack of trust, lack of information sharing, inconsistent performance measures and lack of joint decision making (Whipple & Frankel, 2000; Min et al., 2005; Simatupang & Sridharan, 2005; Cruijssen et al., 2007; Fawcett et al., 2008a, 2008b; Richey et al., 2010; Guan & Rehme, 2012). One important point is that internal integration is required as well as external. For example, integration of planning between the logistics and purchasing department is necessary if the logistics department is attempting to integrate services with external organisations (Stank et al., 2001; Gimenez & Ventura, 2005; Lambert et al., 2008; Chen et al., 2009).

Governance models adopted stretch from a purely transaction- or market-based approach at one end to a fully integrated or hierarchical ownership model at the other (Golicic & Mentzer, 2006; Rinehart et al., 2004). The former are governed by contracts of varying duration, regularly compared with the price and service offered by competitors, whereas integration models can include an outright purchase or merger of one firm by another or the creation of a new organisation through a joint venture. In between these two extremes lies a variety of dynamic hybrid or relational models such as written contracts without equity involvement and minority stake agreements (Williamson, 1975; Parkhe, 1991; Dussauge & Garrette, 1997; Klint & Sjöberg, 2003; Rinehart et al., 2004; Todeva & Knoke, 2005; Halldorsson & Skjøtt-Larsen, 2006; Humphries et al., 2007; Schmoltzi & Wallenburg, 2011). As well as classifying such models according to equity stake, they can also be characterised by increasingly integrated services, from basic cooperation to coordinating business planning to strategic long-term process collaboration (Spekman et al., 1998; Lambert et al., 1999; Whipple & Russell, 2007).

Market or contractual governance means that relationships are managed through contracts with incentives or penalties. As firms move towards greater collaboration, relational characteristics such as trust, information sharing and mutual decision making become more important. Different mechanisms can be used to coordinate partner relationships, such as monitoring, incentives/hostages and social enforcement based on personal relationships (Dyer & Singh, 1998; Wathne & Heide, 2000; Hernández-Espallardo & Arcas-Lario, 2003).

In transport, governance is about coordination of service requirements (as shown in section 4), but in logistics and supply chain management the focus is on firm creation (transaction costs, make vs buy, internalise vs market-based – for transaction cost economics
see Coase, 1937; Williamson, 1975, 1985; Wilding & Humphries, 2006) and resource utilisation (for more on the resource-based view see Wernerfelt, 1984; Barney, 1991; Dyer & Singh, 1998; Lavie, 2006; Hernández-Espallardo et al., 2010; Peters et al., 2011; Schmoltzi & Wallenburg, 2011), leading eventually to a relational or network approach (Dyer & Singh, 1998; Pfohl & Buse, 2000; Skjoett-Larsen, 2000; Zacharia et al., 2011).

Bowersox et al. (1989) established a 5-stage model of logistics integration:

1. Single transactions
2. Repeated transactions
3. Partnerships
4. Third-party agreements
5. Integrated logistics service agreements.

In this model the partnership stage is when the shipper retains control of planning and management, while a third-party agreement is when the 3PL takes a more direct role in the relationship with a tailored service requiring information sharing, which increases the level of trust required. Finally, an integrated service agreement is where the entire logistics function or at least large parts of it have been outsourced to the 3PL. This will necessarily require a higher level of information integration possibly through joint ICT, and may also include additional value-added services as the inventory may in fact be stored at warehouses operated by the 3PL. Integration can even involve the placement of an “organisational implant”, which is when a representative from a 3PL is placed within the client organisation (Grawe et al., 2012).

Thus the key issues from logistics governance relate to internal and external resource and relationship management, in terms of providing logistics services, and how integrated the logistics service provider is with the planning of the shipper.

6. Issues impacting on governance at intermodal terminals and logistics platforms

6.1 Overview

The governance models discussed in previous sections provide a useful beginning as they highlight the relation between the owner and operator and the separation of the transport function from the logistics function, as well as the role played by the trade-related activities at the periphery. They do not, however, disaggregate and identify the different kinds of relations between each level. The governance literature highlights the importance of working across
boundaries and achieving cooperation among various interests and voices, and the supply chain literature explicitly requires consideration of internal and external integration processes.

These issues have been transformed into four research topics to be addressed:

1. The development process, including the roles of the public and private sectors
2. The relation between the original developer and the eventual operator, including selling and leasing
3. The relationship between the transport and logistics functions, and other issues internal to the site
4. The site functions and operational model, including the relationships with clients and external stakeholders.

Each of these topics will be addressed in its own section, but first the terminology issue will be addressed briefly.

6.2 Terminology

The terminology of intermodal terminals and logistics platforms has been a continuous theme in the literature. Two main streams emerge: the transport function and the logistics function. Table 1 lists the terminology extant in the literature, divided into terms for the transport function, the general logistics function and specific logistics functions.

<table>
<thead>
<tr>
<th>Transport function</th>
<th>Logistics function (overall)</th>
<th>Logistics function (specific)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail or barge terminal</td>
<td>Logistics park</td>
<td>Inland clearance depot (customs)</td>
</tr>
<tr>
<td>Intermodal terminal</td>
<td>Logistics platform</td>
<td>Dry port (customs)</td>
</tr>
<tr>
<td>Inland terminal</td>
<td>Freight village</td>
<td>Container freight station (de-stuffing, consolidation)</td>
</tr>
<tr>
<td>Modal interchange</td>
<td>ZAL</td>
<td>Inland container depot (empty container storage)</td>
</tr>
<tr>
<td>Inland port</td>
<td>GVZ</td>
<td>Warehouses or DCs (storage, processing, etc.)</td>
</tr>
<tr>
<td>Satellite terminal</td>
<td>Platforms logistiques</td>
<td>Other (various admin &amp; services)</td>
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<td></td>
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</table>

Some of these terms (e.g. inland port, dry port, and several of the logistics terms such as freight village) are also used to denote a large site containing both transport and logistics functions, leading to confusion. Rodrigue et al. (2010) advocated the term “inland port”
primarily because of their governance discussion, in which the term encapsulates the varying types of operational models within, in comparison to "sea port".

The terminology is not relevant here except as it is revealed through the other issues, such as ownership and main function. Therefore, this report does not propose to enter that debate; "intermodal terminal" will be used to describe the transport interchange site, and "logistics platform" will be used to describe the logistics part of the operation, which may be large or small and may be a separate site or may be integrated with the intermodal terminal. Whether the two distinct functions are managed together will be addressed as part of the governance study. It should also be noted at this stage that this report considers multi-user sites rather than single-user private operations.

6.3 The development process

The development of freight nodes in the hinterland has received much attention in the literature. The main issues to be addressed in this section are the role of government planning and funding, whether the developer is from the public or private sector and the eventual role of the site developer in transport and logistics operations. While governance has rarely been addressed directly, this section will reveal that it has been raised indirectly through discussions of the role of government in supporting developments, the role of real estate developers and the use of public-private partnerships with varying levels of public involvement. It was established in section 2 that governance is concerned with managing relationships in order to achieve a desired outcome, therefore this section will proceed by identifying the key stakeholders and the relationships between them.

Questions have been raised regarding the efficacy of public investment in terminals considering the difficulties of economically viable operation once the site is built (Höltgen, 1996; Gouvernal et al., 2005; Proost et al., 2011; Liedtke & Carillo Murillo, 2012). Inland freight nodes can be developed directly by government. Examples include Falköping in Sweden developed by the municipality (see Bergqvist, 2008; Bergqvist et al., 2010; Wilmsmeier et al., 2011; Monios & Wilmsmeier, 2012a), or Verona in Italy which is owned jointly by the town, province and chamber of commerce (Monios, 2013). This fully-public model is unusual and depends on the competencies of the public bodies in question. The risk is whether the site can then be leased or sold on to a private operator. Government involvement is more commonly achieved either as a PPP (e.g. Bologna, Italy – Monios, 2013), a one-off funding grant or land provision (e.g. Uiwang, Korea – Hanaoka & Regmi,
Governance framework

2011; Jinhua, China – Monios & Wang, 2013), or through a concession not simply to operate a site but to build it as well (e.g. BOT, DBOT, BOOT – Tsamboulas & Kapros, 2003).

Developments driven by the public sector due to motivations of regional development can run the risk of over-supply, while in North America the private sector focus on profit tends to regulate this problem (Notteboom & Rodrigue, 2009; Rodrigue et al., 2010). On the other hand, public sector developments are more likely to adhere to planning strategies such as location in brownfield sites or economically undeveloped areas. Private sector developments, while technically also subject to the same planning approvals, often succeed in evading such restrictions (Hesse, 2004), partly due to a lack of institutional capacity to manage planning conflicts (Flämig & Hesse, 2011). Even where local planning rules apply, the lack of a coordinated regional approach can lead to suburban sprawl of logistics platforms (Bowen, 2008; Dablanc & Ross, 2012), a lack of incentive to invest (Ng et al., 2013) or a split of scale economies across institutional jurisdictions (Notteboom & Rodrigue, 2009; Wilmsmeier et al., 2011).

Private sector developments are more likely to be logistics platforms than intermodal terminals, and they are generally pursued by a real estate developer. This is more common in countries where the public sector traditionally has less direct involvement, such as the USA and the UK. For example, global company ProLogis, in conjunction with CenterPoint, developed the BNSF Logistics Park in Chicago, within the boundary of which was situated a large intermodal terminal developed by rail operator BNSF (Rodrique et al., 2010). This model is becoming increasingly common in continental Europe, for instance the Magna Park development in Germany studied by Hesse (2004).

Hesse (2004) showed how the real estate market for logistics has changed from one with high ownership levels, primarily local firms, few speculative developments, 10 year leases and a weak investment market to a situation with an increasing share of rental sites, international developers, speculative development, shorter leases of 3-5 years and a strong investment market for new developments. Average warehouse size is increasing (McKinnon, 2009; Cidell, 2010) as is the tendency to agglomeration, with companies locating their DCs within large logistics parks (McKinnon, 2009).

Real estate and public sector developments may be grouped together as sites that are intended to be sold or leased to operators. Other sites are developed directly by the eventual operator for their own use. In Europe, most rail networks were managed by the national government until recent times (Martí-Henneberg, 2013), thus terminals were developed both by private transport operators attached to the national network and by the national rail
operators themselves. These sites are now mostly owned and/or operated by private operators (e.g. UK examples discussed by Monios & Wilmsmeier, 2012b), or, in a liberalised EU environment, the vertically-separated and quasi-private but still nationally-owned rail operator (e.g. European examples discussed by Monios & Wilmsmeier, 2012a). In other countries, the rail operations remain wholly or predominantly under state control (e.g. many terminals developed by state-owned Concor in India, even though private sector involvement is now allowed – Ng & Gujar, 2009a&b; Gangwar et al., 2012). In the United States, where rail is privately owned and operated on a model of vertical integration, intermodal terminals are developed and operated by the private rail companies (e.g. Joliet intermodal terminal Chicago built by BNSF – see Rodrigue et al., 2010). As well as rail operators and 3PLs, intermodal terminals can also be developed by port actors, whether port authorities (e.g. Coslada – Monios, 2011; Enfield, Sydney – Roso, 2008) or port terminal operators (e.g. Hidalgo, Mexico – Rodrigue & Wilmsmeier, 2013).

6.4 Selling or leasing the site to an operator

The next aspect of the development and ownership question related to governance is to consider whether the site is then leased on the landlord model or sold to an operator. In sites developed by a real estate operator the aim is to earn profit through selling or leasing either the entire site or individual plots. For sites developed by government, the decision of selling or leasing is tied to obtaining social benefits. This is first related to whether the site as a whole is being disposed of or only individual plots. A real estate developer is likely to lease or sell individual plots, whereas a public body is more likely to lease the entire site to an operator who will then manage the plots.

Assessment of the government role in operations is dependent to some degree on whether or not the government body in question has direct involvement in the site or just a shareholding. In the fully-public example of Verona in section 6.3 the site is managed by an arm’s length company established by the public shareholders, so they are not directly involved in day-to-day running. In other (rarer) cases, the public owner actually operates the site, at least on a supervisory “tool port” basis (e.g. Shijiazhuang, China – Beresford et al., 2012). In others, the public body fully owns the site but tenders the operation to a private operator on the landlord model (e.g. Coslada, Spain – Monios, 2011; Birgunj, Nepal – Hanaoka & Regmi, 2011).

An important consideration impacting on the lease or sell decision is the problem with the previous system that public sector stakeholders are trying to solve by investing in, owning or
operating an inland freight node. In most cases it is either economic development from supporting the logistics sector to provide jobs and economic activity in the region or seeking modal shift from road to rail to produce a reduction in negative externalities such as congestion or emissions. However, it is not possible to guarantee such outcomes simply by building an intermodal terminal or logistics platform. Many operational and institutional barriers need to be overcome for the site to be successful in developing intermodal traffic. That is why a governance typology must go beyond the simple issue of ownership; the operational model is an essential part of such classifications.

6.5 Relationship between the intermodal terminal and the logistics platform

The relationship between ownership and operation of the intermodal terminal and logistics platform must now be considered. In some cases, both sites may be operated by a single operator, which could produce synergies between the two, but this may produce conflict with the core competency of that single operator. For example, a rail operator operating a joint terminal and logistics platform would be different from a 3PL operating that same joint site. In practice, even where there is a nominally unified organisational structure encompassing both logistics platform and intermodal terminal (e.g. Xi’an, China – Beresford et al., 2012; BNSF Logistics Park Chicago – Rodrigue et al., 2010), the operational reality is that the intermodal terminal and individual parts of the logistics platform will be operated by different organisations, often with part-investment of the overall owner. The development process for such large projects is capital intensive and risky therefore a real estate developer, rail operator and a public authority are likely to be involved in a joint development, but the resulting project, once in operation, will be operated separately by the rail operator (terminal) and real estate developer (logistics platform) (Rodrigue & Notteboom, 2012).

A more realistic scenario is for the two sites to be operated separately but with close operational relations, although this is difficult to capture in a typology. Venlo, Netherlands (see below for more detail) is a good example of close relations between terminal and logistics, with the terminal operator holding a 50% stake in the logistics platform. Of the five Italian freight villages examined by Monios (2013), in all cases the intermodal terminal was operated by a separate operator from the logistics platform; however, in most cases the logistics platform operator had a high proportion of investment in that rail terminal operating company. Indeed, in most cases, the terminal operating company had been set up specifically to operate that terminal, with ownership from the logistics platform and a rail operator. These examples can be considered a demonstration of the “organisational implant” concept
discussed above (Grawe et al., 2012), which increases synergies by placing a representative of one organisation within the other. Further operational integration is possible in the container shunting operations between the terminal and the individual warehouses and distribution centres both within the logistics platform and in the surrounding area. This could be arranged by the shipper or freight forwarder or could be managed directly by the logistics platform operating company through a dedicated shunting operation to serve site tenants and other nearby locations, thus increasing operational integration and lowering costs.

While sites developed without direct involvement of an operator have been found to have higher risks of optimism bias (Bergqvist et al., 2010), those developed by operators as part of their business plan need to be examined in strategic terms. Wilmsmeier et al. (2011) contrasted the conflicting motives of port and inland actors in the development of intermodal terminals, drawing on the port regionalisation approach, in which Notteboom & Rodrigue (2005) characterised inland terminals and load centres as active nodes in shaping the transport chain. Wilmsmeier et al. (2011) argued that missing from the regionalisation model were both the differentiation of drivers of development (e.g. port authority, port terminal, rail operator, public organisation) and the direction (i.e. land-driven vs sea-driven), thus utilising insights from industrial organisation to examine how different institutional frameworks reveal nuances in the different kinds of integration between inland terminals, logistics platforms, rail operators and seaports.

6.6 Function of the site and operation model
The primary functions of intermodal terminals can be split into satellite terminal, transloading site and load centre (Rodrique et al., 2010).

A satellite terminal is generally considered as a terminal located close to a port (see also the short-range dry port model of Roso et al., 2009) and used to overcome congestion by moving containers quickly out of the port area for processing at the inland location (Slack, 1999; Roso, 2008). There is therefore generally a high level of operational integration. By virtue of this need to move the container quickly out of the port, the close-range site will often fulfil administrative tasks, including but not limited to customs clearance. Thus the valuable and congested port land is reserved for container handling functions and the close-range inland terminal can handle other aspects of the process. Examples include Enfield, Sydney (Roso, 2008) and Beijing, China (Monios & Wang, 2013). From a transport perspective, the short distance between the port and the satellite terminal means that the mode is more likely to be road, but rail or barge can also be used (e.g. the so-called “container
transferium” recently developed at Alblasserdam just outside the port of Rotterdam – van Schuylenburg & Borsodi, 2010). While a road-linked terminal would seem to ignore the main function which is to overcome congestion, such a model can reduce congestion by reducing the time each truck spends in the port on administrative matters.

A transloading centre is generally understood as primarily related to changing mode. This site could therefore strictly speaking be just the terminal with no services or storage nearby, but in practice it would generally involve such services. Thus, while its primary function is interchange rather than servicing a local market, in practice it would presumably do so in order to make the site economically feasible, which leads into the third main function, that of a load centre.

The load centre concept refers to a large intermodal terminal servicing a large region of production or consumption. It is probably the classic kind of inland node as it serves as a gateway to a large region and is more likely to be set within a specific logistics platform or in an area with high demand for such services. The load centre approach tends to fit well within the American inland port typology, which generally refers to a large site with a logistics platform located either nearby or as part of an integrated site. Examples include BNSF Chicago (Rodrigue et al., 2010) and Rickenbacker Inland Port (Monios & Lambert, 2013).

A fourth function or operational model that can be considered in this section is the extended gate, which relates all three of the above models, in particular the satellite terminal and load centre. The extended gate concept is a specific kind of intermodal service whereby the port and the inland node are operated by the same operator, managing container flows within a closed system, thus achieving greater efficiency (Van Klink, 1998; Rodrigue and Notteboom, 2009; Roso et al., 2009; Monios, 2011; Veenstra et al., 2012; Monios & Wilmsmeier, 2012a). At Venlo, the Netherlands, the intermodal terminal is set within a logistics platform and the operator of both the port terminal and the intermodal terminal also holds a 50% stake in the logistics platform (for more detail see Rodrigue & Notteboom, 2009; Rodrigue et al., 2010; Veenstra et al., 2012; Monios & Wilmsmeier, 2012a). The extended gate concept entails various institutional barriers but offers significant opportunity to improve the efficiencies of service planning and therefore improve the economic viability of intermodal port shuttles. It also picks up on the port vs inland distinction, widening into an appreciation of international vs domestic traffic, which tend to have different equipment requirements and can involve conflicts between operational models and priorities between port and inland actors (as discussed in the directional model applied in Monios & Wilmsmeier, 2012a and Monios & Wang, 2013).
As with intermodal terminals, a logistics platform can be more or less developed. Some may be small, catering to local shippers and offering few services, while others may be large sites offering comprehensive value-added services with large volumes and wide geographical coverage. Distribution centres are now integrated elements of the transport flow (Hesse & Rodrigue, 2004; Rodrigue, 2006; Rodrigue & Notteboom, 2009; Rodrigue & Notteboom, 2010) and their relation with the transport function must be analysed in more detail.

Different operational models can be identified at logistics platforms. Monios (2013) described different models applied in Italian freight villages. In the more common model, the site operator (a body set up and controlled by the owners) merely sells or leases individual plots to customers (e.g. Bologna). The tenants will be either individual shippers doing their logistics in-house or, in some cases, a site may have a majority of 3PLs as tenants (e.g. Marcianise). At Rivalta Scrivia, however, the operator of the logistics platform performs logistics operations for the tenants, producing a more integrated model. This model allows consolidation and feeds the intermodal terminal, with a result that at this site the proportion of traffic at the intermodal terminal belonging to tenants of the logistics platform is far higher than at other freight villages (Monios, 2013). This result suggests that this is a good model for supporting intermodal transport adoption, and should be captured in the governance typology.

Relations with external stakeholders along the intermodal corridor is the next issue to address. How does the intermodal terminal relate with rail operators and logistics providers organising company trains? How does the terminal operator interact with port authorities, port terminal operators or shipping lines in managing port shuttles? Intermodal corridor operations can be managed in different ways to lower transaction costs, such as contracts, joint ventures and integration through mergers and alliances (Panayides, 2002; de Langen & Chouly, 2004; Van der Horst & de Langen, 2008; Van der Horst & Van der Lught, 2009; Van der Horst & Van der Lught, 2011). Moreover, Bergqvist et al. (2010) noted that terminal volume is linked to traffic flows therefore the terminal operator requires a close relationship if not some level of integration with the rail operator to guarantee usage.

Some examples can be drawn from the literature of different levels of collaboration and integration in intermodal corridors. The intermodal terminal operator may be independent form rail service operation (e.g. Azuqueca, Spain – Monios, 2011), it may run rail services for any users (e.g. Freightliner, UK or Delcatrans, Belgium – Monios & Wilmsmeier, 2012a&b) or it may run rail services directly for the site tenants (Venlo – see above; Minto, Sydney – Roso, 2008). Similarly, the operator of the logistics platform may do the logistics for site tenants (Rivalta Scrivia – see above) or it may not. From a port perspective, there may
be investment from a port authority (e.g. Coslada – Monios, 2011; Enfield, Sydney – Roso, 2008) or port terminal operator (e.g. Hidalgo, Mexico – Rodrigue & Wilmsmeier, 2013). Additionally, the relation between the port and the inland terminal may be a highly integrated extended gate style of operation (Venlo – see above) or it may not (being the majority). Similarly, port actors can be directly involved in establishing intermodal services or corridors (e.g. Barcelona – Van den Berg et al., 2012; Alameda Corridor – Jacobs, 2007; Rodrigue & Notteboom, 2009; Monios & Lambert, 2013; Eurogate – Notteboom & Rodrigue, 2009). In order to pursue such strategies, port actors are required to alter their institutional capacity beyond their core competency of container handling and restructure their business models (Notteboom & Rodrigue, 2005; Sanchez & Wilmsmeier, 2010; Jacobs & Notteboom, 2011; Notteboom et al., 2013). It will mostly be large ports with the necessary resources that are likely to engage in such tactics, meaning that the levels of integration required for such aggressive hinterland control will be the exception rather than the norm. For more detailed analysis of different kinds of port-hinterland terminal relations, see Monios & Wilmsmeier (2012a).

The common elements of these different operational models can now be used to generate the governance typology.

7. Developing the typology

7.1 Development and ownership

The first question is who are the various possible developers of a site: for example, government (what kind of government body and which scale), real estate developers, rail operators, 3PLs, port authorities, port terminal operators, shipping lines, independent operators and others. Each actor will have different motivations; for example, obtaining social and economic benefits (government), to sell the site or parts within it for profit (real estate developer), as part of an existing business (e.g. rail operator or 3PL) or for hinterland capture (e.g. port actors).

7.2 Relation between owner and operator

The second aspect is the relation between the owner and operator, drawing on previous uses of governance in the transport literature. This part of the typology covers whether the owner operates the site directly, at arm’s length, through contracts or via a concession (landlord) or lease.
7.3 Internal operation model

The third issue from the literature addresses the main function(s) of the site, in particular whether the site is an intermodal terminal or logistics platform or both. Part of this question includes the nature of the operator of each site (intermodal terminal and logistics platform) and the relation between them. This follows on from the development process (related to the original aim) and points the way towards more specific questions about the operational model.

7.4 External operation model

The fourth issue concerns operations. A number of detailed operational issues have been raised in the literature regarding the performance and economic viability of intermodal transport. The literature has pointed towards varying models of collaboration and integration as potential aids in this endeavour, so this section will classify the different models as part of the governance typology.

7.5 The typology

The final typology is depicted in Table 2.
### Table 2. Typology of governance at intermodal terminals and logistics platforms

<table>
<thead>
<tr>
<th></th>
<th>Developer of each part (terminal or logistics or both)</th>
<th>Built to sell/lease on in order to get benefits (economic and social for govt, profit for RE developer)</th>
<th>Built to operate themselves as part of a business strategy (although may have government investment or planning support)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Govt body (which level and type)</td>
<td>Rail operator</td>
<td>3PL</td>
<td>Port Authority</td>
</tr>
<tr>
<td></td>
<td>Real estate developer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Operator of each part (terminal or logistics or both)</th>
<th>Relation between owner and operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Operated directly by owner</td>
<td>Tool (operated directly but with some sub-contracting)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Internal operation model (relation between terminal &amp; logistics)</th>
<th>Type of operator of each part</th>
<th>Relation between operator of terminal and logistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Rail operator</td>
<td>3PL</td>
<td>Port Authority</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>External operation model (relation with clients &amp; others)</th>
<th>Relation between logistics platform and site tenants</th>
<th>Relation between terminal and rail service providers</th>
<th>Relation between either terminal or logistics platform and ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Tenants do own or in-house logistics</td>
<td>Tenants are 3PLs doing logistics for various clients</td>
<td>Site operator does logistics for site tenants</td>
<td>Terminal operator is independent of rail service operators</td>
</tr>
</tbody>
</table>
8. Discussion

As noted in section 3, port governance studies have focused primarily on the relation between the owner (usually some level of government) and the operator (usually appointed by a tendered lease). Results show that, by contrast, the key governance aspect of intermodal terminals and logistics platforms is related to operational characteristics. Operational types derive from the relation between the operator and the external actors (ports and rail operators), as well as the relation of the operator to the tenants, and, as reflected in the typology, the relation between the intermodal terminal and the logistics platform.

Therefore, the governance of ownership and operation (covering the landlord issue and tendering) is shown to be more important for ports than for inland sites, and forms only the first half of the typology. The ownership of an inland intermodal terminal or logistics platform matters primarily in terms of the desired outcome from the investment (social and economic benefits for the public sector actor or profit from selling the plots for a real estate developer). If the site is developed by an industry actor (rail operator, 3PL, port authority, port terminal, etc.) then in addition to the profit motive the development represents a long-term strategic decision to operate the site as part of their larger business.

The second half of the typology is based on the internal model (relation between the terminal and the logistics platform and who operates each) and the external model (relations with tenants, rail services and ports). These issues are relevant because, just as a port’s success (both for itself and for its region) is related to the ability of the owner to negotiate a successful concessionaire that will attract shipping lines, the success of an intermodal terminal is related to many operational aspects such as establishing regular intermodal services, consolidating flows to fill them, and reaching out to sea actors (ports and shipping lines) to embed the terminal in global flows.

In port governance, external relations are less relevant to the original lease decision as it is up to the private terminal operator to run the site in the most profitable way, and strategies have merged over recent decades so most terminals have links with shipping lines and with other terminals in the same global company. Intermodal terminals and logistics platforms are far smaller concerns, less likely to be part of a global or even national portfolio; as such, they exhibit a variety of relationships with rail operators, site users and ports. Therefore, the three kinds of external relations identified in the fourth section of the typology form the key distinctions, and lead towards future research on these models, underpinning as they do the ability to achieve successful intermodal services.
The governance typology aids identification of the relevant resources and relationships relating to each model, informing the policy background of supporting intermodal transport services. The recognition of the requirement for greater internal and external integration goes some way towards understanding why intermodal terminals do not always achieve the modal shift aims of government policy, despite often large amounts of public investment. Governments sometimes invest in infrastructure without addressing the governance issue sufficiently, in particular the relation between internal and external integration models. The supply chain literature focuses on these issues as part of the integration decision, a practice that is increasingly necessary for firms to gain competitive advantage. The supply chain literature recognises that competition is increasingly between entire supply chains rather than individual firms (Christopher, 1992), but this realisation is sometimes lacking in the transport literature, and especially absent from government decisions to fund intermodal terminals and logistics platforms in isolation from an analysis of their operational models.

The literature has shown that operational models are crucial in terms of whether an operator can succeed in developing intermodal services, based on the ability to cooperate, integrate, consolidate and plan. These are not just operational concerns but are in many instances derived from the governance model. Thus the governance typology developed in this report can help identify the different ways such integration can be pursued, and, more importantly, recognise when it is not.

9. Conclusion and research agenda

Operational difficulties preventing the economic feasibility of intermodal transport are well known and, while some discussions of the role of integration and collaboration have been raised in the literature, the relation between the owner, operator and operational models of freight nodes has been insufficiently addressed. This report has applied lessons from the governance literature to intermodal terminals and logistics platforms in order to develop a typology that accounts for the importance of internal and external operational models in the success or otherwise of intermodal transport services.

Findings reveal the importance of understanding operational models that provide greater synergies not only between the users of the intermodal terminal and the logistics platform, but relations between the two sites and relations with external stakeholders such as transport providers and port actors. Classifying sites by ownership (e.g. the World Bank and port governance models) is the first step, but insufficient on its own. This report has taken those
models and extended them by adding another two layers derived from the supply chain literature; namely, internal and external integration.

The goal of the typology was not to name or classify specific types but to explore relationships. The report has extended the notion of governance from just ownership to operational models; this expansion is essential to the understanding and especially to the success of intermodal transport services. If policy goals of modal shift are to be achieved, intermodal transport can no longer be considered in isolation from logistics strategies. Thus government money spent on intermodal infrastructure and operational subsidies must be aligned with an understanding of how intermodal flows are embedded within internal and external relationships, and with other logistics decisions. This expanded notion of transport governance requires further research, in particular a greater understanding of coordinating transport requirements with other logistics services. This will be the focus of the case studies undertaken in GreCOR WP4.

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