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# Behind the Big Box: understanding the planning-development dialectic of large distribution centres in Europe

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## ABSTRACT

In Europe, very large distribution centres (XXL DCs) are increasingly appearing on planning agendas due to their growing spatial footprint and environmental impacts. Although the emergence of XXL DCs has gained traction in academic research, empirical knowledge about the process that leads to their oft-debated location choice, geometry and landscape integration is still scarce. This paper aims to improve our understanding of this process, analysing the decisions of key stakeholders in the planning-development dialectic behind four exemplary XXL DC transactions, in the Netherlands. Our analyses shed light on the motivations of public and private actors as well as the (lack of) planning rules that shape these transactions. We find that specific incentives in the Dutch decentralized planning and legal-financial system contribute to logistics sprawl. Existing planning instruments that could steer logistics developments, such as environmental and employment quality regulations, are largely left unused. Our study suggests that multilevel planning competencies and international market standards are important variables in explaining XXL DC outcomes. Unlike often assumed in the literature, internationalization has – next to stimulating the growth of XXL DCs – contributed to more sustainable location choices and landscape integration.

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## Introduction on the emerging of XXL DCs in Europe

Since the 1980s, distribution centres in the logistics hinterland of main European ports have increased considerably (Flämig and Hesse 2011). Since 2000, there has also been a trend of developing so-called XXL DCs with floor areas above 40 thousand square metres. This phenomenon and its environmental effects have, until recently, been largely neglected in the policy and academic debates (Hesse 2020). In the hinterland of Rotterdam, Europe's largest port, the logistics building footprint has quadrupled since 1980. During this period, the average footprint of a single distribution centre (DC) in the exemplary East-Southeast corridor – stretching from Rotterdam to the German border – has tripled.<sup>1</sup> Researchers estimate that not only the growth of the logistics

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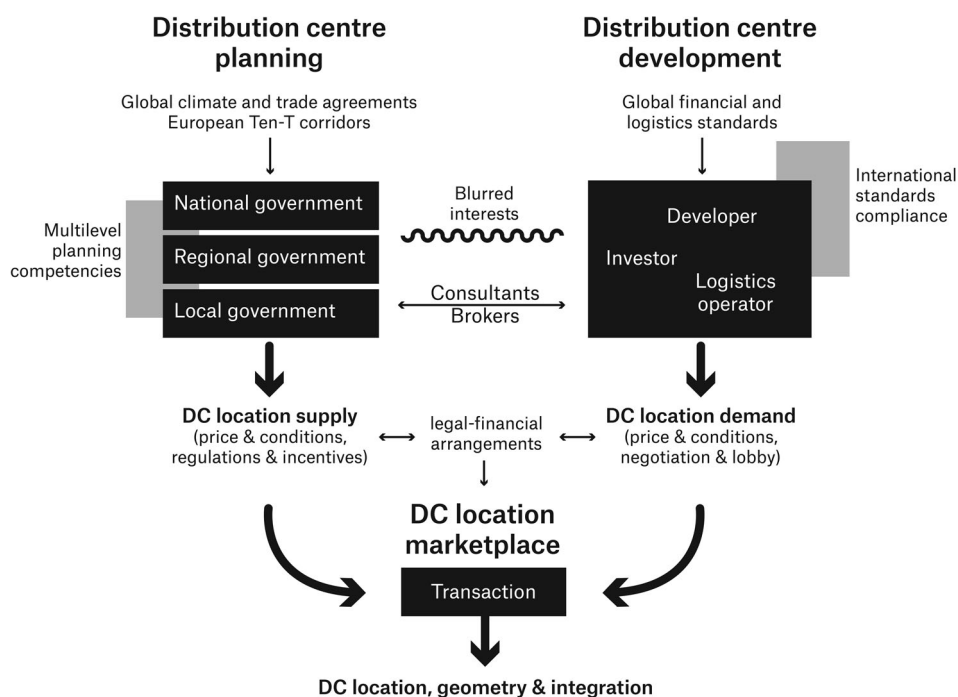
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complex, but also the changing location choice for individual DC developments is an important factor in the fragmentation of the logistics complex, a phenomenon described as logistics sprawl (Heitz, Dablanc, and Tavasszy 2017; Krzysztofik et al. 2019).

The growth and sprawl of the logistics complex – understood as a combination of DCs and transport infrastructure – challenges quality of life in hinterland locations in Europe and North America (Aljohani and Thompson 2016; Witte et al. 2016). Truck movement causes congestion and air pollution, and the footprint and elevation of DCs often eliminate alternative spatial functions while the added value of many DCs to the regional economy is increasingly questioned (OECD 2014; Rli 2016; Kuipers et al. 2018). Therefore, there is an increased interest, particularly among European policy advisors and planners, for understanding how to effectively steer logistics developments in order to mitigate their impacts (Hesse and Rodrigue 2004; Danyluk 2019). The Dutch Board of Government Advisors and Environmental Assessment Agency, for instance, have called for national regulations to steer logistics developments and avoid a ‘waterbed effect’ (CRa et al. 2019; PBL 2019). The recent Dutch National Spatial Vision has outlined some of such regulations (BZK 2020) and in response, government agencies and consultants have started to explore what planning tools could help steer XXL logistics developments towards predetermined clusters and stimulate brownfield over greenfield development (Stec Group 2020).

In the backdrop of these planning responses, this paper aims to contribute to academic insights into the forces shaping the remarkable growth of European distribution centres. We perceive these forces are part of a spatial planning-development dialectic (Figure 1), revealed in the transactions between government agencies and companies, each with



**Figure 1.** Framework of DC planning-development dialectic.

their respective motivations and scope of influence (Healey 1999; Heurkens, Adams, and Hobma 2015). Although logistics firms are often blamed for the poor spatial outcomes and impacts (Frejlichová et al. 2020), we assume that the local planning-development transactions, leading to the spatial outcomes of logistics centres witnessed across Europe, are also shaped by particular institutional arrangements. Hence, instead of merely focusing on the behaviour of particular actors, our approach aims to also understand the rules and resources that shape the transactions between them (North 1987; Scharpf 1997; Williamson 1998).

Although the problem of logistics sprawl has gained attention in the recent literature, in-depth empirical enquiries into recent DC developments as such remain scarce. We aim to contribute to the latter by exploring one of the busiest logistics corridors in Europe and provide an explanatory framework for XXL DC transactions. Regarding the Dutch logistics planning-development dialectic we ask: what are the key forces behind XXL DC transactions? We define XXL DCs as the tangible outcomes of these transactions in terms of location choice, geometry (shape and size) and landscape integration. In addition, we hypothesize that the DC transactions under study are influenced by (1) *the involved tiers of government planning*; and (2) *the internationalization of the DC developer*. These two forces emerged as key variables in our case study analyses. In the latter part of this paper, we propose to use them as the basis for a DC planning-development typology in the European context.

Below, we first present a framework to explain our conceptualization of the planning-development dialectic behind XXL DCs. This helps us to operationalize our main hypothesis about the two key forces that explain large-scale logistics development outcomes in Europe. In the next section, a literature review sheds light on the existing knowledge regarding spatial outcomes of DC planning and development, and discusses insights about key actor decision making in this field. In the subsequent section, we explain our research method and case study selection. Finally, we present, analyse and discuss the results of our case studies, draw our conclusions, and make recommendations for further research.

## A framework for studying DC transactions and outcomes

We propose to view European XXL DCs as the spatial outcome of a transaction between DC development demand generated by logistics markets, and DC location supply generated by planning processes. This equilibrium of planning and development is established in dialectic processes as described by Healey (1999). We divide the spatial outcomes in three components: location, geometry and landscape integration. Hitherto, most studies have focused on either logistics sector explanations, focusing on changing supply chains, or on (the lack of) planning requirements in relation to DC location and geometry, ignoring landscape integration. However, the latter is an increasingly important feature of the spatial outcomes observed by citizens and experts (CRa et al. 2019), and therefore of possible policy measures aimed at steering logistics developments.

The XXL DC transaction is conceptualized in Figure 1. Adapting the theory of Edmondson, Kern, and Rogge (2018), spatial planning is considered a part of the policy subsystem, influenced by international agreements regarding emissions, trade regulation and infrastructure. The logistics sector is part of the sociotechnical system, influenced by global finance and logistics standards. In this section, we identify the

most important actors in these (sub)systems, because these play a key role in our case study approach. DC planning actors focus on making the best spatial conditions and trade-offs for society, while the DC development actors focus on their level of service, added value, and sometimes on the sustainability of their activities.

Government agencies (Figure 1, left) typically have a broader scope than private actors since, besides supporting the development process, they also ‘moderate adverse externalities, safeguard social needs, conserve resources and environmental assets’ (Adams, Russel, and Taylor-Russell 1994). Furthermore, government regulations have helped to sustain industrial land values and decrease market risks. *Local governments* seem to have the most direct role in spatially accommodating DCs. At the same time, some municipalities seem to be insufficiently informed to make these decisions, while competition with other municipalities may create a race to the bottom in terms of land price and quality criteria (Louw 2009; Raimbault 2021). *Regional organizations*<sup>2</sup> attempt to avoid this by coordination of DC location planning. *National and regional governments* (provinces in the case of the Netherlands) may stimulate DC clusters through directive or restrictive planning decisions and (multimodal) infrastructure investments.

On the logistics sector side (right), the *logistics operator* typically looks for functional site requirements such as connectivity and building restrictions, while a *developer* concentrates on exchange value (Adams, Russel, and Taylor-Russell 1994). Large companies are increasingly expected to follow corporate social responsibility (CSR) and sustainability principles such as zero-emission logistics, besides their business interests. Institutional (e.g. pension funds) and private equity *investors* develop distribution centres with specialized *developers*, advised by *consultants* and *brokers*. The resulting pricing and other conditions, on both the supply and demand sides of the DC location marketplace, shape the transaction that determines the spatial outcome.

In recent DC developments, however, interests have blurred substantially. The *operator* of a DC may also be the *investor* and *developer*, while *semi-governmental development companies* under private law mix political and entrepreneurial goals (Raimbault, Jacobs, and Van Dongen 2016; Raimbault 2021). In this context, local authorities are easily biased towards the economic advantages of jobs and land sales despite the increasing environmental disadvantages, such as congestion and visual impact of DCs (Flämig and Hesse 2011; Yuan 2019). Additionally, *corporate lobby and negotiation*<sup>3</sup> constantly influence *regulations and incentives* on various government levels.

The framework focuses on the changes within the timespan of a decade, playing what Williamson (1998, 26) calls ‘the game of transaction cost economics’. The dialectic suggests an equilibrium, while the principal agent theory (Higgs 2018) suggests the possibility of a power and information asymmetry between companies and regulatory organizations in the determination of prices and conditions in land development. The case studies shed light on the transactions between the actors mentioned above. However, we first review the existing knowledge on the spatial outcomes and decision-making regarding distribution centres more in depth.

## Location choice, geometry and landscape integration of XXL DCs

We address the spatial outcomes of logistics developments through the parameters *location* (demand side choices and supply side policies), *geometry* (DC size and shape)

and *landscape integration* (quality standards in façade and public space design). In practice, there is an interdependency between these parameters. Location choice, for instance, depends on the availability of large sites to accommodate the increasing geometry of DCs (Onstein, Tavasszy, and Van Damme 2019; Bak 2020). Some studies speculate that between comparable sites, companies would prefer those with lower standards of integration to avoid extra investments and maintenance costs, and that local governments use this factor to compete amongst each other in search of blue-collar jobs and land sales (Louw 2009). Logistics real estate is distinct from traditional industrial, office and residential developments, since according to Raimbault (2021), the integration of international real estate developers and fund managers is unique for the logistics sector. Secondly, the sector is more strongly determined by rapidly changing global construction and operating standards than other sectors (Santos 2006). Thirdly, logistics real estate is more dynamic, featuring typical short-term leases and profits (Hesse 2004). This means that to gain insight in DC development, existing knowledge on other developments is insufficient and specialized information from DC developers is necessary.

### **Location: beyond traditional factors**

Logistics costs, generally mentioned as the main argument in location choice, still depend highly on traditional location factors such as connectivity through transport networks; availability of land, labour and consumer markets; and local economic factors such as taxation, labour union power, costs of doing business, cost of living and local economic incentives (Woudsma in: Hall and Hesse 2012; Verhetsel et al. 2015; Heitz et al. 2018; Onstein, Tavasszy, and Van Damme 2019; Strale 2020). Additionally, the spread of DCs along hinterland corridors is pushed by centralization of distribution networks, to serve for example the entire market of North-Western Europe, and high land prices and congestion near the seaport of Rotterdam, while it is pulled by the establishment of logistics hotspots near consumers (Flämig and Hesse 2011; Heitz, Dablanc, and Tavasszy 2017; Onstein, Tavasszy, and Van Damme 2019).

Over the years, authors have indicated that neoclassical location theory, assuming a market of perfect competition, cannot explain European practices of industrial land development (Adams, Russel, and Taylor-Russell 1994, 5; Bertaud 2018). There exist several restraints to land supply and other influences on location choice besides land price and profit maximization. Two international trends are increasingly pointed out. First, many distributors no longer make the location choice themselves in the emerging fourth-party logistics (4PL) networks, but rather a ‘service provider offering the use of several supply chains’ (Hines 2013). This volatility explains the decrease of building ownership by the user, as well as an increase in short term leases<sup>4</sup> (Hesse 2004). Second, logistics real estate development and investment firms, often integrated into international conglomerates with large portfolios (Flämig and Hesse 2011; Raimbault 2021), make location choices primarily based on real estate market arguments – based on expected profits rather than efficient logistics operations.<sup>5</sup>

Additionally, the Dutch *Mainport* strategy, including large hinterland infrastructure and land developments, has stimulated the logistics sector and increased the demand for logistics real estate in hinterland corridors since 1980 (Raimbault, Jacobs, and Van Dongen 2016; Rli 2016; Kuipers et al. 2018; Nefs, Zonneveld, and Gerretsen 2022). To



guarantee the success of such developments, local governments often provide incentives to attract businesses. Multimodal logistics clusters in The Netherlands are often nationally planned, in the context of European freight corridors (Ten-T) and spatial-economic policies. These are referred to as *outside-in* developments (Raimbault, Jacobs, and Van Dongen 2016). Other clusters emerge from an existing concentration of growing logistics activities, stimulated by a local or regional government and then acknowledged as hub of national importance, known as *inside-out*. Given this difference, we hypothesize that DC location supply is more strictly planned in outside-in clusters. In both kinds of developments, there is still limited empirical knowledge on the role of the various stakeholders, as well as the legal-financial arrangements and regulations that shape their transactions.

### **Geometry: global standards**

Between 2010 and 2020, the average footprint of large logistics buildings (>2.500 sqm) in the South-Southeast freight corridor of The Netherlands tripled from ca. 6.000 to 18.000 sqm, due to the rise of XXL DCs (>40.000 sqm). According to Valkanova in (Frejlichová et al. 2020), architects have little influence on the shape, size and functionality of a DC since these aspects are largely determined by lawmakers, international conglomerates and investment funds. The trend of large scale DCs, with footprints that can reach almost 200.000 sqm, is visible across Europe and is explained by three factors. First, the centralization of logistics facilitates the handling and value adding activities of goods in global supply chains (Hesse 2004; CRa et al. 2019). Such operations often serve multiple markets in North-Western Europe from a single – and thus larger DC (Andreoli, Goodchild, and Vitasek 2010). While according to Hesse (2020) DC centralization in several countries peaked in the late 2000s, in The Netherlands this peak seems to occur at the time of writing.<sup>6</sup> Second, the growth of e-commerce shifts demand from retail space to e-fulfilment. Competition between online platforms, as well as mergers, tend to increase the catalogue and service levels, while decreasing price and delivery time (Hesse and Rodrigue 2004; Andreoli, Goodchild, and Vitasek 2010). This calls for economies of scale in DCs, made possible by information technology, automation and larger building geometry. And third, logistics developments, which are increasingly performed by real estate firms rather than the users, opt for large multitenant DCs to decrease construction costs and the risk of vacancy. The demand for sites larger than 10 ha has therefore increased, a size that can rarely be found on brownfield sites (Flämig and Hesse 2011). We assume the increased scale of XXL DCs occurs in The Netherlands for the same reasons, given the large share of international DC developers and investors, apparently facilitated on greenfield sites by the traditionally strong Dutch spatial planning system.

### **Landscape integration: local variation**

While geometry of large DCs seems to be highly standardized, the landscape integration – including façade and open space design – has more variation. The geographic and landscape literature rarely mentions the landscape integration of DC projects. Waldheim and Berger (2008) see the rise of the logistics landscape as among the most significant transformations in recent years, and divide it in three emergent landscape categories:



distribution and delivery, consumption and convenience, and accommodation and disposal. There are, however, spatial policy and design instruments available to guide the spatial outcome of DCs. Common instruments include the American concept of landscape embedded industry (Hough 1991) and building regulations – more common in Europe – concerning maximum building dimensions, style guidance, bulk envelopes and vegetation screens (Lehnerer 2009). In the Netherlands specifically, there exist spatial quality plans since the 1990s and so-called Q-teams since the 2000s (Van Assen and Van Campen 2014), both consisting of expert advice – sometimes legally binding – regarding architecture and landscape impacts of spatial developments. However, these instruments are rarely used in logistics developments.<sup>7</sup>

In several countries, European funds finance logistics developments, such as the European Investment Bank, the European Regional Development Fund and Joint European Support for Sustainable Investment in City Areas (Frejlichová et al. 2020). At the same time, national development programmes aim to increase competitiveness and attract foreign direct investment, for example ChechInvest and the Netherlands International Distribution Council. None of these programmes include quality criteria, concerning consequences of soil sealing, land-use change, or effects on social inclusion and added value.

In the academic literature and in journalism, multinational companies such as Amazon are often criticized for disruptive practices (Hesse 2020). This suggests that locally rooted companies might strive for better spatial outcomes than international developers. On the other hand, international investors often demand certificates with strict quality criteria, such as BREEAM (Bulwiengesa 2020). Critical literature suggests, however, that these standards may also be used to avoid stricter local quality regulation (Easterling 2014). We hypothesize therefore that the level of internationalization may affect the way stakeholders approach the location choice and integration of their DC, in different ways. Furthermore, similar to location supply, we presume outside-in clusters with multilevel planning to invest more efforts in landscape integration than inside-out clusters.

From the literature, we conclude that DC planning and development is a distinct emerging sector with strong information and competency asymmetries among actors, in need of additional empirical investigation. DC geometry seems to be generally determined by international standards. In our case study, we want to confirm whether this is also the case in the Netherlands, given its strong planning culture. Location choice and landscape integration seem to be influenced mainly by two factors: the requirements enforced by the relevant planning system(s), and the level of internationalization of the developer. In our case study, we specifically test and discuss the difference between outside-in and inside-out planning of DC clusters, as well as the influence of regionally versus internationally initiated DC developments, regarding the actual spatial outcomes.

## Case study method and areas

Building an understanding of DCs as spatial outcomes of a planning-development dialectic requires a qualitative, in-depth approach. To prepare our case interviews, we compiled a repository of relevant planning documents, including property information, municipal land-use plans, provincial and national strategic plans, landscape and urban

masterplans.<sup>8</sup> Ten in-depth semi-structured individual interviews and several conversations (see acknowledgements) were conducted online in 2020 with all types of key actors defined in the framework: spatial planners on various levels, consultants and real estate brokers, as well as development-, distribution- and investment companies. The interviewees are familiar with one or both of the case study areas and the cases in that area. The purpose of the interviews was to identify patterns of stakeholder actions and motivations behind the spatial decisions regarding DCs, constrained or enabled by rules and (un)available resources.

The interviews focused on aspects typical for the interviewee's role, but all addressed the three spatial DC outcomes (location, geometry, landscape integration) in open questions, as well as the influence of involved planning tiers and internationalization of the logistics sector. The interviews were recorded and transcribed with the help of software<sup>9</sup> and manual review. Prior to the interviews, all ten interviewees filled in a digital poll, scoring the influence of ten types of public and private actors in spatial decisions regarding DCs in the Netherlands, in a five-step range from none to dominant influence.<sup>10</sup> The same poll was also filled in by twelve academic experts of spatial planning and development, to validate the scoring by case stakeholders.

The results section below presents the triangulated case findings in three steps. First, we present short descriptions of the planning-development process of the two case study areas, and analyse the influence of planning and internationalization levels in two DC transactions in each of the areas. Next, we present the views of the interviewees regarding the legal-financial arrangements that shape the current DC planning-development practice. And thirdly, we explain how the stakeholders and experts judge the influence of different actors on spatial DC decisions.

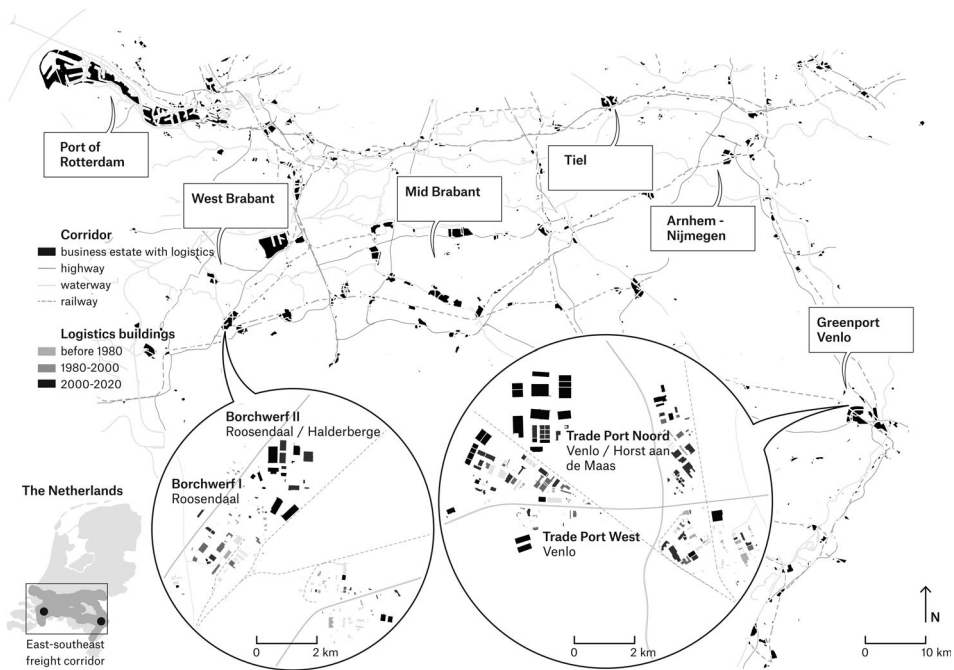
The case studies concern four XXL DCs in the East-Southeast freight corridor (Figure 2), developed since 2015. The selection of the areas was guided by our aim to test the key variables of the hypothesis described above. Two DCs are therefore located in an *outside-in* location: Venlo Trade Port Noord; and two in an *inside-out* location: Borchwerf, Roosendaal. While all four DCs are largely financed internationally and represent a blurring of stakeholder roles, the VidaXL DC complex in Venlo is developed by a locally rooted e-commerce company for its own use, the DSV cluster (Venlo) by an international logistics operator for flexible operations, and both the Primark and VGP park DCs (Roosendaal) by pan-European logistics real estate companies with regional branches. Of the latter two, the first is dedicated to one large international retailer while the second is built for flexible lease.

## Elements shaping transactions and spatial outcomes

We describe the planning and development process of four case DCs in two areas by focusing on the elements shaping the transactions – land pricing and other incentives, governance structure, land-use plans and regulations, actor competencies and resources – and their spatial outcomes.

### Trade Port Noord, Venlo

In national planning documents, Venlo has been defined as an important inland logistics hub from the 1980s onwards, 'building on its history as a border town with trade and

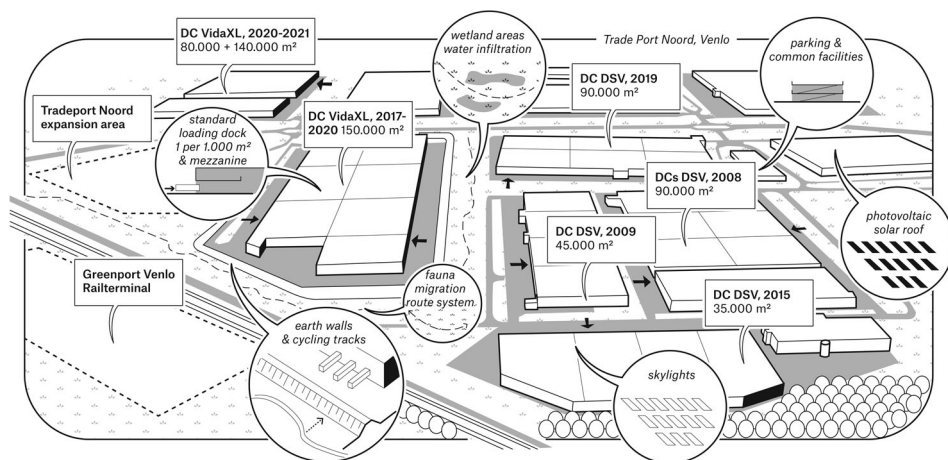


**Figure 2.** Growth of the logistics complex in the East-Southeast freight corridor. Interactive map at <https://mertennefs.eu/landscapes-of-trade/>

customs functions’, explains an interviewed regional government official. After the year 2000, infrastructure and area developments have sought to strengthen Venlo as an agro-logistics hub, a so-called *Greenport*. In 2007 the development concept started in a multi-level collaboration, according to the project leader of one of the local governments involved: ‘our work group also included regional and national government, as well as the private sector’. In 2020, construction of a third rail terminal started in Venlo, initially planned as extended gate of the port of Rotterdam, which soon turned out to be rather an important e-commerce link to China via Central Asia.

Trade Port Noord (Figure 3) is part of Greenport Venlo, for which the 2009 master-plan foresees an area development of 5.400 ha, combining agro-business estates with 600 ha nature development. In the area, the 2012 Floriade was organized, an international horticulture and landscape event. The Greenport Venlo Development Company, a merger of local land development vehicles with Limburg Province and three municipalities as exclusive shareholders, has since been in charge of land sales. Land price discounts incentivised initial DC developments. At the former Floriade site, the development of the Brightlands agro-innovation campus aims to retain talent in the region and stimulate the agro-food sector, ‘by bringing knowledge institutions, governments and entrepreneurs together in the field of healthy food and safe nutrition’.<sup>11</sup>

Several of the high spatial ambitions<sup>12</sup> regarding landscape integration as well as nature development were realized successfully in Venlo. Other ambitions, such as attracting agro-food production companies and setting up a Cradle-to-Cradle business cooperation,<sup>13</sup> have not (yet) been met.<sup>14</sup> The last phase of nature development (200 ha) was cancelled after the withdrawal of national funding in 2011. The most



**Figure 3.** Trade Port Noord, Venlo.

successful sector occupying Trade Port Noord has been the European distribution of consumer goods, medical supplies and, above all, fashion. The local government project leader: ‘We agreed on mixing logistics with agro-food and manufacturing. Big fashion companies are not part of the regional DNA’. The commercial director remains optimistic:

Due to the recent DC real estate boom and the proven success of the location, the Greenport Venlo Development Company can select companies with socioeconomic relevance for the region. [...] Developers of new DCs are required to show lease contracts of at least 5 years for at least half of the floor area in the masterplan, to avoid speculative developments and vacancy.

Trade Port Noord’s spatial outcomes include XXL DCs, accessible through road loops linked directly to a regional highway to avoid mixing with local traffic. The area in between DCs is large enough to include earth walls that block the view of the loading docks from outside the area, a design approach to integrate the complex in the landscape. According to the masterplan, the infrastructure zones include ample space for rainwater containment and shared business facilities, such as a canteen and recycling facilities. Until now, only shared parking facilities have been realized, the commercial director explains, since ‘buildings started to scale up to such an extent that each needs its own facilities’. Ecological corridors and recreational cycling infrastructure have been realized as part of the plan. To accommodate the increasing scale of DCs, Trade Port Noord’s original lots have been joined into larger units, while the initial zoning plan, in contrast, was broken up into smaller legal units to increase the flexibility of future developments.

In the area, Dutch company Vida XL operates three e-fulfilment DCs for furniture and home accessories, while a fourth development started in 2021, increasing the company’s building footprint here to 370.000 sqm. Danish-founded logistics multinational DSV operates four multitenant DCs here,<sup>15</sup> from which the company provides logistics services to various producers and traders. Their DC footprint in Trade Port Noord measures 260.000 sqm, whereas DSV’s portfolio in the Netherlands amounts to about 800.000 sqm in 2020.

## Borchwerf, Roosendaal

Borchwerf is a mixed industrial area at the northern fringe of Roosendaal, planned since the 1980s (Figure 4). Some parts are recently being redeveloped. Its recent extension, Borchwerf II, became a logistics hotspot during the development process. This happened, according to the interviewees, mainly by coincidence, since a nearby multimodal location, Logistics Park Moerdijk, was put on hold due to legal issues concerning the European nitrogen emission ceiling. 'Logistics developers, who had become interested in the area right in between Europe's largest ports, Rotterdam and Antwerp, decided to build in nearby Roosendaal. [...] Like Trade Port Noord, Borchwerf II has a freight rail connection, paid by the national government. There is, however, no project for a rail terminal, since there is already one in Moerdijk', explains a local economic policy advisor.

The lots in the business estate are sold directly by a joint venture sales office of the municipalities Roosendaal and Halderberge. Also in Roosendaal, incentives have helped to attract the early businesses in the area, but these were non-monetary. Instead, local labour and education programmes facilitated the DCs, which would be needing thousands of employees. Borchwerf II has become a recognized cluster for e-commerce and other DCs targeting the Benelux, including food, consumer goods and fashion companies.

As in Venlo, the DCs in Roosendaal have in-between infrastructure zones, integrating a water buffer facility (wetlands) and a recreational cycling network. Buildings are slightly smaller and no earth walls are built here, because of limited space. The plans demonstrate moderate spatial ambitions regarding architecture, and some ecological performance.<sup>16</sup> Both municipalities have realized temporary housing facilities for migrant workers near the DCs.

In the southern edge of Borchwerf II, Irish fast-fashion retailer Primark realized a 90.000 sqm e-fulfilment DC.<sup>17</sup> There has been expert and public criticism<sup>18</sup> on the extensively visible façade along the railway, as well as the façade pattern, which changed from horizontal to vertical in the second construction phase. On a brownfield site near the railway station of Roosendaal, pan-European developer VGP Group has developed a multitenant DC of 41.000 sqm, leased to small e-fulfilment operators such as Active

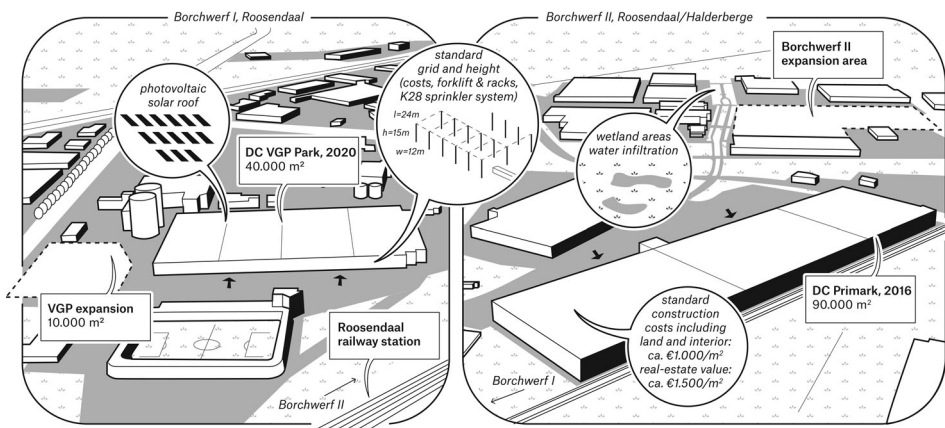


Figure 4. Borchwerf, Roosendaal.

Ant. An additional 9.000 sqm building across the street is planned to be built for a specific operation (Table 1).

### Legal-financial arrangements influencing DC transactions

Interviewees explain that specific legal-financial arrangements observed in the cases – some aggravated by the governance structure in place, as well as the (lack of) regulations and actor competencies – tend to incentivise undesirable spatial outcomes such as logistics sprawl. Frequently mentioned are ‘*quick flips*’, in which developers and municipalities make land deals based on short-term lease contracts (ca. 3 years). According to a critical developer, ‘shortly after such a deal, property is sold to an investor, leaving the area with an uncertain future’. Short term profit-oriented companies with large financial resources tend to make deals with municipalities suffering from budget shortages, both hoping to take advantage of the high demand for logistics development sites in the region. According to a logistics real estate advisor ‘this can cause a speculative bubble and vacancy’. An investor regards it as ‘the main explanation for the boxification of the landscape’.

**Table 1.** Case comparison.

	Venlo Trade Port		Roosendaal Borchwerf	
	VidaXL	DSV	Primark	VGP Park
<b>Spatial outcome</b> location choice, geometry, landscape integration	<i>Location choice</i> based on large available plots near international terminals and infrastructure. <i>Geometry</i> follows international standards, facilitated by increased lots. <i>Landscape integration</i> follows Trade Port directives (earth walls surrounding lots, public green structure and water buffering zones).	Expansion of existing company at <i>location</i> , based on increased customer demand. Greenport reputation was important factor, no use of rail/barge. <i>Geometry</i> follows international standards. <i>Landscape integration</i> follows Trade Port directives and Danish architectural façade design of DSV.	<i>Location</i> near Belgian border, serving both countries under favourable Dutch labour law. Rail link not used. <i>Geometry</i> follows international standards. No <i>landscape integration</i> , except for (publicly criticized) horizontal/vertical façade pattern.	<i>Location choice</i> based on Logistic Hotspot 2017 status, proximity to station and highway Rotterdam-Antwerp, as well as potential workforce in West-Brabant region. <i>Geometry</i> follows international standards, but limited by available land. <i>Landscape integration</i> follows company standards, based on BREEAM, of durable concrete façade panels behind tree line.
<b>Planning tiers</b> local, regional, national	Strategic investments by national government in infrastructure and ecology, paired with infrastructure and area planning by regional and local governments.		Business estate planned only by local government. Switch to logistics due to delayed development close by.	
<b>Internationalization</b> development, standards, financing	Development by e-commerce company VidaXL itself, supported by local consultants. Financed by German investment bank Deka Immobilien as sale-lease back and forward purchase.	Development by logistics service provider DSV itself, following company's international standards. Financed by international investors as sale-lease back.	Developed and managed by Logistics Capital Partners, including land negotiation, permits and tender. Financed by German investor Dietz AG. DSV performs Ireland-based Primark's logistics operations.	Speculative development coordinated from nearby VGP Benelux (Antwerp). Local engineers and contractors involved in construction. VGP founded an electricity company to exploit PV roofs on its DCs.



*Semi-public development companies* are also common. These provide more knowledge and better negotiation power than a municipality. At the same time, they are more distant from public scrutiny and democratic decision making,<sup>19</sup> which increases the risk of watering down of social goals. For instance, in case of a lack of demand by the targeted manufacturing or agro-industrial companies, development companies approve developments that do not match the original high standards. According to a real estate advisor, 'local governments should collaborate more in *land banks*, instead of competing amongst each other'.

The aforementioned *sale-and-lease-back* allows construction and financing of a large DC, quickly shifting the real estate from the company's balance sheet and liquidating the considerable profits,<sup>20</sup> which can be invested in the supply chain or paid to shareholders. German investor Deka Immobilien explains that this usually includes *forward purchase and funding*:

In a matter of weeks, on paper, the DC is funded, bought and leased by Deka, before a developer such as Vida XL starts construction (6 months), followed by interior works (racking and conveyors, 4 months). This arrangement is used by Deka in 35 countries, with almost identical contracts.

While the investor calculates with a building lifespan of 30–40 years and renovation after 15–20 years, the developing logistics operator typically leases for a period of 10 years. Certain conditions attract logistics operators to the Netherlands, close to the Belgian and German borders, such as Value Added Tax and night-shift labour legislation.<sup>21</sup> Furthermore, low interest rates have stimulated large logistics real estate investments, which can be leveraged with foreign capital and give a low-risk return. Deka reports a growing importance of logistics real estate since the Covid-19 pandemic, from 10% to 50% of their investment pipeline, while the investor has stopped considering projects smaller than 70.000 sqm.

*Speculative developments*, as opposed to *built-to-suit* developments, are often seen as an important factor in vacancy and logistics sprawl. 'Developers take building lots hostage – out of the market – by making promises to the local government in exchange for land options, without actually constructing', the spatial-economic advisor explains. An interviewed speculative developer, however, claims the opposite: that 'speculative DCs are more flexible than custom-built ones, optimized for a broad range of tenants in the DC market on the long run'. Another expert claims that 'while this is true, the flexible leases often attract companies that do not necessarily fit in the economic DNA of the region, and lead to shorter contracts and more migrant labour'.

*Land price and scarcity* are seen as key factors in location choice. Governments do not take sufficient advantage of these, to promote brownfield developments for instance.<sup>22</sup> Stacked logistics developments, similarly, have not taken off in the Netherlands, due to the low land prices. An NIDC representative: 'land scarcity is raising prices already, and government policies can further steer locations and innovative developments'. Deka recently financed its first stacked logistics project in the Netherlands.

### Actor influence on DC transactions

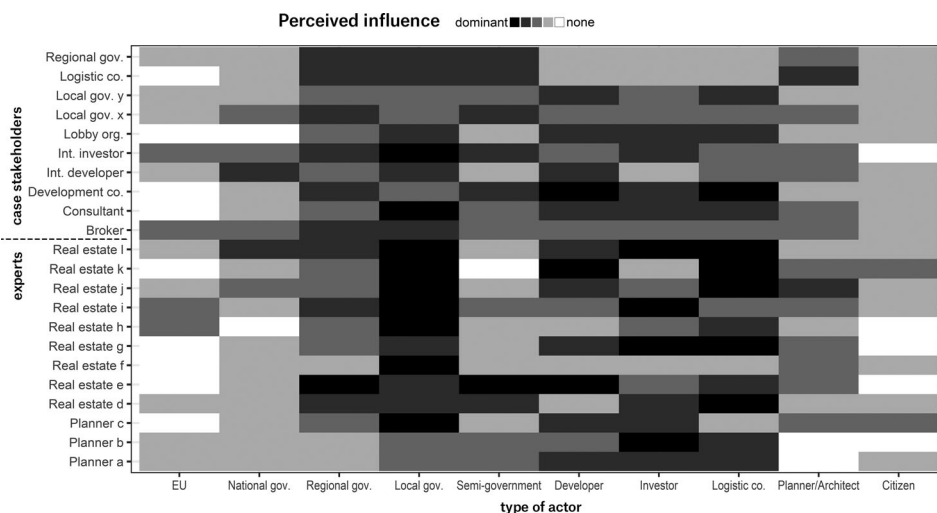
In the context of the cases, especially the interviewees of the logistics and real estate sectors surprisingly share the concerns regarding rapid logistics sprawl and the *boxification* of the Dutch landscape. Although their expressed estimation in the survey indicates a



great fragmentation in influence (Figure 5), the graph also demonstrates two clusters of relatively influential actors: the local and regional governments, and the combination of developers, investors and logistics operators. Municipalities are considered influential through land-use plans (Woudsma in: Hall and Hesse 2012), while they rarely acknowledge that power themselves. Planners, architects, citizens, as well as national and EU governments are considered of little influence.

Besides pointing at each other – municipalities versus developers for instance, stakeholders point at specific subsets of other actors during the interviews, such as *private equity investors* who aim for short-term profits. These might be less interested in the sustainability of the development than institutional investors. *Small municipalities* (<100.000 inhabitants) are often mentioned too, because they are often not as experienced and informed as big cities. In the words of many interviewees, such municipalities ‘don’t know what they’re doing and can be taken advantage of by developers’. In practice, there are many shared responsibilities. Location choice for example, according to most logistics developers and investors, is determined mainly by the choice of the client, e.g. a producer or trader. Corporate players, in turn, are regarded more powerful than local planners and might be making choices from foreign headquarters. Investors and consultants, however, do influence the location choice of their client, when they think it is too risky or not profitable enough.

The interviewees suggest a high level of corporate pan-European standardization, and in contrast a large diversity in government behaviour, including spatial and fiscal legislation, as well as facilitating government bodies who wish to attract logistics companies. Many stakeholders note that the DC planning focus in the Netherlands, compared to other European countries, is rather narrow – emphasizing visual impact, while it should emphasize social-economic effects and sustainability as well, including circularity, energy transition and modal shift.



**Figure 5.** Perceived actor influence on spatial decisions regarding DCs, estimated by the interviewed stakeholders and experts.

## Discussion

The presented Dutch case studies confirm that land pricing and incentives, governance structure, land-use plans and regulations, international standards, actor competencies and resources, are all relevant in explaining the spatial outcomes of European XXL DC transactions. While these variables are also found in other studies, our results suggest that two forces are particularly dominant: multilevel planning and internationalization.

### *Multilevel DC planning competencies*

We found evidence in the cases that planning competencies – especially experience and knowledge about logistics developments – can deliver higher degrees of control over location choice (clustering near multimodal hubs for instance) and landscape integration (e.g. embedding ecological and recreational developments). In larger logistics-savvy cities such as Venlo, these competencies are stronger, and sometimes combined with planning efforts between the local, regional and national scales. The analysed planning documents regarding Venlo Trade Port Noord show the elaboration of spatial regulations and structures, based on expert views, (design) research and collaboration among the local, regional and national governments. Strict local planning, as in Roosendaal, entails less control and less use of specialized information, as is shown in the documentation regarding Borchwerf II and affirmed by both the private and public stakeholders during the interviews. In other more rural municipalities, non-institutional investors seem to cause fragmented DC developments associated with logistics sprawl. Since the 1970s, there has been a large information disparity between large logistics corporations and small municipalities (LeCavallier 2016). While governments use spatial-economic consultants and often publish the reports online, logistics firms are advised by specialized fiscal experts and real estate advisors/brokers. This increases the competency asymmetries between actors in the DC transaction.

According to Stec Group (2020, 52–53) multilevel policy instruments could make a difference in location choice and landscape integration, if these were better used. Indeed, the Dutch instruments found in our study are quite similar to those used in most European municipalities and the US: ‘conditional land-use provisions on landscaping and sound proofing, minimum job density, infrastructure and traffic impact fees, property tax, truck exclusion/concentration zones, and land use buffers between logistics and housing’ (Yuan 2019, 534). Additionally, a brownfield redevelopment fund, filled by charges from greenfield developments, may be a good instrument too, as well as the emerging cross-regional coordination of the East-Southeast corridor (Panteia et al. 2019). The latter, however, we did not observe in our cases.

### *International DC developers: standards and blurring*

Our cases show surprising evidence about the role of local rootedness – or by contrast the internationalization – of companies plays in the spatial outcome of DC developments. It turns out that multinationals do care about sustainable location choice (established multimodal logistics clusters) and landscape integration. Not only do they work with local representatives in the Netherlands, familiar with the regional landscape and socio-

economic context. They also have various quality control and risk-avoiding mechanisms in place to safeguard their investments in DCs in the long run.<sup>23</sup> Such developers invest in flexible building layouts, durable materials and higher than required energy standards, to keep buildings profitable for a period of 30–40 years. Both in Venlo and Roosendaal, there are examples of logistics or parcel operators that invest heavily in automated equipment, written off in about 15 years. By contrast, it appears that especially local and private equity investors, focused on short-term profits, have developed DCs outside of established clusters, with lower construction and integration standards.

Our interview results confirm a strong internationalization in DC development practices, standards and geometry related to the more general internationalization of supply chains. Local land-use plans have adapted to the growing scale of DCs. Integration of the DC in its surroundings often follows from international standards as well, unless a local or regional plan imposes additional requirements, such as Venlo's Trade Port Noord. It seems therefore, that the concern of Easterling (2014, 200) about 'international standards being used to undermine national environmental laws' does not apply to Dutch DCs – sustainability standards of BREEAM NL are higher than its international peer. Some multinationals, such as Amazon, are held responsible for the decline of local businesses and reasonable working conditions (Hesse 2020) and are therefore, according to an interviewed investor, 'explicitly not welcome in certain municipalities in Germany'. We did not find a similar restrictive practice in the Netherlands. Our study shows that, although government-owned land development companies have distanced logistics land transactions from public scrutiny, they enhance the competencies necessary to deal with (multinational) companies and uphold public values.

Finally, we find that logistics companies – regionally or internationally originated – that have strong regional ties depend on the economic vitality of the region as a whole and a positive public image for their 'license to operate'. This matches a recent conclusion by Raimbault (2021) that international DC developers depend on local coalitions to dominate the market. For example, Greenport Venlo and international parcel operator DPD have invested in landscape and cultural heritage as part of their CSR policies. The damaged sector image is a risk for long-term logistics investors and operators, who would therefore welcome stricter regulation of logistics greenfield developments and incentives for brownfield development,<sup>24</sup> effectively creating a level playing field across the Dutch East-Southeast corridor.

## Conclusion

In this paper, we assumed that very large distribution centres (XXL DCs) in Europe are the spatial outcomes of a specific planning-development dialectic (Figure 1). In this view, the location choice, geometry, and landscape integration of XXL DCs are a combined result of transactions between localized planning and development efforts, which in turn are shaped by a variety of rules and available resources. Four Dutch DCs, with differing planning-development interactions confirm that, next to land pricing and other common incentives, multilevel planning competencies and international DC development standards strongly explain the Dutch DC transactions and outcomes studied. While internationalization of the sector has been an important driver of XXL DC growth, it appears that austerity and a lack of knowledge among

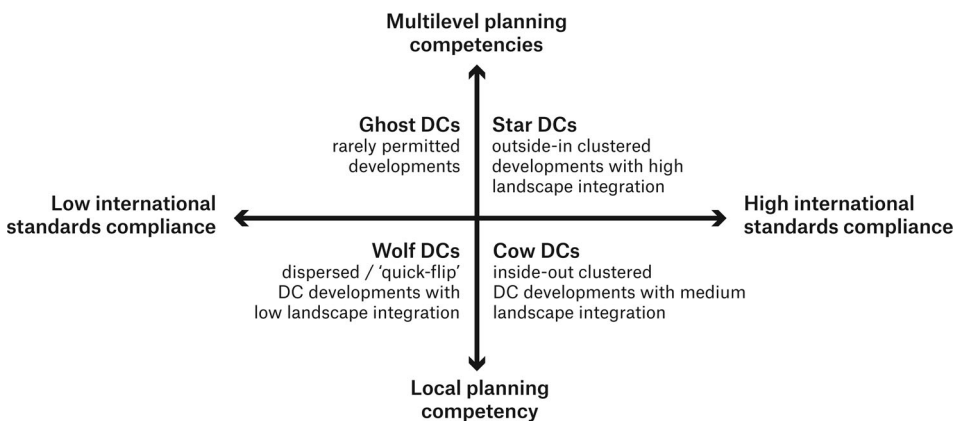
local governments, best explain the logistics sprawl witnessed in Europe outside of established clusters.

Our framework goes beyond a neoclassical land price mechanism to include other transaction costs, particularly those associated with multilevel planning competencies and international development standards. An interviewed investor illustrated the relevance of such costs very clearly:

From an accessibility point of view, we would like to invest in DCs in Rotterdam. The maximum land-lease of 25 years typically offered by the Rotterdam Port Authority, however, does not match our investment horizon, in which we write a building off in 40 years. So, we take our demand to other locations.

Venlo used land price incentives to attract logistics companies, while Roosendaal offered favourable labour programmes. Both municipalities eased their selection criteria for targeted company types (agrofood and manufacturing) to keep land sales going during periods of slow growth. Such incentives are still largely a local affair and the politics behind them remain somewhat of a black box. If governments decide to regulate spatial DC outcomes, our study suggests that a distinction is needed between companies that depend on a specific location and those that are relatively footloose. While the first can be stimulated by local incentives for better performance, the latter may be persuaded to settle in high-performance locations elsewhere through higher industry standards and/or government policies. The theoretical typology resulting from these variables in [Figure 6](#) demonstrates why especially the large multinational firms – in combination with large multilevel government programmes – can lead to better clustering and integration of DCs in the landscape. Less competent public entities, in contrast, sometimes face short-term private equity interests and property developers who produce ‘quick flips’ in suboptimal locations. Multilevel logistics planning, which is an unusual practice in the US, has improved the balance between regional flows and local impacts in Los Angeles (De Lara in Hall and Hesse 2012). Our research shows that the same seems to be true for the European context.

The DC planning-development dialectic offers several pathways of further research, for example into how certain price conditions stimulate innovative sustainable DC



**Figure 6.** European DC planning-development typology.

practices – multifunctional, stacked, or DCs with climate adaptive landscapes. Developing empirical and normative DC assessment methods, e.g. to promote more sustainable spatial DC outcomes, also seems relevant and promising. Besides the two rational components of planning competence and internationalization, however, there is clearly a softer, more irrational component at work in the development and planning process of DCs that consists as much of rhetoric, persuasion and framing as of hard financial-economic assessment (Healey 1999; Neefs, Zonneveld, and Gerretsen 2022). Both rationalities and the irrational component should be part of further research.

For planning practitioners, the two variables that stood out in our analysis offer good starting points for effective policies aiming to influence transactions and hereby improve spatial DC outcomes. Existing local planning instruments and guidelines, if combined with regional and national coordination – perhaps with incentives such as a brownfield redevelopment fund – seem promising spatial steering tools. Also, in the high-profit margins of DC development, there seems to be enough room to improve landscape integration, given a level playing field across regions. Market demand could be enhanced by promoting higher (international) standards in logistics investment funds and the sharing of best practices, for example for creating high-density and landscape integrated DCs.

## Notes

1. Numbers and mapping from the open access research dataset DOI:[10.4121/19361018](https://doi.org/10.4121/19361018)
2. E.g. in the Netherlands: Oost NL, REWIN, Ontwikkelmaatschappij Midden-Limburg and Midpoint Brabant.
3. Dutch logistics lobby is performed by Transport & Logistiek Nederland (TLN) and Evofenedex, joined in the Logistiek Alliantie. The sector is promoted abroad by the Netherlands International Distribution Council.
4. Logistics real estate in Dutch provinces Noord-Brabant and Limburg is currently financed for 95% by foreign investors, while 75% of the buildings have a lease shorter than 5 years, and 50% are leased to logistics service providers with frequently changing client portfolios (Bak 2021).
5. Developers active in Europe have portfolios including millions of sqm in logistic space and land banks of hundreds of hectares (<https://www.prologis.nl/over-ons>, <https://heylenwarehouses.com>, <https://www.vgpparks.eu/nl/properties/>). Dutch logistics real estate development profits are comparable per sqm to the London office market (Trappenburg in Financieel Dagblad, 2019).
6. Logistics development in the US has recently shifted to smaller DCs near consumers in (sub)urban sites. This trend has only recently begun in Europe.
7. Spatial quality plans explained on <https://iplo.nl/thema/ruimtelijke-ontwikkelingen/bijzondere-onderwerpen/beeldkwaliteitsplan/>. The only two Logistics developments with a Q-team are the ones near the airports of Schiphol and Eindhoven.
8. Repository DOI:[10.4121/14717058](https://doi.org/10.4121/14717058)
9. MS Teams and Amberscript
10. See repository
11. <https://www.maastrichtuniversity.nl/research/food-claims-centre-venlo>
12. Described in the regional and co-municipal visions, masterplan and landscape plan (Greenport Venlo & Studio Marco Vermeulen 2009; BRO 2010; Heusschen Copier 2010; Venlo 2012; Limburg Province 2014).

13. Described in masterplan, landscape plan and the national Greenports implementation (Government of the Netherlands 2010).
14. In 2021, a large agro-logistics company was landed in Trade Port Noord. Similar to the fashion DCs, the agro-logistic company's arrival was criticized in local politics for the dependence on migrant workers.
15. DSV is present in Venlo since around 1900, in the form of transport company Frans Maas, acquired by DSV in 2006.
16. Described in the land-use and spatial quality plans (Roosendaal 2012; Dhondt 2013; Roosendaal & Halderberge 2013; Halderberge 2017).
17. <https://www.logisticscapitalpartners.com/Case-studies/Primark.htm>
18. In our interviews as well as newspapers: <https://www.ad.nl/binnenland/hoe-ze-roosendaal-tegenwoordig-noemen-dozendaal~a7f73b05/>
19. The Greenport Venlo Development Company, although owned 100% by local governments, is not subject to the Public Administration Transparency Act (WOB).
20. In 2020, a typical DC of 100.000 sqm in the Netherlands has a land and construction cost of around 100 million, and a real estate value of 150 million on the balance sheet.
21. Dutch VAT legislation allows for an attractive delay for re-export and e-commerce: tax is not due until goods are exported from the warehouse. In contrast with Belgium, Dutch DCs can operate 24/7.
22. Recently, large logistics developments on brownfield sites have also been criticized, for competing over industrial land with small local companies.
23. Especially closed-end fund investors (not registered at the stock market) have a strong influence on DC location choice. They prefer larger clusters in the East-Southeast corridor of the Netherlands, within reach of 150 million consumers in a 500 km radius.
24. Sometimes as their personal opinion rather than an official company statement.

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## Research data

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