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Applying a logistics cluster typology in spatial planning for circularity: lessons from a Dutch policy lab

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ABSTRACT

The spatial planning of logistics is an emerging topic due to scarcity of land, environmental impacts and the transition to a circular economy. This paper proposes a policy information tool for these issues, including a new logistics cluster typology applied in suitability maps. The validity and applicability of this tool are tested in a Dutch policy lab. The analysis reveals two stakeholder views: one emphasising an informed multilevel dialogue and the other pointing to local freedom of decision making. Applicability can be improved by training, updating and deciding on a clear status of the tool in the policy process.

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Logistics typology; spatial planning; circular economy; policy tool; policy lab

Introduction to the spatial planning issue of logistics

In spatial planning—occurring in the Netherlands, other European countries and the US—logistics clusters have become a key topic due to their increasing spatial footprint, employment conditions, nuisance and the 'landscape boxification' debate (Aljohani & Thompson, 2016; Woudsma *et al.*, 2016; Heitz *et al.*, 2017; CRa, Rademacher & De Vries, & Stec Groep, 2019; Krzysztofik *et al.*, 2019; Yuan, 2019; Hesse, 2020; Strale, 2020). Nevertheless, spatial planning remains a crucial facilitator of logistics through zoning and infrastructure planning.

Recent research has highlighted three urgencies in the practice of planning logistics clusters: (i) multilevel planning appears to be necessary to achieve logistics developments of sufficient quality and adequate quantity with regard to location choice and landscape integration (Nefs & Daamen, 2022); (ii) the use of detailed typologies – while considering location characteristics and the socio-economic context of logistics activities – is deemed necessary for accurate spatial planning (Heitz *et al.*, 2019; Sakai *et al.*, 2020); (iii) the new economic paradigm of the circular economy (CE) will change the spatial requirements of the logistics system and are not yet part of planning practice (Akkerman *et al.*, 2019; Rood *et al.*, 2019). Logistics is traditionally seen as an enabler of what is called the linear economy, predominantly distributing products in extensive global supply chains. More recently, the logistics sector has been seen as a key factor in the transition to the circular economy since the handling of goods and materials facilitates recycling and remanufacturing activities (Rli, 2013, 2015; Van Buren *et al.*, 2016; Kębłowski *et al.*, 2020; Bucci Ancapi *et al.*, 2022).

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Although providing information on these topics in the policy-making process seems crucial, there remains limited knowledge of how this can be done with sufficient validity and applicability. This paper contributes to this issue by proposing an information tool for the spatial planning of logistics from a CE perspective. Policy tools or instruments have been categorised in many ways, ranging from restrictive (sticks), to procedural to stimulating (carrots) to strategic (Van Nispen, 2011; Acciai & Capano, 2021; Stead, 2021). The proposed tool falls in the category of information tools, which join and communicate information to influence policy. It is based on four new logistics cluster types, which were elaborated from present typologies in the literature.

The present study tests the validity and applicability of the tool in a Dutch policy lab in 2022/2023. In a policy lab—an organisational form increasingly used in countries such as the UK—knowledge from research, peer institutions and experts is applied, thereby bridging 'the gap between what we know and what we do', to develop policies and test and adapt these without going through the implementation process (Lee & Ma, 2020; Whicher, 2021). In this lab, the typology is operationalised in suitability maps for each logistics cluster type. These maps are based on parameters and mechanisms found in the literature and data sources, after which they were adapted several times after feedback from stakeholders. Like other maps, they are thus a social construct of selected norms and issues that are part of a discourse regarding the territory (Zonneveld, 2021). The use of map tools as planning support systems is often suboptimal since these tend to focus on the digital system and spatial elements and too little on the stakeholder context (Pelzer *et al.*, 2015). In this context, there are often groups with varying views on policy problems, goals and solutions (Veselý, 2021), as well as varying interests and knowledge levels. Furthermore, the better a tool strengthens the existing features of the policy context, the sooner it is selected (Bressers, 1998). By analysing the policy lab, the present study aims to answer the following question:

> How are the validity and applicability of logistics cluster typologies for the CE, as well as related information tools, perceived by Dutch planners and policymakers?

The next section proposes a cluster typology based on the recent logistics and CE literature. The third section introduces the Dutch policy lab, in which the typology is applied as a map tool. It also introduces the Q-methodology used to assess different stakeholder views on the typology as a policy tool of spatial planning. Section four presents the results, whilst section five discusses the implications for the interdisciplinary spatial planning discourse and provides directions for further research.

A logistics cluster typology for spatial planning in the CE

A CE, or circular (city) region, is generally understood as a system that strongly reduces the intake of primary resources and energy, as well as environmental impacts such as waste and emissions (Bucci Ancapi *et al.*, 2022). Although CE is a normative, emerging and not (yet) uniformly defined concept, researchers have argued that CE activities have direct implications for logistics activities and land use. For example, decreasing material consumption, increasing reuse, the repair and refurbishing of products, as well as changing scales of production chains and cycles are argued to be necessary to transition towards a CE (Hanemaaijer *et al.*, 2021; PBL, 2022; Warringa *et al.*, 2022). The core

activities of a CE, such as recycling (Burger *et al.*, 2017), are indeed hardly imaginable without logistics. Recent CE policy instruments have varied broadly from green import tariffs and green innovative production incentives (Rodrik, 2018, p. 262; Bauwens *et al.*, 2020) to spatial policies prioritising CE companies in spatial developments, such as the Port of Antwerp project BlueGate. No matter how the CE develops, it appears unavoidable that it will require more space than the current economy (PBL, 2022). Researchers have argued that, besides the changing production chains, a more comprehensive approach to wellbeing is also part of the CE. Planning should therefore also aim to decrease environmental impacts and spatial injustice regarding logistics (Yuan, 2018; Strale, 2019; deSouza *et al.*, 2022).

Existing typologies

Logistics location typologies in the literature have generally focused on these parameters:

(1) The logistical function of individual facilities, such as ports, inland terminals or transport companies (Sakai *et al.*, 2020; BCI, 2021), as well as specialised value-adding activities including customs clearance, warehousing, postponed manufacturing and third-party logistics services (Hsuan Mikkola & Skjøtt-Larsen, 2004; Bowen, 2008; Meza-Peralta *et al.*, 2020). A comprehensive overview of these functional aspects is shown in the typology by (Buldeo Rai *et al.*, 2022).
(2) A business-to-client (B2C) or business-to-business (B2B) orientation, as well as a geographical range, which can be regional, national or international (CRa *et al.*, 2019; Rodrigue, 2020; Buldeo Rai *et al.*, 2022).
(3) Market segments such as food, agro bulk, manufacturing components, consumer goods, parcels and express shipments, and returned purchases (Heitz *et al.*, 2019; Meza-Peralta *et al.*, 2020).
(4) The distance to urban centres and the population density of their surroundings, building footprints and the number of employees (Cidell, 2010; Boudouin, 2012; Dablanc *et al.*, 2014; Ducruet in Geerlings *et al.*, 2018, p. 92; Heitz *et al.*, 2019; Rodrigue, 2020).
(5) Socio-economic context, distinguishing urban and suburban wholesale trade, logistics nodes, suburban logistics, as well as low-logistics areas in either a suburban high-income context or a rural low-income context (Dablanc *et al.*, 2014; Strale, 2020).

The literature also highlights a rapidly growing number of logistics services that are relevant for a typology based on CE, such as reverse logistics—handling returned goods for reuse or recycling—and the supply of spare parts in repairs or remanufacturing (Rushton & Walker, 2007; Coe & Hess, 2013). It appears that for a logistics typology to be effective in spatial planning with regard to the CE, it must extend beyond the mere operational functions of a single terminal or warehouse in the logistics network (e.g. transhipment or storage). What needs to be included is the economic function of logistics facilities in their spatial contexts, discerning at least the urban/suburban position, roughly the types of services that are provided and the orientation towards either (re) manufacturing processes or consumers. Since these aspects often transcend a single

building and involve a larger area, what seems to be required is a logistics cluster area typology rather than a logistics company location typology.[1]

Role of logistics in the circular economy

The logistical requirements of the CE include at a minimum reverse logistics—the upstream movement of goods back from consumers to distributors and producers with the purpose of dealing with purchase mistakes, the recycling of materials as well as the remanufacturing and refurbishing of products (Hawks, 2006; Korhonen *et al.*, 2018; Bucci Ancapi *et al.*, 2022). Recent economic policies and business strategies, such as near-sourcing and reshoring of industries, can also be important steps towards the CE (Adrian *et al.*, 2018; Geerlings *et al.*, 2018, p. 275). Logistics networks, clustering and the co-agglomeration of interdependent industries are mentioned in these strategies as means to decrease transportation and the importation of raw materials (Van Buren *et al.*, 2016).

The economic activities that shape the CE in cities and regions are an emerging field of study (Smit *et al.*, 2014; Burger *et al.*, 2017; Ekins *et al.*, 2019; Kishna *et al.*, 2019; Williams, 2019). Many studies have labelled these activities by order of impact in the so-called R-strategies, ranging from refuse (R0) via repair (R4) to recovering energy from waste incineration (R9) (Kirchherr *et al.*, 2017; Potting *et al.*, 2017). Another way of distinguishing CE activities is between core and enabling activities. The core (R3–R9) requires specific logistics cluster locations, featuring bulk transport hubs, warehouses and the possibility of producing nuisance, while the enablers (R0–R2, including design, engineering, digitalisation and supply chain management) are often found in urban offices. Thus, for the development of a logistics cluster typology, the core CE activities are most relevant. In many logistics locations, the CE will likely face competition for space due to other autonomous trends that drive demand for warehouses, such as e-commerce and the de-risking of supply chains (Nefs & Daamen, 2022).

However, for a logistics cluster typology, this paper focuses on the qualitative spatial characteristics derived from expected activities in the CE of the Netherlands, as recently assessed by Van Buren *et al.* (2016, p. 8), PBL (2022), and Warringa *et al.* (2022, pp. 5,9), following the aforementioned R-strategies. Several assumptions are made regarding the possible spatial impacts of CE activities on logistics clusters in the Netherlands in Table 1. Notably, three patterns stood out. First, the increase in spatial demand seems to be more impactful than the possible reduction in spatial demand in the CE. Second, various CE activities in the R-strategies appear to have similar spatial requirements. Third, medium-sized warehouse facilities in urban areas close to consumers are required, as well as (extra) large facilities in high-nuisance peripheral locations.

In summary, the following variables appear to be key in a logistics cluster typology within the CE and applicable to spatial planning:

(1) Urban/suburban position, with regard to proximity and nuisance.
(2) Provided services.
(3) Orientation on manufacturing (B2B) or consumption (B2C).
(4) Regional/global flows of goods.
(5) Size of logistics facilities.
(6) Grouping—vertical or horizontal clustering—of CE activities.

Table 1. Assessed potential spatial requirements of logistics in the CE, by the author. Based on the R-strategies Kirchherr *et al.* (2017), Van Buren *et al.* (2016), PBL (2022), and Warringa *et al.* (2022).

R-Strategy definition	Assessment of activities (literature)	Assessment of spatial requirements (author)
0. Refuse 1. Rethink 2. Reduce *(Product function replaced by alternative; sharing or other intensive use; manufacture with less resources)*	Less consumption of products; Extended life cycles of products; Minimising of unnecessary transportation of goods.	Reduced demand for extra-large (reexport, retail and e-commerce) warehouses; Reduced demand for transport capacity related to global supply chains. Increased demand for consolidation of freight flows in intermodal hubs; Spatial clustering of interdependent industries, possibly near such hubs.
3. Reuse 4. Repair 5. Refurbish *(Product in good condition used by other consumer; maintenance of defective product; restoring and updating products)*	Increased regional flows of existing products for temporary storage before reuse, repair services, and refurbishing; Shortening of certain chains and cycles.	Increased demand for medium-sized warehouses with specialisation in certain niche markets and services, near the consumers; Increased demand for (extra)large warehouses for more common flows of used products, including platform-based services (Amazon, Alibaba etc.)
6. Remanufacture 7. Repurpose *(Using part of discarded product in new product with same or different function)*	Not explicitly mentioned.	Arguably the same spatial requirements as R3-R5, with possibly more nuisance.
8. Recycle *(Processing materials to obtain same or lower quality)*	Collection, storage, separation, processing, and packaging of materials.	Increased demand for medium-sized warehouses for collection near the consumers; Increased demand for (extra)large warehouses and exterior spaces in clustered nuisance-permitting locations with bulk-transport capacity for effective handling and storage of collected and processed materials.
9. Recover *(Incineration of material with energy recovery)*	Not explicitly mentioned.	Demand for high-nuisance permitting locations with bulk-transport capacity.

New typology for logistics clusters

The aforementioned variables are used to build a new typology of logistics clusters aimed at spatial planning and the CE, following the following argumentation. The first variable in practice is a result of the chosen market orientation and range (variables 3 and 4), whilst the second variable has too many different and changing options for a simple typology (it also seems highly dependent on variables 3 and 4). In contrast, variables 5 and 6 are not distinguishing enough for four meaningful quadrants in a typology. Variables 3 and 4, the orientation on manufacturing versus consumption and the enabling of regional versus global flows, thus appear to be determining variables from which the others can largely be explained. Therefore, these form the main axes of the typology (Figure 1), whilst the other variables are used in the detailed description of the four resulting quadrants: *materials and energy*, *(re)manufacturing*, *(inter)national distribution* and *city logistics clusters*. The assumption for each type is that in the CE and

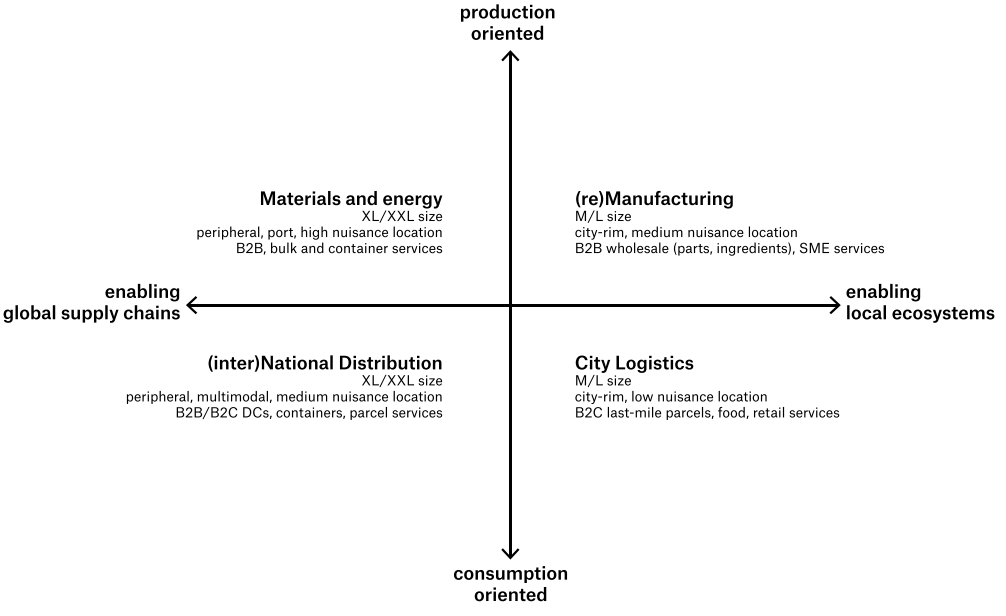

Figure 1. New logistics cluster typology, by the author.

spatial planning,[2] logistics is spatially more combined with other productive or consumptive functions.

The level of suburbanisation and warehouse size varies per logistics cluster type: the types in the left part of the new typology (Figure 1) are likely to be located in peripheral areas and contain (X)XL buildings, whereas the types on the right are located near urban centres and contain M/L buildings, in line with (Heitz *et al.*, 2019; Buldeo Rai *et al.*, 2022). Although the spatial typology differs from the existing—mostly functional—ones, the location types of the discussed references can be quite clearly accommodated. To verify the relationships with the existing typologies, Figure 2 superposes these, along with three large groups of activities that came up in the policy lab discussions but do not fit strictly within one of the quadrants: value-added logistics, (circular) manufacturing and e-commerce.

Implementation and assessment of the new typology

Policy lab focusing on large logistics buildings

The Netherlands provides a critical spatial planning case for the application of such a typology (Flyvbjerg, 2011) because the country has concrete policy goals of transitioning to a CE[3] by 2050 (IenW & EZK, 2016; VNO-NCW and MKB-Nederland, FNV, VNG, IPO, & Rijksoverheid, 2017; BZK, 2020) whilst maintaining its logistical position as a gateway to Europe (BZK, 2020; Nefs *et al.*, 2022). With its large freight infrastructure and strategic position in Europe, the Netherlands can arguably serve a significant role in the CE, such as with regard to plastics (CE Delft, 2021). Estimates in the Netherlands suggest that the spatial impact is large since circular port activities in Amsterdam and Rotterdam would take up 30% more than the current space (Peters, 2018; Rienstra, 2022;

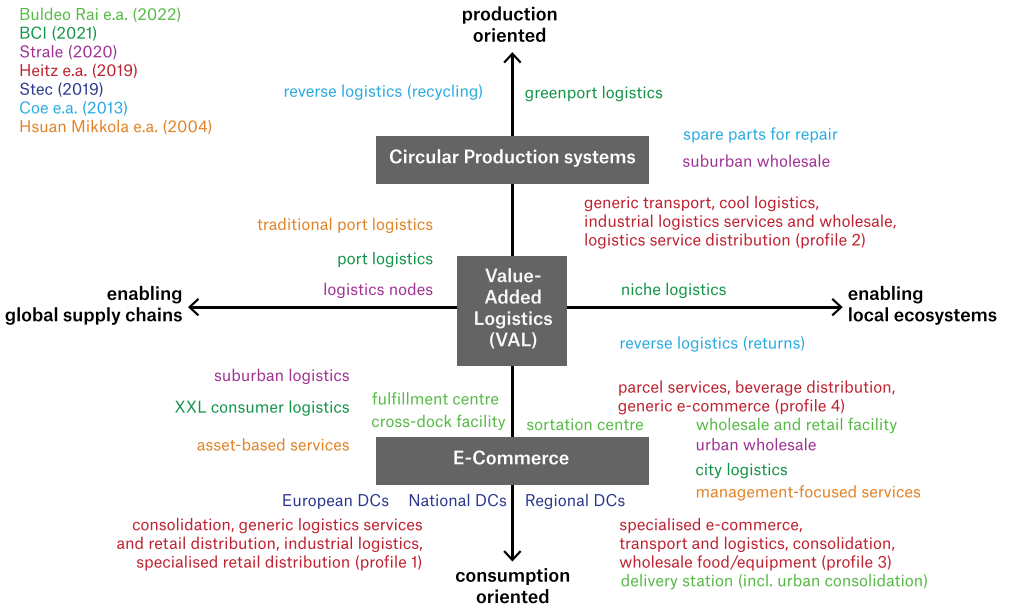

Figure 2. New logistics cluster typology populated with existing typologies by Heitz *et al.* (2019), Coe and Hess (2013), Strale (2020), Hsuan Mikkola and Skjøtt-Larsen (2004,) Stec Groep in CRa *et al.* (2019), Buldeo Rai *et al.* (2022), and BCI (2021).

Warringa *et al.*, 2022). However, in practice, the co-agglomeration of (re)manufacturing and logistics in the Netherlands remains scarce (Nefs *et al.*, 2023).

The Dutch national government has recently initiated a programme called Grip[4] to increase the clustering of logistics development in appropriate locations until 2050. Four important issues in achieving that goal include the following: (i) national direction or restriction on certain locations or location types; (ii) organising a level playing field of land scarcity and quality criteria among provinces to temper the 'waterbed effect' of logistics developments; (iii) stimulating the more intensive use of existing sites and infrastructure, such as by promoting function mix and densification; (iv) stimulating brownfield redevelopment without excluding local small and medium-sized enterprises (SMEs) from such areas.

The spatial impact of logistics buildings on landscapes, known as 'boxification', has become more prominent in the national policy debate. A parliamentary motion forcing the government to control logistics sprawl (Bontenbal, 2022) has increased the political urgency of the Grip programme. In its setup, the programme fits the definition of a policy lab (Lee & Ma, 2020). It has been led since 2019 by the ministry responsible for spatial planning and integrates two other ministries—responsible for economic affairs and infrastructure—with the participation of the 12 Dutch provinces and other stakeholders (in total ca. 45), as well as ca. 15 external experts. The ca. 60 participants have mostly a policy making or advisory role (not political or operational), while they have a varying knowledge level on logistics—some having responsibilities in spatial planning and others in infrastructure or economic policy. It aims to apply knowledge from research, the participating stakeholders and experts to

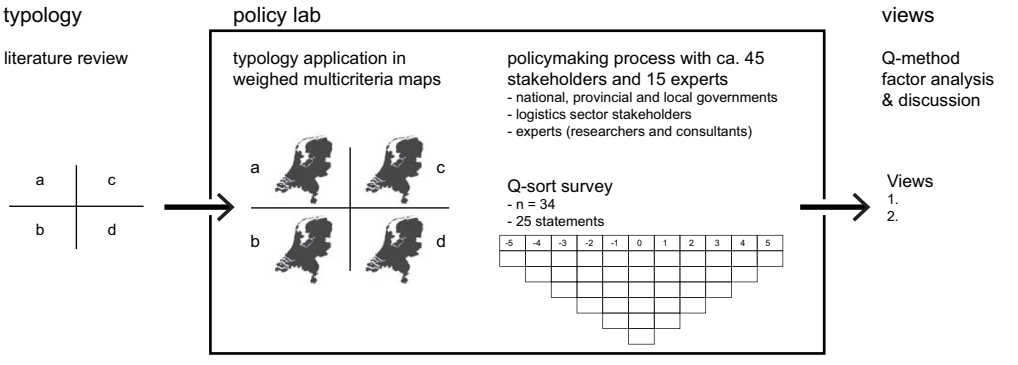

Figure 3. Structure of the analysis.

develop spatial policies for logistics. The political urgency and the ambition of a coherent policy framework—across all provinces and national government—make it necessary to develop, test and adapt these policies without going through implementation. The programme was to deliver planning guidelines for large developments by the beginning of 2023; however, this has been delayed due to provincial elections in March 2023, which changed the political stance on the issue considerably in some provinces.

Part of the lab's activities concern spatial planning research in 2022/2023, focusing on the application of the above typology in a policy information tool and learning from it (Nefs, 2023). The policy tool consists of an online map tool[5] to visualise the potential of locations regarding each of the four logistics cluster types.

The main hypothesis driving the analysis is that groups of stakeholders in the lab have different perceptions of the application of the typology in the map due to the following reasons: (i) diverging views on how multilevel governance should be organised (e.g. top-down[6] versus bottom-up use of the map); (ii) diverging views on the validity of the typology and maps (e.g. its representation of the CE and location factors); (iii) diverging views on the applicability of the typology and maps in policy making.

An additional hypothesis concerns the variation per province. In the policy lab, some provinces tend towards restrictive policy, especially logistics-concentrating provinces that are dealing with public protests. Some are willing to accept certain logistics developments, but only if they are of sufficient regional benefit. Others are ambitious in attracting such developments for reasons of employment and available space. These contrasting interests were frequently verbalised throughout the policy lab: 'We ordered cake from the local bakery to celebrate that a large fashion distributor chose another province.' It may also be expected that provinces view the issue differently from national government and experts.

The following parts of the paper analyse stakeholder views regarding the validity and applicability of the aforementioned typology, implemented as multicriteria suitability maps in the policy lab. The main structure of the analysis is presented in Figure 3. In the discussion and conclusion section, the results are generalised to the broader planning discussion regarding different views on the use of typologies and map tools. In the paragraphs that follow, the suitability maps and Q-method are introduced.

Multicriteria suitability maps

The typology discussed above is implemented as four suitability maps-one for each logistics cluster type – by using a GIS-based weighted multicriteria analysis (WMCA) covering the entire Netherlands in 500 × 500 m grid cells. The criteria consist of 22 location pull and push factors for logistics suitability, weighted differently for each type (Figure 4). The selection of location factors and their weights were based on existing literature where possible. Researchers have shown the importance of proximity to (i) linear infrastructure and transport nodes, (ii) to consumer and labour markets, and (iii) to production facilities (Flämig & Hesse, 2011; Verhetsel *et al.*, 2015; Hesse, 2020; Sakai *et al.*, 2020; Onstein, 2021; Tare *et al.*, 2021). Rents are mentioned as well, although these tend to reflect the aforementioned factors (He *et al.*, 2018; De Oliveira *et al.*, 2020).

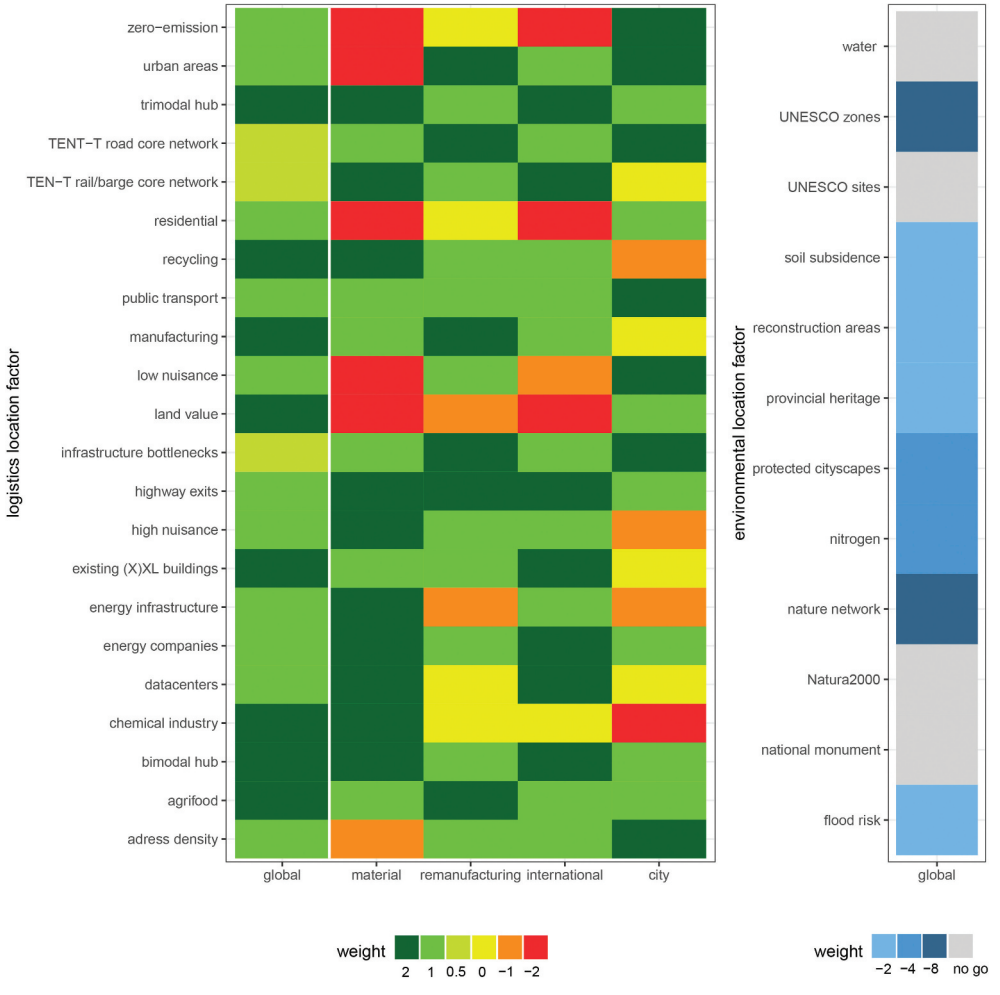

Figure 4. Location factors weighted for the multicriteria suitability maps. Logistical suitability is weighted globally and per logistics cluster type, whilst environmental suitability is only weighted globally.

Researchers also mention proximity to communities or ecological reserves that are likely to be impacted by traffic and emissions of the logistics cluster (Wagner, 2010; Aljohani & Thompson, 2016; Yuan, 2021). From a landscape perspective there are ecological, heritage, soil aspects that play a role (BZK, 2020). Since the literature does not offer a comprehensive set of weights and factors, the list was complemented and validated by several stakeholder feedback sessions in the policy lab, as well as expert opinions outside the lab. The same was done regarding the factors of environmental suitability, some of which are no-go areas: Natura2000 European nature reserves as well as UNESCO world heritage sites and national heritage sites in rural areas (these generate blank areas on the map). Provincial nature and heritage zones may also create limitations in practice or require additional landscape integration efforts for logistics developments. They are not indicated as no-go areas a priori, but rather weighted as negative factors.[7] The resulting suitability maps (Figure 5) became more refined during the reiterative process of adding factors, tuning weights and discussing the outcomes in the policy lab.

There is large variation and some overlap among the four resulting maps. Generally, suitable locations for the *material and energy* clusters are scarce and concentrated around the (inland) ports with bulk terminals, where nuisance regulations permit such activities. In contrast, *city logistics* clusters are possible in and near most population centres. Suitable sites for *inter(national) distribution* clusters are found mainly along the major infrastructure corridors. Moreover, *(re) manufacturing* clusters are more suitable near the existing urban-industrial centres with a high potential availability of skilled labour. The maps are presented in

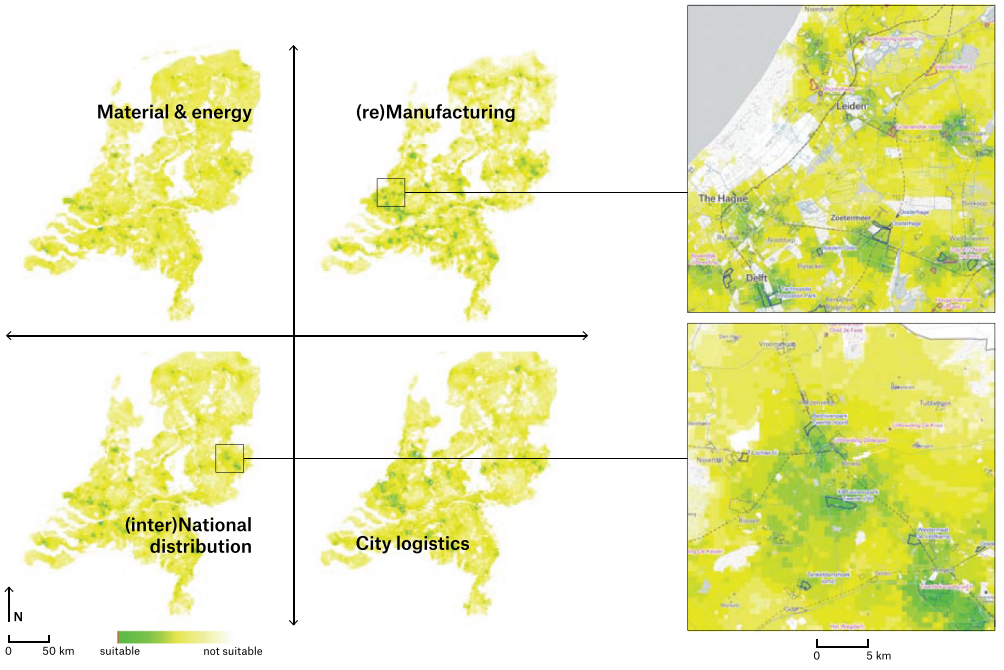

Figure 5. Weighted multicriteria suitability maps (the greener the more suitable). Left: clean maps. Right: details of the zoomable online viewer showing suitability in 500m grid cells and existing (blue) or planned (pink) business estates.

a report with informative labels, legends, interpretations and a link to an online zoomable map viewer.[8]

Q-method

From the research activities in the lab, the main arguments of the discourse were already known. Therefore, interviews would not yield much new information, nor would a questionnaire. The advantage of the Q-method (Coogan & Herrington, 2011) compared to other survey types is that it is specifically developed for the analysis of views in a discourse. The Q-method maps opinions in great detail; not just agree-disagree, but many points in between. On top of this data, participants can add qualitative remarks to enrich the analysis.

To analyse stakeholder views on the typology and maps, the Q-method executes four steps. First, 25 statements are formulated regarding governance preferences (s1–s4), as well as the validity and applicability of the typology (s5–s9) and map tool (s10–s25), representing as completely as possible the 'concourse' of existing views on the topic gathered from stakeholder sessions and documents of the policy lab. Second, the 25 statements are assessed by the participants in the online Q-sort[9] interface over two stages. In the initial stage, one divides the statements into three bins (disagree, neutral, agree). In the final stage, one refines the division into nine bins, ranging from strongly disagree to strongly agree (see Figure 3). Third, the resulting Q-sorts of the participants are used to load factors in factor analysis and identify different views on the topic using a dedicated Q-method statistics package (Zabala, 2014). Fourth, the resulting views are discussed, combining statistical results with the qualitative information of the statements and remarks made by the stakeholders. Overall, 34 of the ca. 60 stakeholders and experts in the policy lab completed the survey. Four provincial stakeholders explicitly refused to participate in the survey, citing the delicate policy process and concerns about the outcomes leading to unwanted top-down steering.

The choice of generating two factors (i.e. two views on the topic) was made by the author, based on test runs using two, three and four factors. Notably, two factors provided the most significant outcome: the lowest number of factors to describe (2) with similar sizes (18 and 15 respondents), the lowest number of respondents that cannot be statistically included in one of the factors (only 1), combined with high reliability (98 and 99%) and low standard errors of the difference between the factors (0.17). In the online Q-sort interface, additional data are collected from each participant before they perform the assessment: their role (government official at the national, provincial or local level, company or non-profit) and their self-reported level of knowledge regarding the typology, map and policy lab (high, medium, low). Directly after performing the assessment, remarks are collected from the participants. These additional quantitative and qualitative data are used to describe the results in the next section.

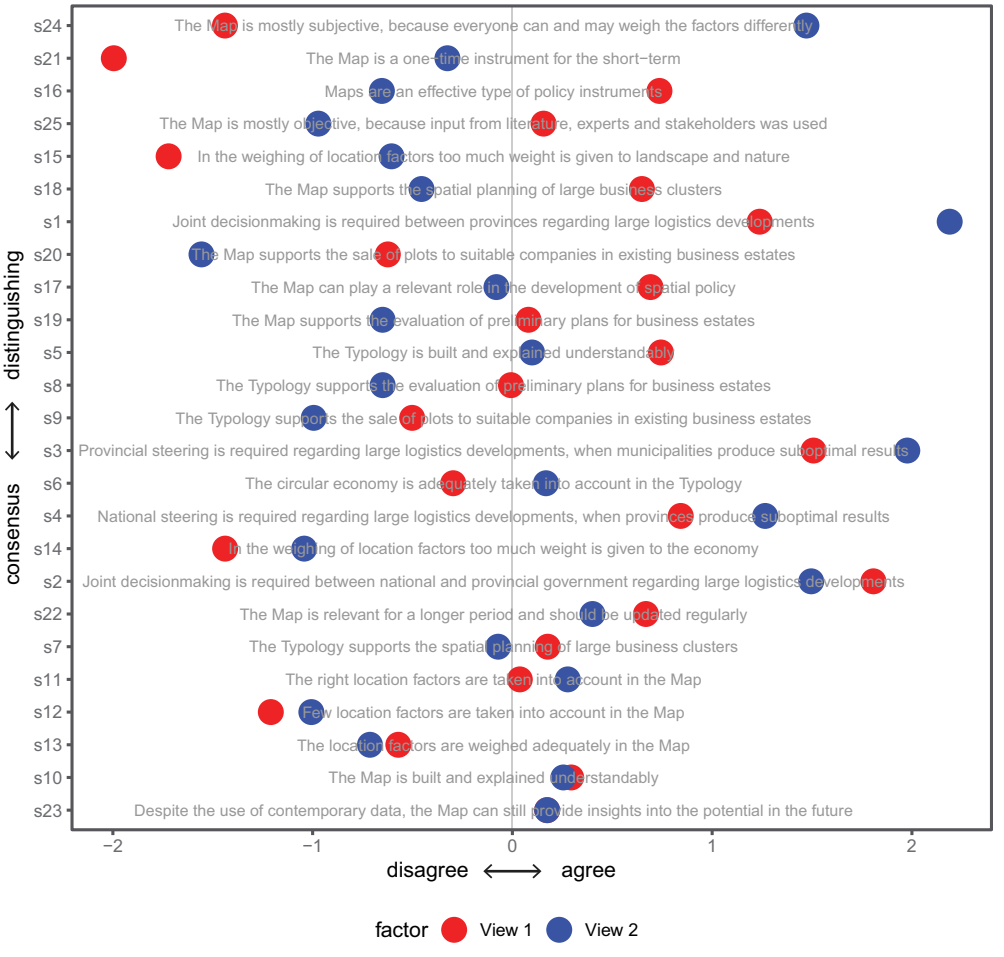

Figure 6. Q-sort statements, translated from Dutch and ranked by their distinguishing effects among the factors. The greater the distance between the scores (disagree-agree) of both views, the more distinguishing the statement.

Two views on the applied logistics typology

In this section, the results of the factor analysis are presented, starting with the numeric outcomes and followed by the qualitative interpretation of the two views (factors) on the topic. The outcomes of the analysis indicate that the two views have a similar size: *view 1* includes 18 respondents and *view 2* includes 15. Some statements are more instrumental in distinguishing the views (see the top of Figure 6). Consensus (bottom rows of Figure 6) is moderate regarding most governance statements (s1–s4) about dialogue and steering between government levels. There is reasonable consensus on the design and quality of the typology and map tool (s5, s10). Both views agree that the tool is not applicable for the selective sale of land to certain companies in existing business sites (s9). Also, regarding the tool's ability to assess the future potential of locations (s23), there is consensus. Both views have a rather neutral opinion on how the CE is represented in the typology and map tool

(s6). Statements about the map generate more distinguished opinions than the typology.

The first view has a relatively large share of national government stakeholders, whereas the second includes more provinces. The only local government stakeholder participating in the survey is in *view 1*. Furthermore, companies and non-profits are rather evenly distributed. The three different types of provinces discussed in the former section are not separated clearly in the views. In the description of the two views below, the more distinguishing statements are used. Knowledge levels varied across both factors: respondents in the first view studied the report and map better (by their own account, on average) than those in the second view.

Figure 7 presents the distribution of the individual respondents in both views across the most distinguishing statements regarding the validity (left) and applicability (right) of the map tool. The plots[10] show that validity and applicability generate a similar contrast between both views. While the distributions of both views sometimes overlap, their averages are located distinctly apart, especially regarding the subjectivity of the map (s24).

View 1: information-based multilevel decision-making

This view is shared by 18 respondents: 5 from national government, 3 from a provincial government, 1 from a local government, 4 from companies and 5 from non-profits.

Concerning governance, this view is strongly committed to multilevel decision-making. Participants with this view highly value dialogue between the national and provincial levels (s2). They have more moderate stances than the other view concerning inter-provincial dialogue (s1) and top-down steering (s3 and s4), leaving room for local decision-making based on more specific information. One participant noted the following: 'The typology is, in principle, a good division in types of companies. For effective

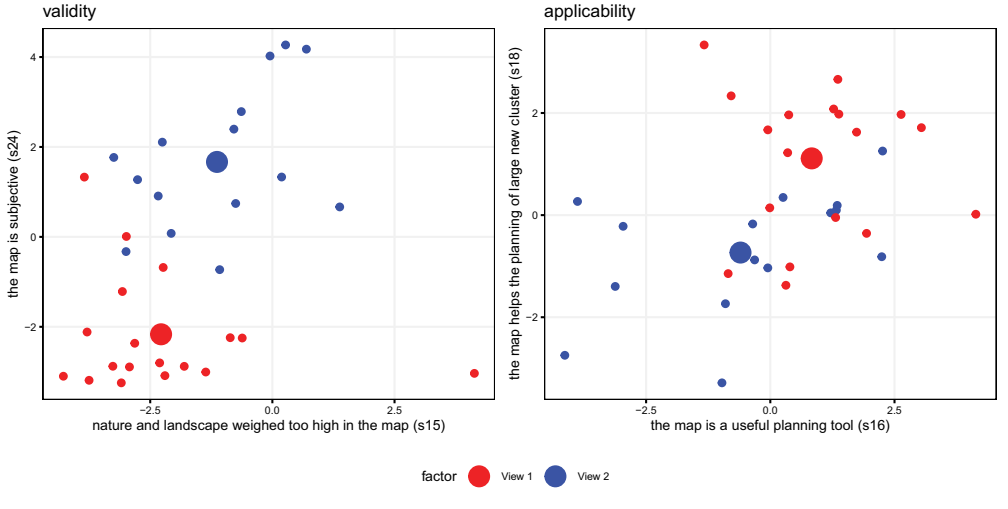

Figure 7. Individual respondent distribution regarding two distinguishing criteria. Left: validity. Right: applicability. Large dots represent the mean of each view.

local location policy, however, knowledge from individual companies might be necessary.'

View 1 presents high trust in the validity of the typology and map (s24 and s25 for objectivity, s5 for understandable design). Additionally, the view envisions their long-term use as policy tools (s21). The participants see a relevant role for such a typology and map tool in spatial policymaking, especially in the case of large-scale logistics developments (s16, s17, s18). One participant noted the following:

> The map is a supporting tool for which the underlying arguments and information should be available. The map is most applicable for 'soft' plans [not yet confirmed in local legislation]. To adapt 'hard' plans and the selective sale of land in such areas, more information is needed, mostly about the companies.

They believe that it may be necessary to increase the landscape and nature weight (s15). One participant noted the following:

> I am very enthusiastic about the Grip approach, but I hope the following steps will make clearer choices. The maps still show ample location options. The environmental factors of landscape perception and lack of urban green areas could be added. [. . .] Infrastructure investments for heavy international transport should be a hard policy choice, excluding other locations for international logistics. XXL logistics asks for national steering in dialogue with provinces. Updating the map should be part of the monitoring and development of the policy.

Even though the proximity of a potential labour force (urban density) is considered in the maps, one participant believed that actual availability could be valuable additional information because 'this is a critical factor for the location choice of companies'.

View 2: freedom of negotiation and adaptation of priorities

This view is shared by 15 respondents: 2 from national government, 6 from provincial governments, 4 from companies and 3 from non-profits.

View 2 highly emphasises the need to avoid an overly decisive role of the information tool to maintain freedom of regional and local negotiations and the adaptation of priorities in an area when local actors believe that this is necessary. This is how it has worked in practice over the last couple of decades. The participants value inter-provincial dialogue (s1) very highly, whilst they are more moderate than the first view on multilevel dialogue (s2). In contrast, *view 2* believes more in top-down steering from the national and provincial levels (s3, s4). Uncertainty regarding the use of the map in the policy process worried several participants: 'Are the maps to be used as inspiration or to inform the dialogue, or will they be used top-down to enforce decisions? I need to know before I can give any reaction.' Participants with this view are also strict on the definition of the typology and map, not as an 'instrument' but as an 'information tool', in an attempt to avoid the formal status of the tool. One participant noted the following: 'With regard to the scoring of statements about the map, I fear that maps can very easily gain a life of their own out there, despite the useful applications they can have in practice.'

The view sees the typology and map tool as a subjective yet reasonable outcome (s11, s12). Still, participants believe that it is more useful for the short term (s21). This view finds limited applicability of the tool for the planning of large logistics clusters and spatial

planning in general (s16, s17, s18). A logistics sector participant took a defensive stance, seemingly without having read the report:

> The map and typology feel subjective. How is it decided how a project scores on which factors? For me, the study lacks the urgency of creating more space for business estates. These are the heart of our economy and the logistical artery of society.

Another participant summarised *view 2* very well:

> The map is really an information tool and not a policy instrument. In the allocation of functions in an area, many trade-offs play a role. The context in which decisions are made is very relevant. Is a community willing to house a certain function? How much of it is already there? Is there a lot of opposition? How important is it to accommodate the function? One factor can have so much weight that the others become irrelevant. If it is argued that logistics is needed, a place must be found that presents the most advantages and least disadvantages. Sometimes that goes against the logic of the map. Naturally, that can happen—but therefore it is important to call it an information tool and not an instrument. Mitigating policy with regard to the decision can change the trade-off completely once again, making developments acceptable after all.

Discussion and conclusion

This paper proposed a typology of logistics clusters for spatial planning in the (emerging) CE based on existing typologies in the literature. The typology was applied as an information tool in a Dutch policy lab, where the validity and applicability were analysed using the Q-method. This method also gathered information on governance preferences, roles and knowledge levels. Combined with qualitative remarks by the respondents, the analysis yielded two views on the subject: (1) information-based multilevel decision-making; (2) freedom of negotiation and adaptation of priorities. The first view emphasises the benefits of the typology and map application in a policy setting of dialogue between government levels and moderate top-down steering. It highlights the information advantage of multilevel dialogue in spatial planning in the long run. The second view recognises the strength – but simultaneously the fallibility – of such tools and emphasises possible conflicts with traditional policy making based on dialogue between and within provinces, especially the opportunity to make deals if decision-makers find this necessary. How can these views be explained, and which insights do they provide for the general spatial planning debate and further research?

Validity and applicability of the typology and map tool

The hypothesis in the paper was that stakeholders of the policy lab would present diverging views on the validity and applicability of the logistics cluster typology and its implementation in maps, in line with the observations of Veselý (2021) in other policy tool applications. This is clearly the case, but less so because of diverging views on the policy goals and solutions. Instead, such divergence is due to diverging governance styles and government levels. National government officials are mostly concentrated in *view 1* (information-based multilevel decision-

making), whereas provincial governments are found more in *view 2* (freedom of negotiation and adaptation of priorities). Companies and non-profit experts are spread rather evenly among the two views. It was further hypothesised that these differences would occur along the lines of different province's attitudes towards logistics. This does not appear to be the case, which may be an indication of the independence of personal beliefs with regard to the opinions in the survey, low policy bias of the typology and maps, or both.

Based on the above, it can be argued that with any tool, there will always be a more adopting and more sceptical group of stakeholders. However, other research (Bressers, 1998; Pelzer *et al.*, 2015) suggests that the acceptance of the tool might improve if it fits better to the structure of the policy network – in this case, multilevel with varying governance styles.

In general, several factors appear to be important in the use of typologies in maps by policymakers. First, the perceived benefits of insights provided by such maps are perceived to come at the cost of a loss of freedom to make local deals—as has been the modus operandi in the Dutch spatial planning of business estates. Even though the cost of this restriction highly depends on the status of the maps (regulatory, restrictive, directive, informative), their mere existence worries several stakeholders. They would need to argue better to propose developments in locations that have a low suitability score on the map. Second, the varying knowledge level with regard to the typology and its application in the weighted multicriteria maps serves an important role in the views on their validity and applicability. Although the development process of the tool was transparent and involved input and feedback from the policy lab participants, not all users had a similar understanding due to the time they spent reading the report and using the map tool. *View 1* has a higher knowledge level than the second, and also clearly has a higher appreciation of the typology and map tool. Third, the practical use and interpretation of the typology and maps requires trust in the other actors involved in the policymaking process to respect and understand each other's interests. As an illustration, a logistics sector lobbyist worried about the separation of the interconnected logistics complex into four types since this might stimulate policymakers to favour certain types and ban unpopular ones (e.g. XXL distribution centres). Simultaneously, a landscape expert from the national government perceived risk in the large amounts (in her view) of suitable (green) areas for such distribution centres on the map, which might stimulate a gold rush by investors and developers.

In short, the effective application of informative map tools in spatial planning depends less on their perceived validity and more on their information benefits (insight) and costs (decreasing freedom to make deals that conflict with the information), as well as the perceived trust among stakeholders. A wider group of policy makers appears to be inclined to use the tool when training and updates are provided, and when the tool's status is well-defined. Depending on the tool this may be difficult to do in advance. In the analysed policy lab, a joint decision was made between the participants, when the tool was already developed. The choice of an *information tool* reflects the negotiation between the two views, ending up with the middle ground between a regulatory and inspirational status.

Further planning and research

The validity of the typology of logistics clusters is perceived as reasonably good among the stakeholders in the Dutch policy lab. It would be interesting to apply such typological information tools in other countries and compare the resulting stakeholder views. Given the standardization of logistics practices worldwide and the diverse planning systems across countries, both similarities and differences would be expected to occur. Additionally, following the use and adaptation of the map tool by the stakeholders, a longitudinal study may provide insights into its long-term applicability and points of improvement. Particularly, training efforts and participatory updating of the tool by the user group in the policy context are needed to balance the need for structured, data-driven approaches with the flexibility required in local and regional decision-making contexts.

There was a broad consensus in the policy lab that the emerging CE should be facilitated by the supply of the appropriate quantity and quality of space for logistics in planning at all levels of government. The translation of the CE characteristics in the typology did not generate highly distinguished opinions, possibly due to a lack of information on what the CE might entail. During policy lab discussions, the conservation of (inland) port areas for CE activities was an important point of consensus. Despite recent studies (Becker & Kuipers, 2018; Van den Berghe *et al.*, 2023), more insights are needed into which types of scarce water-bound business estates need to be preserved and enhanced to facilitate the CE. Nevertheless, possible top-down planning and restrictions on the transformation of such areas (usually to housing) were not agreed upon. Additional research on defining and applying spatial typologies for logistics including CE characteristics, building on earlier works, e.g. Heitz *et al.* (2019), Sakai *et al.* (2020), and Buldeo Rai *et al.* (2022), appears to be necessary. The practical question of how a new typology relates to the existing legal planning terminology of industrial sites also remains. The proposed typology and map appear to be helpful in the qualitative aspects of planning logistics—especially in new sites and extensions of existing sites. Additionally, it needs to connect to other tools that can assess the quantitative aspects—primarily the demand and supply in each of the types. One challenge may be that this part also remains under development and is often performed by market consultants, without the usual academic transparency and methods.

Finally, the policy context around such spatial information tools, including stakeholder group dynamics and the possible relation to other non-spatial policy measures, provides a relevant angle for further research. For example, how does this context influence the application and performance of the tool, and what types of decision-making can (not) be informed by these tools, e.g. top-down central planning, product- or service-oriented policy goals, or an incremental approach to the CE?

Notes

1. The spatial planning debate on logistics in The Netherlands also moves in that direction (CRa *et al.*, 2019) since the fragmentation caused by single warehouse projects is considered damaging to the landscape.
2. See the recent spatial planning principles of The Netherlands (BZK, 2020, p. 73). The combination of functions is stimulated rather than monofunctional areas.

3. Since 2021, there has been an EU-wide policy for circularity in 2050, with binding 2030 targets for material use and consumption, as well as an EU Green Deal in 2022(https://www.europarl.europa.eu/news/en/headlines/society/20210128STO96607/how-the-eu-wants-to-achieve-a-circular-economy-by-2050)
4. The Grip programme (in Dutch and in full: Grip op Grootschalige Bedrijfsvestigingen) focuses on large commercial buildings. In practice, these mostly pertain to logistics developments (more information on available at https://denationaleomgevingsvisie.nl/mooi+nl/nieuws+mooi+nl/2454074.aspx).
5. https://mertennefs.eu/landscapes-of-trade/grip/
6. In the Netherlands, this would mean national government steering the decisions at the provincial level, with provinces steering municipal decisions.
7. More detailed argumentation on the weights, areas of influence and other parameters used in mapping the factors, as well as the data sources, are available in the repository. DOI: 10.4121/9fc68331-a857–4775-8cd0-cb562a64fc51
8. To facilitate the evaluation of spatial policies, the viewer features a layer of existing and planned business estates. https://mertennefs.eu/landscapes-of-trade/grip/
9. https://qsortware.net/
10. The individual dots directly correspond with the response for the two plotted statements, causing them to overlap on whole numbers. Therefore, a jitter plot was used, which randomly redistributes the dots to avoid overlap. The mean values are plotted at their exact values.

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