

Grip location factor weights

Suitability of locations for the four area types is mapped from multiple environmental factors, weighted differently for each type. The sum of all factors in 500 x 500 m grid cells generates four maps. These are corrected by subtracting a map of landscape appropriateness, also generated by adding weighted landscape-related environmental factors. In the next sections the factors and weights are explained.

Two groups of location factors are assessed, one focusing on the spatial-economic suitability for a certain logistics cluster type, the other focusing on the appropriateness of such a cluster type in the landscape. In some locations these two (partly) cancel each other out. In the appropriateness, a few knock-out factors are introduced, referring to international agreements that have to be met.

The location factors are gathered in multiple iterations, discussed with stakeholders and improved. The starting point was the set of factors found in the academic and professional literature (see the paper by Merten Nefs published in *Journal of Planning Practice & Research*, 2024). After this, factors were added from discussions in the Grip policy program. The preliminary results were critically assessed by this group and by external experts, sometimes adapted or redefined (by using alternative data), and if needed weighted differently. This led to a more validated and workable base for

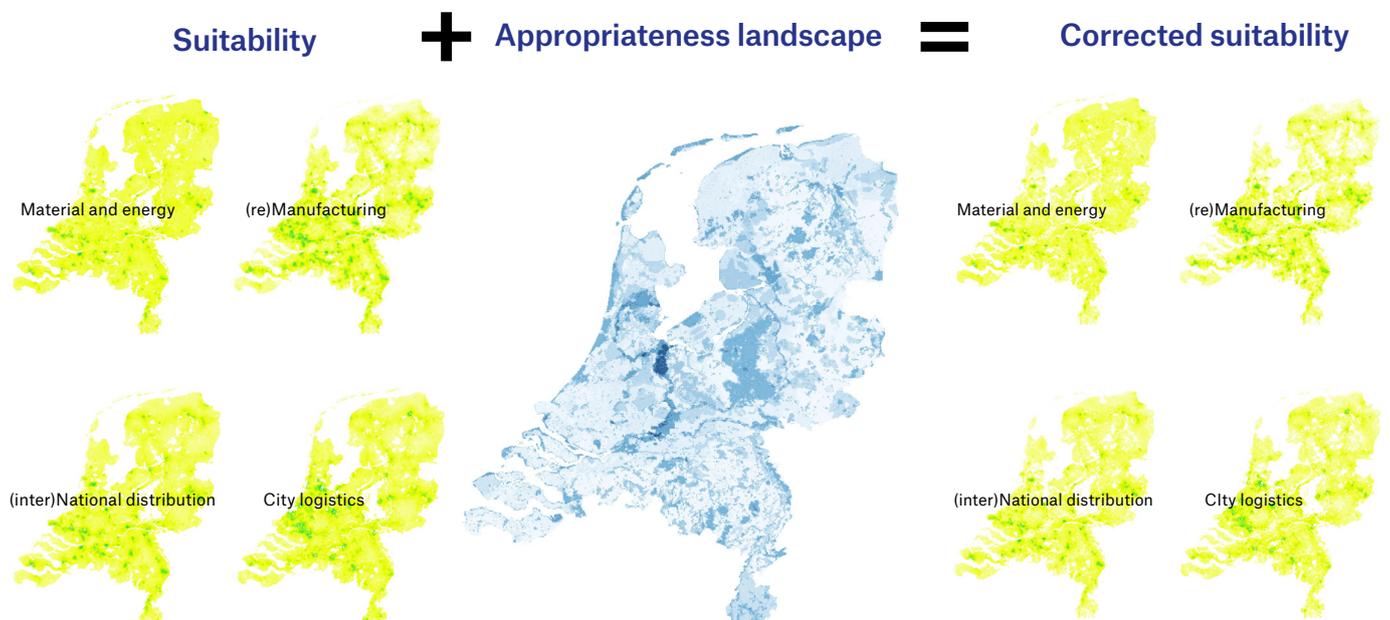
the maps, which can be updated later on if necessary.

The aim has been to show as much useful variation as possible between the four types of areas. Therefore, when possible, a positive or negative weighting was chosen, rather than neutral 0 values.

The factors and maps are no prediction of the future, but rather an information tool aimed at creating insights in possible future developments. If there are already infrastructure, companies in certain economic sectors or other qualities available in a location, these will jointly determine part of the suitability in the future. This matches the dynamics in reality, and often used research methods to predict land use change. It may happen that an important policy measure, like investments in heavy infrastructure or stimulation of a new business cluster, alters strongly the suitability of certain area. These decisions are hard to predict, but are likely to occur sometimes. Other factors can also play a role, factors which cannot be

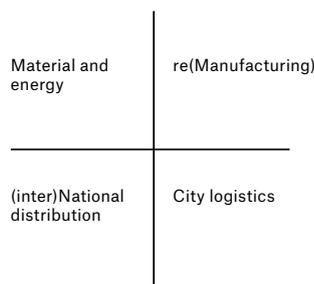
calculated in this method, such as the propensity of people to travel to work in a region or the effects of future economic policies.

The maps of this analysis are therefore primarily information tools in the dialogue on location choice and regional programming of large business clusters. Besides this, they may give insights into the redevelopment potential of existing business estates. Already urbanised areas also regularly turn green in the maps - e.g. redevelopment of a neighbourhood may provide opportunities for co-developing city logistics facilities. The maps generate more meaning when they are combined with the local political-administrative decisionmaking of that moment, for example concerning areas that are being considered for new functions and the societal responses and debate.

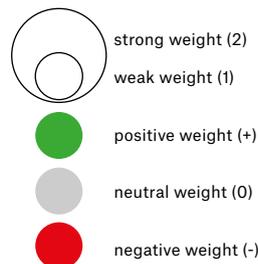


Suitability

The four area types are mapped using multiple environmental factors, which are weighted differently for each type. The sum of the factors in 500 x 500 m grid cells generates four maps. About a third of the factors concerns networks and accessibility, a third concerns productive land use (economic sectors) and a third relates to degrees of urbanisation (availability of consumers and workers). Scarce (point) elements are given an area of influence. Below the factors and weights are introduced and explained.



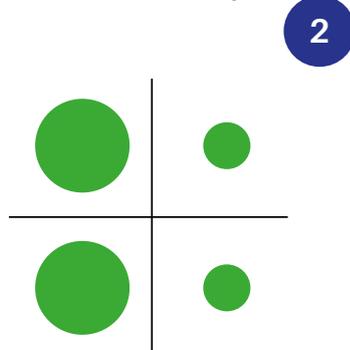
LEGEND



Scores of each factor are normalised between 0 and 1. For relevant points, lines and polygons from which there can be assumed a decreasing influence over distance, a stepwise model is used to bring the score down from 1 to 0, in 4 steps of 2500 m (total 10 km). In the case of data containing large numbers of points a heatmap is used, representing the intensity of points in space. For this calculation a radius of 3 km is used.

NETWORKS AND ACCESSIBILITY

Trimodal hubs (rail and barge combined with road transport)

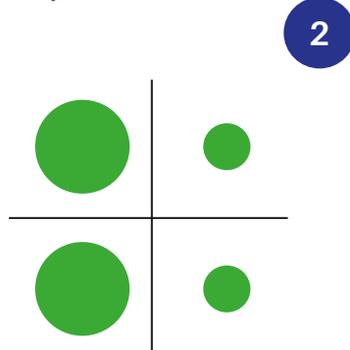


Trimodal hubs enable zero-emission transport in large volumes of containers. Consolidating large cargo flows via these transport modes is therefore seen as an important step in the transition to a circular economy. A positive side effect is that congestion in the road network can be decreased. For smaller cargo flows these modes are less relevant. Trimodal hubs are seen as important locations in the future transport network.



Trimodal terminals. Source: ministry of IenW. Scores decrease from 1 to 0 in steps of 2500m.

Bimodal hubs (rail or barge with road transport)



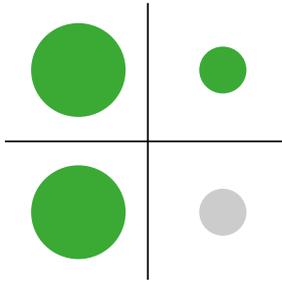
Rail and barge enable (in the future) zero-emission transport in large volumes. Consolidating large cargo flows via these transport modes is therefore seen as an important step in the transition to a circular economy. A positive side effect is that congestion in the road network can be decreased. For smaller cargo flows these modes are less relevant, because these are more dependent on road transport.



Bimodal terminals Source: ministry of IenW. Scores decrease from 1 to 0 in steps of 2500m.

European Ten-T network (core network barge and rail)

0.5



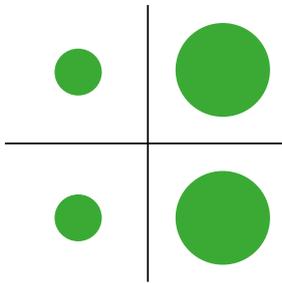
Rail and barge enable (in the future) zero-emission transport in large volumes. Consolidating large cargo flows via these transport modes is therefore seen as an important step in the transition to a circular economy. A positive side effect is that congestion in the road network can be decreased. At the European level these networks are stimulated in the Ten-T program. For smaller cargo flows these modes are less relevant.



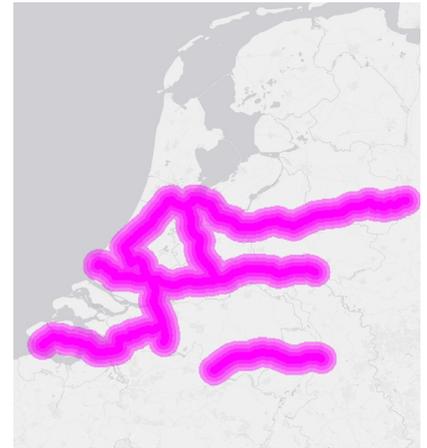
Ten-T barge & rail core network. Source: European Union. Scores decrease from 1 to 0 in steps of 2500m.

European Ten-T network (core network of roads)

0.5



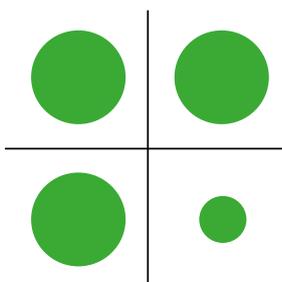
Road transport is an important mode for flexible and fast transportation, suitable for smaller cargo flows that cannot be consolidated, or freight going to more rural destinations and producers in Europe. At the European level these networks are stimulated in the Ten-T program. Congestion is a risk in parts of the road network (see location factor of road bottlenecks).



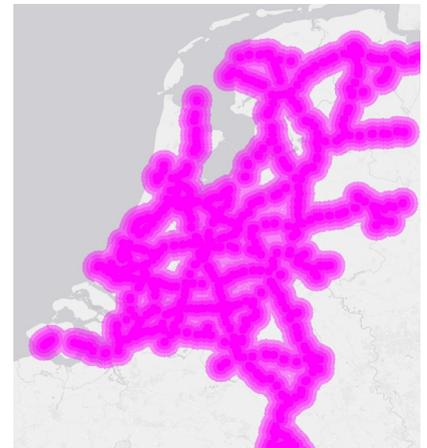
Ten-T road core network. Bron: European Union. Scores decrease from 1 to 0 in steps of 2500m.

Highway exits

1



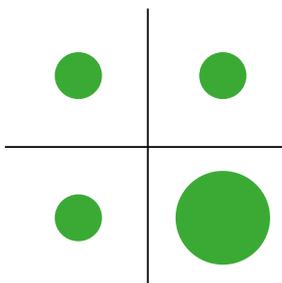
Road transport is an important mode for flexible and fast transportation, suitable for smaller cargo flows that cannot be consolidated, or freight going to more rural destinations and producers in Dutch regions. Locations near highway exits are more suitable for this kind of transport. Congestion is a risk in parts of the road network (see location factor of road bottlenecks).



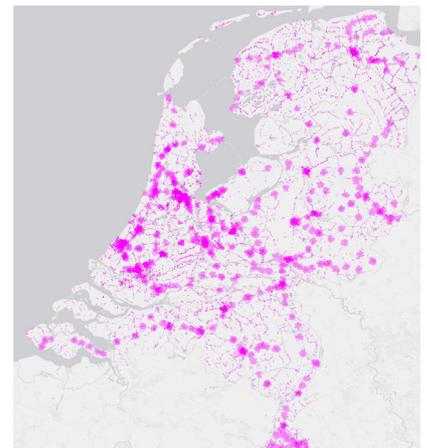
Highway exits. Source: BGT topography. Scores decrease from 1 to 0 in steps of 2500m.

Public transport

1

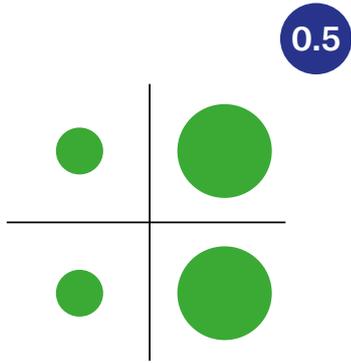


Availability of public transport is crucial for attracting sufficient workers in the large industrial locations of the future. It is also an effective way to decrease emissions of commutes. For city logistics, stations and other public transport hubs are relevant locations for last-mile delivery, package lockers etc.



Public Transport Accessibility Level (PTAL). Source: Deltametropolis Association. Scores decrease from 1 to 0 in steps of 2500m.

Infrastructure bottlenecks (road)

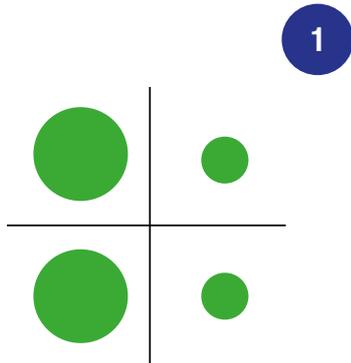


Bottlenecks in the road network decrease the efficiency of freight transport. This is relevant for all types of business, but mostly for activities that are dependent primarily on the road network (flows that cannot be bundled). As freight traffic can go on 24/7, bottlenecks measured outside of peak hours are the most relevant.

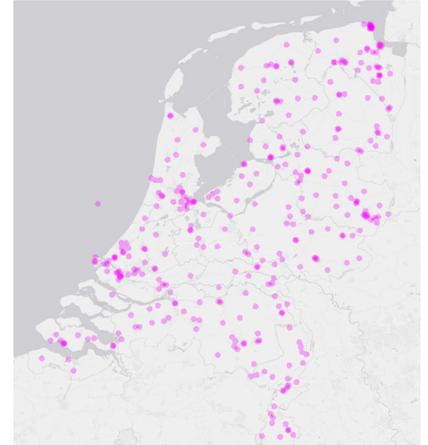


Expected bottlenecks until 2030 - high scenario. Source: Integrale Mobiliteits Analyse (IMA), ministry of IenW. Scores decrease in 4 steps to 0.

Electricity network



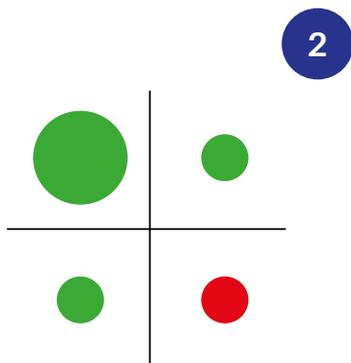
Being connected to the electricity network is of increasing importance for large companies, due to their high energy usage (to charge electric vehicles for example), or because they generate large amounts of electricity on solar roofs. The substations of the high voltage network are leading here, since these provide the actual access to the network. In practice, they are interconnected via overhead or subterranean cables.



Electricity substations, weighted for voltage. Source: Tennet. Scores decrease in 4 step to 0 (r = 3km).

PRODUCTION LOCATIONS

Recycling

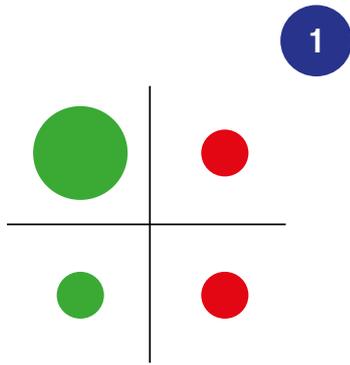


Availability of existing companies in the recycling sector (waste treatment and treatment of used materials) is evidently a relevant factor for the clustering of large scale recycling activities. Additionally, a combination with the energy sector appears obvious (see the location factor of energy), due to the same requirements of space with bulk transport and high nuisance categories. For this reason it is not logical to make combinations with more urban activities in the same area, but rather at a distance.



Concentration of recycling companies. Source: Lisa 2017 (SBI 382). Scores in density heatmap decrease from 1 to 0 (r = 3km).

Energy production

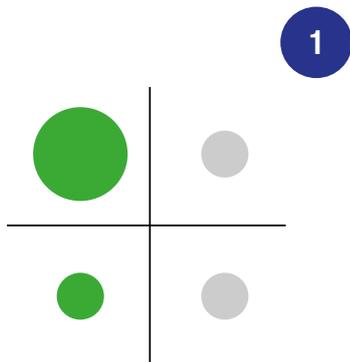


Availability of existing activities in the energy production sector is evidently a relevant factor for the clustering of large scale energy companies. Additionally, a combination with the recycling sector appears obvious, due to the similar spatial requirements. There is a possible synergy with (energy producing) XXL distribution centres, (energy intensive) manufacturing and datacentres.



Concentration of energy producers. Source: Lisa 2017 (SBI 06, 091, 035). Scores in density heatmap decrease from 1 to 0 ($r = 3\text{km}$).

Datacentres

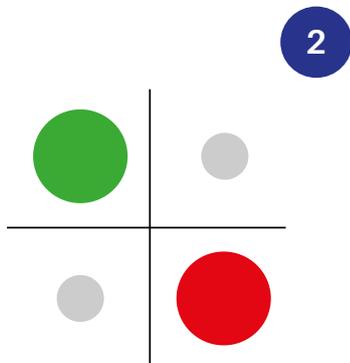


Datacentres use large quantities of energy and can therefore be adequately combined with large scale companies in the energy production sector. Hyperscale datacentres are particularly well suited for port areas and (other) arrival points of marine wind parks. In urban areas they are a less relevant factor for clustering of other activities.

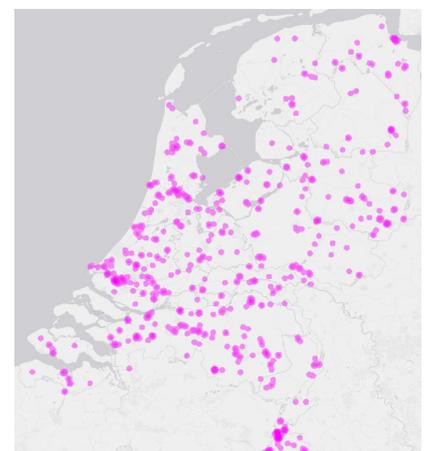


Concentration of datacentres. Source: Vereniging Deltametropool & VU, 2021. Scores in density heatmap decrease from 1 to 0 ($r = 3\text{km}$).

Chemistry

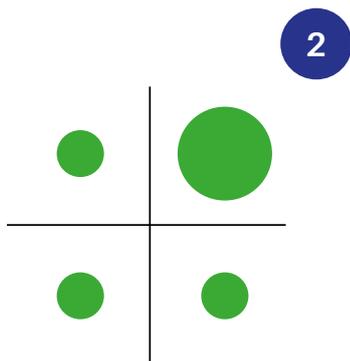


Chemical industry relates to other large scale companies in different ways. Due to the large (bulk) transport and high nuisance categories the combination with materials and energy seems obvious. For distribution and manufacturing certain chemical industries can be an advantage or disadvantage. In general chemical activities are not easily fitted into urban areas with high concentration of people.

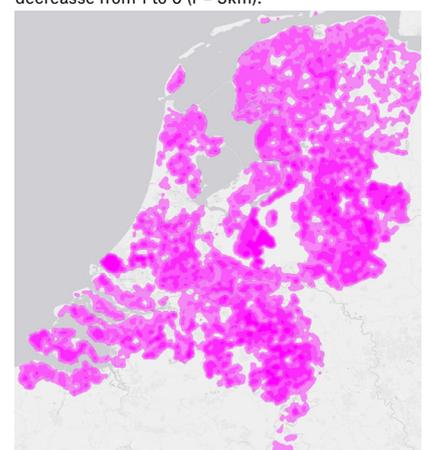


Concentration of chemical industry. Source: Lisa 2017 (SBI 20). Scores in density heatmap decrease from 1 to 0 ($r = 3\text{km}$).

Agrifood

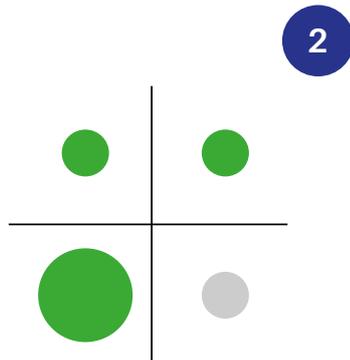


Availability of the agrifood sector is often a positive factor for clustering of large companies, due to the many value chains involved with this sector. There are large agrobulk chains including materials and energy, food processing companies, suppliers of supermarkets, and e-commerce and last-mile delivery of food products. Trade and processing of food may benefit from proximity to consumer and labour markets. Furthermore, there are successful Dutch companies specialised in seeds, glasshouse systems and agricultural machinery.



Concentration of agrifood companies. Source: Lisa 2017 (SBI 0111, 0113, 0116, 012, 0141, 0142, 0145, 0146, 0147, 015, 016, 03, 10, 11, 12). Scores in density heatmap decrease from 1 to 0 ($r = 3\text{km}$).

(X)XL logistics

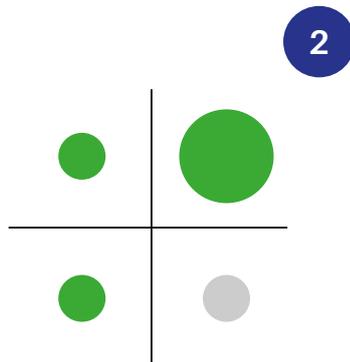


Large scale logistics facilitates several other (large) business processes. Availability of (X)XL warehouses are thus a relevant factor. In practice the large scale and rapid development of this sector, however, also turns out to increase the scarcity of industrial space and real estate, particularly in urban surroundings, where SMEs and manufacturing can suffer from lack of space to continue or expand their activities. (X)XL warehouses often use road instead of waterbound transport when located in port areas, which can also lead to conflicts.

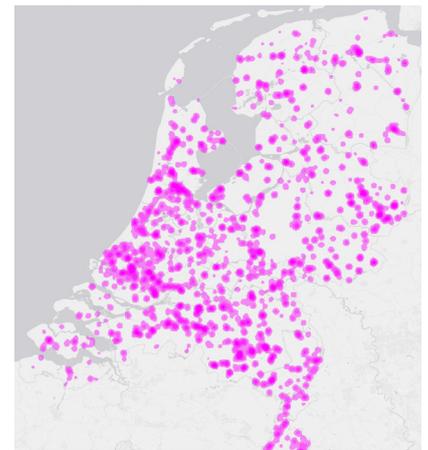


Concentration of (X)XL logistics. Source: Landscapes of Trade, Merten Neefs, 2021. Scores in density heatmap decrease from 1 to 0 (r = 3km).

Manufacturing



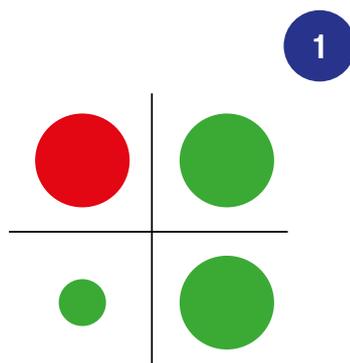
Availability of manufacturing sectors, such as hightech, machinery and building components, are relevant for large scale company clusters that may strengthen these sectors and supply them. Since this type of activities can not regularly be moved and often has relations among other manufacturing firms (in terms of products, personnel and knowledge), existing manufacturing clusters are an important starting point for new manufacturing companies.



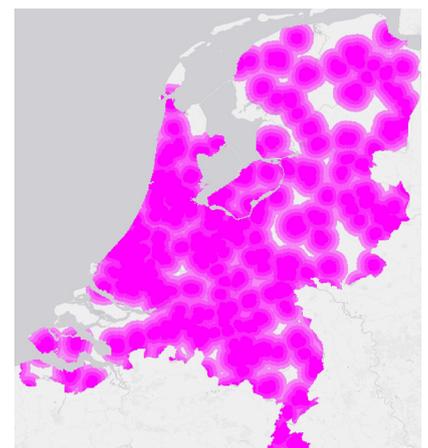
Concentration of manufacturing. Source: Lisa 2017 (SBI 13:17, 19, 21:32). Scores in density heatmap decrease from 1 to 0 (r = 3km).

URBANITY

Distance to urban cores

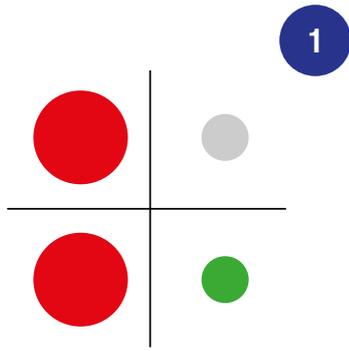


Availability of cities is important for many large scale company clusters. On the one hand they concentrate potential consumers, clients and workers. In the case of materials and energy, however, a certain distance to cities is required, due to the nuisance of economic activities that can hinder the inhabitants. The distance to urban cores located across the border, in Belgium and Germany, is therefore also relevant and included in the data.

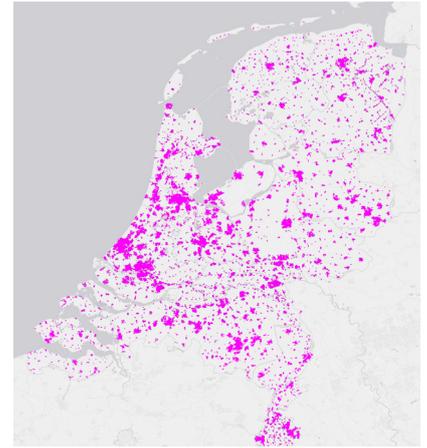


Distance to urban cores > 500 ha. Source: BGT topography and Corine Land Cover. Scores decrease in steps of 2500m from 1 to 0.

Residential function

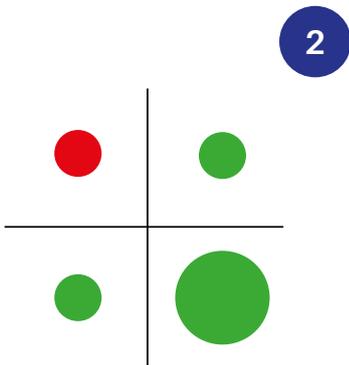


Availability of cities is important for many large scale company clusters. On the one hand they concentrate potential consumers, clients and workers. In the case of materials and energy, however, a certain distance to cities is required, due to the nuisance of economic activities that can hinder the inhabitants.

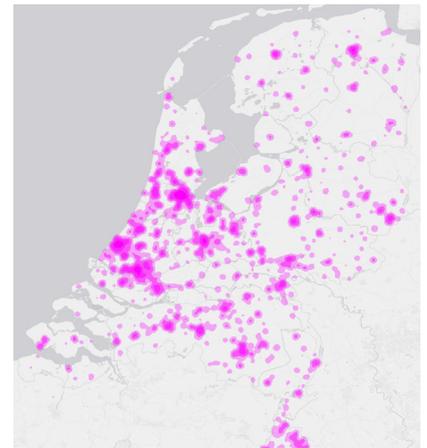


Residential function in urban cores > 500 ha. Source: BGT topography.

Urban address density

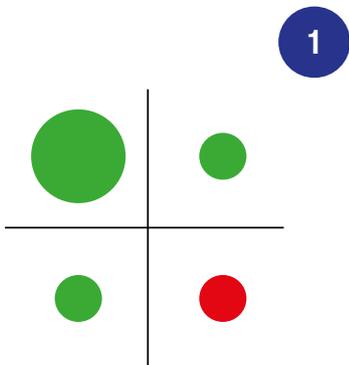


The urban address density (OAD) is another measure of urbanity that provides a more detailed insight than the proximity to urban cores. This facet is also important for concentrations of potential consumers, clients and workers. In the case of materials and energy, however, a certain distance to cities is required, due to the nuisance of economic activities that can hinder the inhabitants, amenities and companies (addresses).

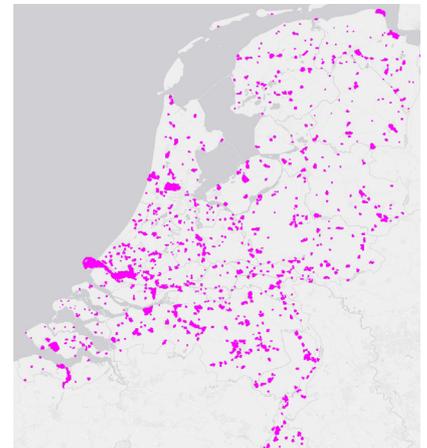


Urban address density. Source: CBS, 2021. Scores decrease from 1 to 0.

High nuisance category

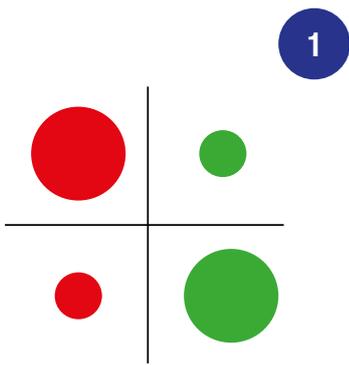


A land use plan that enables activities of a high nuisance category is evidently a precondition for the establishment of large industrial activities with great amounts of nuisance (noise, traffic, dust, odour). For several logistical activities or hightech manufacturing, such a category of land use is not required.

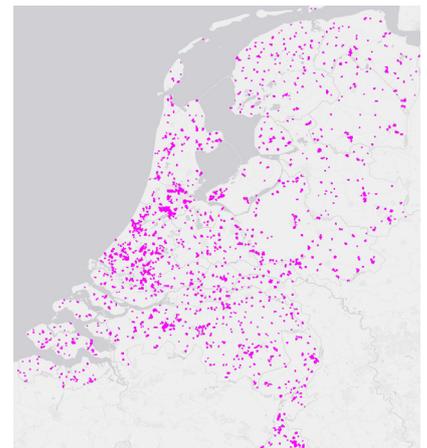


Business estates with nuisance category > 3, including a buffer of 500m. Source: Ibis, 2022. Scores 1 or 0.

Low nuisance category

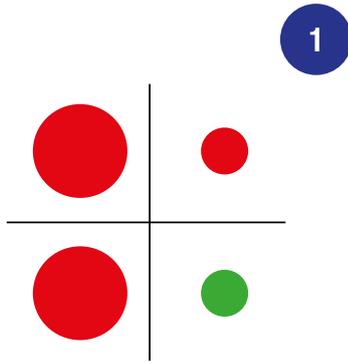


A land use plan that enables activities of a high nuisance category is evidently a precondition for the establishment of large industrial activities with moderate amounts of nuisance. However, for large bulk transshipment, heavy industry and chemical plants, such areas are not suitable.

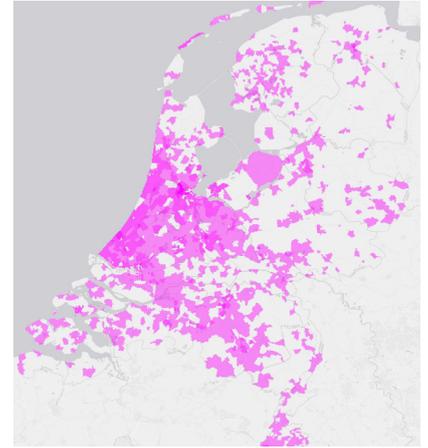


Business estates with nuisance category < 4, including a buffer of 500m. Source: Ibis, 2022. Scores 1 or 0.

Land price

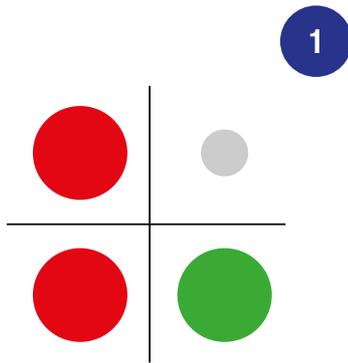


A high land price is an important negative location factor for large companies, since it represents higher costs of establishment (this also explains the effectiveness of space scarcity and high land price to stimulate intensive use of space and stacking of functions). Simultaneously, the high land price is also an indicator of the presence of urban amenities, clients and more affluent consumers. This can be a valid reason for city logistics to establish in these areas.



Hedonic land price calculation. Source: VU & NVM. Scores decrease from 1 to 0.

Zero-emission zones



Zero-emission zones are established in various cities in the country, between 2025 and 2030. In these zones freight and other commercial traffic cannot produce emissions and must therefore make use of electric (or bicycle) transport. This entails that at the edges of such zones, sometimes within them, city distribution centres will be needed to organize the last-mile.

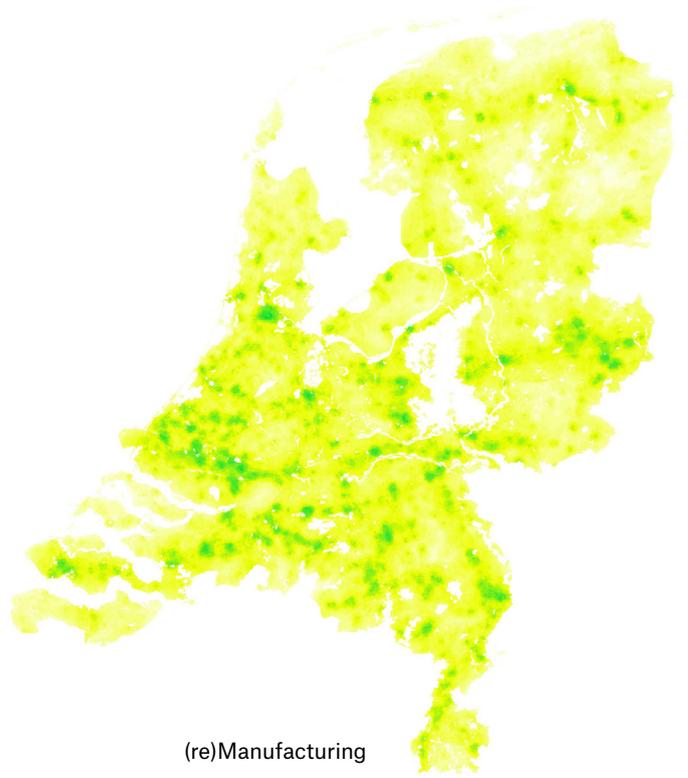


Zero-emission zones planned. Source: www.stadshubs.nl (TLN). Scores are 1 just outside the zones, and 0.5 within them.

Suitability



Material and energy



(re)Manufacturing



(inter)National distribution



City logistics

Appropriateness

From a landscape perspective, large scale economic activities can be less or more appropriate in some locations. For this study, this entails that at some locations no such companies can be established, for instance in a Natura2000 reserve or at a national heritage site. Additionally, in some places extra care is required to fit the activity in the landscape, for example in the inundation zones of the Dutch Waterlines (Unesco World Heritage). Soil and water aspects also play a role. Starting point in the present maps is that these limitations of appropriateness are applicable in each of the four cluster types of large companies. All used factors are part of the current National Spatial Vision (NOVI) and subsequent policy programmes as well.

LEGEND



Natura 2000



Due to international agreements, development of large company clusters is not possible in these fragile and valuable nature reserves.



Natura 2000 areas in the Netherlands. Source: European Union.

UNESCO World Heritage locations



Due to international agreements, development of large company clusters is not possible in these fragile and valuable heritage sites.



UNESCO World Heritage locations. Source: RCE.

Water



In areas of water surfaces, it is almost impossible to develop large company clusters. A possible exception is an eventual port expansion in Rotterdam (Maasvlakte III), for which there are at present no concrete plans. In the hinterland, the Netherlands will need more surface water for climate adaptation (water buffering) purposes.



Surface water > 10 ha. Source: BGT topography.

Green national monuments



Due to national agreements it is impossible to develop large company clusters in green national monuments. These include fragile and valuable heritage locations such as historic rural estates.

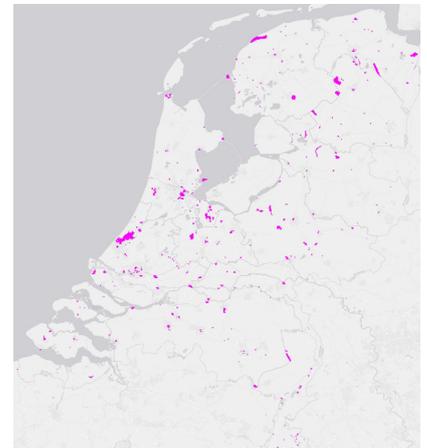


Green national monuments. Source: RCE.

Protected city and village cores

4

In areas with protected city and village cores, developments may be possible, but these would need to fit the protected environment, and not compromise it. In practice, large developments will turn out to be difficult to realise, unless behind existing facades or in courtyards.

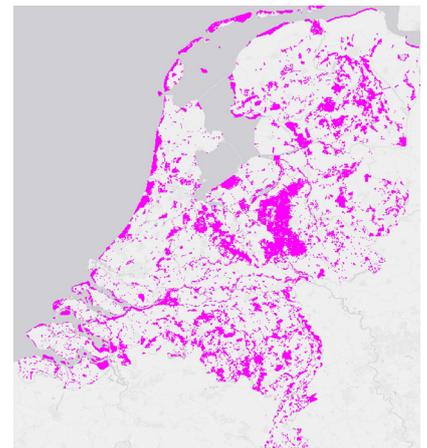


Protected city and village cores. Source: RCE.

Nature Network Netherlands (NNN)

8

Nature Network Netherlands is a national structure, following up the Ecological Main Structure (EHS), planned and executed by the provinces. Development of large scale company clusters is not likely in these protected areas. Nevertheless, economic activities already take place in the NNN, such as recreation and extensive agriculture. It is imaginable that in the future certain carefully planned large scale developments could go hand in hand with nature development.



Nature Network Netherlands (NNN). Source: Nationaal Georegister, 2022.

UNESCO World Heritage zones

6

UNESCO World Heritage includes besides locations also zones, for example the renaissance polder De Beemster and the inundation fields of the New Dutch Waterline. In such zones large scale developments are not obvious, but in practice these occur from time to time (sometimes resulting from plans from the past). At least, developments would require additional attention to fit them into the landscape. In many occasions it would not be possible to realise a large development without compromising the landscape quality.

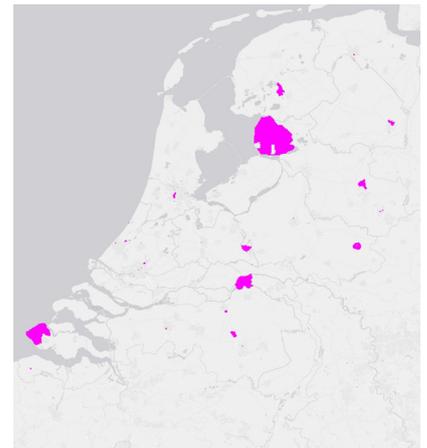


UNESCO World Heritage zones. Source: RCE.

Reconstruction areas

2

Reconstruction areas are land consolidation zones pertaining to the post-war tradition in the Netherlands with a unique character. Large scale developments are not necessarily strange in these areas, due to the rational landscape structures. It does require, however, careful selection of appropriate sites and fitting developments into the landscape.

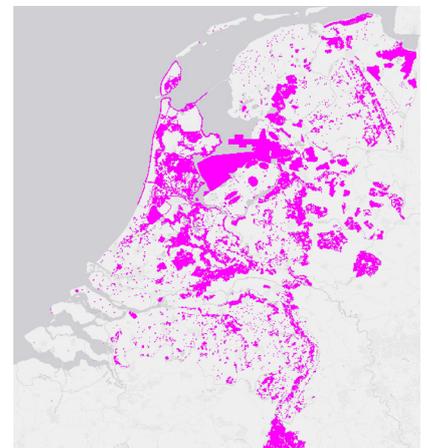


Reconstruction areas. Source: RCE.

Provincial protected landscapes

2

At the province level several landscape protection regimes exist, which are not allways comparable across provinces. The National Heritage Agency (Rijksdienst voor het Cultureel Erfgoed, RCE) is currently gathering these protection regimes and unifying them. The many locations mapped provide a preliminary but comprehensive overview of locations with limitations from a landscape perspective. To avoid overlap, the NNN was clipped from this map.

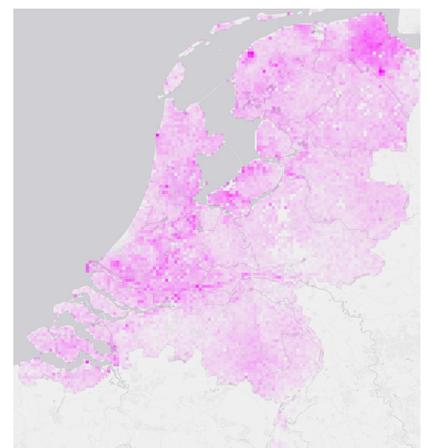


Provincial protected landscapes. Source: RCE.

Soil subsidence

2

Areas with soil subsidence, mostly peat soils in the western and northern areas of the Netherlands, are less appropriate for large scale company clusters. The limited load bearing capacities and subsidence of these soils make construction difficult and public infrastructure more expensive to maintain (roads, sewers and lighting for example).



Areas sensitive to soil subsidence. Source: Bodemdalingskaart

Flood risk

2

Areas with considerable flood risk, often located in the estuary regions of the middle and south-east of the Netherlands, or in areas not protected by dikes, are less appropriate for large company clusters. In the future, in these areas considerable climate adaptive measures will be taken, for example increasing the floodplains of rivers. Large scale developments that can contribute to this effort may therefore be a possibility. However, these areas also overlap largely with fertile soils used in agriculture.

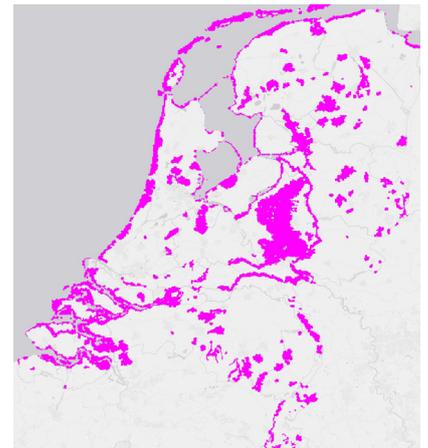


Flood risk. Source: Klimaateffectatlas.

Nitrogen-sensitive nature

4

Some habitats in nature reserves are more vulnerable for deposition of nitrogen compounds. Therefore, the areas around these sensitive 'hexagons' are less appropriate for large scale company clusters, unless these can be realised in a nitrogen-neutral manner.

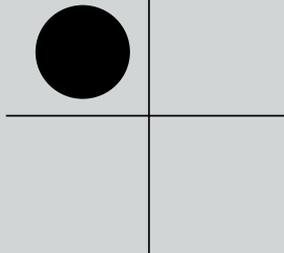


Nitrogen-sensitive hexagons. Source: RIVM.

Landscape appropriateness



Material and energy



Reading this map

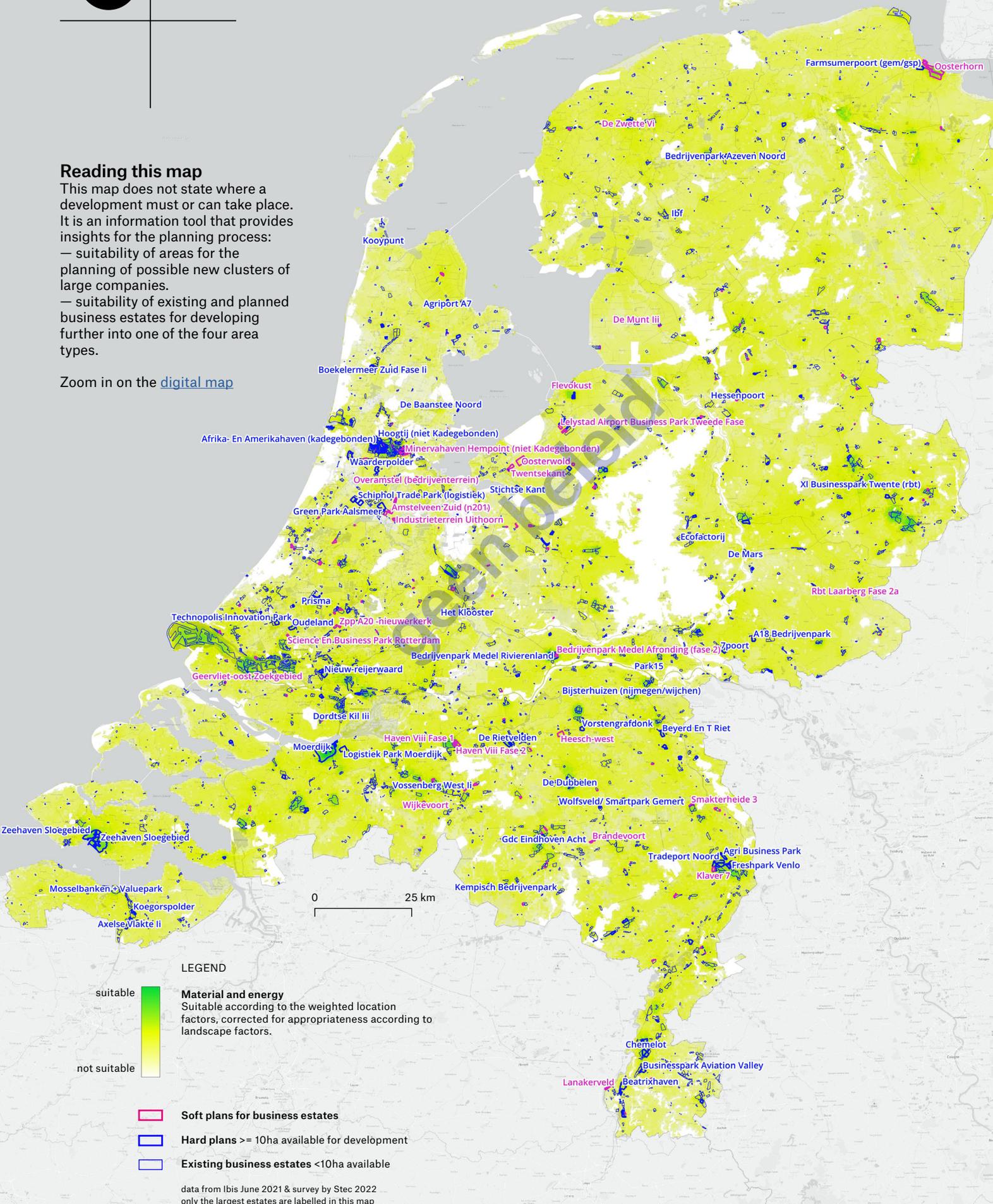
This map does not state where a development must or can take place.

It is an information tool that provides insights for the planning process:

- suitability of areas for the planning of possible new clusters of large companies.

- suitability of existing and planned business estates for developing further into one of the four area types.

Zoom in on the [digital map](#)



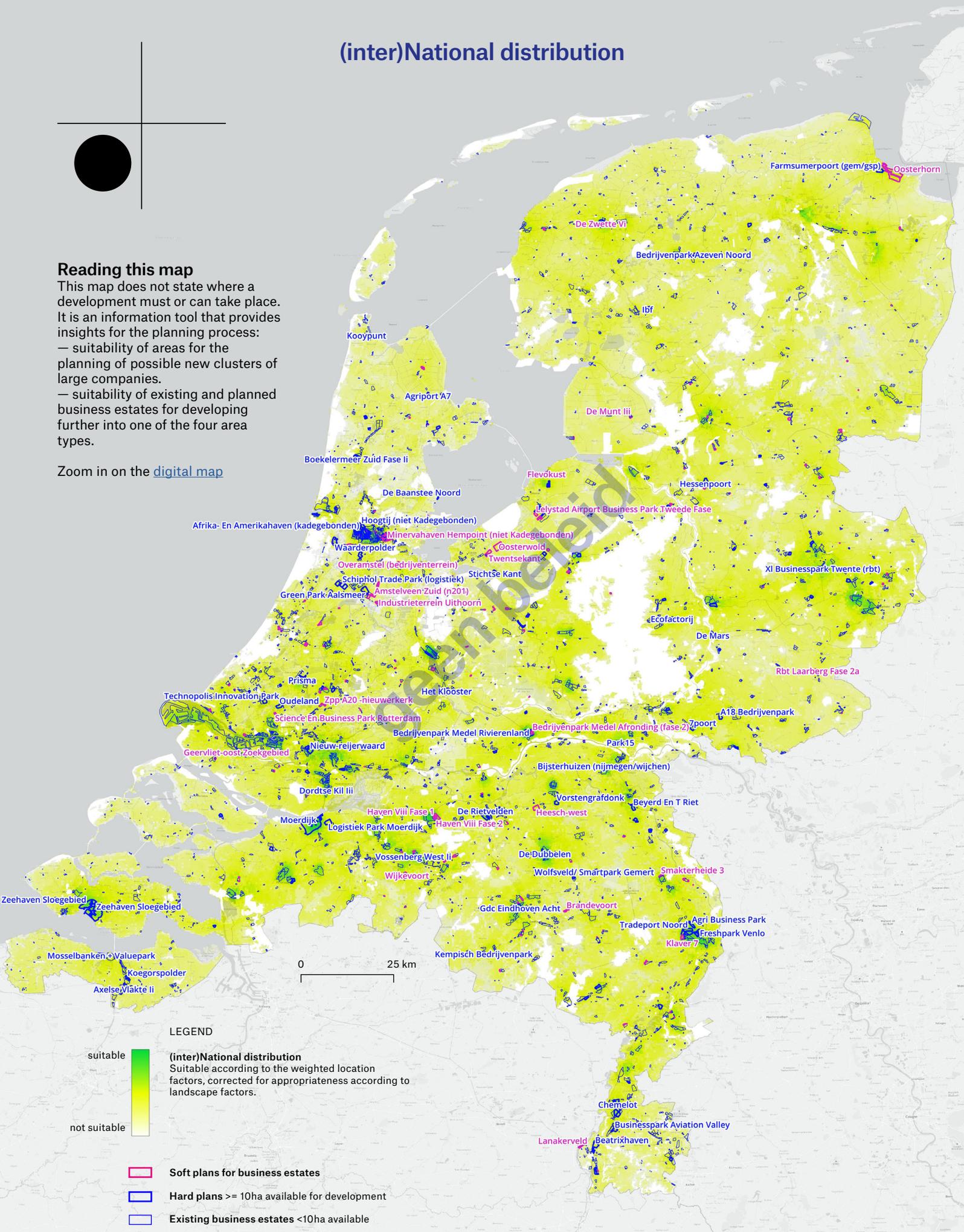
(inter)National distribution

Reading this map

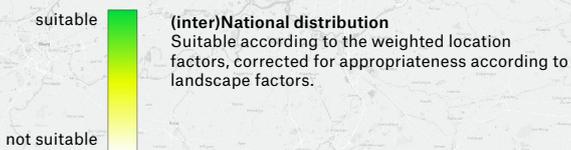
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Zoom in on the [digital map](#)



LEGEND



(inter)National distribution
Suitable according to the weighted location factors, corrected for appropriateness according to landscape factors.

- Soft plans for business estates
- Hard plans >= 10ha available for development
- Existing business estates <10ha available

data from Ibis June 2021 & survey by Stec 2022
only the largest estates are labelled in this map

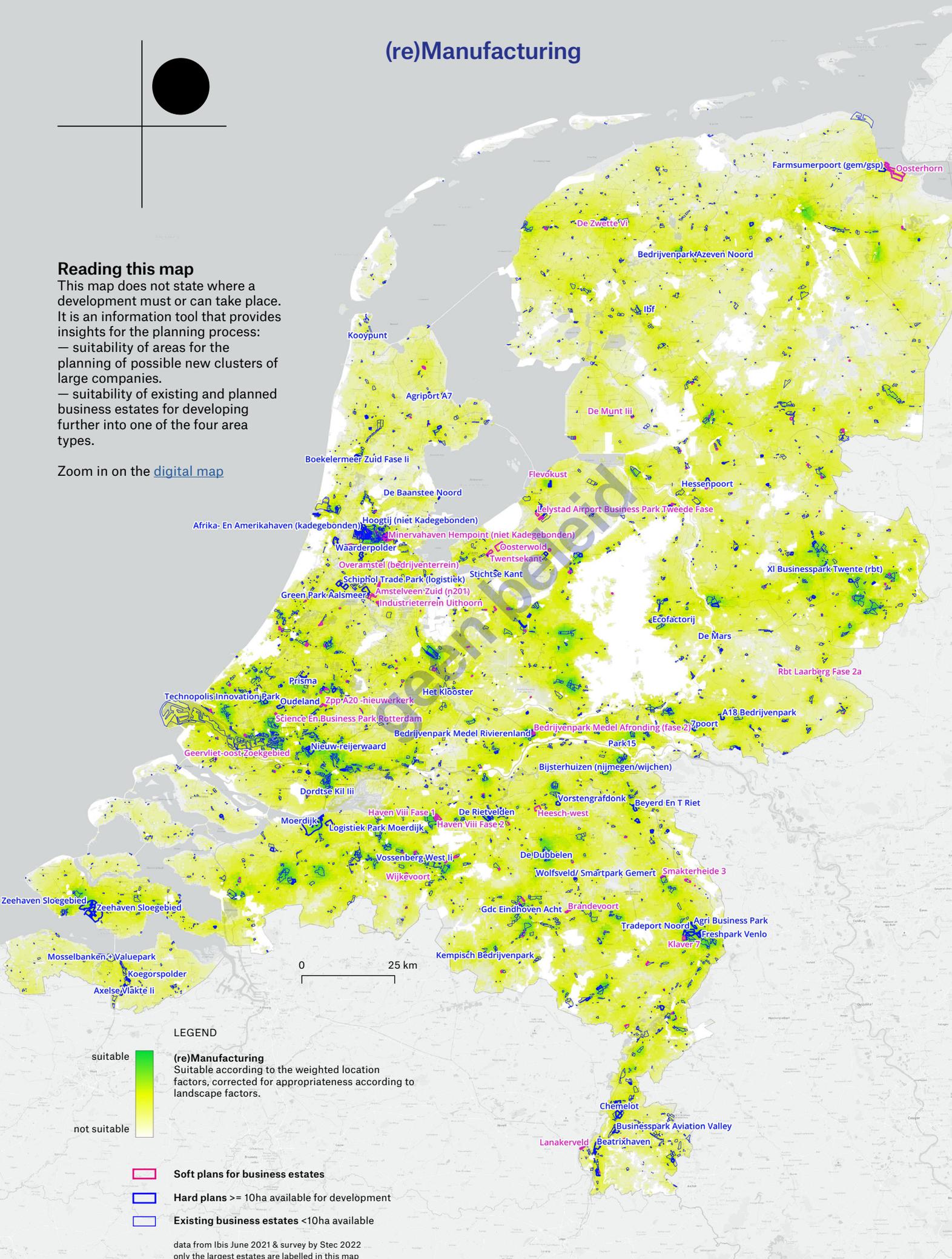
(re)Manufacturing

Reading this map

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- suitability of existing and planned business estates for developing further into one of the four area types.

Zoom in on the [digital map](#)



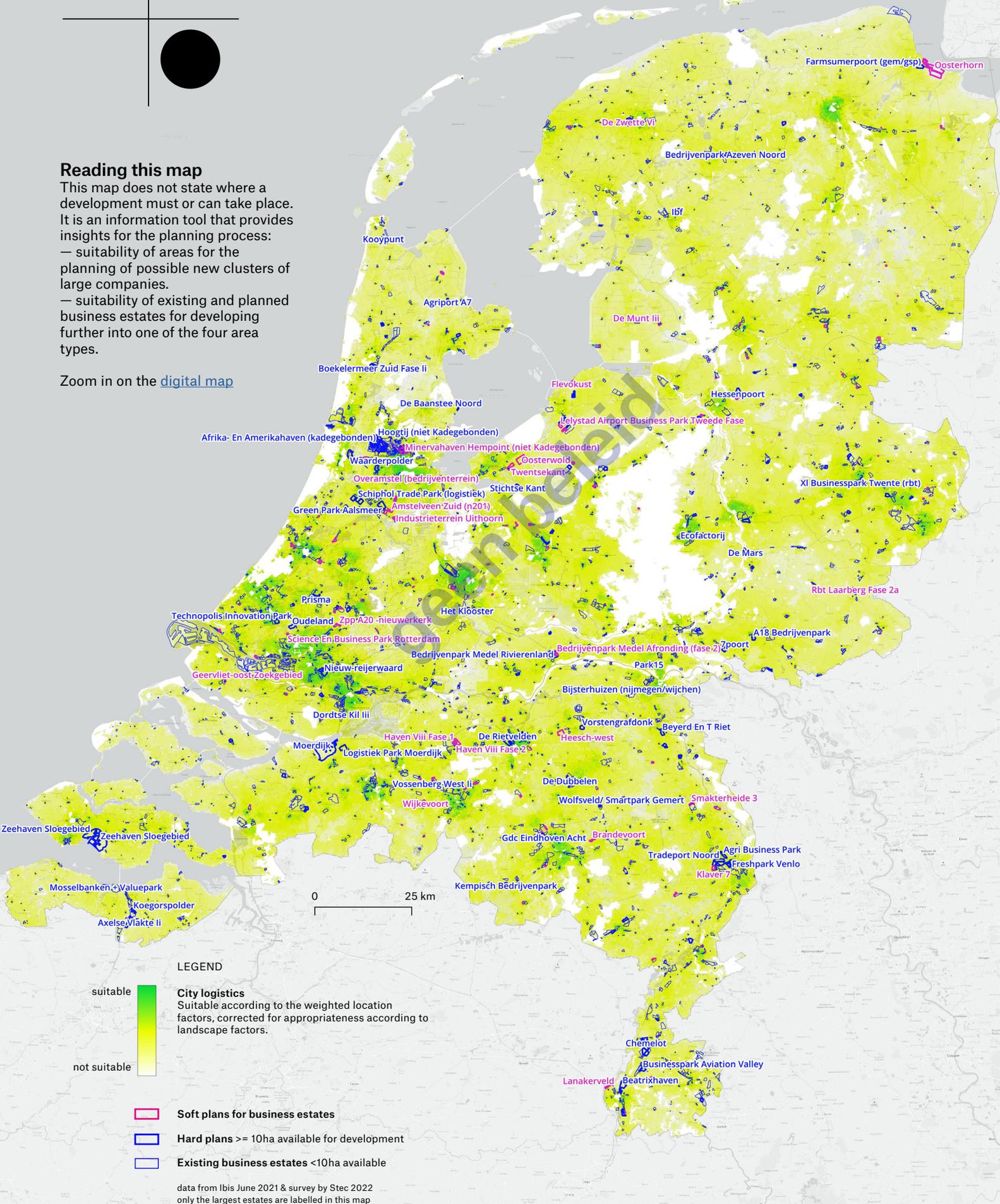
City logistics

Reading this map

This map does not state where a development must or can take place. It is an information tool that provides insights for the planning process:

- suitability of areas for the planning of possible new clusters of large companies.
- suitability of existing and planned business estates for developing further into one of the four area types.

Zoom in on the [digital map](#)



LEGEND

suitable  **City logistics**
 Suitable according to the weighted location factors, corrected for appropriateness according to landscape factors.

not suitable 

-  **Soft plans for business estates**
-  **Hard plans >= 10ha available for development**
-  **Existing business estates <10ha available**

data from Ibis June 2021 & survey by Stec 2022
 only the largest estates are labelled in this map

Chemelot knowledge development for sustainable materials takes place at the Brightlands campus, close to the production facilities.



Refurn, Apeldoorn reuse of components of photovoltaic cells and gas heaters



Agristo, Tilburg automated and refrigerated highbay warehouse for potatoe fries, under construction, featuring racks as structure.



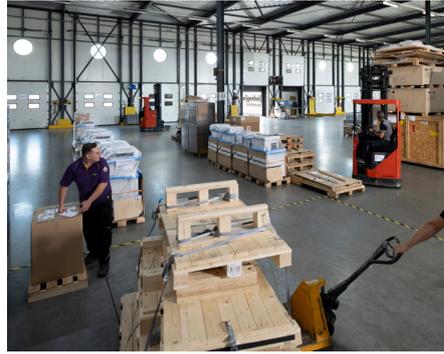
Broekman Logistics, Born final assembly of engineering machinery, from internationally sourced parts



Many of the large scale economic activities can be fitted into one of the four cluster types. Often there is an overlap with another quadrant, for instance concerning value-added logistics in (inter)National distribution centres, and manufacturing combined with urban reverse logistics. Photos: Rufus de Vries



Nationale Munt, Houten
production of coins, partly from molten existing coins



Eijgenhuijsen, Ruuro
refurbishing and assembly of printers from internationally sourced components



Capi, Tilburg
robotic production of plastic flower pots and vases from circular materials, in combination with distribution



Vepa, Hoogeveen
production of furniture from circular materials



Wikkellhouse, Amsterdam
production of prefab dwellings from cardboard, wood and other largely circular materials, in combination with pre- and post transport



Jumbo, Nieuwegein
regional distribution of supermarket products (e-commerce)



City logistics Zutphen
bundled electric last-mile distribution in the region of Apeldoorn, Deventer, Apeldoorn

Weighted factors

