



# **A**msterdam **A**irport **A**rea

## **The Amsterdam Metropolitan Area and the Digitalisation of Logistics**

**A description and analysis of the digital supply chain ecosystem**

# Contents

	<b>The Amsterdam Metropolitan Area and the Digitalisation of Logistics</b>
03	<b>1. Introduction and scope</b>
03	<b>2. Interviews</b>
04	<b>3. Introduction to the Amsterdam Metropolitan Area and logistics</b>
04	‘Traditional’ logistics
04	Digitalisation of the logistics chain
05	Increasing application of high-tech and robotics
05	<b>4. The two main trends in the development of the digital supply chain</b>
07	<b>5. Sharing data and organising trust</b>
07	Examples of successful public-private partnerships in this area
10	<b>6. The development direction of the digital supply chain</b>
10	Creating a non-traditional supply chain
11	Competition from a new angle
11	How can you compete with the non-traditional competitors?
12	One size no longer fits all
12	The new competitors are more agile, more customer-oriented and more innovative
12	Recommendations to companies in traditional logistics
14	<b>7. The role of artificial intelligence (AI) in the digital supply chain</b>
14	What is artificial intelligence (AI)?
14	AI in the supply chain
14	Advantages of AI in the supply chain
14	Who is active in AI in Amsterdam and the Netherlands?
16	<b>8. Summary of strengths</b>
16	I. Talent and job market
18	II. The logistics and high-tech/IT clusters in the AMA
18	III. The strength of science and innovation
18	IV. Education in logistics and digitalisation
19	V. The culture of collaboration and the power of ecosystem thinking
19	VI. The existing physical and digital infrastructure
20	<b>9. The Amsterdam Metropolitan Area ecosystem</b>
20	A. Sector Overview (business and industry)
20	Logistics
21	Tech and R&D
22	B. Education & Research
24	Working area AAA
26	C. Business Parks and Campuses
27	D. Collaboration and Networking in the Amsterdam Metropolitan Area (industry, academia, government)
28	E. Government Support

## 1. Introduction and scope

Amsterdam Airport Area (AAA) commissioned Ben Engel of *Engel – Een Heldere Blik* to make an initial overview of digitalisation in logistics in the Amsterdam Metropolitan Area (AMA). This comprised of a compact analysis and description of this ecosystem, a brief SWOT analysis, an outline proposition for international acquisition, and a preliminary suggestion for next steps.

Interviews with professionals in business and science were a key aspect of the project: they are an important source of insights and a means to assess theory in practice.

Discussions were held with a selection of parties concerned with collating and drawing value from data flows in logistics in order to make transport flows faster, more efficient, safer and more customer-oriented, and to use different transport modes more sustainably.

## 2. Interviews

It would have been impossible to write this without interviews with specialists in the field. Their views on the status quo and the expected developments in the coming years were important building blocks in this project. We would like to express our gratitude to our panel of interviewees from business, science and the intermediary field:

- Leon Gommans, Air France-KLM – University of Amsterdam
- Marcel Andriessen, Airspace Technologies
- Remco Weevers, C.H. Robinson
- Karin Blankers, Centrum voor Wiskunde & Informatica (CWI)
- Rob van der Mei, Centrum voor Wiskunde & Informatica (CWI)
- Hjalmar van der Schaaf, CargoLedger
- Mats Ravensbergen, CargoLedger / Aexus Europe
- Floris Koppejan, CargoLedger / Aexus Europe
- Bas van Bree, DINALOG, Dutch Institute for Advanced Logistics
- Wouter van Dijk, DHL Global Forwarding
- Tim Siebers, DSV Lead Logistics
- Jan van Casteren, Flexport
- Jochum Reuter, FourKites
- Thierry Verduijn, Amsterdam University of Applied Sciences
- Hendriena Ritsema, ORTEC
- Martijn Leenstra, ORTEC
- Frans van der Beek, SADC
- David Coenen, TMC, a division of C.H. Robinson

### 3. Introduction to the Amsterdam Metropolitan Area and logistics

The Amsterdam Metropolitan Area (AMA) is an almost unparalleled logistics region, yet this is not what the region is most commonly associated with. In contrast, Rotterdam, home to Europe's largest port, does carry this immediate association.

It is actually a little funny that Amsterdam's connection with logistics should not be the aspect that immediately springs to mind. It is, after all, a region with:

- The Port of Amsterdam – one of the largest ports in Europe (no. 4 overall in Europe (2019); no. 1 worldwide for cocoa; no. 1 worldwide for petrol).
- Amsterdam Airport Schiphol – one of the largest airports in Europe (2019) (no. 3 for freight; no. 4 for passengers).
- AMS-IX – one of the three largest internet exchanges in the world.
- Greenport Aalsmeer – the largest flower auction in the world.

In total, this amounts to a cluster comprising around 2,000 logistics companies and around 180,000 direct jobs (source: I amsterdam, 2021).

### 'Traditional' logistics

Traditional logistics companies have often existed for a long time and are generally renowned in business and science, and even by the general public. They range from postal companies, parcel deliverers, logistics service providers, transport companies, shipping companies and airlines to the suppliers of pallets, packing robots, packaging material, containers, conveyor belts, sensors, forklift trucks and cranes.

A few examples of these companies in and around Amsterdam are DHL, DSV Panalpina, PostNL, Van Zaal Transport, Zandbergen Transport, Cargill, AirFrance-KLM, Vanderlande Industries, PKF Pallets, VDL, Nedap, Smart Robotics, Nature's Pride, STILL, Mitsubishi and CAT, but there are hundreds, if not thousands, of other companies in the region.

### Digitalisation of the logistics chain

Over the past 10 years, however, a development has been taking place in logistics that has gained an additional boost due to the impact of COVID-19: logistics has increasingly acquired a digital data component. This is not surprising in itself: logistics consists of three flows – a flow of goods, an information flow and a financial flow.

And all three flows are increasingly automated and digitised: the flow of goods, because shippers, carriers and customers want a better, real-time view of where their goods are; the information and financial flows, because there are major savings to be made, for example in administrative costs, waiting times, number of errors made and payment arrears.

This digitalisation is taking place in the traditional logistics companies and shippers, and because of the cost and complexity, chiefly in larger companies. However, the development of the digital supply chain and visibility platforms is perhaps gaining the greatest impetus from companies that were not originally active in logistics, such as software developers, consultancy firms and data analysts, principally in the IT sector.

They include many smaller startups and scale-ups, such as CargoLedger, Quicargo, ChainCargo, SendCloud and Shyppl. But there are also companies which have already become very large and which operate worldwide, such as Flexport, FourKites, TMC (a division of C.H. Robinson) and Project44.

In addition, large chains (department stores, supermarket chains) and enablers from FinTech also play an important role in the digitalisation of logistics. Amazon, Alibaba.com, Picnic, Just Eat Takeaway.com, Gorillas, Getir and the financial facilitators Adyen and Mollie are striking examples of companies that have grown rapidly in this area in recent years. And of course, the Dutch supermarket chains Albert Heijn and Jumbo have already been offering online ordering and home grocery deliveries for some time. All the companies mentioned above operate in the Netherlands – the vast majority of them also in greater Amsterdam.

### Increasing application of high-tech and robotics

In addition to the digitalisation of the chain, strong growth can also be observed worldwide in the development and implementation of high-quality technology for logistics and transport. This includes sensors and scanning technologies to track, detect and inspect shipments worldwide, as well as robot technology for transporting goods in warehouses: packing robots, handling systems and conveyor belts, clean propulsion technologies for transport, and indeed entirely new transport concepts. There are already drones that can deliver parcels or emergency aid, and spectacular research is being conducted in the Netherlands on high-speed hyperloop transport.

Dutch high-tech companies are also playing a role in all these areas. For example: Nedap (RFID), ZEBRA / DSV (scan technology), Fizyr (handling robotics software), Smart Robotics (robotics software), VanderLande (automated handling, transport and robotics systems), DAF Trucks (clean propulsion systems), VDL (electrical propulsion systems), Lightyear (electric vehicles), Picnic (planning, distribution and handling systems for home delivery), Avy (drones) and Hardt Hyperloop (hyperloop transport).

These companies are often located around the Dutch universities of technology in Delft, Eindhoven or Twente, but also have excellent ties with logistics clients and customers or partners in IT, who are mainly located in the greater Amsterdam area.

### 4. The two main trends in the development of the digital supply chain

The logistics sector is increasingly realising the importance of improved control of data flows and financial administration, combined with real-time insight into goods flows. This is partly because:

- a) both shippers and end customers want more, better, real-time insight into their outgoing and incoming goods flows, and
- b) the optimisation of logistics flows is also becoming increasingly important from the perspective of sustainability

Although not everyone in the logistics sector is taking action on this issue, they are certainly aware of it. Not all players in the sector are able or willing to respond actively, often due to lack of funds and/or knowledge in the field of IT.

Among the parties that are working on the large-scale digitalisation of the chain, two main trends are now emerging in the move towards digital data sharing, data analysis and process optimisation in the logistics of the future:



1) **Companies in logistics, which are generally large and established, develop their own platforms in-house or with specialised IT service providers and software developers, or use their own modified versions of existing platforms.** They roll this out over their own internal and external network, internationally. Such companies include logistics service providers, transport companies, and shippers with in-house logistics capacity.

The challenge for these large international companies, some of which have thousands or tens of thousands of employees and hundreds of offices in dozens of countries, is that they often have to deal with an organisation that has grown partly through mergers and acquisitions. As a consequence of this process, these organisations have many different internal IT systems (including TMS, WMS, ERP, etc.), which sometimes cannot be integrated. Rationalising or optimising these legacy systems poses a major challenge in logistics and takes a lot of time, attention, expense and effort.

This process is not made any easier by the fact that logistics service providers have relatively independent organisations in each country, and may even have independent units at regional level – independent in the sense that they are responsible for their own profit and loss (P&L) statements. This structure and culture does not encourage spontaneous cooperation and the integration of systems. Large-scale, structured standardisation processes imposed from the top down are sometimes required. This is actually taking place at

several of the large international logistics service providers. Their advantage in these processes is that they have the financial resources and international reach, and can draw on or hire in the necessary knowledge and experience.

Standardisation creates unity and interchangeability. In one known case, an acquired logistics company with more than 10,000 employees worldwide switched to the logistics IT systems of the new parent organisation in 18 months.

Examples of large companies that are at the forefront of this development are K+N, DSV Panalpina, CTI and DHL.

2) **External innovators ('disruptors') – often from the IT sector, business services or the high-tech world – are entering the realm of logistics services with new platforms and data sharing and visualisation systems.** These are newly developed, so it is unnecessary to take existing systems or protocols into account. Their differentiation often lies in systems that are highly customer-oriented (for the shipper), user-friendly and easy to integrate and connect, providing unprecedented information on the location of shipments worldwide and their expected dynamic arrival times.

Examples of these innovators are Quicargo, CargoLedger, ChainCargo, Transporeon, Project44, FourKites, Flexport, BlueRock Logistics, TMC and Sennder.

## 5. Sharing data and organising Trust

**The need to share data plays a key role in all these developments. And this is a sensitive issue. Companies do not like to share any information they consider to be confidential and competitive with external parties.**

It is precisely in this area that large-scale research and development projects, experiments and pilots are taking place in the Netherlands and in Europe. They are often public-private partnerships (PPPs) working on methods for sharing data safely and reliably with other companies, or even in other sectors. These projects frequently relate either to the data architecture required for this data sharing, or to the creation of trust between the players involved and how you can organise it.

The Netherlands is good at this:

- Scientifically, with pioneers such as the University of Amsterdam, Vrije Universiteit Amsterdam, Centrum voor Wiskunde en Informatica (CWI), TKI Dinalog – Dutch Institute for Advanced Logistics, TNO and the Amsterdam University of Applied Sciences.
- In collaboration with the business community. There are several public-private partnerships that are developing and applying data sharing in practice.

### Examples of successful public-private partnerships in this area

#### I. DL4LD – Data Logistics for Logistics Data

The DL4LD research project aims to help the Dutch logistics sector with the digitalisation of business processes. DL4LD focuses on the reliable sharing of data, including data which is potentially sensitive. Confidence that the handling of such data is controlled and secure is a prerequisite for many organisations to be willing to share their data.

Central to the DL4LD research is the maintenance of control by data owners over the access, use, processing and distribution of their data ('data sovereignty'). DL4LD demonstrates how to incorporate sufficient

facilities that foster trust and protect data sovereignty to create a trusted data sharing relationship between two logistics partners.

The DL4LD project has led to the establishment of AMdEX, the Amsterdam Data Exchange, an initiative in which field lab experiments take place relating to data sharing and the organisation of trust.

Partners in DL4LD are NWO, Commit2Data, TKI DIALOG, CIENA, AirFrance-KLM, Thales, Amsterdam Smart City, BiZZdesign, Oracle Nederland, Transfides, EVOfenedex, University of Amsterdam, UvA Systems and Networking Lab, and TNO.

The DL4LD project will run until December 2022 and is open to additional participants.

#### II. AMdEX

"The world's most valuable resource is no longer oil, but data. In the information age, data drives growth and change and offers new opportunities for fairer and more efficient societies. But this prospect is being hampered for several reasons. One is that less than 1% of all data is actually used, shared and analysed. Due to uncertainty about security, privacy and other legal issues such as data ownership, organisations either share no data at all or resort to individual contracts to exchange data. This means we are missing big opportunities." (Source: 'The world's most valuable resource is no longer oil, but data', The Economist, 2019)

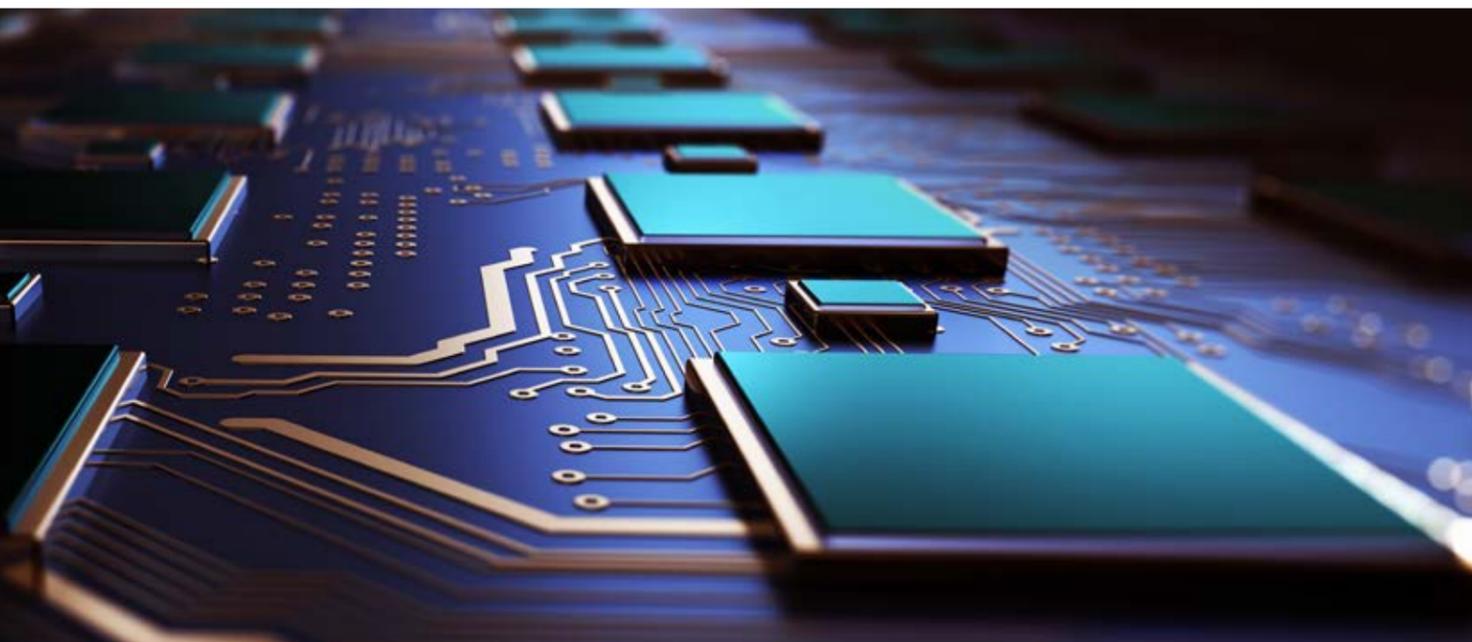
AMdEX is an innovation field lab initiated by AMS-IX, SURF (an IT cooperative for education and research), University of Amsterdam, Dexes (a supplier of data marketplaces) and the Amsterdam Economic Board, and co-financed by the European Regional Development Fund.

As the overarching coordinator, AMS-IX (the Amsterdam internet exchange) will provide a place for neutral data exchange.

In this field lab, organisations are working together to develop and test reliable, fair and scalable technologies to support data markets in which members can freely decide with whom they communicate and under what conditions.

AMdEX approaches this by researching, testing and implementing a neutral exchange infrastructure which:

- provides and executes reliable archetypes for data sharing;



- technology vendors can integrate into their products to serve data markets and data trusts;
- is language and operating system independent, so users are free to choose their IT infrastructure, development platform or programming model;
- is not in the hands of only a few parties, but functions as a public facility by and for everyone.

AMdEX's objectives are:

- Cost savings – technology vendors and data markets are able to implement data sharing archetypes which are offered by AMdEX as a service. Investment in hardware and software is unnecessary.
- High speed – AMdEX replaces one-off solutions that take a long time to implement and enables organisations to develop secure and fair data sharing solutions quickly.
- Competitive advantage – AMdEX enables users to implement quickly and iterate faster with a focus on innovation, not infrastructure management.

The current funding of between 2.7 and 3 million euros is used for conducting research, devising technical standards, making partnership agreements, and building an infrastructure to test the first applications. The long-term aim is for AMdEX to be self-supporting on the basis of membership fees. The organisations involved will therefore also work on expanding the AMdEX ecosystem in the coming years. AMS-IX, Dexes, SURF, the Amsterdam Economic Board and the University of Amsterdam have entered into a commitment of two and a half years. Their contribution includes generating interest and connecting to similar initiatives abroad in order to achieve a comprehensive network of exchange facilities.

### III. Data Sharing Coalition

The Data Sharing Coalition is an open, growing international initiative in which a wide variety of organisations are working together to unlock the value of cross-sectoral data sharing.

The initiative was launched in January 2020 when the Ministry of Economic Affairs and Climate Policy invited the market to seek partnerships for cross-sectoral data sharing. The Data Sharing Coalition, supported by the ministry, emerged from this invitation.

The aim of the Data Sharing Coalition is to stimulate cross-sectoral data sharing under the control of the rights holder(s) by realising interoperability between data sharing initiatives and strengthening individual initiatives.

The Data Sharing Coalition applies the following six core principles that guide the execution of its activities and the realisation of its objectives:

1. Be open and inclusive: Any interested party is welcome to participate in the Data Sharing Coalition.
2. Deliver practical results: The Data Sharing Coalition will deliver functional frameworks and facilities that provide true value for all stakeholders of the data economy and that will help them accelerate in their data sharing context.
3. Promote data sovereignty: The Data Sharing Coalition aims to enable the entitled parties to control their data by including this as a requirement in the use cases and frameworks.
4. Leverage existing building blocks: All Data Sharing Coalition frameworks and facilities will incorporate international open standards, technology and other existing facilities where possible.
5. Utilise collective governance: All frameworks and facilities produced by the Data Sharing Coalition will be governed in a transparent, consensus-driven manner by a collective of all Data Sharing Coalition participants.
6. Be ethical, societal, and compliant: All activities of the Data Sharing Coalition are in line with societal values and compliant with relevant legislation.

Within the Data Sharing Coalition, generic agreements on sharing data to achieve harmonisation in a fragmented landscape are documented in the 'Data Sharing Canvas'. Cross-sector use cases are also defined and realised, and knowledge is shared to support the development of new and existing data sharing initiatives.

One such real-life case involves sharing freight data with insurers to improve processes and risk management.

The current partners in the Data Sharing Coalition are Connect2Trust, Dexes, Digie, ECP, Enable U, Equinix, Exact, FOCWA, Fortierra, GO FAIR, HDN, Impact IoT Solutions, International Data Spaces Association, iSHARE, KPN, Maas-Lab, Maastricht University Institute of Data Science, Marlin, MedMij, Mylette, Netherlands AI Coalition, NEN, Netbeheer Nederland, Nexus, NOAB, Ockto, Roseman Labs, SAE ITC, SBR, Skarp, SURF, Sustainable Rescue, TanQyou, Techniek Nederland, Thuiswinkel.org, University of Amsterdam, UNSense, Vault, Dutch Association of Insurers, Visma Connect, and Weolcan.

The Data Sharing Coalition is an open, growing initiative which welcomes organisations that support the coalition's aim and want to accelerate together.

### IV. iSHARE

iSHARE is a system or set of agreements on the basis of which parties provide each other with access to their data. They use the same method of identification, authentication and authorisation, so that they do not have to make new agreements each time to share data. Organisations that operate according to the iSHARE agreements can share data among themselves barrier-free. This means that organisations within the system:

- Have no need for costly and time-consuming integrations to share data.
- Can share data with previously unknown parties.
- Keep full control over their own data. At all times, they determine the conditions under which their data is shared, with whom, for what purpose and for how long.

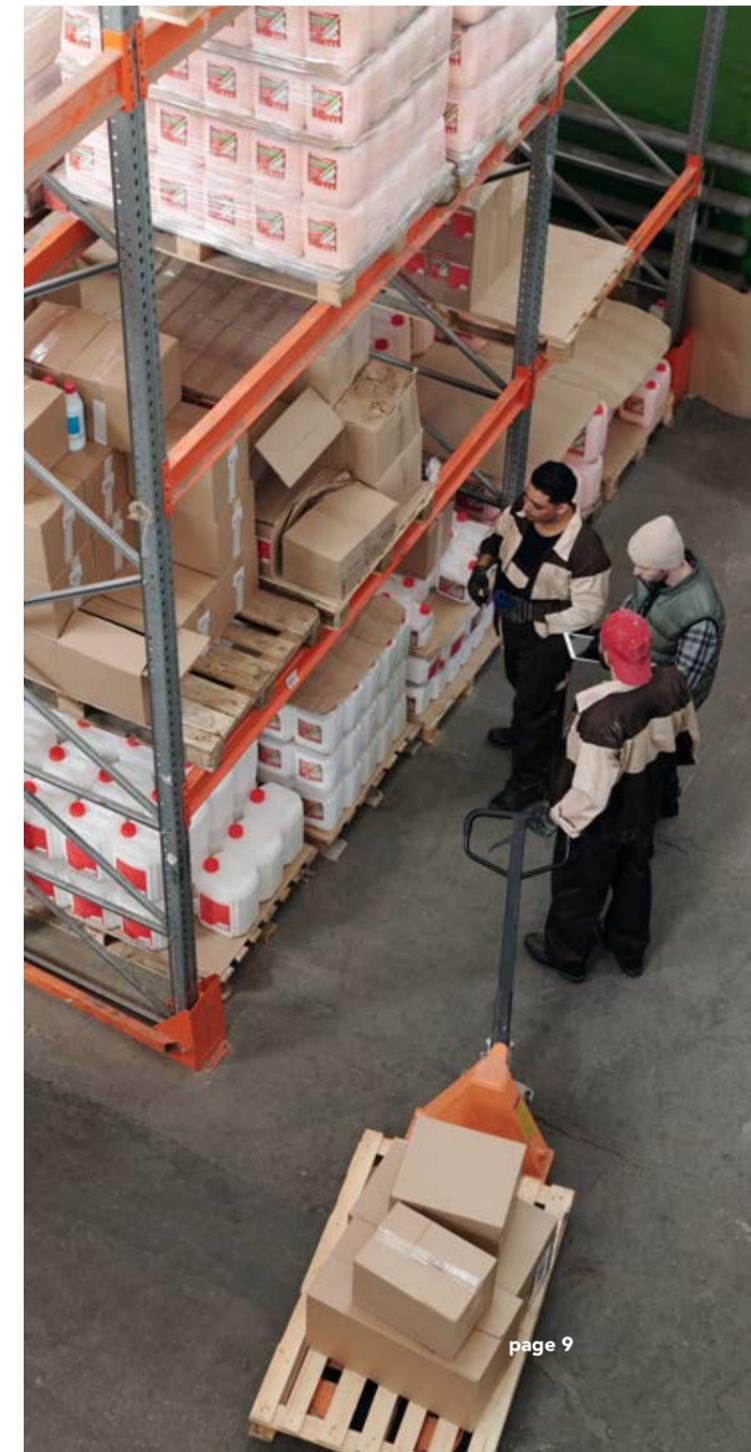
In 2017, on behalf of the Dutch Top Sector Logistics, dozens of public and private parties from the Transport & Logistics sector jointly developed uniform agreements for identification, authentication and authorisation in the iSHARE project. Since 2018, this system of agreements has made simple and controlled data sharing possible between any parties in the logistics sector, even if they were previously unknown to one another.

With iSHARE, Top Sector Logistics aims to boost data sharing in the logistics sector. INNOPAY, a consultancy for digital transactions, facilitated the development and roll-out of the agreement system between 2016 and 2019.

The iSHARE Foundation fulfils a crucial role in the move towards barrier-free data sharing in logistics. By entering into an agreement with the foundation, logistics organisations can join a network of organisations that all work according to the iSHARE agreements.

iSHARE's implementation and authorisation partners are Crebos BI, ECS International, expertum, Globis, ICT Group, INNOPAY, InnoTractor, Maxcode, Modality, Poort8, Rojo Consultancy, SEEBURGER, Teroco, UC Group, Yellowstar, Secure Logistics and Visma Connect.

iSHARE ambassadors in logistics are 4shipping, ACN, AirFrance KLM Martinair Cargo, APM Terminals, Cargonaut, CBRB, Collect+Go, Dakosy, DBH, Dutch Customs, ECT, eHerkenning, Evo fenedex, Fenex, Globis, GFH, Hewlett Packard Enterprise, holland fintech, ICT Group, IDSA, Kloosterboer, Loodswezen, Ministry of Economic Affairs, Nature's Pride, NLIP, nxtport, Port of Amsterdam, Port of Rotterdam, Portbase, Rijkswaterstaat, Ritra Cargo Holland, Sany Group, SAP, Schiphol Airport, Secure Logistics, Smartloxs, Stichting Vervoeradres, Technolution, TLN, Top Sector Logistics, Tosoh, Total Produce, TransFollow, TU Delft, UC Group, Visma and VNC.



## 6. The development direction of the digital supply chain

Based on 'Creating a non-traditional supply chain' (2020) by Gartner, Inc.

### Creating a non-traditional supply chain

Established logistics companies and shippers are seeing that major economic and social forces are affecting their supply chains and could lead to fundamental changes in the logistics sector. They are changes on a level and scale similar to those that led to the demise of Kodak 10 years ago. Although it was Kodak that invented the digital camera, the company failed to recognise that digital photography, and especially digital photo sharing, were the business models of the future. Facebook and others saw this and added to it; Kodak did not enter this market and was forced to file for bankruptcy in 2012.

According to Gartner, the major developments in logistics are:

1. The rapid evolution of technologies and the emergence of new digital business models – such as platform-based (for example, e-commerce), direct-to-customer and pay-as-you-go – are spurring profound change in the supply chain operating models.
2. Circular economy business models are presenting the opportunity to reach customers for a higher purpose, while reducing dependency on increasingly scarce raw materials. Such models require setting up a circular supply chain, where maintenance, refurbishment, reuse, reverse logistics, recycling and parts harvesting all become core capabilities needed within the supply chain.

3. Constant trade uncertainty, sourcing risks and supply disruptions are driving Chief Supply Chain Officers (CSCOs) to redesign their supply chains and make them more flexible and resilient to change.

(Source: 'Creating a non-traditional supply chain', Gartner, Inc., 2020)

These developments have been given a huge boost by the coronavirus crisis, which has acted as a catalyst for supply chain disruptions and opportunities for change. This is also felt by decision-makers in logistics. At the end of 2020, Gartner surveyed CSCOs worldwide and asked them about their expectations regarding the key changes in logistics. The main outcomes were:

- 23% of supply chain leaders expect to have a digital supply chain by 2025, compared to just 1% today.
- CSCOs expect globalisation and offshore production to decline by 46% and 61% respectively over the next five years.
- 79% of supply chain leaders believe an internet-/platform-based supply chain model is the most crucial new model for recovery from the pandemic.
- 69% of supply chain organisations expect to see a decrease in consumer willingness to visit physical stores (and hence a corresponding growth in e-commerce) in the next five years.
- 98% of supply chain leaders believe that working from home (remote working; distributed teams) will increase in the next five years.

In other words, more than ever, progress in the digitalisation of logistics is fast and furious, but it is a world operating at two speeds. Large logistics companies, a limited number of progressive medium-sized logistics companies, and outsiders are investing a lot in the digital supply chain and developing rapidly, but the vast majority of smaller companies are lagging behind. They realise they need to move towards digitalisation, but they do not know exactly how to go about it, and often have only limited capacity for investment.

Based on these expectations, the CSCOs say they see the greatest opportunities in making supply chains more agile, accelerating digitalisation and strengthening risk management. Digitalisation is a prerequisite for all of these.

What is new and striking compared to previous studies is that supply chain executives now see concrete opportunities for the supply chain to enable and support new business models.

## Competition from a new angle

In this changing context, Gartner's 'Future of Supply Chain Survey' found that more than half of all supply chain organisations in different sectors expect to be threatened by new competitors in the coming years. The biggest threat comes from a range of non-traditional competitors, including the 'digital giants' (such as Alibaba.com, Amazon, Apple, Tesla and Uber), as well as companies from other industries which are trying to diversify, emerging startups and innovative suppliers.

According to the survey, the digital giants pose the biggest threat to traditional logistics companies. Most supply chain executives interviewed in the survey believe that non-traditional competitors are better able to cope with the new challenges facing the logistics sector and supply chains. These new competitors are changing entire sectors through disruptive innovation, their ability to meet the needs of fluctuating customer expectations, and their highly flexible supply chains.

## How can you compete with the non-traditional competitors?

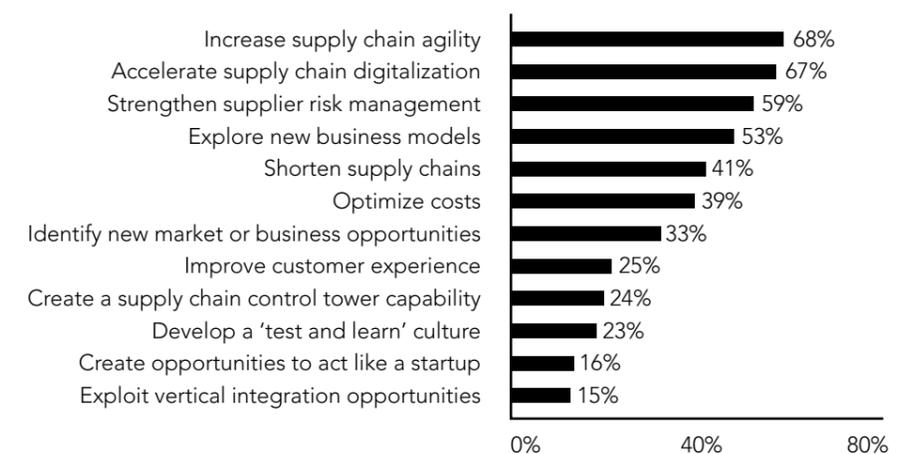
The CSCOs need to overhaul many aspects of their supply chain to compete with non-traditional competitors. They have to be able to start playing the same game at the same level. This usually calls for a revision of the organisational structure, management model and even corporate culture, or 'people mindset'.

For CSCOs of traditional corporate logistics companies, this represents a fairly fundamental shift towards creating a non-traditional supply chain strategy and a different style and organisation of leadership and management/supervision. Supply chain management has to become a competitive differentiator (and therefore less traditional).

Four elements are essential to create a non-traditional supply chain:

1. Getting close to customers
2. Developing a culture of innovation among employees
3. Creating an agile organisational design
4. Aligning supply chain operational models with new business models

**Figure 1. Handling Disruptive Supply Chain Events**  
Multiple Responses Allowed



n = 528

Q. What do you think the opportunities are after a crisis? Please select your top five choices.

Source: Gartner - 2020 Gartner Opportunity After Crisis Survey (June 2020)



## One size does no longer fit all

The key success factor for supply chains to become non-traditional is to pair new products and new business models carefully with an appropriate supply chain business model. Traditional logistics service providers need to recognise that the existing product portfolio ('one size fits all') is no longer suitable for everyone, that different segments in the portfolio need different supply chains, and that a one-sided focus on cost reduction should make room for segmentation and risk management.

Let the large logistics service providers continue to benefit from their well-managed chains where possible. In addition to segmenting the supply chains to accommodate emerging new products and business models, they can greatly benefit from the key advantages of their existing supply chains. Cost-effective, global and financially sound supply chains provide a platform for success for traditional businesses. These capacities are not easily replicated by enterprising competitors, particularly due to their scale, experience, and breadth.

### **The new competitors are more agile, more customer-oriented and more innovative**

Most digital giants began as startups and grew to become leaders in traditional industries such as retail, high-tech and transportation. Their size, organisational structure and finances meet or exceed the characteristics of large companies, yet they still have the key features of emerging startups.

For example, they are still able to adapt quickly and enter niche markets in which it is often more difficult for established players to compete. They make use of their ability to maintain a closer relationship with their customers than the logistics establishment is able to achieve, which means they can develop innovations in products and processes much faster. This innovation approach stems from the conscious choice to take a full customer journey perspective. Thanks to the closer relationship to the end customer, they are able to register customer needs and preferences much faster. In addition, the culture of innovation enables non-traditional players to deliver products quickly. For traditional organisations, it is vital to embrace change and develop the capacities that make non-traditional organisations so competitive. By creating the right supply chain operating model, the CSCO is able to provide critical support across the board. The

supply chain's ability to meet all extremes in customer preferences – personalised, purpose-driven products and services delivered fast to any location – is what makes a business non-traditional.

### **Recommendations to companies in traditional logistics**

I. Gain a deeper understanding of the customer. Market leaders should avoid complacency and keep listening to customers. Direct observation of the customer is one of the best ways to understand the customer journey and yields greater insight into what really matters compared to incidental feedback from customers regarding their needs. The supply chain function should be involved in understanding the critical points of interaction with the customer so a supply chain can be designed that is able to respond to varying customer preferences.

II. Invest in an innovation culture among your own employees. Commit to making innovation a daily responsibility throughout the chain and at all levels. Encourage employees to connect, open lines of communication, share ideas and learn from each other. Let employees take risks and celebrate learning from failure.

III. Make the organisation agile. This starts with clearing away the silos and islands within the organisation and stimulating end-to-end responsibilities/tasks. It is also important to reduce hierarchical command structures. With less hierarchical organisational and leadership models, CSCOs can leverage more of the talent available to them to develop new ideas for operations, products, and customer service. CSCOs must empower their staff at all levels of the organisation to use data to make informed decisions and foster collaboration.

IV. Think of the existing global supply chain as a platform to beat both traditional and non-traditional competitors. However, 'one size fits all' no longer applies. Competing with the new competitors calls for different ways of developing and producing services in order to build a diverse portfolio of innovative services. Create a supply chain business model that strives not merely for efficiency, but rather for agility, resilience and segmentation.



# 7. The role of artificial intelligence (AI) in the digital supply chain

## What is artificial intelligence (AI)?

Artificial intelligence consists of adaptive systems that display the kind of intelligent behaviour that is usually seen only in humans. In other words, they are systems that can observe and reconstruct their state and environment (sense), analyse and predict (think), and with a certain degree of autonomy can make decisions, give advice or even take action (act). A fundamental aspect of AI is learning from data. For complex mobility and transport systems, it is also crucial to make use of large amounts of available data for AI applications. This makes it possible to identify and implement the best possible decisions at system level. (Definition by TNO on behalf of TKI Dinalog.)

## AI in the supply chain

As global supply chains become more complex, the margin of error is rapidly shrinking. With increasing competition in a connected digital world, it is becoming even more important to maximise productivity by reducing uncertainties of all kinds. Growing expectations of speed and efficiency between suppliers and business partners only confirm the need for the industry to use the power of artificial intelligence (AI) in supply chains and logistics. AI and machine learning (ML) are already starting to change the face of the supply chain industry. By removing fundamental inefficiencies and uncertainties, AI and ML provide insight into all aspects of the supply chain at all levels across the business. And they do so with a clarity and in a way that humans simply cannot match at such a scale. AI in supply chains provides the tools needed for true optimisation of capacity planning. It thus contributes to more accurate capacity planning, improved productivity, higher quality, lower costs and greater output, while fostering safer working conditions.

## Advantages of AI in the supply chain

Studies show that AI and machine learning can deliver high added value in supply chains and logistics operations. From cost savings due to reduced operational duplication and risk mitigation, to improved supply chain forecasting and fast deliveries via optimised routes, to improved customer service.

According to McKinsey, 61% of all production managers report lower costs and 53% report higher revenues as a direct result of introducing AI into the supply chain. Furthermore, more than a third suggested an overall sales increase of more than 5%. The areas of supply chain management in which the impact is highest are planning and organisation, forecasting, cost analysis, and optimisation of logistics networks.

## Concrete examples

### I. Accurate stock management

Accurate stock management can ensure that the flow of items in and out of warehouses is correct. Because there are many stock-related variables such as order processing, picking and packing, this can become very time consuming and carry a high risk of errors. Accurate stock management can also help prevent overstocking, understocking and unexpected stock outages.

Because they can process vast amounts of data quickly, AI-driven tools can prove to be very effective in stock management. Intelligent systems can quickly analyse and interpret huge data sets and provide timely support in forecasting supply and demand. The algorithms of AI systems can also predict and discover new consumer behaviours and predict seasonal demand. AI thus helps to anticipate customers' future demands and minimise the cost of overstocking.

### II. Warehouse efficiency

An efficient warehouse is an integral part of the supply chain, and automation can help with the timely retrieval of an item from a warehouse and ensure smooth transportation to the customer. AI systems can solve a variety of warehouse problems faster and more accurately than a human can, while also simplifying complex procedures and speeding up work. In addition to saving valuable time, AI-driven automation

efforts can also significantly reduce warehouse staffing needs and costs.

### III. Improved safety

AI-based automated tools can enable smarter scheduling and efficient warehouse management, which can improve safety for workers and materials. AI can also analyse workplace safety data and inform manufacturers of potential risks. This helps manufacturers to respond quickly and decisively to keep warehouses safe and meet safety standards.

### IV. Reduced operational costs

This is a major advantage of AI systems for the supply chain. From customer service to the warehouse, automated intelligent operations can perform faultlessly for longer, reducing errors and workplace incidents. Warehouse robots provide greater speed and accuracy, resulting in higher productivity.

### V. Timely Delivery

AI systems can help reduce reliance on manual efforts, making the entire process faster, safer and smarter. This helps to facilitate timely delivery to the customer. Automated systems speed up traditional warehousing procedures, removing operational bottlenecks with minimal effort to meet delivery targets.

*Source: analysis by Anita Raj (AI & Industry 4.0 Evangelist) and Tina Jacobs (ThroughPut Inc.), 23 January 2020, edited by Ben Engel*

## Who is active in AI in Amsterdam and the Netherlands?

### Science

Organisations in the Netherlands that are highly active in developing, testing and demonstrating AI in logistics applications are working together under the coordination of the Netherlands AI Coalition (NL AIC), which has a special working group in the field of Mobility, Transport and Logistics.

Top scientific institutes in this field are TNO Traffic & Transport, Centrum voor Wiskunde & Informatica (CWI), the University of Amsterdam (Innovation Center for Artificial Intelligence, ICAI) and the Eindhoven and Twente universities of technology. The Eindhoven Artificial Intelligence Systems Institute (EAIISI) will also play an increasingly important role in this area.

### Industry

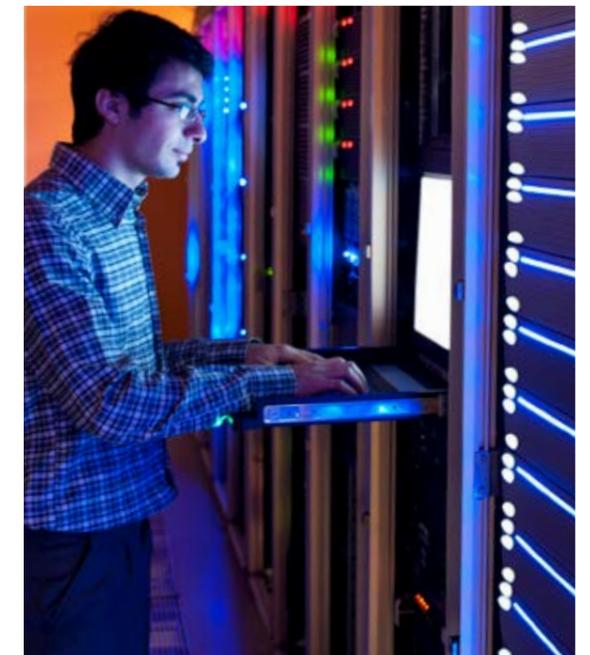
Ahold Delhaize, ING, KLM, NS and Philips have committed to investing tens of millions of euros in the development of artificial intelligence in the Netherlands in the coming years, in part by funding the appointment of 25 professors and associate professors.

The five companies are involved in the Kickstart AI project and advocate a 'critical expansion of local knowledge and local talent', and work on both the technology and ethics of artificial intelligence.

It is still unclear where the jobs will be created, but according to a spokesperson, universities such as TU Delft, the University of Amsterdam, Eindhoven University of Technology and the University of Twente are being approached.

Besides funding scientists, the project also comprises competitions for talent titled the 'AI super challenges', plus a Dutch national course for AI. The participating companies will also publish in English to encourage wider participation.

More than 65 other companies, civil society organisations and research institutes have now rallied behind these goals to launch the Netherlands AI Coalition. The organisations concerned, including MKB-Nederland (SME Netherlands) and VNO-NCW (the Confederation of Netherlands Industry and Employers), want the Netherlands to become a major player in the field of AI.



# 8. Summary of strengths

The strength of the Amsterdam Metropolitan Area in the digital supply chain can be summarised by describing its most important building blocks :

- I. Talent and the job market
- II. The existing logistics and high-tech/IT clusters in the AMA
- III. The strength of science and innovation
- IV. Education in logistics and digitalisation
- V. The culture of collaboration and the power of ecosystem thinking
- VI. The existing physical and digital infrastructure

## I. Talent and job market

The AMA – integrated into the Dutch labour market as a whole – has a large talent pool of top professionals in the digital supply chain. They include both young radicals as well as logistics veterans with 30 years of experience, and talents both from the Netherlands and abroad. In fact, for top international talents, the AMA's appeal as a place to live and work has never been greater.

An investigation in practice shows that international companies in the digital supply chain want to be in Amsterdam because they are able to find young, international talents here to design the intelligent components of the logistics chain (supply chain management and visibility systems; communication platforms; big data infrastructure and transactional services).

The evidence for this can be seen in the overview below of the market of digital supply chain and logistics tech companies in the AMA and the Netherlands. All these companies are located in the Netherlands; the vast majority of them are in the AMA.

### Digital Supply Chain & Logistics Technology Market Amsterdam Metropolitan Area / the Netherlands July 19<sup>th</sup>, 2021

#### LSPs & Supply Chain Mgt.

- K+N
- MOL Logistics
- VCK Logistics
- Amazon
- Rapid Logistics
- FedEx
- DHL
- CEVA Logistics
- Gefco Forwarding
- UPS SCS
- C.H. Robinson
- DSV Panalpine
- Nippon Express

#### Digital Freight Shipping & Supply Chain Mgt.

- Flexport
- uShip
- CTi - Control Towers International
- Cogoport
- Bonded Services
- KNControlTower

#### Sensors & Asset Tagging

- SODAQ
- C3.ai, Inc./C3 IoT
- SkyLab
- Intel
- Nedap

#### Inventory Management

- EyeOn
- Retailisation
- BearingPoint

#### Blockchain

- BitFury
- TradeLens
- Blockdata
- IBM Blockchain
- CargoLedger

= Exceptionally well-developed in the AMA ecosystem

#### Datasharing & Communication Platforms

- Portbase
- Cargonaut
- SURF

#### Datasharing & Communication Platforms

- FourKites
- Transporeon
- BearingPoint
- DSV Lead
- TMC - a C.H. Robinson division
- Logistics Project44
- ORTEC
- Shippeo
- Ab Ovo
- Sensitech, Inc.
- BlueRock Logistics

#### Trucking marketplace & Fleet Management

- Quicargo
- WebFleet Solutions
- The Plan B Company
- Sennder / Uber Freight
- Wallenborn
- ChainCargo
- ViriCiti
- LeasePlan

#### Robotics, Warehouse and Handling Technology

- VanderLande
- Amsterdam Warehouse Compagny
- Locus Robotics
- ALC Warehousing
- Smart Robotics
- Fizyr

#### Enterprise Resource Planning

- Oracle Netherlands
- E2open
- Oyraoid Analytics
- Infor
- Rootstock / Vaanenburg
- VISMA Software
- Aera Technology
- SAP
- ChainCode
- PlanLogic

#### Big Data Infrastructure & Transactional Services

- AMS-IX
- Equinix
- AMdEX
- Mollie
- Dexes
- Buckaroo
- Agilitas
- Ingenico
- Adyen

#### E-Commerce Logistics

- ViaEurope
- Shippo
- B2C Europe
- Cainiao
- ShipBob
- SendCloud

#### Autonomous driving

- TNO
- HERE
- DAF Trucks
- TomTom
- NXP
- Lightyear

#### Green / sustainable mobility

- GreenFlux
- Lightyear
- DAF Trucks (E'hoven)
- ViriCiti

#### New Transport & AV technologies (incl. drones)

- Hardt Hyper Loop
- Amsterdam Drone Lab
- Avy

#### Last-Mile Delivery Services

- Budbee
- Logistic Cityhub
- DHL Parcel
- Amazon
- PostNL
- Parcels
- Bringly
- FoodLgica
- Amsterdam

#### Online Supermarkets & Food Delivery

- Picnic (Technologies)
- Crisp
- Just Eat Takeaway.com
- Uber Eats
- Gorillas
- Getir

## II. The logistics and high-tech/IT clusters in the AMA

The digital supply chain is optimally established when the brightest and best from both the logistics sector and the high-tech/IT sector work together. That is exactly what happens in Amsterdam.

This metropolitan region is home to Amsterdam Airport Schiphol, a top European airport; the Port of Amsterdam, the world's largest port for cocoa and petrol; the world's largest flower auction, with a turnover of €4.5 billion in 2019; and AMS-IX, one of the world's largest internet hubs.

In addition, Amsterdam is home to an extensive, vibrant and rapidly growing high-tech and IT cluster. This seems to be reinventing itself by the day, becoming more dynamic in areas such as media, FinTech, software development, aerospace, life sciences and health, and platform technology. There are literally thousands of companies in an environment which invites mutual inspiration and collaboration – with each other, with universities and research institutes, or with government – in every way imaginable. This in turn has resulted in some of the most spectacular new companies in the world, from Picnic Technologies to Adyen, and from Mollie to Just Eat Takeaway.com.

## III. The strength of science and innovation

Amsterdam alone is home to the University of Amsterdam, Vrije Universiteit Amsterdam, the Centrum voor Wiskunde & Informatica (CWI) and the Amsterdam University of Applied Sciences – four renowned institutions, each with dozens of professors and scientists who are specifically involved in the digitalisation of chains, including logistics. Between them they run dozens of research and development projects with hundreds of private partners.

Add to that the leading institute TKI Dinalog (Dutch Institute for Advanced Logistics) and, for example, the Sustainable Transport and Logistics department of the major Dutch research institute TNO, and it becomes

clear that the innovative strength in high-quality logistics in Amsterdam is formidable.

In the wider context of the Netherlands, it should be noted that all three Dutch universities of technology (Delft, Eindhoven and Twente) have strong research groups in advanced logistics. And they often collaborate with universities and institutes in Amsterdam.

## IV. Education in logistics and digitalisation

The entire learning path that is important for companies in the logistics chain has a strong presence in the AMA.

Relevant higher education streams range from senior vocational education and training at the MBO College Airport – a vocational college for logistics – to higher professional education at the Amsterdam University of Applied Sciences, with programmes including Logistics Engineering and Software Engineering, and research-oriented higher education at the University of Amsterdam and Vrije Universiteit Amsterdam, with relevant master's programmes. PhD students can then go on to bring innovation to the world at the Centrum voor Wiskunde en Informatica (CWI), the national research institute for mathematics and computer science located at Amsterdam Science Park.

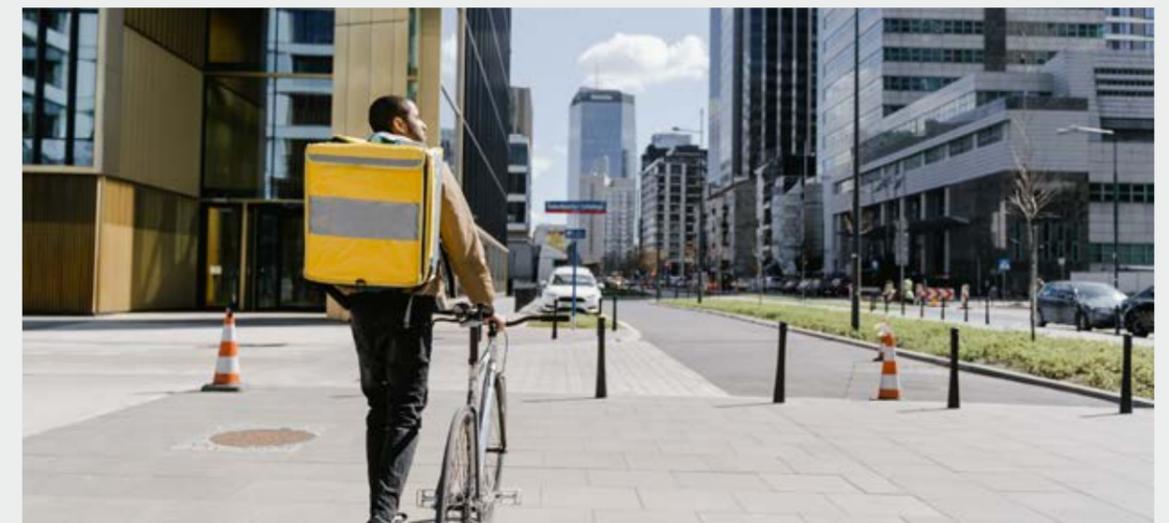
Also worth mentioning is the strong connection with leading logistics programmes in the south of the Netherlands:

- Fontys University of Applied Sciences in Venlo: the leading university of higher professional education in logistics management, logistics engineering, software engineering and business informatics, and with a master's programme in international logistics/procurement/supply chain management.
- Executive Master of Operations and Supply Chain Management (MOS), TIAS School for Business and Society in Tilburg.
- Operations Management & Logistics, Eindhoven University of Technology.
- Supply Chain Management, Tilburg University.

## V. The culture of collaboration and the power of ecosystem thinking

A cluster or ecosystem can only flourish where the culture of thinking allows it to do so. Amsterdam and the Netherlands have been known globally for decades as an international, open, curious, tolerant and collaborative environment in which to live and work. This is the reason that collaborative projects in the AMA come about so easily: it's in the Dutch DNA. There is another factor which plays a role: the Netherlands is an egalitarian country in which everyone's contribution is valued and respected. This has developed historically because the Dutch have traditionally had to work together in their fight against water in order to survive. The sea had to be kept at bay with dikes and locks; inland lakes and seas were partly drained to create dry land on which villages and towns could be built. Even the historic centre of Amsterdam is famously built on piles driven into the marshy ground.

As a consequence, ecosystem thinking is very strongly developed in the Netherlands. This is a way of thinking about the wider interests of society and thus jointly achieving a greater result than the sum of its parts. 'Open innovation' is also an example of this. The digitalisation of the logistics chain requires this way of thinking, because it is about sharing data – organising trust and having faith that the digital supply chain will ultimately benefit everyone.



## VI. The existing physical and digital infrastructure

In every international survey, the Netherlands emerges as a country in which the physical and digital infrastructure is very well developed. This applies to all land, sea and air connections and infrastructure, and equally to digital infrastructure. In the Netherlands, the heart of this digital infrastructure is in Amsterdam – with AMS-IX and all the supporting companies, services, infrastructure and data centres, Amsterdam has become one of the largest data hubs in the world.

Every year, DHL publishes a report detailing which countries in the world are the most 'connected' with the rest of the world. This index is based on research on the globalisation of international trade flows, capital, information flows and people. In the DHL Connectedness Index for both 2019 and 2020, the Netherlands sits in first place.

Thanks to Amsterdam as the Netherlands' digital heart.

# 9. The Amsterdam Metropolitan Area ecosystem

## A. Sector Overview (business and industry)

The Amsterdam Metropolitan Area (AMA) is highly developed when it comes to both IT and logistics. The potential for exchange and ‘cross-pollination’ between these sectors makes the AMA the perfect location for businesses and branch offices active in those areas. In addition, the professionals who live and work in the AMA are internationally oriented, inquisitive, open-minded, and open to collaboration.

### Logistics

Amsterdam’s strategic location and drive to innovate have won it a place at the heart of European logistics. The Amsterdam region is home to thousands of logistics companies offering a wealth of knowledge and expertise, as well as a valuable international network.

- The Netherlands boasts the world’s highest broadband penetration per capita, making it the ‘most connected country in the world’
- Amsterdam Airport Schiphol is Europe’s third-largest air freight hub
- 170 million consumers live within a 500-kilometre radius of Amsterdam
- The Netherlands is currently ranked number one in terms of self-driving vehicle readiness
- More than 2,000 logistics companies are active in the Amsterdam Metropolitan Area
- These companies have generated over 180,000 logistics jobs in the region

#### Amsterdam’s strategic location

Amsterdam’s strategic location is one of its greatest assets. Companies based in the city have easy access to nearly 500 million potential customers throughout Europe, with destinations like London, Paris, and Brussels only a short train or plane journey away. The Dutch capital is also home to the award-winning Amsterdam Airport Schiphol, which handles over

95% of all air freight in the Netherlands. It is also the location of the Amsterdam Internet Exchange (AMS-IX), one of the world’s largest data hubs; Royal FloraHolland, the world’s largest wholesale flower and plant market; and the Port of Amsterdam, which plans to open the world’s largest sea lock in 2022. These and other destinations are all well-connected by over 500 kilometres of cycle paths – ideal for both commuters and cycling enthusiasts!

#### A long history of trade and logistics expertise

The Amsterdam region has a long, rich history of international trade and logistics going back over 700 years. Trade brought a great deal of wealth to the city over the centuries, ultimately leading to the Dutch Golden Age in the 17th century. In recent decades, roughly 2,000 logistics companies have settled here, bringing with them a wealth of knowledge and expertise, as well as strong ties to other parts of the world. In 2018, the Global Logistics Guide gave the Netherlands a perfect 10/10 score, calling it ‘the model for European logistics excellence’.

#### One of the world’s premier innovation hubs

Amsterdam’s status as an innovation hub has greatly benefitted the logistics sector. Logistics chains are constantly being improved through close cooperation between the government, industry, universities, and research institutes. This cooperation has brought about innovative new solutions like supply chain visibility, the use of artificial intelligence and algorithms to reduce ambulance response times, and data processing and delivery optimisation for online supermarkets.

#### Making logistics greener

Amsterdam’s logistics sector is defined by a strong commitment to sustainability. For example, Amsterdam Airport Schiphol – the world’s third-most connected airport – has been implementing environmentally friendly measures such as electric transport and the use of biofuels and wind power, while the Port of Amsterdam was awarded the Silver Port Environmental Award for its commitment to sustainability and is currently working to increase the amount of non-fossil fuel cargo that is processed there.

A selection of key players in the Amsterdam Metropolitan Area

Air France – KLM	DHL Global	Nedairfreight
Alibaba.com	DSV Panalpina	Nippon Express
Amazon	Expeditors	ORTEC
Apex	Fast Forward	Penske
Aviair	FedEx	Rangle.io
Best Global	Flexport	Rapid Logistics
Bolloré Logistics	FourKites	Rhenus
Bonded Services	Geodis	TMC, a division of C.H. Robinson
C.H. Robinson	Hellmann	Top Cargo
CargoLedger	IAA	UPS
Ceva	IDA Cargo	VCK Logistics
Copex	Kuehne+Nagel	XPOLogistics
CTi - Control Towers International	Kintetsu	Yusen Logistics
DB Schenker	KN Control Tower Integrated Logistics	

## Tech and R&D

In addition to its logistics prowess, Amsterdam is also a flourishing high tech hub. The city is home to a great many innovative companies and a vibrant startup scene, making it the perfect environment for multidisciplinary cooperation between market leaders in logistics, digital solutions, creative industries, and fintech.

- The AMA is a giant talent pool, with over 215,000 professional tech developers living and working in the region
- The area boasts strong tech ecosystems in the life sciences and health, fintech, business software, and tourism and travel industries
- The Netherlands has ranked number one on the EF English Proficiency Index for years
- One of the world’s largest data transport hubs, AMS-IX, is located in Amsterdam
- Amsterdam was ranked fourth globally and second in Europe on Savills’ Tech Cities Index 2019

#### A thriving tech hub

Amsterdam has emerged as a major player on the international high tech scene. The AMA is home to over 2,200 tech companies, which together employ 77,000 people – roughly 14% of the local workforce. Over 450 multinationals have their global or European

headquarters in Amsterdam, including Heineken, Philips, Stryker, Tesla, Nike, Netflix, ING, and Tommy Hilfiger/PVH.

As a result, Amsterdam was named a top tech destination by Savills, KPMG, and startup magazine CoFounder. Amsterdam’s excellent quality of life, well-educated labour force, and international outlook (over 90% of Dutch people speak English) not only help tech companies to thrive, but also attract new talent to the area. The UK’s withdrawal from the EU has only accelerated Amsterdam’s growth: since Brexit, Amsterdam has seen a surge in interest from US tech firms and international fintech companies looking to serve the European market. This influx has given the local business community a significant boost.

#### A flourishing startup ecosystem

Amsterdam-based startups not only create jobs and attract millions in investment, but they are literally changing the future with every innovative new discovery and invention. Pioneers like Booking.com, Adyen, and Mollie got their start in Amsterdam. Other home-grown success stories include Bynder, Hotelchamp, and Framers.

In addition to enterprise software and travel/tourism, fintech firms are also making waves in Amsterdam's tech scene, with jobs in the sector up 35% from 2017. Companies like Adyen and Elastic have delivered multibillion-dollar IPOs, while up-and-coming fintech companies like Ohpen, bunq, and Bux have been changing the way that businesses and private individuals handle banking and investments. Young entrepreneurs, programmers, and designers can take advantage of Amsterdam's thriving network of accelerators and incubators to give their businesses a boost. Thanks to programmes like these, jobs in SaaS (Software as a Service) have risen by 30% in recent years.

#### **Ready for the future**

Amsterdam boasts an impressive talent pool that includes senior executives, technical experts, and sales and marketing professionals. Companies like Uber, Booking.com, Backbase, and Amazon have large technical development teams based in Amsterdam. The city offers an attractive living and working environment for skilled workers from around the world and is known for its open, inclusive business culture. The Netherlands ranks fourth when it comes to attracting non-EU tech workers to Europe.

The Dutch are known for their ability to adapt to working in different countries and cultures and for their willingness to take on new challenges. In the Dutch tech industry, this pragmatism translates to a robust business environment with plenty of expertise in crucial areas like laws and regulations, sales channels and organisational structures, online behaviour, and consumption-based policymaking.

## **B. Education & Research**

#### **In the Amsterdam Metropolitan Area**

The AMA is home to a number of relevant secondary vocational education (MBO) programmes, including:

- House of Logistics / Vocational school for logistics
- MBO College Airport

The Amsterdam University of Applied Science also offers a number of relevant bachelor's programmes:

- Logistics Management
- Logistics Engineering
- Business IT & Management
- Software Engineering
- System & Network Engineering

The University of Amsterdam and the Amsterdam University of Applied Sciences offer the following master's programmes:

- Transport & Supply Chain Management
- Business Administration
- Computer Science
- Artificial Intelligence

The Netherlands' foremost research institute for mathematics and computer science, CWI (*Centrum Wiskunde & Informatica*, or 'Centre for Mathematics and Computer Science'), is located at Amsterdam Science Park. Much of the research conducted at CWI is applicable to the field of logistics, including artificial intelligence, machine learning, and smart algorithms.

CWI focuses on finding practical, real-world applications for advanced scientific concepts, and as such cooperates frequently and closely with industry. More than 20 highly successful spin-off companies have already emerged from these types of collaborations, including:

- Photosynthetic - Hardware solutions for the microfabrication industry
- Seita - Smart sustainability
- Stokhos - Logistics and planning for emergency services

MonetDBSolutions - Database technology for business analytics

- Spinque - Search technology for information specialists, combining the key advantages of databases and information retrieval
- VectorWise - Analytical database technology
- Unipay Technologies - Encryption and electronic authentication

#### **Elsewhere in the Netherlands**

Companies in and around Amsterdam aren't limited to the AMA when it comes to attracting up-and-coming talent in logistics and IT, but can also draw on talent pools in other parts of the Netherlands. AMA-based companies also cooperate with universities and research institutions outside of Amsterdam on development and innovation.

#### **TKI Dinalog – Dutch Institute for Advanced Logistics**

The Netherlands' most important player when it comes to innovation in advanced logistics is TKI Dinalog in Breda. Dinalog stands for Dutch Institute for Advanced Logistics.

TKI Dinalog is the Netherlands' top consortium for knowledge and innovation in the field of logistics,

facilitating public-private cooperation between businesses, research institutions, and government agencies. They serve as a matchmaker for interested parties, support consortium development, assist in strategic planning, and help lay the groundwork for research programmes. TKI Dinalog's management programme monitors the content of innovation projects and helps to set their governance structure, ensuring that investments by both the government and industry remain clear, transparent, and accountable.

In addition, TKI Dinalog is actively involved in knowledge transfer and valorisation, providing support in the form of an SME service desk, general communication and networking, participation in events, and assistance for projects looking to translate knowledge into social and economic value. They focus on key topics for building a strong, sustainable logistics sector: chain management, synchro-modality, trade compliance, circular economy, and strong logistics professionals.

Degree programmes with a significant focus on digital supply chains elsewhere in the Netherlands:

- Fontys School of Technology and Logistics in Venlo is one of the country's top schools for higher professional education in:
  - Logistics Management
  - Logistics Engineering
  - Software Engineering & Business Informatics
  - Master's programmes in International Logistics, Procurement, and Supply Chain Management

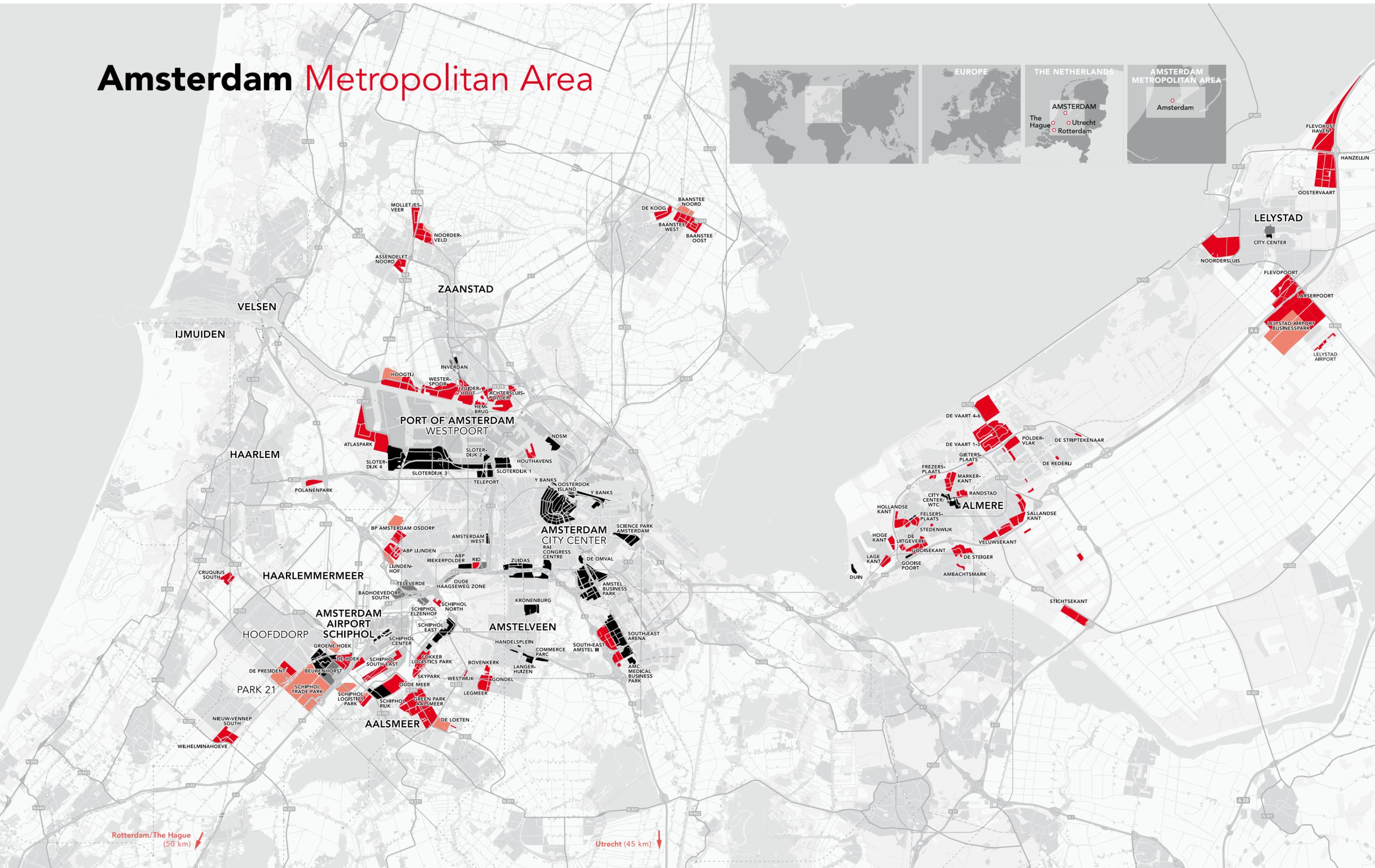
Other leading master's programmes:

- Executive Master of Operations and Supply Chain Excellence (MOS), TIAS School for Business and Society in Tilburg
- Operations Management & Logistics, Eindhoven University of Technology
- Supply Chain Management, Tilburg University
- Transport, Infrastructure & Logistics, Delft University of Technology
- Supply Chain Management, University of Groningen
- Global Supply Chain Management & Change, Maastricht University (Venlo campus)

From an international perspective, even the last programme on the list is relatively close to Amsterdam: Venlo is about 180 km away, or roughly two hours by car. The Netherlands is easy to get around – most cities are within a two-hour drive from Amsterdam.



# Amsterdam Metropolitan Area



Rotterdam/The Hague (50 km) ↓

Utrecht (45 km) ↓

- |                            |                          |                        |                   |         |                 |                 |                      |               |
|----------------------------|--------------------------|------------------------|-------------------|---------|-----------------|-----------------|----------------------|---------------|
| Amsterdam Airport Schiphol | Existing office location | Existing business park | Residential area  | Highway | Secondary roads | Railway         | Metro / Express tram | R-NET Busline |
| Port of Amsterdam          | Future office location   | Future business park   | Recreational area | Future  | Future          | Railway station | Stations / stops     | Future        |

Scale (km) 0 1 2 3 4 5

## C. Business Parks and Campuses

The Amsterdam Metropolitan Area offers a variety of locations for businesses. 'Traditional' logistics service providers are primarily concentrated around logistics hubs, including Amsterdam Airport Schiphol, the Port of Amsterdam, and the Port of Flevokust in Lelystad. Tech firms and digital logistics companies are more likely to choose locations closer to Amsterdam's city centre or at Amsterdam Science Park.

### Science Park Amsterdam

Amsterdam Science Park is home to one of Europe's largest concentrations of scientific education and research institutions. It is a hotbed of innovation, where businesses can meet and collaborate with talented students, scientists, and fellow entrepreneurs. Together, they can develop revolutionary solutions to today's problems and tomorrow's challenges.

Amsterdam Science Park is organised around four key focus areas, each with its own dedicated ecosystem consisting of research, business, talent, and infrastructure:

- AI & Data Science
- Sustainability
- High Tech Systems & Materials
- Life Sciences

### AI & Data Science – leveraging our knowledge base

Amsterdam Science Park is the Netherlands' foremost centre for research on artificial intelligence and big data. The park's prominence is due in large part to the number of leading research institutions based there, including CWI, SURFsara, the Netherlands eScience Center, and the University of Amsterdam's Informatics Institute. This strong knowledge base, combined with excellent infrastructure, has led to innovations in cybersecurity, quantum software, computational imaging and computer vision, and high-performance computing.

### Building connections

Amsterdam Science Park was literally the birthplace of the European internet and it remains one of the world's best-connected locations today. The park contains 600 network hubs, enabling users to reach 80% of Europe within 50 milliseconds. But the connections made here aren't just digital – the park is a collaborative space where businesses, scientists, and innovators come together to discover and create.

### Fostering collaboration

Researchers at the park work closely with industry partners to translate ground-breaking research into innovative new products and services. At the University of Amsterdam's Bosch Lab, for instance, a team is working on making self-driving cars more scalable and cost-effective.

The focus is primarily on finding solutions in the fields of engineering and artificial intelligence/machine learning. Joint ventures such as these, which connect innovative businesses to today's brightest minds, continue to generate a broad range of real-world applications.

### Investing in AI and data science

The fast-growing fields of AI and data science have earned a prominent place at Amsterdam Science Park. The following developments at the park have helped to establish the Netherlands as one of the world leaders in terms of innovation power, particularly when it comes to AI:

- The Innovation Center for Artificial Intelligence (ICAI) was launched at Amsterdam Science Park in 2018. ICAI is a nationwide initiative that encourages collaboration between knowledge institutes, industry, and the government in order to develop new technologies in the field of AI.
- ICAI works closely with the other fields of focus at the Amsterdam Science Park, including the life sciences, sustainability, and high-tech materials. Cross-pollination between these areas of research has opened up new possibilities and applications for artificial intelligence.
- CWI hosts an 'innovation space' focused on fintech for the European Institute of Innovation & Technology.
- Startup Village, a community where entrepreneurs can develop their ideas and research into successful businesses, is adding a new facility. The extension will be dedicated to AI and data science, with an emphasis on blockchain technology.
- New university programmes in AI will ensure that future graduates are up to date on the latest technological developments. Student enrolment in these programmes has been increasing by 15% annually.

### Growth through innovation

The rapid pace of innovation at Amsterdam Science Park has already attracted the attention of many multinational corporations. For example, successful startup Scyfer, which got its start at the park, was

acquired by Qualcomm, while one of the Netherlands' top banks, ABN AMRO, has set up its digital branch here. Companies like Bosch, Ahold Delhaize, Tata Steel, and Elsevier, as well as institutions like the Dutch national police, have established a presence at the park in order to be among the first to take advantage of new advances in technology.

The Amsterdam Science Park is home to over 170 businesses and research institutions that together employ around 4,500 professionals. In addition, over 7,000 students are enrolled in programmes based at the park.

## D. Collaboration and Networking in the Amsterdam Metropolitan Area (industry, academia, government)

### Amsterdam Logistics Board (ALB)

The Amsterdam Logistics Board aims to strengthen the competitive position of logistics hubs in the Amsterdam Metropolitan Area, as well as the AMA as a whole, by working together to make logistics hubs smarter, cleaner, and faster. The ALB provides direction on a strategic level and actively promotes its vision and methods in order to bring about real-world change. The ALB is made up of the Royal Schiphol Group (chair), the Port of Amsterdam, Royal FloraHolland, the Municipality of Haarlemmermeer, the Amsterdam University of Applied Sciences, and SADC.

Its mission is as follows: *'The common interests of the Amsterdam Metropolitan Area and its major logistics hubs (the Port of Amsterdam, Schiphol Airport, and Greenport Aalsmeer) are our top priority. We see the logistics sector as the lifeblood of the AMA. Its value goes beyond the local to the national and international levels and it is essential for achieving sustainable growth in the AMA. Cooperation between the three major hubs, the government, industry, and research institutions (a multi-helix model) is key.'*

*The Amsterdam Logistics Board aims to contribute to this shared goal by acting as a driving force for innovation and the development of smart, clean*

*logistics and goods transport. The ALB takes an active role in this multi-helix network, lobbying to make this vision into a reality.'*

### Amsterdam Logistics Programme (ALP)

The Amsterdam Logistics Programme (ALP) is made up of the ALB plus a programme team. Within the ALP, a number of businesses, public organisations, and research institutions in the Amsterdam Metropolitan Area (AMA) work together to achieve common goals. These include Amsterdam Airport Schiphol, the Port of Amsterdam, Royal FloraHolland/Greenport Aalsmeer, the Province of North Holland, the Amsterdam Transport Authority, the Municipality of Haarlemmermeer, SADC, and the Amsterdam University of Applied Sciences.

### ALB and ALP's goals for 2030

#### Clean logistics within a circular economy

- 30% reduction in carbon emissions from hinterland and continental transport by 2030 (National Climate Agreement)
- AMA transport and logistics hubs will lead the pack when it comes to alternative energy sources (wind, tidal, solar, hydrogen, biomass), both in the Netherlands and abroad
- Logistics at AMA hubs will contribute to a fully circular economy and to the energy transition within the AMA

#### Smart logistics

- The transport of goods to and from AMA hubs by road, water, and rail will be optimised in terms of accessibility, throughput, and safety by 2030
- Logistics chains between AMA hubs, carriers, shipping companies, and the government will be fully digitised and optimised by 2030
- AMA transport and logistics hubs will take a leading role in regional and international trade flows thanks to supply chain innovation, improved chain management, and service logistics, cementing their status as a valuable asset in the region
- By 2030, goods will be transported as cheaply and efficiently as possible, using the best transport technology for the job, thereby making the most effective use of the available capacity

#### Together

- By 2030, the AMA logistics sector will have sufficient well-trained personnel at all levels and will cooperate efficiently and effectively with universities and research institutions thanks to a local-for-local policy
- Robust mechanisms will exist for public-private

- policy-making, and logistics policies at municipal and provincial levels will be sufficient to achieve the ambitions and goals laid out in this vision
- The default approach will consist of a 'learning by doing' framework combined with solid project management and effective monitoring and evaluation
  - The AMA logistics sector will add value to the financial, economic, and social gains achieved by businesses, residents, the government, and research institutions in the region

## E. Government Support

### *AAA – Amsterdam Airport Area*

The Amsterdam Airport Area (AAA) aims to strengthen the competitive position of the Amsterdam Metropolitan Area (AMA) in a sustainable way, making it a more attractive place for international companies to base their physical and digital logistics-related activities. The AAA's methods include international marketing and acquisition, as well as investor development and networking with members from the public and private sectors. The goal is to attract innovative, sustainable businesses to the region through cooperation with regional and national acquisition partners.

### *Marketing and acquisition*

- The AAA cooperates with intermediaries and regional partners to promote the AMA internationally in order to ensure the region remains 'top of mind' for potential investors
- The AAA works to attract new international businesses and retain existing ones, together with acquisition partners at national level (Netherlands Foreign Investment Agency) and regional level (amsterdam inbusiness, or AiB)

### *Networking platform*

- The AAA's networking function serves to strengthen its marketing and acquisition activities
- The AAA works with industry and the government to formulate a strong proposition for the AMA as a location for international activities in the aviation and logistics sectors
- The AAA provides industry-specific knowledge and encourages involvement from market players in order to further develop the AMA in a number of selected clusters





*Regional role*

The AAA focuses on the Trade & Logistics cluster. AiB is responsible for acquisitions within the Creative Industry, Life Sciences, IT, and Financial & Business Services clusters.

<https://www.iamsterdam.com/en/business/key-sectors/logistics>

<https://www.iamsterdam.com/en/business/key-sectors/aerospace>

**AiB – amsterdam inbusiness**

Amsterdam inbusiness (AiB) is the official foreign investment agency for the Amsterdam Metropolitan Area (Amsterdam, Amstelveen, Almere, and Haarlemmermeer). AiB – a sister agency to the AAA – helps foreign companies to establish and expand their operations in the Amsterdam region.

The specific roles of AiB and AAA are described above and are based on the business clusters in which each agency specialises.

<https://www.iamsterdam.com/en/business>

**Holland International Distribution Council (HIDC)**

Holland International Distribution Council (HIDC) is a private, non-profit organization providing advisory and matchmaking services for supply chain operations in Europe. We can help you find the reliable logistics partner that suits your needs best, or assist in setting up your own facility.

<https://www.hidc.nl/en>



**Invest in Holland / NFIA – Netherlands Foreign Investment Agency**

The Netherlands Foreign Investment Agency (NFIA), an operational unit of the Dutch Ministry of Economic Affairs, has joined forces with the Ministry of Foreign Affairs and a number of regional partners under the name 'Invest in Holland' (IiH). The Invest in Holland Network aims to promote the Netherlands abroad as an attractive country in which to invest or set up a business. It also helps interested foreign companies to establish or expand upon their international activities in the Netherlands.

*The NFIA:*

- Provides information, practical assistance, and advice to foreign businesses
- Was founded over 40 years ago as an operational unit of the Dutch Ministry of Economic Affairs
- Is responsible for identifying and attracting direct investment from foreign companies (greenfield or expansion) in the Netherlands
- Offers access to a vast network of business partners and government bodies
- Employs around 35 people at its headquarters in The Hague

NFIA support begins abroad, with 27 offices located around the world employing a total of 75 representatives. These NFIA offices work closely with embassies, consulates, and other organisations representing the Dutch government worldwide, as well as with a large network of partners in the Netherlands.

<https://investinholland.com/>



**More information?**



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