



Douane
Belastingdienst

Pushing boundaries

Future vision for customs supervision:
principles, developments and results



Foreword

Customs supervises the fiscal integrity and security of the EU's cross-border trade in goods, as well as the integrity and remittance of excise duties domestically. At the same time, Customs is expected to contribute to the competitiveness of the Netherlands and the European Union, such as by carrying out predictable inspections whilst minimising disruption to logistics.



With a view to efficiently and effectively fulfilling this dual role, a future enforcement vision was adopted a number of years ago: 'Pushing Boundaries'. This vision centres on one hundred per cent supervision, with a reduced number of logistical interventions for bona fide businesses. It is against this background that Customs aims to automatically check larger volumes of goods flows based on the auto-detection of data and goods in order to avoid unnecessary logistical delays. And if the equipment is not yet able to detect certain risks, we adapt the place, time and nature of enforcement to the level of knowledge Customs has of the commercial chains, the proven reliability of economic operators and the nature of the goods. This knowledge leads to goods being placed in blue, green and yellow flows respectively.

This white paper sets out the developments within this vision that have been started and implemented since the introduction of Pushing Boundaries. Many of these developments are tested in a laboratory or research environment, in collaboration with science, technology producers and industry. Only when a process is ready for implementation will Customs and the business community start to notice it. It should be noted that most of these innovations only gradually lead to changes, which is why we also refer to changes 'under the hood'.

Customs will continue to be confronted with many changes in trade flows, social and political wishes, technology and legislation. These changes call for our constant attention, and 'Pushing Boundaries' gives us a compass we can use to steer this movement in the right direction.

Nanette van Schelven, Managing Director Customs Netherlands

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1 Introduction:

The boundary-pushing model of layered enforcement

In the 2014 position paper 'Pushing Boundaries', Customs Netherlands began to work towards an innovative way of supervising the continuously growing goods flows. An innovative and smart way of working, aimed at striking an appropriate balance between enforcement and facilitating trade. Pushing Boundaries is not a blueprint, but rather a compass to help us take the right steps in the right direction.

Numerous activities have been developed in recent years to put this future enforcement vision into practice. This is a sometimes laborious development in which Customs also sets out to explicitly include the business community.

The central starting point for the new enforcement vision is to supervise the ever-growing flow of goods one hundred per cent. It should be noted that these days about a third of all goods entering and leaving Europe pass through the Netherlands. Given this huge volume of goods, 100% supervision is of course an ambitious goal, and one that can only be achieved using innovative methods and technologies. An example of such a boundary-pushing technology is the auto-detection of data and goods, i.e. the automated assessment and processing of data on goods flows and companies, and the automated assessment and processing of sensor data, including scan images.

Layered enforcement

The core of the 'Pushing Boundaries' vision is the layered enforcement model: less drastic logistical interventions for reliable companies, and more checks for unknown entrepreneurs. The layered structure of customs supervision is mainly determined by the quality and reliability of the available information about goods, economic operators and logistics chains. Customs uses different enforcement methods depending on the knowledge of consignments, parties and supply chains.

Frank Heijmann, Head of Customs Netherlands Trade Relations, explains the importance of this information position for customs supervision. "If we don't know which entrepreneurs are behind the shipments, then it makes sense to check the goods at the border.

However, if, in addition to the goods information, you also have information about the entrepreneurs in question and that data is such that those entrepreneurs can be regarded as demonstrably reliable, then you can organise the monitoring of that flow of goods in a different way."



Frank Heijmann

To provide an insight into the stratified enforcement model, goods traffic has been divided into three flows: the blue, green and yellow flows.

Customs generally checks the first category – the blue flow of goods for unknown entrepreneurs – at the border, based on the selection and analysis of goods risks. The monitoring concept for the green flow of goods is aimed at demonstrably reliable (or 'compliant') economic operators. Where possible, Customs checks that these companies are acting correctly at the front end, i.e. before the goods are transported. For the yellow goods flow, Customs is working on fully reliable trade lanes, based on part on the automated collection and exchange of all relevant data on goods shipments within these logistics chains. In this context, this is sometimes referred to as Smart & Secure Trade Lanes (SSTL).

The layered enforcement model: the blue, green and yellow goods flows



The Pushing Boundaries vision centres on the model of layered enforcement: fewer and less drastic logistical interventions for reliable companies, and more checks for unknown entrepreneurs. To supervise goods movements, a distinction is made between a blue, green and yellow flow of goods:

- The blue flow of goods for unknown entrepreneurs: customs generally carries out checks at the border, based on risk selection and analysis.
- The green flow of goods for demonstrably reliable economic operators, or 'trusted traders': customs carries out observations - where possible outside the logistics process - to check the correctness of the actions.
- The yellow flow of goods is for smart and secure trade lanes: Customs works to make complete trade lanes secure, based in part on the automated collection and exchange of all relevant goods-related data of each party within such a trade lane.

Pushing Boundaries

In addition to the principle of 'one hundred per cent supervision', Customs also applies another principle for the design of layered enforcement. It sets out to supervise with minimal logistical delays. This entails striking an appropriate balance between enforcement and trade facilitation. In short, to facilitate the bona fide business community, the aim is:

- to reduce the administrative burden and inspection burden as much as possible;
- to carry out customs supervision outside the logistics process wherever possible;
- to minimize the logistical delay.

In the consultation between Customs and the business community, three expectations were communicated to Customs, which are important for the business community:

1. set up customs controls at logical times and places in the logistics chain;
2. coordinate the controls and procedures of the various inspection services;
3. make use, where possible, of the safeguards provided by companies' internal management systems.

On the Customs side, the expectations put forward for the business community are important benchmarks for the design and elaboration of the model of layered enforcement. These design requirements are set out in more detail in the box below.

Pushing Boundaries



Pushing control out of the border - Carry out the customs interventions at logical times and places in the supply chain. In the case of reliable shippers, for example, supervision can be exercised during the packing or unpacking of the cargo, so that it no longer needs to be checked at the border. Another example: businesses often scan their own cargo for security reasons; Customs can be given access to this to avoid having to carry out any more scanning themselves at a later stage.

Coordinated border management - The government acts as one authority by arranging better coordination between the various inspection services. Arrange for checks to be carried out at the same location and in the same time frame (One-Stop-Shop). An example of such a one-stop-shop is the Joint Inspection Center (JIC) at Schiphol South, in which various enforcement agencies and inspection services carry out their supervision at the same time, so that delays are kept to a minimum. Customs has set up a similar location in the port of Rotterdam: the State Inspection Terminal. Also make sure that data for different services can be delivered once, and that all services together provide a single report (Single Window).

System-based approach - The business community is asking the government's inspection services to move from transaction-based to system-based supervision.

Try to re-use as many guarantees as possible that the business community itself has already put in place. After all, many companies already operate a high standard of safety and quality for internal or commercial reasons. Companies with good internal control and high quality internal audits do not need to be checked in the same way as unknown parcels or shipments from companies for which no data is available.

Under the banner of 'Pushing Boundaries', many steps have been taken in recent years in the direction of one hundred per cent supervision and reducing logistical delays. Nevertheless, many developments in the field of 'pushing boundaries' remain under the radar of the customs organisation and the business community.

Many innovations play out under the bonnet. In the next chapter, Frank Heijmann explains the progress of the 'boundary-pushing' innovation process.

2 Pushing Boundaries: *Innovating under the hood*

Since the publication of the 'Pushing Boundaries' vision in 2014 customs has set many things in motion, regarding aspects such as the audit method, system-based supervision, scanning and sensor technologies and the access to and use of data. But these innovative processes mainly take place under the hood of the organisation. The outside world has certainly so far been given little insight into the progress and results of the innovation process.

Innovation: through trial and error

Frank Heijmann, Head of Customs Trade Relations, understands the impatience he sometimes notices in trade and logistics. "We're not always satisfied with the pace of innovation, either. But innovation always involves some trial and error: two steps forward, one step back. Nor is it always that easy to make the transition from the drawing board to the practice of Customs. That's understandable, too. On the one hand, you work on all kinds of research and pilot projects, sometimes with a view to many years ahead. On the other, our service is simply an operational enforcement service, which is set up to supervise the here and now. That sometimes causes friction."



Heijmann has been asked several times when the 'boundary-pushing' innovations will become more apparent in customs practice. "My answer is that a lot of innovation has already found its way into the operational work of Customs in an almost organic way. And that development continues. If we look at the customs organisation over time, we'll eventually see that the engine has been almost completely overhauled. But before that time arrives, we still have a lot of work to do."

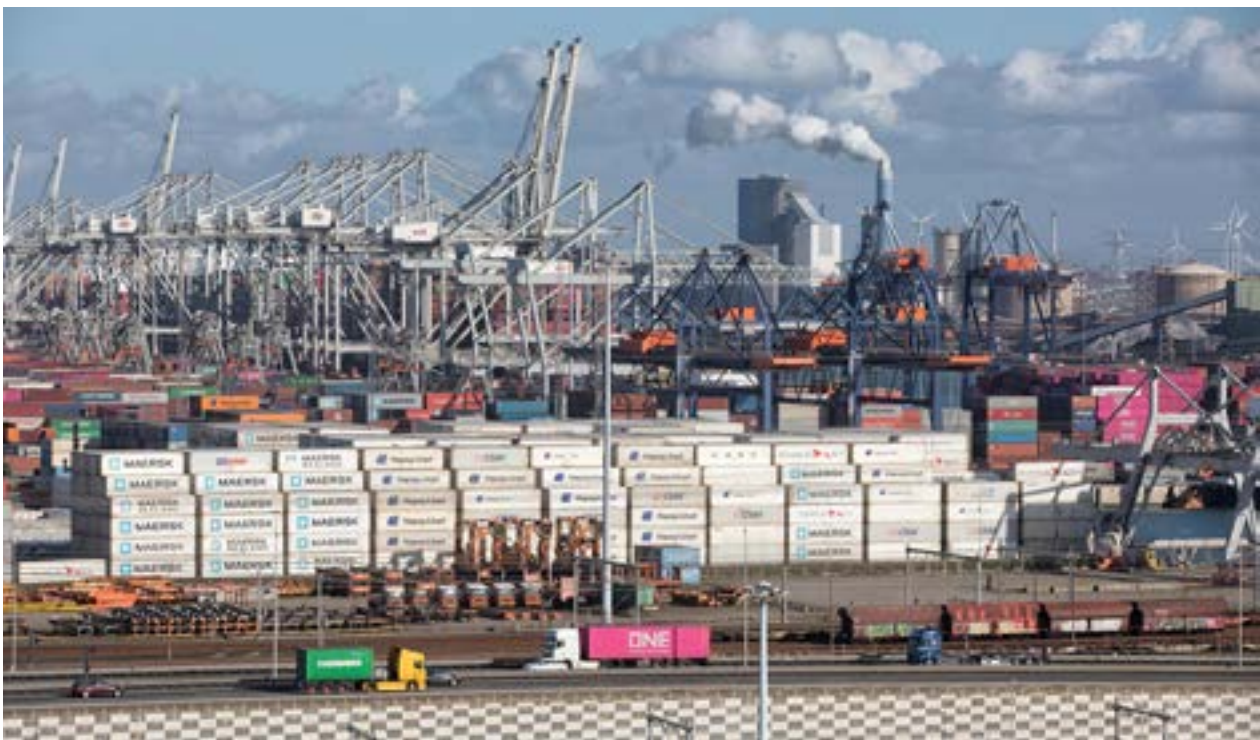
What innovations are already in place?

The question is which innovations are now up and running. The answer is more than many people think. This is illustrated by the introduction of the pre-declaration in AGS for import goods, which, technically speaking, makes it possible to complete customs formalities before the shipment arrives.

Innovations in scanning and detection technology

Most of the progress made in recent years is in the field of scanning and detection technology, and this innovation continues unabated. The first notable fact is the transfer of the container scans from Customs to the port terminals. This means that containers can be scanned within the logistical flow and delays are reduced.

Heijmann: "When containers were previously checked in the port of Rotterdam, they were delayed for up to three days. First they were taken out the logistics process, and then they were brought to a location for inspection, after which they had to be re-scheduled into the logistics process.



With the container scans at the terminals, these checks go much faster. But that's not all. Before a ship arrives in Rotterdam, Customs has already via data management selected the containers to be checked by them. This can therefore be taken into account when unloading the vessel."

Since 2012 customs in Rotterdam has also had a state-of-the-art scanner that inspects containers on trains, while they pass through the scanner at a speed of about sixty kilometres an hour. "This obviously saves a lot of time compared to scanning each container separately", explains Heijmann.

Customs now uses an impressive arsenal of cargo scanners, which ensure safer and more efficient and therefore faster cargo handling. For example, the Joint Inspection Centre at Amsterdam Airport Schiphol works with a ULD (Unit Load Device), a mobile container scan, a remote scan and a 'backscatter' for scanning means of transport (including aircraft). And nuclear detection gates have been installed everywhere both at Schiphol and in the port of Rotterdam to detect radiation. There is also a fruit scan to detect narcotics in pallets of fruit being tested in Zeeland.

Schiphol Smart Gate Cargo

The animation below provides an insight into the innovative control process at Schiphol, which has been set up partly as part of the public-private partnership project Schiphol Smart Gate Cargo.



The emergence of data analytics

The next crucial step in the innovation process is the automated analysis of scan images. Evaluating scan images is still time-consuming human work, which causes logistical delays. For that reason, Customs is now working hard on developing of the auto-detection of data and the auto-detection of goods (scans), so that the computer will not only make the scans, but will also assess and process them. This leaves Customs free to focus on the goods for which a higher risk has been detected. The technology of automated scan image analysis, for example, already works with automatic passport control at airports, where facial recognition is used and the system makes its decisions on that basis. A trial with biometric border passage is also being carried out at Amsterdam Airport Schiphol as part of the public-private partnership project 'Seamless Flow'.

The following chapters discuss the developments in the field of auto-detection of data and goods in more detail. These new analysis technologies (data analytics) are mainly used for monitoring in the blue flow, which is by far the largest volume of goods. We also zoom in on the other innovations in the blue, green and yellow flow of goods, which are currently under development.

3 Innovations in the blue flow



Within the 'Pushing Boundaries' vision, a great deal of attention is paid to goods from unknown and lesser known economic operators: the blue flow of goods. This is because these are the largest volumes, which are also subject to the greatest fiscal and security risks. Customs is gradually gaining more control over this blue flow, in all sorts of ways. But customs supervision can be further strengthened, says enforcement director René Doolhoff. "The service's supervision needs to be even more data-driven, and we're working hard on that."

Camera surveillance and drone technology

In the context of 'Pushing Boundaries', good progress has been made in the supervision of the blue flow in recent years. Important innovations have already been covered in the previous chapters: the arrival of fixed scan systems at all container terminals on both Maasvlaktes, and the realisation of the State Inspection terminal in Rotterdam and the Joint Inspection Center at Schiphol.

Schiphol and the port of Rotterdam are also equipped with camera surveillance. "This is of great value to the customs organisation," says Doolhoff. "The good public-private partnership in this area means that we have been able to sharpen our focus on large parts of these logistic hubs. This provides us with an additional instrument to strengthen our supervision on the spot and provides us with useful input for our risk analysis by the Customs National Tactical Centre. These cameras also have a preventive effect."

An area still under development is airborne inspection. Using drones will make it possible in the future to observe port areas, vehicles and vessels. In 2018 the Port of Rotterdam carried out experiments with unmanned aircraft as a potential additional tool for customs supervision. In this pilot, Customs joins the Coast Guard, which has been conducting experiments into the added value of drone technology for the maritime domain for some time now.

For Customs, for example, there were tests to establish whether airborne objects could be selected for inspection using cameras, whether the surroundings of these objects could be closely monitored, and whether any risks could be identified more quickly in this way. Customs will also look into whether drones can contribute to the monitoring of locations around ships with a high risk. This aerial inspection should be seen as complementary to the existing surveillance using video networks of fixed security cameras.



In the future, Customs also plans to experiment with mini-drones. These drones will not operate in the open air, but only in enclosed spaces - especially on board vessels. This concerns small locations that are difficult for tracking dogs and officers of the national inspection team to pass through. There are also places where there is a danger to people and animals, such as fuel tanks where toxic gases are present: these are, of course, ideal hotspots for concealed contraband.

Research into state-of-the-art scanning and sensor technologies

The previous chapter discussed the high-quality technologies and x-ray scanning and radiation detection methods, which have been part of the Customs' enforcement arsenal for some time now. But scanning and detection technology is rapidly developing. That's why Customs is taking part in various international research projects in which all kinds of new technologies in this field are being tested. A promising initiative from 2016-2018 was the European investigation into an advanced and integrated inspection line for trucks: the project C-BORD (Effective Container Inspection at Border Control Points).

European research project C-BORD

In the European high-tech project C-BORD, customs services, knowledge institutes, universities and industrial partners are working on the development of a wide range of ultramodern scanning and sensor techniques, which are used for integrated inspection purpose in a single passage for trucks. Special attention is paid to the detection of narcotics and nuclear goods in freight containers.

How does exactly does C-BORD work? As soon as a truck passes through the gate, it is subjected to a wide range of inspection technologies. A component or a combination of components of the inspection line is activated for each type of goods and for each type of risk selection. Gas phase measurement is carried out, for example, by means of sensors, i.e. an analysis of air from the container. This is followed by passive radiation detection. Classical x-ray scanning technology is also part of the C-BORD arsenal, but in its most advanced form.

These steps may give rise to further checks, such as when a significant radiation value is detected. The second-line photofission measurement offers a solution; this is a new method in which an x-ray beam is briefly aimed at a single position, after which secondary radiation is released and captured. This can be used to identify heavy metals, such as uranium or plutonium. The recently developed neutron scan is also being operated in the second line. This instrument is specifically aimed at identifying organic substances, especially narcotic drugs and drug precursors.

All in all, the mix of technological gadgets in the C-BORD array will help to confirm or disprove suspicions about selected batches of goods relatively simply and quickly. This is a win-win situation for both Customs and the business community. After all, both are subject to the same rules: the fewer containers to unpack, the better.

For the time being, a C-BORD-type inspection line is still a thing of the future. It will take years before such an advanced cargo inspection line is actually operational. This is mainly because C-BORD uses relatively new methods and technologies, which are still being developed into ready-to-use commercial end products.



European research project COSMIC

The European COSMIC project, which, like C-BORD, is funded under the European Framework Programme Horizon 2020, is used to test new experimental sensor technologies. For Customs, this particularly concerns the application of mass spectrometry and the use of muons. Muons are short-lived unstable particles that look like electrons and occur in cosmic radiation. These particles can be used to visualize container contents. Mass spectrometry is another technology that could offer additional inspection options for Customs. This is a new, versatile technology for analysing air for undesirable substances.

The COSMIC project, which started at the end of the year 2018, is used to test whether these innovative sensor technologies can be used for customs purposes. The ultimate goal is to ensure that all such sensor measurements can be processed and interpreted automatically in the future.

What is Horizon 2020?

Horizon 2020 is the European Union's framework programme for research and innovation. The programme funds knowledge institutions, companies and science for research projects, strengthening international networks, and/or acquiring new knowledge and expertise. The European Commission thus stimulates science and innovation in business and increases Europe's competitiveness. Horizon 2020 provides research funding in a wide range of areas, including the Secure Societies domain. All activities aimed at strengthening border control and the safety of logistics chains fall within this domain.

Apps & Tools for customs supervision

More tools have recently been developed to manage the blue flow of goods more efficiently and effectively in terms of risk. A striking example is the construction of a web crawler to browse the internet at lightning speed to ascertain the correct market value of goods. Customs staff are also equipped with handheld scanners and RAMAN equipment.

A web crawler for the postal and courier process

Customs also takes part in research projects financed by Horizon 2020, the European Union Framework Programme for Research and Innovation. Customs is the initiator of the 'Webcrawler' work package within the PROFILE project.

The web crawler for the postal and courier process can be used to collect additional data from external sources to cross-validate customs declarations. The first check is for the price of a product. If the value of a given goods description differs significantly from the average value, this could be a reason to physically check the shipment. The long-term aim is to automate the cross-validation process.

Another objective is to create more precise risk indicators and risk profiles by means of data mining in historical datasets. Algorithms are also being developed that can identify risks with increasing accuracy based on historical declaration data, profiles and inspection results.

But there's more. An app has been developed to detect prohibited Chinese medicines in passenger luggage. Applications for value classification of flora and fauna and other types of goods are still under development.

Declaration behaviour

Another favourable development is that Customs will have more means at its disposal to monitor and influence the declaration behaviour of businesses.

René Doolhoff: "In recent years, we've been running the 'Quality of the Declaration' project, which is now part of the existing organisation.



René Doolhoff

We analyse which fields in import declarations cause problems for entrepreneurs. We also use our business rules to gain an insight into the number of declarations made by companies that are refused by our AGS system right from the start. These validation rules recognise certain invalid combinations in fields, such as a document code that does not belong to a commodity code. Such a report will not be processed, but will immediately be returned to the submitter for correction. This is done annually with 1.5 million import or export declarations, or eight per cent of the total. So there's much to gain. Once we have an idea of what's going wrong, we can instruct companies to pay more attention from then on. This saves them additional administrative costs and wasted time. And we ourselves can gain valuable knowledge about these economic operators."

Customs Realtime Information System (CRIS)

A data dashboard has also been developed to improve risk selection: the Customs Realtime Information System (CRIS). This system ensures that all relevant inspection information about shipments that have so far been manually retrieved from internal and external customs systems can be accessed and retrieved with the aid of a one-click dashboard. Data on goods shipments are thus enriched with additional data from internal and external sources. Examples include information from systems such as Customs Manifest, Customer Relationship Management, Customer Information System, Chamber of Commerce, ConTraffic (container status messages) and historical compliance figures. CRIS makes it easier for customs officials to select cargo for inspection upon arrival. This improved risk selection also contributes to a reduced inspection burden for the business community.

Data-driven supervision

However, the innovation area in which Customs stands to gain the most is from monitoring the blue flow is the development of data-driven monitoring: the auto-detection of data and goods. This is the area of innovation that Customs will be focusing on in the years to come.

The possibilities and bottlenecks concerning the auto-detection of data and goods are discussed in more detail in the next chapter.

4 Auto-detection of data and goods



To continue to control the growing volumes of goods, Customs needs to put a great deal of effort into the auto-detection of data and goods. The aim is to develop automated systems that use artificial intelligence to recognise deviations in patterns, in this case patterns in goods and data flows.

Computer systems equipped with artificial intelligence make use of self-learning algorithms, which can produce predictions, solutions and conclusions using large amounts of data. In the future, this process of machine learning will make it possible for more and more complex cognitive tasks and work activities to be carried out by computers (robots).¹

¹ A widely-known example is the Google Translate application, a service that many people have installed on their smartphone or tablet. Since Google stated using an artificial neural network (Google Neural Machine Translation), the quality of these machine translations has improved by leaps and bounds.

What are algorithms?

An algorithm is simply a step-by-step method - in the form of a series of logical instructions - of solving a problem or achieving a goal, in particular by a computer. This step-by-step method is usually based on a sequence of mathematical operations (equations, arithmetic, algebra, calculus and logic), which are translated into computer code. Algorithms are fed with data from the real world, are given a target or objective, and are instructed to achieve this target step by step using mathematical operations.

Computers equipped with Artificial Intelligence excel mainly in recognising speech, images and patterns, as well as in detecting anomalies in those patterns². For Customs, this opens up the prospect of automatically detecting and analysing deviations (or irregularities) in declaration data and scan images of goods, for example.

Conditions for automated detection

Some important steps still need to be taken to implement this data-driven supervision. In particular, progress must be made in the following two areas in order to enable the automated analysis of data and goods:

1. More and better quality data.
2. The standardised recording of data.

The more data Customs has on goods flows and businesses at its disposal, the better it will be able to automatically identify and analyse signs of possible deviations or irregularities. This is subject to the condition that this flow of data is collected, combined, weighted, analysed and refined at a central location.

To obtain better quality information, it is necessary, among other things, to enrich the AGS declaration data with other internal customs data, such as with findings from other customs controls. A second step is to enrich and combine your own customs information with data from external sources, such as data from logistics platforms or hubs.

² In the medical field, for example, it has been shown that cancerous tumours can be diagnosed and treated much faster and better with the aid of artificial intelligence.

For the automated analysis of data, it is also necessary that data is recorded in a clear and standardised manner. It is undeniable that much progress still needs to be made in the customs sector with regard to the unambiguous recording of observations and audit findings in the customs system. Customs is currently working on a project to improve this situation.

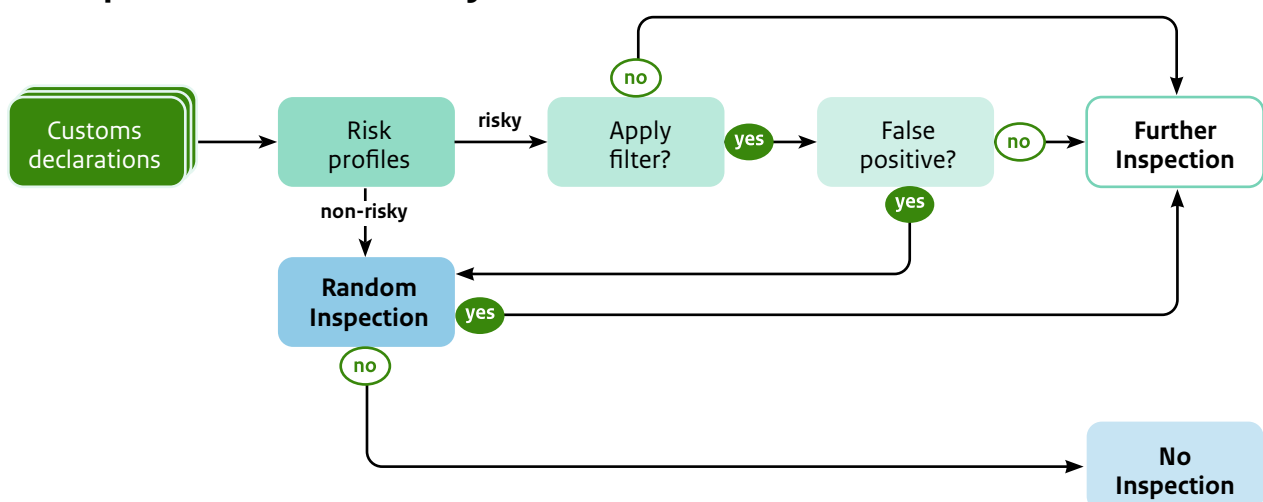
False positive filters

Data scientists at Customs Netherlands are involved in the design of smart technologies (algorithms) for accessing, structuring and analysing large amounts of data. With the aid of these smart technologies it will eventually become possible to automatically detect irregularities and fraud patterns in declaration and other data and scan images and to programme predictive algorithms.

Customs is currently working on a project concerning risk filters. The aim of these filters is to reduce the relatively high number of false positives in the traditional risk selection of Customs. Based on historical data, a number of test filters have been built, through which what is rejected goes back in, as it were. These are test filters on the Entry process and for taking samples for examination in the Customs laboratory.

The filtering method makes it possible to determine whether a perceived risk is actually real and whether it is worthwhile to actually check a batch of goods. This is expected to make customs supervision more efficient and effective. It is also good news for the outside world, because it means a reduction in unnecessary delays.

False positive filter for Entry



How exactly does the filtering method work? The model assigns a risk score to each selection produced by a risk profile. If the risk score is higher than a set limit value, a selection is checked; if it is lower, no check is carried out. So: the higher the threshold used, the fewer checks there will be. But also: the higher the number of missed non-compliant declarations. Research by the data specialists shows that it should be possible to reduce the rejections in the Entry process by a maximum of 30 per cent, without this leading to non-compliant declarations being missed.

Auto-detection of scan images

A second development track of which Customs has great expectations in the long term is the co-creation of scanning equipment that not only makes images but also assesses them for irregularities. These are self-thinking systems that signal that there is a mismatch, for example, between the data entered in the declaration and the goods actually present. Or that there are items in a container, suitcase or postal package that are prohibited or subject to a licence.

In the meantime, predictive models for goods scans are being developed, based on algorithms. But that's no easy task. In order to design predictive models, data analysts must be able to rely on an archive (database) with a large number of scan images. To process the goods scans automatically, it is necessary that all sensor data - in this case the x-ray images - is collected and processed in one central location, together with the declaration data and historical inspection data. The results of this automated processing must then be taken back to the scan.



In the past, there was no need for this infrastructure to store, collect and process sensor data. Customs is now faced with the challenge of building this infrastructure with a minimum of delay.

The first thing to do now is to store and label scan images on a large scale for reuse and analysis. To place what scanned images can reveal in the right context, it is important to label each type of object with the utmost care. There can be no reliable algorithm without thorough data preparation! It goes without saying that this data preparation is a time-consuming and labour-intensive process.

The process of storing, labelling, reusing and analysing scan images also involves formal legal aspects. Take the overriding importance of information security, for example. In short, what are the preconditions for using and sharing data to enable the auto-detection of scan images? And how do we ensure that we put these conditions into practice in the right way? These issues are relatively new to Customs and take time.

For Customs, the development of auto-detection of data and goods calls for investment in time and effort. But the first steps in this promising direction have been taken.

5 Innovations in the green flow



The green flow consists of economic operators in international trade with an AEO permit or status. AEO stands for Authorised Economic Operator.

This type of enterprise concerns companies that have a proven track record of reliability (trusted traders). Authorised economic operators enjoy a variety of advantages in international trade, including priority for inspections and reduced physical and documentary inspections.

The licensing system of the Authorised Economic Operator

The concept of the Authorised Economic Operator was developed by the European Union in 2007. There was a sharp increase in the attention paid to security following the 9/11 attacks. International trade was also subjected to stricter rules, resulting in more logistical delays at the border.

The AEO certificate was introduced to reduce the inspection burden of demonstrably reliable companies (from 1 May 2016: the AEO authorisation).

In 2008, Customs Netherlands started issuing AEO certificates or authorisations. By 2019, some 1.600 companies in the Netherlands had an AEO authorisation

To be eligible for an AEO authorisation, companies must demonstrably have their business processes under control by means of internal control and monitoring measures. Customs makes maximum use of the company's own guarantees and procedures, including the existing security systems, for the monitoring of the green flow.

Types of AEO authorisation

There are two types of AEO authorisation:

- the authorisation for Customs simplification (AEO-C)
- the security and safety authorisation (AEO-S)

Or a combination of the two (AEO-F).

Companies with an AEO status take their own responsibility to monitor all guarantee and security procedures. Customs carries out regular validation checks to ascertain whether these businesses are doing what they have promised to do. This involves checking whether companies are still in control and meet the agreed criteria.

In short, the functioning of the internal control measures of AEO authorisation holders is only established after cyclical monitoring (audit), reassessment or any other form of periodic review. If that effect turns out to be sufficient, the system is proven to be reliable and enforcement follows in accordance with the principles of the green flow. The green flow is therefore not a company's choice for a particular supervisory regime.



System-based supervision

In other words, the starting point for supervising the green flow is the monitoring and evaluation of guarantees and security procedures in a general sense, and no longer the monitoring of individual (cross-border) goods transactions. As a result, this approach to checks is much less intrusive in terms of the logistic transport chain: the risks are covered at the front end, i.e. before the goods are transported. In short, customs supervision in the green flow is a form of system-based supervision - an accountancy-like approach to business management systems, which is increasingly being applied globally.

Conditions for participation in the green flow

An AEO permit is a precondition for being eligible for supervision in the green flow and the associated facilities. "But that's not to say that all companies with an AEO authorisation can participate in the green flow," says Wim Visscher - national AEO coordinator. "Firstly, the supervisory regime for the green flow sector has so far only been developed for the Import customs process. We do not yet have a clear enough understanding for the other processes. For example, during the Entry process, Customs does not yet have enough insight into the actual importer, which means that that import cannot be facilitated. Also, research has shown that in the past the AEO status did not necessarily lead to better declaration behaviour among customs representatives

These findings have prompted Customs to slightly tighten up the conditions for participation in the green flow. Only authorised economic operators who are also principal in the legal sense are now eligible. These companies have a role and responsibility in the logistics chain, which enables them to file high-quality declarations (for import). The principal is responsible for the content of the declaration, as well as the debtor. In the case of direct representation, this means that both the customs representative and the importer or customer for which he lodges the declaration (the person direct represented) must henceforth have AEO status; in the case of indirect representation, the customs representative acts in his own name (but on behalf of the person represented), and the person indirect represented does not necessarily need AEO status.

Importers eligible for the green supervision regime

In the case of the green flow, these are declarations submitted by the following companies:

- *In your own name and for your own account*: the party filing the declaration is a (demonstrably reliable) AEO authorisation holder.
- *Indirect representation*: 1. the customs representative is a (demonstrably reliable) AEO authorisation holder and the person indirect represented is also a (demonstrably reliable) AEO authorisation holder; 2. the customs representative is a (demonstrably reliable) AEO, but the person indirect represented is not.
- *Direct representation*: both the customs representative and the person direct represented is a (demonstrably reliable) AEO authorisation holder.

Opportunities and bottlenecks

Since the introduction of the AEO system in 2008, the notion of 'demonstrably reliable companies' has in fact not changed. The principle of no longer letting go of all the risk profiles of such an economic operator's shipments, with the exception of those required by law, remains valid. However, Wim Visscher acknowledges that innovation in the green flow has not yet got sufficiently off the ground. "At present, we only apply the supervision regime for the green flow to the Import process, but in the future we hope to extend the green flow to other customs processes, such as Entry in and Transport."

Bonus/malus

The promised extra services for the green flow companies have not yet been realised either. So far, Customs has had to limit itself to the statutory AEO frameworks. Also, the introduction of a bonus/malus system has been postponed. According to this principle, companies that keep to the agreements would be rewarded with a step-by-step reduction in the inspection burden, while noncompliant companies would lose the accrued benefit. Unfortunately, the automation systems of Customs were not yet able to support the pilots in this area.



Wim Visscher

Automated Periodic Declarations to the green flow

This does not alter the fact that the development of the green flow will soon be given a major boost. About 250 companies that still use the Automated Periodic Declaration (GPA) must switch to the AGS system, which will then be called the DMS (Customs Declaration Management System), by 1 July 2021. Businesses using GPA are those with a more advanced type of authorisation, and in most cases have AEO status. In principle, they are eligible for the green flow.

In the near future, customer managers and customs staff will be visiting these GPA companies, not only to discuss the transition to DMS, but also to inform them about the conditions and benefits of participating in the green flow. Visscher: "These GPA companies include service providers with a wide range of customers. Some of these customers do not yet have an AEO authorisation. The service providers concerned cannot take part in the green flow, if - as mentioned above - they start to make use of direct representation. We therefore hope that the GPA service providers will encourage their customers to take part in the AEO programme."

The expected arrival of the GPA companies will considerably increase the share of the green flow in the Import process. Whereas in 2019 some 30 per cent of the declarations submitted potentially belonged to the green flow, in 2021 - taking into account the expected growth in the proportion of the blue flow - at least 50 per cent of the import declarations are now being processed in the green flow.

6 Innovations in the yellow flow



Monitoring in the yellow flow centres on the concept of Smart & Secure Trade Lanes (SSTL). This concept comes from the World Customs Organisation (WCO). Smart represents the quality of the data generated in the transport chain, secure for the physical integrity of the flow of goods within that chain. These are logistic chains with which Customs is familiar with every link, from the source or back to the source. Regarding these incoming and outgoing trade flows, the customs service can say: We know who packed the box.

The yellow flow is therefore about international trade lanes that not only guarantee the physical security of goods shipments, for example through the use of electronic container seals and other container security devices, but also the quality and reliability of the relevant data about the shipments that the chain parties exchange in a single network of reliable networks. All this data is combined on a single dashboard, which - depending on the user rights - can be viewed as required by all parties involved in the logistic chain. The information required for customs supervision is already available before the containers are loaded at the seaport or airport of departure.

Physical checks in the yellow flow are therefore carried out as far as possible at the time of loading and departure. The result: improved efficiency, lower costs, more predictability and reduced delays at the border.

Up to now, the yellow flow has been developed within (among others) the European research programmes SSTL (Smart & Secure Trade Lanes), Cassandra and CORE* (Consistently Optimised REsilient secure global supply-chains) and a single national project under the auspices of the Top Sector Logistics.

Pilot projects with SSTL

The first SSTL pilot project was launched by Customs in 2007, in cooperation with the customs services of China and the United Kingdom. This pilot project involves the flow of sea containers between the Chinese port of Shenzhen and the European ports of Rotterdam and Felixstowe. This pilot project centres on the exchange of secure and reliable data on goods shipments between the customs administrations concerned.

In the context of SSTL, the Chinese customs authorities check the goods before departure and share their findings with the customs services in the Netherlands (Customs Port of Rotterdam) and the United Kingdom. Conversely, the European partners alert the Chinese customs authorities when a shipment in Rotterdam or Felixstowe is ready for departure.

More than ten years' experience has already been gained with the SSTL concept. In the meantime, the programme has been extended to include air and rail transport. Also, a new EU-China Joint Administrative Arrangement has been adopted, which makes the project permanent. The scope of the SSTL programme has been expanded in recent years to include Hong Kong, and later Singapore and Indonesia.

From the point of view of optimal enforcement and trade facilitation, the yellow flow is in principle the ideal form of customs supervision. However, there is still a long way to go before the high expectations concerning the yellow flow can be met. "It's fair to say that so far the flow of goods has been modest, with only a handful of participating companies." Those are the words of Pedro Op 't Hoog, Coordinating Advisor Supervision and National AEO Coordinator. "In 2018, we looked at some 100,000 containers entering Europe under the SSTL flag, about 10,000 of which were destined for our country. These are small numbers if you compare them with the total number of containers that pass through our ports every year."

Internet of logistics

In the video Internet of Logistics , the operation of SSTL's is illustrated by (among others) the CORE project on the import of flowers from Kenya. The contributors are Frank Heijmann (Customs Netherlands), Norbert Kouwenhoven (IBM Tradelens), Roel Huiden (Royal Flora Holland), Gé Coenen (Seacon Logistics), Nanne Onland (Cargonaut), Marty van Pelt (Portbase) and Professor Yao-Hua Tan (TU Delft).



European research project CORE

The European research project CORE is also about the safe exchange of relevant and reliable data within logistics chains. However, there is a clear difference with the SSTL programme. CORE involves the reuse of data that commercial parties share with each other, while SSTL involves customs services exchanging information.

CORE focused in particular on research into a web-based data chain, the data pipeline. This pipeline interface is primarily a commercial development aimed at supporting and securing global trade. The advantages for the industry could be considerable, such as visibility and control of the entire logistics chain. The project was not only about demonstrating the technical feasibility of the concept, but also about testing concrete business cases.

Royal FloraHolland pilot

A successful air freight pilot was led by Royal FloraHolland. The aim of this project was to get cut flowers from Kenya to the Dutch auction as quickly and safely as possible. There were a number of bottlenecks in this chain, including a lack of transparency and the use of a paper phytosanitary certificate. During the pilot, a data pipeline was used to make use of source data - supplemented as much as possible with data about the goods during transport from other links in the logistics chain. Integrity measures were also taken to secure shipments. Communication within the business and authorities was established by means of two data dashboards. As well as clear benefits for Royal FloraHolland, this also improved the cooperation between Customs and NVWA. This chain currently involves coordinated border management.

According to Pedro Op 't Hoog, this approach is now standing practice. "In fact, Royal FloraHolland has already suggested using this method after Brexit. After all, after entering Schiphol Airport about three quarters of the Kenyan flowers are transported to the United Kingdom, which will soon be a third country."



Pedro Op 't Hoog

Seacon Logistics pilot

In addition to the Royal FloraHolland project, two CORE pilots have been running in the maritime area in recent years. The first - led by the company Seacon Logistics - focused on IT products from Malaysia, which arrived by container in the port of Rotterdam and continued their journey to Venlo.

With Océ Technologies, Seacon Logistics has created a secure supply chain between Malaysia and Limburg, more specifically between Penang and Venlo, the home base of the logistics service provider. How does it work? In Penang, a shipment of industrial printers is ready for departure on the Océ Technologies production line. Seacon Logistics ensures that a container arrives at the factory at the agreed time. Once it has been loaded, it is given a smart seal. This digital seal measures temperature differences and changes in light intensity, which can indicate that the container has been opened along the way. After loading, the truck sets off for the port of Penang. There the container goes on a freighter that sails to the main port of Singapore or to Port Klang, where it is then transferred to a main ocean vessel that sets a course for Rotterdam. During the crossing, the container ship is continuously monitored via track & trace. When the container arrives in Rotterdam, it is immediately transhipped and sent to the Venlo terminus.

Seacon Logistics used an on-site agent/partner who attends to all the activities needed to load the container and get it ready for export. The documents such as a packing list and commercial invoice were uploaded from the source to a specially designed IT system. These documents were linked in turn to an order number. Then some unique numbers were registered, of the container and the seal, for example. All that shipment-related data was entered into Océ Technologies' own portal, and Seacon Logistics took it over precisely as it was. That's how a data pipeline was made with pure information from the source. This not only reduced the administrative burden of all parties concerned, but also the risk of human error (such as typos). Some of the data remained protected, in consultation with Océ Technologies and Customs. They were able to use their own dashboard, on the basis of notifications, what parties had designated as a trusted CORE shipment.

The experiences with this CORE project have met the approval of both Customs and Seacon Logistics. The Venlo service provider has considerably reduced its administrative burden, and the quality of the data in the data pipeline enabled Customs to make better risk analyses.

TradeLens: secure data exchange through blockchain technology

Together with IBM, the container giant Maersk has also looked into the safe collection, sharing and reuse of competition-sensitive information about cross-border shipments of goods in a data pipeline. For this purpose they developed TradeLens, an industry-wide platform for the exchange of data within logistics chains based on blockchain technology.

Blockchain technology makes it possible to encrypt information and to strictly separate data flows by working with channels. That makes it possible to securely shield vital business information.

What does blockchain technology mean?

Blockchain technology is all about a value transaction between two parties. That initially brings money to mind, but it could also be about information about or the ownership of goods or possessions. Blockchains are distributed databases that together form a network. Blockchains make it possible for parties to clearly and securely record facts and transactions and to agree on the existence, status and changes of this shared information.

Using blockchain technology means that several computers register the blocks of information that are associated with the transfer of value, or information independently of each other. Software links these blocks to each other to create a digital general ledger in which the assets, debts and properties of the participants are kept. The information stored in the digital ledger is irrefutable and cannot be manipulated. It is also possible to programme conditions for a value transaction in advance, such as a minimum balance or the availability of the right authorisations. The network can then verify a number of aspects, such as the authorisation of the parties concerned. Only when all the conditions have been met is the transaction automatically completed.

The technology that makes blockchains possible is in fact based on various emerging techniques such as data transmission, cryptography, storage capacity, computing power and algorithms.



TradeLens users experience the global platform as a messaging service. It gives the exporter a web address to which he sends a contact number, which is then stored in the blockchain. Which data he receives himself (e.g. from the forwarder) and in what form, depends on his authorisation. The Customs officer can use his own dashboard to retrieve CRIS data about the containers coming to Rotterdam, i.e.: all the data provided by the parties concerned in TradeLens. Using a risk filter, Customs can identify the most high-risk shipments. Based on these findings, Customs could in turn provide status information to the TradeLens platform, such as 'container selected for inspection' or 'container released'.

TradeLens can count on the increasing interest of the business community. More and more shipping companies, shippers, importers and exporters are now using the industry-wide platform.

Taking steps in the yellow flow

All in all, in recent years we have gained a great deal of experience in the secure exchange of relevant and reliable data within global logistics chains. But there is still a long way to go before the yellow goods flow with smart and secure trade lanes is fully operational. A fully operational yellow flow of goods is not yet available.



The investments needed to put the fully reliable trade lane into practice must come from the business community, says Pedro Op 't Hoog. "However, some market players are reluctant, for example because the benefits do not outweigh the costs or because the results are disappointing. Take container security devices, which communicate in real time with interested parties if there may be a problem with cargo. The reliability of these smart seals is a key success factor, but it is not always at the desired level. Also, e-seals can be used for very different purposes. The one company has an interest in constantly monitoring the temperature of its goods, while another wants to measure CO2 emissions to see if stowaways are hiding in containers. And semiconductor manufacturers often protect transmitters with all kinds of sensors because of the high value of their products, but that is far from being an option for all types of goods."

In conclusion, the yellow flow is progressing less quickly than was hoped. Op 't Hoog: "Still, it's very important that we continue to move ahead in the development of smart and secure trade lanes. It is also important for the business community that Customs can continue to base its chain-oriented supervision on the guarantees offered by logistics parties themselves. The more data on the status and reliability of goods shipments, the smaller the chance that Customs will have to intervene in the logistics chain."

