Findings and Practices on Smart Customs in APEC Free Zones/Free Trade Ports

APEC Sub-Committee on Customs Procedures

March 2024

Asia-Pacific Economic Cooperation

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APEC Project: SCCP 05 2022S

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Acknowledgement

Dear esteemed SCCP members of the APEC,

We are pleased to announce the completion of the report titled "Findings and Practices on Smart Customs in APEC Free Zones/Free Trade Ports" along with its two annexes. This study is the culmination of a collective effort invested in the self-funded Project SCCP 05 2022S "Strengthening Customs Smart Control and Services to Improve the Development of Free Zones / Free Trade Ports (FZs/FTPs)" from September 2022 to December 2023. It was initially proposed by China and received joint sponsorship from Thailand and Viet Nam.

On behalf of the project research team: Dr. Hua Tong, Dr. Xia Zheng, Dr. Min Deng, Mr. Longhai Wang and Mr. Chongyu Lin from the Shanghai Customs College, Mr. Ruiqian Wang from Dalian Customs District, Ms. Jianyi Ye from Haikou Customs District among others, we express our profound appreciation towards the relentless support from APEC Secretariat and SCCP members, the professional guidance under the International Cooperation Department and the Free Trade Zone and Special Control Area Department of the General Administration of Customs of the People's Republic of China (GACC). And special thanks to Mr. PIPAT SIRIJUMRASSKUL from Thai Customs Department for his valuable contribution. Notably, we extend our gratitude to Mr. Jun Xu and Ms. Liu Yang of the GACC for their diligent oversight on the project. Their collaborative spirit and seamless coordination have been indisputably crucial to this accomplishment.

The Project Research Team

23 December 2023

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1. Research background

1.1 Smart upgrade and current trade status

Currently, major cutting-edge and disruptive technologies are advancing rapidly around the world, propelling the new wave of technological revolution and industrial transformation into a deeper development trajectory. In the era of digital economy, the advancement of smart technology will revolutionize technological paradigms and production methods, leading to a shift in comparative advantages among economies and exerting a transformative impact on the international trade landscape. As of 2023, according to the latest forecast of the International Monetary Fund's "World Economic Outlook", global trade growth is expected to decrease from 5.2% in 2022 to 2.0% in 2023, and increase to 3.7% in 2024[1]. Global trade is showing signs of recovery, and it continues to play a vital role in enhancing global economic resilience. Additionally, according to the World Trade Organization's "Global Trade Outlook and Statistics" report, global merchandise trade volume is projected to grow by 1.7% in 2023, higher than the 1% predicted in October last year[2]. WTO Director-General Ngozi Okonjo-Iweala further pointed out that trade in 2023 will face pressure from external factors and has recommended that governments worldwide avoid trade fragmentation and exercise restraint when introducing trade restriction policies. With the recovery of global trade and the rapid rise of new-generation information technology, international trade is accelerating its digital transformation, which places a higher demand on the smart upgrade of customs trade control and services. On one hand, the upgrade and implementation of customs smart technology can help to break down international trade barriers, facilitate

[1] International Monetary Fund's World Economic Outlook (July 2023)
[2] The World Trade Organization (WTO) report "Global Trade Outlook and Statistics" on April 5, 2023

trade channels, and bring vitality into global trade recovery. On the other hand, the enhancement of smart customs control and service can create a secure, convenient, and efficient regulatory environment, optimize regional supply chains, industrial chains, and value chains, and improve the quality and growth potential of global trade.

1.2 Customs faces new challenges under the background of smart upgrade

As a vital department dedicated to promoting global trade facilitation, Customs plays a pivotal role in accelerating customs clearance efficiency and invigorating world trade. The theme of the World Customs Organization (WCO) International Customs Day in 2023 is: "Nurturing the next generation: promoting a culture of knowledge-sharing and professional pride in Customs". This theme calls for Customs authorities worldwide to think about how to cultivate digital composite talents and enhance the efficiency of Customs smart control in the era of the digital economy. From the expected changes in medium to long-term work, it becomes evident that the expansion of cross-border e-commerce, the negotiation of Economic Partnership Agreements (EPAs), the increasing prevalence of Free Trade Agreements (FTAs), the growth of international shipping scale, and the ongoing development of international sea transportation networks have led to a significant surge in cargo logistics movement. It is imperative for Customs authorities in various economies to deepen cooperation, elevate their informational control and services levels, and promote international trade security, convenience, and efficiency through the Customs smart upgrade. The theme of International Customs Day in 2022 is "Scaling up Customs Digital Transformation by Embracing a Data Culture and Building a Data Ecosystem", offering a blueprint for APEC economies' Customs authorities to collaborate in building an international Customs "smart technology and service upgrade".

Specifically, in response to shifts in the global trade landscape and the promotion of trade facilitation, Customs authorities across APEC economies must bolster the application of smart technology and innovative approaches. They should collectively build a smart customs. Secondly, there is a need to enhance information sharing and mutual recognition of control, and jointly build a smart border. Lastly, deepening cooperation with various stakeholders is essential to collectively build a smart connectivity. On one hand, innovating digital control and services methods can foster the upgrade and optimization of smart technology within Customs, leading to continuous enhancements in the trade environment. On the other hand, participants should focus on the demand for smart upgrades, establish a model of comprehensive customs smart technology services, enhance smart control efficiency, and thus support the sustainable development of free zones/free trade ports.

2. Research purposes

2.1 Enhancing the Smart Customs control and services upgrade in APEC economies

The APEC Putrajaya Vision 2040 highlights the commitment to fostering a trade and investment environment within APEC that is free, open, fair, non-discriminatory, transparent, and predictable. This vision includes the delivery of a well-functioning multilateral trading system and the promotion of stability and predictability in international trade flows. Furthermore, it aims to advance economic integration in the region, including through efforts related to the Free Trade Area of the Asia-Pacific (FTAAP) agenda, which contributes to high-standard and comprehensive regional arrangements. This project is dedicated to strengthening cooperation and fostering exchange among Customs authorities across APEC economies in the realm of smart control and services for free

zones/free trade ports. It involves collecting best practices, fostering theoretical discussions, and conducting in-depth cooperative research. The ultimate goal is to promote the economic and trade development of the region while advancing the realization of the objectives outlined in the APEC Putrajaya Vision 2040.

2.2 Promoting high-quality development of Free Zone/Free Trade Port in APEC Economies

In the process of economic recovery in APEC economies, free zones and free trade ports play a pivotal role. Enhancing the quality of Customs control and services is paramount in achieving this goal. This enhancement encompasses various aspects, including policy requirements, operational standards, management principles, information systems, technological equipment, and law enforcement operations. By bolstering the precision of customs control and improving the efficiency of services within free zones and free trade ports, we can ensure trade security and enhance the convenience of investments. The objective of this project is to assess the current state of control and services provided by APEC Customs in free zones and free trade ports. It involves the analysis of practical cases of smart technologies, identification of existing challenges, proposal of solutions, and the application of smart customs control and services to facilitate the smooth flow of goods, personnel, data, trade, and investment in these regions.

2.3 Advancing trade facilitation and interconnectivity among APEC economies

The Strategic Plan 2022-2025 of the APEC Sub-Committee on Customs Procedures recognizes the importance of exploring new technologies and innovative solutions to ensure the security of supply chains as a top priority. One of the objectives in support of this priority is

to embrace smart and innovative working methods and collaborative models, including the application of technology to enhance the efficiency of border management. The implementation of smart control and services can contribute significantly to achieving this objective. This project will unveil and showcase a set of research findings regarding the current state of intelligence in customs within free zones and free trade ports of APEC economies during an international seminar. It will share the customs technology application scenarios from each economy, explore the use cases of smart technologies in customs operations, and more. Additionally, the project will delve into the seamless integration of smart technologies with customs control and services, aiming to unlock the economic potential of the Asia-Pacific region. Its ultimate goal is to create favorable conditions for guiding the development of new business models while ensuring the security and stability of the industrial and supply chains.

3. Research contents

3.1 Concepts

3.1.1 Free zones/Free trade ports

3.1.1.1 Definition of Free zones/Free trade ports

International organizations and research institutions have defined free zones and free trade ports in relevant economies and regions from different perspectives, but there has not yet been an internationally unified official definition. The WCO Revised Kyoto Convention (RKC) is currently the only international convention that formally defines the free zone[3]. Its Annex D, Chapter 2, defines a free zone as ‘a part of the territory of a Contracting Party where any goods introduced are generally regarded, insofar as import duties and taxes are concerned, as being outside the

[3] World Customs Organization Research Paper No. 47

Customs territory'. However, the definition and application of free zones can be different in each economy, and other terms are also being used in different economies and regions, including but not limited to special economic zones, industrial and commercial free trade zones, export free zones, free tariff zones, duty-free trade zones, tax-free zones, free trade ports, free zones, free industrial zones, investment promotion zones, and foreign trade zones, etc.

Overall, free zones/free trade ports, as economic incentives, are mainly specific areas where an economy or region is granted a series of special incentive policies to expand exports, attract foreign investment, or create employment. These policies may include exemption from tariffs and fees, simplification of administrative procedures, relaxation of market access and trade controls, as well as a range of other special policies.

3.1.1.2 Types of Free zones/Free trade ports

Due to the inconsistent definition of free zones, the classification of types of free zones/free trade ports is even more diverse. In 2020, the World Customs Organization released the 'Practical Guidance on Free Zones'[4], which roughly classified free zones into four types based on their territorial definitions:

PATTERN	TERRITORIAL DEFINITION OF FZs	APPLICATION OF CUSTOMS PROCEDURES/CONTROL
1	FZs are regarded as inside the Customs territory	Customs procedures/control are applicable to FZs
2	FZs are regarded as outside the Customs territory only insofar as duties are concerned	Customs procedures/control are applicable to FZs
3	FZs are regarded as outside the Customs territory	Customs procedures/control are applicable to FZs, supported by clear provisions in related domestic laws
4	FZs are regarded as outside the Customs territory	Usual Customs procedures/control do not apply to FZs

[4] WCO "Practical Guidance on Free Zone" page 23-24
https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/activities-and-programmes/free-zone/wco-fz-guidance_en.pdf?la=en

In the report titled 'The World of Free Zones Towards a New Global Trade Order,' released by the World Free Zone Organization[5], free zones are categorized into two primary functional business categories. The first category encompasses free zones primarily engaged in activities such as trans-shipment, goods distribution, re-export, and international business. These areas are typically situated in seaports and airports along major trade routes, including sea, railway, and road connections, as well as in development corridors and border regions. The second category includes export processing zones that specialize in manufacturing and production, spanning industries such as textiles and clothing, footwear, sports goods, consumer electronics, and industrial components. Moreover, these zones are increasingly offering services that can be delivered remotely via digital networks, including digital data processing and call centers[6].

3.1.2 Smart technologies

3.1.2.1 Traditional technologies

Traditional technologies refer to the initial stage of utilizing smart technology, which has already garnered consensus within the Customs authorities of APEC economies and boasts a broader base of application and practical experience. This includes the use of video surveillance for basic data collection, computer and network technology for information transmission, and the assistance of scanning equipment for data verification and analysis. Based on a comprehensive analysis of literature collection, questionnaire design, and responses from the Customs authorities of APEC economies, the traditional technologies covered in this report primarily encompass image scanning, paperless electronic systems, surveillance cameras, electronic sealing logs, and more. These application

[5] World Free Zone Organization. https://www.worldfzo.org

[6] World Free Zone Organization. 'The world of free zone towards a new global trade order' page 12-13

scenarios within the customs field are primarily composed of:

①**Application of image scanning:** for example, X-ray inspection, CT (computed tomography) scans, as well as the use of QR code and barcode technologies, etc.

②**Application of paperless electronic system:** such as electronic data filing, real-time online communication through electronic systems, and the adoption of paperless office systems, etc.

③ **Application of surveillance cameras:** for example, fixed or controllable-angle cameras for recording audio and video data, as well as movable or wearable camera technology for capturing images used in monitoring, supervision, law enforcement records, and evidence collection.

④**Application of Electronic seals:** for example, the replacement of physical unlocking technology traditionally used in Customs seals, the expansion of the use of electronic seals across various scenarios, and the enhancement of convenience, confidentiality, and security.

3.1.2.2 Disruptive technologies

Disruptive technologies refer to seven categories defined by the WCO that may have a significant impact on Customs control and services. These categories include blockchain, Internet of Things (IoT), and artificial intelligence (AI), among others. Based on a comprehensive analysis of literature collection, questionnaire design, and responses from the Customs authorities of APEC economies, the disruptive technologies covered in this report primarily encompass blockchain and distributed ledger, IoT, big data, data analytics, AI and machine learning, biometrics, unmanned aerial vehicles (UAVs), virtual, augmented, and mixed reality, as well as 3D printing.

① **Blockchain and distributed ledger:** refer to a time-stamped, decentralized, and distributed digital record (or ledger) of transactions in

which transactions can be securely stored in a permanent and nearly immutable manner through the use of various cryptographic technologies. In this publication, the terms 'blockchain' and 'distributed ledger' are used interchangeably.

②**Internet of Things (IoT):** refers to objects that are connected through the incorporation of various information sensing devices or other means, and are then combined with the Internet or mobile communication networks to eventually form a vast intelligent network. Through computers or cell phones, smart management of objects is achieved, enabling them to send and receive data. This technology can assist in locating items in vehicles, buildings, and embedded electronics.

③**Big Data:** typically refers to ultra-large data sets, often reaching petabytes or more in size, that exceed the processing capabilities of traditional data storage and analysis technologies. **Data analytics:** refers to the analysis of large data sets using computer systems to support decision-making. It incorporates complex techniques such as statistics, machine learning, pattern recognition, systems theory, operations research, and artificial intelligence (AI). **AI:** refers to systems that change their behavior without explicit programming, relying on data that is observed, collected, and analyzed. This includes techniques such as machine learning, deep learning, computer vision, and natural language processing. **Machine learning:** as a subset of AI, refers to providing computers with the ability to learn without explicit programming. It does so by identifying patterns in data, constructing analytical models, and using them to make predictions and decisions.

④**Biometrics:** refers to the measurement and statistical analysis of the physical and behavioral characteristics of individuals. The basic premise of this field is that each person is unique and can be identified by

their physical or behavioral characteristics.

⑤**UAV:** refers to an unmanned aircraft or vessel guided by remote control or an onboard computer. It is a component of the Unmanned Aircraft System (UAS), which includes UAVs, ground controllers, and the communication system between them.

⑥**Virtual reality:** is the complete immersion of a user in a virtual environment through a head-mounted device (headset) that allows them to interact with and manipulate digitally rendered objects. **Augmented reality:** refers to the projection of digital content into the user's field of view through a mobile device or headset (headphones), enabling the user to interact with the real world. **Mixed reality:** is the fusion of augmented reality and virtual reality that enables users to manipulate and interact with digital content in real environments.

⑦**3D printing:** also known as additive manufacturing, refers to the process of creating three-dimensional objects from digital files using 3D printers and raw materials such as plastics, metals, and nylon. It finds widespread applications in industries such as manufacturing, healthcare, construction, and consumer goods.

3.2 Free Zones/Free-Trade Ports (FZs/FTPs) development in APEC economies

3.2.1 The current status of APEC Free Zones/Free-Trade Ports development

Reports on Free Zones released by organizations such as the WCO, OECD, Financial Action Task Force (FATF), McKinsey, and others have shown a continuous increase in the number of free zones and free trade ports worldwide, along with an expansion of their functions. APEC economies are experiencing a similar trend. According to incomplete statistics, nearly half of APEC economies have established approximately

300 free zones, free trade ports, or special economic zones with similar functions. As of 25 June 2022, documents released by the WCO indicate that Papua New Guinea and Singapore, two APEC economies, have joined the RKC Free Zone Special Annex without reservations. Additionally, China; the Republic of Korea; the Philippines; and the United States have joined with reservations, while the remaining 15 APEC economies have chosen not to join or are not members of the WCO.

It has been observed that although the majority of APEC economies have not joined the RKC Free Zone Special Annex or strictly adhered to its standardized procedures for free zone development, many of them have drawn inspiration from the characteristics and principles of RKC free zones to some extent. They have established special economic functional areas with unique features in terms of functional positioning and operational models. For example, China has established 171 customs special supervision areas. The Republic of Korea; Malaysia; and Thailand have established around 200 free zones, while Indonesia and Singapore have set up over 10 Free Trade Zones (FTZs). In addition, Mexico has 80 Authorized Strategic Fiscal Precincts, and Peru has established 4 Special Treatment Zones.

3.2.2 Facing the Problems and Challenges

①Unlawful Actors Exploiting Free Zone Policies for Illicit Trade

Some economies consider free zones as 'extraterritorial free areas,' exempt from regular Customs control. This exemption allows free zones to enjoy less stringent customs procedures compared to other areas within the economy. Due to this characteristic, free zones not only attract legitimate enterprises for trade and investment but also become susceptible to exploitation by unlawful entities for illicit trade. In the context of globalized trade, the minimum regulatory controls in free zones not only impact the economy in which the free zone is located but also affect the

international trading partners of that economy. A document titled 'Combating Illicit Trade: Enhancing Transparency in Free Trade Zones' adopted by the OECD Council reflected that some enterprises may take advantage of inadequate regulation and the lack of transparency in free trade zones to engage in illicit trade. WCO Research Paper No. 47 in 2019 indicated that seizures related to free zones represented a cross-regional trend. The types of illicit trade in free zones are diverse and include tax fraud, drug trafficking, intellectual property violations, origin fraud, arms trafficking, money laundering, and antiquities smuggling. In certain free zones, lawbreakers have been found to misuse their qualifications and facilities to enter and exit the zones, abusing tax exemption policies for personal gain. In cases where lawbreakers congregate, it becomes easier for them to form organized criminal groups with a collective nature to engage in illegal activities. They exploit the access qualifications and convenience of others to organize illegal elements and seek unlawful gains, ultimately undermining the economic development of the free zones.

②Insufficient Customs Authorization in Free Zones Establishment and Operation

In the process of establishing and operating free zones, several issues may arise, including inadequate customs participation and insufficient authorization of management powers. On one hand, since the creation of free zones is an economic incentive policy, it is typically led by the ministries or regional authorities responsible for economic or industrial development within the economies. During the initial stages of establishing free zones, customs may have limited involvement, and compliance aspects of companies operating within free zones may not be thoroughly considered. On the other hand, the regulatory authority of customs in free zones varies among different economies based on the duties assigned by administrative departments. According to research conducted by various

international organizations and commercial institutions, there is a lack of authorization for the supervisory authority of customs in some free zones. For instance, the Free Zone Practice Guide issued by the WCO in December 2020 reveals that some customs authorities have very limited authority to conduct inspections and investigations within free zones. Customs can only enter free zones and business premises when specific evidence of illicit trade exists. Considering the differences in legislation and customs jurisdiction delegated to free zones in APEC economies, the types and functions of free zones vary, including general, special, and mixed zones. Additionally, the duties and scope of customs jurisdiction diversify due to different legislative principles and specific legal terms. Currently, research indicates a lack of comprehensive data and in-depth research on the legislation and authorization of customs jurisdiction in free zones.

③ Insufficient Data Integration and Utilization for Customs Oversight of Free Zones

When free zones are administered by authorities other than customs, customs typically have limited access to cargo data management systems operated by free zone management institutions. In the operation of free zones, the negative impacts of limited customs access to free zones can be exacerbated by insufficient possession and utilization of data by customs, leading to weakened risk management capabilities. For instance, in certain free zones, traders are required to submit data on the movement of goods to the free zone operator or management agency, rather than to customs directly. However, customs authorities may have limited access to these cargo data management systems, hindering their ability to track the movement of goods, manage inventories, and monitor enterprise operations within free zones. The lack of data integration affects customs' risk management and evidence collection related to illicit trade within free

zones, limiting customs' ability to conduct inspections of relevant goods within the free zones. Additionally, surveys have indicated that in some small free zones, there may still be a reliance on paper-based customs declarations.

3.3 APEC economies Free Zones/Free Trade Ports and customs smart control and services

On the basis of preliminary data collection, the project team focused on the actual situation of customs smart control and services in the free zone/free trade port within the APEC economies. A survey questionnaire was designed and distributed to the customs authorities of 21 APEC economies, and 13 responses were received. The following summarizes the survey questionnaire results.

3.3.1 APEC economies Free Zones/Free Trade Ports and Customs control and Services

3.3.1.1 Overview of the APEC economies Free Zones/Free Trade Ports

Among the 13 responding economies, 10 have established free zones, accounting for 77 % (see Figures 1 and 2).

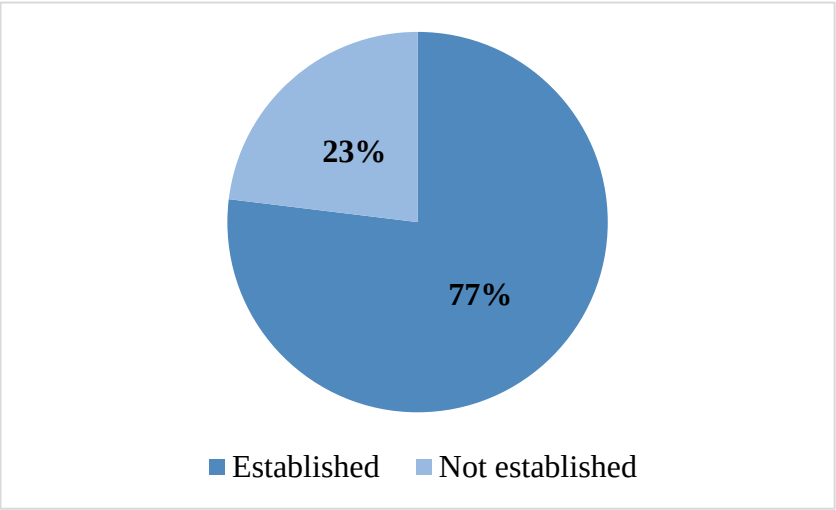

Figure 1: establishment of free zones in 13 APEC member economies (%)

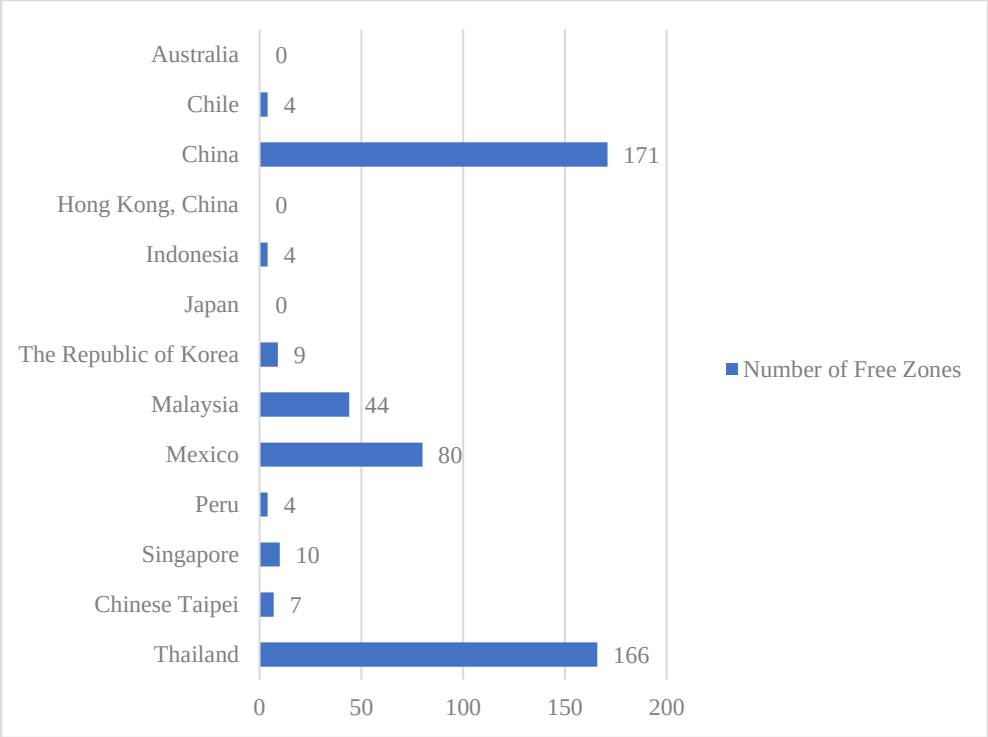

Figure 2: number of free zones established in 13 APEC economies

Responding APEC economies have different names for their free zones, such as free trade zone, free economic zone, authorized strategic fiscal precinct, etc. There are questions that call for an answer, such as to what extent can areas with different territorial definitions be seen as free zones, which will indicate that there are no internationally recognized definition and standards introduced by international organizations (such as WCO) about free zones and there is no international consensus on the basic functions of free zones. As a result, the development of free zones and free trade ports in APEC economies exhibits local characteristics.

3.3.1.2 The development of free trade ports in APEC economies

Among the 13 responding economies, 10 said that they have free zones, but only 5 out of the 10 have both free zones and free trade ports (50%), as shown in Figure 3. It is thus fair to say that there is possibly a preliminary consensus among APEC economies, highlighting significant differences between the two. This lays a solid foundation for achieving a conceptual consensus within APEC regarding free zones and free trade

ports.

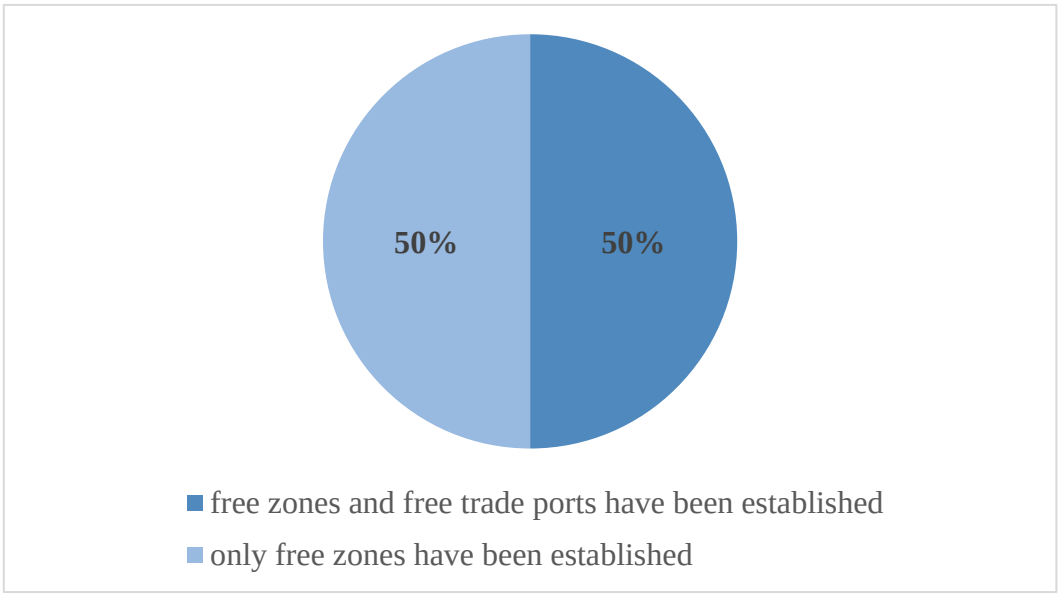

Figure 3:11 Development of free trade ports in 10 APEC economies (%)

3.3.1.3 Availability of Consultation Channels for Customs smart control and Services in APEC Economies

Among the 13 responding economies, most customs authorities have established one or more information consultation channels, such as service hotlines, consultation centers, official website email addresses, and chatbot, to address the needs of businesses and the public (77%), as shown in Figure 4. This indicates that the majority of APEC economies' customs authorities recognize that customs smart control and services should be carried out through e-government efforts to ensure information transparency, in line with the requirements of the WTO Trade Facilitation Agreement. This is a crucial prerequisite for advancing the development of free zones and free trade ports.

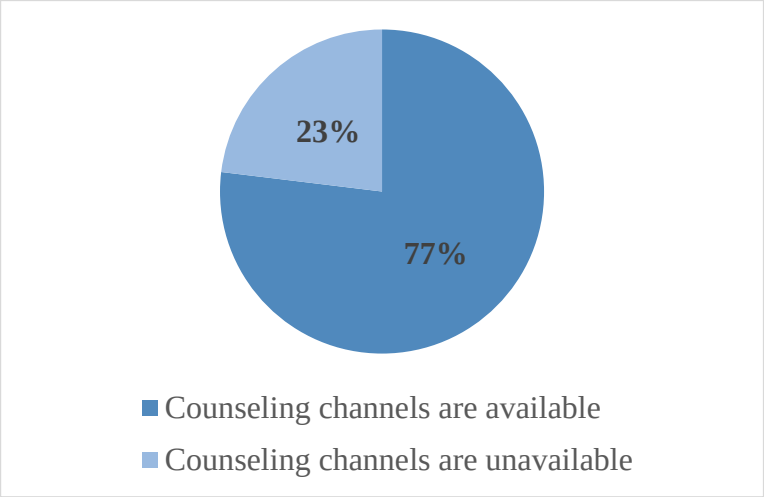

Figure 4: Availability of consultation channels for customs smart control and services in 13 APEC economies (%)

3.3.1.4 Status of Customs Information Management System Development and Usage in free zones of APEC Economies

Among the 10 APEC economies with free zones, customs authorities from five economies, including Chile; China; Indonesia; Chinese Taipei; and Thailand, have established specialized management information systems for free zones (50%). The other customs authorities in APEC economies (50%) have not set up specialized management information systems for free zones, as shown in Figure 5. This indicates that some customs authorities strengthen smart control and services through the means of establishing dedicated systems to ensure targeted service through information technology. Meanwhile, the customs authorities in the other economies either establish separate modules within their customs clearance systems for free zones or share the same system with regular import and export trade, and further research is needed for data collection and analysis. This situation reflects varying levels of technology application for customs control and services within free zones and free trade ports due to differences in economic development, regional functions, and positioning, providing feasible directions for future capacity building and assistance

within the APEC framework.

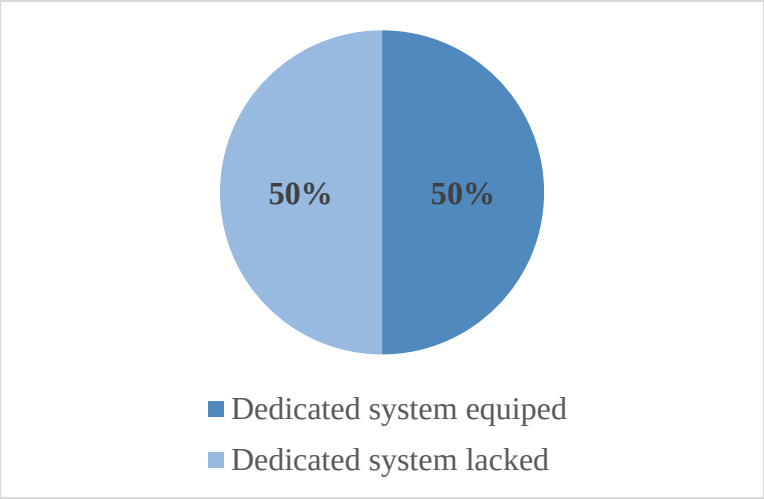

Figure 5: Development and usage of customs management information systems in free zones in 10 APEC economies (%)

3.3.1.5 Data Exchange in Customs Information Management Systems in Free Zones of APEC Economies

Among the 10 APEC economies with free zones, six economy customs departments (60%) engage in data exchange between their customs management information systems and third-party systems, as shown in Figure 6. Data exchange between systems mainly includes two categories: exchange with other government departments, such as customs departments and port management departments in free zones, and exchange with businesses, such as companies submitting declaration data via a single window, and customs providing results through a single window. Economies that engage in data exchange achieve data sharing related to customs management in free zones, enhancing the level of customs smart control and services. From another perspective, data exchange may not be a universal practice or a mandatory choice. If third parties do not require system data exchange for customs management and services in free zones or if there are difficulties in exchanging data between

different systems, suitable methods for data exchange can be selected based on local conditions.

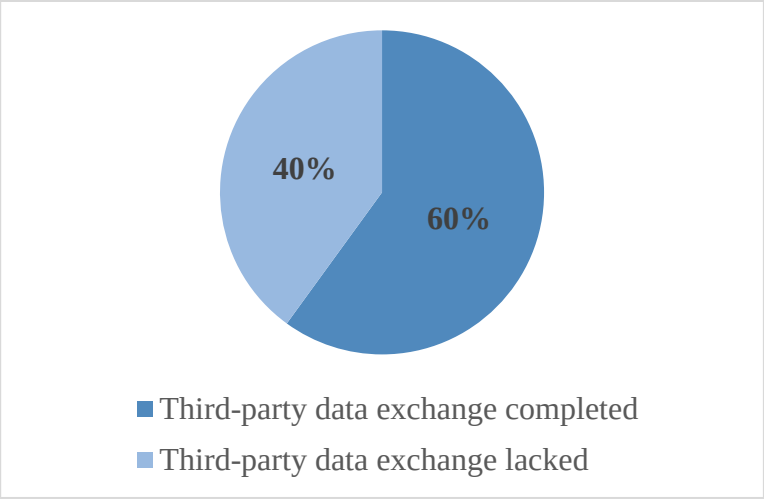

Figure 6: Data exchange between customs management information systems in free zones and third-party systems in 10 APEC economies (%)

3.3.2 Application of traditional and disruptive technologies in customs scenarios

3.3.2.1 The applying practice of traditional technologies in customs scenarios

Regarding the procedures of FZs logistics, the customs authorities of APEC economies have generally applied traditional technologies when goods are transported into FZs, out of FZs for export, out of FZs for domestic consumption. The majority of the customs authorities have applied traditional technologies especially when goods are transported out of FZs for domestic consumption.

Regarding the practical application, video surveillance is the most-used technology, followed by non-intrusive inspection scanners, and then the body-worn cameras and others.

①Video surveillance is mainly applied in the entry & exit procedure.

The Australian Border Force (ABF) is equipped with closed circuit television (CCTV) in airports to monitor all port activities. The securing

and surveilling of the Australian border included 14,700 aerial surveillance hours in 2021–22. Moreover, the use of SmartGates effectively enabled the processing of outwards travelers to return to normal business practices which reduced processing times by 5.4 seconds in 2021–2022.

The Canada Border Services Agency (CBSA) has announced the completion of essential infrastructure upgrades at the Ferry Point Bridge port of entry, in St. Stephen, New Brunswick. The upgraded primary inspection lanes with modern booths have been integrated with CCTV, allowing for safer and more efficient processing by CBSA officers, improving the flow of traffic while providing a safe and smooth border experience for travelers seeking entry into Canada.

The Korea Customs Service (KCS) has applied networked CCTV surveillance cameras at the immigration control site, and also carried out real-time verification of the control site by zooming in and out on the CCTV. In the parcel control site, CCTV surveillance cameras are applied along the streamline of parcel carousel to achieve real-time process in tracking, recording and monitoring.

The Philippines Bureau of Customs (BOC) has issued body-worn cameras to the officers to ensure transparency in the process of inspection. Moreover, BOC has installed CCTV to its office areas to secure all seized smuggled goods 24/7.

Chinese Taipei Customs has stipulated that the warehouse gates, import warehouses, export warehouses, transit warehouses, sea-air or air-sea transit containers stripping areas, express consignments handling units, warehouses for cargo examined and released alongside an aircraft, exclusive sections for valuable goods, and warehouses for detained goods and other locations deemed necessary by Customs, shall be installed with surveillance cameras with capabilities of 24-hour non-stop video recording, dynamic vision sensing, playback and optical disc backup, and at least 30-

day video storage. The surveillance video shall be accessed by Customs officers from Customs offices or designated places for monitoring and reviewing instantly. Warehouse operators shall extend the video storage of surveillance cameras to at least 90 days when the Customs deems it necessary.

The Thai Customs Department has developed a practical framework for the detection of goods utilizing X-Ray, CCTV, Vehicle Information System (VIS), and License Plate Recognition System (LPRs) as a guideline for future customs procedures. The CCTV Center can monitor all major airports, seaports and land border posts nationwide with more than 2,000 of cameras. The Customs Department has upgraded the CCTV system for its agencies from an analog system to an IP Network Camera. The Customs Department has supplied a high-speed network system for CCTV connection from all agencies.

②Non-intrusive inspection scanners is mainly applied in customs inspection.

The Australian Border Force (ABF) has initiated different types of inspection methods through X-ray (static or mobile), trace particle detection, canine teams, etc. to assist physical examination of cargo.

China Customs is equipped with H986 large container X-ray scanning inspection equipment and CT inspection equipment, which realizes the application and coverage of non-intrusive inspection. According to the automatic analysis and identification of scanning images in accordance with goods and modes of transport, the inspection system can automatically display warnings to customs officers and carry out manual review and analysis request or physical inspection as results.

Customs and Excise Department of Hong Kong, China (C&ED) uses a variety of advanced inspection equipment to facilitate the clearance efficiency. The CT scanners, X-ray checkers and handheld X-ray imagers

provide the X-ray images of baggage and cargoes for Customs officers to determine whether an in-depth examination is required.

Korea Customs Service (KCS) uses X-ray scanners to implement multi-angle synchronous non-intrusive inspection of containers and vehicles, and uses X-ray scanners for luggage and postal parcels. KCS also adopted the barcode scanning technology in collecting and reading data integrated with the parcel information to the inspection system.

Royal Malaysian Customs (KDRM) has equipped the SmartCargo with a new scanner that enables the detection with the help of radiation monitors integrated into the scanner. When the container is undergoing radiation detection, the customs image inspector can review the declaration status and the scanning image simultaneously.

Singapore Customs has established inspection process for export goods at five locations — Pasir Panjang Export Inspection Station (PPEIS), Brani Export Inspection Station (BEIS), Tuas Export Inspection Station (TEIS) and at the various air cargo terminals within the Changi Airfreight Centre (CAC), and the Airport Logistics Park of Singapore (ALPS). The sea export inspection stations are equipped with high-tech vehicular X-ray technology and passive radiation portal monitors, making efficient and accurate non-intrusive checks of containers possible. There are currently three sea export inspection stations and one air export office in Singapore. PPEIS, which opened in 2013, is Singapore Customs' first inspection station to identify and target high-risk export containers for X-ray scanning and inspection. BEIS, the second inspection station, commenced operations in 2015. It is equipped with the technology that makes efficient and accurate non-intrusive checks of containers possible. The latest addition, TEIS, started operations in late 2021, and features new scanning capabilities to enhance existing container scanning operations.

Chinese Taipei Customs has been devoted to modernizing preventive

equipment and practices such as X-ray instruments complemented by detector dogs, so as to effectively locate high-risk cargoes and passengers while speeding up clearance for legitimate passengers and cargoes.

The Thai Customs Department has modified the work procedures by implementing a container inspection system using an X-ray machine rather than physical examination by officers to facilitate business operators and improve the container customs clearance service in accordance with international standards. For X-ray container inspection system, there are different types of scanners currently operated; 4 fixed type, 3 drive-through type, 1 railway type, 10 relocatable, 12 container mobile type, 2 parcel mobile type, and also scanners attached to the conveyor belts insider passenger terminal of Suvarnabhumi Airport. During fiscal year 2022, the Thai Customs Department provided 15 Handheld X-ray machines to internal customs agencies in order to increase the efficiency of goods package parcels, as well as for the inspection of vehicles transiting the border in the event of concealed goods such as door, control panels, inside tires, or inside fuel tanks.

Viet Nam Customs, the Ho Chi Minh City Customs uses X-ray scanners to implement non-intrusive inspection of containerized goods and vehicles, combined with computer gray imaging display to analyse the shape, volume, quantity and location of goods, effectively improving the efficiency of inspection.

③Paperless Information System is mainly applied in electronic data transmission.

Customs and Excise Department of Hong Kong, China (C&ED) uses the Road Cargo System (ROCARS) that requires submission of relevant data through the system prior to shipment. In conjunction with radio frequency identification (RFID), the system is also used to identify cross-border trucks, reducing processing time at land border checkpoints

to about 20 seconds. The Air Cargo Clearance System is also employed to facilitate the transfer of cargo information and Customs clearance instructions between C&ED and air cargo operators.

Korea Customs Service (KCS) has operated an electronic customs clearance system UNI-PASS. With real-time sharing of trade documents, the clearance services are implemented through declaration selection & audit, B/L issuance, manifest submission & audit, inland transport, trade document issuance, transport information, etc.

Royal Malaysian Customs (KDRM) has combined statistics with information and communication technology (ICT) and applied in the supply chain of goods and service by online e-service system. Customs statistics including e-payment, e-manifest and e-declare have been integrated into paperless information system.

Chinese Taipei Customs has established "Bonded Intelligence Service Platform" and "Electronic Book-Keeping Management System" for auditing bonded business entities and free-trade-zone enterprises efficiently. Moreover, the above-mentioned platform and system enable paperless customs procedures so as to facilitate the clearance process and have positive impact on the green customs.

The Thai Customs Department uses Thai Customs Electronic System (TCES) to operate clearance system which also equipped with the Single Window interconnected with other relevant agencies. Traders can submit information such as manifest data (e-Manifest), import declaration (e-Import), export declaration (e-Export), and make a payment of duties and other taxes online (e-Payment) as well as keep tracks of their shipments via e-Tracking platform.

④ Electronic seal (e-seal) is mainly applied in collaboration and facilitation of cross-border control.

Customs and Excise Department of Hong Kong, China (C&ED) has

launched the Single E-lock Scheme (SELS) jointly with China Customs. To further facilitate the transhipment of goods under the SELS, only one mutually recognized electronic lock (e-lock) is used to interconnect the SELS with China Customs' Speedy Customs Clearance System. The transshipment cargoes are monitored according to the principle of "across the boundary with one single e-lock under separate monitoring". The green light on the e-lock serves as a mutual reference for minimizing duplicated inspection on the same shipment.

Indonesia Customs has conducted customs control over containers transferred by using e-seals to lock containers while simultaneously monitoring containers' GPS signals in the customs offices.

Chinese Taipei Customs has applied electronic seals to supervise the movement of unreleased high-risk containers in the local tax area. The supervision includes the movement of import containers from the port area to the warehouse, the movement of re-export containers between two different controlled ports, and the movement of export containers from the warehouse to the port. It has become the best tool to replace manual escort, improve supervision safety, and save customs manpower.

The Thai Customs Department launched a pilot project in 2006 to facilitate movement of Customs bonded goods among the free trade zones located around Bangkok using RFID technology. Phase 1 of the project provided electronic cargo tracking and surveillance between the free trade zones, namely Nava Nakorn Industrial Estate, Hi-Tech Industrial Estate and Bang Pa-in Industrial Estate. Phase 2 linked the Suvarnabhumi International Airport with Hi-Tech Industrial Estate. Phase 3 will track cross-border movement of goods between Malaysia and Thailand.

From 2016, The Thai Customs Department has launched a tracking system combining RFID and GPS technology into one seal called 'e-Lock'.

3.3.2.2 Application of disruptive technologies in customs scenarios

①Blockchain and distributed ledger technology: mainly used for trade data exchange.

A blockchain PoC was conducted under the auspices of the ***Australia-Singapore*** Digital Economy Agreement to achieve document interoperability for cross-border paperless trade, allowing for the issuance and verification of Certificates of Origin.

LACChain is a global public-private alliance supported by the IDB (InterAmerican Development Bank Group) Lab to promote integration and economic and social development among ***Chile;*** Colombia; ***Mexico; and Peru*** by providing the infrastructure to develop interoperable blockchain applications in Latin American and the Caribbean.

China Customs and Singapore Customs have signed a Memorandum of Understanding (MOU) to establish a Single Window Interconnection Blockchain Consortium using the decentralised blockchain model. The first use-case of the blockchain is the Track & Trace service which is made possible through the exchange of port-to-port customs clearance and logistics status information for containerised trade between Singapore and China.

Korean Customs Service[7] has achieved a new upgrade of the electronic customs clearance system UNI-PASS through the introduction of blockchain technology. After the upgrade of blockchain, 80% of the more than 60 types of import and export paper documents can be digitized. The new system also connects enterprises, individuals, institutions, and organizations on the international trade chain, achieving automated business based on smart contracts. With the support of blockchain, electronic trade has expanded from exports to imports, and trade related

[7] https://www.customs.go.kr/english/na/ntt/selectNttList.do?mi=8025&bbsId=1746

certificates of origin have also achieved electronic certificate data exchange.

A pilot project for AEOs in ***Malaysia*** is in a preliminary study phase. The new blockchain service will ensure a high level of system compliance while increasing efficiency in the supply chains of companies under the AEO programme, making them more competitive.

The Thai Customs Department[8] was the second government agency in ASEAN to adopt a blockchain-based shipment tracking and information sharing platform to streamline procedures in 2019. The department has been working with IBM Thailand and logistics provider Maersk on the adoption of the platform, called TradeLens, which will support the Thailand 4.0 policy.

Among Thai Tax Departments; Revenue Department, Excise Department, and Customs Department, there has been a plan to develop e-Receipt system using Blockchain technology. Meetings were held since 2020.

The US Customs and Border Protection (CBP) conducted a PoC in September 2018 on the application of blockchain technology in the submission process for entry summary declarations under the Central America Free Trade Agreement (CAFTA) and trade with Canada and Mexico.

②Internet of Things: mainly used for customs seal tracking and positioning, declaration information identification and comparison, payments of customs duties and other types of taxes, data collection and customs clearance efficiency improvement.

For seal tracking and positioning:

Since 2016, the Single E-lock Scheme (SELS) has connected the

[8] https://www.bangkokpost.com/life/tech/1738611/blockchain-easing-customs-process
https://www.asiablockchainreview.com/thai-customs-department-adopts-tradelens-blockchain/

Speedy Customs Clearance System of ***China Customs*** with the Intermodal Transshipment Facilitation Scheme of ***Customs and Excise Department of Hong Kong, China (C&ED)***. The single e-lock and GPS technologies accredited by both sides are used for real-time monitoring of the movement of goods.

For identifying and comparing declaration information:

In ***Malaysia***, SmartCargo uses new cargo scanners, integrated with a radiation portal monitor and AI and optical character recognition technology, all linked to the Customs system. The license plate and container number are run against stored Customs declarations.

For payments of customs duties and other types of taxes:

The Thai Customs Department has adopted the domestic e-Payment policy to implement the "Bill Payment" platform which allows traders to make their payments of customs duties, excise taxes, Value Added Tax (VAT) and other types of taxes collected by Customs Department through various channels. Payment can be done by using a Customs document, such as the Import Declaration or payment form with QR code, barcode, or reference number appearing on the document, and pay through a bank, internet banking, ATM, or other form of bank payment service, or pay via official counter service at major convenient stores.

For data collection and improving clearance efficiency:

The US CBP is exploring the use of IoT to manage its extensive network of sensors. The objective is to improve domain awareness and to make the data available to a wider audience within CBP by using an IoT gateway. CBP is also looking at IoT to help to modernize the experience of cargo processing at the border, reduce time spent on inspections and increase the speed of passage.

③Big data, data analysis, artificial intelligence (AI), and machine

learning (ML): mainly used to combat illegal and criminal activities, conduct customs control and services, and carry out cutting-edge innovation exploration.

For carrying out cutting-edge innovation exploration:

Korean Customs Service uses AI to upgrade X-ray scanning inspection. After X-ray scanning, AI will be added to detect and form scanned images. During the scanning and inspection process, AI will be used to detect and label goods containing threats or prohibited goods in real time. KCS also combines AI with ML, providing feedback and learning on the results judged by AI through a result feedback mechanism. During the scanning process, the goods subject to security checks are automatically compared with HS product codes, and real-time alarm prompts are provided through human-computer interaction for goods or items that do not match the declaration.

The US CBP established the AI Center of Innovation (COI) in late 2020 to act as the catalyst to create the enterprise processes, tools, and infrastructure needed to rapidly develop, test and deploy new AI solutions.

For combating illegal and criminal activities:

Customs and Excise Department of Hong Kong, China (C&ED) has introduced the "Intellectual Property Rights (IPR) Big Data Analytics System" for combating IPR crimes in 2017 and been working to expand the system to cover other customs-related offences, such as trafficking in dangerous drugs, sale of illicit cigarettes, and illegal import and export of endangered species, with a view to developing the Customs Crime Analytics System which applies artificial intelligence (AI), big data analytics and predictive analytics with a view to unveiling hidden trends, patterns, relations and anomalies on various customs-related offences.

Chinese Taipei Customs has applied the AI image recognition system to assist customs officers in identifying contraband in X-ray inspection

with Big Data to improve the efficiency of inspection and maintain convenient customs clearance. The current phase of the system focuses on the identification of contraband such as drugs.

④Biometrics: mainly used for visa processing and identity information recognition.

The ***Australian Border Force (ABF)*** uses biometric identification services in visa and border processing. The ABF also uses SmartGates, which perform an automatic face-to-passport check of the traveler at the Border. As part of a broader programme in response to delivering a bio-secure border, the Digital Passenger Declaration (DPD) will be replacing the existing Incoming Passenger Card.

In addition to the disruptive technologies mentioned above, **drones** are mainly used to monitor illegal and criminal activities and carry out ship water gauge measurements. **Virtual, augmented, and mixed reality** have potential applications in cargo inspection, intellectual property protection, and training officers. The impact of **3D printing** needs further observation and analysis, and the main controversy lies in whether customs still participate in the control of the virtual supply chain involved in 3D printing according to current laws and regulations.

3.3.3 APEC Economy Free Zone/Free Trade Port Customs Traditional and Disruptive Technology Application

3.3.3.1 Overall Statistics of Customs Technology Application in Free Zones/Free Trade Ports

①Traditional technology: Among the 10 economies with free zones, all economy customs employ one or more traditional technologies in their smart control and services within their free zones. Notably, the two most commonly used traditional technologies are video surveillance (70%) and non-intrusive inspection scanners (70%), highlighting the widespread adoption and effectiveness of these two technologies (Figure7).

Furthermore, some economy customs utilize portable law enforcement recorders, working dogs, sampling equipment, and other technologies within the free zone context. It is evident that traditional technologies form a crucial foundation for customs' smart control and services in free zones. In the realm of disruptive technology, there is no notion of "one size fits all." Economic customs may concurrently deploy both types of technologies. Moreover, data obtained through traditional technology can serve as a source of information for the deployment of disruptive technology, and the two can complement each other.

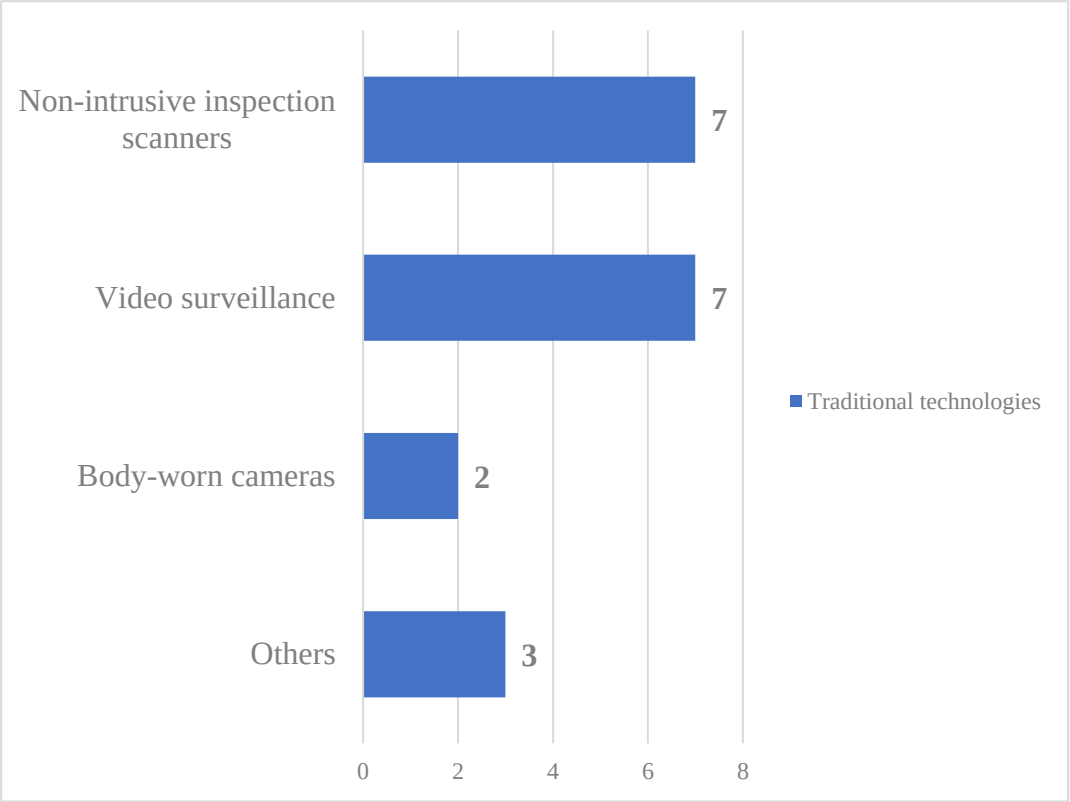

Figure 7: Traditional Technology Usage of 10 APEC Economies
Note: This title is multiple choice, and the total number of answers is 19.

②Disruptive technologies: Out of the 10 economies with free zones, a total of five economies (50%) have utilized one or more disruptive technologies in their smart control and services within their free zones (Figure 8). Among these, all five economies' customs have adopted big

data, data analysis, artificial intelligence, and machine learning technologies, demonstrating a high adoption rate. This reflects the shift in the focus of customs control and services from merely concentrating on the physical flow of goods to balancing the flow of both physical goods and data within the context of free zones. The collection, analysis, and utilization of data have become a common approach to enhance the level of smart control and services provided by customs within free zones. Additionally, disruptive technologies such as the Internet of Things and drones have also found applications in the smart control and services processes of customs within these areas (Figure 9).

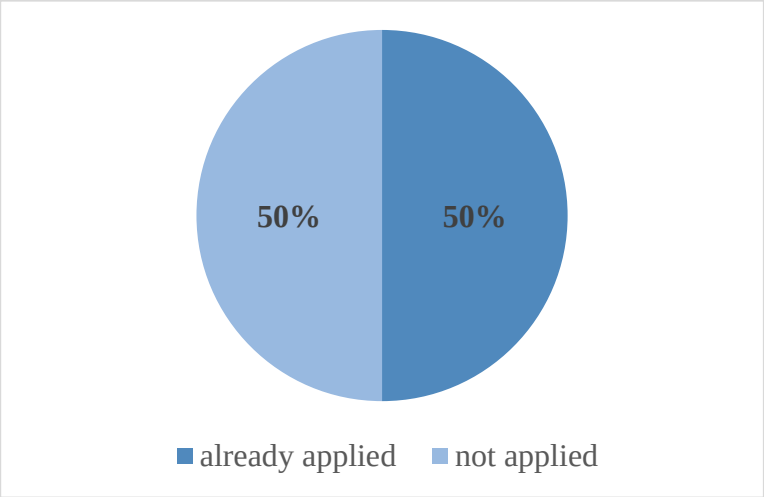

Figure 8: Disruptive Technology Usage in 10 APEC Economies' Free Zones and Free Trade Ports (%)

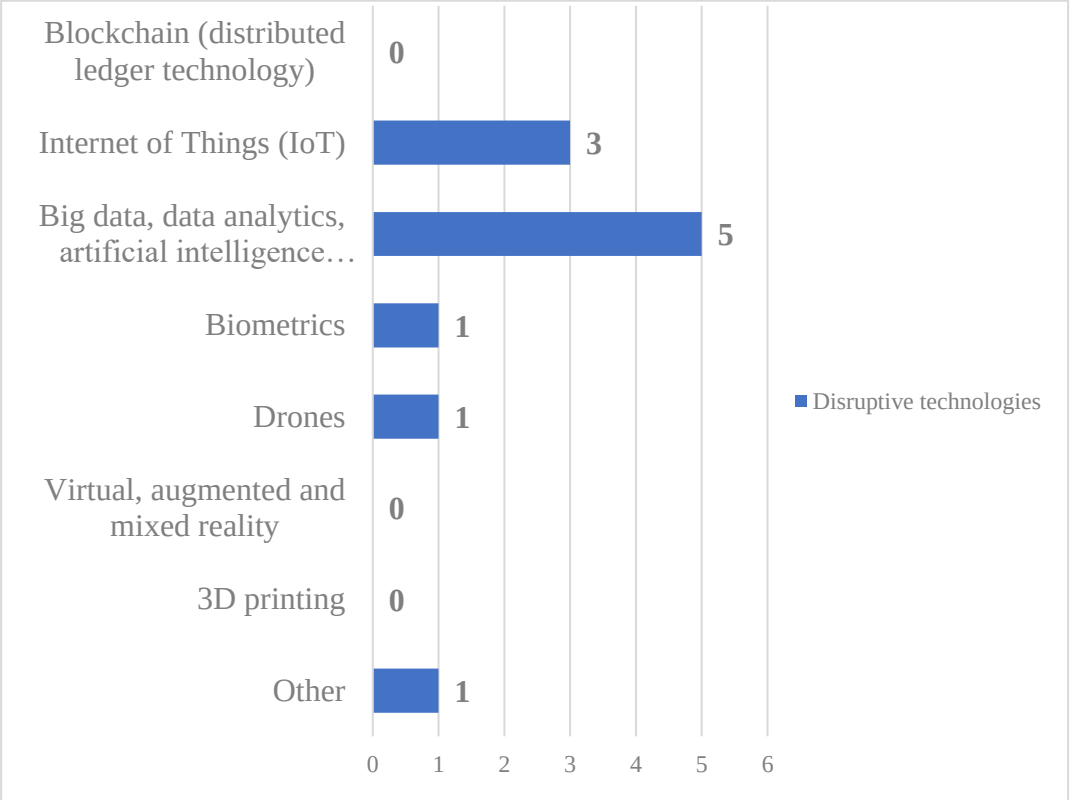

Figure 9: Use of disruptive technologies in customs free zones and free trade ports in five APEC economies.
Note: This title is multiple choice, and the total number of answers is 11.

Overall, APEC Economies' Customs have undertaken practical explorations in the realm of smart customs control and services within free zones. This includes the utilization of traditional technologies such as CCTV and non-intrusive inspection scanners. The deployment of disruptive technologies like artificial intelligence and machine learning reflects the multifaceted approaches, diverse technologies, and varied practices within the domain of smart customs control and services. This experience holds significant value for case research and knowledge sharing.

3.3.3.2 Current status of Customs Technology Application in Free Zones/Free Trade Ports

A total of 10 economies' customs have responded to this, as shown below.

①**Chilean Customs:** Currently, none of the seven major disruptive

technologies have been used, and only non-intrusive technologies are occasionally employed for cargo inspection, as extreme risks are concentrated at land borders.

②**China Customs:** Disruptive technologies, including the Internet of Things, big data, data analysis, artificial intelligence, machine learning, and drones, have been used. Traditional technologies such as video surveillance, portable law enforcement recorders, and non-intrusive inspection scanners are also used. These technologies are applied to the transportation of goods into the free zone, export from the free zone, transfer from the free zone to the domestic market for consumption, and trading and circulation within the free zone.

③**Indonesian Customs:** Disruptive technologies, including big data, data analysis, artificial intelligence, and machine learning (data analysis methods are being developed), have been used. Traditional technologies like video surveillance are also in use. Specifically, data analysis techniques are applied when goods enter the area, and data analysis and video surveillance technology are used when goods are exported for domestic sales.

④**Korean Customs Service:** Currently, disruptive technologies have not been used, and traditional technologies such as non-intrusive inspection and scanning equipment and video surveillance have been employed for goods exported for domestic sales.

⑤**Malaysian Customs:** Currently, no disruptive technology has been employed, and traditional technology, including video surveillance and non-intrusive inspection scanners, is used for goods entering and exiting the economy for domestic sales.

⑥**Mexican Customs:** Disruptive technologies, including the Internet of Things, big data, data analysis, artificial intelligence, machine learning, biometrics, and mobile devices, have been used. Traditional

technologies like video surveillance, non-intrusive inspection scanners, canine team, and sampling equipment have been applied to the export of goods for domestic sales.

⑦**Peru Customs:** Currently, no disruptive technology has been utilized; in terms of traditional technology, designated officers have implemented real-goods inspection models, and information on goods entering the area, exports, and exported areas of the region can be analyzed.

⑧**Singapore Customs:** Disruptive technologies, including big data, data analysis, artificial intelligence, and machine learning, have been utilized. Traditional technologies like non-intrusive inspection scanners and law enforcement recorders are also in use. These technologies are applied to the import, export and transshipment of goods, wherever necessary.

⑨**Chinese Taipei Customs:** Disruptive technologies, including the Internet of Things (Free Trade Zone Goods Cross Regional Transport Tracking and Monitoring System), big data, data analysis, artificial intelligence, and machine learning, have been used. Traditional technologies like video surveillance and non-intrusive inspection scanners are also used. These technologies have different applications in the process of goods entering the area, goods leaving the area for export, goods leaving the area for domestic sales, and sales and circulation within the goods area.

⑩**Thai Customs Department:** Currently, seven disruptive technologies are not being used exclusively for free zones. Traditional technologies are, on the contrary, widely used and adopted by free zone operators as it is a compulsory to properly installed CCTV system. For commercial free zones, the free zone operators have to ensure that any goods being stored inside their premise are under CCTV coverage and screenshots must be taken periodically. And these screenshots should also be matched with cargo management system where Customs officer can

remotely access and monitor. High-risk goods, such as alcohol and tobacco, need to have more frequent records of CCTV footage than others.

Moreover, technical specifications of CCTV cameras and its system including network apparatus should also be matched with the minimum requirement announced by the Thai Customs Department.

3.3.3.3 Typical cases of Customs Technology Application in Free Zones/Free Trade Ports

①China Customs: They are accelerating the construction of smart customs within free zones and free trade ports. China Customs is accelerating the construction of smart customs. They are building a smart customs for Hainan Free Trade Port, targeting the control of duty-free goods on offshore islands of Hainan Free Trade Port. They are fully utilizing new technologies such as big data and blockchain, equipped with advanced customs control facilities and equipment, and improving the efficiency of duty-free control on offshore islands of Hainan Free Trade Port. The Yangshan Special Comprehensive Bonded Zone implements a new customs control system with the core of "first-line clearance, second-line unilateral declaration and no separate customs account books established within the zone". Shenzhen Customs District implements the control model of "implementing online control based on docking enterprise ERP/WMS data", implements adaptive and collaborative control, further optimizes bonded control in special customs control areas, and improves the digital and smart level of customs control.

②Customs and Excise Department of Hong Kong, China (C&ED): In addition to a 24-hour general enquiry hotline and email service, Hong Kong Customs and Excise has been developing the Smart Customs Interactive Response System to enhance the overall efficiency and service level of handling public enquiries. The system includes a virtual ambassador to help passengers search information at control points,

and an online chatbot to answer public enquiries on Customs Homepage. C&ED has formulated the Smart Customs Blueprint to steer the development of Smart Customs on various fronts of C&ED's work.

③**Indonesian Customs:** They have a National Logistics Ecosystem (NLE) for Goods Management and Information Exchange. To support the smooth operation of customs business processes at KPBPB, an electronic-based service and control mechanism is implemented using an information system called the Customs and Excise Information Systems Automation Free Trade Zone (CEISAFTZ). To improve the effectiveness and efficiency of the supply chain, KPBPB also implements the NLE, which includes the implementation of autogate and Single Submission (SSm) mechanisms.

④**Mexican Customs:** They conduct risk management based on big data for customs declaration documents. Users transmit and pay the customs declaration. Afterward, they carry out a "Notice of crossing" incorporating the customs declarations that will be included in the means of transport, with the system automatically performing a risk analysis based on big data and selecting the "Notices of crossing" that will be subject to customs control. When the control is carried out, RFID, non-intrusive technologies, sampling, etc., are used, according to the type of merchandise.

⑤**Singapore Customs:** Goods inspections are conducted using a risk-based approach supported by data analysis. Certain goods that enter the free trade zones in Singapore require permits to be taken up by traders. The data declared by traders in the permits is submitted to the Single Window, TradeNet, and data analysis is conducted on the data received to enable Singapore Customs to adopt a risk-based approach to target high-risk shipments for checks while ensuring smooth trade.

⑥**Thai Customs Department:** They widely use technologies such as CCTV and e-seals to monitor the flow of goods. In the process of free

zone control and services, Thai customs' electronic system confirms the import and export transfer of goods in the "customs free zones" by linking the goods confirmation report. A closed-circuit television monitoring system (CCTV) is used in both the entry and exit areas, as well as internal circulation-related procedures (checkpoints). They deploy an electronic tracking system during the transportation of goods, in conjunction with applications such as electronic locks, radio frequency identification, and the global positioning system (GPS), to establish a monitoring and command center for real-time monitoring of the transportation and flow of goods. Thai customs conducts risk management based on enterprise inventory control system data, financial credit status, compliance with laws and regulations, and more.[9]

3.3.4 Challenges faced by customs traditional and disruptive technologies applications within the APEC free zones/free trade ports

Among the 10 economies with free zones, all economy customs face one or more challenges in the background of smart control and services in their free zones and during the process of deploying new technologies. Among these challenges, the most significant obstacle faced by the economies is resource restrictions (90%), encompassing various resources, including capital investment and transformation costs, which impose significant limitations (Figure 10). It can be seen that enhancing the smart control and service capabilities of customs in the free zone and garnering support from various stakeholders, including funds, politics, technology, and talent, is of paramount significance. Additionally, the utilization of standardized data sets, practical conditions, and information sharing can also contribute to addressing the problem to some extent.

[9] https://www.wcoomd.org/-/media/wco/public/global/pdf/events/2019/picard/free-zone_how-to-balance-between-trade-facilitation-and-customs-17_10_19.pdf?la=en

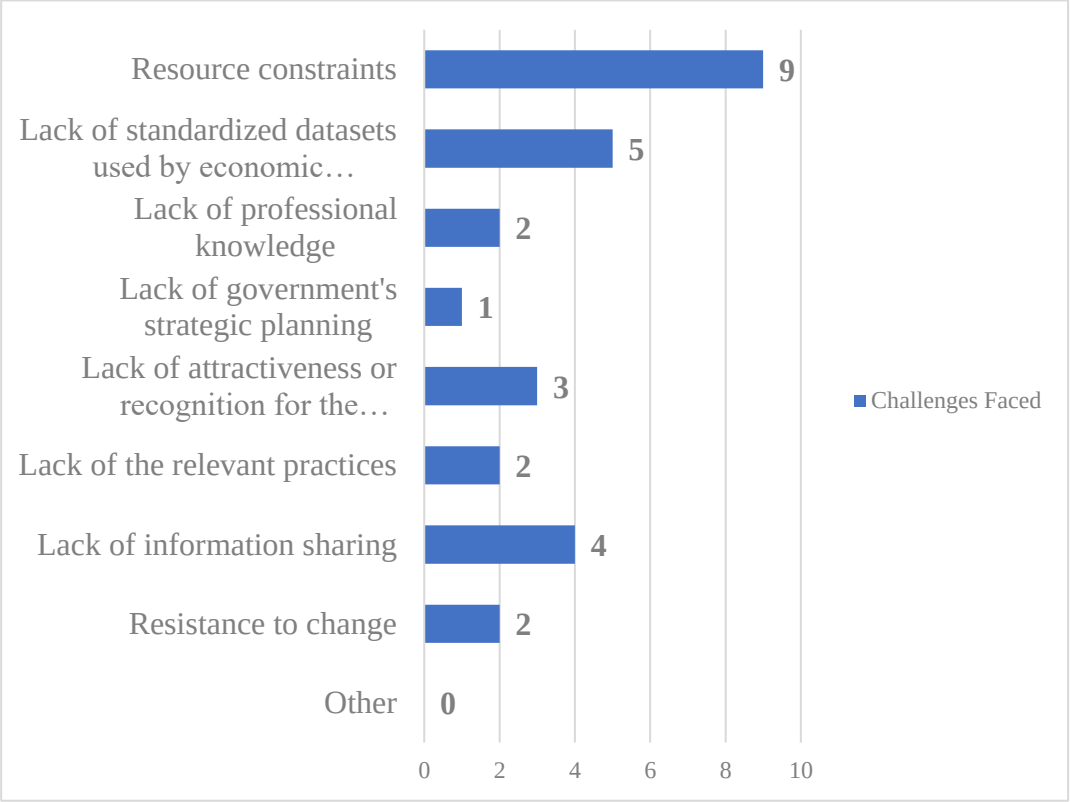

Figure 10:10 APEC economy technology application is facing challenges
Note: This title is multiple choice, and the total number of answers is 28.

The relevant challenges are summarized as follows:

3.3.4.1 Challenges in the Application of Traditional Technology

First, due to the rapid development of the scientific and technological revolution and industrial reform, advanced management and leapfrog development concepts have raised higher demands for traditional technologies. While traditional technologies are widely used, emerging smuggling methods and technologies have become more concealed and complex. Traditional technology may face challenges in integrating new technologies and addressing novel threats.

Secondly, besides traditional cross-border trade methods, the significant growth of service trade and digital trade at the customs service trade level has heightened expectations for the advancement of customs regulatory authorities in traditional technologies.

3.3.4.2 Challenges in the Application of Disruptive Technologies

First, the use of disruptive technologies relies on the development of supporting infrastructure. This includes the need for professional technical talent, capital investment, technology introduction, and technology localization. The application and promotion of disruptive technologies are constrained by the availability of local technical talent and the pace of educational processes.

Second, there are objective differences in the level of disruptive technology adoption. These differences exist not only between customs in APEC economies but also between different types of disruptive technologies in the implementation process. This disparity may further exacerbate imbalances and disparities between regions and application fields.

Third, the maturity and stability of disruptive technologies lack comprehensive and reliable verification, especially when dealing with non-structural or non-standardized tasks. Smart technologies face credibility challenges in such cases.

Fourth, disruptive technologies are primarily aimed at improving efficiency, which can, to some extent, challenge labor rights. The use of disruptive technologies may lead to the displacement of certain job positions, particularly in areas with high levels of disruptive technology utilization.

Fifth, the application of disruptive technologies may impact existing or traditional responsibility rules and regulations. This anticipated impact will primarily affect legislation and law enforcement. The application of disruptive technologies requires improvements in legislation as the foundation of the legal framework and necessitates addressing legal liability issues in law enforcement. Disruptive technologies may introduce various legal risks in different application scenarios.

Among the 10 economies with free zones, all customs authorities believe that several measures can be adopted to enhance the application of disruptive technology in the future. Among these measures, customs authorities consider the effective training of officers (80%) and the establishment of specialized information platforms (70%) as the most two beneficial for the deployment of disruptive technology (Figure 11). This indicates that customs authorities have a strong demand for information platforms and big data analysis concerning disruptive technology deployment. At the technology usage level, customs authorities also emphasize the importance of customs officers' proficiency in and use of disruptive technologies, reflecting their unanimous recognition that "technology should be accessible and usable by customs."

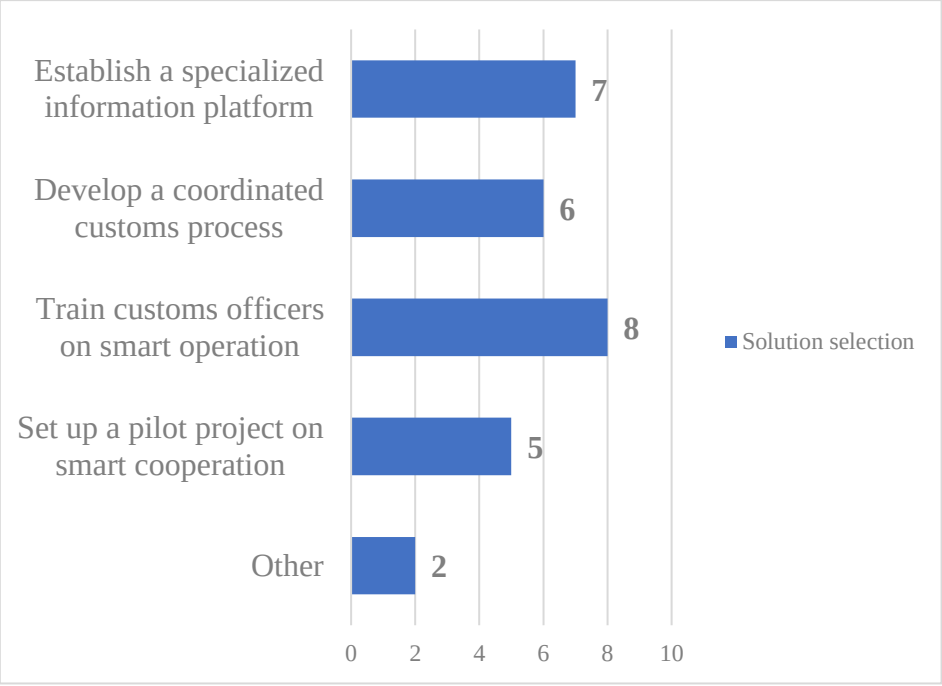

Figure 11:10 APEC Economy Technology's Solution selection of Disruptive Technology Deployment
(Note: This title is multiple choice, the total number of answers options is 28)

Most Economies' Customs Show Interest in Applying Innovative Technology Solutions. The customs authorities of most economies express interest in the application of innovative technology solutions. Some of

these economies have existing plans and deployments that align with the general objectives of improving smart control and services within free zones. This presents new opportunities for economic customs.

APEC and Regional Development Guidance. From the perspective of APEC, development guidance can be considered at the regional level to provide overarching direction and support.

Economy-Level Perspective and Experience Sharing. At the economy level, there are already pilot economies that can actively share their local experiences and contribute to the enhancement of the level of smart control and services in the region.

4. Conclusion and Way Forward

4.1 Conclusion

This report aims to enhance smart customs control and services to promote the high-quality development of free zones and free trade ports. The research data were collected through questionnaires distributed to customs authorities in various APEC economies, providing a comprehensive overview of the current status of free zone and free trade port development within these economies.

Firstly, the project team conducted data compilation and survey questionnaires to conduct a thorough analysis of the evolving landscape that customs authorities are facing in the current era of digital transformation. The objective of this report is to foster the implementation of smart customs technologies, improve trade facilitation and connectivity among APEC economies, promote the high-quality development of free zones and free trade ports, continuously enhance the business environment, and drive APEC member economies towards regional economic recovery in the post-pandemic era.

Secondly, based on the survey responses collected in this report from

customs authorities across APEC economies, it is evident that customs face challenges in the current landscape of free zone and free trade port development. These challenges include low adoption rates and difficulties in collecting information and data related to disruptive technology control. However, feedback from most APEC economies indicates that the application of smart technologies has significantly improved customs control efficiency. Customs authorities are increasingly investing in the application of smart technologies to address both traditional and non-traditional issues and challenges, thereby promoting the stability and enhancement of customs control quality. Moreover, customs authorities have responded to the challenges of the new era by embracing smart technologies, leading to the development of control and service approaches with regional characteristics.

Thirdly, currently, most APEC economy customs authorities have integrated smart technologies into their customs clearance and control processes, encompassing both traditional and disruptive technologies. Through practical case studies, some APEC economy customs authorities have achieved significant results by implementing disruptive technologies.

Finally, based on case research and analysis, it can be concluded that some customs authorities in APEC economies are still in the early stages of exploring and piloting innovative technologies. These customs authorities need to put more effort into enhancing smart control measures to support sustainable development, both domestically and in international trade. It is recommended that they collaborate to establish resilient governance of cross-border industrial and supply chains in the Asia-Pacific region, aiming to ensure smooth and uninterrupted trade. By doing so, they can contribute to the collective development of APEC economies and work towards the goal of building an Asia-Pacific community with a shared destiny.

4.2 Way forward

A substantial portion (50%) of customs authorities in APEC economies have already initiated plans or projects for innovative technologies and solutions within free zones. This underscores the significant attention and importance that these customs authorities attach to improving smart control, as illustrated in Figure 12.

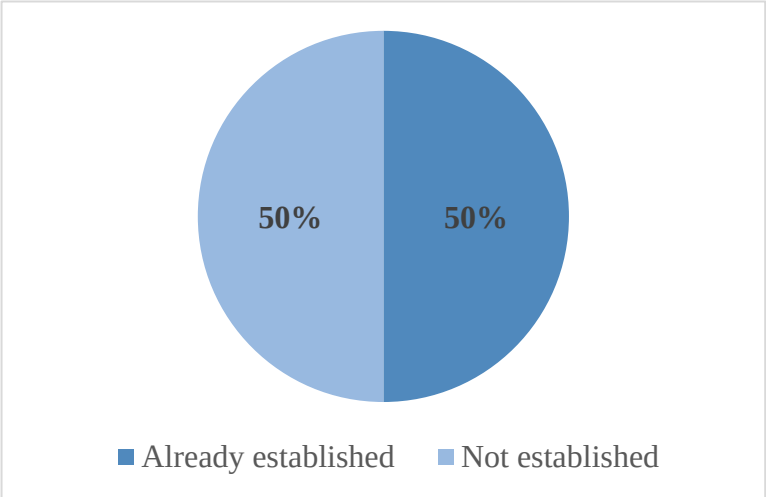

Figure 12: Adoption of Disruptive Technologies in Free Zones and Free Trade Ports by 10 APEC Economy Customs authorities (%)

After conducting preliminary data collection and analyzing survey questionnaires, this report has summarized the following findings:

Firstly, this research exhibits both pioneering and sustainable qualities. A significant number of customs authorities in APEC economies are currently involved in exploring customs technologies in free zones and free trade ports. Consequently, this study establishes the initial framework and lays the groundwork for a more comprehensive investigation of this thematic area in the future. The report, along with the compilation of case studies resulting from this research, can serve as dynamic resources that are regularly updated to incorporate new applications and cases from customs authorities in APEC economies.

Secondly, there is significant potential within the APEC framework to

enhance the levels of smart customs control and services among customs authorities in member economies. By focusing on technological advancements, there may be an opportunity to explore the establishment of specialized information platforms across economies. In the realm of customs clearance and regulation, there is potential to develop coordinated customs processes. It could be beneficial to consider providing training in smart operations for customs officers' enforcement. Additionally, prioritizing practical pilot projects in smart cooperation is worth considering. The underlying rationale for these feasible spaces and directions lies in the capacity of smart technologies to better balance the growth of goods trade with the limited resources available for customs control and services. The widespread adoption of smart technologies can serve as an enabler for modernizing customs authorities and empowering regional economic development.

Thirdly, it is essential to promote cooperation in customs smart control and services within the APEC framework. We propose the establishment of a platform for sharing experiences in customs smart control and services under the APEC SCCP framework. This platform can facilitate regular regional seminars, capacity-building training, and the development of mechanisms for nurturing expert talents. We expect customs authorities from different economies to actively share their valuable experiences in piloting initiatives. This exchange of experiences can help clarify strategic planning, feasible pilot projects, and robust technological support, collectively advancing the development of customs smart control and services to a deeper level.

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ANNEX 1

Case studies of Free Zones, Free Trade Ports, and Customs Smart Control and Services

Based on the preliminary information collected and feedback from the Survey, the project systematically sorted out relevant practical cases with the theme of "free zones, free trade ports, and customs smart control and services", divided into three parts, namely "Cases of Traditional Technologies applied by APEC Customs authorities", "Cases of Disruptive Technologies applied by APEC Customs authorities", and "APEC Customs authorities' customs smart control and services in free zones and free trade ports", the results are now compiled as follows.

1. Cases of Traditional Technologies applied by APEC Customs authorities

1.1 Australia: Using video surveillance, X-ray scanning and other technologies for travel and cargo inspection[10]

During 2021-22, as travel restrictions eased and traveller volumes increased, the return to the use of SmartGates effectively enabled the processing of outwards travellers to return to normal business practices which reduced processing times by 5.4 seconds in 2021-22. The ABF continued to deliver strong outcomes that contribute to the protection, security and management of our borders through collaboration and engagement with government and industry stakeholders. This included 14,700 aerial surveillance hours and a total of 2,337 days of maritime vessel patrols to ensure the vast Australian coastline is monitored and protected.

In addition, in 2021–22, the Department launched a project which consolidated the video remote and pre-booked services into the TIS Online booking tool, allowing self-service capabilities for all agencies. This innovation will see video remote interpreting being recognised as a formal service channel and will offer greater access to services in regional communities throughout Australia where on-site interpreting can be limited.

In terms of cargo inspection, ABF adopts comprehensive inspection techniques including dynamic and static X-ray scanning technology for non-invasive inspection, detection of trace particles, detection canine, and actual cargo verification.

[10] https://www.homeaffairs.gov.au/reports-and-pubs/Annualreports/home-affairs-annual-report-2021-22.pdf

1.2 Canada: Utilizing video surveillance to monitor cross-border road transportation[11]

The Canada Border Services Agency (CBSA) has deployed a Trusted Trader pilot based on Secure Corridor Concept in the cross-bridge sections between Canada and the United States. The project uses video surveillance to monitor the truck drivers by installing closed circuit television (CCTV) on the main roads under inspection.

The CBSA has completed the essential infrastructure upgrades at the Ferry Point Bridge port of entry, in St. Stephen, New Brunswick. The three former primary inspection lanes and booths have been replaced by two upgraded primary inspection lanes with modern booths and an improved parking area. This will allow for safer and more efficient processing by CBSA officers, and will improve the flow of traffic. These upgrades were essential to providing a safe and smooth border experience for travellers seeking entry into Canada. They also play a part in reducing CBSA's carbon footprint.

[11] https://www.canada.ca/en/border-services-agency/news/2023/06/upgrades-complete-at-st-stephen-ferry-point-bridge-port-of-entry.html

1.3 China: Using non-intrusive scanning equipment for cargo and travel inspection

China Customs is equipped with H986 large container X-ray scanning inspection equipment and CT inspection equipment, realizing the application and coverage of non-invasive inspection and scanning technology. According to different goods, items and conveyances, after the system automatically analyzes and identifies the scanned images, it can transmit early warning information to customs officers and perform manual review, analysis or physical inspection.

Huangpu Customs District, directly under the leadership of the General Administration of China Customs, actively promotes the practice of "advance non-intrusive inspection (NII)"[12], which effectively embeds non-intrusive inspection into the procedures of customs control and services, lifting and unloading import containers at the shipside or transporting export containers to the dock checkpoint and transfer to the storage yard. When encountering inspection instructions after declaration of goods, customs can make judgments and handle the inspection and release procedures based on the retained images, eliminating the need for lifting and transporting goods, reducing logistics and operating costs, improving the operation efficiency, compressing the customs clearance time within the regulatory area. Non-intrusive inspection has been integrated into smart image review systems. The smart image review system is a solution based on inspection equipment such as H986, CT machine, X-ray machine, etc., integrating algorithms, software and hardware, and dedicated networks. It realizes the deep integration of artificial intelligence and frontline practice of customs, provides a solid foundation for customs to carry out smart control and services while offer

[12] https://baijiahao.baidu.com/s?id=1705333974757462096&wfr=spider&for=pc

quick clearance.

China Customs has adopted scanning video surveillance, non-invasive inspection, and scanning technology in both travel inspection and postal express channels. This technology has covered both entry and exit scenarios. Take Pudong International Airport Customs House (under the leadership of Shanghai Customs District) as an example [13], before passengers arrive at the baggage carousel, their luggage has been synchronously under customs control at the sorting point.

Based on the smart technologies applied in travel inspection, a safer and more convenient customs clearance has become a reality. Complete electronic health declaration verification in 2 seconds and individual luggage "advance NII" in 6 seconds. The vast majority of luggage can be determined as normal release through 3D image review, with only a few suspicious luggage requiring on-site inspection. Most passengers can directly go through customs after picking up their luggage, and on average, it only takes 20 minutes to check all luggage on a single flight to complete the inspection. Under the premise of intense control, China Customs can provide better services for passengers, improve the quality and efficiency of port operations, and ensure the safe and convenient customs clearance experience of passengers.

[13] https://m.thepaper.cn/baijiahao_23837691


1.4 Hong Kong, China: Utilizing X-ray scanning, computer scanning and e-lock for customs clearance[14]

Hong Kong Customs and Excise (C&ED) has been introducing more advanced inspection equipment to facilitate the clearance efficiency. The CT scanners, X-ray checkers and handheld X-ray imagers provide the X-ray images of baggage and cargoes for Customs officers to determine whether an in-depth examination is required.

C&ED kept introducing advanced inspection equipment, for instance, Computed Tomography (CT) scanner with artificial intelligence function to provide 360-degree scanned images with no blind spots and automatic recognition of dangerous drugs and other contrabands; auto-detection device for existing X-ray checker with AI functions embedded to assist in screening for suspicious objects and automatic detection of various contrabands, such as firearms and its parts and weapons; Raman Spectrometer to speedily identify dangerous drugs without contact or opening of the package of the sample, etc. These advanced inspection equipment could greatly facilitate the clearance efficiency and enhance the ability in combating smuggling and other customs-related offence.

14 https://www.customs.gov.hk/hcms/filemanager/common/pdf/pdf_publications/Departmental_Review_2021_c.pdf

Customs officers can use the electronic distance meters in discovering false compartment in the course of examination of the container. The borescopes allow Customs officers to conduct visual inspection of narrow and difficult-to-reach spaces. The metal detectors and Passive Millimeter Wave Screening System allow passengers to be inspected in a walk-through mode and detect contraband that are hidden under clothing. These devices boost both the efficiency and precision of contraband detection, and facilitate more speedy clearance of passengers and goods at boundary control points.

C&ED has also implemented the Road Cargo System (ROCARS) and requires that relevant cargo data must be submitted through the system before shipment. The system, in conjunction with wireless radio frequency identification, has also been used to identify cross-border trucks, reducing the processing time at land border checkpoints to about 20 seconds. It also uses a mobile vehicle inspection system to conduct X-ray scanning for the containers, simplifying the automatic clearance procedures. The Air Cargo Clearance System also facilitates the transfer of cargo information and Customs clearance instructions between C&ED and air cargo operators.

To further facilitate the transportation of goods from Hong Kong, China to the Mainland, C&ED and the Mainland Customs authority jointly launched the Single E-lock Scheme (SELS). Under this scheme, only one mutually recognized electronic lock (e-lock) is needed to interconnect to the "Intermodal Transhipment Facilitation Scheme" (ITFS) of C&ED with Mainland Customs' Speedy Customs Clearance System (SCC

System), and the goods are monitored according to the principle of "across the boundary with one single e-lock under separate monitoring", and the green light on the e-lock serves as a mutual reference for minimizing duplicated inspection on the same shipment.

The scheme has been implemented at 76 clearance points, covering over 800 cross-border routes to support the rapid development of cross-border trade. The scheme was extended to Hunan province, which is the second Mainland province apart from Guangdong to implement the scheme since 2016.

1.5 Indonesia: Using e-seal and GPS for customs clearance[15]

In Indonesia, the Customs Office of Tanjung Priok seals containers with electronic seals (e-seals) to supervise the transfer of containers and to monitor, in a control room, the shipment history in real time with GPS.

1.6 Singapore: Using X-ray scanning and e-seal for customs clearance[16]

Singapore Customs uses X-ray to conduct non-intrusive inspection on containerised cargoes at the export inspection station.

[15] https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf
[16] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

2. Cases of Disruptive Technologies applied by APEC Customs authorities

2.1 Blockchain and distributed ledger technology (DLT)

2.1.1 Concepts[17]

A blockchain is a time-stamped, decentralized and distributed digital record (or ledger) of transactions in which the transactions are stored securely in a permanent and near inalterable way using various cryptographic techniques.

It is a continuously growing list of records (called blocks), which are chained to each other using cryptographic tools. Unlike traditional databases, which are administered by a central entity, blockchains rely on a peer-to-peer network that no single party can control. Although blockchain is technically one type of DLT, the two terms are used interchangeably in this publication.

2.1.2 Examples

①Australia and Singapore[18]

A blockchain PoC was conducted under the auspices of the Singapore-Australia Digital Economy Agreement to achieve document interoperability for cross-border paperless trade, allowing for the issuance and verification of Certificates of Origin, in accordance with an interoperability framework, the so-called TradeTrust framework.

The Australian Border Force (ABF), IMDA, and Singapore Customs along with industry participants, have concluded a blockchain pilot which was first launched in November 2020 to prove that trade documents can be issued and verified digitally across two independent systems, reducing cross-border transaction costs. The blockchain pilot was initiated as part

[17] https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf

[18] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

of the Singapore-Australia Digital Economy Agreement to make cross-border trade simpler between the two economies. The pilot successfully tested the interoperability of two digital verification systems - the ABF's Intergovernmental Ledger (IGL) and IMDA's TradeTrust Reference Implementation using the certificate of origin (COO) as a first test case.

ABF is currently seeking government approval to implement an intergovernmental ledger to improve production quality, and to conduct further concept validation pilot projects with the goal of making it a permanent feature of Australian trade practices.

②Chile, Mexico, and Peru[19]

LACChain is a global public–private alliance supported by the IDB Lab (the innovation laboratory of the InterAmerican Development Bank Group) to promote integration and economic and social development among Chile; Colombia; Mexico; and Peru by providing the infrastructure to develop interoperable blockchain applications in Latin American and the Caribbean. The founding members of LACChain identified a fragmentation and dispersion of the communities and blockchain networks, which limited the efforts being made to adopt this technology.

In addition to a highly fragmented environment with non-interoperable networks, there was also an absence of international standards and protocols, and a lack of collaboration between public, private and academic entities. One application using the LACChain ecosystem is CADENA, as mentioned above.

③China and Singapore[20]

Singapore Customs and the General Administration of Customs of the People's Republic of China (GACC) have signed a Memorandum of

[19] https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf
[20] https://www.customs.gov.sg/files/news-and-media/2022-02-15-Issue62.pdf

Understanding (MOU) to establish a Single Window Interconnection Blockchain Consortium using the decentralised blockchain model. This will enable the transmission and exchange of trade and customs-related information between Singapore and China.

The first use of the blockchain is the Track & Trace service which is made possible through the exchange of port-to-port customs clearance and logistics status information for containerised trade between Singapore and China. The information is made available to traders and logistics players in both economies. This service has been launched in December 2022.

The Track & Trace service provides timely updates on containerised cargo movements between China and Singapore to traders and logistics companies. The enhanced visibility enables businesses to better manage their physical supply chains and financial flows, thereby improving decision-making to help businesses stay competitive.

④Malaysia[21]

A pilot project for AEOs is in a preliminary study phase. This project is being carried out in collaboration with the economy's R&D centre MIMOS, under the Ministry of Science, Technology and Innovation, to develop an alternative option to industries in addition to the current AEO service provided by the Royal Malaysian Customs Department. The new blockchain service will ensure a high level of system compliance while increasing efficiency in the supply chains of companies under the AEO programme, making them more competitive.

⑤United States[22]

The United States Customs and Border Protection (CBP) conducted a PoC in September 2018 on the application of blockchain technology in

[21] https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf
[22] https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf

the submission process for entry summary declarations under the Central America Free Trade Agreement (CAFTA) and trade with Canada and Mexico.

The assessment of the application and the policy and legal issues raised by the PoC found that the use of blockchain achieved improved communication between the CBP and traders, improved documentation of receipt and expedited processing, with the elimination of manual documentation requirements and duplicative data entry.

There was also easier access to back-up documentation, and since full data were received with the initial submission of the entry summary, potential issues were captured early on. Furthermore, in September 2019, the CBP conducted the intellectual property rights PoC, which tested a blockchain technology in facilitating shipments based on known licensing relationships (licenser and sub-licensee relationships).

2.2 Internet of things (IoT)[23]

2.2.1 Concepts

IoT is the network of sensors and smart devices connected to the internet that can send and receive data and which are often found in vehicles, buildings and items embedded with electronics. IoT enables the tracking of products along the supply chain and can reduce the costs of global trade by increasing the efficiency of shipping and transport.

2.2.2 Examples

①Hong Kong, China

Since 2016, the Single E-lock Scheme (SELS) has connected the Intermodal Transhipment Facilitation Scheme of C&ED with the Speedy Customs Clearance of the Mainland Customs authority towards establishing a green lane to facilitate the flow of goods through a seamless clearance service.

One single e-lock and GPS technology accredited by both Customs authorities are applied in the SELS under the principle of across the boundary with one single e-lock under separate monitoring. The GPS device is used for real-time tracking of the movement of the goods to ensure the security of transhipment cargo in Hong Kong, China.

②Malaysia

The image analyst reviews this declaration together with the scanned cargo image while the container is monitored for radiation, which will automatically alert the analyst, who then decides either to release the container or to send it for physical inspection. Ideally, this takes place within one minute because of the interconnectivity of the different systems that generate real-time data.

Malaysia also has a project to use embedded certificate authority to

[23] https://www.wto.org/english/res_e/booksp_e/wcotech22_e.pdf

authenticate a new tax stamp. When the QR code is scanned, the authenticity of the tax stamp is verified, which will lower the risk of counterfeited tax stamps.

③Singapore

Singapore has an integrated command centre system at PPEIS to analyse X-ray images from BEIS.

④United States

CBP is exploring the use of IoT to manage its extensive network of sensors. The objective is to improve domain awareness and to make the data available to a wider audience within CBP by using an IoT gateway. CBP is also looking at IoT to help to modernize the experience of cargo processing at the border, reduce time spent on inspections and increase the speed of passage. AI and machine learning will utilize data from IoT devices to gain deeper insights on the information gathered and better secure borders.

2.3 Big data, data analytics, artificial intelligence and machine learning

2.3.1 Concepts

Big data usually refers to ultra large datasets (usually reaching PB level or above) that exceed the processing capabilities of traditional data storage and analysis techniques. In the era of big data, data analysis refers to the application of computer systems to analyze large datasets to support decision-making. It is an interdisciplinary field that integrates complex technologies such as statistics, machine learning, pattern recognition, system theory, operations research, and artificial intelligence, The explosive growth of heterogeneous data elements from multiple sources has greatly promoted the rapid development of artificial intelligence. Artificial intelligence (AI) is a field of computer science that changes behavior based on observed, collected, and analyzed data without explicit programming. Therefore, it is a broad term that includes different technologies such as machine learning, deep learning, computer vision, and natural language processing. Among them, machine learning (ML) is a subset of artificial intelligence that provides computers with the ability to learn without explicit programming. It is a process that uses mathematical models to predict results rather than relying on a set of instructions. This can be achieved by identifying patterns in the data, constructing analytical models, and using them to make predictions and decisions. Machine learning is similar to human learning because increasing experience can improve accuracy.

2.3.2 Examples

①China

China Customs has implemented artificial intelligence in the identification of documents, cargo, and personnel, and achieved remarkable results.

The customs risk operation system applies smart analytical tools to change the traditional manual review of documents one by one, and establishes a new tax risk prevention and control model with industry and enterprise risks prevention as the core.

In 2020, Customs National Supervision Bureau for Duty Collection (Shanghai) applied artificial intelligence to the identification of certificates of origin issued by China and Switzerland. The accuracy rate of the unqualified certificate identification system reached 93.9%, and based on the analysis, a supplementary tax of CNY11.74 million was actually paid, and 11 anti-smuggling clues were handed over.

Shanghai Customs District combines practical application scenarios such as document review and risk analysis to carry out smart identification and comparison of the images of documents attached such as foreign official inspection and quarantine certificates. Detect false and invalid documents, and severely crack down on forged inspection and quarantine certificates.

The smart image review system covers various regulatory fields such as maritime, land, express, cross-border e-commerce, mail and travel inspection. It has achieved remarkable results in identifying solid waste and combating the false declaration and concealment of contraband such as guns, drugs, and ivory. Taking Huangpu Customs District as an example, in the first half of 2021, it implemented smart image review inspection of 32,000 TEUs, saving enterprises a total of approximately CNY7.2 million in logistics costs, which has enhanced the enterprise's sense of gain.

②Hong Kong, China

In 2013, the Department set up the Electronic Crime Investigation Centre (ECIC) to tackle the emerging enforcement challenges arising from advancement in cyber technologies. In 2017, the ECIC launched the "Big Data Analytics System" to assist front-line officers in retrieving and

analysing massive information from various Internet platforms for online investigations. Since then, the system has been undergone enhancements to address the emerging trend of technological crimes.[24]

C&ED is developing the Smart Seizure Management System (SSMS) to better rationalise the control and security of seizures during deposit, storage and retrieval stages. The system will provide real-time monitoring of the location of the seizures in the store, and optimise the use of storage spaces through the application of technology, such as radio-frequency identification which could greatly improve the overall store management efficiency.

C&ED has launched the Cargo Big Data System (CBDS) aiming to apply big data analytics and artificial intelligence (AI), thus augmenting C&ED's risk management capability in analysing colossal amounts of cargo data. The system will also minimise the inspection of legitimate cargo and boost customs clearance efficiency.[25]

③United States

The U.S. CBP established the AI Center of Innovation (COI) in late 2020 to act as the catalyst to create the enterprise processes, tools, and infrastructure needed to rapidly develop, test and deploy new AI solutions.

[24] https://www.customs.gov.hk/en/service-enforcement-information/intellectual-property-rights-protection/index.html

[25] https://www.legco.gov.hk/yr20-21/english/panels/se/papers/se20210706cb2-1249-5-e.pdf

2.4 Biometrics

2.4.1 Concepts[26]

Biometrics is the measurement and statistical analysis of an individual's physical and behavioural characteristics. The basic premise of this field is that every individual person is demonstrably unique and therefore identifiable via his or her physical or behavioural traits.

Technology has also produced significant developments in facial recognition technology, DNA, and iris imaging, allowing new sources of information to verify an individual's identity.

Besides the above sources of biometric data, other examples can include palm veins, palm prints, hand geometry, and odour/scent. Behavioural characteristics can also serve to biometrically identify an individual. Such behavioural identifiers include typing rhythm, gait, and voice recognition.

2.4.2 Examples

Biometrics is mainly used in border protection and homeland security management. Customs can use biometric technology to enhance cooperation in improving data collection, enhancing existing systems, and implementing automation technologies to narrow information gaps and strengthen identity verification capabilities in the context of border protection and homeland security.

①Australia[27]

For example, the Australian Border Force (ABF) uses biometric identification services in visa and border processing. Facial and fingerprint biometrics are already collected from a range of visa and citizenship applicants at offshore and onshore locations. This allows the ABF to handle

[26] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf
[27] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

any risks relating to visa applicants offshore. The ABF also uses SmartGates, which perform an automatic face-to-passport check of the traveller at the Border. Prior to the COVID-19 pandemic, approximately 70% of travellers departing Australia and 50% of arriving travellers self-processed using SmartGates. As part of a broader programme in response to delivering a bio-secure border, the Digital Passenger Declaration (DPD) will be replacing the existing Incoming Passenger Card. All travellers wishing to come to Australia will be required to complete a DPD. This will anchor identity through the collection and use of biometrics.

②Canada[28]

Who?		Where?	Why?
Primary	ePassports holders	10 airports with kiosks	Identity verification 1:1 match against chip image
	Enrolled foreign nationals	8 airports with kiosks	Identity verification 1: many search against enrolment database. Once search complete, 1:1 validation between fingerprint ID on file against traveller's fingerprints.
	NEXUS (trusted travellers)	9 airports with kiosks	Identity and membership verification 1:1 match against enrolment database
Secondary	Enrolled foreign nationals	16 airports with biometric equipment and 15 land sites.	Identity verification 1: many search against enrolment database. Once search complete, 1:1 validation between fingerprint ID on file against traveller's fingerprints.
	Foreign nationals (permits,	119 LiveScan devices including portable units; 37 airports, 9 inland	Identity verification 1:many search against

[28] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

	asylum claims, removal and arrest)- enrolment of biometrics	offices and 73 other locations including land sites.	criminal and immigration databases

③China

China Customs has set up smart health declaration gates at passenger entry and exit ports. The gates are connected to the smart health inspection system and have functions such as temperature measurement, facial recognition, document recognition, fingerprint collection, and QR code collection. The smart gate collects passengers' facial recognition information while measuring temperature. The customs risk management department can issue control and interception requirements based on the passenger's facial recognition information, and automatically trigger an alarm when the control object passes through the gate to implement interception.

China Customs has established professional laboratories. For the purpose of investigating smuggling cases, the laboratories can collect and compare fingerprints related to smuggled goods and items, collect and compare suspects' voiceprints, and collect and compare biological traces (for example, conduct DNA analysis). For the detected endangered species and their products, China Customs also has biometrics technology to analyze and identify the biological species.

④New Zealand

The New Zealand Customs Service has deployed an automated border control system using facial recognition to process passengers arriving and departing at Auckland, Wellington, Christchurch and Queenstown airports in New Zealand. This system, known as SmartGate New Zealand, was initially deployed in 2009 and consisted of separate kiosks and gates. Since

2009, the system has gone through multiple improvements, with changes to the facial recognition algorithm, the cameras and, most recently, the gates themselves.[29]

⑤United States[30]

CBP is leveraging advances in technology from the biometric exit solution to transform the entry process by using facial comparison technology. With a faster and more secure clearance process, airports, airlines, and travellers benefit from shorter connection times and standardized arrival procedures. Security is increased by reducing the imposter threat while increasing the integrity of the immigration system. CBP has deployed the use of biometrics for arriving travelers at 205 U.S. airports by upgrading the software application it uses to now include a facial biometric check. CBP was able to manage costs of this new capability, by using existing hardware, including camera technology that has helped to reduce the financial burden for CBP. As of 18 January 2022, CBP has identified 52 imposters at 14 airports.

[29] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf
[30] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

2.5 Drones

2.5.1 Concepts[31]

According to Webster's dictionary, a drone is an unmanned aircraft or ship guided by remote control or onboard computers. Unmanned aerial vehicles (UAVs) are a component of an unmanned aircraft system (UAS) which includes a UAV, a ground-based controller, and a system of communications between the two. The flight of UAVs may operate with various degrees of autonomy: either under remote control by a human operator, or autonomously by onboard computers. Compared to manned aircraft, UAVs were originally used for missions too "dull, dirty or dangerous" for humans.

Drone technology allows a high level of autonomy. Using GPS signals for navigation and Wi-Fi for communication, some models require human operators to guide the vehicle manually by remote radio control, using on-board cameras that can act as digital eyes over several kilometers, depending on battery life. Other, more sophisticated vehicles can follow entirely pre-programmed take-off, flight, delivery and landing routines without human intervention.

2.5.2 Examples

①China[32]

Customs officers in southern China's technology hub Shenzhen discovered a group of criminals using drones to smuggle CNY500 million (USD79.8 million)-worth of smartphones from Hong Kong, China to Shenzhen. The smugglers usually operated after midnight and only needed seconds to transport small bags holding more than 10 phones using the drones. The gang could smuggle as many as 15,000 phones across the border in one night. Regulating the use of drones has become an important

[31] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf
[32] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

task for China, the world's largest manufacturer of consumer drones.

②United States[33]

U.S. Customs and Border Protection have advanced the exploitation of drone data through their existing digital forensics capabilities. As drones continue to be utilized more extensively in the smuggling of illegal contraband, and in counter-surveillance by Customs and immigration officials, data retrieved from drones is becoming a necessity for both law enforcement and intelligence use. Drone data is not easily accessible like the data in traditional electronic devices used in the Customs environment. The need for ever-evolving digital forensic techniques is beyond question. Collaboration across the WCO and WTO memberships could vastly improve the pace and quality of data exploitation for everyone.

[33] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

2.6 Virtual, augmented and mixed reality

2.6.1 Concepts

Virtual reality, augmented reality and mixed reality that create fully simulated worlds or embed digital elements in real environments are of great value in customs training. Virtual reality completely immerses users in the virtual environment, augmented reality projects digital content into the real environment, and mixed reality integrates digital content with the real world. The following further defines the differences between these (immersive) technologies:

1. Virtual reality enables users to fully immerse themselves in a virtual environment through a headset, allowing them to interact and operate with digitally rendered objects;

2. Augmented reality projects digital content into the user's field of vision through a mobile device or headset, allowing the user to interact with the real world while being able to move freely and use their hands;

3. Mixed reality is the fusion of augmented reality and virtual reality, allowing users to manipulate and interact with digital content in a real environment.

Like virtual reality, augmented reality and mixed reality products are also being developed with the intention of using them in business settings. Examples of such products are Google Glass, spectacles that also come with AR and VR capabilities, and HoloLens, a pair of mixed reality smart glasses developed and manufactured by Microsoft.

2.6.2 Examples[34]

There are different potential future uses in Customs and border management for virtual, augmented and mixed reality. Augmented and mixed reality can be used to project visual assistance in the physical world,

[34] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

e.g. when doing a physical inspection. This assistance can be in two forms. The first is general assistance that is provided in advance to all employees. The second is the possibility that the assistance is provided by someone who can see what the Customs officer sees, in real time.

Shanghai Customs District utilizes advanced smart algorithms such as "facial recognition" and "liveness detection" to compare facial features and identity documents, solving the problem of authenticity of cross-border e-commerce subscribers' identity information. Customs is equipped with smart wearable equipment at the front line of aircraft boarding, and uses "5G+AR" technology to achieve real-time docking of wearable equipment with the GACC's audio and video law enforcement recorder management platform, ensuring that all stages of boarding inspection are controllable and traceable, achieving voice prompts, semantic recognition, and main perspective follow-up recording, effectively reducing work intensity.

For example, Shanghai Customs District has been conducting pilot work on the application of AR glasses since 2020, making every customs officer wearing AR glasses in different business scenarios an extended entry point for information collection on the customs big data platform. Comprehensive application of various technologies such as process prompts, voice commands, remote knowledge base calls and storage, real-time communication of audio and video, multi conference rooms, voice to text, retention of audio, video and graphic information, QR code recognition, infrared temperature measurement, facial recognition, etc., suitable for scenarios such as collaborative operations of transportation vehicle quarantine and inspection, and identification of exhibits during exhibition tours, Providing real-time decision-making information and on-site guidance for both frontline and backend customs officers, as well as conducting on-site rapid disposal, has improved the work efficiency of frontline customs officers and reduced their work intensity.

The U.S. Customs and Border Protection (CBP) Office of Trade, for example, is exploring the role of augmented reality not only for training simulations, but also to protect intellectual property rights on American imports and fill knowledge gaps that may exist between experience levels. According to a CBP publication, while the application of this technology is still in progress, it is expected that Customs agents will benefit from the use of augmented reality headsets by making a library of searchable goods readily available for agents to compare and identify counterfeits with 3D renderings. Because these technologies have been integrated into headset devices like Microsoft's HoloLens, agents can perform their duties hands-free.

Extended use of these technologies has multiple applications for the public sector, and, in the realm of Customs, they can be used to perform efficient security screenings by reducing common risks and errors that can occur during regular checks. Facial and behavioural recognition software can alert Customs agents of potential risks when dealing with individuals attempting to cross borders. Other services these devices can provide are to identify and assess vehicles (e.g. warning agents if a vehicle is lower to the ground than it should be in the case of smuggling), as well as provide translating services if interacting with foreign-speaking individuals.

Finally, another potential use is the visualization of big data sets. Big data is hard for a layman to visualize and manipulate. When using mixed reality, data can be projected in the physical world as digital artefacts that can be manipulated as real objects.

2.7 3D printing

2.7.1 Concepts[35]

3D printing, or additive manufacturing, is a process of making three-dimensional solid objects from a digital file, using a 3D printing machine and raw materials such as plastic, metal, nylon, or others.

3D printing is widely used for industrial, medical, construction and consumer goods. The technology is also at the early stages of adoption within the automotive and aerospace sectors, along with some applications in the consumer electronics sector for the manufacture of cases and covers for smart phones, tablets and other portable devices.

2.7.2 Examples

3D printing is one of those technologies where there is no evident benefit of use by Customs. However, some believe it will have a potentially important impact on the work of Customs in the future.

Discussions on the growing area of 3D printing were launched by the Virtual Working Group on the Future of Customs (VWG FC) at the October 2015 PTC Meeting. China, as the initiator of the topic, submitted a paper which formed the basis of a very intense and fruitful discussion.

Some delegates felt that the enhanced use of 3D printing would probably have more impact on movements on the domestic market rather than across borders and that, based on current legislation, that might mean 3D printing could have more implications for other governmental agencies rather than for Customs (e.g. tax administrations, domestic police, etc.). Questions were raised as to whether Customs would nevertheless be involved in monitoring the virtual supply chain, and if so, how this could be achieved, including whether existing legal instruments were sufficient to cover such responsibilities. In general, the cooperation of Customs with

[35] https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

tax authorities and other relevant agencies, possibly as a new dimension of coordinated border management, was regarded as important in this field.

Several delegates also stressed the possible implications of 3D printing for origin, valuation, IPR and security, while one Member stressed that it should not present new restrictions in cross-border trade. Other delegates indicated that there might be revenue implications, especially VAT implications and, in addition to the legal issues already addressed, there might be a need to redefine the term "goods" in the future - which might be relevant to Customs responsibilities in 3D printing overall.

3. APEC Customs authorities' customs smart control and services in free zones and free trade ports

3.1 China: Accelerates the Construction of Smart Customs within the Hainan Free Trade Port[36]

China Customs is accelerating the construction of smart customs within Hainan Free Trade Port. In response to the control of offshore duty-free commodities within Hainan Free Trade Port, new technologies such as big data and blockchain are fully applied, and advanced customs control and services facilities and equipment are applied to enhance the efficiency of customs duty-free control and services. For example, building off-shore duty-free customs control and services system needs to open corresponding electronic review interfaces for the review process of paper documents that were originally required, and achieve document transmission and data exchange through electronic systems, achieving paperless approval of 19 types of approval processes, including filing, allocation, in and out of storage, sales, and pick-up and departure of duty-free products; need to increase investment in smart equipment and facilities. Set up customs controllable high-definition cameras, audio intercom devices, and fixed smart e-lock readers in areas such as loading and unloading of duty-free commodities and centralized loading and unloading of duty-free commodities waiting for shipment, to achieve non-contact control of duty-free commodities in and out of storage, logistics transportation, and tracking of transportation trajectories. Promote cross-departmental data sharing and regulatory mutual recognition.

China Customs, through the local government information resource

[36] Derived from the Survey.

sharing and exchange platform, achieves data sharing and risk collaborative analysis with subjects such as banks, railways, ports, airlines, postal services, and civil aviation, forming a strong deterrent against smugglers.

3.2 China: Shanghai Pilot Free Trade Zone Lingang Area Cross-border Trade Big Data Platform[37]

Yangshan Free Trade Zone in China is the core functional carrying area of the Shanghai Pilot Free Trade Zone Lingang Area. It is an important platform entrusted by the government to carry out regulatory system innovation in the Lingang Area, and an important spatial and policy carrier for implementing domestic strategies. The construction of smart customs is the way to promote the implementation of the "Smart Customs, Smart Borders, and Smart Connectivity" Initiative and achieve customs modernization. The construction of a cross-border trade big data platform (Lingang Area) is a powerful grasp and concrete practice for Shanghai Customs District to carry out smart customs construction.

The new customs control system with the core of "first line clearance, second line one-side declaration, and no separate customs account books established within the Yangshan Free Trade Zone" has put forward higher requirements for effective customs control and services, and also provides a practical environment for exploring the overall reconstruction of customs management through digital transformation and improving the level of customs governance capacity. In order to give full play to the role of Yangshan Free Trade Zone as an important carrier that benchmarks internationally recognized and most competitive free trade zones, Shanghai Customs District has strengthened data empowerment for customs digital control and services and made full use of the basic environment for big data application. Focusing on the goal of "using big data to achieve convenience, using big data to achieve the balance between security and facilitation", with digital transformation and smart management as the core drive, Shanghai Customs District will promote the construction of a cross-

[37] Derived from the Survey.

border trade big data platform (Lingang Area).

Taking "supply chain security assessment + smart risk control model" as the starting point, customs will build a high-level management system that is compatible with the control system of the Yangshan Free Trade Zone, and realize the integrated control of entry and exit risks and internal management risks therein, promoting the realization of safe and non-sensory cross-border circulation of all factors in domestic and international dual circulation, further reducing the clearance time and cost of border procedures, promoting the overall reconstruction of customs management through digital transformation, improving the level of customs governance capacity building with Shanghai methods.

3.3 China: Shenzhen Customs District implements online supervision based on docking enterprise ERP/WMS data[38]

The model of "implementing online control based on docking enterprise's ERP/WMS data" refers to fully applying digital technologies to innovate customs bonded control and services concepts, systems, and methods within special customs supervision areas, introducing enterprise production and operation data to assist customs control, streamlining procedural review processes, implementing favorable and collaborative control, further optimizing customs bonded control in special customs supervision areas, and improving the level of customs smart control and services.

Currently, this control model is being trialled in the special customs supervision areas within the jurisdiction of Shenzhen Customs District. In accordance with the idea of "direct connection capture, real-time display, and smart calculation", by docking the enterprise's ERP/WMS, the original production and operation data of the enterprise can be directly captured, and corroborated with customs control data such as customs declarations and account books, and simplified on this basis. The bonded control process in special supervision areas is supported by convenient measures such as "Internet + post-clearance audit" and consumable account book management model, and strives to build a new control model that is efficient, convenient and risk-controllable, further reducing institutional costs and ensuring the stability of supply and industrial chain.

Through this innovative practice, one is to promote the transformation of regulatory concepts, promote the transformation of customs control from "planned pre-control" to "embedded process control", observe the transformation of enterprise compliance from "segmented monitoring" to

[38] Derived from the Survey.

"full-process monitoring", the transformation of regulatory methods from "manual experience analysis" to "system smart analysis", and the transformation of regulatory data sources from "enterprise-organized declaration" to "direct capture of enterprise real production data". The second is to improve the level of customs smart control, use parameterized and modular analytical methods to make good use of data, implement customs control with the characteristics of "multi means, less procedures" and "low intervention, high efficiency" for pilot enterprises, and enhance the customs' ability to detect and intervene anomalies in a timely manner through online automatic comparison and early warning with enterprise ERP/WMS data. The third is to improve efficiency and reduce costs for enterprises. This model can simplify and reduce procedural regulatory operations to further assist enterprises in reducing costs and increasing clearance efficiency. On average, the implementation of online post-clearance audit can reduce the time for enterprises to cooperate in obtaining evidence by more than 80%, and the pilot "Internet + bonded logistics" model can save about 50% of the declaration time and expenses on average.

3.4 Hong Kong, China: A Smart Customs Interactive Response System[39]

Apart from the 24-hour general enquiry hotline and email service, C&ED has developed the Smart Customs Interactive Response System, which comprises a virtual ambassador to help passengers search information at control points as well as an online chatbot to answer public enquiries on our Customs Homepage.

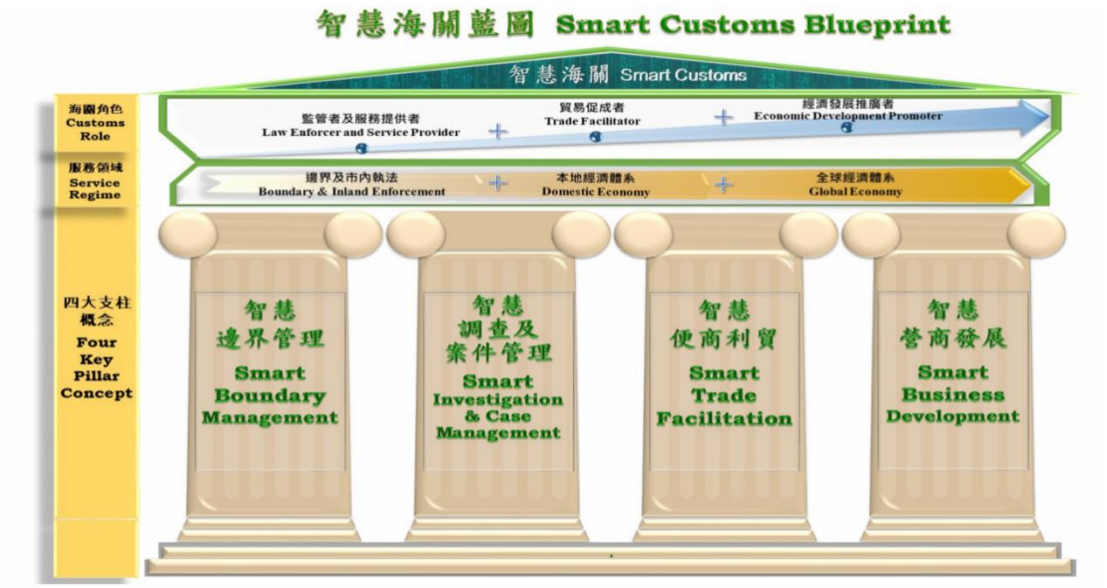
3.5 Hong Kong, China: Smart Customs Blueprint[40]

The Smart Customs Blueprint covers three overarching directives, namely the extension of customs role, expansion of the service regime, and enhancement of customs functions. In addition to maintaining its traditional role as "law enforcer and service provider", C&ED will play a more diversified role by strengthening its role as "trade facilitator" and becoming an "economic development promoter". C&ED's service regime will also be extended from conventional boundary and inland enforcement as well as provision of service for the domestic economy to making a

[39] Derived from the Survey.
[40] https://www.legco.gov.hk/yr20-21/english/panels/se/papers/se20210706cb2-1249-5-e.pdf

contribution to the regional and global economic development, in the context of the Guangdong-Hong Kong-Macao Greater Bay Area development and the Belt and Road Initiative. Covering all core aspects of the C&ED's business, the ultimate goal of the "Smart Customs Blueprint" is to build up an all-in-one Smart Customs, through using innovative technology in the formulation, development and deployment of various systems, equipment, devices and tools, as well as enabling data sharing within the department.

The following four key pillar, namely Smart Boundary Management, Smart Investigation & Case Management, Smart Trade Facilitation, and Smart Business Development, of the Smart Customs Blueprint will further enhance C&ED's functions through the application of innovative technology.



3.6 Indonesia: National Logistics Ecosystem (NLE) for Goods Management and Information Exchange[41]

Indonesia customs applies smart approaches (technologies and innovation) which has been implemented are explained as follows:

i. To support the smooth operation of customs business processes at KPBPB, an electronic-based service and supervision mechanism is implemented by using an information system which is called Customs and Excise Information Systems Automation Free Trade Zone (CEISAFTZ).

ii. To improve the effectiveness and efficiency of the supply chain, the KPBPB also implements the NLE which includes the implementation of autogate and Single Submission (SSm) mechanism which are briefly explained as follows:

ii.1. The autogate system is a form of recognition the trust of the Temporary Storage (Tempat Penimbunan Sementara-TPS) entrepreneurs by Directorate General of Customs and Excise (DGCE) to conduct their own import and export goods coming into and exiting from TPS without being directly supervised by DGCE officer. Supervision of TPS is carried out through real time CCTV systems and online TPS systems.

ii.2. Single Submission (SSm) mechanism is the form of integration of information systems between DGCE and other authorities, such as port authorities (Kesyahbandaran Otoritas Pelabuhan-KSOP), Plant Quarantine Agency, and other agencies through the Single Submission (SSm) mechanism.

3.7 Mexico: Conducting Risk Management Based on Big Data for Customs Declaration Documents[42]

Users transmit and pay the customs declaration. Afterwards, they carry out a "Notice of crossing" incorporating the customs declarations that

[41] Derived from the Survey.
[42] Derived from the Survey.

will be included in the means of transport, with this the system automatically performs a risk analysis based on big data and selects the "Notices of crossing" that will be subject to customs control.

When the control is carried out, RFID, Non-intrusive technologies, sampling, etc. are used, according to the type of merchandise.

3.8 Singapore: Goods inspection conducted using a risk-based approach supported by data analysis[43]

Certain goods that enter the free trade zones in Singapore require permits to be taken up by traders. The data declared by traders in the permits are submitted to our Single Window, TradeNet, and data analytics is conducted on the data received to enable Singapore Customs to adopt a risk-based approach to target high-risk shipments for checks while ensuring trade remains smooth.

Going forth, FTZ Operators will provide Singapore Customs with bill of lading information from shipping agents for all cargo entering/ exiting our sea FTZs, via system linkages, which will improve Singapore Customs and other enforcement agencies' visibility of such cargo and enhance risk profiling and targeting of high-risk cargo, including suspected TBML cases.

3.9 Singapore: Supporting Customs Risk Management through Data Analysis[44]

As a partner of business and a guardian of trade, Singapore Customs strives to strike a fine balance between making sure sufficient controls are in place to interdict illicit trade, and ensuring that legitimate trade continues to flow unhindered. This requires Singapore Customs to be adept at data analysis, which strengthens enforcement and boosts compliance by the trading community.

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[43] Derived from the Survey.
[44] Derived from the Survey.

Accurate profiling and targeting enhance the effectiveness of Singapore Customs' compliance checks. This also sends a clear message to would-be smugglers that despite the huge volume of goods crossing the economy's borders, Singapore Customs remains highly capable in detecting illegitimate or fraudulent transactions.

Step 1: DATA COLLECTION

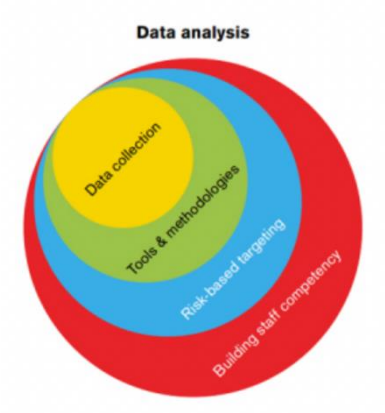
Data collection is the first step in the data analysis process. Singapore Customs obtains data from multiple data sources. Such sources of data include information from Customs declarations, other domestic agencies, commercially available databases, and open source information platforms. Information is also obtained from intelligence sources, of local origin and via international collaborative efforts such as feeds from the WCO Regional Intelligence Liaison Office (RILO).

The collected data, which may be in a structured or unstructured form, may not be fed into the same risk engine. Some of the data that has been collected is used to substantiate an analysis. It is also important to ascertain the reliability and validity of collected data, which Singapore Customs does through various means, including verifying the data against the relevant supporting trade documents received.

Along with analysing historical data, Singapore Customs scans the environment to identify evolving trends and patterns, assesses their impact, and responds to threats and opportunities posed by them.

Step 2: ADVANCING WITH TOOLS AND METHODOLOGIES

With the advancements in data analytics, i.e. the pursuit of extracting meaning from raw data using specialized computer systems, Singapore Customs has endeavoured to strengthen its data analytics capabilities by progressing from descriptive analytics to the use of predictive analytics.



Descriptive analytics uses data aggregation and data mining to provide insight into the past and answers the question: "What has happened? Predictive analytics, on the other hand, uses statistical models and forecast techniques to understand the future and answers the question: "What could happen?"

To make sense of the data that it collects, Singapore Customs leverages its Data Analytics System (DAS) to manage and store voluminous data from various sources, such as shipment clearance times, entity, offence and declaration-related information. The DAS contains machine learning (ML) models and business intelligence (BI) rules to automatically identify outliers and anomalies in trading patterns, shipping routes, etc. and potential high-risk consignments using current and historical data for further intervention actions.

Capability-wise, Singapore Customs is developing in-house expertise in using ML and artificial intelligence (AI) to better harness data to optimise its operations, perform more efficiently and make better-informed decisions.

As there are continual developments in the area of data analytics, Customs officers are required to keep abreast of new technologies, and constantly upgrade their knowledge. Singapore Customs also actively

engages other government agencies and Customs administrations to learn about their experiences and best practices in the application of data analytics for fraud detection, as well as developments in data analytics capabilities.

Step 3: RISK-BASED TARGETING

By analyzing data, such as data on historical shipment trends and modus operandi (MO), Singapore Customs officers are able to triangulate irregularities that could, for example, suggest non-compliance, and use the results to target suspicious shipments for inspection. The outcome of these inspections also enriches the risk profiling capabilities of Singapore Customs.

To illustrate: in a case involving the detection of duty-unpaid cigarettes, Singapore Customs officers, through data analysis, observed that the weight of goods declared in a declaration was lower than the historical norm. In addition, shipment details were found to be inconsistent with an importer's past business activities. These irregularities were assessed to fit the risk profile of historical cases involving similar modus operandi, providing officers with enough just cause to target the shipment for inspection, which led to the detection of duty-unpaid cigarettes.

Step 4: BUILDING STAFF COMPETENCY

Singapore Customs has a dedicated team doing threat assessment on shipments and producing reports on evolving trends and patterns. The team comprises officers who are trained in diverse disciplines such as engineering, economics and social sciences. At the organizational level, all Singapore Customs officers are taught to apply risk assessment in various aspects of Customs' work. The officers are also subject to job rotations every 2 to 5 years, enabling them to broaden their knowledge and experience, and build up their risk assessment capabilities as a whole.

The 'soft knowledge' acquired by Singapore Customs officers from

data analysis is critical in decision-making. Such knowledge is strongly associated with officers' domain knowledge and experience. As such, the two critical factors contributing to the success of data analytics are the soft knowledge of Singapore Customs officers, as well as the hard elements of data analytics tools.

Singapore Customs officers performing data analysis are provided with comprehensive training so that they understand the rules and underlying theories of data. They are also given hands-on experience in the enforcement and compliance aspects of Customs' work. Regular joint training sessions with other Customs administrations and other domestic agencies are also conducted to enhance the officers' competencies in data analytics.

Through courses, formal meetings and site visits to relevant industry sectors, Singapore Customs officers have acquired insights into the evolving business environment, including industry trends and consumer behaviour, all of which have added further value to their knowledge base.

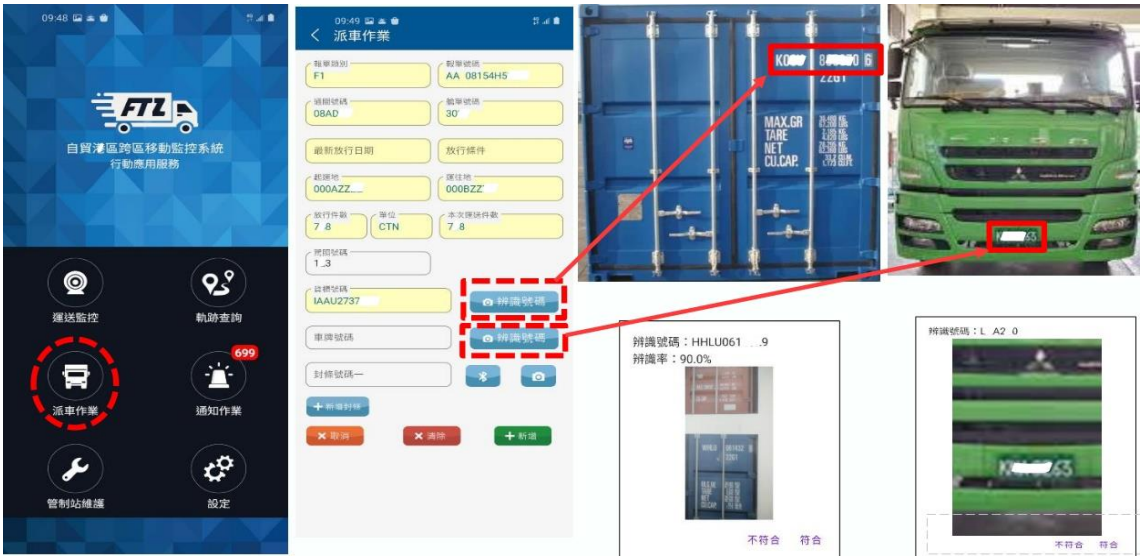
In addition, Singapore Customs actively monitors the latest developments in the field of data analytics and available technologies, through study visits to domestic agencies which have adopted data analytics in their operations, and engagements with commercial vendors. By doing so, Singapore Customs is better able to understand the advancements in related technology, including products/tools, available on the market.

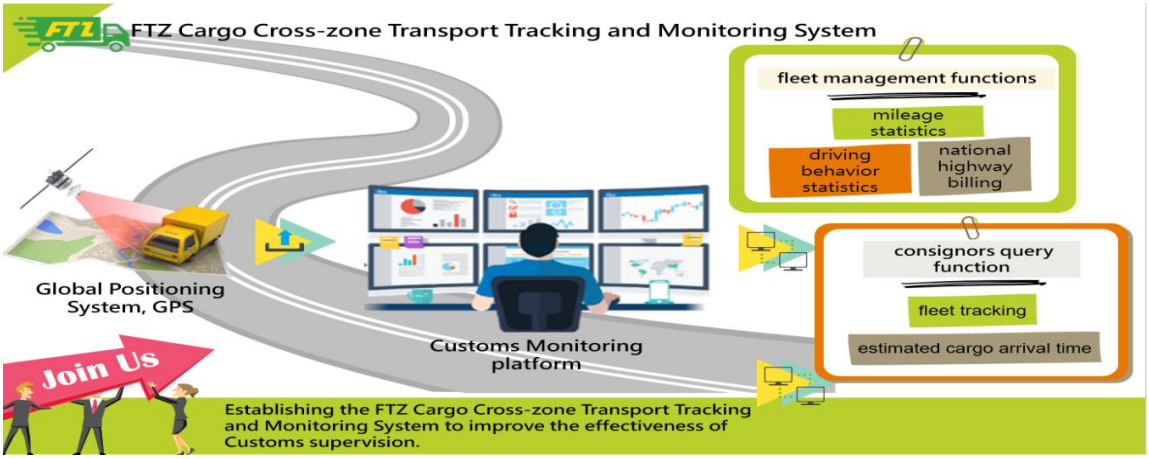
3.10 Chinese Taipei: Customs Smart Control and Services to Improve Cargo Movement Security in FTZs

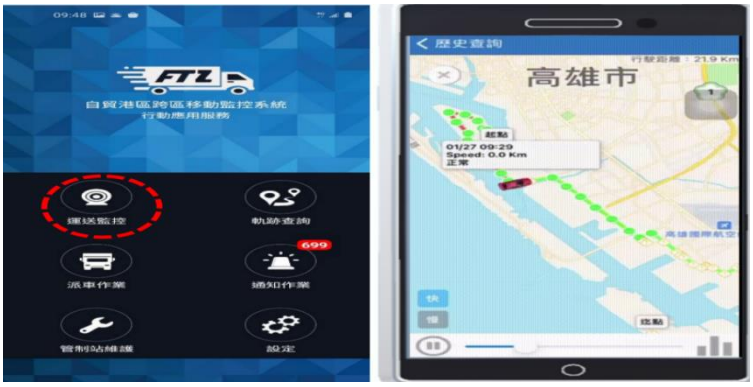
In order to establish a technology-controlled mechanism for cargo transportation in free trade zones, to effectively supervise the movement of goods into and out of the zones as well as the dynamic information including the route and transportation status during the transportation

period, and to ensure the security of goods movement, Chinese Taipei Customs introduced Global Positioning System (GPS) technology to build the “FTZ Cargo Cross-zone Transport Tracking and Monitoring System” in November 2020.

With fleet operators participating in the pilot, the system not only provides fleet management functions, such as driving behavior statistics, local highway billing, and mileage statistics, but also provides consignors with real-time information like fleet tracking and estimated cargo arrival time. The purpose is to provide high-quality services to cargo owners, increase opportunities for fleet operators to be consigned, and improve operational performance. This system is currently under the trial operation.







3.11 Thailand: Implementation of integrated functions in customs electronic systems

The Thai Customs Department has launched additional control measures for "customs free zones" (CFZ). One additional requirements set out in Customs Notification No. 22/2022, for both CFZ establishers and the CFZ users in commercial CFZs, concern:

Customs office area: The customs office space is not to be less than 40 square meters, located in an appropriate area near the checking post, and comprising office equipment, a customs electronic system (TCES), and receiving and delivery control systems such as bar code systems, electric weighting systems, CCTV, etc.

The electronic system of Thai customs integrates electronic import, electronic export, electronic manifest, electronic payment, electronic refund, personal digital assistance, electronic guarantee, Thailand NSW, e-Tax Initiative Multiple functions including electronic licensing. Thai customs has established a development plan for this system to promote the electronic development of customs.[45]

In the process of free zone control and services, the Thai customs electronic system confirms the import and export transfer of goods in the

[45] https://www.v-servelogistics.com/media/file/2012/06/VSL_TCES_Present_Rev_9_20x.pdf

"customs free zones" by linking the goods confirmation report; Closed circuit television monitoring system (CCTV) is used in both the entry and exit areas and the internal circulation related procedures (checkpoints); Deploy an electronic tracking system during the transportation of goods, in conjunction with applications such as electronic locks, radio frequency identification, and global positioning system (GPS), to establish a monitoring and command center to monitor the transportation and flow of goods in real-time. Thai customs conducts risk management based on enterprise inventory control system data, financial credit status, compliance with laws and regulations, etc.[46]

[46] https://www.wcoomd.org/-/media/wco/public/global/pdf/events/2019/picard/free-zone_how-to-balance-between-trade-facilitation-and-customs-17_10_19.pdf?la=en

ANNEX 2

APEC SCCP 05 2022S Self-Funded Project

Strengthen Customs Smart Control and Services to Improve the Development of Free Trade Ports/Free Zones (FTPs/FZs)

SURVEY

I. Introduction

In order to carry out further cooperation and exchange among customs authorities of APEC economies in the field of smart control and services of free zones (FZs) and free trade ports (FTPs), a research survey to gain more understanding on strengthening smart control and services in FTPs and FZs by the customs authorities of APEC economies is carried out.

Please note that “free zone (FZ)” herein means “a part of the territory of a Contracting Party where any goods introduced are generally regarded, insofar as import duties and taxes are concerned, as being outside the Customs territory”, which is defined by the World Customs Organization (WCO) in Specific Annex D to Revised Kyoto Convention (RKC). Despite that terminology, definition and application of FZ can be different from one economy to another such as free trade zones, special economic zones, export processing zones, free ports, special Customs zones, special Customs supervision areas, foreign trade zones, free trade ports, etc. Economies using the above terminology are also included in this survey.

"Smart Control and Services" means that customs authorities conduct control and provide services with the support of smart approaches (technologies such as big data, Internet of Things, artificial intelligence, and innovations on legal frameworks, capacity buildings and risk management, etc.)

The Project Overseer

II. The Survey

(A) Contact information

APEC Economy:	**E-mail:**
Contact Name:	**Position:**

(B) Basic information of FZs

1. The number of FZs in your economy_____; The FZ with the largest trade volume in your economy _____.

2. Is there a free trade port in your economy? It yes, please provide 1 or 2 example(s) of best practice(s) or case(s) of your customs authority applying smart approaches (technologies and innovation).

(C) The use of new technology and innovative solutions

3. Are there any communication channels offered by your customs authority to provide consultations on customs smart control and services? For example, whether your customs authority sets up a hotline, an e-mail service or an online Q&A portal for the public. *[Select One]*

A. Yes

B. No

If yes, please list the relevant channels here: _____.

4. Is there a customs management information system exclusively dedicated to FZs? *[Select One]*

A. Yes

B. No

If yes, please list the relevant system(s) (by names): _____.

5. Is there data sharing and exchange between the FZ management information system(s) of your customs authority and the information systems of other authorities and users in the FZs? *[Select One]*

A. Yes

B. No

If yes, please briefly describe the data sharing process or mechanism: _____.

6. Does your customs authority apply the following disruptive technologies when conducting customs control and providing customs services within FZs? *[One or more following options could be selected, and please fill in if you select the option "Other"]*

A. Blockchain (distributed ledger technology)

B. Internet of Things (IoT)

C. Big data, data analytics, artificial intelligence (AI) and machine learning (ML)

D. Biometrics

E. Drones

F. Virtual, augmented and mixed reality

G. 3D printing

H. Other _____

I. Not used so far

Please rank the disruptive technologies you select based on their application effectiveness (in descending order):_____.

7. What are the traditional (non-disruptive) technologies that are used by your customs authority within FZs? *[One or more following options could be selected, and please fill in if you select the option "Other"]*

A. Video surveillance

B. Body-worn cameras

C. Non-intrusive inspection scanners

D. Other _____

Please rank the ones you select based on their application frequency (in descending order): _____.

8. In which procedure of FZs logistics flow does your customs authority adopt smart technologies you select in question 6 and 7 to prevent risks and improve efficiency? *[One or more following options could be selected, and please fill in if you select the option "Other"]*

A. When goods transported into FZs (If you select this option, please specify the technologies _____)

B. When goods transported out of FZs for export (If you select this option, please specify the technologies _____)

C. When goods transported out of FZs for domestic consumption (If you select this option, please specify the technologies _____)

D. When goods sold and circulated in FZs (If you select this option, please specify the technologies _____)

E. Other _____(If you select this option, please specify the technologies

_____)

9. What are the main obstacles for your customs authority introducing new technology and innovative solutions? *[One or more following options could be selected, and please fill in if you select the option "Other"]*

A. Resource constraints

B. Lack of standardized data sets used by economic operators in the supply chain

C. Lack of professional knowledge

D. Lack of government's strategic planning

E. Lack of attractiveness or recognition for the stakeholders to introduce the technologies

F. Lack of the relevant practices

G. Lack of information sharing

H. Resistance to change

I. Other _____

10. Please provide 1 or 2 typical examples(s) showing your customs authority's application of smart approaches (technologies and innovation) within the FZs, including, but not limited to the disruptive ones (e.g.: blockchain, IoT, big data, data analytics, AI, ML, biometrics, Drones, 3D printing, VR, AR and MR, etc.).

11. Please give comment on how should the Customs authorities of APEC Economics can adopt disruptive technologies for smarter control and services of FTPs/FZs? *[One or more following options could be selected, and please fill in if you select the option "Other"]*

A. Establish a specialized information platform

B. Develop a coordinated customs process

C. Train customs officers on smart operation

D. Set up a pilot project on smart cooperation

E. Other _____

12. Please introduce the future plan(s) or project(s) of your customs authority for using new technology and innovative solutions within the FZs.

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