II. OVERVIEW OF THE EXISTING NEW TECHNOLOGIES AND MANAGEMENT AT BORDER CROSSINGS

A. Overview of modern equipment and technological solutions

The model on integrated control at border crossings developed under this study intends to establish an efficient and effective information management system. The system can be enhanced with integrated use of modern equipment, technologies and solutions. Each of these components already exists and has practical applications both in ESCAP region and outside. Some of them are popularly used, while others are used by quite a few countries or yet to be introduced.

Currently the modern equipment or systems are used by different control authorities. The results from the use of the equipment or systems are not always shared among the authorities. The model will present a way for more integrated use of them and sharing of data and information collected from them under an information management system.

The following sections contain brief introductions to the main types of existing technological equipment and solutions currently used by control authorities involved in conducting control formalities at land borders.

1. Automatic system of vehicle weight and dimensions control

This system is most commonly used for transport inspection purposes and controls the weight and dimensions of a truck automatically. It is an intelligent identification system with data collection process operated by a computer.

The data on overall weight and dimensions of a truck with or without cargo are measured by sensors and electronic weighing scales and transferred to the computerized work station of the transport inspector automatically.

The system is designed to provide convenience for the users, quickly collect data and avoid possible occasional or deliberate errors made by manual measurement.
This system is currently also used by Customs to check weight/dimension of vehicle and estimate weight of goods against the customs declaration.

2. Automatic vehicle/container recognition systems

The technology of license plate number reading itself is not so new and is widely used by road police in many countries to monitor and identify motor vehicles.

For the purposes of border control, it is important for the control authorities to have the possibility to capture not only the vehicle license plate number, but also the container code in the case of goods carried in containers.

The typical currently used systems can capture images of container code and/or vehicle license plate numbers in real time with a camera, encrypt and transmit them to the computerized operating system. At the same time, the images of license plate number or container code can be displayed on the screen of the control officer operating the system at the border-crossing. The control officer can thus remain at the workstation and does not need to approach the vehicle or container to take note the plate number or code and then input into the computer system.

Being cross-referenced with a relevant database, the license plate number can be used to verify the country of the vehicle (container) registry, the carrier’s previous export/import
operations, transport permit, operating license as well as the driver’s records.

The database may contain information about any infringements previously made by the carrier on the territory of the country. Such information can then be automatically displayed to the control officer at the border crossing before the vehicle enters the inspection zone. Risk assessment and elaboration of decisions for appropriate control measures for the particular vehicle can be made accordingly.

The container code reading system is largely similar in technical design to the system of vehicle license plate number reading system. Although container code reading systems are mostly applied at seaports, they can also be useful at land border crossings handling large number of containers.

In the course of vehicle/container movement through the control point, the reading equipment (video camera with reading interface) automatically compares the container code with the information on the container in the Customs database.

The system can be applied at border crossings by Customs, transport inspection, and by health/animal/plant quarantine authorities.

3. Video surveillance system

Video surveillance system, widely used nowadays in different fields, can also be applied at border crossings for the purposes of border-crossing safety, detection and prevention of smuggling and thefts in its premises. Video surveillance cameras are installed at workstations of the officers of a border crossing to monitor their activities.

Another task for such a system is to capture entry/exit of vehicles to/from the control area of a border crossing and keep such records in the system.

Video surveillance cameras are sometimes integrated into closed-circuit television (CCTV) at a border crossing. Video images can be transmitted from the video cameras to a monitor situated in the premises of a control room within or outside the control area of a border-crossing, viewed in real-time mode by relevant officers. The images are also recorded to be viewed and analyzed later. Contemporary equipment and facilities for data storage may provide for continous non-stop recording for many years.
In many cases, crimes or attempts of crimes at border crossing points were either prevented or detected with the aid of CCTV systems.

Depending upon the purpose of video surveillance, such systems are currently operated either by border security authority (for theft or robbery prevention and detection) and by Customs authorities (for smuggling prevention and detection).

4. **Automatic radiation detection system**

Automatic radiation detection system is widely used at border crossings in order to prevent proliferation of radioactive materials and nuclear weapon precursors and to ensure the safety of people and environment. Radiation detection is usually not a separate kind of border control and is being conducted in automatic mode. In case the radioactive emission is detected, the control officers, which have received alert signal from the automatic system, call emergency service.

The system is usually shaped as a frame containing radioactivity detectors. If the radioactivity level exceeds the limit, the system generates alarm signals automatically.

**Figure 2. Examples of radiation control systems at border crossings**

<table>
<thead>
<tr>
<th>Radiation control system for travelers</th>
<th>Radiation control system for commercial cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

*Source: Oleg Kazennov, consultant, and Fedor Kormilitsyn, Economic Affairs Officer, Transport Division, ESCAP.*
5. **Automatic health-check equipment**

Automatic health-check equipment (fever scanners) is installed at border crossings to detect people suffering with potentially dangerous infection diseases. A number of countries started to apply such equipment at border crossings (mostly at the airports, but at other types of border crossings as well) following the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003.

6. **Vehicle smart card**

Vehicle smart card is a device with a built-in microchip and radio transmitter, which can read, store and transmit information. Smart cards applied on transport contain all the data on the vehicle, goods, transport operation and all other data, required by the control authorities at the border-crossing, and can be applied for all kinds of checks performed at the border-crossing in order to simplify and expedite data reading and processing.

It is technically possible today to keep all the necessary documents, including vehicle documents, consignment notes, transport permits and special authorizations, in the electronic format and store them in the smart card, thus totally abandoning paper-based documents.

However, total shift of all documentation related to transport operations into a paperless format requires many preliminary institutional and regulatory arrangements, including arrangements at international level. Therefore, application of smart cards as data storage device for such documents as, for example, transport permits or consignment notes, has not been seen at present.

7. **Automated passport control system and portable passport reader**

Several countries have already implemented such systems alongside traditional manual passport control, mostly at the airports, and also at some land border-crossings.

The system requires people to undergo automated control procedures with travel documents (e.g., passport), which contain personal data on their holders, including biometrical parameters, some of which can be verified directly at a border-crossing by means of the installed reading equipment. Typically such parameters comprise of fingerprints and/or iris. The user needs only to put the travel document into the reading slot at the border clearance booth, and exposes face and fingerprints to be verified by reading equipment. In the case of
successful verification of all the parameters, the gate behind the booth automatically opens, allowing the person and the vehicle to proceed further.

The system is desirably to be backed up by manual control to avoid problems in case of equipment or microchip errors.

**Figure 3. Automated passport control booth for trucks at a land border crossing**

Another currently available technological solution is portable passport data reading. Such system can not be regarded as a fully automated passport control system, but allows simplification and acceleration of the procedures of passport data reading in any locations, for example inside the vehicles or trains. The modern portable passport readers are very compact, lightweight and can be easily operated by one officer. This type of device is especially used by immigration officers at small border-crossings with insignificant flow of people making installation of fixed passport reaing electronic gates not feasible.

**8. Scanners**

There are several main types of scanners with different degree of mobility that are used at land border crossings:

- Mobile scanner – built on a truck and usually have their own power supply system, which can be easily relocated and provide service for several border crossings on occasional basis;
- Relocatable scanner – usually installed within a building, yet can be disassembled, relocated and then reassembled within a relatively short period of time;
- Fixed scanner - permanently installed on the site, which is used at land border crossing with significant flow of goods;
- Railway scanner - basically the same fixed or relocatable units, constructed for scanning of trains;
- Pallet scanner – relocatable scanners allowing fast and reliable screening of large boxes and pallets; typically used at airports, but occasionally installed at land border crossing points as well; and
- Luggage scanner - generally of the same design as pallet scanners, but of smaller size and intended for screening of personal luggage.

Figure 4. Pictures of a fixed and a mobile scanner

Though scanners are quite expensive lot of countries use them, mostly for Customs purposes. The main objectives of such inspections are:

- to reveal unauthentic declaration of goods; and
- to prevent smuggling of drugs, arms and ammunitions, weapons, historical and cultural values, poisonous substances, furs, tobacco and other sensitive commodities.

The further step in the application of scanners is the transmission of data (X-ray image) on the cargo content to the Customs point of destination. In the course of transit the Customs point of destination has enough time to thoroughly examine the X-ray image and make a decision on necessity of physical inspection and measures of control.
In some cases, the authorities of a country using scanning complexes also interact with big sea ports and reach the agreement to mutually exchange the information on container contents (container X-ray image). In such cases the country of destination has the opportunity to elaborate measures of cargo inspection well beforehand the cargo arrival. This kind of interaction of ports and Customs is used in the countries with several seaports.

9. Electronic seal and vehicle transit tracking systems

The electronic seal is used by Customs:

- to ensure the safety of cargo, container or vehicle in transit; and
- to ensure all information about cargo available for Customs.

The electronic seal is the seal with a computational device at its core. The Customs inspector at a border-crossing reads the unique ID of electronic seal with a special data reader. The seal is attached to the sealed object (container or truck with fixed load compartment) and all necessary data on the cargo are recorded electronically in the seal. All the data is entered into the computer of Customs inspector, and transferred to the central database. Then the system prints out the special sticker with electronic seal ID, which is adhered to transport documents.

The Customs officer at the Customs office of destination reads the electronic data recorded in the seal with special mobile terminal and checks the conformity of the information on cargo in the documents to the data in the central database.
When the seal is attempted to be broken, reading of all the data recorded inside it becomes impossible and, which is the indication that the seal was opened (even if it has no visual signs of breakage).

Electronic seal ensures the security of cargo transport and provides cargo information both at Customs offices of origin, destination and en-route.

**Figure 6. An example of an electronic seal**

![Electronic seal example](http://www.ntc-np.kz/index.php?option=com_content&view=article&id=23&Itemid=14&lang=en)

Electronic seals are also combined with vehicle tracking systems. Such systems typically require installation in a vehicle of an electronic device receiving satellite positioning systems signals and transmitting the data (typically via cellular communication networks) on the vehicle location to the operation centre with regular intervals. The other essential component of such system is the special computer software at an operational centre, which allows analyzing and interpreting the signals on the vehicle location.

10. **Portable detection and laboratory test equipment**

Portable equipment, such as narcotic detectors and substance analyzers, are used by the control authorities to quick yet effective identify substances, such as narcotics, attempted to be illegally moved across the border.

Suspicious substances can be tested in a few minutes without a need to design and construct costly laboratories at border-crossings.

Drug and metal detectors can be used for additional scanning of suspicious persons hidden in the clothes and even inside the human body.
11. Electronic declaration and customs clearance system

Goods intended to be brought to the customs territory of a country can be pre-notified by an electronic advance customs declaration (EACD)\textsuperscript{2} submitted to the Customs agency of the country in question by a carrier, agent or any other entity responsible for the transport operation. The electronic advance customs declaration is used to reduce the time needed for control operations at the border crossing, origin and destination.

Application of such solution is considered to bring at least four important benefits:

1. Customs officer on site, having all the required information on the cargo, only needs to check whether it corresponds against the information in cargo documents submitted.
2. The Customs agency officers have enough time to analyze the received data and to take a decision on the appropriate action on a particular cargo before the cargo arrives at the border checkpoint.
3. The application of EACD reduces risk of customs fraud.
4. Waiting time on site for inspection and clearances is being reduced for carriers. The carrier’s office can send the advance information through Internet either to the central database of the Customs agency, or directly to the Customs agency represented at the border crossing.

EACD is being currently applied in different countries on both mandatory and voluntary basis.

(a) Mandatory EACD

In some countries the carrier of commercial cargo is obliged to submit preliminary information on the cargo to the Customs agency (usually not later than an hour before the arrival to the border crossing). Otherwise, the cargo is not permitted to enter the territory of that country. The electronic preliminary information can be transmitted to Customs agency by means of free software through Internet by consignor, carrier or freight forwarder, or through Customs brokers at the border crossing.

There are special webpages for EACD in the countries where it applied mandatorily. Such

\textsuperscript{2} Other terms are used in practice, for example, “pre-arrival electronic information”, “electronic pre-declaration”, “electronic summary declaration”, “preliminary electronic declaration”, etc.. In this publication, the term “electronic advance customs declaration” and its acronym “EACD” are used, along with the term “advance electronic information”, which is referred to describe technical possibilities to submit wider range of information (not only related to customs) in advance.
webpages are typically hosted by national Customs administrations.

The introduction of the system of mandatory EACD requires large amount of preparatory work. All the stakeholders should be informed about its introduction well in advance; regulatory arrangements for favorable conditions at the border crossings should be made; and special computer software to ensure the transmission of information via Internet should be developed and tested, etc..

Introduction of obligatory advance information normally requires overall high level of ICT development in the country in question, as well as previous experience in the application of advance customs information on voluntary basis.

(b) Voluntary EACD

Voluntary EACDs are usually applied in “test mode” by the countries which plan to introduce mandatory EACD in the near future.

The carrier (consignor, freight forwarder or agent) has the opportunity to transmit the preliminary electronic information about cargo via the official website of the national Customs administration of a country. The carrier transmits the EACD through Internet and receives the unique ID for a particular transport operation. The carrier declares the cargo at the border crossing point and reports the unique ID to the Customs inspector. The inspector checks the conformity of electronic data in his computer against the data in the documents submitted to him/her by the carrier and, if there are no discrepancies and the cargo can be released according to rules and regulations, then releases the cargo.

The inspector, having obtained the necessary customs information in advance, does not need to enter this information into the database manually, which was estimated to save at least 10 minutes to process one shipment of commercial cargo.

The Customs agency of a country in question can make arrangements with neighboring countries or group of countries to mutually exchange the EACD. In this case the Customs offices of the country of import can receive the official information about cargo which was submitted by carrier in the country of export.
12. Computerized systems for transit control

The Customs authorities of the integration community member countries or customs unions use the computerized transit systems to control transit of goods through the territory of all the members of such communities or unions. They can access the information on cargo which entered the customs territory of the member country in question through the border crossing on the territory of another member country.

The computerized transit system is usually based on unique ID of every transit operation and on exchange of messages between the Customs offices and the central database. The unique ID may have certain structure or be formed in a random way.

The Customs officer at the border checkpoint creates a message about transit operation which has commenced. This message contains all the required information on transit operation (seller, buyer, carrier, cargo description and term of delivery, etc.). The Customs officer sets the term of cargo delivery for the carrier. The message with data on transit operation is then sent to the central database. The Customs office of destination automatically receives it and controls the cargo delivery. If the term of delivery is about to run out and there is no information about delivery, the Customs officers at the border crossing, which originated the transit, and the Customs office of destination can start investigation.

In some countries the ID of transit operation is duplicated with a bar code. The bar code is being printed in upper corner of transit document. Due to the uniqueness of ID the transit document is printed out on plain paper, with no need to use special protected forms. With the bar code, the Customs officer doesn’t need to search the transit operation ID in database. Scanning of the bar code makes all the information on cargo immediately available on the screen of the workstation.

13. Electronic queue management system

The electronic queue management system is widely applied nowadays in our everyday life, including banks, offices and medical clinics. The similar system is used at some border crossings, mostly by Customs agencies. According to carriers’ reviews, this system makes waiting time much more comfortable.

The user takes the ticket and waits for his/her turn to come. The queue moves electronically and the user doesn’t need to search for a free desk and has no opportunity to contact with a “desired” inspector.
The electronic queue management system at border crossings is also used for preventing long lines of vehicles queuing for entry into the inspection zone. Instead of standing in line and causing congestion on the road, the driver, having received the queue ticket, can move the vehicle to the special parking lot while the queue is moving.

B. Joint control at border crossings

1. Varying practices in the number of agencies represented at border crossings

There may be no single solution or recommendation on the optimal number of government agencies to be located at border-crossings as such number may depend on the needs for specific kinds of checks desired to be conducted at the border. The set of such checks may depend upon such factors as, for example:

- Priority targets for checks conducted at the border-crossings (public security protection, smuggling combating and prevention, customs revenue collection, public health protection, etc.);
- Prevailing type of traffic through the border (goods, passengers, local people, etc.);
- Prevailing type of goods carried through the border-crossings;
- Potential risks for illegal immigration or human trafficking; and
- Potential risks for smuggling of illicit goods, such as narcotics, weapons and explosives.

The checks at a border crossing may typically include, but not limited to:

- Immigration control;
- Customs inspections;
- Health, phytosanitary and veterinary inspection and quarantine;
- Checks of goods quality certificates (typically for foodstuffs); and
- Transport inspections (checking transport permits and licenses, vehicle weights and dimensions, collecting road tolls or taxes, etc.).

Some of the checks, for example, passport control and customs formalities, are to be conducted in respect of every vehicle crossing the border, so that the government authorities in charge of such checks should be represented at the border on permanent basis.
Other checks may be conducted on selective cases, and the number of checks may not be significant, depending on the type of traffic flow, geographical position of a border crossing and types of goods transported across the border. In such cases, it may not be necessary to have all the government agencies represented at the border crossings permanently.

Some of the checks, for example, transport inspection, can be effectively performed inland, reducing the workload of the border crossings.

In cases when multiple agencies are being represented at border crossings, and the control procedures are being organized in a way that each of the agencies has its own control line at the checkpoint, the number of such lines may be excessive and lead to long lines of vehicles and thus long waiting time at the border.

Planning the improvements at border crossings in respect of more streamlined procedures, a clear distinction between the appropriate number of agencies and the number of control lines need to be made.

2. Initiatives on the reduction of the number of agencies

The recent trend followed by many countries is the introduction of various initiatives to simplify the control procedures at border crossings and to reduce the number of required checks. Apart from details and terminology used, there are generally two approaches:

(a) Cooperation among the government agencies, under which various relevant agencies could carry out a number of control procedures in the way enabling to reduce the number of required checks and to simplify the applicable formalities.

Such initiatives widely known in the Asia-Pacific region is single-window and single-stop inspection, such as in the countries of Greater Mekong Subregion (GMS)³ on the basis of the GMS Cross-Border Transport Agreement⁴.

According to Article 4 (a) of the Agreement, single-window inspection is “the different inspections and controls of People (passport/visa, driving license, foreign exchange, customs, health/epidemiological), Vehicles (registration, roadworthiness, insurance), and goods (customs, quality, phytosanitary/plant protection, veterinary) shall be carried out jointly and simultaneously by the respective Competent Authorities involved (e.g., customs, police,

---

³ Including Cambodia, China, Lao PDR, Myanmar, Thailand and Vietnam.
immigration, trade, agriculture, health department).”

Some border crossings in GMS are in the process of implementing the initiative in phases.

(b) Reduction of the number of government agencies represented at border crossings

Implementation of border-crossing policies under this approach requires delegation of authority by some of the government agencies to other agencies. For example, some simple routine checks, which do not require deep narrow-field knowledge and skills, such as vehicle weighing, can be easily handed over from transport authority to Customs or quarantine authority. Delegation of authority as a modality of border checks reduction can be combined with arranging for some of the control procedures inland.

In some other countries, some types of border checks, such as transport inspection, health and plant quarantine inspection, were delegated to the existing agencies, typically, Customs authority.

Implementation of both approaches requires series of preparatory work, starting with legal arrangements at government level, other institutional arrangements, including providing for the exchange of information, additional staff training.

C. Separation of flows at border crossings

At some border crossings handling large flows of goods and passengers separate lanes for different categories of vehicles can be organized.

This measure can prevent or reduce queues and waiting time at the borders and avoid unnecessary delays in processing vehicles of different types.

Simplified comparison of only three types of the procedures applied at a border crossing (passport control, customs procedures and transport inspection) shows that the amount of time required for each group of procedures significantly varies for different categories of vehicles.

In the case of vehicles with goods crossing the border, mostly customs procedures in respect of the goods need more time required for border clearance, especially if customs clearance of goods is being conducted directly at the border-crossing.
In the case of processing commercial passenger vehicles (buses and coaches) at the border, the most time-consuming part of formalities is checking passports of the passengers. Customs procedures in respect of passengers’ luggage are much simpler than for commercial goods and do not require much time.

Finally, the formalities for private passenger vehicles (private cars) are the simplest, as such vehicles do not carry many passengers, and passport control procedures do not require much time. Transport inspection procedures which should be conducted in respect of commercial transport (transport permits, driving time and rest periods, etc.) are normally not applicable for private cars.

Table 1 shows that in the case of common flow at the border crossings, processing of the vehicles, for which more complicated and time-consuming control procedures are required, can lead to unjustified for other categories of vehicles, which can be processed quicker.

Table 1. Main categories of vehicles and selected border formalities

<table>
<thead>
<tr>
<th>Types of border formalities</th>
<th>Commercial cargo vehicles (trucks)</th>
<th>Commercial passenger vehicles (buses and coaches)</th>
<th>Private vehicles (cars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passport control</td>
<td>Quick</td>
<td>Slow</td>
<td>Quick</td>
</tr>
<tr>
<td>Customs formalities</td>
<td>Slow</td>
<td>Quick</td>
<td>Quick</td>
</tr>
<tr>
<td>Transport inspection</td>
<td>Required</td>
<td>Required</td>
<td>None</td>
</tr>
</tbody>
</table>

At some border crossings, where it is not possible or not reasonable to organize separate lanes due to low volume of traffic, special arrangements for priority checks can be made in respect of passengers of buses and coaches.

Another possible way of organizing special lanes is installation of special booths and gates for the holders of electronic passports, as well as for the persons enjoying simplified immigration procedures, such as visa exemption.