MODEL ON INTEGRATED CONTROLS AT BORDER CROSSINGS

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ABBREVIATIONS

BCMIS	**Border Crossing Management Information System**
BCP	**Border crossing, border crossing point, border checkpoint**
CCTV	**Close-circuit television**
CDEP	**Common Data Exchange Platform**
EACD	**Electronic Advance Customs Declaration**
ESCAP	**United Nations Economic and Social Commission ofr Asia and the Pacific**
ICT	**Information and communications technology**
ID	**Identity document**

I. INTRODUCTION

Despite the impact of the current economic crisis, the increase of flow of cross-border trade and people movement remains a general trend. The trend will contribute significantly to intra-regional trade and regional economic development.

However, the trade between countries is highly impeded by delays at border crossings[1] due to different and complicated border control procedures. Many of the existing border-crossing technologies and procedures are not structured to meet today's challenges.

It is obvious that the increase of capacity of border crossing points is an absolute must in the present environment. Government agencies in charge of border control, however, inevitably face serious challenges with the growth of cargo volume and number of people moving across the border, as they need to safeguard national interests and facilitate trade at the same time.

Therefore, the procedures used at border crossings need to be modernized to allow efficient border clearance, assure security and prevent smuggling and trafficking. Another major problem is impossibility to increase human and financial resources allocated for border control procedures in proportion to the growth of cross-border flow of goods and people.

Border control authorities can address those challenges through the adoption and application of equipment and systems based on information and communication technologies (ICT) and streamlined procedures, making border crossing procedures, including immigration clearance, Customs control and other necessary border inspections efficient and effective, yet less resource-consuming. However, potentials of the modern equipment or systems have not been fully utilized to achieve more efficient and effective inspections and clearances.

All the countries of the ESCAP region are currently exerting efforts towards border crossing automation, and some countries have achieved very impressive results, while others face multiple difficulties preventing from introduction or effective use of modern systems.

The objectives of this study are to provide an analysis of the existing practices, modern equipment and systems and solutions used at border crossings, and to propose a conceptual

1 In this study report the terms "border crossing", "border crossing point" and "border checkpoint" are used as synonyms to indicate a place on the border between two countries, where the checks of people of goods are being conducted

model of integrated controls at border crossings, which can be used as an approach for technical design of information management and workflows at border crossings.

The model is being developed under an inter-Divisional project of ESCAP entitled “Deepening Asian Connectivity-Capacity building for trade and transport facilitation through ICT development”, which was jointly implemented by Trade and Investment Division, Transport Division, and ICT and Disaster Risk Reduction Division, ESCAP.

The model is also a part of the initiatives under the Regional Strategic Framework for the Facilitation of International Road Transport that was adopted by the Ministerial Conference on Transport held in Bangkok in March 2012.

The model will be updated periodically based on the development of new technological solutions or innovative approaches in the applications of such solutions for simplifying border-crossing prcedures and formalities.

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.

Figure 1. Automatic truck scale

Source: http://www.kjhq.com/Product-EN/Truck-Scale/11.html, accessed on 12 September 2012.

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-curcuit 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-crosing, 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

Radiation control system for travelers	Radiation control system for commercial cargo
	

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 crossing 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

Source: http://www.gov.hk/en/residents/immigration/control/echannel.htm

Another currently available technolgical 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 reaeing 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

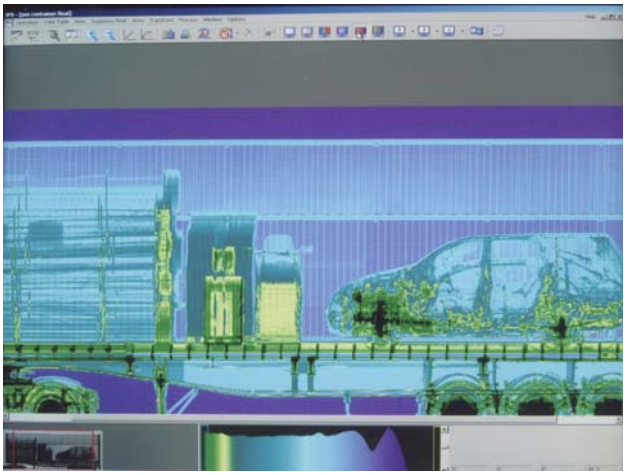
Fixed scanner	**Mobile scanner**
	
Source:http://stock-clip.com/video-footage/smuggling	*Source: http://www.sciencephoto.com/media/418761/enlarge*

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.

Figure 5. Image of scanned goods inside the truck displayed in the control room



Source: http://www.customs.gov.au/webdata/resources/photogallery/031118_x_ray_imagery1.jpg

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

Source: 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)[2] submitted to the Customs agency of the country in question by a carrier, agent or any other entity responsibe 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. and
4. Waiting time on site for inspection and clearances is being reduced for carrier. 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

2 Other terms are used in pracrice, 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:

- Prioritiy 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, dependidng 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 approporiate 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 Agreement[4].

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.

4 The GMS Agreement for Facilitation of Cross-Border Transport of Goods and People, 1999.

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 reptresented 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 simplier than for commercial goods and do not require much time.

Finally, the formailties for private passenger vehicles (private cars) are the simpliest, 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

Types of border formalities	Commercial cargo vehicles (trucks)	Commercial passenger vehicles (buses and coaches)	Private vehicles (cars)
Passport control	Quick	Slow	Quick
Customs formalities	Slow	Quick	Quick
Transport inspection	Required	Required	None

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.

III. THE MODEL ON INTEGRATED CONTROL AT BORDER CROSSINGS

A. Information related to cross-border goods transport operations required by government agencies

Whatever are the number, combinations and duties of the government agencies represented at border checkpoints, they need to collect and process information related to movement of goods and vehicles across the border in order to conduct their functions successfully. All the control formalities at border crossings are anyway related to information collection and processing. For goods transport operations, such information may relate to either goods, vehicles carrying the goods, and drivers of such vehicles.

The ways to collect information related to border-crossing formalities may include:

- Checking the documents submitted by a carrier at the border crossing;
- Checking electronic information submitted prior to the arrival of a carrier to the border crossing;
- Receiving data on the results of actual checks of goods, vehicle and driver at the inspection zone within the border crossing; and
- Capturing data from the databases available to the government agencies.

Table 2 provides a provisional and non-exhaustive list of data that may be required for goods transport across the border. The categories of information required by government authorities in particular cases may differ from that list in the table. Some data categories may not be needed for all transport operations; some other types of data not mentioned in the table may also be required. This table serves as an example of the number of data categories that can be typically required. The sequence of the lines in with the data names is provisional.

Table 2. Provisional list of data collected and processed by government agencies in the case of cross-border movement of goods

Data on goods	Data on vehicle	Data on driver
Description of goods	Transport permit	Passport (ID) and visa
Import licenses/export permits	Special transport permit for over-sized or over-weighted goods	Driving license/ Professional competency
Waybill/bill of lading/ consignment note	Vehicle registration/certificate/ plate number	Personal effects Personal carriage
Invoices/contracts	Vehicle information (make, engine, chassis, year of manufacture, net weight etc.)	Weapon or explosive
Packing lists	Vehicle roadworthiness (loaded)	Health
Certificates of Origin	Weights and dimensions	Radiation
Veterinary certificate	Compulsory insurance	Driving time and rest period
Phytosanitary certificate	Vehicle taxes, road charges	Criminal record
Sanitary certificate	Temporary importation document	Record of offense to traffic rules
Quality control certificate	Quantity of fuel in tank or number of tanks	Record of offense to Customs rules
Guarantee for transit	Carrier/operation license	
Loading/unloading places	Route	
Consignor/consignee	Infection of human disease	
Weight/volume	Insect pest	
Container information	Animal disease	
Packaging information	Radiation infection	
Duties/taxes	Customs certificate of vehicle	
Dangerous/hazardous/prohibited goods	Certificate for carriage of dangerous goods	
Radiation goods	Certificate for carriage of perishable goods	
Letters of Credit	Vehicle irregularity record	
Value/valuation	Collection of statistical data	
Customs seals		
Collection of statistical data		

This list contains 23 categories of data on the goods, 21 categories of data on the vehicle and 10 categories of data on the driver, altogether 54 categories.Time required by the control agencies at border crossings to collect and process all the necessary data directly influences overall time required for control procedures.

Some types of data mentioned in Table 2 are required by only one of the government agencies involved into border-crossing formalities, while other categories are required by two or more agencies.

The names of the government agencies mentioned in this chapter are related to the types of border-crossing formalities conducted by them, rather than to the official names of such agencies, as same type of formalities can fall under the sphere of duties of different government bodies in different countries.

Figure 7 displays the types of data related to cross-border transport, which are required by multiple government agencies.

The same as in Table 2, the data categories shown in this diagram are provisional, as are the sets of agencies which require such data.

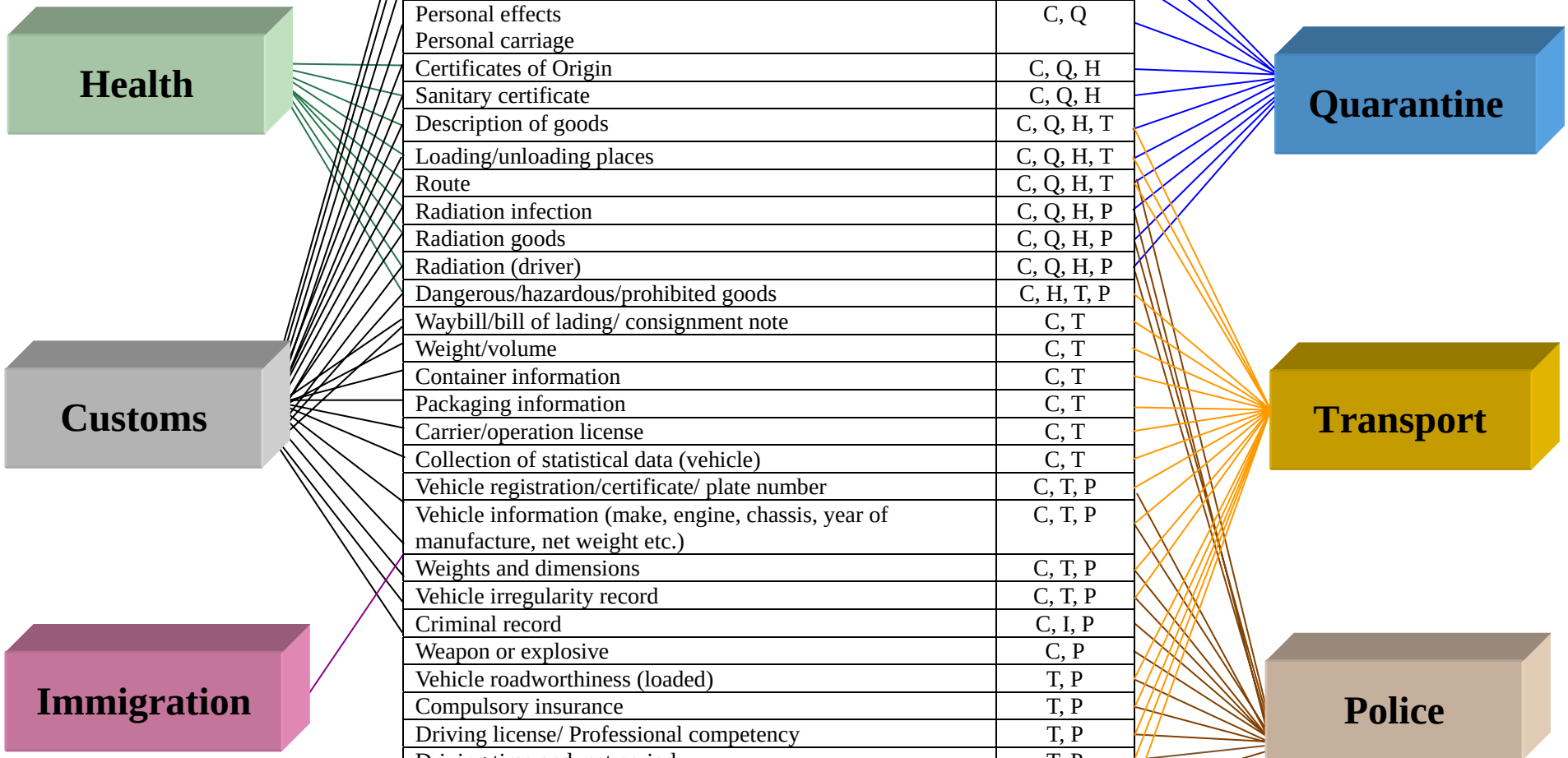
In practice, the number of categories of information required by particular government agencies involved into border-crossing checks related to goods transport depends on several factors, for example, the types of goods moved through the border crossing in question and the number of such agencies in a particular country.

The estimated number of data categories that may be required by several government agencies, is 30 out of total 54 categories shown in Table 2; 16 categories required by two government agencies, 7 categories – by three agencies and other 7 – by four agencies.

Multiple demands for the same type of data by different government agencies may potentially result in additional time required for repetitious processing of such pieces of information, which would significantly increase overall time required for border-crossing formalities.

In theory, information required by four agencies may need to be submitted for processing totally four times. This is, perhaps, an extreme case rarely met in practice. However, even if two agencies need the same data at a border crossing, this may require repetitious procedures of capturing and processing information originating from the same source.

Figure 7. Common information needed by major agencies relating to cross-border transport



Veterinary certificate	C, Q
Phytosanitary certificate	C, Q
Quality control certificate	C, Q
Personal effects Personal carriage	C, Q
Certificates of Origin	C, Q, H
Sanitary certificate	C, Q, H
Description of goods	C, Q, H, T
Loading/unloading places	C, Q, H, T
Route	C, Q, H, T
Radiation infection	C, Q, H, P
Radiation goods	C, Q, H, P
Radiation (driver)	C, Q, H, P
Dangerous/hazardous/prohibited goods	C, H, T, P
Waybill/bill of lading/ consignment note	C, T
Weight/volume	C, T
Container information	C, T
Packaging information	C, T
Carrier/operation license	C, T
Collection of statistical data (vehicle)	C, T
Vehicle registration/certificate/ plate number	C, T, P
Vehicle information (make, engine, chassis, year of manufacture, net weight etc.)	C, T, P
Weights and dimensions	C, T, P
Vehicle irregularity record	C, T, P
Criminal record	C, I, P
Weapon or explosive	C, P
Vehicle roadworthiness (loaded)	T, P
Compulsory insurance	T, P
Driving license/ Professional competency	T, P
Driving time and rest period	T, P
Record of offense to traffic rules	T, P

B. Border Crossing Management Information System (BCMIS)

1. Overall description

The present study proposes a concept of a solution that could help minimize the excessive time required at border crossings to process all the necessary information by elimination (or at least reduction) of procedure duplication and simplification of ways for data processing by government authorities.

The model of Border Crossing Management System (BCMIS) is based on integration of information flows and application of modern equipment and technological solutions to capture and process the required information on goods, vehicles and drivers (crew) crossing land borders, mainly by road.

The BCMIS is based of several main principles, namely:

- Cooperation between the government agencies in information sharing;
- Joint use of equipment for data collection and processing;
- Integration of data into common data exchange platform; and
- Possibility to use common or compatible software to process and analyze data for the purposes of each agency.

Table 3 and Figure 8 are to give visual presentation of BCMIS logical framework design.

In Table 3, all the categories of information are being grouped in three columns (data on goods, data on vehicles and data on driver). A code is designated to each category of information, showing its source and provisional sequential number. Some categories of information can be captured from different sources. In that case, two codes are designated in the table. The abbreviation for each agency, which may require a particular category of information, is being placed in the table against each category.

The same codes of information categories are also used in Figure 8.

Table 3. Data required for carrying goods across the border, its sources and government agencies concerned

Data on goods			Data on vehicle			Data on driver		
Type of data	**Data code**	**Agencies concerned**	**Type of data and its code**	**Data code**	**Agencies concerned**	**Type of data and its code**	**Data code**	**Agencies concerned**
Description of goods	D1, I1	C, Q, T	Transport permit	D24	T	Passport (ID) and visa	D42, P1	I
Import licenses/export permits	D2	C	Special transport permit for over-sized or over-weighted goods or dangerous goods	D25	T	Driving license/ Professional competency	D43	P, T
Waybill/bill of lading/ consignment note	D3	C, T	Vehicle registration/certificate/ plate number	D26, C2	T, C, P	Personal effects Personal carriage	D44, I5	C, Q
Invoices/contracts	D4	C	Vehicle information (make, engine, chassis, year of manufacture, net weight etc.)	D27, I3	T, C, P	Weapons or explosives	I6	C, P
Packing lists	D5	C	Vehicle roadworthiness (loaded)	D28	T, P	Health	F1	H
Certificates of Origin	D6	C, Q, H	Weights and dimensions	D29, A1	T, P, C	Radiation	R3	C, Q, H, P
Veterinary certificate	D7	C, Q	Compulsory insurance	D30	P, T	Driving time and rest period	D45, I7	P, T
Phytosanitary certificate	D8	C, Q	Vehicle taxes, road charges	D31	T	Criminal record	H5	I, P, C
Sanitary certificate	D9	C, Q, H	Temporary importation document	D32	C	Record of offense to traffic rules	H6	P, T
Quality control certificate	D10	C, Q	Quantity of fuel in tank or number of tanks	D33, I4	C	Record of offense to Customs rules	H7	C
Guarantee for transit	D11	C	Carrier/operation license	D34	C, T			
Loading/unloading places	D12	C, Q, H, T	Route	D35	C, T, Q, H			
Consignor/consignee	D13	C	Infection of human disease	D36, H1	H			
Weight/volume	D14	C, T	Insect pest	H2	Q			
Container information	D15, C1	C, T	Animal disease	D37, H3	Q			
Packaging information	D16, I1	C, T	Radiation infection	R2	C, Q, H, P			
Duties/taxes	D17	C	Customs certificate of vehicle	D38	C			
Dangerous/hazardous/prohibited goods	D18, I2	C, T, P, H	Certificate for carriage of dangerous goods	D39	T			
Radiation goods	D19, R1	C, Q, H, P	Certificate for carriage of perishable goods	D40	T			
Letters of Credit	D20	C	Vehicle irregularity record	H4	T, C, P			
Value/valuation	D21	C	Collection of statistical data	D41	T, C			
Customs seals	D22, E1	C						
Collection of statistical data	D23	C						

Table 3 key:

1) Abbreviations for the functions of the government agencies used in the table (see “Agencies concerned” columns):

C = Customs (checks and procedures related to collecting and safeguarding customs duties and controlling the flow of goods across the border)

H = Health (sanitary and phytosanitary checks, checks of certificates for goods which can affect public health, e.g. foodstuffs, etc)

I = Immigration (checks of travelers’ documents (passport, ID, visa, etc.) validity and decisions to permit entry to or exit from the territory of a country)

P = Police (law enforcement, including road traffic rules, border crossing point overall safety and security, immigration irregularities; in some cases, transport irregularities as well)

Q = Quarantine (checks of certain categories of goods transported across the border with the purpose of limiting or preventing spread of animal and human diseases)

T = Transport (checks of vehicles crossing the border, including checks of transport permits, appropriate certificates, vehicle weight and dimensions, commercial transport irregularities, etc.)

2) Abbreviations for information sources (see “Type of data and its code in relation to source” columns):

a) Module1: Data collected with equipment installed at the border-crossing

A - Automatic system of vehicle weight and dimensions control
C - Automatic vehicle/container recognition system
P – Automated or mannual passport control system
R - Automatic radiation detection system
F - Automatic fever scanner
E - Electronic seals and vehicle transit tracking system
I – Inspection (using modern equipment, including scanner, laboratory test equipment, etc.)

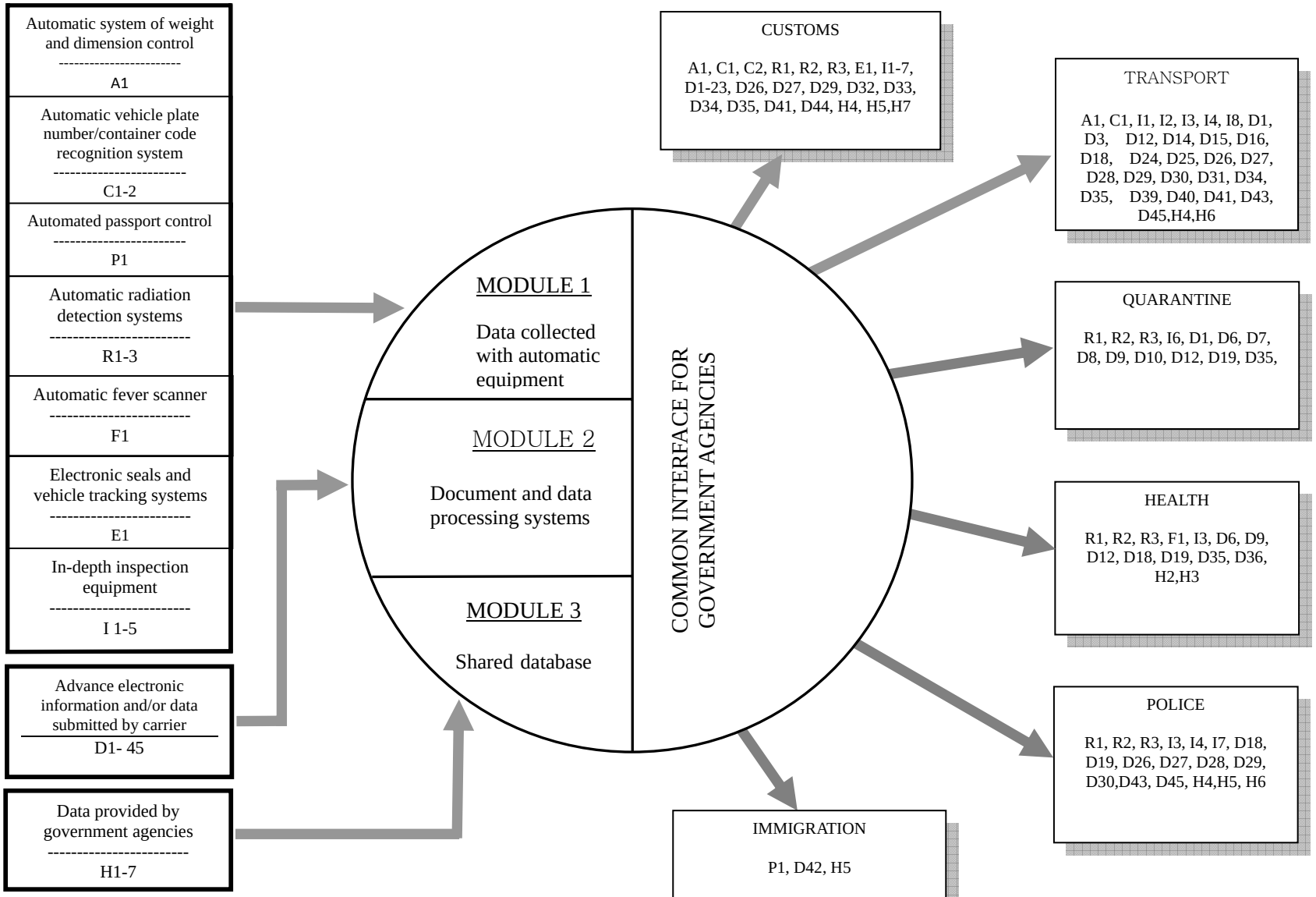
b) Module 2: Document and data processing systems

D - Advance customs information submitted by means of electronic summary declaration or documents submitted by the carrier at the border crossing and read electronically or manually (including electronic documents or data recorded on vehicle smart card)

c) Module 3: Shared database

H – Data provided by government agencies for shared use

Figure 8. Border Crossing Management Information System (BCMIS) for goods transport



The key feature of the model is to integrate collection and processing of the data related to cross-border transport operations into the common exchange platform for subsequent shared use by the government agencies concerned.

The required information is being collected from various sources shown in the boxes in the left part of Figure 8.

The first group of information sources includes:

- Collection of information captured at the border crossing automatically with electronic equipment, or, in absence of such equipment installed at a particular border crossing, by "traditional" visual and/or instrumental checks; and
- Actual checks of goods and vehicles, if such checks are being conducted in respect of a particular vehicle.

The second group of information sources, which comprises the largest number of data categories, including most of the data related to customs procedures, is the data submitted to the government agencies electronically (including advance (pre-arrival) electronic information) or with paper-based documents;

The third group of information sources comprises historical records already available for government agencies and used mostly to check the availability of information on past infringements, which can affect decision on imposing restrictions or applying more detailed checks. This group may also include various warnings for potential additional risks related, for example, with the origin of particular goods, such as livestock transported across the border and originating from areas currently affected with epizootic outbreaks.

The data collected from each source (group of sources) is initially recorded and stored in relevant agencies' databases. Such databases can be connected to the Common Data Exchange Platform (CDEP), and all or the agreed part of data is made available for shared use by all government authorities concerned.

The common difficulty for sharing information among the agencies at present is unwillingness of most of them to disclose their databases to other government bodies, as some pieces of information are of restricted nature. The other reason for such policies is the traditional approach to collect and record data exclusively for their own agencies.

The CDEP is not a common database jointly used by all the government agencies, but a

special software application that allows to process data, originating from various sources, and to transmit it to the agencies concerned in a suitable electronic format.

Application of the CDEP does not require disclosure of all data contained in the agencies' databases to other agencies.

Using the approach of joint information management at border crossings (BCMIS) can save a lot of time in terms of conducting border crossing formalities, as the same type of data need not to be collected from the same sources several times.

Technically, BCMIS generally consists of the following components:

- Information collection;
- Information processing;
- Information storage;
- Information exchange (CDEP); and
- Connections between the components.

The best effect of BCMIS application can be reached when all the components operate on the basis of modern ICT-based technological equipment and solutions. However, the important feature of BCMIS is its flexibility in terms of pieces of electronic equipment and technological solutions required. Some pieces of such equipment can be extremely expensive and it may be not feasible to install all of them at each border-crossing.

Depending on availability of ICT-based equipment and solutions, BCMIS can be not only fully, but also partly electronic, in which case some of the components could be based on more traditional procedures.

The time-saving effect of avoiding the duplication of formalities for partial electronic versions of the system would still take place, though to less extent compared to full electronic system.

The full electronic BCMIS can have the following general features:

- Collection of information at border crossing with ICT-based automatic equipment;
- Application of advance electronic information systems in place;
- Remaining part of information submitted through paper-based documents to be read and processed electronically (bar-code reading technology, etc.);

- Electronic databases with records on goods shipment/carrier/vehicle/driver available for shared use by different government agencies;
- In-depth checks conducted with modern equipment (scanners, laboratory test equipment, etc.);
- All data transmitted electronically to the government agencies' separate databases and part of the data agreed for shared use available to other government agencies through the CDEP;
- All data being processed electronically with computer software and available to government agencies through the common interface; and
- Forms of documents automatically generated by computer software used by various government authorities, which allows field officers at border crossings not to spend time on inserting data manually.

The partial electronic BCMIS can have different versions, depending on the combination of the equipment and/or solution items available for processing data at a particular border crossing. The following examples are to illustrate partial electronic BCMIS:

- Some parts of information flow being collected and with electronic equipment, same as described above;
- Other parts of information flow being processed by manual inputting of information obtained from paper-based documents, visual checks and in-depth actual checks (with or without automatic equipment) into government agencies' databases connected to the CDEP;
- The data available in the CDEP to be used by the appropriate agencies through the common operational interface; and
- Forms of control documents to be generated by manual keying in data by the control officers at a border crossing.

The essential common element of any type of BCMIS, whether fully or partly electronic, is the possibility for shared use of data by the agencies involved into border control formalities by means of the CDEP.

2. BCMIS and government agencies represented at border crossings

One of the current trends in the facilitation of the control procedures at border crossings is the reduction of the number of agencies at border crossings by delegation of authority to other agencies, mainly for documentary checks conducted at border crossings, or by combination of both methods.

Such measures may bring tangible results in terms of reduction of time required for discharging the formalities at the border crossings. At the same time, their implementation requires quite complex set of preparatory measures, including re-design of the existing border infrastructure, which may be quite costly. Institutional arrangements, especially for authority delegation, may be more complicated and imply more direct and indirect costs for the governments then the costs of investment into infrastructure modernization.

The BCMIS concept is based on the assumption that the exchange of information and rational use of technological equipment may benefit the users of the border crossings irrespectively of other simplification measures in place.

It can provide quicker access to the required information related to international transport operations to all the agencies concerned whatever is their positioning, inside the territory of a border crossing or inland, and whatever is the number of agencies and control lines at such border crossing point.

BCMIS can be applied in flexible environment both along with measures on optimization of the number of agencies represented at border crossing point or keeping the existing number of agencies and their spheres of competence in border-crossing formalities unchanged.

Whatever is the number of agencies represented at border crossings or involved into conducting the necessary checks, extensive sharing of information can result in reduction of control lines (or so-called “faces”) at border crossings for mainstream documentary checks.

The simplified BCMIS-based workflow concept described in this chapter assumes that two control lines at border checkpoint are sufficient for processing of the main flow of vehicles, when only documentary checks are required, while the facilities for in-depth checks are being located aside the main control lines.

One of the two main control lines is designated for passport control, usually conducted by immigration authority. All other routine documentary checks, not requiring in-depth inspections, can be conducted at the other control line, which can be operated by the officers of Customs agency. Officers of other government agencies (health, quarantine, transport, etc.) may be located aside form the main control line, for example, at in-depth inspection area. Having access to all the required information on border-crossing operation (data on goods, vehicle and driver) through the CDEP, the officers of such government agencies decide on their need to participate in the documentary checks physically (in this case, the relevant

officer(s) can approach the main control line) and/or on the need on in-depth inspection (in this case, the vehicle is being directed to the in-depth inspection area).

3. Joint use of equipment by different agencies

Modern technological equipment, including ICT-based units, can substantively improve the efficiency of the inspections at the border, but implies high costs for operation, maintenance, as well as other direct or indirect costs.

It is thus desirable to plan the procurement and installation of such equipment at the border crossings in an integrated way, avoiding use of sets of equipment, which can be substituted with other types of equipment for the same types of checks.

Using integrated BCMIS approach on information sharing, different government authorities can use same pieces of equipment and results of the same checks for different purposes. For example, the results of cargo scanning can be used by both customs and quarantine authorities, for different interests respectively.

Joint use of equipment may include not only exchange of data received by means of automatic systems through the CDEP, but extend to sharing costs related to the procurement, installation, maintenance, etc. by several government authorities. Such extended form of cooperation requires additional arrangements between the government bodies, but at the same time reduces costs related to upgrading of border-crossing facilities.

4. The importance of software compatibility

The available practical experience of cooperation between the government agencies in border management based on information exchange approach reveals that the efficiency of such cooperation largely depends on the possibility of quick processing of the relevant data by control officers of each agency and making it available to other agencies. This requires careful design of technical solutions applied for the exchange of information, namely the software used by different government authorities involved into inter-agency cooperation.

There are some negative practical examples, when the control officers of different agencies continued to use their operational software applications, compatible to those agencies' databases only. Because of that, control officers of each agency had to open the databases of all other agencies to check the required information. In the best case, that slowed down the control operations at border crossings and almost totally nullified the positive effect of

information sharing, and, in the worst case, made information exchange impossible, as databases used by some of the agencies could not be accessed to from the workstations of the control officers of other agencies.

The effective technical design of BCMIS at particular locations thus requires application of common or at least compatible operational software for different government agencies exchanging information.

C. A vision of possible application of ICT-based equipment for data collection and processing

Modern ICT-based equipment and solutions for capturing and processing of data related to border-crossing formalities can significantly reduce time required for such formalities and enhance efficiency of BCMIS.

Subject to technical design of the system for particular border crossings, the following systems can be applied to accelerate information flow and save time for data processing.

a) Automatic data collection systems installed at the border crossings

This group of equipment may include automatic weight and dimensions control system and automatic vehicle/container recognition systems, which can be supplemented by automatic radiation detection system and automatic fever scanning system.

The first three systems can be installed at the entrance to the controlled areas of a border crossing.

The automatic weight and dimensions control system can integrate scale for vehicle weighing and video camera or sensors to capture vehicle dimensions. The data reading equipment is being connected to the computer which can process the data and send it to relevant databases and/or to the CDEP.

Alternatively, the systems of weight and dimensions reading can be separated into two components. In that case, it is easier technically to implement system of weighing, which does not require the vehicle to stop (weigh-in-motion system).

The automatic vehicle/container recognition system consists of video cameras (connected to the computer) capturing and sending the images of vehicle license plates and/or container

code plates to the CDEP.

Before the vehicle approaches the control line, the data on vehicle weight, dimensions and license plate number, as well as on container code, can already be processed and appear in the CDEP, which enables the officer of the relevant control authority to read it immediately and to take appropriate decision on the required actions. The operational software can have an option to highlight the parameters of the vehicle, which exceed standard requirements ("alert marker"), to attract the control officer's attention to oversized/overweighted vehicles.

Automatic radiation detectors, if their installation is necessary, can also be located at the entrance to the border crossing, and if the system sends an alert signal, the vehicle can be stopped by police or other security authority before passing the passport control by the driver.

Automatic fever scanners can be installed prior to the entrance to driver's passport control line and send alarm signal before the clearance of immigration formalities.

b) Electronic seals and vehicle tracking systems[5]

At border crossings, e-seals can be visually checked by control officers in charge of customs formalities.

In case of application of vehicle tracking systems by Customs authorities, the Customs officers at the border crossing may have technical possibility to request the data from the vehicle tracking operation centre regarding the route of a vehicle equipped with a tracking unit. They can also receive notification from the operation centre on deviation of such vehicle from the route or request for additional check of such vehicle.

c) Advance (pre-arrival) electronic information

The possibility to use the advantages of receiving advance electronic information, which relates mostly to customs matters (EACD and, possibly, some other pieces of information), depends largely on the scope of technical design of the information management system at particular border crossings and depends on the availability of the advance electronic information system in the country in question.

In the case such solution is being applied by the government authorities, it is highly desirable

5 For detailed descriprion of application of e-seals and vehicle tracking systems for cross-border transport, see ESCAP Secure Cross Border Transport Model available http://www.unescap.org/ttdw/common/TFS/SCBM.asp.

to provide for linking border-crossings to such system, as it would significantly reduce time to process data at the border.

d) Data submitted by the carrier upon the arrival to the border crossing

Even in case of availability of advance electronic information, lots of data are anyway to be collected and processed directly at the border crossing point. The source of such information is the documents submitted to the control officers by the transport operators, drivers or agents.

Electronic ICT-based equipment and solution can expedite reading and processing of the data contained in such documents.

The applicable equipment and solutions may include electronic passport/ID readers for passport control, document bar-code electronic readers and paper document scanners. All those kinds of equipment are widely used in daily life nowadays and are neither costly, nor difficult to learn to use.

The more prospective and comprehensive solution for automation of data processing at border crossings is smart card used for border clearance procedures. Technically, already today the smart card can totally substitute all paper-based documents used currently, as all the necessary data related to cross-border transport can be recorded in its embedded electronic chip.

The main difficulties in the implementation of smart cards instead of paper-based documents are mostly related to the required institutional and legal arrangements for recognition of the data recorded to smart card as official documents.

e) In-depth inspection equipment

Some items of data required for border crossing formalities can be obtained through in-depth inspection of goods and vehicle.

The tools for automation of in-depth inspection include fixed site or mobile vehicle scanners, fixed and portable detection and laboratory test equipment.

These equipment items, being linked to the CDEP of a border-crossing point, can quickly provide information on the results of the relevant inspections to the officers of the government agencies, which require such information for their purposes.

D. The Common Data Exchange Platform (CDEP)

The Common Data Exchange Platform (CDEP) is an electronic system serving to provide the possibility of shared access for the government agencies conducting control procedures and formalities related to cross-border transport operations to data on such operations. The number of data items subject to exchange and shared use depends upon the policies applied by the government agencies concerned and the arrangements among them.

The platform presented in this publication is a general conceptual framework that could be used as a base for the technical design of such system.

The CDEP conceptual structure consists of three main modules purposed to accumulate data for subsequent shared access by the government agencies concerned and the common interface or operational software which can be used by several agencies. The description of the modules is based on the assumption that all the pieces of technological equipment and solutions are available, so the full level of data management automation can be showcased. Some pieces on information can be alternatively collected with traditional visual or instrumental checks. In this case, officers conducting such checks should anyway have computers or other devices able to transmit the captured data, whatever is the way of its collection, to the CDEP.

Module 1 of the CDEP stores the data that can be collected with the equipment installed at or near the border crossing, depending on the location of the relevant government agencies. Such equipment can either be applied for capturing some data automatically (for example, automatic system of weights and dimensions control) or for collecting additional data in the course of in-depth inspections (scanners).

Module 2 of the CDEP is to collect and store the information related to transport operation, submitted by the carriers at the border crossing (in the form of paper-based documents or electronically), as well as advance electronic information (if such information can be accessed to at the particular border checkpoint).

Those categories of information can be transmitted to the CDEP by means of software operated by control officers conducting checks at the border crossing. Through the CDEP, the data can be accessed by other government agencies.

Module 3 of the CDEP is to store the data agreed between the government agencies for shared use, available from databases of such agencies. That category of data may include

historical records on vehicle and driver, including previous infringements of transport, traffic, customs, immigration and other rules. The analysis of such data can be used as a part of risk assessment methodology for taking decisions on the admission/denial of admission of the vehicle and/or dri0ver to the territory of the country of entry or on applying additional checks at the border crossing. Apart from historical records, this module can display various warnings available at government agencies' disposal for potential additional risks related, for example, to the origin of particular goods (or to the goods' loading places or to the vehicle route) from the areas of potential risk. Such risk can be connected, for example with current epidemic or epizootic outbreaks or with criminal situation in a particular region.

Technically, Module 3 may be designed as a separate database which provides a possibility of shared use by different agencies or links to "open-for-shared-use" parts of databases operated by different government agencies.

The Common interface for government agencies can help the officers of various government agencies to quickly capture and process the data from databases operated by the other government agencies. It can minimize the number of software applications that should be used by each of the agencies involved into information exchange through the CDEP and thus, can contribute to time-saving and overall efficiency of data exchange system applied at a border crossing.

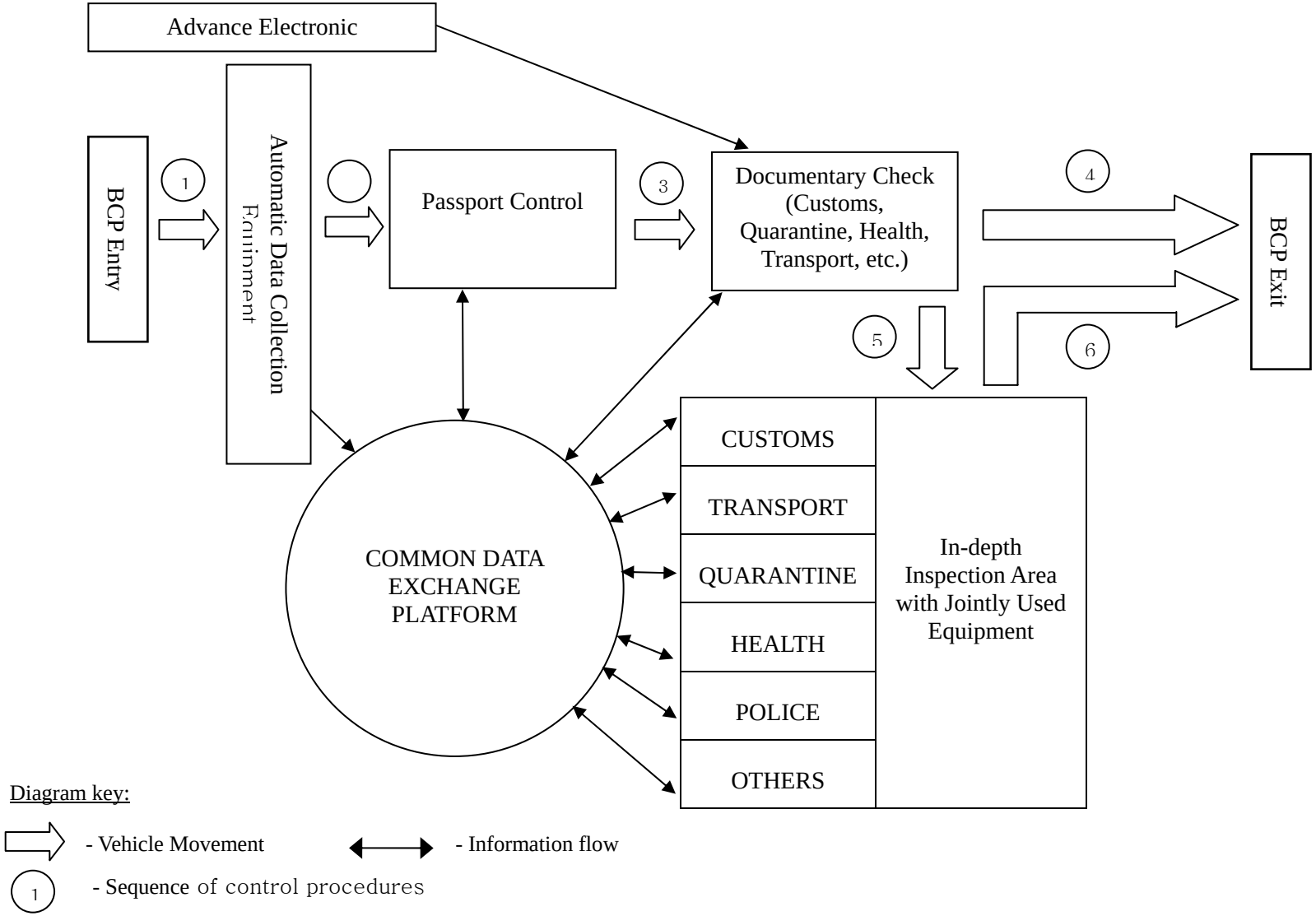
Preliminary arrangements should be made on the possibility of access for particular agencies to particular pieces of data sent to the CDEP by other agencies. For example, quarantine authority may need some particular pieces of data on goods collected with technical equipment operated by Customs authority. The system may thus be designed in the way that quarantine can only have access to this group of data through the CDEP and no access to other data provided by Customs.

Alternatively, the full set of data agreed to be shared through the CDEP, may be made available to all the agencies potentially concerned.

E. Simplified border crossing workflow based on BCMIS

The following workflow descriptions are to showcase the possible way of applying BCMIS as a basis to design the system for border crossing management. They should not be considered as examples or direct recommendation on application of particular pieces of equipment or technological solutions, as well as on the number and types of government agencies represented at the border and on the sequence of checks and other actions.

Figure 9. BCMIS-based simplified workflow for the entry of goods



1. Example of a possible workflow for the entry of goods

Figure 9 displays an example of a possible border crossing workflow for the entry of goods based on the BCMIS. The description below provides explanation on the sequence of control operations, vehicle movements and information flows at a border crossing operating on the basis of such workflow.

As early as possible, preferably at the beginning of the transport operation, and at least prior to entrance to the border crossing, the transport operator or the agent on behalf of transport operator submits advance information on the goods online (EACD and other information, as appropriate), filling in the web-form available on the specialized website run by Customs agency. The data becomes available to the Customs officers at the border crossing through the link to the database, which stores the advance customs-related information. The whole set of advance electronic information or its part may, as appropriate, also appear in the CDEP applied at a particular border crossing point.

The operational software of the online-resource used for data submission automatically assigns a bar code to the transport operation. The transport operator prints out the web-form with the bar code appearing on it and hands it to the driver.

In the case that the technology of smart card processing is being applied by the control authorities of a country in question, information on EACD, along with other information relevant to cross-border transport operation, can be recorded on the embedded chip of such smart card, which accompanies the vehicle throughout the transport operation.

At the entrance to border crossing the system of electronic queue management can be applied. Having received the queue coupon, the driver moves the vehicle to the parking lot until the queue number appears at the monitor installed visibly. Alternatively, the vehicles queue in the lane. The lanes are desirably to be separated for commercial trucks, buses and coaches and private vehicles.

<u>Vehicle movement step 1. Automated data collection</u>

The vehicle enters the border crossing and passes through the following systems of automatic data reading:

- Automatic vehicle/container recognition system;
- Automatic weight and dimensions control system(s); and

- Automatic radiation control unit (optional)[6].

The data captured with those systems are being automatically uploaded to the CDEP, which can be accessed to by the officers of all the agencies involved into the checks related to cross-border transport operations.

Vehicle movement step 2. Passport control

a) Manual mode

In the case of manual mode of immigration check, the driver submits personal travel document (passport or other ID) to the immigration officer.

The immigration officer requests all the required information on the driver, such as personal history and criminal record from the available databases.

Optionally, the information on the vehicle and goods carried can also be requested from other agencies. For example, if the vehicle is already registered in the database, the officer can access the history of its cross-border movement of the vehicle and information on previous infringements connected with the use of the vehicle.

In the case that “alerts” on the particular shipment or truck were issued by other government agencies, the immigration officer can take appropriate measures, such as informing the police force of the arrival of such truck and/or shipment of goods under suspicion.

Having processed the data, the immigration officer takes decision on permission of the entry into the country and keys it into the file. The data on the decision (with special remarks or comments, if approprioate) is automatically uploaded into the electronic database administered by immigration authority and is made available to other agencies through the CDEP.

Upon the successful completion of passport control, the immigration officer presses the button to open the gate installed behind the control booth, allowing the vehicle to proceed to the next control line.

6 The sequence of vehicle movements through the mentioned systems may vary depending on the design of the workflow for a particular border crossing point.

b) Automatic mode

In the case of application of automated passport control system, the travel document (passport or other ID) is placed by the driver into a reader (which reads the embedded chip of the document) installed at the control booth. Fingerprints and/or iris are being scanned with reading devices to identify the holder of the travel document. In case of confirmation of identity of personal identification data of the person with the data contained in the embedded chip of the travel document and absence records of travel restrictions in the database, the immigration procedures are being successfully completed. The data on the permission of the entry into the country is then automatically uploaded into the database and made available to other agencies through the CDEP[7].

Upon the successful completion of passport control, the gate installed behind the control booth can be automatically opened, allowing the vehicle to proceed to the next control line.

c) Common features for manual and automated passport control modes

- The control booths may be installed to fit the height of the vehicle cabin, so the driver does not need to leave the vehicle for passport control;
- The vehicle smart card can be applied to capture previously available data and to record data on the approval of the entry the country; and
- Video surveillance system (CCTV) can also be applied for monitoring of passport control formalities.

Vehicle movement step 3. Documentary checks for goods and vehicle

The vehicle moves to the second control line for documentary checks.

The driver submits vehicle and cargo documents required for customs, transport, sanitary, phytosanitary/veterinary and quarantine inspections, as well as the vehicle smart card[8], to the

7 In the case of application of fully automated passport control system , it is, however, desirable to have at least one duty officer at this control line to monitor the procedure and handle emergency cases (absence of microchip in the travel document, system or microchip error, etc.).

8 At present, most documents required for transport inspection, such as transport permits, special authorizations for overweight, oversized or dangerous goods carriage, consignment note, special certificates for sanitary, veterinary or phytosnitary inspection etc., are mostly paper-based. With the further development of ICT, such documents could be transferred to paperless electronic form. Once it becomes possible, all the information on the carrier's appropriate permits could be recorded on the microchip of the carrier's smart card. In that case, submission of the smart card would be sufficient for the purposes of transport inspection, as well as for additional inspections (sanitary, veterinary or

officer(s) of the government agency in charge of managing routine documentary checks[9].
The control officer reads the data from the smart card with an electronic reader and requests information from the relevant databases through the CDEP. The data on passport control, as well as data on the vehicle weights and dimensions, vehicle plate number, continer code and other automatically collected data appear on the screen of the workstation.

On the basis of the available data the control officer conducts documentary transport inspection procedures.

The control officer also scans the bar code form the document containing EACD to receive the goods' codes indicating the need for additional kinds of documentary inspection (sanitary, veterinary or phytosnitary inspection, etc). In case of need for such inspections, the officer checks the required authorizations and certificates.

In case of specialized documentary expertise required, the control officer can communicate with the officers of other agencies located at the border crossing aside from the main control line (for example, at in-depth inspection area). Such agencies normally do not need to be present at the main control line, as all the information related to the vehicle being currently checked is available to them through the CDEP.

Depending on the nature of additional documentary check(s) and time required for such check(s), either the approporiate officer may join the check at the main control line, or the vehicle can be directed to the in-depth inspection area or to the other designated area aside from the main control line (especially in cases when more detailed checks with the use of special inspection equipment are required).

The control officer at the main control line also conducts customs procedures.

EACD, submitted by the carrier in advance, can be encoded in the customs document's bar code.

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phytosnitary inspection, etc). However, implementation of such "electronic permit" technology requires serious preliminary institutional and regulatory arrangements, including arrangements at international and bilateral levels. Due to that fact, totally paperless transport inspection is the matter of near future, but can not be introduced immediately. The present-day application of the smart card may be limited to recording of data on the vehicle parameters, due payment of vehicle-related taxes and road tolls, as well as data on the status of the procedures which need to be conducted at the border crossing.

9 There is no particular recommendation provided by this study on the way to manage the control line for the mentioned type of checks. Due to that, the term "control officer" is used further in the text. In practice, however, the most probable choice of the government agency to be permanently stationed at that control line would be Customs, as they anyhow need to conduct checks in respect of all goods crossing the border, while other agencies can often act on selective basis.

All the data relevant to customs formalities can also be captured by reading smart card with an electronic reader. The control officer scans the document with electronic reader, or, alternatively, has to search the data on the goods in the database. In any case, the data on the goods moved across the border appears on the screen, and the control officer does not have to fill in the electronic copy of the customs document, which results in saving a significant amount of time.

The control officer compares the available electronic data with the data contained in the submitted documents. Using the methodology of risk assessment and analysis and the results of the preliminary analysis of EACD, the control officer takes a decision on application of in-depth forms of customs inspection, which may include vehicle scanning.

Upon the confirmation of safety and legality of the imported goods, the control officer takes measures to secure the delivery of goods to the Customs office of destination.

In the case that the goods are not cleared by Customs at the border crossing, the operational software automatically creates a notification on the direction of the goods for the computerized system of transit control and sends this notification to the customs office of destination. The Customs office at the border crossing and the Customs office of destination in question then keep the delivery under control. In case the goods are not delivered to the Customs office of destination within the time-limit set at the border crossing, the Customs initiate investigation.

Alternatively, the system of vehicle tracking system can be applied. The Customs can then accurately locate the vehicle and initiate investigation in the case of its suspicious movements or deviations from the prescribed route.

Upon the successful completion of documentary checks (if no additional in-depth checks are required) the control officer approves the entry of the vehicle with the goods into the country, making a record on such approval in the appropriate database connected to the CDEP. The data on entry approval is also recorded in the embedded chip of the smart card.

Vehicle movement step 4. Exiting the controlled area of the border crossing after the completion of documentary checks

Upon the approval of the entry into the country on the basis of documentary checks, the control officer at the second control line returns the documents and the smart card with the record on entry approval to the driver.

The vehicle moves to the border crossing point's exit gate. The driver attaches the smart card to the reading device of the gate installed in the manner to be within the driver's reach from the vehicle's cabin. The gate automatically opens if all the necessary approvals are recorded in the smart card's chip, and the vehicle leaves the border-crossing and enters the territory of the country.

Vehicle movement step 5. In-depth inspection

In the case of need for additional and/or in-depth inspection, the control officer at the second control line defines the number and type of such inspections and routes the vehicle to in-depth inspection area. The information on the required inspections is being sent to the databases of the government agencies in charge of particular types of inspection through the CDEP. The same data is being recorded on the vehicle smart card. The officers of the relevant agencies at in-depth inspection area can thus be notified of the due inspection either through the CDEP or by reading the data from the smart card.

In-depth inspection zone situated inside the controlled area of a border crossing may be jointly run by various government agencies, depending on the number and type of such agencies represented at a particular border crossing.

It is desirable to arrange inspection zone at the border crossing in a manner not interrupting or impeding the movement of other vehicles through the controlled area of the border crossing.

In-depth inspection procedure may include, but not limited to:

- Vehicle non-intrusive inspection (scanning);
- Checking earlier attached seals, including e-seals;
- Laboratory tests for the purposes of health, animal and plant quarantine;
- Checking driver's personal effects and personal carriage; and
- Detailed vehicle inspection for the purposes of transport control.

In-depth inspection zone may typically include a separate building or a group of bulidings with scanning, laboratory and other measurement equipment installed inside. In smaller border crossings, where the installation of a fixed scanner may be not feasible, relocatable or mobile scanners could be used for the purposes of non-intrusive inspection.

The in-depth inspection zone can also serve as a location for the government agencies, which are not represented at the main control lines (quarantine, health, police and others), as they

conduct checks on selective basis only.

The technological equipment installed in the in-depth inspection zone can be jointly used by several government agencies involved in border control procedures.

Joint use of equipment or sharing of the results of tests and inspections can save costs of investment in special equipment and increase time-efficiency of the border check point.

After the vehicle arrives to the in-depth inspection area, the driver submits the vehicle smart card to the control officer of that area. The control officer reads the data on the required checks from the card, compares it with the relevant data received through the CDEP, decides on the sequence of the checks and instructs the driver.

The same in-depth checks can be applied for different purposes. For example, a laboratory test for some particular kind of goods can be required by quarantine authority for its purposes. The same goods may be a matter of interest for the Customs authority and the required laboratory equipment may be the same. Samples of such goods can be tested once, and the results shared among Customs and quarantine agency through the CDEP.

Following the instuctions, the vehicle and/or goods or driver then undergo the required inspections. The information on the result of each such inspection is being saved in the databases of the relevant agencies. The non-restricted part of such information can be accessed by other agencies through the CDEP.

Upon the completion of all required in-depth inspections, the received data can be analysed by the officers of the relevant authorities represented at the border crossing point together with the data, which was available earlier. On the basis of such analysis, the decision on the permission of the entry into the country is being made.

In the case of a positive decision, the control officer located at the in-depth inspection area approves the entry of the vehicle into the country, making a record on such approval in the appropriate database connected to the CDEP. The notification on the approval is also being sent to the control officer at the second control line, who has initiated in-depth checks. Upon the receipt of this notification, the officer at the second control line can complete the file on the border-crossing operation, having retrieved the additional data on the border-crossing operation through the CDEP. After the processing of all the required information, the officer at the second control line generates and sends the message on the final approval of the entry of the vehicle into the country to the database connected to the CDEP. As soon as the control

officer at the in-depth inspection area receives such message, the data on entry approval can be recorded into the chip of the vehicle smart card.

Vehicle movement step 6. Exiting the controlled area of the border crossing after the completion of documentary and in-depth checks

Upon the approval of the entry into the country on the basis of documentary checks and in-depth checks, the control officer at the in-depth inspection area returns the documents and the smart card with the record on entry approval to the driver.

The vehicle moves to the border crossing's exit gate. The driver attaches the smart card to the reading device of the gate installed in the manner to be within the driver's reach from the vehicle's cabin. The gate automatically opens if all the necessary approvals are recorded in the card's chip, and the vehicle leaves the border crossing and enters the territory of the country.

2. Example of a possible workflow for the exit of goods

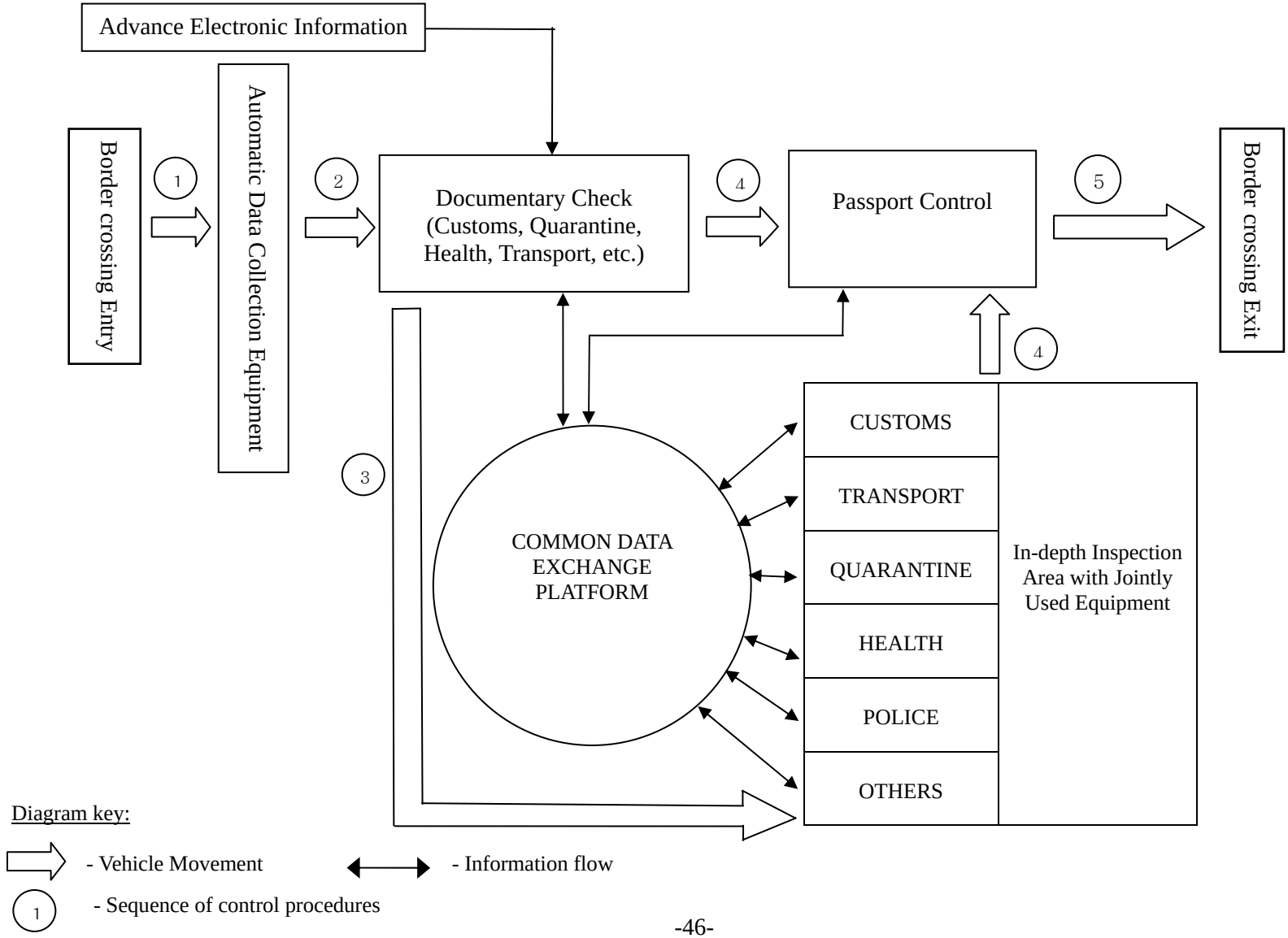
Figure 10 displays an example of a possible border crossing workflow for the exit of goods based on the BCMIS. The description below provides explanation on the sequence of control operations, vehicle movements and information flows at a border crossing operating on the basis of such workflow.

As early as possible, preferably at the beginning of the transport operation, and at least prior to entrance to the border crossing, the exporter or the transport operator submits advance information on the goods online (EACD and other information, as appropriate) to the Customs office of departure, filling in the web-form available on the specialized website run by Customs agency.

In the case that the technology of smart card processing is being applied by the control authorities of a country in question, information on EACD, along with other information relevant to cross-border transport operation, can be recorded on the embedded chip of such smart card, which accompanies the vehicle throughout the transport operation.

The vehicle then moves to the Customs office of departure. The transport operator (agent, driver) submits the cargo documents to the Customs officer (consignment note, customs declaration, invoice(s) and others) for export clearance.

Figure 10. BCMIS-based simplified workflow for the exit of goods



After completing the customs procedures, the software automatically assigns a bar code to the transport operation. When cargo is cleared, the customs officer prints out the web-form of the customs declaration with bar-code appearing on it and hands it over to the representative of the transport operator (agent, driver, etc.). The customs declaration and other information on is being automatically transmitted to the appropriate database, which stores the advance customs-related information. It is also can be recorded on the embedded chip of the vehicle smart card.

The data becomes available to the Customs officers at the border crossing through the link to the database. The whole set of advance electronic information or its part may, as appropriate, also appear in the CDEP applied at a particular border crossing point.

The officers at the Customs office of departure can apply cargo security measures depending on the type of goods being exported. These can be cargo scanning, use of e-seal and/or installation of the vehicle tracking unit.

At the entrance to border crossing the system of electronic queue management can be applied. Having received the queue coupon, the driver moves the vehicle to the parking lot until the queue number appears at the monitor installed visibly. Alternatively, the vehicles queue in the lane. The lanes are desirably to be separated for commercial trucks, buses and coaches and private vehicles.

Vehicle movement step 1. Automated data collection

The vehicle enters the border crossing and passes through the following systems of automatic data reading:

- Automatic vehicle/container recognition system;
- Automatic weight and dimensions control system(s); and
- Automatic radiation control unit (optional)[10].

The data captured with those systems are automatically uploaded to the CDEP, which can be accessed to by the officers of all the agencies involved into the checks related to cross-border transport operations.

10 Same as in the previous description, the sequence of vehicle movements through the mentioned systems may vary depending on the design of the workflow for a particular border crossing point.

Vehicle movement step 2. Documentary checks for goods and vehicle

The vehicle moves to the first control line for documentary checks.

The driver submits vehicle and cargo documents required for customs, transport, sanitary, phytosanitary/veterinary and quarantine inspections, as well as the vehicle smart card, to the officer(s) of the government agency in charge of managing routine documentary checks.

The control officer reads the data from the smart card with an electronic reader and requests information from the relevant databases through the CDEP. The data on the vehicle weights and dimensions, vehicle plate number, container code and other automatically collected data appear on the screen of the workstation.

The information on the vehicle and goods carried (and, if necessary, on the driver) can also be requested from other agencies. For example, if the vehicle is already registered in the database, the officer can access the history of its cross-border movement of the vehicle and information on previous infringements connected with the use of the vehicle.

In the case that “alerts” on the particular shipment or truck were issued by other government agencies, the control officer can take appropriate measures, such as informing the police force of the arrival of such truck and/or shipment of goods under suspicion.

On the basis of the available data the control officer conducts documentary transport inspection procedures.

The control officer also scans the bar code form the document containing EACD to receive the goods’ codes indicating the need for additional kinds of documentary inspection (sanitary, veterinary or phytosnitary inspection, etc). In case of need for such inspections, the officer checks the required authorizations and certificates.

In the case of specialized documentary expertise required, the control officer can communicate with the officers of other agencies located at the border crossing aside from the main control line (for example, at in-depth inspection area). Such agencies normally do not need to be present at the main control line, as all the information related to the vehicle being currently checked is available to them through the CDEP.

Depending on the nature of additional documentary check(s) and time required for such

check(s), either the approporiate officer may join the check at the main control line, or the vehicle can be directed to the in-depth inspection area or to the other designated area aside from the main control line (especially in cases when more detailed checks with the use of special inspection equipment are required).

The control officer at the main control line also conducts customs procedures.

As the main control procedures for goods exports are usually conducted at the Customs of departure, the task of customs control at a border crossing point is mainly to confirm the exit of goods from the country.

The control officer compares the available electronic data with the data contained in the submitted documents. Using the methodology of risk assessment and analysis and the results of the preliminary analysis of EACD, the control officer takes a decision on application of in-depth forms of customs inspection, which may include vehicle scanning.

Upon the successful completion of documentary checks, in the case no additional in-depth checks are required, the control officer approves the exit of the vehicle with the goods from the country, making a record on such approval in the appropriate database connected to the CDEP. The data on entry approval is also recorded in embedded the chip of the smart card.

The vehicle can move directly to the second control line for the driver's passport control (see "Vehicle movement step 4. Passport control").

Vehicle movement step 3. In-depth inspection for goods and vehicle

In the case of need for additional and/or in-depth inspection, the control officer at the control line defines the number and type of such inspections and routes the vehicle to in-depth inspection area. The information on the required inspections is being sent to the databases of the government agencies in charge of particular types of inspection through the CDEP. The same data is being recorded on the vehicle smart card. The officers of the relevant agencies at in-depth inspection area can thus be notified of the due inspection either through the CDEP or by reading the data from the smart card.

In-depth inspection zone situated inside the controlled area of a border crossing may be jointly run by various government agencies, depending on the number and type of such agencies represented at a particular border crossing.

It is desirable to arrange inspection zone at the border crossing in a manner not interrupting or impeding the movement of other vehicles through the controlled area of the border crossing.

In-depth inspection procedure may include, but not limited to:

- Vehicle non-intrusive inspection (scanning);
- Checking earlier attached seals, including e-seals;
- Laboratory tests for the purposes of health, animal and plant quarantine;
- Checking driver's personal effects and personal carriage; and
- Detailed vehicle inspection for the purposes of transport control.

In-depth inspection zone may typically include a separate building or a group of bulidings with scanning, laboratory and other measurement equipment installed inside. In smaller border crossings, where the installation of a fixed scanner may be not feasible, relocatable or mobile scanners could be used for the purposes of non-intrusive inspection.

The in-depth inspection zone can also serve as a location for the government agencies, which are not represented at the main control lines (quarantine, health, police and others), as they conduct checks on selective basis only.

The technological equipment installed in the in-depth inspection zone can be jointly used by several government agencies involved in border control procedures.

Joint use of equipment or sharing of the results of tests and inspections can save costs of investment in special equipment and increase time-efficiency of the border check point.

After the vehicle arrives to the in-depth inspection area, the driver submits the vehicle smart card to the control officer of that area. The control officer reads the data on the required checks from the card, compares it with the relevant data received through the CDEP, decides on the sequence of the checks and instructs the driver.

The same in-depth checks can be applied for different purposes. For example, a laboratory test for some particular kind of goods can be required by quarantine authority for its purposes. The same goods may be a matter of interest for the Customs authority and the required laboratory equipment may be the same. Samples of such goods can be tested once, and the results shared among Customs and quarantine agency through the CDEP.

Following the instructions, the vehicle and/or goods or driver undergo the required

inspections. The information on the result of each such inspection is being saved in the databases of the relevant agencies. The non-restricted part of such information can be accessed by other agencies through the CDEP.

Upon the completion of all required in-depth inspections, the received data can be analyzed by the officers of the relevant authorities represented at the border crossing point together with the data, which was available earlier. On the basis of such analysis, the decision on the permission of the exit from the country is being made.

In the case of a positive decision, the control officer located at the in-depth inspection area approves the exit of the vehicle from the country, making a record on such approval in the appropriate database connected to the CDEP. The notification on the approval is also being sent to the control officer at the first control line, who has initiated in-depth checks. Upon the receipt of this notification, the officer at the first control line can complete the file on goods and vehicle checks, having retrieved the additional data on the border-crossing operation through the CDEP. After the processing of all the required information, the officer at the first control line generates and sends the message on the final approval of the exit of the vehicle and goods from the country to the database connected to the CDEP. As soon as the control officer at the in-depth inspection area receives such message, the data on entry approval can be recorded into the chip of the vehicle smart card.

The vehicle can move to the second control line for the driver’s passport control.

Vehicle movement step 4. Passport control

a) Manual mode

In the case of manual mode of immigration check, the driver submits personal travel document (passport or other ID) to the immigration officer.

The immigration officer requests all the required information on the driver, such as personal history and criminal record from the available databases.

If required, the information on the previous checks of vehicle and goods carried can also be requested from other agencies through the CDEP.

Having processed the data, the immigration officer takes decision on permission of the exit from the country and keys it into the file. The data on the decision (with special remarks or

comments, if approprioate) is automatically uploaded into the electronic database administered by immigration authority and is made available to other agencies through the CDEP.

Upon the successful completion of passport control, the immigration officer presses the button to open the gate installed behind the control booth, allowing the vehicle to proceed to the next control line.

b) Automatic mode

In the case of application of automated passport control system, the travel document (passport or other ID) is placed by the driver into a reader (which reads the embedded chip of the document) installed at the control booth. Fingerprints and/or iris are being scanned with reading devices to identify the holder of the travel document. In the case of confirmation of identity of personal identification data of the person with the data contained in the embedded chip of the travel document and absence records of travel restrictions in the database, the immigration procedures are being successfully completed.

The data on the permission of the entry into the country is then automatically recorded in the embedded chip of the passport or other ID uploaded into the database and made available to other agencies through the CDEP[11].
Upon the successful completion of passport control, the gate installed behind the control booth can be automatically opened, allowing the vehicle to proceed to the next control line.

c) Common features for manual and automated passport control modes

- The control booths may be installed to fit the height of the vehicle cabin, so the driver does not need to leave the vehicle for passport control;
- The vehicle smart card can be applied to capture and cross-check data on previous control procedures and to record data on the approval of the exit from the country; and
- Video surveillance system (CCTV) can also be applied for monitoring of passport control formalities.

11 In case of application of fully automated passport control system , it is, however, desirable to have at least one duty officer at this control line to monitor the procedure and handle emergency cases (absence of microchip in the travel document, system or microchip error, etc.)

Vehicle movement step 5. Exiting the controlled area of the border crossing after the completion of passport control

Upon the successful completion of the passport control, the vehicle can move towards the exit from the territory of the border crossing point to the neutral land at the border with the neighboring country or the territory of the neighbouring country.

IV. RECOMMENDATIONS FOR THE MODEL APPLICATION

The model provides a concept of integrated use of management information and ICT-based systems and equipment at land border-crossings grouped around the system of necessary sharing of information among the government agencies involved into conducting control procedures at land border crossings and management of information flows.

It can serve as a general guidance for technical design of border-crossing workflow, based on complementary application of a number of modern technical solutions and simplified and time-efficient control procedures.

The main components of the successful implementation of the model is the proper technical design of the system for the exchange of information and appropriate agreements reached by various government authorities on the possibility to share information related to border-crossing operations.

Therefore, the preparations for the design of the system on integrated control should start with consultations among the relevant agencies on the types of information they are ready to share with other agencies.

Even if the number of pieces of such data is smaller than it is assumed in this publication, the government agencies and the users can anyway benefit from sharing of this information.

Once the issue of information sharing is solved, it is no less important to design the technical configuration of the system, starting with information exchange facilities, such as the set of operational software and means of communication.

As it was already mentioned in the description of the model, the availability of interoperable software (and hardware) is of utmost importance for smooth and efficient functioning of information sharing systems.

The next step in the technical design for integrated border control systems is the choice of technological equipment and solutions as the tools for collecting and processing of information. The proposed conceptual workflows described in this publication are supposed to be applied at busy border crossing points designed to process significant flow of goods and people. Such traffic conditions obviously can not and need not to be targeted for every land border crossing, as the flow of cargo and passengers at some of them can be rather low. In this case, the whole set of powerful machinery may not be demanded. In other cases, the

required infrastructure may be unavailable to host for the whole set of equipment and solutions.

The proposed model is designed to be flexible in terms of availability of particular items of technological equipment, and its core component – the system of information exchange, is by far not the most costly in terms of required investment.

The model also proposes the concept of joint use of technological equipment by different government agencies. Implementation of this concept can make some of the expensive pieces of equipment much more affordable. The arrangements on that subject are also to be made at early stage, as they may impose influence on the choice of equipment for a particular border crossing.

Before designing the technical configuration of ICT-based and other modern equipment at a border crossing, several pre-requisite steps should be taken, including:

- Assessment of current and prospective goods and people flow to be processed at the border crossing and reasonable capacity targeting;
- Thorough pre-feasibility study of the application of technological systems, which would consider climate conditions, accessibility of communication channels, engineering networks, availability of sufficient power supply, availability of adequate human resources able to operate comprehensive systems and/or facilities for professional training;
- Careful planning of the required investmtnts, considering the structure of necessary costs to be borne;
- Assessment of institutional and regulatory arrangements required to provide for full effectiveness of particular technological solutions and possibility of such arrangements, as well as time needed to reach them;
- Study on possibility to integrate the principles of integrated control into the existing technological and institutional environment; and
- Creating self-awareness on the capacity and plans for modernization of counterpart border-crossings in the contiguous countries.

On the basis of the above-mentioned studies, an integrated master-plan on introduction of innovative technologies and solutions at a particular border-crossing (or a group of border crossings with similar or close parameters) should be drafted and approved.

The emphasis in the implementation arrangements of the master plan should be made on: the

coordination and cooperation among the government agencies concerned, especially if the border crossing subject to introduction of the new system is managed by multiple agencies. Ideally, mechanisms of cooperation between the government authorities can be ensured at all the levels, including regional and local.

Smooth introduction and subsequent efficient application of the model requires other preparatory work as well. Success of some technological solutions, for example, introduction of automated immigration control or the system of electronic advance information, requires a certain degree of loyalty from the potential users. Advance promotional mass-media campaigns, informing the users of the basics of operation and explaining potential advantages of the new systems or procedures, could help avoiding difficulties and misunderstanding in their application, which often hinder the efficiency of the innovative solutions at early stages of their introduction.

V. POTENTIAL BENEFITS AND COSTS

The implementation of innovative technologies, equipment and solutions at border crossings requires significant direct and indirect investments. The lack of sufficient resources for such investments becomes a major hindering factor in the expansion of the application of modern equipment and technologies for the purposes of transport and border crossing facilitation. On the other hand, benefits and overall economical effect of the new technologies allowing streamlining of border-crossing procedures are also very promising. Careful investment plans and feasibility studies of ICT implementation may help reduce unnecessary or excessive spending, to shorten pay-back time and to multiply the benefits.

Awareness of cost structure and of conceivable benefits could help in competent planning of technical improvements and overall development of border crossing facilities, and in the choice of the most suitable equipment and solutions.

The general for the application of the model (assuming that the whole set of equipment and solutions described are in place) includes:

- Project pre-feasibility and feasibility studies;
- Development of the infrastructure of the border-crossing;
- Communication channels;
- Equipment procurement, delivery and installation;
- Equipment maintenance;
- Staff training;
- Power consumption;
- Software development and update;
- Hardware procurement and maintenance;
- Institutional and regulatory arrangements; and
- Temporary capacity decrease during the setting up of the new equipment and workflow rearrangements.

Application of the model can bring the following benefits and advantages to the main groups of stakeholders:

(a) Benefits and advantages for the control authorities:

- Enhanced level of security of border-crossing procedures and formalities;
- Increased capacity of a border-crossing;

- Increased time for control authorities to analyze data and take circumspect decisions;
- Lowering costs per transaction;
- Saving manpower and workspace;
- Prevention/reduction of smuggling and non-payment of due Customs taxes and duties;
- Corruption prevention/reduction;
- Avoidance/reduction of man-made mistakes;
- Improving image of control authorities; and
- Relatively easy institutional arrangements and absence of need to restructure the functions of particular government agencies.

(b) *Benefits and advantages for the users:*

- Increase of goods and people cross-border flow and overall better development of international trade;
- Substantial time-saving on border-crossing procedures and formalities and reduction of delays;
- Increased possibilities for self-service and saving on brokers' fees;
- Unification of documentation required to cross different borders (in the long-term perspective);
- Reduction of border-crossing expenses;
- More comfortable border-crossing procedures;
- More transparent rules and formalities; and
- Reduction or elimination of corruption.