Learning Materials on

Dry Ports

UNITED NATIONS
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Economic and Social Commission for Asia and the Pacific

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The learning materials were developed for capacity building activities to strengthen subregional connectivity in East and North-East Asia through effective economic corridor management.

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Learning Outcomes

After completing this module and having consulted the reference readings, you will be able to:

- understand the basic concept and functions of dry ports
- outline the provisions and discuss the guiding principles of the Intergovernmental Agreement on Dry Ports
- identify the different elements for consideration in the development, design, planning and operation of dry ports
- assess the importance of institutional determinants for dry port developments
- recognize the catalytic role of technology in dry port operations and development

Reference Readings

Intergovernmental Agreement on Dry Ports

https://www.unescap.org/resources/intergovernmental-agreement-dry-ports

ESCAP/RES/74/2, May 2018. Resolution adopted by the Economic and Social Commission for Asia and the Pacific 74/2. Promotion of the regional framework for the planning, design, development and

operation of dry ports of international importance

https://www.unescap.org/commission/74/document/E74_RES2E.pdf

3rd Meeting of the Working Group on Dry Ports (13-14 Nov 2019, Bangkok, Thailand)

https://www.unescap.org/intergovernmental-meetings/3rd-meeting-working-group-dry-ports

Regional Framework for Development, Design, Planning and Operation of Dry Ports of International Importance (study report)

https://www.unescap.org/sites/default/files/REGIONAL%20FRAMEWORK%20FOR%20%20DEVELOPMENT.pdf

Regional Framework for Development, Design, Planning and Operation of Dry Ports of International Importance (regional guideline)

https://www.unescap.org/sites/default/files/Regional%20Framework%20for%20upload%20V1_0_0.pdf

Institutional Determinants for Dry Port Development and Logistics Performance in Cambodia, Lao PDR, Thailand and Viet Nam (study report)

https://www.unescap.org/sites/default/files/Study%20Report_Institutional%20determinants%20for%20dry%20port%20development.pdf

Review of Sustainable Transport Connectivity in Asia and the Pacific: Addressing the Challenges for Freight Transport 2019 (Sub-chapter 2.3. "Dry ports and intermodal facilities in Asia and the Pacific", pages 45-53)

https://www.unescap.org/publications/review-sustainable-transport-connectivity-asia-and-pacific-addressing-challenges

- Regional Framework for the Development of Dry Ports of International Importance for South-East Asia Capacity Building Workshop (23-24 May 2018, Bangkok, Thailand) (materials)
  https://www.unescap.org/events/regional-framework-development-dry-ports-international-importance-south-east-asia-capacity

- Regional Framework for the Development of Dry Ports of International Importance for North and Central Asia Capacity Building Workshop (31 May – 1 June 2018, Almaty, Kazakhstan)

Regional Framework for the Development of Dry Ports of International Importance - Capacity Building Workshop for Countries of South Asia (1-2 Aug 2018, New Delhi, India)

https://www.unescap.org/events/regional-framework-development-dry-ports-international-importance-capacity-building-workshop

Workshop on Strengthening the Institutional Framework for the development of Dry Ports in Cambodia, Lao People's Democratic Republic, Viet Nam and Thailand (25 Jun 2019, Bangkok, Thailand)

https://www.unescap.org/events/workshop-strengthening-institutional-framework-development-dry-ports-cambodia-lao-people-s

1 Introduction

Growth in the global economy over the past two decades, increased manufacturing and agricultural production, and new marketing techniques creating more demand, have resulted in the need for more efficient transport infrastructure and services. These services are important because industries now operate globally and require frequent shipments, precise scheduling and efficient logistics to bring components together for assembly and to deliver finished products where they are wanted.

In this context, inland intermodal facilities or dry ports have attracted much attention because of their potential to improve transport efficiency and meet supply chain requirements by grouping access to highways and railways together with customs processing, warehousing, consolidation and distribution, manufacturing and clustering of economic activities along domestic and cross-border economic corridors.

The dry port concept initially emerged from the idea of a seaport directly connected by rail to inland intermodal terminals, where shippers can leave and/or collect standardized units as if they are at the seaport. This was a response to the problems posed by the growth of containerized transport and the corresponding lack of space at seaport terminals and growing congestion on the access routes serving their terminals.

Seaports can generate economies of scale economies to operate cost effective intermodal transport with high frequency to different destinations beyond their traditional hinterland, namely, to use rail to enlarge their hinterland and at the same time to stimulate intermodal transport.

In contrast to a seaport, which is an integral link between the maritime and land transport systems, dry ports can be considered as an essential part of inland trade distribution system, providing an inter-modal link between inland transport modes (for example, road and rail, rail and inland waterway, etc.)

2 Definitions and functions

The term "dry port" has been in use for decades. It has often been used interchangeably with "inland clearance (or container) depot". More recently, it has been used to imply that a facility has reached a particular level of sophistication in terms of services offered, such as customs or the presence of third party logistics

firms within the site and/or an adjoining freight village.

The Intergovernmental Agreement on Dry Ports first and foremost provides a uniform definition of dry ports:

> *"an inland location as a logistics centre connected to one or more modes of transport for the handling, storage and regulatory inspection of goods moving in international trade and the execution of applicable customs control and formalities".*

Although the Inter-governmental agreement provides a standardized definition of a dry port, in fact a number of different terms are in use throughout the UNESCAP region to describe facilities which have the functions of a dry, or inland, port.

Thus, the terms: "dry port"; "inland container depot"; "inland clearance depot", and, more rarely, "container freight stations" are used almost interchangeably within the region to describe such facilities. Different types of inland trade distribution facilities may be offering a range of different services depending on the type of cargo to be transported. However, all share the common characteristic that their main functions are to complete customs and other border crossing formalities for traded cargo and to transfer this cargo between the different modes used for transportation between a port origin and an ultimate inland destination, or vice versa.

In the longer term, the Inter-governmental Agreement on Dry Ports will offer the benefit that trade consignments will be directly transported and customs cleared between an inland port in one country and another inland port in another country.

The Agreement also specifies that dry ports should, ideally, be connected to the Asian Highway and/or the Trans-Asian Railway Networks and eventually brought into conformity with the Annex II to the Agreement.

Read **Know more about the Intergovernmental Agreement on Dry Ports:**

https://www.unescap.org/resources/intergovernmental-agreement-dry-ports

Note: **Jot down some basic facts about the Agreement:**

- When did it enter into force?
- What is the latest status of signatories and parties?
- How to become a Party to the Agreement?

More about the Agreement in succeeding sections.

Dry ports have the following functions:

- Container handling and storage
- Container stripping and stuffing
- Breakbulk cargo handling and storage
- Customs and other border controls inspection and clearance
- Container light repairs
- Freight forwarding and cargo consolidation services
- Banking/insurance/financial services
- Transport booking/brokerage
- Value added services (e.g. packaging, labelling, long term warehousing)

A dry port as an element of hinterland transport is a part of many supply chains and, therefore, affect supply chain performance. Dry ports can also play a significant role in inducing a modal shift, as they are designed to allow the diversion of cargo movement from inefficient to efficient combinations of transport, mainly from all road to rail plus road, but also from all road to inland water transport, where applicable, plus road.

For example, dry ports close to the cargo sources (or trade-generating locations) and far from a seaport could optimize transport costs by employing small-medium trucks for transport of breakbulk cargo between the cargo source and the dry port and rail or inland water transport, if available for the transport of containers between the dry port and a seaport. In turn, this shift and the corresponding cost reduction would contribute towards an increase in trade volumes.

As such, benefits arise from modal diversion in four ways:

- through a net reduction in transport operating cost which will induce increased trade
- through a net reduction in environmental damage (possibly through reduction in greenhouse gas emissions; noxious emissions; noise propagation)

- through a net increase in public safety (reduced accident costs)
- through a net reduction in transport infrastructure maintenance cost

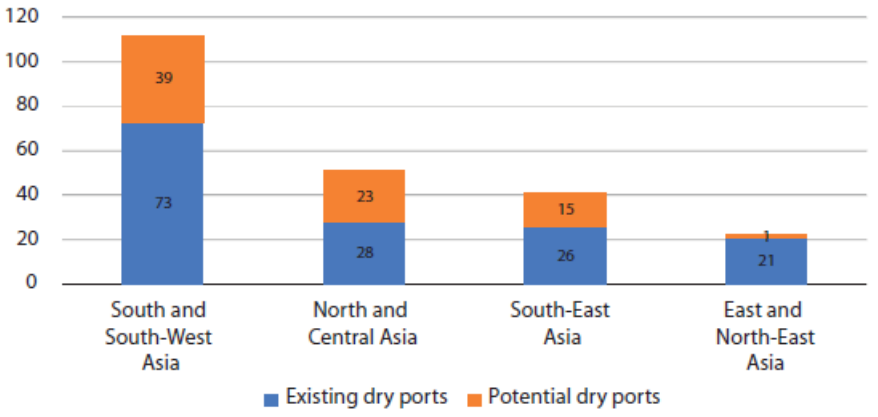
3 The Intergovernmental Agreement on Dry Ports

The Intergovernmental Agreement on Dry Ports (hereinafter –"the Agreement"), which entered into force in April 2016, provides a uniform definition of a dry port of international importance, identifies the network of existing and potential dry ports of importance for international transport operations and proposes guiding principles for their development and operation.

The key principle underlying the development of the Agreement was that it would lead to consistency among them in terms of the services that they provide, their location in relation to trade-generating industries, and their transport connections. While the Agreement provides guidelines with respect to all these factors, the facilities identified by countries as dry ports under the Agreement fall within a wide range of types, infrastructure links and service functions. Some do not have the authority or facilities for customs and other border-control functions.

To date, the Agreement has 15 Parties and covers 248 dry ports in the ESCAP subregions, except for the Pacific, including 86 potential dry ports. Mongolia became a Party to the Agreement on 30 June 2016.

Figure 1 Dry ports coverage, by subregion



Source: ESCAP, 2019. Review of Sustainable Transport Connectivity in Asia and the Pacific 2019.

Annex I of the Agreement provides a list of existing and potential dry ports. The dry ports are normally located in the vicinity of: (a) inland capitals, provincial/state capitals; and/or (b) existing and/or potential production and consumption centres with access to highways and/or railways including the Asian Highway and/or Trans-Asian Railway, as appropriate.

Annex II of the Agreement sets out principles for guidance in developing and opening dry ports. A summary of its main elements below:

- Functions
  - Basic: Handling, storage and regulatory inspection
  - Others: Receipt and dispatch, consolidation and distribution, warehousing, and transshipment

- Institutional, administrative and regulatory frameworks
  - Initiation of frameworks favourable to development and operation of dry ports
  - Designation of dry ports as points of origin or destination in customs documents
  - Ownership permitted may be public, private, or public private partnership

- Design, layout, capacity
  - Sufficient to support secure and smooth flow of cargo, containers and vehicles and to allow for expected future cargo and container volumes

- Infrastructure, equipment, facilities
  - Provision of infrastructure, equipment and manpower commensurate with existing and

expected freight volumes (recommended list)

Read: Carefully read through Annexes I and II:
https://www.unescap.org/sites/default/files/Intergovernmental%20Agreement%20on%20Dry%20Ports_English.pdf

Note **Write down your answers to the following questions:**

- What are the dry ports identified in your country (refer to Annex I)?
- Can you describe/characterize the dry ports in your country based on the main elements (refer to Annex II)? For instance, what are the existing infrastructure, equipment and facilities?

More on the technical aspects of dry ports in succeeding sections.

4 Regional framework for development, design, planning and operation of dry ports of international importance

A regional framework for the development, design, planning and operation of dry ports of international importance was developed with a view to facilitating the definition of a common approach to the development and operationalization of the dry ports. The concept underlying the framework is the establishment of a network of interconnected dry ports in the Asia-Pacific region. It is envisaged that such a network could be formed from the dry ports nominated for coverage by the Intergovernmental Agreement on Dry Ports. The framework also provides a means by which their development may be planned so that they may follow the same standards and be interconnected in future.

The framework identifies fundamental issues related to both 'hard' and 'soft' infrastructure of dry ports. And along with the description of each issue, the framework proposes a related target to be set when designing or operating dry ports, as well as process to follow to reach each target. The following section elaborates on the details.

4.1 Basic requirements

- **Description of the issue.** To be able to exchange cargo effectively among themselves, dry ports must satisfy certain requirements as to the basic services they provide and the facilities with which they are equipped in order to provide these services.

- **Target.** Dry Ports should have infrastructure and equipment for the handling, consolidation, storage and modal transfer of containers and other types of unitized cargo. They should also have the authority, capability and facilities for all border clearance of cargo and they should be located within, or close to, concentrations of industry which generate export/import trade with adequate connections to sea ports and other dry ports via rail and road linkages.

- **Process.** Dry ports should adhere to the guiding principles for the development and operation of dry ports (as stated in Annex II to the Intergovernmental Agreement on Dry Ports).

4.2 Dry port location

- **Description of the issue.** The location of a dry port is a major determinant of its operational and financial success, as well as of success in minimizing logistics cost (i.e. overall handling, transport and storage cost between an origin and destination). Dry ports should be located as close as possible to cargo sources and trade generating centres.

- **Target.** Dry ports should be connected to cargo sources by short-distance road haulage services (either small breakbulk trucks for de-consolidated cargo or trailer trucks for containers), as transport by road is cost effective for short distances of less than 300 kilometres. For linkages to seaports or dry ports in other countries, dry ports should be connected by long-distance railway container haulage services as cargoes can be delivered cost effectively by rail transport for distances over 300 kilometres.

- **Process.** Transport infrastructure planners should locate dry ports as close to trade generating centres as possible and at adequate distances from seaports and other dry ports to ensure the financial viability of the dry ports and to provide cost effective transport solutions to industry.

4.3 Transport infrastructure linkages

1. Dry port - seaport linkages

- **Description of the issue.** An Important function of dry ports is to facilitate access to the sea for land-locked countries and the hinterland regions by consolidating cargo and by providing cost effective land transport linkages to seaports. However, few seaports can accommodate full length trains in loading/offloading sidings inside port boundaries. Few, if any, of the region's seaports locate rail sidings close to container stacks adjacent to berths (in most cases they are 500 metres to 2 kilometres away). This results in multiple handling of rail-delivered containers (typically 3 lifts per container to/from stacks as compared with only a single lift for road-delivered containers) and a significant competitive disadvantage for rail.

- **Target.** Port operators need to commit to improving railway access inside seaports. Rail access inside ports should be located as close to the container stacks as possible to reduce multiple handling of containers.
- **Process.** Transport planners in member states should wherever possible incorporate rail access as close to the container stacks inside ports, as possible. In the case of existing ports, improving existing or deploying new rail access inside ports should be given priority.

2. Rail infrastructure within dry ports

- **Description of the issue.** Rail-served dry ports must be connected to the nearest mainline via a short access line which in most cases will be setup by the concerned infrastructure authorities. The rail network within the dry port should have adequate rail infrastructure to accommodate full length trains.

- **Target.** The railway infrastructure to be provided inside a dry port should allow the receipt and dispatch of full length unit container trains running between a single origin and a single destination, without the need to be broken up or re-marshalled outside of the dry port.

  Loading and unloading of trains would take place in centrally located sidings comprising at least three tracks, one each for loading and unloading and one for the release and re-positioning of locomotives. The actual number of loading/unloading tracks to be provided would, however, depend on forecast traffic volumes. The container stacks of the container yard would be located either side of the tracks and the paved areas on which the stacks would rest would extend the entire length of the tracks, to allow container handling equipment to discharge and load containers

along the length of each train.

The length of the loading/unloading tracks is determined by the number and length of the wagons comprising a train. For example, for a train with 40 wagons pulled by one diesel locomotive, the track length required between the track points or switches may be calculated as 660 metres. (Note: The detailed calculation is: 1 diesel electric mainline locomotive of 22 metres + 40 x 2 TEU wagons of 14.45 metres + 10% allowance for braking = 666 metres.)

The design axle load in the rail sidings should be compatible with that of the mainline. In the case of metre gauge railways, this is typically 20 tonnes per axle and for wider gauges, it is generally in the range of 22.5 – 25 tonnes. Even at the lower level, the axle load is sufficient to accept heavy locomotives and wagons carrying two fully loaded 20-feet containers or a single fully loaded 40 feet container.

- **Process.** Dry port planners should ensure that rail served dry ports are equipped with the necessary rail infrastructure to ensure seamless connectivity between dry ports and seaports and/or other dry ports.

3. Road transport linkages

- **Description of the issue.** Dry ports need good quality road linkages to cargo sources and to seaports and/or other dry ports. In case of countries lacking a comprehensive rail network, they also need access to seaports via multi-lane highways. The Asian Highway Network can provide good coverage to the region's dry ports. However, the quality of roads that make up the Asian Highway network varies across countries which can affect transit times and also contribute to congestion on highways.

- **Target.** Dry port planners need to ensure that there are no missing links in the highway networks linking the dry ports that would prevent seamless transport between dry ports and seaports, or between dry ports in the region. Especially in countries where road transport is used instead of railway transport, to transport containers to seaports. Road capacity bottlenecks that would hinder seamless connectivity between dry ports and seaports need to be eliminated.
- **Process.** Dry port planners should ensure the deployment of adequate primary road links between seaports and inland trade generating centres and dry ports. Any capacity bottlenecks along highways that hinder seamless transport connectivity should be eliminated.

4. Road infrastructure within dry ports

- **Description of the issue.** The efficient operation of the dry port will depend in large part on the unimpeded circulation of trucks throughout most of the dry port area, except at the intersection with the rail access line, which would need to be protected by automatic level crossing barriers and warning devices.

- **Target.** The internal roads within the dry port should be constructed with a width of 15 metres, to allow handling equipment and trucks to pass safely. Moreover, the roads should be designed taking into account the axle loads applicable to the local highway system as the trucks delivering break bulk cargo between shippers or consignees premises and the dry ports will have to meet these requirements.
- **Process.** Dry port planners should ensure that road infrastructure within dry ports are adequate to ensure smooth flow of vehicles operating within and entering and exiting the dry ports.

4.4 Technical standards for dry ports

- **Description of the issue.** Adherence to identical design standards is not necessary for dry ports to function effectively as inter-related components of a regional network, but there is a need for some consistency among them as to the basic types of services offered and the design of the infrastructure needed to provide these services.

- **Target.** In order that dry ports within the network can directly consign and transport cargo from one to another, it will be necessary for them to provide facilities for the:

  - Handling, consolidation, storage and modal transfer of containers and cargo; and for
  - Customs and other border control inspection and clearance of international cargo.

  These facilities should comprise, at minimum of a fenced, customs secure area with a limited number of entry/exit points and with segregation of working areas and entry points for the handling of different types of traffic; A container yard (CY) which can receive and dispatch containers by road and rail, as well as store containers; A container freight station (CFS) in which cargo can be loaded into and discharged from containers; A customs inspection area where cargo may be discharged for inspection; A bonded warehouse for storage of under bond cargo; An

administration building of two or more levels accommodating: dry port management, offices for customs inspectors, offices for freight forwarders and cargo agents, offices for banking or financial service providers, and staff amenities (restaurant, etc.).

- **Process.** The scale of the necessary infrastructure must be planned in accordance with the projected peak level of container and cargo volume to be handled within the planning horizon (of about 20 years). The areas of the CY, the CFS, and the under-bond warehouse will in particular depend upon projected handling volume, but the area of the CY will in addition depend upon the type of container handling system to be deployed (which itself will be demand driven) and on the length and number of railway sidings to be incorporated in the design.
  In order to satisfy the requirement to promote environmentally sustainable forms of transport, dry ports will have to provide efficient access to rail. Where relevant, they should also be connected to inland waterway transport landings, quays, etc.

4.5 Container yard capacity and equipment

- **Description of the issue.** The layout of the container yard (CY) depends upon the length of the rail siding tracks as well as the type of handling system to be employed.

- **Target.** Generally, the choice of the latter is between a reach-stacker system and portal crane systems, such as rubber-tyre gantry cranes (RTGs) or rail mounted gantry cranes (RMGs). While the former are land intensive (i.e. require more land area to store a given number of containers) and are relatively inexpensive as compared with the latter, the latter systems can accommodate denser stacking of containers and are therefore less land intensive.

  The choice of handling system will depend in part on the expected volume of containers to be handled. In general, the reach-stacker system is cost effective for CY throughputs of up to 200,000 TEU per year, beyond which a portal crane system may be justified.

  Whether reach-stacker or portal crane systems are used, it will be requirement for container lifting equipment to work along the length of the loading/unloading tracks.

  In the case of a portal crane system, the crane will straddle at least the tracks and a roadway, and possibly even the container stack as well. This is because containers may be stacked in dense blocks with very little space in between the blocks.

In the case of a reach-stacker system, at least two reach-stacker units will work simultaneously either side of the loading/un-loading tracks, so that the CY will be separated into two paved areas, separated from each other by the tracks. In each section, container stacks will be arranged along the train working length in blocks of about 4 TEU wide, 3 TEU deep and 3-4 TEU high, each separated by a width of 13 metres to allow for the turning circle of a reach-stacker. The actual dimensions of the blocks will depend upon the lifting capacity of the reach-stackers used. (In this case, it was assumed that reach-stackers can lift near full loads 4 high to and from the third row of containers in a stack.) The reach-stackers will lift containers directly between wagons and the stacks, thereby avoiding the need to use prime movers and yard trailers, except for re-positioning of containers from the stack or wagons to the CFS or customs inspection area.

The annual container throughput capacity of a dry port is determined by the number of times per year on average that its CY storage volume is turned. If the CY storage volume is 1,400 TEU, then the average dwell time for a container cannot exceed 4.5 days if the annual throughput is to reach 100,000 TEU (assuming an operating year of 330 days).

- **Process.** To minimize costs, the CY would be constructed in heavy duty flexible paving materials, such as interlocking paving blocks, but the pavement must be designed to withstand the heavy wheel loadings of container lifting equipment. For example, the wheel loading of a reach-stacker lifting up to 45 tonnes is 25 tonnes per wheel.

4.6 Design of other major facilities

- **Description of the issue.** At some dry ports of the region, the facilities such as container freight station (CFS), the bonded warehouse and of the customs inspection area are designed and built without proper consideration of the capacity and/or factual throughput of a dry port in question. It results in hindering the efficiency of operations of such dry ports.

- **Target.** The area of the container freight station (CFS), the bonded warehouse and of the customs inspection area will be determined in proportion to the maximum container throughput volume expected to be handled in the dry port. The daily number of containers (TEU) to be handled or processed through these facilities will be calculated as some proportion of the expected TEU

throughput volume. The floor area of cargo discharged from these containers will be calculated by applying to the TEU volume an average area per TEU of 30 square metres and a traffic circulation factor of 1.3.

The CFS should be designed with container bays facing on to a raised loading/unloading platform on one side and truck loading/unloading bays on the other. Containers will be packed and unpacked by forklift trucks while still on their trailers. Similarly, break-bulk trucks will be loaded and unloaded from a raised platform by smaller forklifts.

- **Process.** Detailed requirements for other buildings, such as the administration building, the bonded warehouse, the customs inspection facility, and the security building should be determined through consultations with local Customs staff as well as with freight forwarders and other service providers. The buildings design should take into account the expected volume of containers that will be handled at the facilities.

Note

Write down your answers to the following questions:

- In relation to the technical aspects described above, what are the some of the technical issues/ challenges faced in the development and operation of dry ports in your country?
- For instance, you may consider the assessment in relation to the different transport infrastructure linkages. (Refer to 4.3)

Read

Case Study

This would be a good time to look into the illustrations of possible layout of dry port and examples of good rail access planning. (Refer to Case Studies section at end of the module)

4.7 Terminal management IT system

- **Description of the issue.** Application of real-time container and other cargo tracking systems based on information technology can increase reliability and security of goods transport operations between dry ports and seaports, thus allowing simplification of customs and other control formalities at dry ports.

- **Target.** It will be essential that the entry, exit and placement into storage of containers and cargo

be tracked by a real-time computer system, such that it will be possible to locate any container or cargo consignment from the time of its departure from a seaport, or from a shipper's premises, until its arrival in the dry port and placement into storage.

In addition, a computerized yard control system should be used to determine with precision where a container is to be placed in the stack.

- **Process.** Dry port planners or operators of the existing dry ports should consider deployment of IT systems identifying location of containers or other consignments to be shipped to a dry port from a seaport in real-time mode, as well as computerized container yard management systems.

4.8 Coding of dry ports of international significance

- **Description of the issue.** The United Nations Code for Trade and Transport Locations, or UN/LOCODE, is a system of codes developed for uniquely identifying locations, such as airports, seaports, and inland freight terminals, which handle international trade. The codes are of a five-character format, the first 2 alpha characters indicating the country in which the place is located, followed by 3 alpha characters indicating the specific location.

  However, so far very few dry ports have applied for a LOCODE, which prevents them from being easily identified and recognized as points of origin or destination in the course of a transport operation and limits the possibility of establishing a network of dry ports of international importance.

- **Target.** Through the adoption of international port codes, electronic links can be established between dry ports in the regional network. This will be of considerable benefit in facilitating trade and the electronic exchange of documents between dry ports located in different countries. Indeed, this is already happening for the exchange of cargo between two dry ports located in at least two countries of the region.
  UN/LOCODES are managed, maintained and updated by the UNECE Secretariat. The codes are maintained as a relational data base and may be updated on request from users.

- **Process.** It is strongly recommended that all dry ports which have not yet applied for a LOCODE, should do so. There is a procedure for interested parties to register new locations on-line, details

of which are available on the UNECE website. The UNESCAP Transport Division is available to assist countries in this process.

Note

Transport operators and logistics service providers rely on the codes as location identifiers to enable seamless transport connectivity. Dry ports assigned with such codes can act as points of origin and destination of international cargoes, where customs clearance of goods can take place, which would not be possible otherwise. The assignment of a code to a dry port facility also enables transport operators and logistics service providers to develop transport services for these locations.

In November 2018, the Government of Mongolia informed ESCAP that, following the recommendation of the regional framework, codes were applied for and assigned to dry ports and other logistical centres in the country. (Source: 3rd Meeting of the Working Group on Dry Ports, Bangkok, 13-14 November 2019)

- In relation to above, how did the use of codes affect the logistical operations and performance in the country?

4.9 Incorporation of dry ports into international transport documents

- **Description of the issue.** In practice, transport documents applied for cross-border transport operations are already used for the consignment of cargo between dry ports located in different countries of the region. The current format of these documents is adequate for international cargo exchanges between dry ports. In particular, there are practical examples of application of FIATA Multimodal Bill of Lading for operations between two dry ports of the region. Similarly, the existing international railway consignment notes (SMGS, CIM-SMGS, etc.) and international road transport consignment note (CMR) can also be applied for dry port-to-dry port operations. However, this type of transport operations is generally uncommon in the region.

  One of that reasons for that is lack of recognition of dry ports by government authorities as points of origin or destination where customs formalities and other control procedures associated with cross-border transport operations can be fully discharged with due efficiency.

- **Target.** All dry ports covered in the Intergovernmental Agreement on Dry Ports should widely serve as points of origin or destination for cross-border transport operations and be identified accordingly in the related transport documents.

- **Process.** Cross-border transport operations between dry ports located in different countries should

be further promoted among shippers, freight forwarders and transport operators. It does not need changes in the transport documents utilized for cross-border transport operations.

However, introduction of dry-port-to-dry port transport operations in some countries may (but not necessarily) require adjustment of domestic regulations related to customs and other control procedures and formalities.

Recognition of dry ports by government control authorities as points where customs and other control formalities related to cross-border transport operations could be efficiently carried out may be another important precondition for introduction of dry ports as points of origin and destination for cross-border transport operations.

4.10 Proposed arrangements for customs clearance at dry ports

- **Description of the issue.** Dry ports must be able to offer the full range of functions (customs, quarantine and health) for the border clearance of international cargo. As already observed, effective interoperability of dry ports within a regional network will require that they have the facilities and full authority to clear international cargo and that intermediate border checks be kept to the minimum necessary for border security.

  Preferably, border inspection staff should be based permanently at dry ports, or alternatively that staff will be available on demand to undertake inspections there. Customs inspection staff are permanently based at many existing dry ports in the region.

- **Target**. To make fully effective the border clearance functions of dry ports, it will be necessary to integrate the different border control processes (customs, quarantine and health) and documentation under a single authority within each dry port. This is the "single window" concept, the adoption of which will be essential to eliminate duplication of procedures and staff, as well as to reduce the volume of document processing, in dry ports.

  The border clearance functions of dry ports will also be enhanced if on-site inspection staff could be provided with the IT systems necessary to carry out risk assessment of import consignments. In some countries of the region, customs authorities have adopted a system of cargo pre-clearance whereby import consignments are risk-assessed 72 hours before vessel arrival in port. Such assessments are carried out with the assistance of on-line information related to customer (or consignee) profiles to determine whether clearance of consignments poses an acceptable level of risk. There are strong benefits to be realized from such assessments being carried out by border control staff based at dry ports, particularly if the latter will in future have ultimate authority for the clearance of cargo consigned to their facility.

- **Process**. Where necessary, the relevant regulations should be amended to eliminate comprehensive checking of cargo at maritime or land borders and to allow full clearance procedures to be carried out at destination dry ports.

4.11 Policy measures, legislation and solutions for planning dry port development

- **Description of the issue**. A generally fragmented authority for the coordination and planning of dry port development in the region has limited the effectiveness and delivery of government policies designed to assist this development. Co-ordination is particularly weak in countries which rely extensively (and sometimes exclusively) on private sector investment in dry port development.

- **Target**. The activities of a proper coordination agency can be usefully directed at developing and applying the following policy initiatives to assist the development and establishment of dry ports:

  - Taxation and other financial measures, including tax holidays or waivers, concessional land rent or public utility rates, etc;
  - Priority development of transport infrastructure connecting to dry ports, including where relevant, provision of investment incentives for private developers of dry ports;
  - Incorporation of dry ports in export processing or other free trade zones (FTZ) (taking care to ensure that such facilities are capable of generating cargo handling volume for dry ports);
  - Regulatory measures to encourage sustainable transport connections to dry ports, including the regulation of truck weights and dimensions to discourage the operation of environmentally damaging vehicles.

- **Process**. Policy measures on taxation and other financial measures do not seem to have been applied widely within the Asia-Pacific region and where it has, seem not to have been very effective. There is evidence that measures on priority development of transport infrastructure connecting to dry ports has been applied successfully in at least one country of the region. Measures on FTZ can be successful in generating sufficient volume to ensure the financial viability of dry ports, but only where the FTZ has a strong manufacturing base. An FTZ located at or near an inland border is unlikely to have this characteristic.

  In the case of regulatory measures, there may be a need to reverse the direction of policies previously applied to relax regulations related to truck weights and dimensions.

  Coordination of planning activities for dry port development should be assigned to an inter-agency committee, under the authority of a single transport ministry and with representation from all agencies with a regulatory interest and involvement in dry port development and operation. There is evidence that such an approach is being applied successfully in a few countries of the region.

4.12 Practical options for financing development and operation of dry ports

- **Description of the issue**. Within the Asia-Pacific region, Public Private Partnership (PPP) is currently the most popular option for financing investment in new dry port development, but there are relatively few existing dry port projects which have been financed in this way. PPP concepts have recently been applied widely throughout the region to transport infrastructure projects, such as highways and seaports – applications where the level (and stability) of demand is guaranteed. There is a high level of risk associated with dry port investments, due to the uncertain level and stability of demand, particularly in some inland areas, and in some cases the uncertain level of competition.

- **Target**. There are three main options for development financing and operation of dry ports:

  - Option 1: Financing by public sector and outsourcing of operation through a management contract with the private sector;
  - Option 2: Private sector financing and operation;
  - Option 3: Public Private Partnership (PPP) variants

  There are varying levels of investment risk associated with these options. Under Option 1, all of the risk is assumed by the public sector, which may make it unattractive relative to the constraints and limitations of the public sector budget. Option 2 assigns all of the risk to the private sector, which may make the project unattractive to some potential investors. Variants of Option 3 assume different levels of participation by public and private sector parties, ranging from maximum public sector investment in land and infrastructure to minimal public sector and maximum private sector investment in infrastructure and equipment.

- **Process**. PPP is seen to offer an opportunity for governments to reduce the burden on national budgets, by attracting private investments for expensive infrastructure projects and at the same time to introduce private sector expertise to the management and operation of these projects.

Governments can make PPP more appealing to potential private sector investors by shouldering a larger part of the capital cost and associated risk. There are several examples in the region when a PPP scheme was successful because the public sector covered all of the project's infrastructure costs, in addition to providing the land for the project.

Note

Write down your answers to the following questions:

- In relation to the institutional arrangements and policy measures described above, who are the relevant actors/entities involved in the operation and development of dry ports in your country?
- For instance, you may consider illustrating the institutional arrangements with their mandates.
- Are there gaps? duplications?
- What relevant legal institutions (i.e. statutes, laws, regulations and rules, administrative orders) govern dry port development and operation in your country?

More on institutional issues in succeeding sections.

Read

Case Study

This would be a good time to read through the country examples of institutional determinants for dry port development. (Refer to Case Studies section at end of the module)

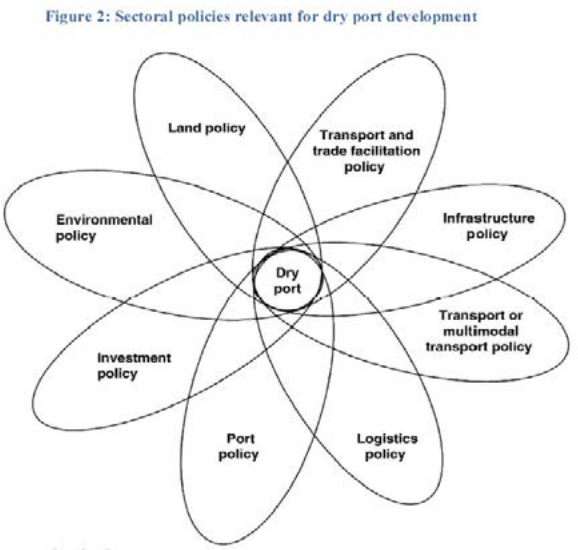
5 Institutional determinants for dry port development

In broad strokes, the term "institutional framework" refers to the set of formal organizational structures, rules and informal norms for service provision. This generally includes:

- governance institutions that define the distribution of power and authority between levels of governments, government organizations, and other actors;
- the legal institutions that refer to statutes, constitutional provisions, laws, regulations and rules, and high-level administrative orders governing the sector; and
- social and organizational culture within which the organizations and other stakeholders play their role.

An institutional framework could also be considered to include personal and group dynamic relationships between government organizations and the private sector, and various pressure groups that influence the decision-making environment and the allocation of resources.

Figure 2 Sectoral Policies Relevant for Dry Port Development



Source: ESCAP, 2019. Institutional Determinants for Dry Port Development and Logistics Performance in Cambodia, Lao PDR, Thailand and Viet Nam.

There is no one single recipe or template for institutional arrangements for dry port development. For instance, selecting a location for a dry port alone could be an overwhelmingly complex issue, as that decision, in principle, needs to be considered in relation to a number of factors that may include inter alia its relative proximity to seaports; connections to other modes of transport; cost of development, operation, and transport; potential for encouraging mode shift; environmental concerns; potential for attracting manufacturing and distribution facilities; and economic stimulus for regional economic development.

Based on an ESCAP study-report on institutional determinants, in terms of overall strategic aspects, the project research and implementation have revealed that national policy should ideally be conceived in an integrated manner rather than the sum of sub-sectoral development plans. As such, policy planning and implementation should be designed on the basis of how cargo is serviced and not on the basis of the mode of transport, as well as take due account of the productivity and competitiveness of the goods and services a country produces and commercializes abroad or domestically.

Planning should be done with both a medium- and long-term global perspective through a participative process that is public-private and interinstitutional. Furthermore, the development of a national policy on infrastructure, transport and logistics is a process of ongoing improvements, requires periodic modifications and must consider the internal and external environments in which it is implemented.

Regarding the institutional and organizational aspects, it is essential that there is clarity on the meaning of "strengthened institutions". In the context of dry port development, this is understood to mean that platforms should be created for dialogue and analysis, as well as that coordination and cohesion be achieved within the government and beyond. High performing countries in the region tend to have a coordination mechanism in which all government ministries and institutions involved in the process are represented, but in which the private sector, as the major generators and users of cargo, academia and NGOs are also present. A lead agency serving as the visible head under clearly defined jurisdictional relationships has shown to make a difference towards a common vision and implementation of related policies.

Regarding the legal aspects, integrated logistics and multimodal transport call for modern legal frameworks and flexible structures. In the case of the cross-cutting nature of dry ports and logistics, this could materialize in the form of the establishment of a legal frame of reference that is clear, cohesive and condensed into a single legal body that will facilitate enforcement. Furthermore, the drafting of legislation should, in line with optimal policy, streamline the logistics and transport of products, and not merely represent the mode by which they are transported.

6. Digital solutions for dry port operations

There is a need to develop a more comprehensive approach to the development of dry ports as components of intermodal transport corridors. There is also emphasis on the need to include dry port development in the broader context of the international intermodal transport and economic corridors, scaling up the catalytic role of dry ports and expanding the scope of the economic and social benefits of transport connectivity.

To this end, there is high relevance of the application of modern information and communications technologies, digital solutions and innovative business models for increasing the attractiveness of intermodal and multimodal transport operations, as well as of developing a region-wide strategic vision of digital transport corridors.

The dry ports environments have become intricate partner networks that include the authorities, terminals, shipping lines, trucking and logistics companies, and off-dock storage providers. To stay effective, stakeholders have to do more than simply adopt these technologies on their own. Instead, they must embrace platforms and services that make it easier for stakeholders to work together to promote the efficiency of the overall ecosystem.

Digitization is now the first step towards improving the situation with operating a dry port by transforming all relevant information into digital form, making it available for centralized use and management.

Modern digital technologies that can be applied on dry ports and other types of transport and logistical terminals include systems that support basic infrastructure, as well as tools for handling cargo, managing traffic, dealing with customs, assuring safety, and monitoring energy use.

The existing solutions can be divided into several fields of application:

- dry port infrastructure – embedded smart sensors that could transmit real-time data on operations
- cargo handling – reliable monitoring systems
- intermodal traffic and trans-shipment – terminal appointment systems
- safety and security – networked biometric scanners
- maintenance

- energy and the environment – motion-based terminal illumination system
- autonomous vehicles
- warehouse robots
- artificial intelligence

Case Study Some technical descriptions/illustrations for design and planning of dry ports

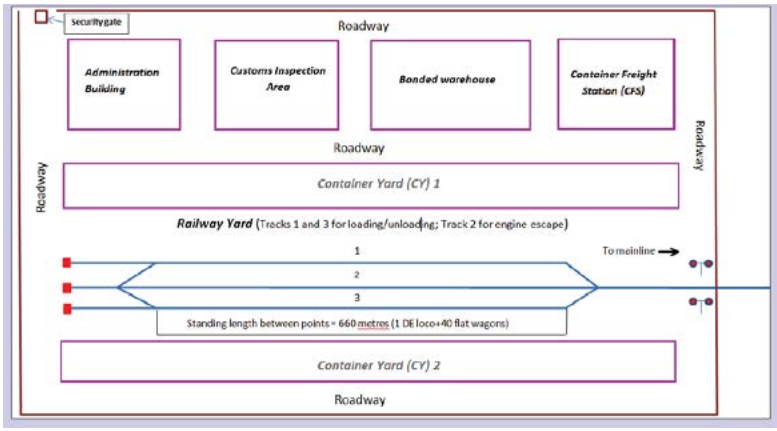
Excerpts from materials used during Capacity building workshop on planning, design, development andoperation of intermodal freight interfaces, including dry ports (Regional Framework for the Development of Dry Ports of International Importance - Capacity Building Workshop for Countries of South Asia)

https://www.unescap.org/events/regional-framework-development-dry-ports-international-importance-capacity-building-workshop

1. Key principle for container yard (CY) design: good rail access

- Rail infrastructure to be provided inside a dry port should allow receipt and despatch of full-length unit container trains running between a single origin and a single destination, without need to be broken up or remarshalled outside the dry port.
- CY should be designed around rail access and not the reverse
- Loading and unloading of trains would take place in centrally located sidings comprising at least three tracks – loading, unloading and locomotive release
- Actual number of tracks depends on forecast traffic volumes
- For a reach-stacker served facility, container stacks of CY located either side of the tracks (to allow for separation of import and export containers and for loading and unloading on both sides at a time)
- Paved area of CY on which stacks rest would extend entire length of tracks

2. Possible layout of dry port (reach-stacker served terminal)



3. Example of good rail access planning

Lard Krabang ICD (Thailand)

- Rail loading/unloading tracks centrally located, permitting working of handling equipment on either side

- Tracks are one km long permitting full length trains (loco plus 30-40 wagons carrying 60-80 TEU) to

arrive and depart directly in/from the terminal

Whitefield ICD (India)

- Rail access directly from/to Bengaluru-Chennai mainline
- 2 access tracks, one each serving export/import container stacks and domestic container stacks
- 2 loading/unloading tracks in each section (900 m long = 62 x 2 TEU wagons; actual/train = 45 x 2 TEU)

- Loading/unloading tracks placed centrally between container stacks
- All lifting (trains and stacks) by reach-stacker
- Annual handling capacity (estimated by consultant): 232,000 TEU

• Electric traction (approach track to sidings is wired)

Uiwang ICD (Rep.Korea) Terminal 1

• Rail access directly from Uiwang Marshalling Yard

• 3 access tracks each switched into 3 loading/unloading tracks of about 570 m length

• Trains of 30x2 TEU and 20x3 TEU wagons

• Loading/unloading tracks placed centrally between container stacks

- Trains loaded/unloaded by RTGs; reach-stackers work stacks
- Annual handling capacity (2 terminals): 1.37 million TEU

4. Planning for track length and number

Track length

- Length of loading/unloading tracks determined by number and length of wagons comprising a train
- For a train of 40 container wagons pulled by a single locomotive, length = 1 loco x 22 m + 40 wagons x 14.45 m + 10% allowance for braking and loco release = 660 metres approx.
- Length should not be planned for current train lengths, but for likely future economic lengths, based on advice from railways

Number of tracks

- Required number of loading/unloading tracks determined on basis of forecast container handling volume, number of trains operated and average train turnaround times
- To this number must be added an additional track for release of locomotive(s)

5. Dry port design and operation

CY layout determined by choice of handling system

- Layout depends on number and length of rail siding tracks as well as type of handling system to be employed
- Choice of container handling system (reach-stacker or portal crane system- in some cases straddle carrier system?) will in turn depend on expected volume of containers to be handled:

Reach-stacker:

- has wide turning circle, is therefore land area intensive, and has slow handling rates (typically only 12-15 lifts per hour)
- advantage is a low capital cost, ranging from US$ 500,000 (for an Indian manufactured Hyster unit) to US$ 800,000 (for a new Kalmar unit)

Portal crane system, either a rail mounted gantry (RMG) or a rubber tyred gantry (RTG), crane:

- can accomodate denser stacking of containers, is therefore less land area intensive, and has fast handling rates (typically 20-30 lifts per hour)
- disadvantage is a high capital cost (about US$ 1.6 million for an RTG and US$ 2.6 million for an RMG

- In general reach-stacker suitable for throughput volumes up to 200,000 TEU p.a., but this system is now handling nearly 465,000 TEU p.a. of rail-hauled containers at Lard Krabang
- Owing to much higher cost, portal crane systems are justified for throughputs in vicinity of million TEU p.a.

Reachstacker in operation, India

RTG transferring containers rail to road, ROK

RMG discharging containers from rail, ROK

Straddle carrier moving containers rail to stack, Bangladesh

For a reach-stacker served terminal

- Two CY sections placed either side of loading/unloading tracks to separate import and export containers
- At least two reach-stackers will work one train at a time (working along the length of the train), lifting containers directly between wagons and container stacks in one of 2 CY sections, avoiding need for trailer transfer
- With increase in number of reach-stackers, loading/unloading can be done simultaneously on both sides of the tracks (i.e. simultaneous handling of import and export containers)
- In each CY section, container stacks will be arranged in blocks of about 4 TEU wide, 3 TEU deep and 3-5 TEU high, along the length of tracks, each separated by a width of 13 metres to allow for reach-stacker turning circle. Storage capacity = 1,300 TEU approx.
- Annual throughput capacity depends on number of times CY storage volume is turned. In this case average dwell time of a container cannot exceed 4.5 days for throughput of 100,000 TEU
- To minimize capital cost, CY can be constructed in flexible paving materials, but will have to withstand heavy wheel loadings of container lifting equipment (reach-stacker lifting 45 tonnes = 25 tonnes per wheel).

For a portal crane served terminal

- Container stack arranged in a single block along the length of the loading/unloading tracks
- Crane will straddle at least the tracks and a roadway and possibly even the container stack as well (to allow container transfers between rail and road and between rail and stack as well)
- Cranes will need to run up and down the length of the train on rails or rubber tyres as the case may be
- To minimize capital cost, CY can be constructed in flexible paving materials, but will have to be strengthened for heavy loading under the runway of the portal crane(s)
- Wheel loadings for an RTG are approximately 26-35 tonnes

Case Study Practical proposal for digital solution in the logistics industry

Excerpts from on-going ESCAP study on "Digital Solutions for Dry Ports".

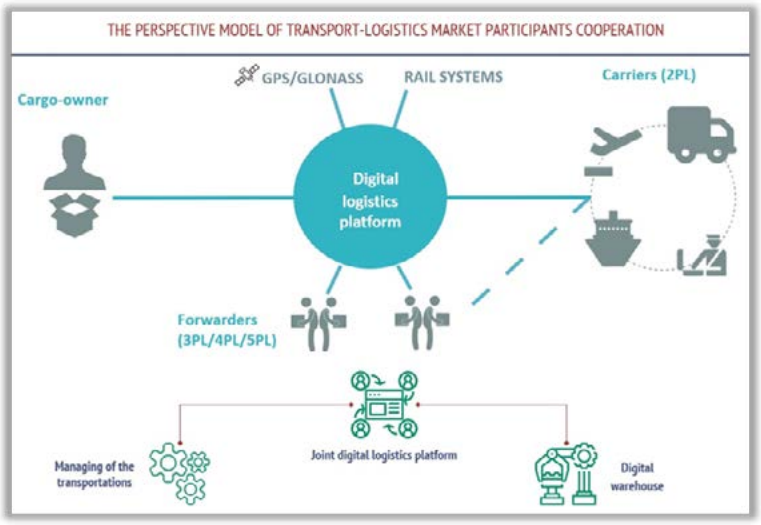
Practical proposals of digital solutions for the logistics industry can be most effectively integrated in a joint transport logistics digital platform. Such platforms could achieve the optimization of assets, production processes, logistic chains and profits of key market players (i.e. traders, suppliers, cargo holders, carriers, forwarders, etc). These platforms can also address issues related to operational management and optimize the transport assets usage.

The digital logistics platform is envisaged to:

- automate business processes, analyze consumer behavior and optimize organization of transport flows
- take into account the specifics of railway, auto, water and air transport
- simplify the workflow among participants in logistics processes
- use big data for data analytics to anticipate/predict events and minimize risks
- optimize transport and terminal assets utilization, improve its profitability and reduce logistics costs and expenditures.

On managing transport operations, the digital logistics platform:

- searches the optimal routes using technologies of machine learning
- uses facile interfaces for forwarders and the clients
- integrates information systems between regulators (e.g. government units) and users, enabling data and information exchanges/circulation


THE PERSPECTIVE MODEL OF TRANSPORT-LOGISTICS MARKET PARTICIPANTS COOPERATION
GPS/GLONASS
RAIL SYSTEMS
Carriers (2PL)
Cargo-owner
Digital logistics platform
Forwarders (3PL/4PL/5PL)
Joint digital logistics platform
Managing of the transportations
Digital warehouse

Learning Materials on Dry Ports

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific