

Dnieper – Danube Corridor Pilot Dataset Alignment to International Standards and Data Models and Documents Implementation Prototypes for Use in Eastern Europe

Project report

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Disclaimer: this report has been prepared by Mr. Dmytro Iakymenkov and Ms. Galyna Roizina, UNECE consultants. The views in this document are those of the authors and do not necessarily express the position of the UNECE.

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Project overview

Fulfilling the recommendations of the 2019 and 2020 UNECE “Odessa” seminars to support the development of digital multimodal transport corridors, with a view to increasing the harmonization and standardization of data exchange in international transport, trade and logistics to encourage electronic data exchange and thereby to reduce person-to-person contacts during the COVID-19 crisis and in the post-pandemic recovery, using relevant UN/CEFACT standards, a pilot project under the overall UN Development Account project “Transport and Trade Connectivity in the Age of Pandemic: United Nations solutions for contactless, seamless and collaborative transport and trade”¹ produced the following results:

- Analysis of data and documents transported via the Dnieper – Danube route (as a pilot implementation project);
- Development of electronic document equivalents for Inland Water Transport using the DAVID forms of the Danube Commission for inland waterways;
- Analysis of the feasibility of using API in this corridor;
- Test for interoperability.

The aim is to foster the harmonization of electronic data sharing using global (UN/CEFACT) standards for transport, trade and logistics, and to prepare standards for e-documents based on the UN/CEFACT semantic standards and reference data models. The focus will be on the development of electronic document equivalents for the documents mentioned above, using UN/CEFACT tools in the countries developing a digital multimodal transport corridor.

Project Activities and Outputs

1. Standardized Dataset

This UNECE-facilitated project focuses on a standardized dataset aligned to the international standards and data models prepared for pilot use in cooperation with Ukraine, notably, in the framework of the route passing through Ukraine using inland water transport, e.g. the Dnieper and Danube rivers (passing through Belarus, Serbia, Ukraine and several EU countries – Romania, Austria and others).

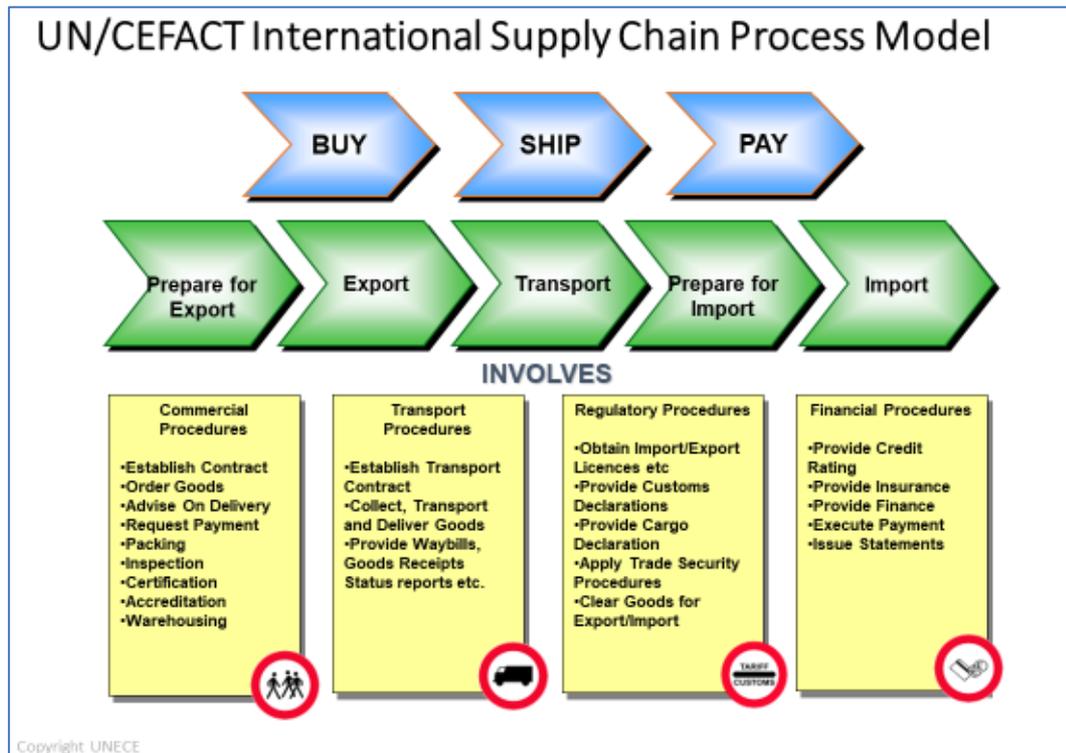
In the framework of the project, we developed an overall standardized dataset of the documents mentioned in the project overview (particularly the DAVID forms). We presented that standardized dataset in a technical structure view, along with an overall XML schema following the UN/CEFACT schema rules. The overall standard dataset of the documents supports contextualization by means of a restricted use of international standards.

Documents were reviewed against actual business documents examples that are actually used in transport corridors, and we identified several issues that should be solved in order to allow for real-life use of the electronic document equivalents.

The overall dataset is a reuse of the UN/CEFACT Multi-Modal Transport Reference Data Model (MMT-RDM) D19A for individual transport related documents. Yet it is still based on the wider Buy/Ship/Pay (BSP) Reference Data Model, the scope of which covers general international supply chain processes (Figure 1).

¹ For more information, see the UNDA COVID-19 Trade and Transport Project website: <https://www.unttc.org>.

Figure 1: The UN/CEFACT International Supply Chain Model (Buy-Ship-Pay, BSP)



Source : UN/CEFACT Recommendation No. 18, https://unece.org/fileadmin/DAM/cefact/recommendations/rec18/Rec18_pub_2002_ecetr271.pdf

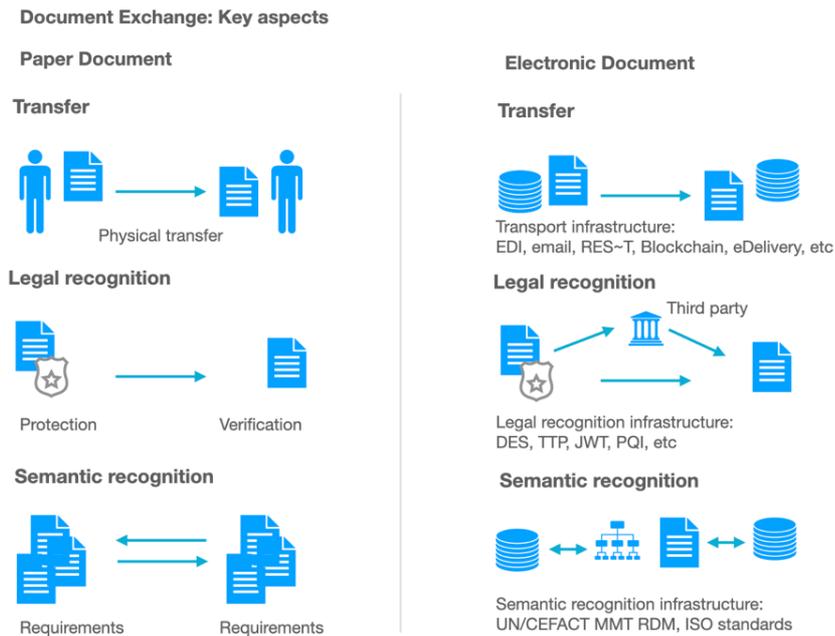
Document exchange can generally be presented in terms of three main aspects: document delivery (or transmission), legal recognition of the document and semantic understanding of the document's content.

From the point of view of paper workflow, delivery is realized by the physical transfer of a document from the author to the consumer, legal enforcement is implemented by applying agreed authentication strings to the document, such as forms, signatures of the parties, seals and other physical means of protection. The semantic understanding of the content of the document is realized through the development, approval and publication of requirements for the design of the content of the document, including forms, conditions, standards, etc. (see Figure 2)

In electronic document management these 3 aspects are implemented by other means, in particular:

- Delivery is implemented by creating a so-called transport infrastructure, which can represent both the simplest solutions, such as email, and more complex EDI systems or REST interfaces, as well as specialized platforms, including Blockchain and e-Delivery
- Legal recognition is implemented using crypto algorithms and electronic digital signatures, as well as such mechanisms as a trusted third party and others
- Semantic recognition was often implemented by means that migrated from paper document flow, namely, the use of beams and a highly specialized set of requirements for a specific document or set of documents. At the same time, the very nature of an electronic document flow allows for the use of new mechanisms of semantic recognition, namely, harmonized data models, on which both the electronic documents themselves and the data sets are built.

Figure2: Document Exchange: Key aspects



Source: the author.

The main task of this project focuses precisely on the semantic aspect of electronic document management, i.e. on providing the ability to understand the contents of a document or dataset to create a seamless information exchange accompanying the movement of goods and transport operations, by harmonizing such documents (datasets) with international standards.

2. Overview of the individual datasets

Table 1. Datasets

Document	Base International Reference Standard
DAVID Arrival /Departure Report	UN/CEFACT Multi Modal Transport Reference Data Model
DAVID Crew List	UN/CEFACT Multi Modal Transport Reference Data Model
DAVID Passenger List	UN/CEFACT Multi Modal Transport Reference Data Model
IMO General Declaration	UN/CEFACT Multi Modal Transport Reference Data Model
IMO Cargo Declaration	UN/CEFACT Multi Modal Transport Reference Data Model
IMO Crew List	UN/CEFACT Multi Modal Transport Reference Data Model
IMO Passengel List	UN/CEFACT Multi Modal Transport Reference Data Model

Source: the author.

The individual reports and outputs attached in annexes to this report reflect datasets created per provided paper document used nationally in Ukraine and globally for facilitation of trade along the corridor. These subsets show the usage of paper document names and terms in alignment with international standards data exchange modeling. In addition, box numbers from paper documents are reflected in the reports where applicable.

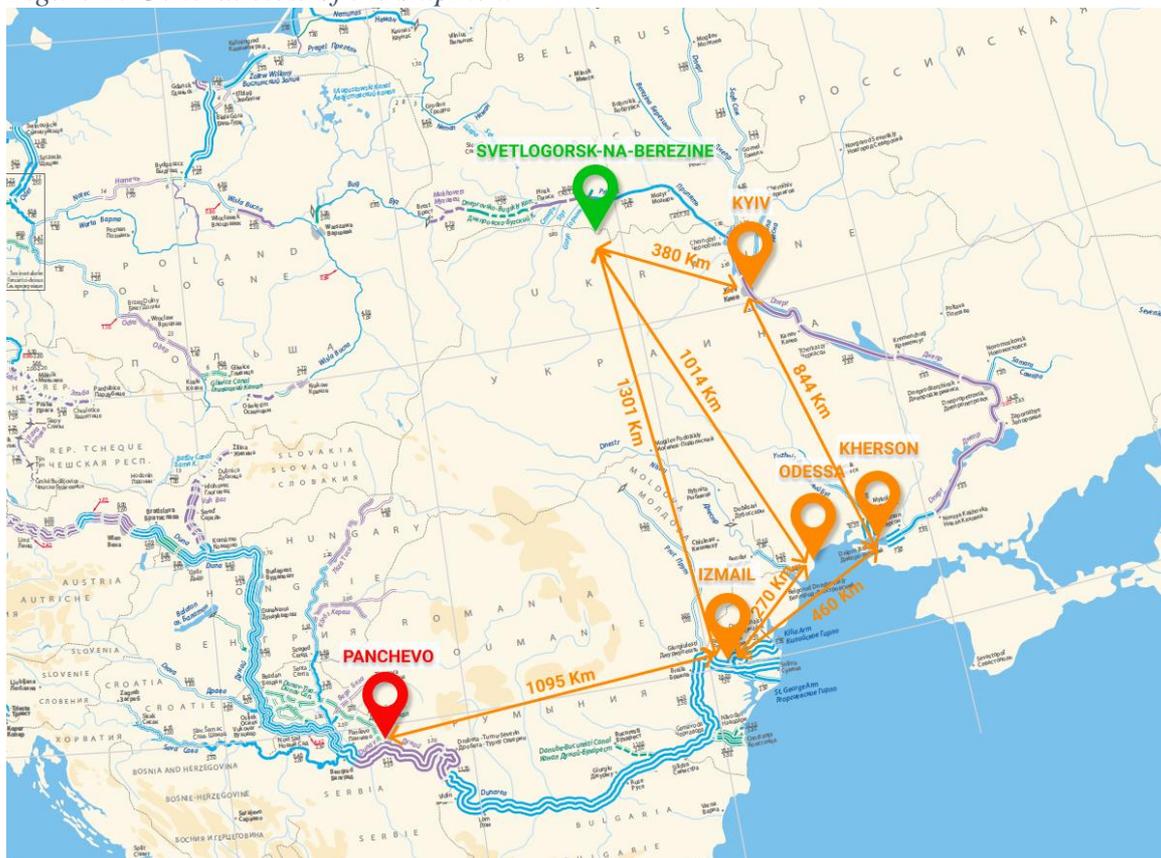
The Exchanged Document section for the subsets contains message- (document-) related electronic signature data, but the electronic signature itself is attached to the message envelope and separate from the message content. The Signatory Authentication information in the Exchanged Document section includes metadata about authentication of the content (paper or electronic signatures).

3. An analysis of merchandise and information flows for the pilot project

3.1. Overall pilot description

The pilot assessment was built around a real-world shipment of bleached softwood kraft pulp from Belarus to Serbia via Ukraine. The project involved different modes of transport and was performed in several scenarios. That allowed to assess the practical usage of different transport documents and data transformation from one to another during the steps of the shipment. The general presentation of the shipment is shown on the Figure 3.

Figure 3: General view of the shipment



Source: MAP – UNECE, Map of the European Inland Waterway Network, https://unece.org/fileadmin/DAM/trans/main/sc3/European_inland_waterways_-_2012.pdf DIAGRAM and the author

The physical pilot project to explore alternative routes from Belarus to EU developed against the background of the changing political situation inside the country and the consequences arising from this situation. It led to the fact that direct transportation by rail or road became unattractive. Three scenarios were examined as alternative routes, all based on the use of inland water transport.

Table 2. Details of the route

Route and points	Mode of transport	Documents
Route 1		
Belarus -Ukraine (Korosten) -Ukraine (Berezhn) -Ukraine (Kiev river port)	Railway	CIM/SMGS
Ukraine (Kiev river port) - unloading to the warehouse	Warehouse	Warehouse receipt

Ukraine (Kiev river port): loading on a ship	Warehouse	Warehouse receipt Delivery order
Ukraine (Kiev river port) -Ukraine (port of Kherson)	Inland waterways (Dnieper) - barge	Bill of Lading Cargo Declaration General declaration Crew List Departure report
Ukraine (port of Kherson) -Ukraine (port of Izmail)	Sea - tug + barge	
Ukraine (port of Izmail) - Serbia (Pancevo)	Inland waterways (Danube) - barge	
Route 2		
Belarus - Ukraine (port of Odessa)	Railway – Viking container train	CIM/SMGS
Ukraine (port of Odessa): unloading to the warehouse	Warehouse	Warehouse receipt
Ukraine (port of Odessa): loading on a ship	Warehouse	Warehouse receipt Delivery order
Ukraine (port of Odessa) -Ukraine (port of Izmail)	Sea - tug + barge	Bill of Lading Cargo Declaration General declaration Crew List Departure report
Ukraine (port of Izmail) -Serbia (Pancevo)	Inland waterways (Danube) - barge	
Route 3		
Belarus - Ukraine (port of Izmail)	Railway	CIM/SMGS
Ukraine (port of Izmail): unloading to the warehouse	Warehouse	Warehouse receipt
Ukraine (port of Izmail): loading on a ship	Warehouse	Warehouse receipt Delivery order
Ukraine (port of Izmail) -Serbia (Pancevo)	Inland waterways (Danube) - barge	Bill of Lading Cargo Declaration General declaration Crew List Departure report

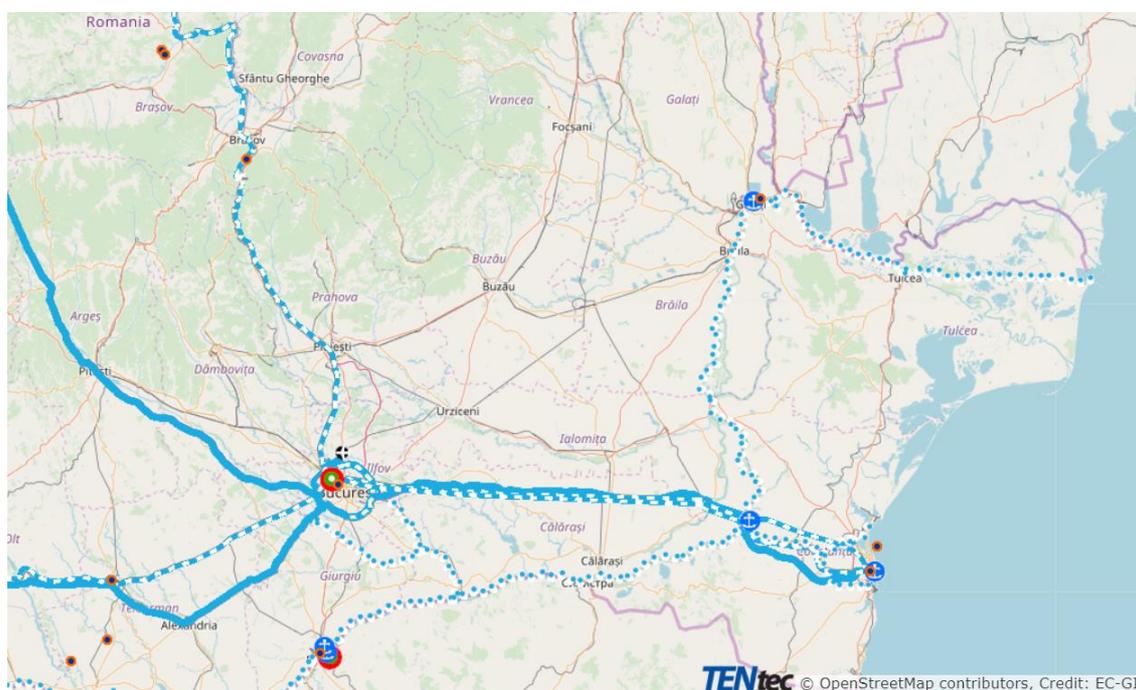
Figure 4: The Dnieper river segment of the route



Source : UNECE, Restoration of the international waterway E40, https://unece.org/fileadmin/DAM/trans/doc/2015/sc3wp3/Presentation_S3_59th_session_-_Restoration_of_the_international_waterway_E40.pdf

The Danube River segment of the route is part of the Rhine-Danube transport corridor. The Dnieper River segment of the route is part of the Black Sea – Baltic Sea transport corridor and waterway project “E-40”

Figure 5: The Danube river segment of the route



As indicated in Table 1, other elements of transport corridors were used to complete the assessment, particularly, railway transportation from Belarus to Ukraine, including the Viking container train, which goes from Lithuania to Ukraine via Belarus.

3.2. Documents used per modes of transport

The documents covered in the project are described in Table 3.

Table 3. Documents per mode of transport

Modes of transport			
Inland Water Transport			Rail
	DAVID	Real Documents (Ukraine)	
General Declaration (FAL form 1)	Arrival and departure report	General Declaration	CIM/SMGS
Cargo Declaration (FAL form 2)	-	Cargo Declaration	
Ship's Stores Declaration (FAL form 3)	-	Ship's stores declaration	
Crew's Effects Declaration (FAL form 4)	-	Crew's Effects Declaration	
Crew List (FAL form 5)	Crew List	Crew List	

Passenger List (FAL form 6)	Passenger List	Passenger List	
Dangerous Goods (FAL form 7)	-	-	

3.3. Considerations stemming out of the assessment

Certain political developments in the region made the usual routes for transporting goods from Belarus in the European direction uncompetitive. This prompted the search for alternative routes. The route proposed in the framework of this study is based on the partial use of inland waterway transport.

The advantages of this approach are:

- Environmental friendliness of inland water transport;
- Possibility of transportation of large consignments;
- Safety of cargo during transportation;
- Economic advantages;
- Possibility to combine various modes of transport (railway/road/container/inland water transport),

and the risks are:

- Impact of weather conditions (storms, fog, ice) that would decrease the speed of delivery; or
- Natural phenomena of a decrease in the water level of the Dnieper and Danube rivers.

In conclusion, the implementation of the three transportation scenarios in the framework of one project showed the competitiveness of the transport corridor Black Sea - Baltic Sea (in the section Belarus -Ukraine).

3.4. DAVID forms for inland water transport

As a part of the EU Strategy for the Danube Region Priority Area 1a (EUSDR PA1a), which aims at improving the mobility and multimodality on inland waterways on the Danube river, its working group WG6 (Administrative processes) proposed a harmonization project to facilitate vessel control procedures.

The comparison of control procedures in the Danube basin region made evident that data harmonization was important for the decrease of variations in control procedures along the Danube. With this objective in mind, the joint Working Group of PA1a (Inland Waterways) and PA11 (Security) developed the set of Danube Navigation Standard Forms (DAVID). Stakeholders from the shipping sector and control authorities from different countries combined their efforts to harmonize data in three often used forms: arrival and departure reports, crew lists, and passenger lists.

In 2018, the Working Group reached an agreement on the final first set of so-called Danube Navigation Standard Forms (DAVID):

- DAVID Arrival & Departure Report
- DAVID Crew List
- DAVID Passenger List

The DAVID forms were meant to replace the respective national forms required for controls at the Schengen external borders. Replacing the previously used forms with the harmonized DAVID forms became a national responsibility and involved administrative adjustments on a national level. Hungary, Croatia, Serbia, Bulgaria and Ukraine introduced the DAVID forms on a national level in 2020.

In parallel to these efforts, the Working Group concentrates on the digitalization of the harmonized set of DAVID forms to diminish administrative barriers, making shipping on the Danube even more attractive for existing and potential new customers.

WG6, in coordination with the participating States implemented the first approach for creating the DAVID forms within their existing IT solutions (RIS) with the possibility to export the forms to a PDF document.

In the frame of the RIS COMEX project (co-financed by the Connecting Europe Facility) the comprehensive digitalization of border control forms, including the DAVID forms is planned to make it possible to send all required control forms to the relevant control authorities directly from the Common Electronic Reporting System (short: “CES”), following the “single data entry” and “report only once” principles.

Such activities make the harmonization of the new DAVID forms with the UN/CEFACT Multimodal Transport Reference Data Model (MMT RDM) extremely important. As shown in this assessment, inland waterway transportation often makes part of a multimodal or combined shipment process, and a seamless flow of data elements between documents of different mode of transport (including IWT) has key importance for facilitating procedures and raising the efficiency of each mode of transport.

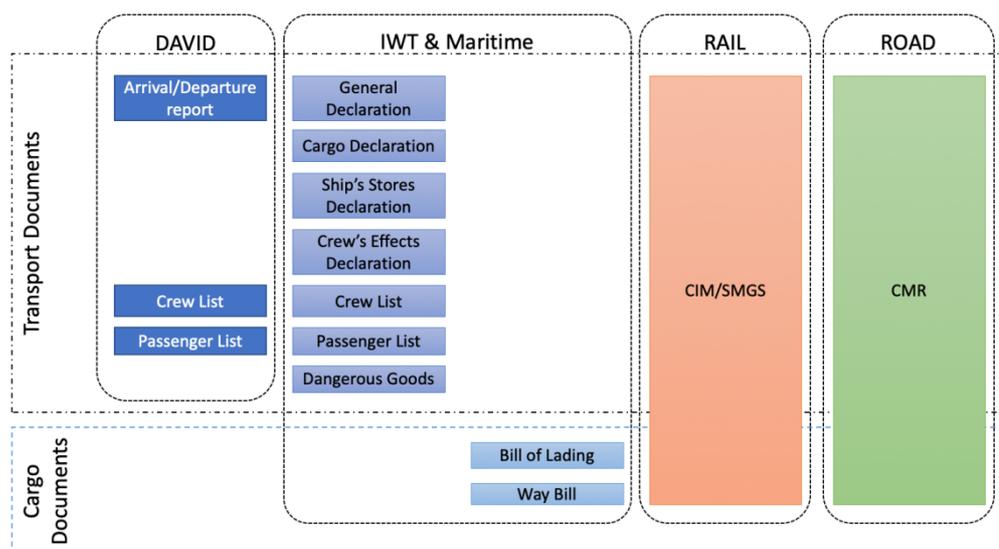
3.5. Correlations between the DAVID forms and other transport and cargo documents

In real shipment conditions, there are many documents accompanying transportation, related to both the transport operation and the cargo.

The DAVID forms can be well mapped to IMO FAL forms 1 (General declaration), 5 (Crew List) and 6 (Passenger List), which are widely used for both maritime and inland water navigation.

Also, the information about used transport equipment (in particular vessels) can be mapped to documents of other modes of transport, but only on the semantic modeling level, because the DAVID forms are not used as multimodal documents. Consequently, the mean of transport and transport particulars should be changed while changing the modality.

Figure 6: Documents of different modes of transport



Source: the author.

More details about mapping particular documents to MMT RDM and data conversion between documents will be presented in the next chapters.

4. Description of dataset mapping results

4.1. Work on the IWT documents used in the Ukrainian leg of the pilot project included:

- a) Mapping of the following real business case documents:
 - General Declaration
 - Crew List
 - Crew's Effects Declaration
 - Cargo Declaration
 - Ship's stores declaration
- b) The original documents, used for the mapping, are shown in Annex I.
 - General Declaration
 - Crew List
 - Crew's Effects Declaration
 - Cargo Declaration
 - Ship's stores declaration
- c) The results of the mapping are shown in Annex II.
- d) General considerations

The forms of documents used for transportation by inland waterways on the Ukrainian leg of the project correspond to similar documents used for maritime transportation. This, *inter alia*, made it possible to carry out the passage of the goods by sea from the estuary of the Dnieper to the estuary of the Danube, using the same set of documents.

The profile MMT RDM IMO FAL was used as a basis for prototyping a new profile for IWT. We can conclude that the documents included in the scope of the project were well matched and the structure of the documents follows the data model (and vice versa). This means that the documents that are listed can be mapped to MMT and all the necessary information from MMT profile is present in the documents

In general, there is a need to maintain the use of international code lists in their integrity and with relevance to the local requirements at the state level, in particular the UN/LOCODE from the point of view of river ports of Ukraine.

4.2. DAVID forms

- a) Mapping was performed using real business case documents and the paper documents of the DAVID forms, that are officially approved:
 - Arrival and departure report
 - Crew List
 - Passenger list
- b) The forms of the documents used for the mapping are shown in Annex I.
 - Arrival and departure report
 - Crew List
 - Passenger list
- c) Results of the mapping are shown in Annex II.
- d) General considerations

DAVID forms largely correspond to commonly used maritime documents used for similar tasks, in particular FAL 1, 5 and 6 forms (General Declaration, Crew List and Passenger List). Thus, the MMT RDM IMO FAL profile was also used for comparison. Similar to the previous set of documents, it can be noted that the DAVID forms were well matched with the data model.

At the same time, there are several details that could not be matched. This applies, in particular, to information on the re-registration of the vessel, which is not indicated in the maritime documents: the previous names of the vessel, the previous countries of registration (nationality) of the vessel. Due to certain specificities of river transportation, we recommend to consider a possible expansion of the MMT RDM profile for DAVID forms with appropriate attributes. In addition, the ENI number for vessel identification is absent in the IMO FAL documents.

There is also a need to update the code list of river ports in LOCODE.

5. Examples of documents implemented

The documents, used for the assessment, were implemented in electronic format (XML) based on the mapping, carried out under the project, and the UN/CEFACT guidelines for XML naming and design rules. Examples of these documents are provided in Annex III.

6. Analysis and results of the test of interoperability

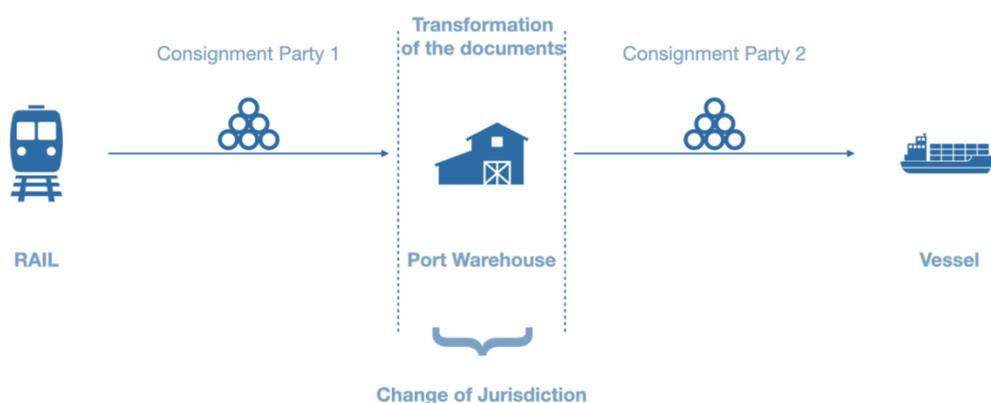
Given the different kinds of documents used in the multimodal shipment procedure, the interoperability test included several aspects:

- Transformation of transport documents for changing the modality;
- Transformation of cargo documents for changing the modality.

In addition, there is a transformation of both types of documents in case of changing the legal jurisdiction for multimodal and unimodal shipment procedures. For this purpose, efforts of the EU Strategy for the Danube Region Priority Area 1a (EUSDR PA1a) should be mentioned as a good practice for facilitating procedures for vessel documents on the Danube River.

As for the remaining part of the shipment, described in chapter 3.1, no single document was used as multimodal. Moreover, in practice, no direct transformation between modes of transport were used. Instead, the port warehouse is used as an intermediate link between rail and inland water transport (see Figure 4).

Figure 7: Transformation of the documents



Source: the author.

This approach allows for changing the consignment size and details. This approach also copes with the complexity of the task of transforming transport and cargo documents between

different modes of transport. Regarding the transport documents, the modes of transport are not linked to one another. Regarding the cargo documents, besides possible difference in requirements for the different modes of transport, the details on the consignment can be significantly changed - for example shipping the goods in containers for some segments of the shipment and as bulk for another.

In the framework of the pilot project, we assessed the transformation of the IMO FAL-based documents for inland water transportation into DAVID forms:

- IMO FAL 1 (General Declaration) – DAVID arrival report
- IMO FAL 5 (Crew List) – DAVID Crew List

Given the absence of any passengers on the vessel during the pilot project (during the pandemic), there was no possibility to assess a transformation of the IMO FAL 6 (Passenger List) to DAVID Passenger List, but due to the common structure of these documents, we can assume the results of such transformation would be very similar.

As the MMT RDM is used as a foundation for all these types of document, it is also used for the mapping in the conversion. The results of the test of data conversion are provided in Annex IV.

6.1. IMO FAL 1(General Declaration) – DAVID arrival report

- a) The conversion was performed using real business case documents:
 - General Declaration - Ukraine
 - DAVID Arrival and Departure report – officially approved
- b) The original documents, used in the conversions, are shown in Annex I.
 - General Declaration - Ukraine
 - DAVID Arrival and Departure report – officially approved
- c) The results of the conversions are shown in Annex IV.
- d) General considerations.

The documents compare well with each other due to the general structure. Considering the previous remarks on aligning the data filled in the DAVID forms to the MMT RDM, the following transformation results should be noted:

- The general structure and use of a single profile of the MMT RDM greatly simplify the transformation
- Using the same lists of codes in both documents allows to automate the transformation process
- There are certain differences in the set of details in both documents, in particular, the DAVID form contains the dimensions of the vessel that are absent in the General Declaration, as well as information about the movement of vessels in a convoy mode.

6.2. IMO FAL 5 (Crew List) – DAVID Crew List

- e) The conversion was performed using real business case documents:
 - Crew List - Ukraine
 - DAVID Crew List – officially approved
- f) The original documents used in the conversions are shown in Annex I.
 - Crew List - Ukraine
 - DAVID Crew List – officially approved
- g) The results of the conversions are shown in Annex IV.

h) General considerations.

The considerations about the structure of the documents are the same. Identified discrepancies in documents include:

- Previous names and previous nationality of the vessel
- ENI number of the vessel
- Ports of arrival and departure.

7. Report on the assessment of using Application Programming Interface (API)

The use of API is a common trend today. It is the result of widely spread Internet (or WEB) applications. The need of API is an answer to the question – how to connect different IT systems in an open network like Internet. Bilateral connections, widely used in the corporate world, are not effective anymore because of the huge quantity of parties.

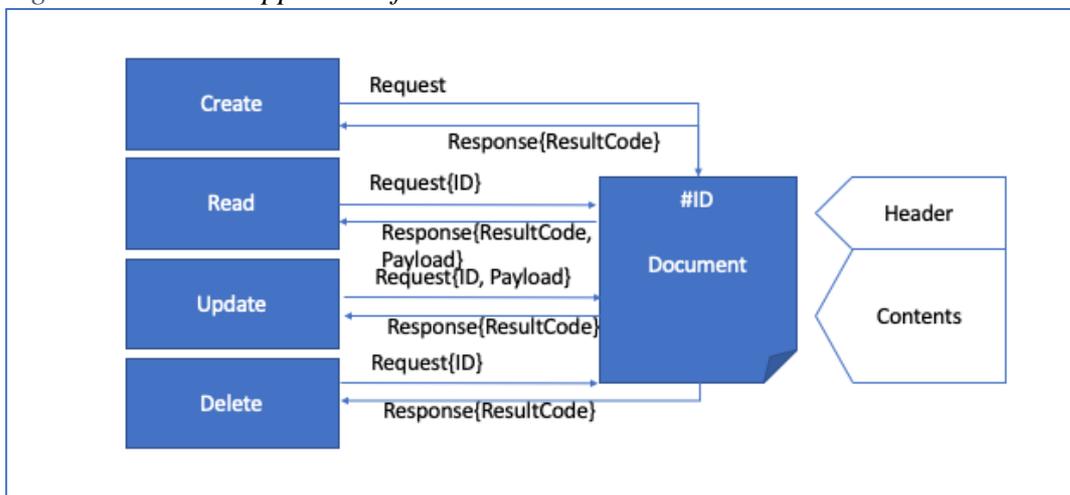
The use of APIs suggests a common rule for interface definition between systems that need to exchange data and/or documents. The advantages of using API is that it can offer a standard approach that can be used by multiple parties in open networks.

In the previous phase of the project, the REST-based API based on the CRUD model has been proposed. The main point for such approach instead of strait movement to classical API is that most of trade and transport IT solutions are still heavy linked to document-based information exchange procedures. Standards for such documents are, on the one hand, stable and approved, but, on the other hand, may not be compatible between industries. This issue can be solved by using the CRUD semantic model for building API – the unit of information exchange remains the document, while all operations with documents are described by the following four methods:

- Create – creating new document in the target system
- Read – retrieving or requesting an existing document from the target system
- Update – modifying an existing document in the target system
- Delete – removing an existing document from the target system

In each case all or just some of these methods can be used, depending on the requirements of a certain system and/or regulations. For example, some systems prohibit the deletion of documents. Instead, they can only be marked as inactive.

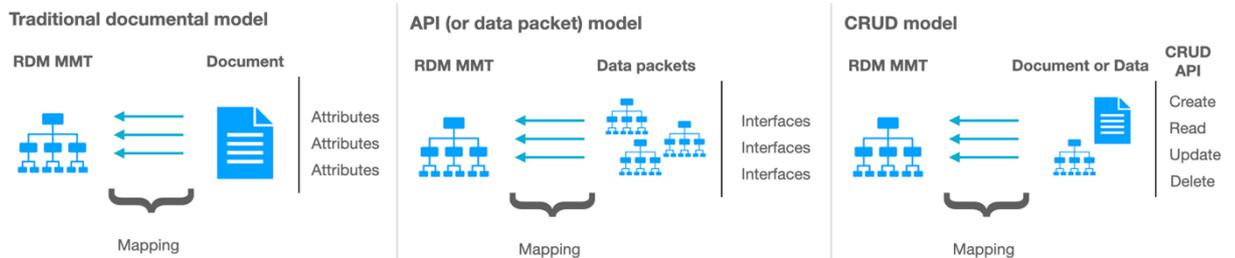
Figure 8: General approach of the CRUD model



Source: the author.

The great advantage of the API approach is a possibility of shifting the paradigm of document exchange to the exchange of data packets or data sets, that will allow to move from providing the document to a certain Receiver (a Single Window system, for example) – which is a “push” model – to requesting the portions of data directly from the point where the data is produced – a “pull” model.

Figure 9: The difference between the classical documentary model, the API model and CRUD



Source: the author.

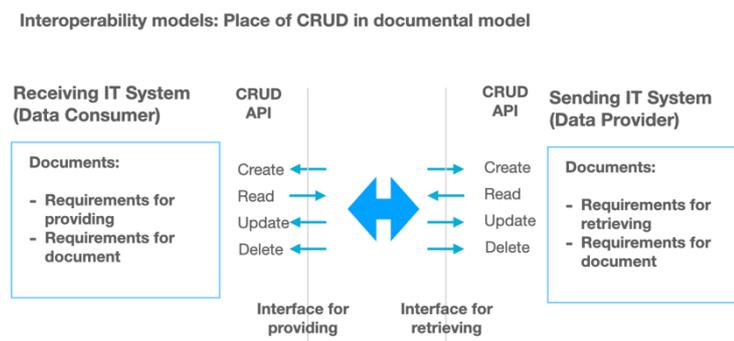
In the documentary model the document is the entity of information exchange. The contents of the document are described by attributes (data elements). One document can contain several data sets and can be used by multiple consumers, as described in the principle “Supply once, use many times”. The push model of delivery is used – the document is provided by a data supplier to a Single Window and, usually, the event of providing the document is separated from the events that are described in the document itself.

In the API model, data are hidden from external consumers by programmatic interfaces. This intermediate layer allows to implement such additional functionalities as access control and data conversion. The pull model is preferable; it allows to implement data pipes.

The CRUD model can operate both documents and data packets, but the strongest advantages that it can provide are for the integration of document-based IT solutions to another document-based IT systems with different requirements (for example - from different jurisdictions) as well as to the API-based IT systems. The point is that the CRUD API is much simpler than the full API and is absolutely schema-neutral, so any kind of contents can be shared using this approach.

The implementation of the interoperability solution, based on such approach, is shown in Figure 5.

Figure 10: Implementation of an interoperability solution using API



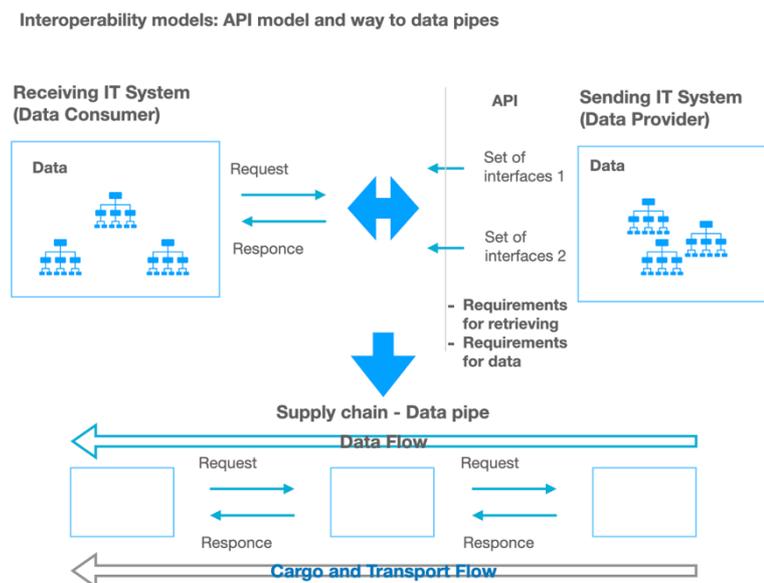
Source: the author.

The CRUD API, as any other API, highlights the complexity and specificities of certain implementation and harmonization requirements for retrieving and providing data. As shown on Figure 10, two points of applying programmatic interfaces exist. One is on the receiver side (a providing interface) and the second one is on the sender side (a retrieving interface).

The requirements for a document can be harmonized by mapping (the data in) the document to the UN/CEFACT MMT RDM, as indicated in this project. Inside the API, the results of such harmonization can be used in populating a document manifest, which contains an XML schema (XSD). Based on the CRUD model, the schema is also the electronic document equivalent and can be operated via the same API.

As a next step to expanding the API and moving to data pipes is the implementation of automated negotiation of such document requirements using the mechanism of the XML transformation (XSLT). Such transformation can be implemented as a schematron by the sending side, which is also required as a document via CRUD API and executed on the receiving side. This can guarantee consistency of the content of the converted document and will not break the existing legal recognition schema (or legal regime, if exists). Such an approach requires publication of extra metadata, particularly – mapping to the RDM entities type (ABIE and BIE) and data type details.

Figure 11: Interoperability models: API model and way to data pipes



Source: the author.

Further implementation of the interoperability solution with the full API model is shown in Figure 6. In this approach both systems – on the receiving and sending side - should be ready to move to the pull model and to operate data packages instead of documents. An advantage here is that connecting such systems within the supply chain produces a data pipe, that creates a seamless data flow accompanying the cargo and transport flows.

8. Considerations

- Harmonization of the semantics of documents and datasets is an important component of electronic data and document exchange workflow. Considering the development of electronic document management, automating the understanding of the content of the document acquires key importance. The approach proposed by UN/CEFACT to bring all trade and transport documents involved in the supply chain to a single reference model for multimodal transport appears to be the most promising.
- The issue of legal recognition is important and requires attention in the area of cross-border and multimodal information exchange. Although it is beyond the scope of the current project, the mechanisms considered in this study, regarding the applicability of APIs, can be used among others to resolve this issue.
- When updating existing or developing new trade and transport electronic document equivalents at the regional and sectoral level, aimed at simplifying procedures, it is advisable to consider the experience and recommendations of UN/CEFACT on harmonizing datasets. Intermodality and interoperability will be inevitable in the inclusion of regional or sectoral supply chains in global supply chains.
- The API approach in general and, more specifically, the CRUD model can be used as a mechanism for the evolutionary transition from a documentary model to a data pipeline model.
- The CRUD model can also help to solve the problem of the readiness for and utilization of standards by participants in information exchange:
 - API ready
 - e-Document (RDM-compliant) ready – can be supported by CRUD API
 - e-Document (non RDM-compliant) ready – can be supported by CRUD API
 - e-copies of paper documents (PDF and etc.) – can be supported by CRUD API
 - Paper documents

9. Recommendations

- Use the Buy-Ship-Pay Reference Data Model (BSP RDM) as the overall base reference data model to cover Business to Business and Business to Government procedures.
- Coordinate the development of the new trade and transport documents at the regional and sectoral level with UN/CEFACT recommendations and other international standards and best practices.
- Provide an instrument for the creation of schematrons. Specifying detailed information on attributes for each entity in a document schema can be instrumental for the creation of schematrons, and this should help automate the compliance checks on both sides – of the submitter and the recipient. This will provide ground for the next step in minimizing the impact of the subjective factor (the human factor) and facilitating trade procedures.
- Support the efforts of national authorities to keep actual and relevant international code lists used in multimodal transportation.
- Maintain the efforts for further assessments of the use of a JSON API approach. Given the significant difference in the state of implementation of international standards for electronic document exchange in different industries and in different countries, the use of the JSON API approach can be considered as a solution for harmonization. It can also solve the problem of legally trusted electronic documents, which is caused by the difference in digital electronic signature (DES) standards.

The CRUD model, put forward in this report, can be used as a soft changes approach for moving from a document-based to a data packages-based paradigm for information exchange in the transport chain.

This approach relates to both the technical and the organizational aspects of the work and consideration should also be given to the legal aspects of this approach. For this reason, it is important to continue the analytical work in this area.

Annexes

Annex I. Original documents, used for mappings and conversions

1. Real documents (Ukraine)

a. General Declaration

(Name of chipping line, Agent, etc.) Наименование судоходной компании Открытое акционерное общество «Белорусское морское пароходство»		GENERAL DECLARATION Генеральная декларация	
		V	Arrival приход
		V	Departure убытие
1.1 Name and type of ship Наименование судна Теплоход «Надежда»		2. Port of arrival/departure Порт прибытия/убытия Киев	
4. Flag State of ship Флаг судна Республика Беларусь		5. Name of master Ф.И.О. капитана Кацуба.О.Н	
7. Certificate of registry (Port; date; number) Регистрационное удостоверение (порт, дата, номер) Мозырь, 01.03.2019, БРП-486		3. Date and time of arrival/departure Дата, время прихода/убытия	
9. Gross tonnage Вес брутто 483,0		6. Last port of call/Next port of call Прибыл из порта/порт назначения Комарин	
10. Net tonnage Вес нетто		8. Name and contact details of ship's agent Имя и адрес агента	
11. Position of the ship in the port (berth or station) Расположение судна в порту Киевский речной порт			
12. Brief particulars of voyage (previous and subsequent ports of call; underline where remaining cargo will be discharged) Маршрут перевозки (порты захода) Комарин - Киев			
13. Brief description of the cargo Описание груза В балласте			
14. Number of crew (incl. master) Экипаж, человек 8		15. Number of passengers Пассажиров, человек	
Attached documents (indicate number of copies) Прилагаемые документы (указать число копий)		16. Remarks Особые отметки 1. Предметов, запрещенных к ввозу на территорию Украины не обнаружено 2. Посторонние лица на судне отсутствуют	
17. Cargo Declaration Декларация на груз В наличии		18. Ship's Stores Declaration Декларация судовых запасов В наличии	
19. Crew List Список экипажа Судовая роль		20. Passenger List Список пассажиров Судовая роль	
22. Crew's Effects Declaration (only on arrival) Декларация экипажа В наличии		21. Date and signature by master, authorized agent or officer Дата и подпись капитана или агента	
23. Maritime Declaration of Health (only on arrival) Морская санитарная декларация В наличии			

For official use

b. Crew List

Республика Беларусь
 Министерство транспорта и коммуникаций
 ОАО «Белорусское морское пароходство»

Судовая роль

1. Название судна Т/х "Надежда" 3. Род и назначение судна Теплоход-Площадка
 2. Порт № регистрации Речной порт Мозырь 4. Собственник судна ОАО «БМП»

№ П/П	Фамилия, имя, отчество	Год рождения	Гражданство	Должность	Должность по диплому и № диплома	№ паспорта	Дата поступления на судно
1	Кацуба Олег		РБ	Капитан - Сменный Механик	Капитан-механик		01.06.2020
2	Шафоренко Иванович		РБ	Механик - Сменный капитан	Капитан-механик	ВТОС	01.06.2020
3	Кильчевский Александр	1	РБ	I пом. Кап - I пом. Мех.	Капитан-механик	ВТОС	01.06.2020
4	Сазонов Александрович	185	РБ	Моторист	Мех. - 1 пом. кап.	ВТОС	01.06.2020
5	Зайцев Сергей	15.0	РБ	Моторист	1 пом. Кап. - 1 пом. Мех.	ВТОС	01.06.2020
6	Александр Николаевич	14	РБ	Моторист	2 пом. Кап. - 2 пом. Мех.	ВТОС	01.06.2020
7	Кацу Котович	0	РБ	Моторист	3 пом. Кап - 3 пом. мех	ВТОС	01.06.2020
8	Николаевич	0	РБ	Моторист	Моторист	ВТОС	01.06.2020

Капитан



Кацуба О.Н.

c. Crew's Effects Declaration

(Name of shipping line, Agent, etc.)

Наименование судоходной компании:

Открытое акционерное общество
«Белорусское морское пароходство»

CREW'S EFFECTS DECLARATION

декларация экипажа

1.1 Name and type of ship Наименование судна Теплоход «Надежда»			2. Effects which are dutiable or subject to prohibitions or restrictions Имущество, которое является подлежащим обложению налогом или подлежащим запрещению или ограничению							7. Signature Подпись
3. Nationality of ship Флаг судна Республика Беларусь			евро	долл. США	бел. руб.	грн	руб.	спирт	другие ценности	
4. No номер	5. Family name, given names Ф.И.О.	6. Rank or rating Ранг или должность								
1	Кап. Н	Капитан-см. механик		70		300				
2	Шаф А.И.	Механик – см. капитан	1		10					
3	Кал А.В.	I пом. кап. – I пом. мех								
4	Кал	моторист								
5	Сазонов	моторист								
6	Зайцев	моторист								
7	Христанович	моторист								
8	Котович	моторист								
Amount of Captain's and crew members valuables (gold, silver, platinum, jewelries, banks travel checks, etc). Personal fire arms and cartridges (ammunition), explosives and narcotics are the stated in point 2 Личные ценности капитана и команды (золото, серебро, драгоценности и т.д.); личные оружие, боеприпасы перечисляются в пункте 2										
21. Date and signature by master, authorized agent or officer Дата и подпись капитана или агента			«26» 10 2020 года О.Н.Катуба МП							

e. Ship's stores declaration

Наименование судоходной компании
**Открытое акционерное общество
 «Белорусское морское пароходство»**

ПЕРЕЧЕНЬ СУДОВЫХ ЗАПАСОВ

приход убытие

1. Наименование судна Теплоход «Надежда»		2. Порт, где сделано заявление Киев	
3. Флаг судна Республика Беларусь		4. Маршрут перевозки Комарин - Киев	
5. Ф.И.О. капитана Кацуба Олег Николаевич			6. Количество членов экипажа 7
7. Наименование	8. Ед.измерения	9. Количество	
1. Хлеб	бух.	10	
2. Мука	кг.	4	
3. Жиры растительные	литр	2,5	
4. Жиры животные	кг.	2,5	
5. Мясо	кг.	10	
6. Рыба	кг.	-	
7. Колбаса	кг.	3	
8. Яйца	дес.	4	
9. Консервы	банки	12	
10. Крупы разные	кг.	15	
11. Макароны изделия	кг./пачки	8	
12. Молочные продукты	литр	1,5	
13. Сахар	кг.	10	
14. Фрукты	кг.	-	
15. Овощи	кг.	4	
16. Чай	пачки	2	
17. Соль	кг.	4	
18. Напитки	литр	-	
19. Вода питьевая на борту	литр	15000	
20. Диз.топливо на борту	литр	40000	
21. Диз.масло на борту	литр	600	

«26» 10

2020 года

Капитан

О.Н.Кацуба



2. DAVID forms (approved in Ukraine)

a. Arrival and departure report

ЗВІТ ПРО ПРИХІД/ВИХІД
ARRIVAL AND DEPARTURE REPORT
Danube Navigation Standard Form (DAVID)

		Прихід Arrival	Вихід Departure	
1.1 Найменування та тип судна (основного судна), включаючи попередні назви судна (якщо це застосовано) Name and type of ship (main vessel) including previous name(s) of ship - if applicable		1.2 Номер судна / ENI-Європейський номер ідентифікації (основне судно) Ship number/ENI-European Number of Identification (main vessel)		
1.3 MMSI номер - якщо це застосовано MMSI number - if applicable		1.4 Сертифікат судна дійсний до (основне судно) Vessel certificate valid until (main vessel)		
2. Порт приходу/виходу Port of arrival/departure		3. Дата та час приходу/виходу Date and time of arrival/departure		
4. Національна належність судна (країна / район реєстрації), включаючи попередню національну належність судна - якщо застосовано Nationality of ship (country/area of registration) including previous nationality of ship - if applicable	5. Прізвище, ім'я та по батькові капітана Name of master		6. Пункт контролю / пункт перетину кордону Control point/border crossing point	
7. Загальна довжина [м] / Загальна ширинка [м] Total length [m]/Total width [m]		8. Прізвище, ім'я по батькові та контактні дані оператора судна Name and contact details of ship operator		
9. Двоичні проєкт [м] Actual draught [m]	10. Максимальний тоннаж [т] / Загальна кількість вантажу [т] Maximum tonnage [t]/ Total quantity of cargo [t]			
11. Позиція судна в порту (причал або вокзал) - якщо застосовно Position of the ship in the port (berth or station) - if applicable				
12. Короткі відомості про рейс (попередні та наступні порти, зазначити, де вантаж буде розвантажено) Brief particulars of voyage (previous and subsequent ports, underline where cargo will be discharged)				
13. Короткий опис вантажу Brief description of the cargo				
14. Реєстрація та ідентифікація EORI / економічних операторів - якщо застосовно EORI/Economic Operators' Registration and Identification - if applicable		15. Кількість членів екіпажу Number of crew		
16. Режим експлуатації (A1, A2, E) - якщо це застосовано Navigation mode (A1, A2, E) - if applicable		17. Кількість пасажирів - якщо це застосовно Number of passengers - if applicable		
Додаті документи - якщо це застосовано (вказати кількість копій) Attached documents - if applicable (indicate number of copies)		18. Примітки Remarks		

Додані документи - якщо це застосовано (вказати кількість копій) Attached documents - if applicable (indicate number of copies)			
19. Вантажна декларація Cargo Declaration	20. Декларація суден Ship's Stores Declaration		
21. Список членів екіпажу Crew List	22. Список пасажирів Passenger List	23. Вимоги судна щодо обладнання для прийому відходів та залишків The ship's requirements in terms of waste and residue reception facilities	
24. Декларація про особисті речі екіпажу (тільки на прихід судна) Crew's Effects Declaration (only on arrival)	25. Звіт про стан здоров'я (тільки по приходу) Declaration of Health (only on arrival)		
26. Дата та підпис капітана, уповноваженого агента чи посадової особи Date and signature by master, authorized agent or officer			
27. Інформація про конвой (заповнюється тільки для штовхнутих та з'єднаних конвоїв): Convoy information (to be filled out for pushed and coupled convoys only):			
Дані судна Vessel data		Дані про вантаж Cargo data	
Назва та тип судна, включаючи попередні назви судна - якщо це застосовно Name and type of vessel including previous name(s) of ship - if applicable	Номер судна ENI Ship number/ ENI	Сертифікат судна дійсний до Vessel certificate valid until	Порт приходу Port of arrival
			Порт виходу Port of departure
			Максимальний тоннаж [т] Maximum tonnage [t]
			Тип вантажу Type of cargo
			Маса вантажу [т] Quantity of cargo [t]
Головне судно Main vessel			
Судно 2 Vessel 2			
Судно 3 Vessel 3			
Судно 4 Vessel 4			
Судно 5 Vessel 5			
Судно 6 Vessel 6			

b. Crew list

**СУДНОВА ПОЛЬ
CREW LIST
Danube Navigation Standard Form (DAVID)**

		<input type="checkbox"/> Прихід <input type="checkbox"/> Вихід		Номер сторінки			
1.1 Найменування та тип судна (основного судна), включаючи попередні назви судна (якщо це застосовано) 1.2 Name and type of ship (main vessel) including previous name(s) of ship - if applicable		1.2 Номер судна / ENI-Європейський номер ідентифікації (основного судна) Ship number/ENI-European Number of Identification (main vessel)					
1.3 MMSI номер - якщо це застосовано MMSI number - if applicable		1.4 Сертифікат судна дійсний до (основного судна) Vessel certificate valid until (main vessel)					
2. Порт приходу/виходу Port of arrival/departure		3. Дата та час приходу/виходу Date and time of arrival/departure					
4. Національна належність судна (країна / район реєстрації), включаючи попередню національну належність судна - якщо це застосовується Nationality of ship (country/area of registration) including previous nationality of ship - if applicable		5. Короткі відомості про рейс (попередні та наступні порти) Brief particulars of voyage (previous and subsequent ports)					
6. N.	7. Прізвище, ім'я та по батькові Family name, given names	8. Посада Rank or rating	9. Національність Nationality	10. Дата і місце народження Date and place of birth	11. Тип та номер документа, що посвідчує особу Type and number of identity document	12. Країна походження документа, який посвідчує особу Issuing country of identity document	13. Стать (пан або пані) Gender of the person (Mr. or Ms.)
13. Дата та підпис капітана, уповноваженого агента чи посадової особи Date and signature by master, authorized agent or officer							

Annex II. Results of the mapping

1. MMT RDM – Real Documents (Ukraine)
 - a. General Declaration
 - b. Crew List
 - c. Crew's Effects Declaration
 - d. Cargo Declaration
 - e. Ship's stores declaration

MMT IMO FAL Guide_UNECE-Real Documents(Ukraine).xlsx

2. MMT RDM – DAVID Forms (approved in Ukraine)
 - a. Arrival and departure report
 - b. Crew List

MMT IMO FAL Guide_UNECE-DavidForms.xlsx

Annex III. XML document examples

MMT RDM – Real Documents (Ukraine):

- a. General Declaration
- b. Crew List
- c. Crew's Effects Declaration
- d. Cargo Declaration
- e. Ship's stores declaration

IMOFAL_100pD20A-Full.xml

Annex IV. Results of documents conversions

1. Real Document (General Declaration) – DAVID (Arrival and departure report)
MMT IMO FAL Guide_UNECE-DavidForms + Real Documents(Ukraine)-GD.xlsx
2. Real Document (Crew List) - DAVID (Crew List)
MMT IMO FAL Guide_UNECE-DavidForms + Real Documents(Ukraine)-
CrewList.xlsx