# PAPER • OPEN ACCESS

# E-Waybill Using Experience & Development In Estonian State Road Building

To cite this article: Taavi Tõnts et al 2021 IOP Conf. Ser.: Mater. Sci. Eng. 1202 012041

View the article online for updates and enhancements.

# You may also like

- Implementing Building Information Management (BIM) In Estonian Transport Administration Erko Puusaag and Anti Palmi
- <u>Chernobyl cleanup workers from Estonia:</u> <u>follow-up for cancer incidence and</u> <u>mortality</u> Kaja Rahu, Anssi Auvinen, Timo Hakulinen et al.
- Formation of radioactive waste in Estonian water treatment plants M Leier, M Kiisk, S Suursoo et al.





DISCOVER how sustainability intersects with electrochemistry & solid state science research



This content was downloaded from IP address 3.144.97.189 on 05/05/2024 at 09:13

1202 (2021) 012041

doi:10.1088/1757-899X/1202/1/012041

E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

# **E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN** ESTONIAN STATE ROAD BUILDING

#### Taavi TÕNTS & Aivo SALUM #66, Smart Road Solutions & ITS

Road Management Department, Leading Engineer, Estonian Transport Administration, Tallinn, Estonia

Received day month year; accepted date: 17.01.21

Abstract. Estonian Transport Administration (ETA) has since 2010y developed digital solutions for monitoring abnormal 52t transport heavy vehicles (HV). Since 2020y we signed the memorandum between 8 different parties for developing bulk material transport digital solutions (e-waybill system) for road building. The focus is to make the logistic more transparent since beginning of the loading point - for the different authorities. The second focus is to make the truck movement corridor visible for the traffic control, avoiding week roads, bridges etc. The final, and the most difficult, is to develop the mass control system, so that there is automated weight info in the e-waybill system visible for the traffic police and for building supervisors etc. We have met with our Association of Estonian Cities and Municipalities and many others, and everyone is very interested of going from paper waybills for faster, cloud based, e-waybill systems, what is also more CO2 friendly. This digital e-waybill allows single data entry, and all the rest data with statistics is visible for concerned people. ETA is planning to pilot in 2021y also many road building projects with e-waybill demand. So far, the feedback has been mainly positive from different parties. We have started with our Estonian Ministry of Economic Affairs and Communications (EMEAC) also wider digitalisation projects concerning the new regulation (EU) 2020/1056 of eFTI for the gross-border transport logistics digitalisation, what must be applied in every member state 21.08.24.

Keywords: e-waybill; eFTI; Intelligent Access; on-board-weighing (OBW); CEDR RFT WG; CO2 reduction in transport; contact free ITS; VELUB;

### Introduction

Following paper gives an overview about Estonian's digital research and developments in road building and transportation area, since 2010y.

As there are many new EU regulations which ones demands digital freight and transport information systems to develop for the EU member states, it might be useful to chare the development overview with other EU member states.

Some pilot projects have already been with the international e-waybills (e-CMR), made by EMEAC with the neighbour countries, where also ETA was a partner (Figure 1).



Figure 1. Schema. The index registries exchange data with each other using DLT technology /1/

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution Ð of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI. Published under licence by IOP Publishing Ltd 1

1202 (2021) 012041

doi:10.1088/1757-899X/1202/1/012041

#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

#### 1. EU new regulations for the transport sector

EU's Electronic Freight Transport Information (eFTI) regulation demands EU member states to provide the eFTI service starting from 21. August 2024y /2/. Based on that regulation EMEAC is piloting eFTI / eCMR together with the neighbor states and ETA.

Since 2020y ETA is piloting e-waybill in the bulk material transport in building contracts with the target to demand it since 2022y in all building contracts. In the beginning of the 2021y EMEAC joined to our Bulk Material Transport Memorandum and declared the interest to develop also the internal state e-waybill (internal eCMR) - together with international eCMR, according to the eFTI directive. Also, Estonian Association of Information Technology and Telecommunications (ITL) joined as 10. member to the memorandum.

ETA has developed since 2010y also Intelligent Access, with the VELUB System which one allows to control on the Smart Road map, 52t abnormal transport vehicles (with GNSS) for more effective and greener transport, protecting the roads constructions at the same time. /3/

Greener transport vision is detailly described in EU's new Sustainable and Smart Mobility Strategy until 2050y. It describes how greener transport should look like and how it should be developed in the EU member states etc. /4/

EU and EFTA Ministers of Transport declared last year in the Passau Declaration that digitalization is the Smart Deal for Mobility and it shapes the mobility of the future – sustainable, safe, secure and efficient. The Passau Declaration talks about Building Information Modelling (BIM) and eFTI and other digital tools for making the whole transport sector more efficient in coming years. /5/

Different type of e-waybills and digital information (Figure 2) can be very likely developed in one, digital, cloud-based system.



Figure 2 Different waybill types.

In the following paragraphs, the short overview about the Estonian different e-waybill connected developments and researches will be given.

1202 (2021) 012041

doi:10.1088/1757-899X/1202/1/012041

#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

#### 2. eCMR pilots and ongoing process

Estonia supports the fast adoption of eFTI to achieve the goals of the road transport digitalisation as early as possible. There are e-CMR service providers and there are governments capable and interested to receive the data that they are entitled to check. Still, the governmental institutions cannot easily accept the electronic e-CMR, even if the legal ground for it exists. The missing link is the secure and trustful way to exchange e-CMR data between governments and e-CMR service providers.

eCMR solution, which meets the market's expectations, can only function as an internationally connected digital ecosystem which would allow the data exchange on transport documents along the logistical corridor. Therefore, it is reasonable to carry out pilot projects on road transport digitalisation as cross-border service development in cooperation with neighbouring countries.

Under the leadership of EMEAC, the cross-border eCMR prototype between Estonia, Latvia, Lithuania and Poland (Figure 3) was introduced in September 2020/1/.

The objective of prototyping was to create an e-governance compatible eCMR indexing scheme that will allow controlling institutions of partner countries to check the availability and validity of CMR transport documents in a secure and trustful way. Every authorized governmental institution will be able to access minimum available indexing information via a specialized application programming interface (API) and get a link to request original documents relevant data directory from e-CMR service from the county of origin.



Figure 3 eCMR prototype piloting scheme.

For the public sector and authorities, it will create conditions for the more effective transport sector and trade supervision. One of the outcome examples is reducing the time spent on stopping trucks for CMR control, but also minimizing the number of offences related to tax avoidance and <u>transport safety</u>.

The prototype development team includes governmental organisations (ministries, road administrations, tax and customs, police, statistics etc.), logistics and road carriers' associations, consulting experts and leading software developers with an international background.

EMEAC will analyse in 2021y (Figure 4) NAP system architecture and how <u>internal e-waybills</u> can be linked (Figure 1). Also, will be analysed Cost-Benefits, the ownership alternatives and different risks etc. ETA is involved to the development as a road owner, whose interest is to increase construction and traffic safety etc. /6/

1202 (2021) 012041

doi:10.1088/1757-899X/1202/1/012041



#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

Figure 4 National Access Point (NAP) as part of national and global ecosystem (Estonian possible version)

EMEAC will also introduce in EU in 2021y, the Position Paper Towards Interoperable Electronic Freight Information Exchange in Europe. In this position paper the road owners' vison is included for extending the vision to road safety, road maintenance, taxation, etc.

The European Commission's vision to digitize G2B, B2G transport information flow across Europe with eFTI regulation is undoubtedly ambitious. However, it addresses only the information related to cargo, but not the vehicle or a driver. At the same time, there is a strong need for public authorities to handle this information together to achieve greater transparency, safety and efficiency.

Therefore, the eCMR concept can be expanded using the same data exchange channel and technology in:

- **Reducing risks in road traffic** (automated validity of driving license and health certificate; inspection of compliance with working, driving and rest time rules; technical inspection of truck and trailer; payment of fines and tolls; insurance of truck and goods, etc.).
- Improving road constructions safety (truck weight information from On-Board Weighing Systems).
- Handling of dangerous goods, special cargo and contract deliveries (GPS tracking, automated fee payment control).
- Increasing the transparency of tax revenues (payment of customs duties, automatic VAT refunds).
- Other areas (rescue, statistics, insurance, etc.).

Handling this information in a single channel has the potential to significantly improve the efficiency of transport and, therefore, to contribute to the smooth functioning of the Single Market.

Taking into consideration the quick need for a positive transformation in the electronic freight transport information sector, Estonia and others highlight the need to swiftly start discussions by setting up the joint development of eCMR data exchange model in Europe.

1202 (2021) 012041

IOP Publishing doi:10.1088/1757-899X/1202/1/012041

#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

## 3. Internal state e-waybill using experience

In 2020, ETA carried out three procurements, where it was mandatory to use an e-waybill of lading for the transport of bulk materials. The special requirements for documenting, the works applied to both: the contractor and the owner's supervision. All consignment notes for bulk materials and the summary tables, compiled based on them, had to be prepared in an electronic data exchange platform. /7/

The pilot projects assumed the use of either the Waybiller environment developed in Estonia or an analogous electronic data exchange platform. The procurement required that the digital platform allow the creation of separate objects and GNSS locationbased tracking of each load (Figure 5). The vehicle and/or trailer number information had to be generated automatically from the traffic register database and had to reach the electronic environment on the e-waybill. If the truck had a special cargo permit of 48 or 52 tons, its data, permit number and the validity period had to be included. Supervisors and subscribers needed to have access to the environment, so that they could control the information through the cloud.





The e-waybill had to contain at least the number of the truck and/or trailer, the number of axles, the permissible weight / load capacity of the truck; the mass and name of the material, the name of the driver, the haulier, the owner of the load and the quarry. If the transport was on public roads, an e-waybill had to be created for the transport from the intermediate warehouses to the site (except for the intermediate warehouses immediately adjacent to the site). An indication had to be made on the e-waybill, whether the material came from a quarry or from an intermediate warehouse.

As mentioned, the owner supervision was also obliged to use the electronic environment of the e-waybill. For example, he had to check the e-waybills for bulk materials provided by the contractor and confirm receipt of the load in the digital environment. Also, during the asphalting works, the engineer used a data exchange platform to validate the e-waybill of asphalt loads arriving at the site.

This year, the ETA is already planning several times more (14) pilot procurements in order to prepare for the full transition to e-waybills in 2022y, for the transport of bulk materials. One procurement in Pärnu area, will require the use of a weighing station, loader or OBW interfaced with the service provider - to protect the weaker road constructions and bridges (Figure 6).

1202 (2021) 012041

doi:10.1088/1757-899X/1202/1/012041



#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING



For 2022y, a separate contract annex (2 pages) has been prepared for contractors, which contains detailed minimum technical requirements for the e-waybill. This will make it easier for the new service providers to bring data exchange platforms to market and will be better traceable to the all parties.

In 2020y OÜ Üle won the public procurement of surface works in Harju and Rapla County, who, despite the initial critical attitude, finally found that the use of the e-waybill is simple, compact and allows real-time monitoring of the data. The problem was caused by the delivery note, which was required for the forwarding of the material from the intermediate warehouse to the object, although it is also required as a sheet of paper, according to the Road Transport Act.

AS Järvak, which performed the transportation work, highlighted the time savings and the possibility to adapt quickly and expressed the wish that the e-waybill would be fully switched soon. In total, about 2,000 e-waybills were completed during the project. Lääne Teed OÜ turned out to be the repairer of Rapla gravel roads. At the end of the pilot project, their project manager assessed both the ease of use of the e-waybill and the time saved that would otherwise have been spent on paper sheets and the subsequent precise compilation of volumes and shipments. Taital Trans OÜ, which made transports within the project and who already had previous experience, added that the e-waybill is convenient to use. Approximately 1,700 e-waybills were used at the sites.

The largest test object in 2020y was the reconstruction of the state highway No. 11412 (Liikva-Rannamõisa). The contractor of the project was AS TREV-2 Grupp (VINCI Concern), whose project manager said that the environment of Waybiller (Figure 7), the e-waybill service provider they used, worked quite well, although it should be further developed. In the course of the project, about 2,100 e-waybills were issued.



Figure 7 User view of the Waybiller app.

E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

## 4. VELUB Intelligent Access

ETA has since 2010y developed digital Intelligent Access solutions in the VELUB platform for the abnormal 52t transport monitoring (Figure 8). This system can be used in the future for controlling also heavier trucks, adding more controlling criteriums etc. At the moment, 60t and EMS longer and heavier vehicles CBA is ongoing in ETA.



Figure 8 VELUB- ETA's special permit application system; ELVIS - State Forest Management's electronic cargo list information system. /8/

Study of the HV impact to the bridges showed that, less than 7% of the total bridges, are not OK for 52t /9/ Those weaker bridges are not marked inside the strong, digital Smart Road (Figure 9) corridor. /10/



Figure 9 Smart Road (ETA, Tark Tee) strong corridors marked with the purple lines (dots - weaker bridges) 28.02.21

The next step is to develop the VELUB further - automatic control, OBW in the future, etc. Overview about Stakeholders in the VELUB and different waybill developments in Estonia, was given in Aeroflex/i4DF workgroup /11/.

Detail overview about the VELUB development and its digital possibilities was given in HVTT15 Symposium. / 12/

In 2020y, OBW telemetry (Figure 10) tests were completed, with 5 different HV. Good results were achieved for continuing in coming years. This study with OBW tests with HV's, was carried out to determine the possibility of using OBW equipment to reliably and accurately monitor weights of HV's. /13/

Estonia has long been the leading innovator in managing heavy vehicles via new technologies such as telematics, GIS and ITS. Previous developments such as current road networks for HV ("green roads" for winter time and "purple roads" for whole year (Figure 4.2) have been widely accepted by logistics companies and road administrators. These developments give strong background for new innovations with OBW equipment.

doi:10.1088/1757-899X/1202/1/012041

#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING



Figure 10 Example of layout for OBW in a stage 1 truck/semi-trailer vehicle combination / 14/

For this purpose, five trucks were selected, connected and monitored through fleet management platform provided by FleetComplete. Necessary additional hardware and software developments were done to allow to read the weighting data by telematics devices from vehicles CAN bus using FMS interface and display the data through web interface (Figure 11& 12). For verification purposes, weighing of fully loaded HGV vehicles was carried out with portable scales.



Figure 11 HV "Volvo 02 timber truck 4+" moving paths 10.09.2019 – 21.10.2019 (left) & 21.10.2019 – 15.01.2020.

Besides enforcement capabilities, OBW systems provide logistics managers with robust way of optimizing the usage of trucks. As our analysis showed, fuel usage per kilometre does not increase significantly at higher loads. Therefore, loading trucks to maximum safe limit for roads allow saving fuel and thus reduce carbon dioxide emissions.

In order to determine said safe limit, all data must be integrated with road database. In this study, only pavement and IRI were used, providing insight that pavement type does affect the measured values, but road roughness has no effect. In future studies, other road parameters can be used with similar methodology. Also, the current road networks for heavy vehicles ("green roads" for winter time and "purple roads" for whole year) can be linked to weight data providing even more insight for better logistics management and when necessary, also enforcement. In terms of pavement management, more detailed information about actual weights on the road will yield more accurate predictions than current methods using standardized axles and vehicles.

#### doi:10.1088/1757-899X/1202/1/012041



#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

Figure 12 HV "Scania 02 saddle 2+" moving paths 02.09.2019 - 21.10.2019 (left) & 21.10.2019 - 15.01.2020

Integration with road tolling system provides road administrators an opportunity to promote logistics solutions better for road structures and environment. This is also valuable information for procurement of logistics services allowing to choose most effective provider with smallest carbon footprint. In order to achieve this, a follow-up study with more vehicles included is needed to better understand the relations between fuel usage, road deterioration and load weight.

OBW data gives for the traffic control good overview where are the most likely overloaded HV. With that data traffic control points can be decided much quicker - where to go to do the static weighing with traffic control van.

CEDR new RFT (Road Freight Transport) work group has also started Intelligent Access subgroup, to study further possibilities what new, digital cloud-based system allows: road construction protection for aging infra, higher traffic safety and at the same time greener transport etc.

#### Conclusions

E-waybill development in Estonian state road building and other areas, has given us already a lot of savings in  $CO_2$  emissions, making transport more efficient in the same time - with the single data entry to the cloud. Defiantly there is still a lot to do and develop in coming years, to achieve EU's climate targets in the transport sector, using digitalisations as a tool for it.

Hopefully our neighbour Baltic countries, and other EU states, are continuing in coming years, the EU digitalization goals to make more efficient our freight transport between the states, and why not, inside state as well.

ETA's bulk material e-waybill piloting and usage is just a small part of internal transport (ca 5%), but it is a huge step to digitize all internal waybills (over 2mln/y) together with EMEAC, and together with international eCMR, based on the eFTI regulation /2/.

In 2022y ETA is planning to demand e-waybills in all building contracts. There are already now many interested ITS companies with the big interest to develop e-waybills in Estonia, as it's not so complicated in 21. century anymore. If there is interest, our e-waybill providers can help to pilot other EU road owners as well - for the greener future.

Digitized cloud-based transport and road information systems are allowing to develop further Intelligent Access to protect road construction and increase traffic safety. In the same time transport transparency increases, and ca 50mln EUR/y socio-economic benefit is produced in small Estonia.

1202 (2021) 012041

doi:10.1088/1757-899X/1202/1/012041

#### E-WAYBILL USING EXPERIENCE & DEVELOPMENT IN ESTONIAN STATE ROAD BUILDING

#### References

- Final Report eCMR index registry prototype, 2020y, Estonian Ministry of Economic Affairs and Communications 1. https://www.diginnobsr.eu/ecmr-testing-results
- Regulation (EU) 2020/1056 of the European Parliament and of the Council of 15 July 2020 on electronic freight transport 2. information https://eur-lex.europa.eu/eli/reg/2020/1056/oj
- ETA's VELUB page, https://eteenindus.mnt.ee/maantee.jsf?lang=en 3.
- 4. EUROPEAN COMMISSION, Brussels, 9.12.2020, Sustainable and Smart Mobility Strategy - putting European transport on track for the future. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:789:FIN
- PASSAU DECLARATION on the occasion of the virtual Informal Meeting of EU and EFTA Ministers of Transport under 5. the auspices of the German EU Council Presidency on 29th October 2020 https://www.bmvi.de/SharedDocs/EN/Documents/K/passau-declaration.pdf
- 6. E-waybill future possibilities in road owners point of view (E-veoselehe väljavaated taristuomaniku pilgu läbi), Roadpaper (Teeleht), pg 32-33 nr 100, 2020y, Taavi Tõnts, ETA
- https://www.mnt.ee/sites/default/files/road\_paper\_pdf/mnt\_teeleht\_suvi2020\_nr100\_veeb\_1\_1.pdf EU sees "YES" for eCMR (Euroopa ütles e-veoselehele ,jah"), Roadpaper (Teeleht), pg 19-21 nr 102, 2021y, Taavi Tõnts, 7.
- ETA https://www.mnt.ee/sites/default/files/road paper pdf/teeleht nr 102 veeb.pdf Conditions for efficient road transport in Europe, CEDR 2017y https://www.cedr.eu/download/Publications/2017/2017-5-8 Conditions-for-efficient-road-transport-report.pdf
- ETA's Smart Road information system https://tarktee.mnt.ee/#/en
- 10. HV Impact to the bridges, 2020y, ETA (Raskeveokite mõju sildadele. Nende koormuste valideerimine reaalsetel koormustel ning mõju analüüs).
- https://www.mnt.ee/sites/default/files/survey/raskeveokite\_moju\_sildadele\_lopparuanne\_2020-03-23.pdf 11. Experiences with the stakeholder process from Estonia, T.Tonts (2019), Aeroflex/i4DF, Special Focus Workshop: Intelligent Access Part II, Paris.
- 12. Estonian VELUB system for more efficient and greener transport VELUB System is a small part of the much bigger, theoretical, MVMC System (En dimensional movement controlling system), T.Tonts (2018), HVTT15, https://hvttforum.org/wp-content/uploads/2019/11/Taavi-Tonts-ESTONIAN-VELUB-SYSTEM-FOR-MORE-EFFICIENT-AND-GREENER-TRANSPORT.pdf
- 13. OBW tests with HV's (Tänapäeva ja tuleviku rakendused sõidukite kaalumisel, sõidukite masside jälgimissüsteemi loomine ja jälgimine reaalajas), Maanteeamet, ETA, AS Teede Tehnokeskus, Fleet Complete Eesti OÜ, Tallinn 2020y. https://www.mnt.ee/sites/default/files/survey/pohiaruanne\_06\_02\_2020.pdf
- 14. Commission Implementing Regulation (EU) 2019/1213, Laying down detailed provisions ensuring uniform conditions for the implementation of interoperability and compatibility of on-board weighing equipment pursuant to Council Directive 96/53/EC https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R1213