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Transport Platforms in the EU towards Sustainable Development

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Abstract:

Purpose: *The article aims to create a typology of transport platforms according to Gawer`s concept in the EU, their assessment through the prism of the concept of sustainable development and regulatory challenges.*
Design/Methodology/Approach: *It is a conceptual paper based on the desk research method. The first step of the research was a literature review and critical analysis of the reports of research agencies devoted to transportation platforms phenomena. Next, building on established platform types' model from Evans and Gawer, the verification of different transport platforms available on the EU market was conducted. Data were collected from case studies, exchange, and logistics platform websites, reports, and scientific literature. Several practical examples were studied and verified from the perspective of the theoretical platforms types' model. Then the discussion is conducted on the value creation of each type of platform identified in light of sustainable development impact in the EU.*
Findings: *Identification with examples in the EU transport market of transactional, innovative, integrated, and investment platforms. Presentation of economic, social benefits – the greatest for integrated platforms. Formulation of proposals for changes in the approach to regulation of the transport sector in the EU would 1) stimulate the development of platforms, 2) counteract the negative aspects of this phenomenon.*
Practical Implications: *Classification of transport platforms that unable identification leading players of the transportation and logistics services available in the virtual world. Additionally, the way of further transportation platforms' development can be observed based on the study results. It can also help to include the transport platform solutions within activities dedicated to improving sustainable development strategies.*
Originality/Value: *The article indicates a new approach to classify transport platforms. It discusses how these types of business models can bring added value in light of their sustainable development. It points out the actions that the EU should undertake to improve sustainability by enhancing the role of digital solutions.*

Keywords: *Digital platform, transport platforms in the EU, sustainable development.*

JEL classification: *Q01, M21, O32.*

Paper Type: *Research article.*

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1. Introduction

The industrial age has brought numerous negative consequences in its impact on the natural environment, living and working conditions. The concept of sustainable development, which meets the needs of the present without compromising the chances of future generations to meet their own needs, is part of the solution to this phenomenon (WCED, 1987). *Sustainable development* is a multidimensional normative concept in which the assumed ecological, social, and economic objectives are equivalent to each other (Schaltegger, Burritt and Petersen, 2003; UN, 2015). This concept has an important place in the EU. Its primary tool is the EU Sustainable Development Strategy, and its development objectives can be found in many EU documents. In 2019, the EU adopted the European Green Deal (EGD) to make the EU's economy sustainable (European Commission, 2020a). Indeed, the ecological crisis makes it necessary to elevate ecology to a higher status (Slatin, 2019).

Significant changes in transport must accompany the transition to a zero-carbon economy by 2050. This is a big challenge because, according to OECD Transport Outlook 2019, global freight demand will triple between 2015 and 2050 based on the current demand pathway. More than three-quarters of all freight will continue to be carried by ships in 2050, more or less unchanged from 2015 (International Transport Forum, 2019). In terms of a modal split in the European Union (EU), road transport continues to have the largest share of EU freight transport performance among the three inland transport modes. It accounted for three-quarters (75.3%) of the total inland freight transport (based on tonne-kilometers performed) in 2018. Rail transport accounted for 18.7% of the EU total, while the share of inland waterways was 6.0% of the total inland transport performance. At the same time, one-fifth of road freight journeys were performed by empty vehicles at the EU level in 2018, and the share of empty journeys was 12.1% for international transport. A total transport level, most Member States recorded a percentage of empty vehicle-kilometers between 15% and 30% (ec.Europa.eu).

Achieving the climate goals of the European Green Deal requires transport to: a) shift to more sustainable modes, b) improve the quality of infrastructure, c) improve the management of the transport system. Digitization and its tools are expected to accelerate the "green" transformation of economies (TWI2050, 2019), especially in areas responsible for climate change - energy, industry, transport (Acatech, 2015; 2016; TWI2050, 2018). Platforms can provide support in the transition of transport to a zero-carbon economy. In the 21st century, they are found in all sectors of the economy (Evans and Gawer, 2016; Kenney and Zysman, 2016). Their beginnings date back to the 1970s of the twentieth century (Alt and Klein, 1998).

However, digitization is making platforms in the second decade of the 21st century significantly different from them and in terms of functionality and value creation. Their impact on sustainability is also not fully recognized (Bican and Brem, 2020). The article aims to create a typology of transport platforms in the EU, their assessment through the prism of sustainable development and regulatory challenges. The article

is limited only to platforms dedicated to the B2B business model (European Commission, 2020b). They are characterized by a very high growth potential, which affects the scale of the environmental impact.

It is a conceptual paper based on the desk research method. The first step of the research was a literature review and critical analysis of the reports of research agencies devoted to transportation platforms phenomena. Next, building on established platform types' model from Evans and Gawer (2016), the verification of different transport platforms available on the EU market was conducted. In the last part of the article, they are assessed from the point of view of the sustainability of regulatory challenges.

2. Digital Platforms and Sustainable Development

Platforms are variously defined and classified (Rochet and Tirole, 2003; Gawer and Cusumano, 2014; Thomas, Autio and Gann, 2014; de Reuver, Sørensen, and Basole, 2018). From a technical perspective, it is a set of subsystems and interfaces (Gawer and Cusumano, 2014) which are the basis for applications, processes, and complementary technologies under development. The technology platform provides the functionality for the business core with the support of modular services, i.e., software for subsystems that enhance the platform's functionality (Tiwana *et al.*, 2010). At its core, the socio-technical perspective has the management and integration of actors in the platform ecosystem – customers, partners, developers, institutions (de Reuver, Sørensen, and Basole, 2018). In this case, the platform is the basis for creating modified products and, consequently, value using resources and capabilities that it does not own.

Platforms operate on the so-called multi-sided platform, sometimes referred to as a two-sided market, which is seen as a meeting place between two different groups of customers in reality or virtually, facilitating the interaction between them. Multilateral platforms regulate the number and value of transactions, and the chance of finding an increase in value from an interaction depends on the number of agents of the first type to which an agent of the second type can find access and often vice versa (Evans and Schmalensee, 2013). A key feature of multi-stakeholder platforms is network effects (Parker and Van Alstyne, 2005; Rysman, 2009; Gawer, 2014). They can be direct - the benefits of increased product utility arising from an increasing number of customers, or indirect - the so-called intergroup effect (reflecting interdependence/complementarity between two or more groups of customers) (Gawer, 2014). The modular nature of platforms, i.e., a set of rules that help to reduce the complexity of a system by decomposing it into separate parts that are then able to communicate with each other through standardized interfaces, plays a vital role in achieving network effects (Baldwin and Clark, 2000).

Platforms create value in two primary ways (Evans and Gawer, 2016). The first way is to facilitate transactions between different groups that would otherwise struggle to find each other - trading platforms. In addition to the tailored linking of transacting

parties through the advanced use of data, the main functions of platforms can include setting rules and standards that reduce transaction costs and providing functional tools and services (Moazed and Johnson, 2016). Another type is innovation platforms, which consist of technological building blocks treated as the foundation of innovation activity – they create new complementary services and products. A complementary innovator can be anyone (an individual, organization, group of entities) located anywhere globally, co-creating the so-called ecosystem innovation. Its skeleton is the platform. In addition to the two previously mentioned types of platforms, i.e., transaction and innovation platforms, we distinguish two of their derivatives, i.e., investment and integration platforms. An *integrated platform* is a technology, product, or service that is both a trading platform and an innovation platform. On the other hand, investment platforms consist of firms that have developed a platform portfolio strategy and act as a holding company, an active platform investor, or both (Evans and Gawer, 2016).

The sustainability issues in the platform model are first referred to as the transaction platform (and especially to the sharing economy). The sharing economy can be seen as an alternative economic model leading to sustainable development (Heinrichs, 2013; Martin, 2016), but not always. Admittedly, these platforms imply lower costs for transacting parties, but the recorded economic benefits in multilateral markets may negatively affect other markets (Böcker and Meelen, 2017). Platforms often become competitors to firms that are, in some ways, their counterparts in the traditional economy (Gansky, 2010; Owyang, 2013) – they change the rules of the market, and the competitor increasingly often comes from outside the industry. The acquisition of network effects by platforms, reinforced by cascading behavior (the information cascade phenomenon), can lead to monopolization of the economy (Kenney and Zysmana, 2016).

In recent times, the use of artificial intelligence algorithms evident in the BigTech group has further accelerated this phenomenon. Increasing amounts of data translate into more sophisticated algorithms, which means better customer service and more customers. More customers generate more data, which improves existing algorithms and makes the platform offers even more attractive – there is an additional amplification of network effects, leading to a monopolization of the market (Niyazov, 2019).

In the trading platform model, the 'boundaries of the platform's responsibility for the actions of trading participants are blurred (Narula *et al.*, 2019; Egels-Zanden, 2017). As a result, lower transaction costs do not necessarily lead to beneficial social and environmental outcomes. For example, lower transaction costs in multilateral markets can be accompanied by increased consumption, increased GDP leading to an increased ecological footprint (Böcker and Meelen, 2017).

Innovation platforms are equated with technology platforms. This group includes SAP, Oracle, and Microsoft (Evans and Gawer, 2016). In addition to strictly technological solutions, it can sometimes be seen as an innovative business concept

(Aclor, 2020). The platform of innovations makes it easier, cheaper, and faster to enter new markets and increase transactions. It does not have to fit into the principles of sustainable development. The same is true of the investment platform. Active platform investors may or may not invest in pro-environmental investments.

Furthermore, innovation platforms can be seen in the category of disruptive innovation (Corybyn, 2017), i.e., an innovation that creates a new market and network of value. These innovations are unpredictable in their impact on the established socio-economic order. There are no dedicated regulations for them (Berkowitz and Souchaud, 2019).

Compared to a transactional platform, an integrated platform is characterized by increased responsibility for the activity of its participants. Integration requires a platform leader whose role is to execute transactions and create the platform's ecosystem. The leader organizes, synthesizes, and integrates the resources of all participants in the ecosystem; he is responsible for the so-called resource orchestration (Nambisan, 2019). The integrated offering of a platform ecosystem is also more valuable to the customer than the sum of its parts (Adner, 2017; Stonig and Müller-Stewens, 2019; Jacobides, Cennamo, and Gawer, 2018). Leader of the integrated platform seeking to maintain the platform's high competitive position can interact with the resources of other platform participants, also from a sustainability perspective, supported by digital innovation. This is so long as the platform leader's actions navigate towards a circular economy (Bican and Brem, 2020).

3. Transport Platforms - From the Electronic Freight Exchange to the Logistics Platform

The beginnings of using logistics platforms are believed to be in electronic freight exchanges, whose dynamic development in the second half of the 1990s resulted from the spread of Internet access. Their origins, however, are traced back to the 1970s, when the German organization SVG created a database on cargo and carriers and made these data available to entities via telephone lines (Alt and Klein, 1998; Marasco, 2004). However, the French Teleroute is considered the first exchange established before the spread of the Internet (Witkowski, 2019). *Electronic freight exchange* can be defined as "a brokerage service using Internet technology, which supports communication and transactions between companies from the Transport, Forwarding, and Logistics (TFL) industry and shippers ordering loads for transport and other accompanying services" (Witkowski, 2019). The broker benefits from fees paid by exchange users, in most cases in the form of a subscription (Kawa, 2014).

Electronic freight exchange provides access to information about the current supply and demand for services, providing benefits for transport, forwarding, and logistics companies (e.g., reduction of empty runs and fuller use of transport capacity by consolidating loads, especially on the way back), as well as for shippers (e.g., access to current offers of carriers or forwarders at the lowest costs for a given volume and dimensions of the cargo and the preferred route of transport, rolling stock

specifications and additional requirements related to the implementation of the transport service). The basic assumptions for the construction and operation of electronic freight exchanges are primarily similar to other solutions supporting electronic business, such as online stores and auction portals. Their main goal is to automate processes and digitize documents.

There are two basic types of electronic freight exchanges (Skjot-Larsen, Kotzab, and Grieger, 2003; Moroz *et al.*, 2014), open exchanges (accessible to all interested shippers, forwarders, and carriers, dominated by one-off transactions for transport services and price competition; they function as "blackboards" posting information concerning available shipments and transport capacities. The contractual negotiations are then conducted directly between the partners) and closed exchanges (dedicated to specific companies or supply chains, within which long-term relationships are developed and comprehensive logistics services are offered). Within the electronic freight, exchange routes calculate based on algorithms, and the platform offers instant quoted prices. They offer the same functional spectrum as traditional forwarders but use only a digital platform to handle all transport processes and document exchanges.

The value proposition for online exchanges comes from regularly making data standardized and visible to their participants and markets. As a result, dashboards are provided to participants to track shipments (Jain *et al.*, 2020) continuously. Exchange operators following technological progress offer access to their platforms via mobile devices. Thanks to specially prepared applications for mobile phones or tablets, the user can access the stock exchange resources and establish contact with other companies anywhere (Kawa, 2014). Electronic freight exchange provides services mainly for the highly flexible trucking business, being so-called direct contract trucking (Elbert and Gleser, 2019). They do not own transport capacity but rather rely only on external transport capacity (Elbert and Gleser, 2019; Mikl *et al.*, 2020).

Electronic freight exchanges systematically expand the package of services, which causes their evolution towards enhancing logistics operations' solutions, offering a comprehensive package of services that, thanks to integrating with IT systems of users, support their logistic processes and services to build long-term relationships between participants in the process. Integration of new value-added services may include, i.e., vehicle insurance services; optimization of routes and transport costs, vehicle leasing services, factoring services, consisting in pre-financing the purchase of fuel or shortening the payment deadline for transport, which allows for solving problems with financial liquidity; job placement services in a scarce profession of truck drivers.

The online transportation market started to be also impacted by new players. New start-ups dedicated to the freight transportation sector have been developed within the last decade and created the freight technology sector (FreightTech). It refers to software companies and technologies that assist in operations in supply chain management and freight movement (Negrutiu, Vasiliu, and Enac, 2020).

Another group of new players that impacts on transportation market are particular technologies that might serve as a base for developing new platform connecting parties for improving logistics or supply chains activities and needs, these are, i.e., blockchain or three-dimensional printing (3DP), Internet of Things (IoT) or artificial intelligence (AI). For example, blockchain in the supply chain can add value in replacing slow, manual processes, eliminating paper-based transport documentation, strengthening traceability, and reducing supply chain IT transaction costs (Alicke, 2017).

Another technology is 3DP that affects mass customization, resource efficiency, decentralization of production, reduction of the complexity of supply chains, rationalization of inventory and logistic resources, product design and prototyping, legal and safety issues (Mohr and Khan, 2015). 3PD platforms can "cut" long parts of the supply chain and eliminate a group of partners involved in the traditional product's flow. "Low-cost 3D printing enables anyone with a digital design to bypass the traditional supply chain and manufacture a product themselves" (CSC, 2012). Due to 3DP, distribution networks will be organized more efficiently, impacting fewer empty vehicles, but raw materials still need shipping (Boon and van Wee, 2018; Sasson and Johnson, 2016; Halassi, Semeijn, and Kiratli, 2019).

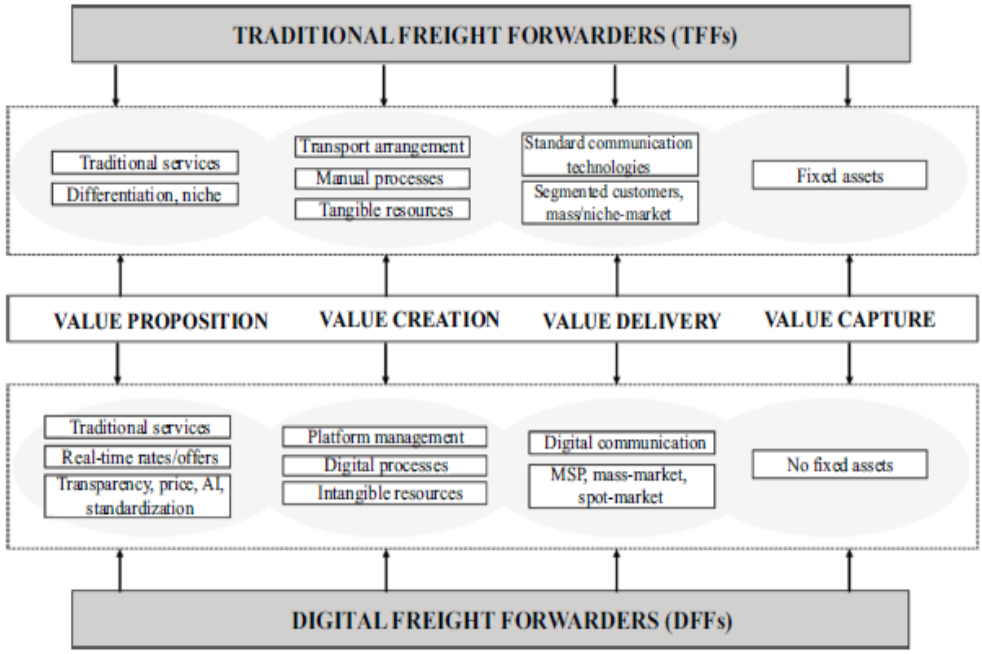
Also, investors from another non-logistics sector might be interested in developing platform-based solutions to diverse their capital investments or protect and support local or national logistics companies. The other possible scenario is the mergers and acquisitions of logistics companies or, instead, electronic freight exchange and logistics platforms being platforms of platforms (multiplatform).

Due to the dynamic digital technologies capabilities development and diffusion, the new functionalists might be easily incorporated into the electronic freight exchanges making them more integrated logistics platforms covering end-to-end supply chain process. Such solutions impact increased information transparency, improving the security of transactions through access to recommendations and documents, proving the reliability of users of a given exchange (payment credibility). It also enables ongoing monitoring of the transport process and cargo safety control, availability of accessible warehouse space, economic situation, and forecasts on the transport services market (Witkowski, 2019). When integrating different supply chain stakeholders on a digital platform, the values might be even higher. Such a solution can be a so-called Supply Chain Control Tower that coordinates the planning and implementation of activities of strategic importance, resulting from the adopted goals for the entire chain (van Doesburg, 2011).

All of the described digital solutions have and will have a disruptive impact on the traditional logistics sector. According to Mikl *et al.* (2020), there are at least several differences between traditional ("analog") and digital freight forwarders, i.e., digital platforms offer services that are new to the logistics industry (e.g., real-time pricing, standardized document management, AI), they carry out internal and external processes digitally, the customer segment consists mainly of the mass market, which

they serve with standardized services. The main differences between traditional freight forwarders and platforms in light of four main business model dimensions: value proposition, value creation, value delivery, and value capture (Teece, 2010) are presented in Figure 1.

Figure 1. *Business model differences between traditional and digital freight forwarders*



Source: *Mikl et al., 2020.*

4. Typology of Transport Platforms in the EU

The digital platforms serving the logistics sector can be divided into four types of transport platforms. There are transaction platforms (electronic freight exchange), innovation platforms (digital technologies platforms), integrated platforms (logistics platforms), and investment platforms (platforms connecting many different stakeholders).

Transaction platform is a model of electronic freight exchange that connects (matches) shippers with carriers and is the simplest solution that might be developed even without the logistics market knowledge but just based on new digital technologies features. The first European electronic freight exchange (transaction platform) was Teleroute, established in 1985 and owned by Wolters Kluwer (Kisielewski and Leśniakiewicz, 2016). Apart from the Teleroute, road haulers and forwarders' most frequently used ones include the German Timocom system, the Polish exchange Trans. E.U., the Spanish Wtransnet, and the Dutch Intermodal Links.

Among the transport and forwarding companies in Europe, there are also, i.e., the Eurasian ATI, 123 Cargo, CargoCore, Euro Freight Exchange, Euroloads.net, Express-online, Haulage Exchange, Loads Today, Everoad, Instafreight, and OnTruck (connect companies that need to ship goods overland with truck drivers), Real or Return Loads dominating in Great Britain. Freighthub and Zencargo offer a similar service for companies looking to ship goods via ocean transport and act as freight forwarders, Cargo. One connects freight forwarders looking to book air cargo online.

Another critical logistics' operation is warehousing, where transaction platforms such as Stowga and Spacefill connecting warehouse space providers with companies that need such a space (Morrongiello, 2018). The entity structure of electronic transport markets on the European market is dispersed, which leads to increased intensity of price competition. In addition, new electronic platforms are constantly emerging, specializing in handling specific loads and shipments. This phenomenon is observed even in areas dominated by domestic leaders, an example of which may be establishing new units in recent years, such as LoadFox in Germany or Infracht in Poland (Witkowski, 2019).

Innovation platforms are based on a particular technology that fits and can improve the quality of flows within supply chains, emphasizing transport activities and the whole system. One of such technologies is 3DP. However, as the solution is very fresh, that are not too many examples for innovation platforms. One of the few can be the AM3D platform (am3d.pl) developed by H.P. covering the whole manufacturing process (import files online, choose technology and materials, production, smoothing and dyeing, quality control and shipment of finished parts).

Based on this innovation platform, Decathlon developed a new offer to the customs impacting changing part of the supply chain in terms of, i.e., suppliers' base and customers' engagement and experience. That, in effect, impacts on transport requirements reconfiguration (https://hp3d.pl/blog/decathlon-add-lab-zyskuje-przewage-dzieki-technologii-hp-mjf-3d/). The development of innovation platforms because of the implementation, i.e., of 3DP, blockchain, A.I., and more advanced data analytics as an ecosystem of technologies, are the basis of digital supply chain business models (Nowicka, 2019).

The integrated platform is a full-service international digital forwarder that offers different modal services and storage facilities on an international basis (Elbert and Gleser, 2019; Mikl *et al.*, 2020). One of the examples is the TradeLens platform (https://www.tradelens.com/) that was established in 2018 and has been jointly developed by Maersk (a Danish integrated shipping company, active in ocean and inland freight transportation and associated services, such as supply chain management and port operation) and IBM (International Business Machines Corporation – an American multinational technology company) as a blockchain-enabled digital supply chain solution (being an innovative solution, innovation platform at the same time).

The TradeLens is a platform connecting the needs of all parties in the end-to-end supply chain, including traders, freight forwarders, inland transportation, ports and terminals, ocean carriers, customs, and other government authorities, onto a single, secure data-sharing and collaboration on a global scale. It enables the digitization and automation of cross-organizational business processes integral to worldwide trade, including import and export clearance, and based on blockchain technology capabilities ensuring all documents and data are secure, auditable. The platform is reported to have processed data on over 15 million containers worldwide, capturing millions of supply chain events and tens of thousands of documents each week, and these numbers are constantly evolving (Huillet, 2020). In combination with blockchain, TradeLens uses IoT, cloud computing, and sensor data to monitor a range of variables, from temperature control to container weight (Huilliet, 2020).

Another type of integration platform is a model of a network of platforms (platform of platforms) going beyond the issues related only to transport or logistics activities and including the coordination and monitoring of the entire supply chain management process. From the platform perspective, the network effects in Europe are achieved, i.e., by cooperation with Alpega Group (https://www.alpegagroup.com/en/about/) that is a global logistics Software Company offering solutions covering all transport needs, including Transport Management Services (TMS) and freight exchanges. Alpega TMS is a cloud-based software solution that connects manufacturers to a network of transport providers to digitize transportation processes. It transforms supply chains into collaborative ecosystems, bringing together all parties involved.

The system is a modular solution providing optimization, scalability, and complete visibility over transportation flows and seamlessly linking logistics providers with shippers. Thus, it impacts transport planning and execution and lower costs being an added value for customers. The freight procurement solution (TenderEasy) is dedicated to sourcing transportation providers across air, land, and sea. In terms of freight exchanges, cooperating transaction platforms – 123cargo, Teleroute, and Wtransnet – match spot transactions for immediate shipments and truck capacity within the E.U. The platform connects a community of 80 000 carriers and 200 000 members to manage transport processes daily and can be called multiplatform for freight transportation needs.

The investment platform is characterized by either platform portfolio strategy, holding, or active platform investor (Evans *et al.*, 2016). One example of an investment platform can be the Polish Digital Logistics Operator (Polski Cyfrowy Operator Logistyczny, PCLO), a digital platform aiming to connect companies looking for transport, logistic, and forwarding services with companies that provide such services in real-time. The PCOL project goal is to improve the processes in the TFL industry and ensure the security of the Polish transport market, among others, by creating a digital system that will be used by companies with Treasury shareholding (GPW, 2020). So far, 17 Polish state-owned companies are involved.

Two of them are connected directly with the transportation activities (Trans. E.U. Group S.A. - a freight exchange cooperating in Europe on road transport that is a transaction platform and Polskie Koleje Państwowe SA – the dominant railway operator in Poland). Others that belong to different industries, i.e., oil, gas, financial, commercial properties, lottery, postal administration, insurance, or copper and silver production, among others. Currently, the project implementation is a subject of obtaining appropriate corporate approvals for further development of its business model and detailed financial projections. It is supposed to start at the beginning of 2022 (www.rp.pl). The main characteristics of different types of transport platforms available within EU (and in some cases worldwide) are presented in Table 1.

Table 1. *Main characteristics of different types of transport platforms in EU*

Transaction	**Innovation**
- matching demand and supply for particular logistics operations (transport modes and storage); - many players on the market concentrated mainly on road freight transport; - based on spot transactions suitable for ad-hoc needs and solutions example, Trans.eu.	- based on (leading) technology that improves transport and logistics operations, i.e., blockchain, 3DP, IoT, cloud computing, AI, or digital supply chain business model; - built in an interoperable manner it allows to add new solutions (tools and stakeholders) example AM3D.
Investment	**Integrated**
- long term cooperation approach - ground for investment for the strategy of assets diversification; - requires a strong leader and clear strategy due to many diversified investors; example The Polish Digital Logistics Operator.	- end-to-end supply chain connectivity and visibility; - digitally based supply chain control tower; - enables planning and coordination on all activities undertaken within particular supply chain processes; - holistic, systemic approach to supply chain management and strategy implementation; - connects many different logistics stakeholders; - long term approach cooperation, example TradeLens, Alpega Group.

Source: *Own elaboration.*

5. Transport Platforms Role in Sustainable Development – A Challenge for the EU

Regardless of the type of platform in transport, they reduce the adverse environmental effects of the sector through digital technologies. When describing benefits from the value proposition of online solutions considering sustainable development principles, one can point out: in economic (e.g., cost savings, market access), social (e.g., reduction in traffic congestion, ensuring that suppliers follow fair working conditions) and environmental (e.g., reduced emissions) terms (Jain *et al.*, 2020). The

main threefold impact of transport platforms on sustainable development is shown in Table 2. External effects of transport platforms usage are evolving fast and are depending on many complex factors; therefore, are challenging to measure and unequivocal evaluation. From one side, the reason lies in the transport characteristics, the changing regulations leading to its transformation for more environmentally friendly modes and evolving customers' needs.

Table 2. *Economic, social, and environmental impact of freight platforms usage*

Criteria of sustainable development	Examples of impact of freight transport platforms usage
Economic	- improving and developing network of partners and other stakeholders (network effects), - new business model development (economies of skills), - effective use of capacity and loading space (economies of scale), - less waste (e.g., tires, well-to-tank) (costs savings), - effective time management, - improving transparency of flows
Social	- less accidents, - connecting individual providers and consumers, - health benefits, - shorten time of deliveries
Environmental	- reduction in CO2 emissions (air pollution, climate change), - reduction of noise, - less congestion and traffic, - reduction of air pollution, climate change, noise, congestion, costs of well-to-tank (energy production) emissions or costs of habitat damage (loss of natural ecosystems)

Source: *Own elaboration.*

On the other hand, these effects are due to the specificity of the platforms themselves. From a theoretical point of view, integrated platforms are the most beneficial – relatively high responsibility for the actions of both sides of the platform market. Investment platforms, on the other hand, are the most difficult to evaluate. If they are oriented towards modernization and development, several benefits can be attached to them from an economic, social, and environmental perspective. However, the capital structure of the example presented makes one wonder to what extent they aim to protect the domestic market and to what extent development. Experience shows that defence strategies are not conducive to innovation. The environmental effects may be minor in this case.

The role of platforms in the digital and green transformation of the transport sector is conditioned by their regulation, a significant challenge for the EU policy. In this cross-section, two groups of activities can be identified: 1) stimulating the platform

station of the transport sector in the EU; 2) counteracting the negative aspects of this phenomenon.

The first cross-section includes the prevalence of the benefits of using the platforms. Despite the upward trend of using electronic freight exchanges, it is estimated that transactions are carried out in the EU countries, representing only 10 to 20% of the total tonnage of transported goods (Baron *et al.*, 2017). It is necessary to improve the knowledge of environmental risks and the digital competence of forwarding companies (Ordieres-Meré, Remón, and Rubio, 2020; George, Merrill, and Schillebeeck, 2020), as well as to unify the standards of the digital economy, i.e., the data-driven economy (European Commission, 2020c). The following actions, from the point of view of sustainability, are part of their countermeasures:

1. Widening the boundaries of responsibility for parties to transactions of players outside the sector. This applies to the following platforms, trading, innovation, and investment.
2. Counter monopolisation – easier to act than ex ante, ex post. The slowly observed integration of platforms, reinforced by network effects (platform of integrated platforms) may lead to the emergence of large market players with unregulated status. Similar observations apply to innovation platforms based on disruptive technologies whose precursors are already present on the EU market. This situation could lead to the emergence of global FrightTechs that will occupy a similar market position to BigTech in the digital sector.
3. Increasing the level of innovation of European FreightTech facing the competitiveness of American and Chinese companies. In 2009-2019, 267 companies in the FreightTech sector were established in Europe alone, which won an average of USD 6.7 million financing per company (in comparison it was 22.2 million in USA and 96.8 million in China). Total funding amount for FreightTech sector in Europe was on the level of 1.8 billion investment between 2009 and 2019 (Roland Berger, 2020).

The above proposals are in line with the recommendations of Agenda 2030. They emphasize that the Sustainable Development Goals must be supported through good governance and global cooperation – the fourth pillar of sustainable development (TWI2050, 2019).

6. Conclusion

The discussed proposals impact the Sustainable Development Goals and must be additionally supported through governance and global cooperation. According to Gawer`s methodology, all types of platforms are present in the European market. Transactional (non-industry players) and integrated are the most represented ones. It can be observed that transaction platforms are the base for further developing different business models delivering different values. This is also the biggest and the most diversified group of companies with freight exchange matching transport from

decades, new start-ups, and digital solutions (applications) offered by traditional freight forwards and Logistics Service Providers (LSPs).

At the same time, innovative platforms are being developed. They are built on new digital technologies that enable the creation of almost any transport and logistics solution that might serve for flows management within supply chains, but what is more important, they can reconfigure the whole system of the supply chain. Based on that potential, integrated platform solutions are emerging.

In the past, only globally integrated companies (i.e., LSPs) could win a contract to deliver a global shipment, but open cross-border logistics platforms can now break down the end-to-end delivery process into steps (by geography or transport mode) and put these steps out for tender separately. Currently, the integrated platform coordinates the commissioned companies, takes care of documentation, and offers monitoring and analytical services to the recipient. They can oversee the different steps and offer an end-to-end service to compete with the big players (World Economic Forum, 2016), impacting resource productivity and efficiency, speed-to-market, and agility and responsiveness. Automated purchasing, sourcing, inventory modeling, and tracking onto a single connected platform, enabling simulations and fact-based decision making (World Economic Forum, 2017).

There is no doubt that platforms in transport bring EU countries closer to achieving the climate goals adopted in the European Green Deal. However, in their assessment, in line with the principles of sustainable development, the economic and social consequences cannot be ignored. The latter goes well beyond the classic sectoral focus, as do the platforms themselves. This raises the need for a holistic view of the conditions of competition and regulation of platform ecosystems. This requires in-depth research on not so much the platforms as their ecosystems. The ecosystem created by each platform is a source of value and defines the conditions under which users can participate (Pakulska and Poniatowska-Jaksch, 2021). Specific macroeconomic effects also arise from this set of relationships.

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