The 15th IEEE International conference of Logistics and Supply Chain Management **LOGISTIQUA 2024**
May 2 -4 _ University of Sousse - Tunisia.

Sustainability Indicators for Evaluating the Activities of a Home Delivery Company: a Tunisian Case Study

Siwar Bellahirich*,[1]
siwar.bellahirich@etudiant-fst.utm.tn
https://orcid.org/0000-0002-4830-5917
Ayla Amamou[1]
ayla.amamou@fst.utm.tn
Lilia Sidhom[1]
lilia.sidhom@fst.utm.tn
Dhafer Mezghani[1]
dhafer.mezghani@fst.utm.tn
Abdelkader Mami
abdelkader.mami@fst.utm.tn
1: LAPER, Faculty of Sciences of Tunis
University of Tunis El Manar
Tunis, Tunisia

Abstract*—The concept of home delivery has developed blatantly, thus mainly affecting all the agri-food supply chain channels. However, this activity has increased exponentially during the COVID-19 pandemic. This increase in home delivery and logistics in general leads to several challenges mainly relating to environmental aspects. Currently, these aspects have been expanded to highlight the sustainability of these home transportation companies. In this context, this paper proposes the development of a methodology to assess the sustainability of transport companies' activities. This methodology is based on the definition of indicators measuring the three dimensions of sustainability, namely the natural, economic, and social dimensions. This measure of sustainability is defined according to a multi-capital sustainability framework. This last one was established qualitatively via a questionnaire. To validate the proposed methodology, a Tunisian use case is presented.

Keywords— ***home delivery; sustainability assessment methodology; application; Tunisian use case***

I. INTRODUCTION

The transport and logistics sector in general and home delivery companies in particular are very important for the economic development of countries. The role of such companies is to effectively link producers, suppliers, and customers over large geographic distances. As well known, logistic activities mainly affect nature and have an important role in increasing carbon emissions as well as increasing damage to the atmospheric pressure. The combustion of gasoline and diesel in vehicles releases greenhouse gases, including carbon dioxide, into the atmosphere, intensifying the global warming crisis, [1]. Despite efforts by many transport and logistics companies to set sustainability objectives and offer sustainable solutions, there are challenges in achieving significant progress. The industry is facing slow progress in reducing CO2 emissions from road freight transport, highlighting the need for a massive reduction to meet climate targets [2]. In addition to environmental concerns, it's important to consider other aspects of this sector. It is a significant contributor to employment and Gross Domestic Product (GDP) growth [3], providing essential services that support various sectors of the economy. Additionally, the industry's operations can impact communities through factors such as noise pollution, congestion, and safety concerns. Furthermore, the sector plays a crucial role in trade facilitation and international relations, facilitating global commerce and connectivity. Therefore, it is imperative to examine and redefine the behaviors of these vital industries as the world grapples with the imperative of sustainability.

To control and assess a company's sustainability measures, particularly given the complex nature of sustainability issues in the transportation and distribution sector, a multi-capital approach emerges as an invaluable strategic tool, [4]. This methodology is gaining popularity and finds application across various industries [5]. Unlike the traditional sustainability consideration of three dimensions: natural, social, and economic dimension- the Triple Bottom Line (TBL) framework, while well-known, has faced criticism for its inability to comprehensively address sustainability issues. Real sustainability involves considering more than just three dimensions. It means understanding which resources should be developed and protected for the future, ensuring fair benefits

for all, and sustaining positive changes over time [6]. The TBL framework falls short in addressing these concerns, particularly in complex sectors. Consequently, researchers recommend incorporating additional categories to gain a more comprehensive understanding of sustainability, which can be further divided into different types of sustainability capitals. Indicators aligned with each of these capitals, which serve as tangible representations of the quality, characteristics, or attributes of a particular context, often conveyed through quantitative or qualitative variables, will be calculated to offer a comprehensive depiction of a business's sustainability performance. They offer insights into the state of a system in comparison to a reference value, making it possible to assess sustainability criteria and performance measures effectively.
Given the multitude of inputs and outputs in-home delivery company, selecting the appropriate key performance indicators (KPIs) can prove challenging. Furthermore, the varying operational requirements and dynamic nature of the transportation industry contribute to the complexity of defining effective KPIs.

The purpose of this paper aims to assess the sustainability of a home delivery company's activity. A methodology is proposed to provide them with road map to help quantitatively measure their activities. Next, a strategic action plan aiming at sustainable management of this company is implemented. The rest of this paper is arranged as follows. Section 2 provides the review methodology employed in our study. Section 3 is dedicated to the results and discussions. Finally, concluding remarks are drawn in section 4.

II. METHODOLOGY

The methodology applied in this research work is resumed in four steps (see Figure 1). Firstable, the context analysis aims to fix the user preferences, home delivery company in our case, that intends to define a multi-capital sustainability framework from which a list of key performance indicators is derived. Secondly, data collection was carried out in two ways: theoretical via the state-of-the-art and empirical via interviews. Then, indicators are computed based on precise formulas. Finally, data analysis to rate the company's pursuit in terms of sustainability.

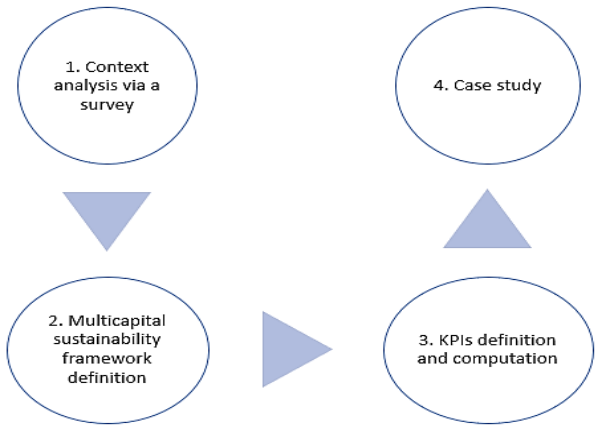

Fig. 1. Home Delivery Company Sustainability Study Methodology

A. *Capitals and indicators definition*

The multi-capital approach is a key to the success of modern companies since it helps to locate the cause of an activity failure and resolves problems by making appropriate decisions to maximize performance and promote the sustainability aspect [7]. Environmental, economic, and social dimensions define the most important pillars of the adopted approach since environmental sustainability aims to reduce greenhouse gas emissions, the social dimension reflects consumer behavior (healthy and sustainable lifestyle), while the economic pillar illustrates the support of digital innovations which implies new business models and new ways of economic growth.

The list of capitals comes from an in-depth bibliographic study that focuses on identifying the factors that influence the AFSC sustainability, highlighting features for each key factor, and checking for options pair matching from different key factors [8–10]. Associated with an empirical study based on a questionnaire carried out with different home delivery company targeted involving him regarding the indicators required within each sustainable development capital [11–13].

Based on their feedback as well as literature, the selection of capitals and indicators is refined so that most of the unavailable indicators are taken into account while adjusting them according to the needs expressed by the stakeholder (see Figure 2).

- Natural dimension represents the environmental dimension and includes all natural resources which are directly useful, or which can be exploited technically and economically. These resources are generally not produced by humans, but they can be consumed or exploited. It includes, for example, air, water, oil, etc.; In our case, the classification of natural indicators has been customized based on.
- Economic dimension incorporating financial capital referring to the financial wealth of the organization expressed in terms of economic resources (for example, money), stakeholder capital that considers the needs and cultural values of each stakeholder (e.g., customers, suppliers), and human capital that represents a mixed set of lessons learned accumulated over time and belonging to the organization itself.
- Social dimension encompasses relational capital referring to the organizational relationships, market relationships, power relationships, and cooperation established between companies, institutions, and people, which arise from a strong sense of belonging and an ability to highly developed cooperation, typical of culturally similar people and institutions.

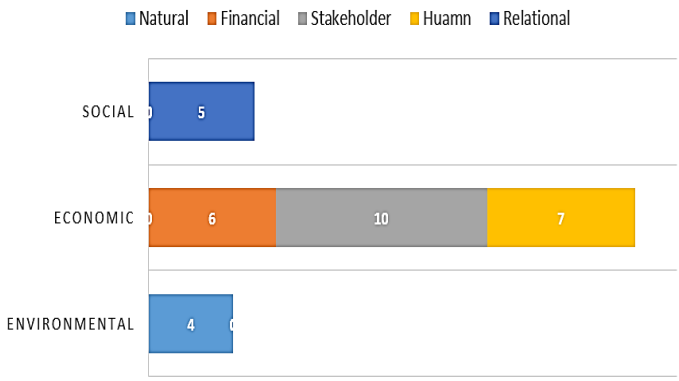

Fig. 2. Stakeholder Involvement in Capital Ranking

Therefore, based on the figure above, the most important capital, according to home delivery companies, is human capital; while the least important capital in their opinion is environmental capital.

Subsequently, each capital is evaluated in terms of sustainability using specific indicators. Indicators selection phase, enriched through a systematic literature review, is presented in the following table 1. This table specifically aims to identify indicators utilized and defined in the literature concerning the sustainability of AFSC as well as the mathematical methodologies applied in their computation [14–15]. By incorporating insights gleaned from existing literature, the selected indicators adhere to the SMART (Specific, Measurable, Acceptable, Realistic, Timely defined) method [16].

TABLE I. INDICATORS AND ASSOCIATED UNITIES

Dm	Capital	Ct	Cd	Indicator	Unity
Environnemental	Natural	Energy	N0	Potential of Global Warming (GWP)	kg CO2 eq
			N1	Fossil fuels depletion (FDEP)	kg oil-eq/tonne-kilomètre
			N2	Potential of Acidification (AP)	kg SO2 eq.
		Water	N3	Water Scarcity Footprint (WSF)	m^3 H2O eq.
		Waste	N4	Waste to landfill (WL)	tone/year ; %
Economic	Financial		E0	Benefit-Cost Ratio (BC)	--
	Stakeholder		E1	Company's earnings per share (EPS)	TDN
			E2	Degree of satisfaction of information sharing among stakeholders	--
	Human		E3	Labor productivity (LP)	TND/h
Scoial	Relational		S0	Number of deliveries per custome	--
			S1	Number of followers on the social media	--

*Dm : dimension *Ct :category *Cd :code

In the case of the home delivery companies, the SMART method offers a clear vision of the relevance, effectiveness, or ineffectiveness of its activities. Then, it helps to adjust its strategy at the appropriate time to achieve the expected results.

B. Indicators computation

The data collected is now intended to be either directly used for the calculation of key performance indicators or integrated into intermediate equations in order to find the parameter useful for the computation of the indicator.

Global Warming which was presented as a method of comparing emissions about climatic effects (IPCC,199) [17], is given by [18]:

$$GWP = \sum emitted\ quantity\ of\ gas\ i * GWP\ (gas\ i) \quad (1)$$

Where the sum of gases represents the carbon dioxide CO2 gas (equation 2 below), the methane CH4 gas and the nitrogen dioxide NO2 gas.

$$GWC = L*2{,}67\ kg\ CO2 * 1kg\ CO2e/kg \quad (2)$$

L represents the annual amount of diesel used in liters.

Equation 3 represents the fossil fuel depletion with FFET as fossil fuel extraction by type t (in kg/unit output or MJ/unit output of the process under study) and the oil equivalent characterization factor (Oileqt) is evaluated to 1.0 kg oil-eq/kg, [19].

$$FDEP = FFET * Oileqt \quad (3)$$

$$AP = \sum ESO2i * Wi \quad (4)$$

AP is the Acidification Potential where ESO2i is the coefficient of sulphur dioxide equivalent for i-th material [kgSO2eq kg-1] and Wi is the weight of i material transported [20].

$$WSF = Wc / Wa \quad (5)$$

Water scarcity footprint is measuring by dividing the Water consumption Wc including direct and indirect water used by the water availability Wa [21].

$$WL = 100 * Twl/Twt \quad (6)$$

Landfill waste is the division result of the Total weight of waste sent to landfill in tonnes Twl by the total weight of goods transported tonnes Twt.

The benefit-Cost Ratio BC is calculated as follow [22]:

$$BC = \frac{\sum_{i=0}^{n} \frac{y_i}{(1+r)^i}}{\sum_{i=0}^{n} \frac{k_i}{(1+r)^i}} \quad (7)$$

With Yi represents the net annual benefit of year, Ki is the total cost for assets of year i (initial investments and re-investments), r represents the discount rate and n refers to the number of years in operation.

Company's earnings per share EPS is given by the division of the net profit by the number of common shares outstanding [23].

$$EPS = NP / Nb\ Comsh \quad (8)$$

The degree of satisfaction with information sharing among stakeholders or the feedback mechanisms or engagement levels are calculated by adding the number of stakeholders engaged to the evaluation level (not good = 1, moderately good = 2, good = 3).

Then, the labor productivity LP represents the total revenue divided by the total number of hours worked.

Finally, the number of deliveries per customer and the number of followers on social media are provided by the company's responsible.

III. Tunisian Case Study

In order to concretize the work presented, the methodology is applied to a newly created Tunisian transport company, it is located in the Cap Bon area, and it is at the heart of the debate on the sustainability problem. To do so, a questionnaire is made with continuous coordination with the founder of the company to participate effectively in the real application of the methodology created.

Alignment of each question with specific indicators or variables enabled the derivation of necessary data for technical calculations. For example, inquiries related to fuel consumption of delivery vehicles were included to compute CO_2 emissions using established formulas or models.

The survey methodology adhered to principles of structured inquiry, emphasizing clarity, relevance, and reliability in data collection. By following a systematic and targeted approach, "structured questionnaire" method is used to effectively capture pertinent information. This approach facilitates consistent and reliable data collection and analysis.

Indeed, for the environmental dimension, information on the distance traveled by home delivery vehicles in Km/year was requested, the annual consumption of fuel such as diesel, gasoline, or other fossil fuels during the transport activity, the quantity of annual energy consumed in KWh whether for the storage of packages to be delivered or any other activity within the company requiring electrical energy, the quantity of water consumed during a year of activity, like the water used for cleaning cars or cooling systems, the type and weight of the material transported in Kg, the total number of packages. In addition to data concerning the production of waste, i.e. the weight of waste generated by each flow over a year.

For the economic dimension, the questions asked targeted the number of shares and/or shareholders, the number of stakeholders involved, and the level of evaluation of this commitment (not good, moderately good, good), it was also interesting to know the total revenue for a year and the total annual costs.

Finally, the questionnaire was concluded with the number of deliveries per customer and the number of followers on social networks which concern the social dimension.

According to the company's founder, the business experiences a surge in activity during the initial six months of the year, followed by a subsequent decline in the succeeding six months. On the other hand, the distance traveled by the four delivery vehicles always remains constant during all months of the year, i.e. 325 km/day. Diesel consumption differs from one car to another depending on the mileage to be covered and the areas to be delivered.

The first three vehicles are intended for the delivery of packages, every day except Sunday. Moreover, each vehicle is devoted to a geographical sector. In comparison, the 4th vehicle is intended for the collection of packages from product sellers daily (7 days out of 7).

As for the consumption of electrical energy, it is mainly intended for administrative needs and the package storage, this consumption peaks only during the summer period of the year.

Water consumption is minimally required in the company, but the majority of this use is intended for washing vehicles (see Figure 3). Indeed, each car is cleaned twice a week.

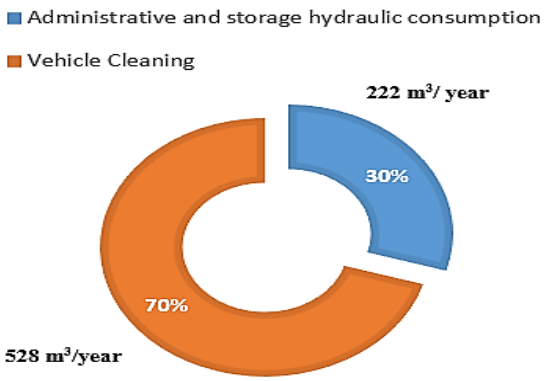

Fig. 3. Annual water consumption in m^3/year

Concerning the type of product to be delivered, there is certainly a multitude of products of which the majority, estimated at 80%, represent textile products.

The rest, i.e. 20% of the total packages transported, are based on plastic, cardboard, glass, ceramics, paper, metal, and food whose weight never exceeds 7 Kg.

The number of packages during the high season reaches 200 packages per day and decreases during the rest of the year to an average of 125 packages per day while estimating a 10% return on packages over a year.

The greater part of the produced waste is due to packaging (56789 kg/year) in addition to maintenance waste (1113.6 kg/year), IT waste (22.5kg/year), and office waste (3.1755 kg/year) since 50% of this waste is kept in the company archive.

The largest part of the waste is based on polypropylene plastic since it presents the ideal material for the manufacture of bags intended for delivery thanks to their great resistance as well as their recycling possibility. Then there is rubber, resulting from the maintenance of car wheels, silica, and graphite, the main constituents of computer products, and finally paper generated by office waste most of which is archived.

Regarding the financial situation, the company estimates that 60% of its annual profit for the year goes towards costs. Besides, the owner has no shareholders and is well satisfied by its engagement with stakeholders which 20 of them are seriously engaged and 30 others are not very active.

The indicators computation is summarized in the following table 2:

TABLE II. INDICATORS COMPUTATION

Code	Indicator	Indicator value	Unity
N0	Potential of Global Warming (GWP)	1451637	kg CO2 eq
N1	Fossil fuels depletion (FDEP)	16825.91	kg oil-eq/tonne-kilomètre
N2	Potential of Acidification (AP)	71.50	kg SO2 eq.
N3	Water Scarcity Footprint (WSF)	2.84	m^3 H2O eq.
N4	Waste to landfill (WL)	30.78	%
E0	Benefit-Cost Ratio (BC)	0.66	--
E1	Company's earnings per share (EPS)	3200	TND
E2	Degree of satisfaction of information sharing among stakeholders	53	--
E3	Labor productivity (LP)	1.068	TND/h
S0	Number of deliveries per customer	2.5	--
S1	Number of followers on social media	40k on Instagram	--
		1k on Facebook	

Despite its novelty, the start-up stands out for its growing turnover, very satisfied engagement with all stakeholders, and relevant activity on social networks.

IV. DISCUSSION AND FUTURE DIRECTIONS

This survey illuminates the positive influence of the examined home delivery company especially on social dimension as a stakeholder and human capitals.

Nevertheless, both environmental and financial capitals are currently falling short, necessitating effective decision-making to steer society toward sustainable development [24–28]. Article [29] highlights a concerning CO2 equivalent consumption of 242.6 tones among a large company. In contrast, our small enterprise utilizes only 16.71% of this value, underscoring our relatively high carbon footprint compared to industry giants. Additionally, with a Benefit-Cost (BC) ratio below 1.0, the transport company under study anticipates a negative net present value, indicating financial challenges. Tunisia's annual GDP per capita stands at approximately 3894.17 US dollars. When this value is divided by the standard 2080 hours worked in a year for full-time employment, the resulting GDP per hour is about 5.2 Tunisian dinars (TND). However, our labor productivity (LP) is reported at 1.068 Tunisian TND per hour, revealing a significant disparity between GDP generation and average labor productivity, suggesting inefficiencies in resource allocation. This discrepancy underscores the urgent need for in-depth analysis to pinpoint the root causes of inefficiency and to implement targeted measures for enhancing labor productivity. Considering these challenges, a strategic plan is proposed to address these issues and pave the way for sustainable growth:

- Reduce the number of delivery vehicles during the low season.
- Use GPS to determine the shortest paths for drivers to follow when delivering packages.
- Invest in a hybrid or electric delivery vehicle.
- Reduce bag waste and use agreements with recycling companies.

By following this strategic plan diesel consumption will be reduced and subsequently harmful gas emissions such as CO2 will be also reduced and local deposits of renewable energy will be well deployed in this sector. Hence, contributing to the reduction of greenhouse gas emissions as well as fuel cost minimization. Also, this plan aims to decrease the plastic spread in the environment and the conservation of the maximum amount of Tunisian hydraulic resources.

This sustainability study, despite its importance for this small delivery company, has one major limitation to mention. In fact, the strategic dashboard, closely linked to the collection and entry of new data, isn't automatically updatable. As a result, it is recommended to integrate it into an autonomous database via intelligent sensors allowing certain relevant information to be measured and updated in real time.

Acknowledgment

This work is part of the research project entitled "Smart Models for Agrifood Local Value Chain Based on Digital Technologies for Enabling covid-19 Resilience and Sustainability" (SMALLDERS), funded by the PRIMA Program - Section 2 Call multi-topics 2021, through the Ministry of Higher Education and Scientific Research (Tunisia).

References

[1] Sagar, A. D. Automobiles and global warming: Alternative fuels and other options for carbon dioxide emissions reduction. Environmental Impact Assessment Review. Vol. 15, Iss. 3, pp. 241-274, May 1995.

[2] Ruamsook, K., and Thomchick, E. A. Sustainable freight transportation: A review of strategies. 53rd Annual Transportation Research Forum, March 15-17, 2012, Tampa, Florida, USA.

[3] Ševčenko-Kozlovska, G.; Čižiūnienė, K. The Impact of Economic Sustainability in the Transport Sector on GDP of Neighbouring Countries: Following the Example of the Baltic States. Sustainability. Vol. 14, Iss. 6, pp. 3326, March 2022. https://doi.org/10.3390/su14063326

[4] Chabouh, S., Sidhom, L. and Mami, A. Towards baseline sustainability scenario development for the agri-food supply chain in the Mediterranean area. 3rd IEEE Signal Control and Communication, December 1-3, 2023, Hammamet, Tunisia.

[5] Amamou, A., Sidhom, L., Zouari, A., & Mami, A. Sustainability-based Multi-capital Approach for the Agri-Food Supply Chain: Research Trends Based on Bibliometric Review. 17th International Conference on Innovations in Intelligent Systems and Applications (INISTA), September 1-3, 2023, Hammamet, Tunisia.

[6] Mor, R. S., Panghal, A., and Kumar, V. Challenges and opportunities of circular economy in Agri-food sector. Book, Springer Singapore. E-ISSN2345-766X, ISBN978-981-16-3793-3, September 15, 2021. https://doi.org/10.1007/978-981-16-3791-9

[7] Mingye, A and al. Multi-capital approach for sustainable Growth: experience from the Oil & Gas companies. Finance: Theory and Practice. Vol. 26, Iss. 4, pp. 29-43, September 2022. https://doi.org/10.26794/2587-5671-2022-26-4-29-43

[8] Escrig-Olmedo, E., Muñoz-Torres, M. J., Fernández-Izquierdo, M. Á., and Rivera-Lirio, J. M. Measuring corporate environmental performance: A methodology for sustainable development. Business Strategy and the Environment, Vol. 26, Iss. 2, pp 142-162. February 2017. https://doi.org/10.1002/bse.1904

[9] Dasgupta, P., Goswami, R., Chakraborty, S., & Saha, S. Sustainability analysis of integrated farms in coastal India. Current Research in Environmental Sustainability, Vol. 3, ISSN 2666-0490, September 2021. https://doi.org/10.1016/j.crsust.2021.100089.

[10] Moller, B.; Voglhuber-Slavinsky, A.; Dönitz, E. Three Scenarios for Europe's Food Sector in 2035. Book. Fraunhofer ISI: Karlsruhe, Germany, September 2020.

[11] Voglhuber-Slavinsky, A.; Derler, H.; Moller, B.; Dönitz, E.; Bahrs, E.; Berner, S. Measures to Increase Local Food Supply in the Context of European Framework Scenarios for the AgriFood Sector. Sustainability, Vol. 13, pp. 10019, September 2021. https:// doi.org/10.3390/su131810019

[12] Melkonyan, A., Gruchmann, T., Huerta, A., Krumme, K. (2019). Scenario Planning for Sustainable Food Supply Chains. In: Melkonyan, A., Krumme, K. (eds) Innovative Logistics Services and Sustainable Lifestyles. Springer, Cham. https://doi.org/10.1007/978-3-319- 98467-4_10

[13] Gómez-Limón, J. A., & Sanchez-Fernandez, G. Empirical evaluation of agricultural sustainability using composite indicators. Ecological economics, Vol. 69, Isss. 5, pp. 1062-1075, March 2010. https://doi.org/10.1016/j.ecolecon.2009.11.027

[14] Kharrat, N., Benaissa, M., Hamani, N. and Kermad, L. Sustainability and resilience freight transport indicators: A multicriteria analysis selection approach. 4th Euro-Mediterranean Conference for Environmental Integration, November 1-4, 2022, Sousse, Tunisia.

[15] Mascarenhas, A., and al. Selection of sustainability indicators for planning: combining stakeholders' participation and data reduction techniques. Journal of Cleaner Production, Vol. 92, pp. 295-307, April 2015. https://doi.org/10.1016/j.jclepro.2015.01.005

[16] Selvik, J. T., Bansal, S., & Abrahamsen, E. B. On the use of criteria based on the SMART acronym to assess quality of performance indicators for safety management in process industries. Journal of Loss Prevention in the Process Industries, Vol. 70, pp. 104392, January 2021. https://doi.org/10.1016/j.jlp.2021.104392

[17] Fuglestvedt, J. S., Isaksen, I. S. A., & Wang, W. C. Estimates of indirect global warming potentials for CH4, CO and NOx. Climatic Change, Vol. 34, pp.405-437, November 1996. https://doi.org/10.1007/BF00139300

[18] Vallero, D. A. Air pollution biogeochemistry, Chapter 8, in book Air Pollution Calculations, Edited by DA Vallero. January 2019. http://doi.org/10.1016/B978-0-12-814934-8.00008-9

[19] Galgani, P., Woltjer, G., de Adelhart Toorop, R., and Ruiz, A. G. Fossil fuel and other non-renewable material depletion: true pricing method for agri-food products. Book. Wageningen University & Research. December 2021.

[20] Švajlenka, J., Kozlovská, M., & Spišáková, M. The benefits of modern method of construction based on wood in the context of sustainability. International Journal of Environmental Science and Technology, Vol. 14, pp. 1591-1602, March 2017. https://doi.org/10.1007/s13762-017-1282-6

[21] Kaewmai, R., Grant, T., Mungkalasiri, J., & Musikavong, C. Assessing the water scarcity footprint of food crops by growing season available water remaining (AWARE) characterization factors in Thailand. Science of the Total Environment, Vol. 763, pp. 143000, ISSN 0048-9697 April 2021. https://doi.org/10.1016/j.scitotenv.2020.143000

[22] Valenti, W. C., Kimpara, J. M., Preto, B. D. L., & Moraes-Valenti, P. Indicators of sustainability to assess aquaculture systems. Ecological indicators, Vol. 88, pp. 402-413, May 2018. https://doi.org/10.1016/j.ecolind.2017.12.068

[23] Senewe, S. P. D., Nurjanah, R., & Nurmayanti, R. Effect of EPS (Earning Per Share) NPM (Net Profit Margin) and ROA (Return on Asset) on Share Prices (a Case Study of Banking and Cigarette Companies Listed in the LQ45 Index on the Indonesia Stock Exchange 2016-2019 Period). Nusantara eps and Technology Proceedings, pp. 145-152, June 2021. https://doi.org/10.11594/nstp.2021.1017

[24] Aalok K. and Ramesh A., Development of Social Sustainability Index for Freight Transportation System. Journal of Cleaner Production, Vol. 210, pp.77-92, October 2018, https://doi.org/10.1016/j.jclepro.2018.10.353

[25] Keita O. and El Khazzar A. Urban Logistics and Sustainable Optimization of Goods Delivery in Urban Areas: Exploring Challenges and Innovative Solutions. International Journal of Accounting, Finance, Auditing, Management and Economics, Vol. 4, pp. 6-1, November 2023. https://doi.org/10.5281/zenodo.102https://doi.org/10.5281/zenodo.10207929

[26] Centobelli, P. and al. Evaluating environmental sustainability strategies in freight transport and logistics industry. Research article. Business Strategy and the Environment. Business Strategy and the Environment, pp. 1-12 January 2020. https://doi.org/10.1002/bse.2453

[27] Chatti W. Moving towards environmental sustainability: information and communication technology (ICT), freight transport, and CO2 emission. Research article. Helyon, Vol. 7, Iss. 10, ISSN 2405-8440, October 2021. https://doi.org/10.1016/j.heliyon.2021.e08190

[28] Xianbo Z. and al. Evaluation of sustainable transport research in 2000-2019. Journal of Cleaner Production, Vol. 256, pp. 120404, ISSN 0959-6526, February 2020. https://doi.org/10.1016/j.jclepro.2020.120404

[29] Oberhofer, P. and Dieplinger, M. Sustainability in the transport and logistics sector: Lacking environmental measures. Business Strategy and the Environment, Vol. 23, Iss. 4, pp. 236-253, May 2014. https://doi.org/10.1002/bse.1769