



HAL
open science

Resilience and Sustainability of Freight Transport: A Comprehensive Review

Nesrine Kharrat, Nadia Hamani, Mounir Benaissa, Lyes Kermad

► To cite this version:

Nesrine Kharrat, Nadia Hamani, Mounir Benaissa, Lyes Kermad. Resilience and Sustainability of Freight Transport: A Comprehensive Review. 23th Working Conference on Virtual Enterprises (PRO-VE), 2022, Lisbonne, Portugal. pp.488-500, 10.1007/978-3-031-14844-6_39 . hal-04007857

HAL Id: hal-04007857

<https://u-picardie.hal.science/hal-04007857v1>

Submitted on 9 Jul 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License



This document is the original author manuscript of a paper submitted to an IFIP conference proceedings or other IFIP publication by Springer Nature. As such, there may be some differences in the official published version of the paper. Such differences, if any, are usually due to reformatting during preparation for publication or minor corrections made by the author(s) during final proofreading of the publication manuscript.

Resilience and Sustainability of Freight Transport: A Comprehensive Review

Nesrine Kharrat ^{1,2,3}, Nadia Hamani ^{2*}, Mounir Benaissa ³ and Lyes Kermad ¹

¹Laboratory of QUARTZ, University of Paris 8, 140 Rue de la Nouvelle France,
Montreuil, France

{ nesrine.kharrat@etud.univ-paris8.fr
l.kermad@iut.univ-paris8.fr }

²Laboratory of Innovative Technologies, University of Picardie Jules Verne, 48 Rue
d'Ostende, Saint-Quentin, France

{ nadia.hamani@u-picardie.fr }

³OASIS (Optimization and Analysis of Industrial and Service Systems) Laboratory,
University of Sfax, Tunisia

{ mounir.benaissa@isgis.usf.tn }

Abstract. Market disruption has made the freight transport (FT) activities more complex. For competitive reasons, companies must operate in more resilient manners to solve problems related to changes with the least amount of damage. So, a communicative indicator to monitor the performance of FT and improve development by prioritizing improvements are crucial. However, the resilience measures of FT are not well-addressed issues. In this paper, we proposed a systematic review of FT resilience by presenting its definitions, identifying its indicators and focusing on its synergies with sustainability and collaboration. This work provides a comprehensive view of resilience as well as new directions.

Keywords: Resilience, Freight Transport, Key Performance Indicators, Sustainability, Collaboration.

1 Introduction

Good movement is fundamental to economic vitality [1]. Despite its vital role in sustaining a given area, FT is also widely recognized for its unsustainable consequences. In fact, it is known as the source of several economic, environmental, and social effects that threaten the citizens' quality of life. With the unexpected changes and disturbances, these harmful impacts are constantly increasing. So, setting up a resilient system has become important. Nowadays, the application of the concept of resilience in FT worldwide is increasingly necessary due to the disastrous effects of the COVID-19 pandemic [2].

Faced with the increase of vulnerability to risk and the accumulation of FT impacts, FT operators deal with what we adopt or change into something new, and maybe better [3]. To deal with this issue, many questions arise:

- *What is resilience, its main characteristics and its assessing indicators in FT?*
- *How can resilience contribute to the sustainability of FT?*
- *How can collaborative strategy lead to a resilient system?*

This paper aims to identify communicative resilient indicators that monitor and define barriers to FT development and emphasize the importance of using them to improve FT sustainability. As well, it addresses the importance of collaboration in building a resilient FT system.

This manuscript is organized as follows. The next section describes the adopted research methodology. In section 3, the definitions of resilience are presented. In section 4, we extract the FT resilience indicators from literature. The importance of resilience to achieve the sustainability of FT is addressed in section 5. In section 6, we highlighted the importance of collaboration to make the system more resilient. In the last section, the conclusion and the future directions are presented.

2 Research Methodology

In the aim to provide a guideline to firms and states to help them understand the importance of resilience in the FT system, we conducted a comprehensive review to define resilience, present its characteristics and indicators and determine its relation with sustainability. This is to point out significant findings and prospects research in the FT field.

The systematic literature review comprises five steps that inspired from [4]. These steps are: (1) define research question formulation, (2) keywords definition, (3) present inclusion and exclusion criteria, (4) database search and collect data, and, (5) analysis and discussion of results. This proposed approach is presented in Fig. 1.

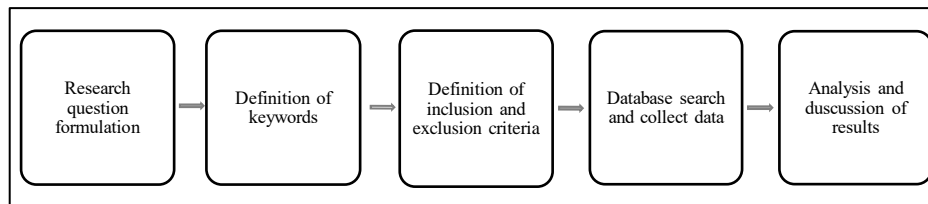


Fig. 1. Research approach.

To select papers, we conducted a search by using the keywords identified: “Resilience”, “Collaboration”, “Sustainability”, “Performance”, “Assessment”, “Indicators”, “Transport” and “Freight”. For this, we have chosen the most widely used databases such as: Google scholar, Science direct and ResearchGate.

In this bibliographic search, we have adopted certain inclusion and exclusion criteria that are defined to refine the literature search. Three inclusion criteria were adopted:

- Select the most recent study
- Focus on works peer-reviewed academic journals
- Consider resilience in all fields

Only articles written in English and French languages are included. A set of 46 papers were selected for the analysis.

3 Resilience Definitions

Risk management is an area of early research. It is defined as a process of identifying, evaluating, and controlling undesirable events that may affect the achievement of an organization's goals. Risk assessment and management are the best way to prepare eventualities. It could improve operational efficiency, safety and security of the system, in addition to the achievement of competitive advantages. Today, with the emergency of the resilience paradigm, risk management has never been more important. Indeed, many practitioners have considered risk management as a part of resilience management [5]. Comtois al. [6] described resilience as the capacity to increase the resilience and regeneration of technical and social systems. Although the resilience concept has appeared over 40 years ago, FT hasn't received much attention. In this section, we review the definitions given in literature defining resilience and presenting its characteristics.

Resilience has become wide-ranging and multidisciplinary which is described in several domains. Because of the multiple definitions of resilience and its related concepts, researchers are unable to give a universal definition. In fact, to deal with disruptions, several keywords could be used such as: resilience, transformative resilience, and antifragility [7]. Resilience is defined as the capacity of a system to recover from a shock. This concept has been used in different contexts. Hosseini [8] classified resilience into four domains namely: organizational, social, economic and engineering. First, the organizational domain is the capability to cope with unanticipated shocks and learn after they become manifest. Sheffi et al. [9] are related to companies that consider resilience as the stability and the speed at which companies could return to their normal performance level. In social domains, resilience is tied to individuals, groups, communities, and environmental capacities. Economic resilience is described as the inherent ability and adaptive response that enables companies and regions to limit losses [10]. In engineering, it is a new concept compared to other fields. According to [11], resilience is the intrinsic ability of a system to adjust its functionality in the presence of disturbances and unanticipated changes. In literature, we can distinguish between adaptive and transformative resilience. If adaptive resilience aims to resist a disruption and maintain the existing structure, transformative resilience aims to reorganize, reconfigure, restructure, and reinvent the system when it is important [12]. It is a radical change. However, the antifragility concept is fundamentally different from the concept of resilience. Indeed, the resilient resists shocks and stays the same; the antifragile improves [13]. It also refers to the survival of a system facing a

disruption. It's a convex response resulting in a positive sensitivity to increased volatility.

In our perspective, FT is considered as a part of engineering. Zhou et al. [14] identified the definition of resilience in the transport sector based on transportation mode. The authors affirmed that all definitions are based on the same general idea whose objective is to quantify resilience in function of the ability of a system to maintain its functionality under disruptions and determine the required time and resources to restore performance level after disruptions. In the field of FT, Ta et al. [15] defined resilience as the ability of the system to reduce the consequences and the impacts of disruptions and maintain freight mobility.

Any disrupted system has four main states over time [16]: preparation, absorption, recovery and adaptation state (See fig. 2).

Preparedness state ($t_0 \rightarrow t_d$): in this phase, the system operates under normal conditions. The anticipation of a disruptive event could lead to the preparation of preventive actions. Therefore, the use of historical data to predict system damage is important.

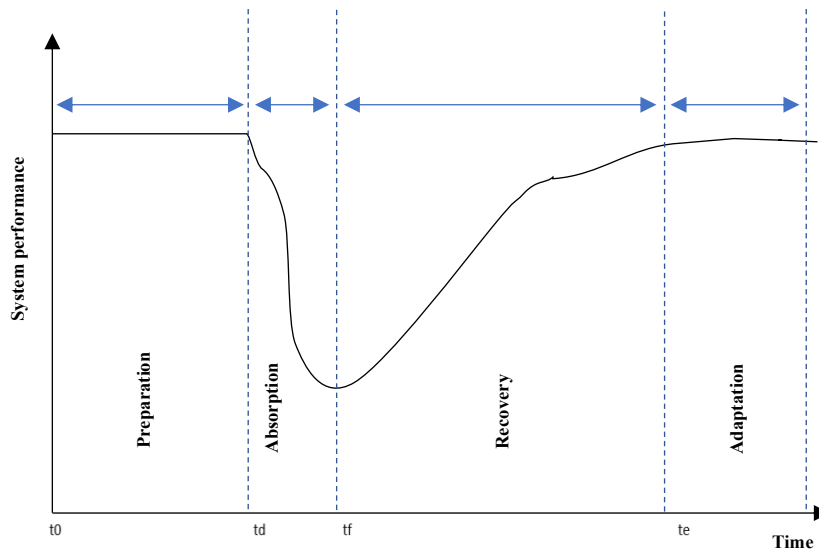


Fig. 2. Resilience performance in function of time.

Absorption state ($t_d \rightarrow t_f$): When a disruptive event occurred, the system must absorb the damage. In this way, the potential impact may exceed the threshold estimated in the preparation phase. So, the system performance is reduced. In this regard, the system must absorb the shocks without destroying the structures and relationships between the system components and its performance.

Recovery state ($t_r \rightarrow t_e$): it is the state of the system's transition from its damaged state to its steady state. To do so, it is important to set up a resource management process to respond and restore system operations and service availability to their pre-event capacity and efficiency.

Adaptation state: it occurs immediately after the restoration of the damaged system when the recovery state is over. It consists of learning from unpredictable event and improving the adaptability of the system that makes it more flexible to future disturbances.

Each state attempts to incorporate many characteristics of resilience. The objective of these characteristics is to understand the resilience term and assess the system performance. In table 1, the most frequently used terms are presented.

Table 1. Resilience key characteristics.

Characteristic	Definition	State				Reference
		Preparation	Disturbed	Recovery	Adaptation	
Anticipation	The capacity to learn, adapt, take precautions, persist, and return the system to normal state after a disruption.	✓				[17]
Absorption	The ability of a system to absorb, resist and mitigate the consequences of disturbance.		✓	✓		[17]
Adaptability	The capacity of a system to absorb perturbations and to adapt to unexpected conditions by accepting certain adjustments.		✓	✓	✓	[17]; [18]
Recoverability	The capacity to recover, repair and restore damage to return to a stable state of functionality.		✓	✓		[17]
Reliability	The probability that a system will continue to operate after a disruptive event.	✓				[19]
Redundancy	The capacity of certain components of a system to take over the functions of failed components without degrading the system performance.		✓			[3]; [17]; [18]; [20]
Robustness	The capacity of the system components to resist and tolerate certain constraints without degrading the system.		✓	✓		[14]; [17];

						[18] ; [20] ; [21]
Vulnerability	It expresses the susceptibility of critical components of a transmission system and generally represents the operational performance of the system.		✓			[3] ; [19]
Preparedness	The preparation of some measures before the interruption	✓			✓	[18]
Flexibility	The ability of a system to respond to disruptions and adapt to changes through contingency plans that are put in place after disruptions.		✓	✓	✓	[3] ; [18] ; [21]
Rapidity	The ability to respond to priorities and meet targets in a timely manner to limit losses and avoid future disruption.		✓	✓		[18]; [20]
Resourcefulness	The capacity to diagnose and prioritize problems and implement solutions by determining the material, monetary, informational, technological and human resources required.			✓		[14]
Interdependence	It designates the connections of the components of the system or its dimensions.		✓	✓		[18]
Survivability	The ability to resist unexpected disruptions while meeting the original requirements.	✓	✓			[22]
Responsiveness	It increases costs while improving the level of service.		✓			[17]

4 Identification of Resilience FT Indicators

Resilience is one of the most interesting topics in FT field. The evaluation of resilience is crucial to determine the system's performance that helps to understand its complexities and investigate different impacts of environmental, social, and economic factors on resilience. Indicators are the best tools for decision making that promote the monitoring of resilience and point weaknesses of FT. Based on the literature results, the indicators of resilience in FT haven't been studied yet. In this section, the most frequently used indicators to assess FT sector resilience are identified.

To develop a resilience evaluation process, the identification of useful resilience indicators has a crucial role. The resilience FT indicators are extracted from literature and summarized in Table 2.

A comprehensive review was conducted by [19] with the aim to compile an overview of the resilience measurement parameters that could be used to formulate resilience quantification and improve the strategies of the transportation system.

resilience analysis of future transport systems. Leobons et al. [20] proposed a set of indicators to measure the resilience of transport systems, focusing on urban mobility. To do so, a bibliometric analysis was carried out to reveal the influence of the ecological, community and economic domains of resilience on the transport domain. Roosta et al. [21] examined the resilience of the street network in three types of urban fabrics (a new street network, an old network and an average network). A formal network resilience indicator was identified based on previous studies. The work of Azad et al. [23] is carried out in the field of FT regarding minimizing the total cost after disruption. A decision framework is proposed to determine the optimal measures to adopt after a disruption to return the normal performance at the lowest possible cost. Fu and Wang [24] proposed an Integrative Urban Resilience Capacity that integrates individual economic, ecological, social and institutional indicators. It helps all stakeholders to take the most preferred scenario.

Table 2. Summary of resilience indicators.

Dimensions	Indicators	Transport field					Other fields			
		[19]	[20]	[21]	[23]	[24]	[17]	[25]	[26]	[27]
Environment	Air quality									✓
	Use of natural resources									✓
	NO/ SO2 emission									✓
	GHG emissions									✓
	Increase in global temperature									✓
Economic	Cost of disruption/damage	✓								
	Transport cost before and after disturbance	✓			✓					
	Recovery budget	✓								
	Energy consumption					✓				
	Infrastructure cost: cost of rebuilding the road	✓				✓				
	Loss rate							✓		
	Alternative modes		✓							
Social	Unemployment rate					✓				
	Equity of distribution									✓
	Social commitment									✓
	Density of the road network									✓
	Rate of increase of accidents									✓
	Road safety									✓
	Distance to nearest transport network									✓
	Level of accessibility	✓	✓	✓						
	Self-administered evacuation plans				✓					
	Integral part of disaster relief and recovery plan				✓					
	Availability of resources (human and material) to deal with disturbances.		✓							

The context is not a barrier to get a comprehensive set of indicators. That is why we have been looking at other contexts to identify resilience indicators. Ahmadi et al [17] pointed out that energy performance, total cost, repair time, and damage performance are the key metrics to analyze the energy system resiliency. In the context of community resilience, Yoon et al [25] developed a methodology to construct a series of indicators that assess the sustainability community resilience index (human, social, economic, environmental and institutional). The aim of the article [26] is to discuss the difficulty of identifying complex networks failures and predicting their environmental impacts in urban area. This paper proposed an assessment flood indicators and mapped resilience levels by considering critical infrastructure networks as risk propagators at different spatial scales. Assarkhaniki et al. [27] conceptualized five key dimensions among twenty-one dimensions considered as frequently addressed dimensions: economic, environmental, social, institutional, and infrastructural.

According to the state of the art on FT, there have been a growing number of studies in recent years addressing the issue of resilience. This research has focused on defining the concept, the type of resources and the characteristics that a transport system must have in order to be resilient.

In addition, we note that little work has identified indicators of resilience to respond to economic, environmental, and social requirements in the FT sector.

5 Importance of Resilience to Sustainable FT: Similarities and Synergies

The existing literature defined a sustainable system as a system that meets the needs of people and societies and in a manner to response to the requirements of future generations. In literature, several definitions are given to present sustainability. In this study, we are focused on definitions that link sustainability to risk concepts.

Sustainability was defined as the system's potential to maintain a desirable state or function over time [28]. In generic terms, sustainable systems are those that can be adapted to changing circumstances [29]. Similarly, Milman and Short [30] pointed out that sustainability indicators should measure the system's ability to adapt to unpredicted change and continue to operate over time. A performance indicator must take into consideration the risks and uncertainties that have a significant impact on the system [31]. These sustainability definitions include elements of resilience that could lead to the fuzzy understanding of sustainability and resilience.

The combination of sustainability and resilience has emerged in the literature under two main categories [32]: (i) the two concepts are synonymous and used indifferently [33] and (ii) the resilience is a critical component of sustainability.

The sustainability of each activity is strongly related to the life-support ecosystems. In addition, if a development strategy is not resilient, it is not sustainable. While, the two concepts focus on survivability under disturbances events [3].

The literature has indicated the lack of a conceptual framework for consolidating sustainability and resilience. In this regard, Marchese et al. [34] carried out a survey of 17 frameworks. Three main integrations are identified:

- Resilience is an element of sustainability,
- Sustainability is an element of resilience,
- Sustainability and resilience have distinct goals.

The first framework considers resilience as one part of a broader field of sustainability. In this state, improving resilience could make a system more sustainable. Conversely, increasing the sustainability of a system does not necessarily lead to greater resilience. Indeed, resilience is a support to the achievement of the sustainability goals set [35]. Thus, a non-resilient system leads to sustainable fragility. Therefore, in front of any disturbance, a system is susceptible to recover its original stable state. Several works have proposed a framework for assessing sustainability and resilience performance by integrating economic, environmental and social indicators in the urban water sector. The second framework presents resilience as the goal of the system where sustainability is presented as a determinant of resilience. Indeed, increasing sustainability makes the system more resilient. However, the reverse is not necessarily correct. In the third framework, sustainability and resilience are considered as complementary or competing. In this context, resilience does not promote sustainability, and vice versa.

6 Importance of Collaboration to Build Resilient FT Network

Collaborative network is a novel emerging discipline focusing on the improvement of network's dynamism through collaboration between partners to better achieve common and compatible goals. It was defined by [36] as a means that two or more independent firms work and plan jointly. There are two main collaboration categories. It can be vertical by focusing on synchronization and coordination of the actors' operations [37], and horizontal between actors that do not belong to the same supply chain but operating at the same level.

Several authors linked the concept of collaboration networks and resilience in the same definition. According to [38], risk management and collaboration are integrated. In fact, the resilience in the risk management field is presented as the mitigation risk process is based on collaboration and coordination. In addition, Barratt [37] defined collaboration as the share of benefit and risk between partners by sharing information. Whipple and Russel [39] considered collaboration as an enabler to the synergy's development among stockholders by joint planning and exchanging real-time information required to prepare, respond and recover in the face of disruptions. In a recent study, Poberschnigg et al. [40] presented collaboration as a capability of resilience.

The more important question arises: "How collaborative strategy can lead to a resilient system?". To respond to this question, we are interested in literature that

highlights the importance of collaboration to build resilient systems. Christopher and Peck [41] highlight the importance of collaboration to build a resilient supply chain. They define collaboration as glue that makes organizations work together in a crisis. Ergun et al. [42] state that collaboration and information sharing contribute to faster risk response processes. Scholten and Schilder [43] focuses on the identification of collaboration role in improving resilience by increasing visibility, flexibility and velocity. Hendry et al. [44] state that horizontal and vertical collaboration between stockholders is the best strategy to build supply chain resilience. Comtois et al. [6] emphasized the importance of collaboration and networked integration of information and operations to ensure that the transportation system is resilient and therefore remains competitive in the marketplace. Lotfi and Larmour [45] find that collaboration helps supply chains be more resilient by improving anticipation, adaptation, response, recovery and learning from a disturbance. Azadegan and Dooley [46] have explained the typology of resilience strategies related to different types of collaboration in supply chain networks. They presented resilience in supply networks at the micro-level (between buyers and suppliers to recover the risk of the network), at the macro-level (between competitors' companies and government that manage together the risks on long-term), and at the meso-level which appears when several supply networks collaborate on short and medium-term supply risks.

7 Discussion

We now give a summary discussion based on the various observations and insights gained from the literature review.:

1. From the definition of resilience, we conclude that a clear and universal definition of resilience is required.
2. In literature a few studies have identified resilience indicators in the FT sector. Our study fills this gap by determining economic, environmental and social indicators.
3. More research is needed to the management of FT and to build a sustainable and resilient system [2] and [47]. Clearly, this is an important avenue of foundational research study to minimize conflicts and maximize synergies between the two concepts based on a well-defined set of indicators.
4. Performance indicators are important to identify best practices and strategies to improve resilience of FT.
5. Combination of resilience in collaborative strategy is needed to create more synergies and improvements in networks [40], [43] and [46].
6. Selection of solutions and strategy to improve sustainability and resilience of FT using tools integrating stakeholders in the decision-making process.

8. Conclusion

The efforts of assessing resilience FT systems have become important in the presence of dramatic changes. The performance assessment could help stockholders understand the state of resilience and highlight needs for enhancing resilience abilities.

The aim of our work was to conduct a comprehensive review to (1) understand resilience of FT, (2) identify the major indicators of resilience FT that influence the economic, environmental, and social aspects, and (3) investigate the resilience importance in sustainable FT system by identifying the similarities and differences. This paper proposes a novel direction for the performance assessment of FT. Consequently, it is needed to propose sustainable and resilient composite indicators that aggregate several indicators to control and monitor the state of performance. The development of a sustainable and resilient framework is important to help decision-makers make the best decisions and improve the sustainability and resilience of the FT system by setting up the appropriate strategies.

References

1. Muñuzuri, J., Larrañeta, J., Onieva, L., & Cortés, P. (2005). Solutions applicable by local administrations for urban logistics improvement. *Cities*, 22(1), 15-28.
2. Roostaie, S., & Nawari, N. (2022). The DEMATEL approach for integrating resilience indicators into building sustainability assessment frameworks. *Building and Environment*, 207, 108113.
3. Lew, A. A., Ng, P. T., Ni, C. C., & Wu, T. C. (2016). Community sustainability and resilience: Similarities, differences and indicators. *Tourism Geographies*, 18(1), 18-27.
4. Durach, C. F., J. Kembro, and A. Wieland. 2017. "A New Paradigm for Systematic Literature Reviews in Supply Chain Management." *Journal of Supply Chain Management* 53.
5. Louisot, J. P. (2015). Risk and/or resilience management. *RISK GOVERNANCE & CONTROL: Financial markets and institutions*, 5(2), 84-91.
6. Comtois, C. (2020). *Changements dans les conditions du marché international : essai sur la résilience des ports de vrac et perspectives à la Canada*.
7. Zitzmann, I., 2014. How to cope with uncertainty in supply chains? – Conceptual Framework for agility, robustness, resilience, continuity and anti-fragility in supply chains. In: Kersten, W, Blecker, T, Ringle, CM (Eds.), *Next Generation Supply chains: Trends and Opportunities*. Springer, Berlin, pp. 361–377.
8. Hosseini, S., Barker, K., & Ramirez-Marquez, J. E. (2016). A review of definitions and measures of system resilience. *Reliability Engineering & System Safety*, 145, 47-61.
9. Sheffi Y. Resiliencereducerisk. *LogistQ*2006;12:1.
10. Rose A, Liao SY. Modeling regional economic resilience to disasters: a computable general equilibrium analysis of water service disruptions. *JReg Sci* 2005;45(1):75–112.

11. Hollnagel E. Prologue: the scope of resilience engineering. In: Hollnagel E, Paries J, Woods DD, Wreathall J, editors. Resilience engineering in practice: a guidebook. USA: Ashgate Publishing Company; 2010.
12. Ramezani, J., & Camarinha-Matos, L. M. (2020). Approaches for resilience and antifragility in collaborative business ecosystems. *Technological Forecasting and Social Change*, 151, 119846.
13. Taleb, N.N., 2012. Antifragile: Things That Gain from Disorder. Random House Publishing Group, New York.
14. Zhou, Y., Wang, J., & Yang, H. (2019). Resilience of transportation systems: concepts and comprehensive review. *IEEE Transactions on Intelligent Transportation Systems*, 20(12), 4262-4276.
15. Ta, C., Goodchild, A. V., & Pitera, K. (2009). Structuring a definition of resilience for the freight transportation system. *Transportation Research Record*, 2097(1), 19-25.
16. Sharifi, A., & Yamagata, Y. (2016). Principles and criteria for assessing urban energy resilience: A literature review. *Renewable and Sustainable Energy Reviews*, 60, 1654-1677.
17. Ahmadi, S., Saboohi, Y., & Vakili, A. (2021). Frameworks, quantitative indicators, characters, and modeling approaches to analysis of energy system resilience: A review. *Renewable and Sustainable Energy Reviews*, 144, 110988.
18. Gonçalves, L. A. P. J., & Ribeiro, P. J. G. (2020). Resilience of urban transportation systems. Concept, characteristics, and methods. *Journal of Transport Geography*, 85, 102727.
19. Ahmed, S., Dey, K. Resilience modeling concepts in transportation systems: a comprehensive review based on mode, and modeling techniques. *J Infrastruct Preserv Resil* 1, 8 (2020). <https://doi.org/10.1186/s43065-020-00008-9>.
20. Leobons, C. M., Campos, V. B. G., & de Mello Bandeira, R. A. (2019). Assessing urban transportation systems resilience: a proposal of indicators. *Transportation research procedia*, 37, 322-329.
21. Roosta, M., Javadpoor, M., & Ebadi, M. (2021). A study on street network resilience in urban areas by urban network analysis: comparative study of old, new and middle fabrics in shiraz. *International Journal of Urban Sciences*, 1-23.
22. Wan, C., Yang, Z., Zhang, D., Yan, X., & Fan, S. (2018). Resilience in transportation systems: a systematic review and future directions. *Transport reviews*, 38(4), 479-498.
23. Azad, N., Hassini, E., & Verma, M. (2016). Disruption risk management in railroad networks: An optimization-based methodology and a case study. *Transportation Research Part B: Methodological*, 85, 70-88.
24. Fu, X., & Wang, X. (2018). Developing an integrative urban resilience capacity index for plan making. *Environment Systems and Decisions*, 38(3), 367-378.
25. Yoon, D. K., Kang, J. E., & Brody, S. D. (2016). A measurement of community disaster resilience in Korea. *Journal of Environmental Planning and Management*, 59(3), 436-460.
26. Serre, D., & Heinzlef, C. (2018). Assessing and mapping urban resilience to floods with respect to cascading effects through critical infrastructure networks. *International Journal of Disaster Risk Reduction*, 30, 235-243.
27. Assarkhaniki, Z., Rajabifard, A., & Sabri, S. (2020). The conceptualisation of resilience dimensions and comprehensive quantification of the associated indicators: a systematic approach. *International Journal of Disaster Risk Reduction*, 101840.

28. Maclaren, V. W. (1996). Urban sustainability reporting. *Journal of the American planning association*, 62(2), 184-202.
29. Jeffrey, P., Seaton, R., Parsons, S., & Stephenson, T. (1997). Evaluation methods for the design of adaptive water supply systems in urban environments. *Water science and technology*, 35(9), 45-51.
30. Milman, A., & Short, A. (2008). Incorporating resilience into sustainability indicators: An example for the urban water sector. *Global Environmental Change*, 18(4), 758-767.
31. Loucks, D. P. (1997). Quantifying trends in system sustainability. *Hydrological Sciences Journal*, 42(4), 513-530.
32. Derissen, S., M. F. Quaas, and S. Baumgaertner. 2011. The relationship between resilience and sustainability of ecological-economic systems. *Ecological Economics* 70(6):1121–1128.
33. Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social–ecological systems. *Ecology and Society*, 9(2) <http://www.ecologyandsociety.org/vol9/iss2/art5/>
34. Marchese, D., Reynolds, E., Bates, M. E., Morgan, H., Clark, S. S., & Linkov, I. (2018). Resilience and sustainability: Similarities and differences in environmental management applications. *Science of the total environment*, 613, 1275-1283.
35. Ahern, J. (2013). Urban landscape sustainability and resilience: the promise and challenges of integrating ecology with urban planning and design. *Landscape ecology*, 28(6), 1203-1212.
36. Simatupang, T. M. and Sridharan, R. (2002) "The collaborative supply chain", *International Journal of Logistics Management*, 13(1), pp. 15-30.
37. Barratt, M. (2004), "Understanding the meaning of collaboration in the supply chain", *Supply Chain Management: An International Journal*, 9(1), pp.30-42.
38. Safyalioglu, Kartal, the selection of global supply chain risk management strategies by using fuzzy analytical hierarchy process a case from Turkey *Procedia - Social and Behavioral Sciences* 58 1448 – 1457, 2012.
39. Whipple, J.M. and Russell, D. (2007), "Building supply chain collaboration: a typology of collaborative approaches", *The International Journal of Logistics Management*, Vol.18 No.2, pp.174 – 196.
40. da Silva Poberschnigg, T.F., Pimenta, M.L. and Hilletoft, P., 2020. How can cross - functional integration support the development of resilience capabilities? The case of collaboration in the automotive industry. *Supply Chain Management: An International Journal*.
41. Christopher, M. and Peck, H. (2004), "Building the Resilient Supply Chain", *The International Journal of Logistics Management*, 15(2), pp.1-14.
42. Ergun, A., Heier Stamm, J.L., Keskinocak, P. and Swann, J.L. (2010), "Waffle House Restaurants hurricane response: A case study", *International Journal of Production Economics*, Vol.126 No.1, pp.111–120.
43. Scholten, K. and Schilder, S. (2015), "The role of collaboration in supply chain resilience", *Supply Chain Management: An International Journal*, 20(4), pp.471-484.
44. Hendry, L., Stevenson, M., MacBryde, J., Ball, P., Sayed, M. and Liu, L. (2019), "Local food supply chain resilience to constitutional change: the Brexit effect" *International Journal of Operations & Production Management*, 39(3), pp.429-453.

45. Lotfi, M., & Larmour, A. (2021). Supply chain resilience in the face of uncertainty: how horizontal and vertical collaboration can help?. *Continuity & Resilience Review*.
46. Azadegan, A. and Dooley, K., 2021. A typology of supply network resilience strategies: Complex collaborations in a complex world. *Journal of Supply Chain Management*, 57(1), pp.17-26.
47. Lizarralde, G., Chmutina, K., Boshier, L., & Dainty, A. (2015). Sustainability and resilience in the built environment: The challenges of establishing a turquoise agenda in the UK. *Sustainable Cities and Society*, 15, 96-104.