International Journal of Applied Optimization Studies
Year 2019 Volume 02 Issue 01 pp. 1-9.
www.ijaos.com

The Sustainability of European Transportation through Intermodality

Sajjad Khaksari[1,*]

[1]*Serial Production Coordinatore (SPC) Engineer at ALSTOM (Savigliano, Italy)*

Abstract

Regrettably, the current European transport is highly dependent on Crude Oil and Petroleum Products, and it has induced some tremendous Environmental Damages and dramatic fatal vehicle accidents as well. Also, the Oil Dependency has generated the dramatic financial crisis in European Union, Japan, Unite State, and industrialized countries while their GDP collapsed during the minimum rise of the Oil Price. Therefore, the following Research Proposal beams to intensify the importance of the advance studies concerning the logistics and transportation ecosystems, and it seriously attempts to represent the needs of research through innovative transportation modes such as Intermodal Freight/Passenger Transportation (Containerization), Cross-modalities, and Sustainability of the Maritime/Road/Rail/Air transportation.

Original Article:

Received 2019-10-24
Revised 2019-11-25
Accept 2019-12-02

Keywords:

Sustainability;

Intermodal Freight Transportation;

Green Supply Chain.

1. Introduction

According to the UNECE report, "climate change is at the top of UN priorities" while Carbon Dioxide (CO_2) as a greenhouse gas contributes principally to global warming (UNECE, 2012). Approximately, 30% of the total human-made CO_2 emissions worldwide is generated by the transport sector. In fact, during the recent century, the traditional (fossil fuel based) transportation has caused climate change, global warming, and the vast range of fatal diseases. Besides, almost 65-billion parcels are delivering in the world over every year while the e-grocery, e-marketing e-shopping habits are growing as well (Zetsche, 2017).

On the other hand, according to Ashby (2012), the future discovery of crude oil's reserves and natural gas will diminish dramatically within the next 20 years. It will cause the reduction of the oil exploitation, and in sequence, the shortage of oil production will cause the Oil Price to rise overwhelmingly (please review Figure 1). Furthermore, the Oil Dependency has caused some dramatic financial crisis, and in many occasions, it has provoked the collapse of the Gross Domestic Products (GDP) in Industrialized Countries throughout the increase of the Oil Price (Appendix A, B, and C).

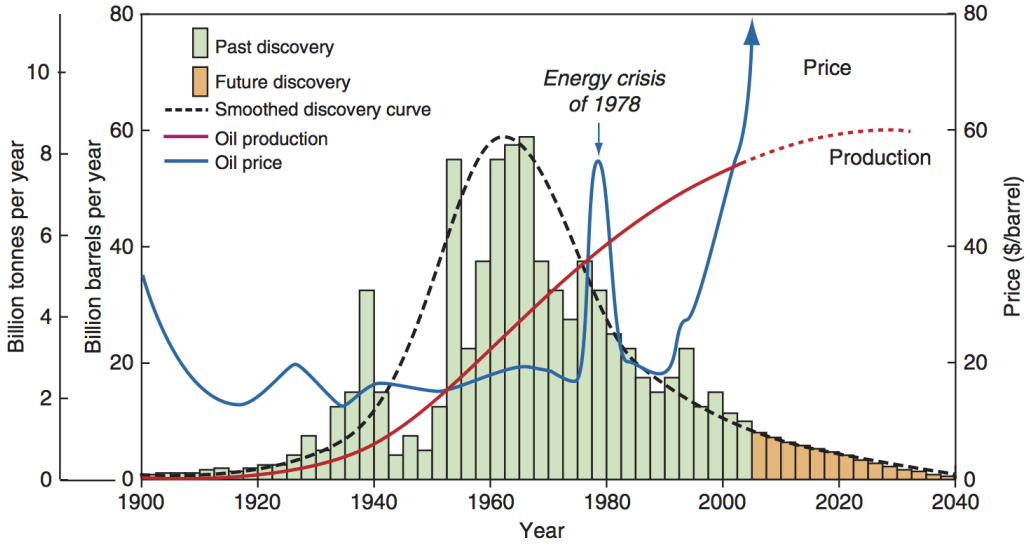


Fig. 1. Evolution and Rates of the Oil Discovery and the Price of Crude Oil (Ashby, 2012).

2. Conventional Logistics Models and Ecosystems

There seems to be no compelling reason to argue that, the conventional freight transportation and traditional logistics industry convey a considerable number of containers and cargo each year, but they discharge many gases and toxic emissions. Having said that regrettably, according to EUROSTAT (2017), the conventional freight/passenger transportation of European supply chain (SC) is fundamentally based on consumption of Crude Oil and Petroleum Products such as fossil fuels, gasoline, benzene, avgas, tires, lubricant greases, bitumen for asphalt of road pavements, and all plastic components in all kind of vehicles (please review Appendix D and E).

Whilst, for the sake of a sustainable assessment, the consideration of the environmental damages caused by fossil fuel-based transportation and Oil Rigs is needed. According to the EIA report, only in 2016, the United States consumed a total of 7.21 billion barrels of petroleum products with an average of 19.69 million barrels per day (EIA, 2017). The available evidence seems to insinuate that, the rescue of the Oil and petroleum products (in particular benzene, gasoline, and avgas) might have saved the future of transportation in harsh conditions such as polar regions, high mountains, hot deserts, and dark forests or anywhere, the approachability to electric resources is a challenge. In this circumstances, burning the fossil fuels during the urban/suburban transportation is one of the worst manners in the world to waste and kill these non-renewable energy resources, dissipate them permanently, and damage the ecosystem (Plata-Rocha et al., 2011).

3. The Ecosystem Of Green Supply Chain And Sustainable Logistics

Allen et al. (1999) believed that the ecosystem is more than a collection, and the components must interact in some way for it to qualify as a system and providing a defined wholeness of function. Besides, Geneletti (2003) denoted that the indirect loss refers to the fragmentation and/or degradation of ecosystems due to the presence of transport infrastructure might reduce the capability of the ecosystem to maintain its original biodiversity.

These insights have enhanced the requirements for measuring, investigating, and improving an efficient and sustainable co-modality of transportation. Also, some estimates detect that the number of parcel deliveries will double within the next ten years while the investigations regarding the reduction of CO_2 emissions, innovative transportation modes, and inventiveness of noise-free commercial vehicles (e-vans, e-trucks, e-buses, and e-vessel) are demanded to help the environment. In conclusion, the Advanced Research would promote the environmental sustainability through the Green Logistics and Green Supply Chain Management (McKinnon et al., 2015; Colicchia et al., 2017).

4. Purpose, Methodology, and Research Design

According to the aforementioned "tested hypothesis", the author believes that the further studies of Intermodal Freight/Passenger Transportation and its comprehensive ecosystem will provide performance development and positive consequences on the future of City Logistics, Internet of Things (IoT), and Logistics 4.0 (please review Figure 2) (Khaksari, 2018a). Moreover, the Research aims to attain a Mathematical Model that could satisfy a Sustainable Logistics Model and explore higher Added-Value approaches to IoT and other futuristic ideas. Also, for the academic enrichment of the author, the studies of modern theories concerning the Business and Management and Advanced Theories would be expected as well.

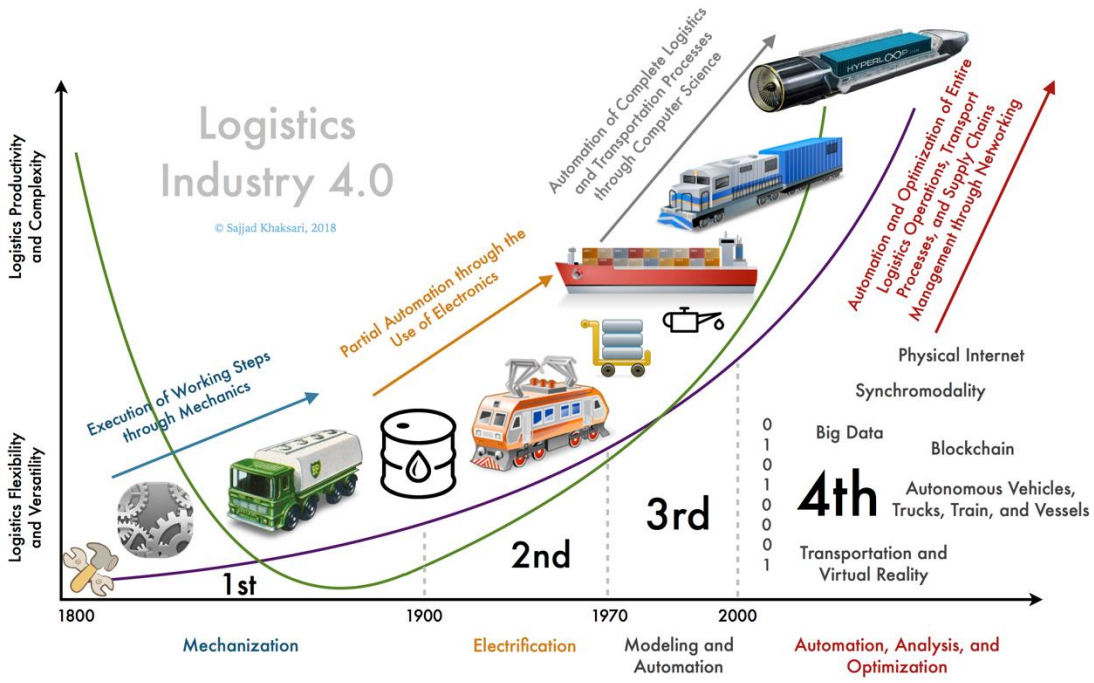


Fig 2. The Logistics Industry 4.0.

To summarize, as Rodrigue (2009) have correctly mentioned, "Transportation modes are an essential component of transport systems since they are the means by which mobility is supported". In fact, the Research Proposal aims to intensify the debate and offer a sustainable business model based on the study of *cross-modality*, *innovative transportation modes*, *intermodal freight transportation (containerization)*, and Road / Maritime / Inland / Rail / Air

transportation in European Union (2014). The adequate research methods are quintessential to the success of the research projects. Therefore, the above Research Proposal intends to employ the modern and interactive methods that provide insight into the development, evolution, procedures, and the results improvement of the investigations. Figure 3 illustrates a concise overview of intention methods from the work experience and desk research into the final dissertation. Also, the methods characterize the distinct stages of the research, and the personal groundwork experiences of the author would tie together the academic world of research and the *real world* of logistics and on-road transportation.



Fig. 3. The Schematic Overview of the Methodologies and Research Designs.

Additionally, during the Desk Studies, the literature would be reviewed, and the proposed solutions would be included in whole parts of the research. Moreover, the literature review would be the primary components for the accomplishment of the project and the farther addition of appropriate erudition. Eventually, the bibliographies and articles citation will be extracted via the libraries of the Elsevier Research Academy, Mendeley, Scopus®, ORCID, IEEE Xplore®, Emerald, MDPI, and other available international journals.

5. Conclusion

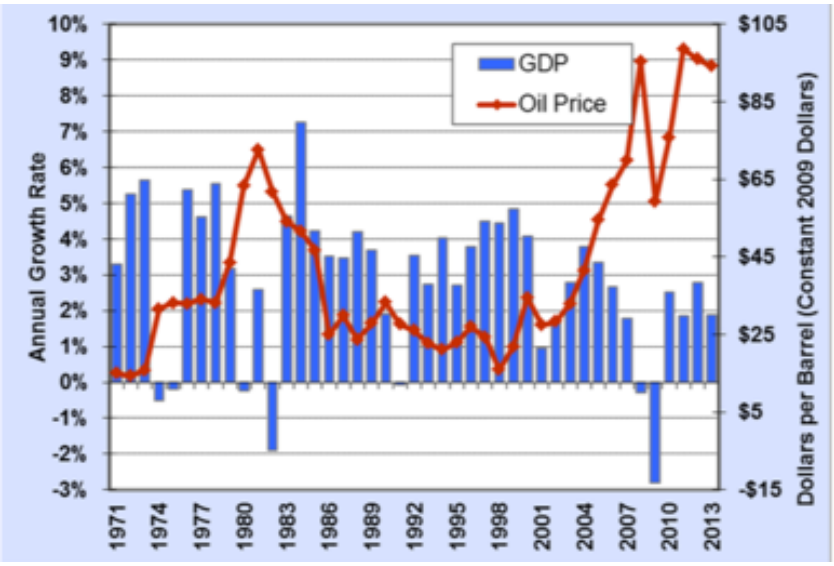
In the final chord of this *Research Proposal*, the author would like to invite all readers to reconsider the destruction of the Industrialized Countries and their massive Gross Domestic Product during the rise of the oil price. In actuality, through the aforementioned condition of *oil dependency*, the whole industries and followed by that the *Freight Transport* might prominently suffer a financial crisis (such as the economic crisis of 1979 and 2008). On the other hand, *Climate Change* might be at the top of the research priorities while the Carbon Dioxide (CO_2) gas emissions by transportation modes (mostly by fossil fuel cars and trucks) and traditional industrialization has caused catastrophic warming of our planet.

6. Acknowledgement

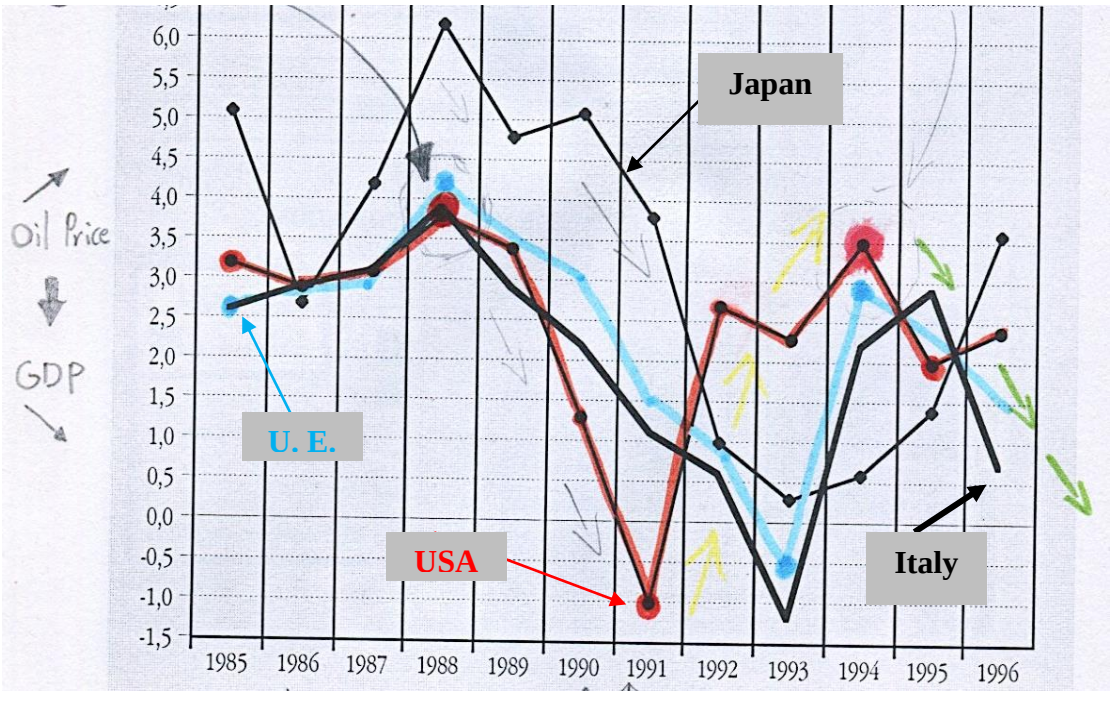
Heartfelt thanks to Professor Guido Perboli and the personnel of the ICT laboratory for City Logistics and Enterprises (ICELAB) those gave the author an excellent opportunity to work in an academic environment to research about the application of the Blockchain Technology through the Logistics Industry and Intermodal Freight Transportation (Khaksari, 2018b).

7. Appendixes

Appendix A: The GDP of USA and Oil Prices - © Oil: Greene (2014)



Appendix B: The USA and Italian PIL (GDP) and Oil prices - © Piercarlo Ravazzi (1998). Please note that Prof. Ravazzi commented that the breakdown of the North American GDP has anticipated (1 – 2 years) the failure of the Italian Gross Domestic Product (Ravazzi, 1998)



Appendix C: Italian fatal light and heavy vehicle accidents; Please consider that the table is prepared and released by (Confetra, 2012). Moreover, the table precisely illustrates the number of traffic accidents (injured and dead) in the Italian motorway networks from 2005 to 2011. Regrettably, in 2011, Italy suffered by loss of 236 persons (171 in Light Vehicle accidents and

65 in Heavy Vehicle accidents), and 2,447 people died in 7 years. The AISCAT is the source of these critical and thoughtful information (AISCAT, 2018)

Anno	Incidenti con feriti e/o morti						Incidenti mortali					
	Leggeri	var.% su anno prec.	Pesanti	var.% su anno prec.	Totale	var.% su anno prec.	Leggeri	var.% su anno prec.	Pesanti	var.% su anno prec.	Totale	var.% su anno prec.
2005	8.393		2.118		10.511		254		124		378	
2006	7.851	-6,5	2.064	-2,5	9.915	-5,7	254	0,0	122	-1,6	376	-0,5
2007	7.437	-5,3	2.109	2,2	9.546	-3,7	233	-8,3	124	1,6	357	-5,1
2008	6.748	-9,3	1.721	-18,4	8.469	-11,3	203	-12,9	103	-16,9	306	-14,3
2009	6.762	0,2	1.506	-12,5	8.268	-2,4	165	-18,7	74	-28,2	239	-21,9
2010	6.477	-4,2	1.493	-0,9	7.970	-3,6	176	6,7	74	0,0	250	4,6
2011	5.890	-9,1	1.395	-6,6	7.285	-8,6	140	-20,5	62	-16,2	202	-19,2

Anno	Feriti						Morti					
	Leggeri	var.% su anno prec.	Pesanti	var.% su anno prec.	Totale	var.% su anno prec.	Leggeri	var.% su anno prec.	Pesanti	var.% su anno prec.	Totale	var.% su anno prec.
2005	13.987		3.057		17.044		305		146		451	
2006	13.704	-2,0	3.084	0,9	16.788	-1,5	313	2,6	139	-4,8	452	0,2
2007	13.066	-4,7	3.114	1,0	16.180	-3,6	278	-11,2	139	0,0	417	-7,7
2008	11.557	-11,5	2.527	-18,9	14.084	-13,0	237	-14,7	121	-12,9	358	-14,1
2009	11.596	0,3	2.218	-12,2	13.814	-1,9	175	-26,2	83	-31,4	258	-27,9
2010	11.315	-2,4	2.194	-1,1	13.509	-2,2	195	11,4	80	-3,6	275	6,6
2011	10.226	-9,6	2.087	-4,9	12.313	-8,9	171	-12,3	65	-18,8	236	-14,2

Anno	Percorrenza (veicoli-km in milioni)					
	Leggeri	var.% su anno prec.	Pesanti	var.% su anno prec.	Totale	var.% su anno prec.
2005	60.221		19.184		79.405	
2006	62.124	3,2	19.764	3,0	81.891	3,1
2007	63.558	2,3	20.229	2,4	83.789	2,3
2008	63.266	-0,5	19.806	-2,1	83.072	-0,9
2009	64.554	2,0	18.364	-7,3	82.920	-0,2
2010	64.498	-0,1	18.773	2,2	83.271	0,4
2011	63.574	-1,4	18.751	-0,1	82.323	-1,1

Fonte: Aiscat

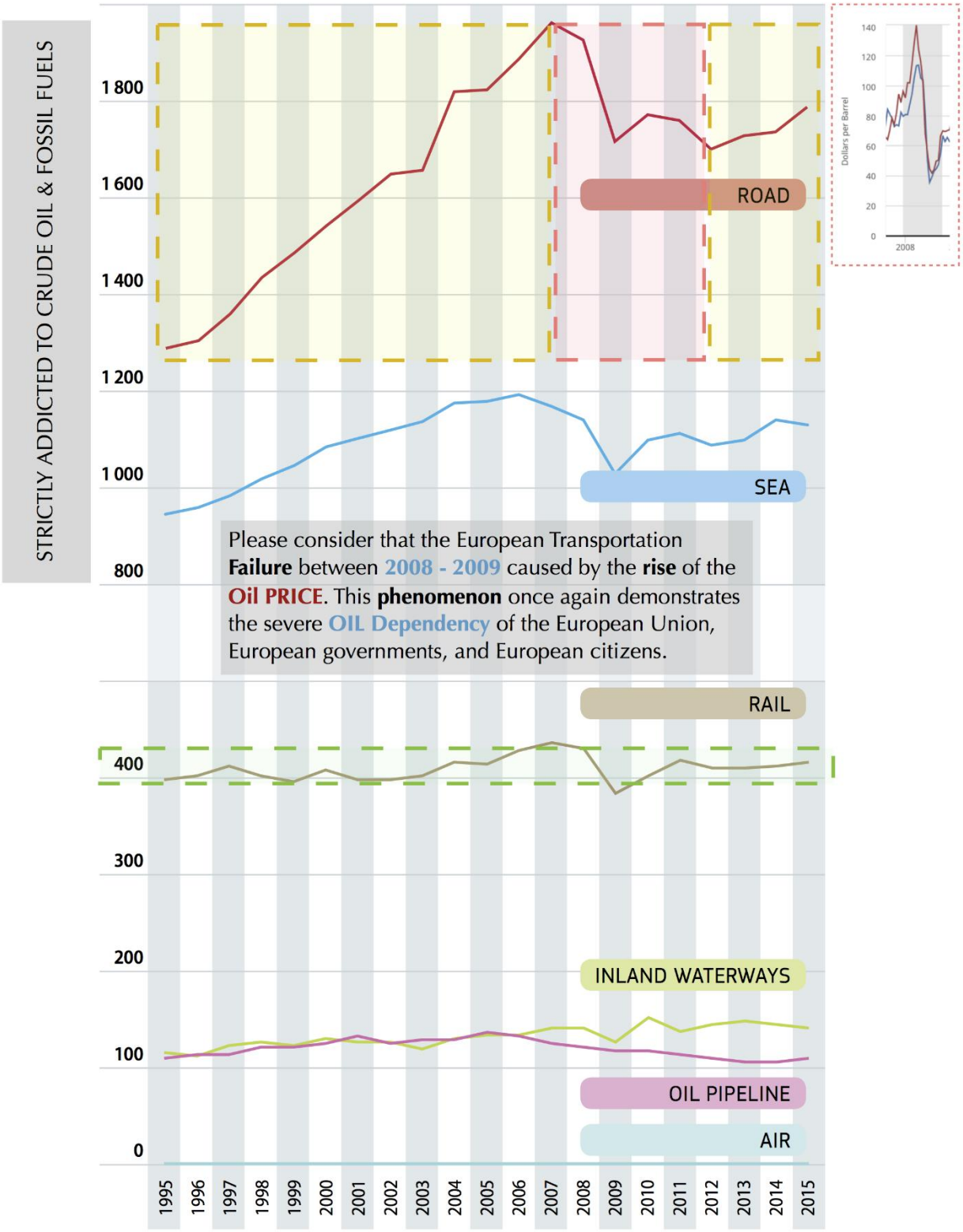
236

1-DAY 1-VICTIM

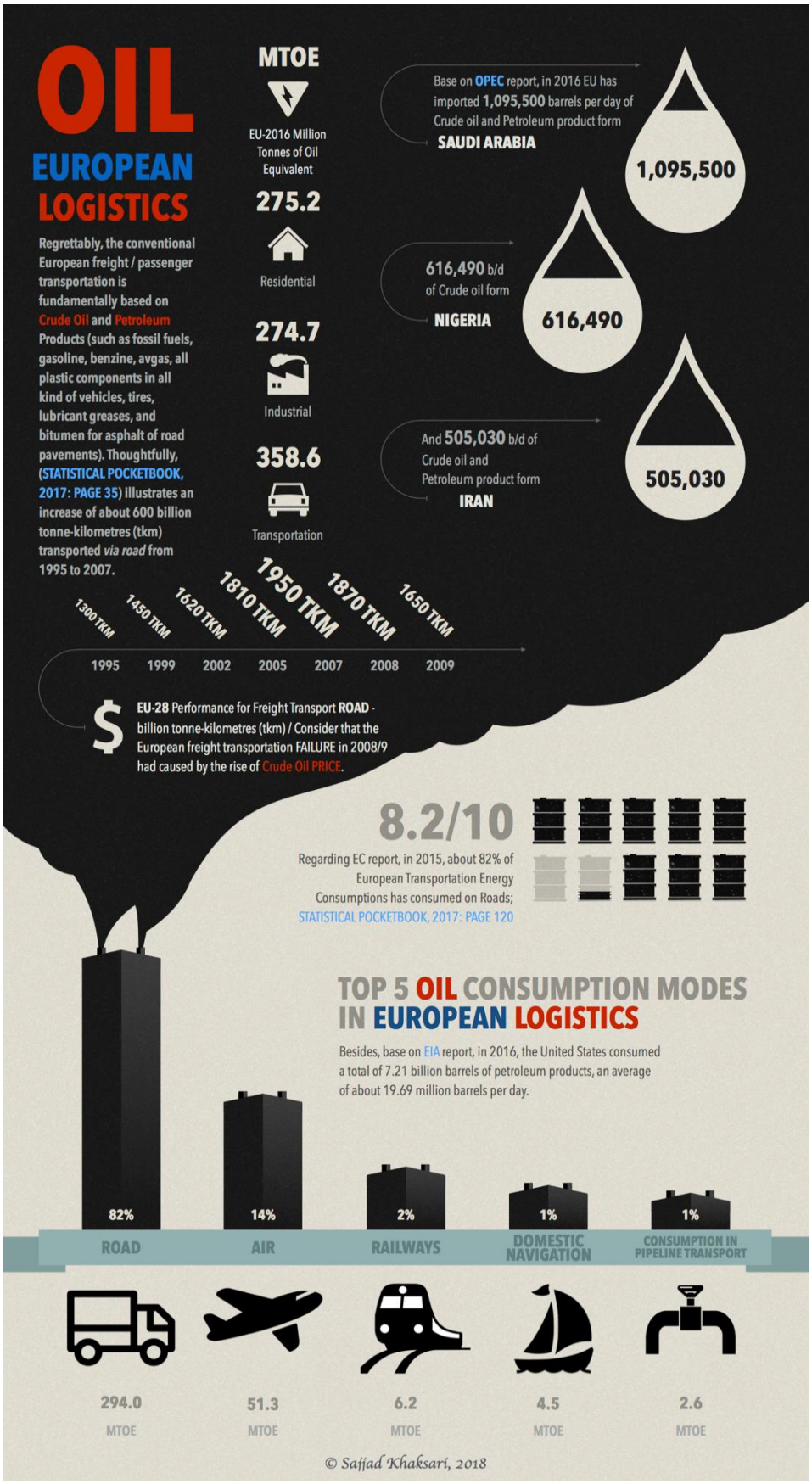
2,447

Appendix D: Initially, the subsequent diagrams were taken from the EUROSTAT (2017), and they demonstrate the performance of the Freight Transportation between 1995 to 2015 regarding their mode (ROAD, SEA, RAIL, INLAND WATERWAYS, OIL PIPELINE, and AIR) in the unit of billion tonnes-kilometres (TKM). Furthermore, it illustrates the failure of

European freight transport once during the oil crunch of 2008, the price of the West Texas Intermediate (WTI) crude oil has approached $140 per barrel (EUROSTAT, 2017)



Appendix E: Infographic of Crude Oil Price and European Logistics and Transportation (EUROSTAT, 2017)



References

AISCAT. (2108). Associazione Italiana Società Concessionarie Autostrade e Trafori. http://www.aiscat.it/

Allen, T. F., Tainter, J. A., and Hoekstra, T. W. (1999). Supply-side sustainability. Systems Research and Behavioral Science: The Official Journal of the International Federation for Systems Research, 16(5), 403-427.

Ashby, M. F. (2012). Materials and the environment: eco-informed material choice. Elsevier.

CONFETRA (2011). The Statistic of the Injured and Fatal Vehicle's Accidents in Italy. https://www.confetra.com/it/centrostudi/doc_pdf/Traffico%20e%20incidenti%20rete%20autostradale%20italiana/Andamento%202005-2011.pdf.

Colicchia, C., Creazza, A., and Dallari, F. (2017). Lean and green supply chain management through intermodal transport: insights from the fast moving consumer goods industry. Production Planning and Control, 28(4), 321-334.

EIA. (2017), How much oil is consumed in the United States?. The US Department of Energy. [Online] Available: https://www.eia.gov/tools/faqs/faq.php?id=33andt=6.

European Union. (2014). EU transport policy (Major challenges for European transport). [Online] Available: https://europa.eu/european-union/topics/transport_en.

EUROSTAT. (2017), Eu transport in figures – Statistical pocketbook 2017, © European Union, Printed by Bietlot in Belgium. ISBN 978-92-79-62312-7. Page 35 and 120.

Geneletti, D. (2003). Biodiversity impact assessment of roads: an approach based on ecosystem rarity. Environmental impact assessment review, 23(3), 343-365.

Greene, D.L., Tishchishyna, N. I. (2014). Costs of Oil Dependence: A 2000 Update. Oak Ridge National Laboratory. [Online] Available: https://cta.ornl.gov/data/index.shtml.

Khaksari, S. (2018a). Logistics Industry 4.0. Medium. Retrieved from https://medium.com/@sajjad.khaksari/logistics-industry-4-0-b132f0a8f391.

Khaksari, S. (2018b). Distributed Ledger Technologies Applied to Logistics Systems (Doctoral dissertation, Politecnico di Torino).

McKinnon, A., Browne, M., Whiteing, A., and Piecyk, M. (Eds.). (2015). Green logistics: Improving the environmental sustainability of logistics. Kogan Page Publishers.

Plata-Rocha, W., Gómez-Delgado, M., and Bosque-Sendra, J. (2011). Simulating urban growth scenarios using GIS and multicriteria analysis techniques: a case study of the Madrid region, Spain. Environment and Planning B: Planning and Design, 38(6), 1012-1031.

Ravazzi, P. (1998). Complementi di Economia. CLUT. Turin, Italy. https://goo.gl/jL3vhk.

Rodrigue, J. P., Comtois, C., and Slack, B. (2009). The geography of transport systems. Routledge.

UNECE. (2012). Climate Change and Sustainable Transport. United Nations Economic Commission for Europe. [Online] Available: http://www.unece.org/?id=9890.

Zetsche, D. (2017). Zero emission and 65 billion parcels: Why we are pushing electric trucks. Daimler, 16th November 2017. [Online] Available: https://goo.gl/wtjVAS.