The impact of Covid-19 pandemic on transportation - the rail transportation -company as a case study

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Abstract:

This paper analyses how the transportation is impacted because of the policies adopted by the Algerian government for the containment of the COVID-19. Various official sources of data such as website, Google mobility trends, were consulted along with recently published research articles on COVID-19 and its impacts.

The secondary sources of data the relationship between COVID-19 prevention measures and the transportation, and the rail transportation company of Algeria as a case study. The results of this study showed reduced demand for transporation with the adoption of COVID-19 prevention measures. Declines in revenues in the transport industry. The survey shows that transportation in Algeria is facing a serious financial downfall has dropped by 70%, a 62,7% drop in revenues. The recovery of the transport sector to the pre-pandemic state is only possible with the relaxation of COVID-19 containment policies and financial support by the government.

Keywords: *corona virus pandemic; transportation, prevention measures, COVID-19 and its impacts.*

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Introduction:

In December 2019, an infectious disease now known as the Coronavirus Disease 2019 (COVID-19) emerged in Wuhan, China and began to spread through direct contact between people and indirect contact with contaminated objects and/or surfaces (Ruey Long Cheu, 2020). Due to its high infectivity, total confirmed cases of COVID-19 dramatically increased from approximately 300 on January 20, 2020 to more than 5.6 million worldwide on May 27, 2020. The rapid increase of confirmed cases raised the common concern of humankind, and the COVID-19 outbreak was officially announced as a pandemic by the World Health Organization (WHO) on March 11, 2020. (Ahmed Karam, 2022)

In order to fight this highly contagious virus, the authorities of many countries have imposed different levels of containment policies. The Chinese authorities are believed to have taken effective epidemic prevention measures, such as case isolation, travel restrictions, closing recreational venues, and banning public gatherings. These anti-epidemic measures have been proven to shorten the period of transmission and result in the subexponential growth of confirmed cases, which demonstrates that the majority of them are effective to control the spread of the COVID-19. (Jizhou Huang, 2020)

The worldwide COVID-19 crisis is first a health crisis, but its impact goes far beyond the health sector and the consequences felt across all economic and social sectors. (Système des Nations Unies en Algérie, 2020)

Transport is in fact a sector very dependent on the rest of the economy: the transport of goods driven by commercial and industrial activity, and the transport of people depends on general activity or tourism. The activity of passenger transport has been most affect by confinement, with travel restrictions severely penalizing the profession. (Huiyu Zhou, 2022)

If Covid-19 has real specificities related to the economy, what is its impact on rail transportation?

Hit hard by the containment measures and the drastic reduction of the number of passengers, the transport, has generated considerable losses of its turnover.

The objective of this research is to shed light on the impact of Covid-19 on transportation activity.

In order to answer our problem, we opted for an analytical study that followed a research methodology based on:

*A literature search that allowed us to identify all the literature related to the

- Response to COVID-19

- The impact of COVID-19 on transportation.

*A case study in the National company railways. As such, the use of internal documents to collect the figures of impact of COVID-19 on transportation in Algeria analyze and interpret the results.

1. COVID-19 and his impact:

a. Covid-19 history:

The environment hides some uncertainties that cannot be anticipate, such as the appearance of The Coronary Virus Pandemic, an emerging infectious disease, called Coronavirus Disease 2019 or Covid-19, caused by the coronavirus SARS-CoV-2. It appears on November 16, 2019 in Wuhan4, in Hubei province (Central China), before spreading worldwide. (wikipedia, 2022).

Coronaviruses are enveloped, positive single-stranded large RNA viruses that infect humans, but also a wide range of animals. Tyrell and Bynoe, who cultivated the viruses from patients with common colds, first described Coronaviruses in 1966. Based on their morphology as spherical various with a core shell and surface projections resembling a solar corona, they were termed coronaviruses (Latin: corona = crown). Four subfamilies, namely alpha-, beta-, gamma- and delta coronaviruses exist.

SARS-CoV-2 apparently succeeded in making its transition from animals to humans on the Huanan seafood market in Wuhan, China. However, endeavors to identify potential intermediate hosts seem to have been neglect in Wuhan and the exact route of transmission urgently needs to be clarify. (Meyer, 2020, p. 278)

The worldwide COVID-19 crisis is first a health crisis, but its impact goes far beyond the health sector and the consequences felt across all economic and social sectors.

Transport is in fact a sector very dependent on the rest of the economy: the transport of goods driven by commercial and industrial activity, and the transport of people depends on general activity or tourism. The activity of passenger transport has been most affect by confinement, with travel restrictions severely penalizing the profession. (Lyshaida Rahmat, 2022)

The transportation sector stung by the coronavirus crisis. Many vehicles have been on standby for more than 10 months. The situation is critical for virtually all businesses.

b. Global Impact of COVID-19 Outbreak on Transportation:

For many public transportation in the United States, the COVID-19 pandemic and associated limitations have led to a substantial decrease in transit demand. A comprehensive study of the dynamics of this extraordinary decline and its aspects was conducted (Hafiz Suliman Munawar, 2021). Using transit demand

data from a frequently used transit navigation app, they formulated logistical functions to model the decline in daily demand and extract key parameters: base value, apparent minimum demand level and peak and base points, reflecting the initial date when the decline in transit demand started and the final date when the rate of decline attenuated. Regression analysis revealed minimum demand for public transport was observed during COVID-19 in communities with higher proportions of critical employees and vulnerable groups (African American, Hispanic, Female, and people over 45 years of age). Around half of the agencies suffered a decline before the local spread of COVID-19 possibly began; most of these are in the Midwest of the United States (Campisi, et al., 2020).

c. Transport sector and broader economic impact and vulnerabilities of international transport systems revealed:

These often-excessive restrictions to cross-border and transit freight transport further aggravated the economic and social impacts of the pandemic shock to the global economy. According to WTO figures the global economy (GDP) is projected to contract in 2020 sharply by up to 8% and global trade will decrease by up to 32% in 2020 due to the COVID-19 pandemic. The Purchasing Managers' Index (PMI), an index of the prevailing direction of economic trends in the manufacturing and service sectors recorded in March 2020 a dramatic decline in the manufacturing sectors. While railway freight transportation which has a number of distinctive comparative advantages such use of less manpower over long distance, efficiency and environmental performance suffered less, at least in the UNECE region, the road freight transport sector on the contrary was hit hard. According to International Road Transport Union (IRU) data, revenue decreased by 40% during the confinement period (in comparison to 2019 figures). Many transport operations including transport of automotive parts, clothing, flowers and construction materials almost came to a complete stand still during confinement. The crisis also resulted in social impacts where professionals including truck drivers, customs and border officers often got stuck for days in a row at border clearance posts, exposed to possible COVID-19 contagion given the often precarious infrastructure and sanitary situation at many land border crossings across the region.

In less than no time the extreme vulnerability of international transport systems to outbreaks of communicable diseases became very apparent. Also in the post-COVID-19 era however the world will likely remain extensively interconnected and will further rely on seamless and efficient transport and logistics systems. As communicable diseases have however occurred repeatedly in the past two decades, like H1N1, H5N1, MERS, SARS, Ebola, and will likely continue to manifest themselves in the future, a global initiative is needed to enhance international cooperation and coordination among inland transport authorities and in doing so

strengthen the preparedness and resilience of countries to possible future outbreaks. (EUROPE, 2021)

d. Impact on Railways/Subways/Metro/Tram/Light Rail in USA:

The Coronavirus pandemic is essentially affecting passenger railway traffic, from a short-term prospect with a large reduction in traffic. Nevertheless, it will further have long-term consequences. Trains may be designed completely different in the near future keeping the current situation in mind. New York subway, which is operating since 1904, is the world's oldest public transportation systems. It serves 472 different stations and also operates 24 hours, the operation has a mediocre weekday ridership about 5.5 million trips, making it the most heavily used public transport system in the United States. The impact of the pandemic on New York City is very severe and has unprecedented ridership drop to approximately 90% in one of the enormous subways in the world (Teixeira & Lopes, 2020). There are several short-term impacts on railways which are listed as following:

-Spread of the Virus: As of available research and science is concerned about, the virus primarily contracts and spreads through droplets which are generated from an infected person. These droplets will either drop on the surface of the train or enter into the body of some other individual travelling on the train.

-Decrease in the Workforce: On 20th of April New York Metropolitan Transportation Authority (MTA) reported that the number of workers who have returned to the normal working hours is 5033 employees and as of then 4112 employees were still in quarantine (Teixeira & Lopes, 2020). As a result of this, the authorities need to re-iterate the employee scheduling. The MTA subway's trips fell down to 13 per cent during the peak of the epidemic due to the crew shortages.

-Human Behavior and Tendency: According to the examination done by Tan and Ma, 97% of the people who were interviewed chose private cars or walking as a safe means of transport rather than commuting in a subway because of the strong sense of self-protection and less trust in subways or any other public transport.

-Government's Support to Rail Sector: The pandemic has its reach throughout the world, but the countries which are affected by this novel virus are acting differently to support the railways and subways. From the current database available, it was known that the United Kingdom and the United States are one of the very few countries who have directly supported railways and subways financially. The United States allocated $25 Billion to the public transportation sector, where the National Rail sector received support for the people working in the sector. The United Kingdom government declared $37 million to specifically support trams and metros. The government transferred all the cost related risks generating from trams and rails for six months

-Future Design of Trains: The practical difficulties involved in social distancing with the current design of train seating should be analyzed. Later, next-generation trains design should make transportation feel secure in case of the next viral spread and make sure to be more agile during the next unknown pandemic

- Substituting the Materials: There are certain theories which have been proved which indicate that coronavirus behaves differently on depending on the nature of the material used. For example, (≥ 72 hours) on plastic and stainless steel (≤ 24 hours) on cardboard (Hu et al., 2020). Another study indicates that copper has been proven most effective where the virus expires after 30 minutes. The materials involved while manufacturing the trains should be resistant to UV light treatments and strong disinfectants and sprays. (Karthik Subramanya, 2021)

2. Case study:

a. presentation of the company:

SNTF ("Société Nationale des Transports Ferroviaire") created on March 26, 1976.

The SNTF is a trader through its passenger and goods transport services and the contracting authority through its infrastructure maintenance missions.

Its mission consists of three main activities:

- Passenger transport (suburbs - regional - mainline),

- Transport of general merchandise,

- Transport of minerals (iron and phosphates).

Thus falls within the competence of the national company:

- Operation of the national rail network and management of the infrastructure.

- Maintenance (infrastructure and rolling stock).

- Development of national and regional plans in relation to the supervision.

- Financing of investments in rolling stock.

- Pricing structure.

b. research results:

We will discuss in this point the result of research on the impact of recent pandemic policies on transport in the Algerian rail transport society while focusing on the transport of passengers and goods.

To measure the impact of COVID-19 on transport in Algeria, this study was based on reports from the national rail transport company, from January 2019 to November 2021. The reports are monthly.

The statistics available to us represent the evolution of the company's turnover and by region over three years, as well as the number of travelers and the quantity transported.

b.1.The evolution of passengers numbers:

Enterprise:

Table 1. the evolution of the company's passenger numbers for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	3 079	2 919	1 854	3 250	2 989	3 107
2020	3 327	3 305	1 825	0	0	0
2021	1 865	2 299	2 851	2 463	2 760	2 802

Source: company activity reports

Table 2. the evolution of the company's passenger numbers for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	3 102	1 655	2 367	3 628	3 312	3 263
2020	0	0	0	0	0	0
2021	2 170	1 839	2 356	2 888	2 714	2 883

Source: company activity reports

According to the tables above, there is no movement during the period from April to December 2020, with a drop of half of travelers for the month of March 2020.

The movement of passenger traffic resumed after the lifting of health measures taken by the Algerian government.

We have below the movement of passengers spread over the four railway regions.

***Region ANNABA:**

Table 3. the evolution region ANNABA passenger numbers for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	63	25	41	65	67	63
2020	77	74	38	0	0	0
2021	64	65	62	73	79	84

Source: company activity reports

Table 4. the evolution region ANNABA passenger numbers for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	67	27	62	90	73	55
2020	0	0	0	0	0	0
2021	46	15	29	72	98	81

Source: company activity reports

***Region CONSTANTINE:**

Table 5. the evolution region CONSTANTINE passenger numbers numbers for the 1st semester

Unit: 10^6

	january	february	march	april	may	june
2019	42	49	17	43	48	44
2020	51	50	26	0	0	0
2021	38	38	34	41	41	50

Source: company activity reports

Table 6. the evolution region CONSTANTINE passenger numbers numbers for the 2nd semester

Unit: 10^6

	july	august	september	october	november	december
2019	42	15	36	84	52	41
2020	0	0	0	0	0	0
2021	27	3	5	35	47	-

Source: company activity reports

***Region ALGIERS:**

Table 7. the development region ALGIERS passengers for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	2 780	2 679	1 613	2 959	2 752	2 839
2020	3 001	2 988	1 626	0	0	0
2021	1 678	2 089	2 623	2 257	2 527	2 534

Source: company activity reports

Table 8. the development region ALGIERS passengers for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	2 797	1 402	2 089	3 266	2 998	2 952
2020	0	0	0	0	0	0
2021	1 975	1 705	2 171	2 611	2 420	-

Source: company activity reports

***Region ORAN:**

Table 9. the development of the company's passengers for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	194	166	183	182	121	161
2020	198	194	135	0	0	0
2021	84	106	131	92	113	134

Source: company activity reports

Table 10. the development of the company's passengers for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	195	212	180	188	189	215
2020	0	0	0	0	0	0
2021	123	116	150	169	149	-

Source: company activity reports

By reading the data collected on passenger traffic from the four regions, we conclude that the same movement has been experienced for these four regions.

b.2.The evolution transport of goods:

***Enterprise:**

Table 11. the evolution transport of goods of the company's for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	328	248	340	249	361	319
2020	346	362	325	270	311	361
2021	386	342	340	367	388	363

Source: company activity reports

Table 12. the evolution transport of goods of the company's for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	352	345	339	367	326	298
2020	289	261	298	319	351	384
2021	355	305	369	356	292	-

Source: company activity reports

The evolution of freight transport is broken down as follows:

***Region ANNABA :**

Table 13. the evolution transport of goods Region ANNABA for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	120	56	146	41	142	125
2020	136	152	120	91	117	134
2021	141	122	99	132	149	144

Source: company activity reports

Table 14. the evolution transport of goods Region ANNABA for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	149	125	134	144	144	110
2020	79	62	96	115	136	156
2021	135	98	135	119	88	-

Source: company activity reports

***Region CONSTANTINE:**

Table 15. the evolution transport of goods region CONSTANTINE for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	109	111	110	111	116	107
2020	115	106	105	88	97	112
2021	117	99	119	122	118	108

Source: company activity reports

Table 16. the evolution transport of goods region CONSTANTINE for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	107	118	105	115	106	104
2020	103	94	97	96	109	113
2021	119	99	119	118	108	-

Source: company activity reports

***Region ALGIERS:**

Table 17. the evolution transport of goods region ALGIERS for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	46	31	43	52	59	52
2020	55	64	59	46	51	67
2021	62	61	62	63	64	63

Source: company activity reports

Table 18. the evolution transport of goods region ALGIERS for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	55	60	55	58	40	42
2020	56	55	51	51	51	53
2021	53	62	65	67	48	-

Source: company activity reports

***Region ORAN:**

Table 19. the evolution transport of goods region ORAN for the 1st semester

Unit: 10^3

	january	february	march	april	may	june
2019	54	50	41	45	44	36
2020	40	40	41	45	47	48
2021	65	60	60	51	56	49

Source: company activity reports

Table 20. the evolution transport of goods region ORAN for the 2nd semester

Unit: 10^3

	july	august	september	october	november	december
2019	41	41	46	50	36	43
2020	50	50	54	56	55	63
2021	48	46	50	53	49	-

Source: company activity reports

As shown in the tables above, total freight transport amounts to 3,877 thousand tons in 2020, a slight increase of 7 thousand tons compared to 2019 due to the suspension of passenger transport. In response to COVID-19, although the demand for passenger traffic has fallen, the supply for freight transport has increased slightly, explained by the free circulation of freight trains on the railway line, whereas before the covid-19 these were circulating overnight.

b.3.The evolution of turnover

***Enterprise:**

Table 21. the development of the company's turnover for the 1st semester

Unit: 10^6

	january	february	march	april	may	june
2019	368	301	333	299	327	400
2020	361	387	289	139	177	212
2021	310	308	345	327	358	355

Source: company activity reports

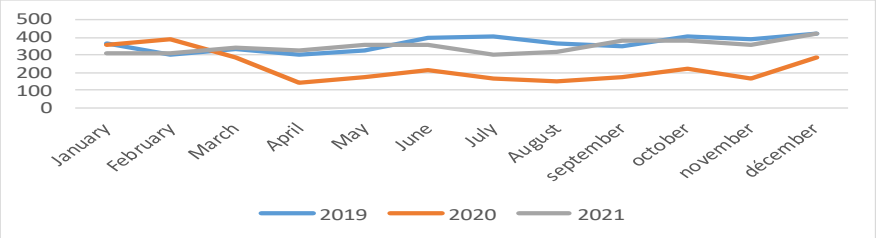
Table 22. the development of the company's turnover for the 2nd semester

Unit: 10^6

	july	august	september	october	november	december
2019	405	362	353	404	388	423
2020	170	151	175	223	169	284
2021	298	316	385	383	354	419

Source: company activity reports

Fig.1. the development of the company's turnover **Unit: 10^6**



Source: company activity reports

We observe a decline in turnover during the period of confinement, and this can be explaining in the following tables.

despite the resumption of travel activity, was characterized by the continuation of the health pandemic event (risk of contamination), which influenced all transportation activities.

***Region ANNABA :**

Table 23. the development region ANNABA turnover for the 1st semester

Unit: 10^6

january	february	march	april	may	june

2019	78	36	96	24	88	80
2020	90	103	77	60	80	91
2021	93	78	65	88	99	94

Source: company activity reports

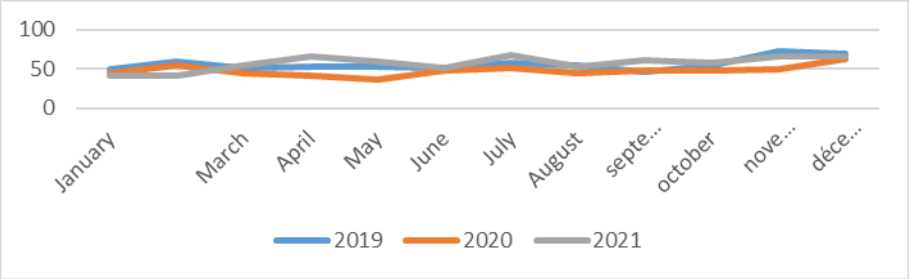
Table 24. the development region ANNABA turnover for the 2nd semester

Unit: 10^6

	july	august	september	october	november	december
2019	98	81	85	92	92	71
2020	51	39	64	79	56	126
2021	41	109	100	86	70	81

Source: company activity reports

Fig.2. the development region ANNABA turnover **Unit: 10^6**



Source: company activity reports

***Region CONSTANTINE:**

Table 25. the development region CONSTANTINE turnover for the 1st semester

Unit: 10^6

	january	february	march	april	may	june
2019	50	59	51	53	53	52
2020	45	54	45	41	37	48
2021	42	42	54	67	60	51

Source: company activity reports

Table 26. the development region CONSTANTINE turnover for the 2nd semester

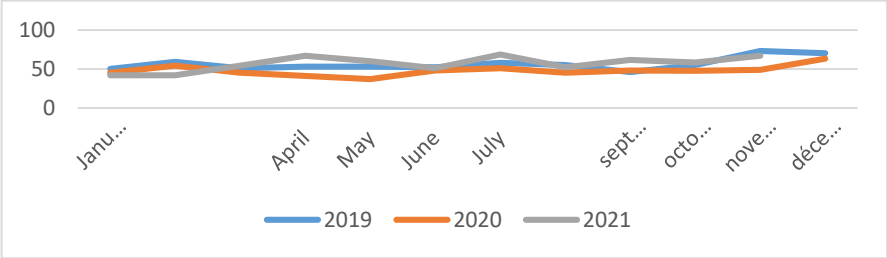
Unit: 10^6

	july	august	september	october	november	december
2019	58	55	46	55	73	70

2020	51	45	48	48	49	63
2021	69	52	61	58	67	-

Source: company activity reports

Fig.3. the development region CONSTANTINE turnover **Unit: 10^6**



Source: company activity reports

***Region ALGIERS:**

Table 27. the development region ALGIERS turnover for the 1st semester

Unit: 10^6

	january	february	march	april	may	june
2019	131	117	89	123	110	126
2020	129	137	82	14	17	22
2021	97	104	126	105	118	124

Source: company activity reports

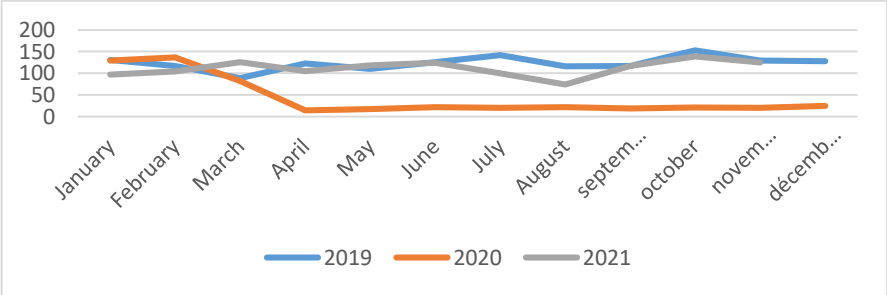
Table 28. the development region ALGIERS turnover for the 2nd semester

Unit: 10^6

	july	august	september	october	november	december
2019	142	116	117	153	129	128
2020	20	22	19	21	20	25
2021	100	74	117	139	125	-

Source: company activity reports

Fig.4. the development region ALGIERS turnover **Unit: 10^6**



Source: company activity reports

***Region ORAN:**

Table 29. the development region ORAN turnover for the 1st semester

Unit: 10^6

	january	february	march	april	may	june
2019	91	77	84	86	63	87
2020	79	79	71	14	33	21
2021	67	74	90	57	71	76

Source: company activity reports

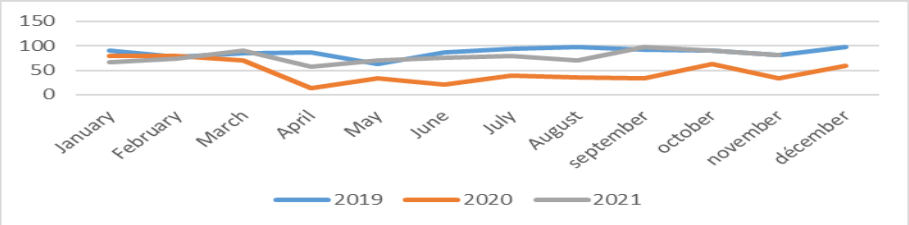
Table 30. the development region ORAN turnover for the 2nd semester

Unit: 10^6

	july	august	september	october	november	december
2019	94	97	92	91	81	98
2020	38	35	34	63	34	60
2021	79	71	97	90	82	-

Source: company activity reports

Fig.5. the development region ORAN turnover **Unit: 10^6**



Source: company activity reports

***company's headquarters:**

Table 31. the development company's headquarters turnover for the 1st semester

Unit: 10^6

	january	february	march	april	may	june
2019	18	12	13	13	13	55
2020	18	14	14	10	10	30
2021	11	10	10	10	10	10

Source: company activity reports

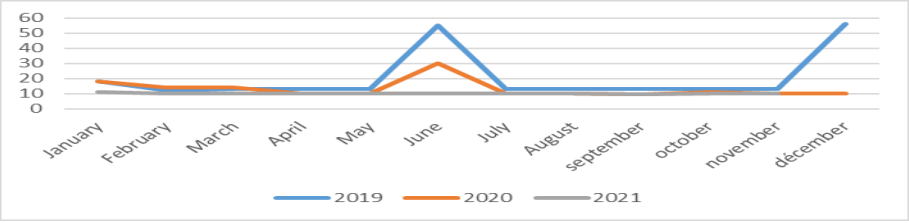
Table 32. the development company's headquarters turnover for the 1st semester

Unit: 10^6

	july	august	september	october	november	december
2019	13	13	13	13	13	56
2020	10	10	10	11	10	10
2021	10	10	10	10	10	10

Source: company activity reports

Fig.5. the development region company's headquarters turnover **Unit: 10^6**



Source: company activity reports

Since the adoption of the measures, the passenger transport is suspended. Or a shortfall of ten (10) estimated at 1,700 million DA.

While passenger traffic dropped significantly when the COVID-19 pandemic hit, freight traffic remained reasonably stable. Demand for deliveries has skyrocketed with residents and staff staying at home, one of the main impacts of the pandemic on the freight industry. At these direct costs graft the indirect costs of loss of activity such as trade in service stations and trains (catering, various sales, etc.)

c. Discussion:

The restrictions to minimize the diffusion and impacts of the pandemic had a largescale impact on people's lives and the energy consumption across various economies. The pandemic has largely impacted all forms of transportation, from cars, and public transport in cities, to trains, buses, and planes nationally and internationally. The majority of the population has significantly lowered the use of public transport. Does this lead to a greater concern of whether the crises will result in the permanent behavioural change in passengers or the transport systems will return to the pre-COVID-19 patterns.

freight transport driven by commercial and industrial activity, and passenger transport dependent on general activity or tourism. The passenger transport activity was the most affected by the confinement, with travel restrictions severely penalizing the profession.

while the transport of goods experienced a slight increase compared to the year of 2019, following the daily traffic activity (goods traffic was at night, while in 2020 the activity was 24 hours out of 24).

Passenger transport and the financial situation experienced significant losses for rail transport from April to December 2020. i.e. a drop of more than 62.7% in turnover. In January 2021, rail activity experienced a refresh, after the resumption of its passenger transport activity.

Conclusion:

This study investigates how the measures and policies adopted by the Algerian government and transport authorities affect the transport division of the country. Primary data was obtained using website, Google Mobility reports, and recent research on COVID-19. Secondary data was gathered by interviewing the relevant the rail transportation company as a case study.

The study found out that:

-The suspension of passenger transport activity was among the health measures taken to combat the spread of covid-19

-Like many companies in the international freight and passenger transportation sector, the national railway company has been impacted by the coronavirus pandemic.

-In early April 2020, public transport consumption was consistently 62,7% lower than the average daily usage relative to the pre-COVID-19 crisis.

-The impact of the coronavirus outbreak on logistics and the economy is booming and is likely to worsen if spread cannot be contained.

-The COVID-19 pandemic has had an unprecedented impact on passenger transport services. The transport of goods was not impacted by health measures to combat the spread of covid-19.

-It should be mentioned that the decline in the company's turnover is halved, which confirms our hypothesis.

-The lessons learned from the immediate and short-term measures taken by Governments show that the transport sector was not prepared to operate in the conditions resulting from the pandemic.

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