

Driverless Cars will Make Rails Obsolete

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Abstract

Driverless vehicles will be common on the road in a short time. They will have many impacts on the global transport market trends. One of the remarkable driverless vehicles impacts will be the laying aside of rail systems, because of several reasons, that is to say - traffic congestions will be no more a justification for rail, rail will not be the best answer for disableds, air pollution of cars are more or less equal to air pollution of trains and the last but not least reason is that driverless cars are safer than trains.

Keywords: *Driverless Vehicle, Rails, Transportation Means.*

1. Introduction

There are four key reasons why the rail is still alive and even subsidized in most of the countries:

- A. Reducing congestion in jammed roads [1].
- B. Transportation means for people who are unable to drive because of their disability or because they have an exhausting job [2].
- C. Reducing air pollution, because one train can replace many cars [3].
- D. Reducing number of vehicle accidents and fatalities [4].

Some of these arguments can be to a certain extent valid but just until driverless cars are available on the market. In California, the autonomous vehicles will be available without a necessity of a driver as early as June 2018 [5]. This paper shows that none of the justifications for rails is valid anymore.

Each of the sections herein below from 2 to 5 explains why the reasons detailed above from A to D (relatively) are not a valid reasoning for rails any longer, nor are they a valid justification.

2. Traffic congestions are not a justification for rail

Studies in various countries have shown that currently traffic congestions and jams are mainly triggered from different responses to events in the roads and different driving patterns of different drivers [6,7]. On the other hand, driverless cars of even competing companies will behave much the same way, so the trouble of traffic congestions is going to be significantly alleviated when the driverless cars will be the standard.

In addition, street parking occupies areas that could be utilized for moving vehicles [8], because a vacant driverless vehicle can move automatically to a remote parking [9,10] which will generate uncomplicated expansion of roads.

Another issue is the subsidization of rail systems. Most of the countries subsidize their rail systems. China invests \$128 billion in rail each year [11], whereas Europe

invests €73 billion in rail each year [12]. The subsidizations are a chief financial part of rail system budgets almost anywhere in the world. Only Japan rail system is not subsidized. Without subsidization almost no rail system can survive. Only, no more than few freight rails in several lines can be moneymaking [13]. Accordingly, most of the rail systems will perish as soon as the subsidization is brought to an end.

Rail systems in reality lose billions of dollars every year. If these rail systems cannot stay alive, they should be allowed to humbly depart this life. The billions saved from the rail systems can be invested in roads with the aim of reduction of traffic congestions.



Figure 1. Second floor of roads in Kobe, Japan

Where an expansion of the road is possible, such an expansion should be carried out [14,15,16]. Where a road expansion is impossible, a second floor of roads should be built as was done in Kobe, Japan, Chicago, USA and many other places in the world [17]. A second floor of roads in Kobe, Japan is shown in Figure 1. The Iranians built a second floor of traffic lanes on the highway goes across Tehran as well [18]. So, any road can be expanded and the money saved from eliminating subsidization of rail systems can be used for this expansion.

3. Rail is not the best answer for disableds

In the era of driverless cars, even people with disabilities or people with an exhausting job will be able to travel in a car without driving [19]; What is more, shared driverless car will be much more attractive than a train arriving at a location not nearby home.

Furthermore, drunk, reckless, or distracted drivers usually are not mindful of their unsafe way of driving. Many authorities try to convince these drivers to leave their cars and use public transportation like trains. Some of these drivers come to an

understanding that it is better for them not to drive, but there are still too many vehicles in the hands of inapt drivers. When the driverless cars are a standard, these risky drives will come to an end [20].

When the use of driverless cars becomes widespread, the question of whether the state must provide rail services or rail services should be a profitable private-owned business like the Japanese model would be an interesting question for historians of transportation.

4. Air pollution of rail and cars are more or less equal

Modern vehicles, if kept in good condition, emit only very small air quality pollutants [21]. New cars are manufactured with advanced Catalytic Converters [22] and in most of the developed countries the use of Catalytic Converter is obligatory [23]. In addition, the selling of leaded fuel is outlawed in most of the developed countries. Unleaded fuel is obligatory because lead is a potent neurotoxin and pollutant [24]. Nowadays, unleaded fuels are commonly standard [25].

On the other hand, many developing countries do not inspect the emission of vehicles moving in their territory; nor do they inspect the quality of the fuel sold in the gas stations. Also, since catalytic converters contain expensive materials like platinum, palladium, rhodium and gold, thefts of catalytic converters are nothing special and sometimes even the car owner takes out the catalytic converter and sells it [26]. Only the car owner will be paid for the catalytic converter, but everyone will breathe the pollutants.

It is common to measure the pollution concentration in the air by the values of PM10 and PM2.5; whereas PM10 is particulate matter in diameter of 10 micrometers or less and PM2.5 is particulate matter in diameter of 2.5 micrometers or less [27], so PM2.5 will never be greater than PM10.

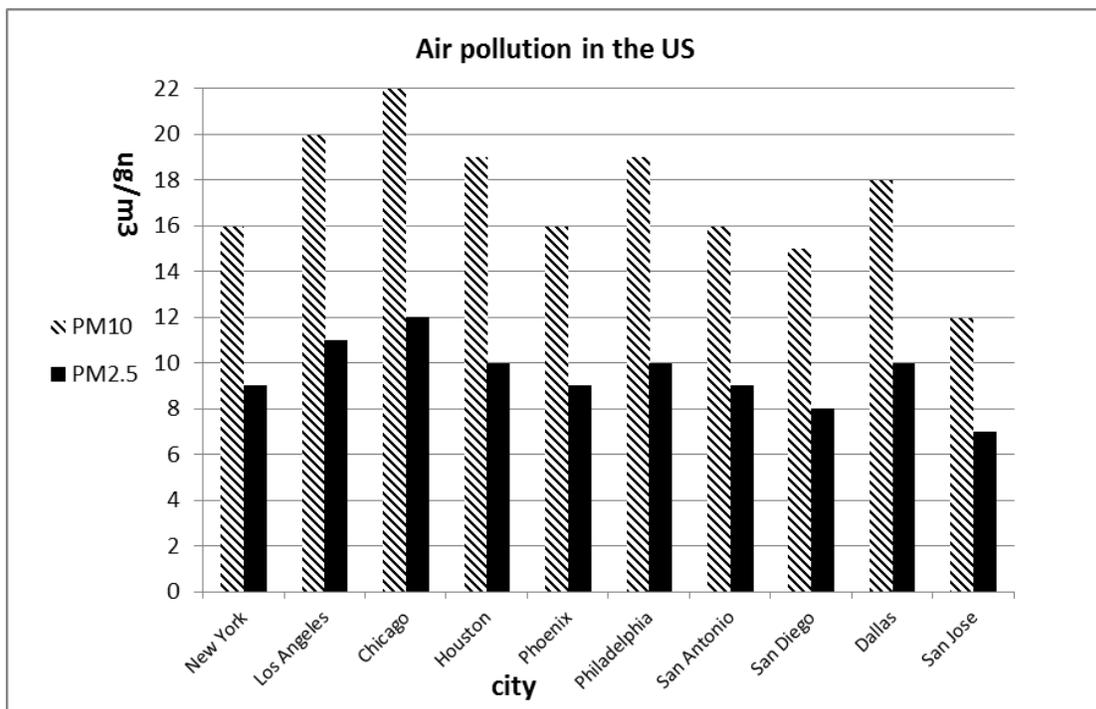


Figure 2. Air pollution in the 10 most crowded cities in the US

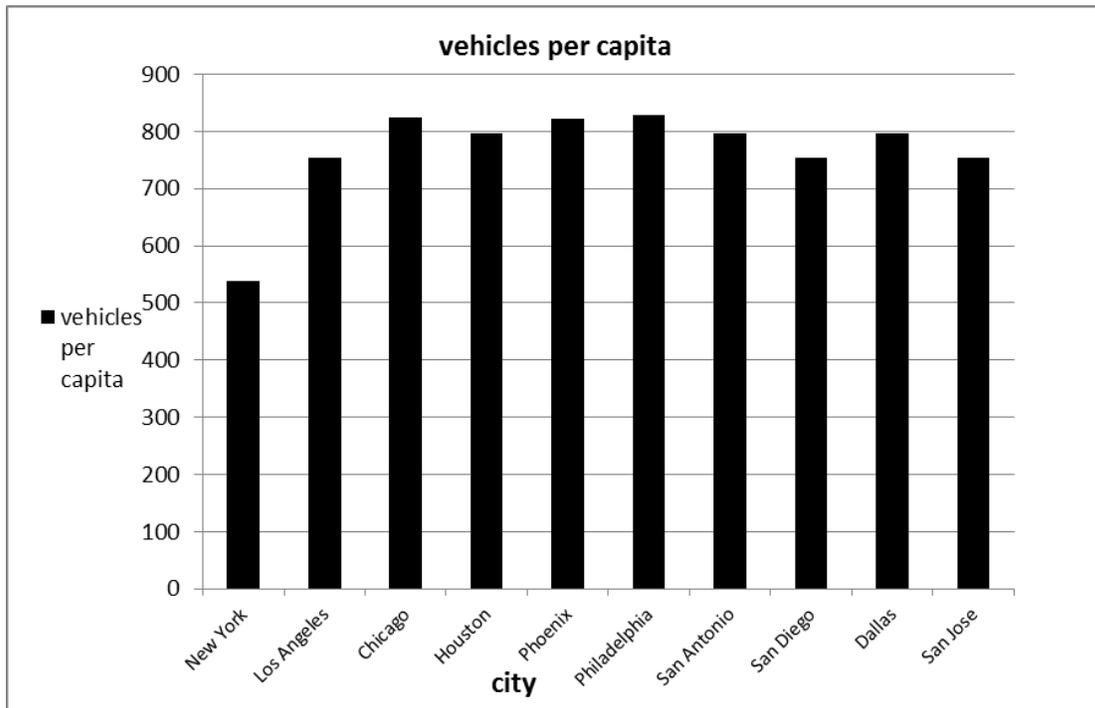


Figure 3. Vehicles per capita in the 10 most crowded cities in the US

The typical threshold for air pollution is quite similar in most of the developed countries. The American standard [28] is with accordance of the World Health Organization stipulating a threshold of 50 for PM10 [29]. The Europeans are more cautious with a threshold of 40 for PM10 [30]. The threshold of 25 is accepted worldwide as the threshold of PM2.5

In The United States, despite the relatively high rate of motorization, the average level of air pollution in the 10 most crowded cities are well below the threshold. The amount of pollutants that were published by the World Health Organization [31] are detailed in Figure no. 2; whereas the numbers of vehicles per capita that were published by the Federal Highway Administration [32] are detailed in Figure 3. The total number of vehicles per capita in the US is 797 which is a much higher number than the typical number of vehicle per capita in the world, but still The United States are not polluted.

On the other hand, in many developing countries, vehicles have not been checked properly by environmental regulating authorities lead to increase concentrations of pollution. We can take for example Nigeria which has much higher concentrations of both PM10 and PM2.5. The data about the pollution is shown in Figure 4; however, it is flabbergasting to realize that there are only 61 vehicles per capita in Nigeria [33] which is just 7.65% of the rate of motorization in the US.

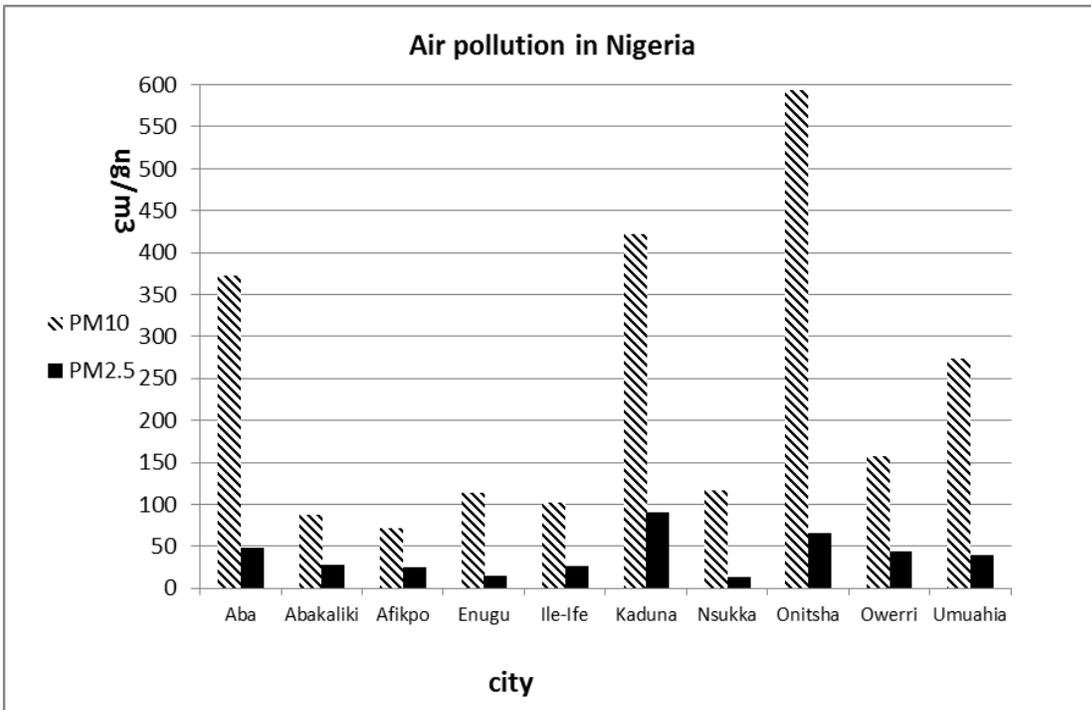


Figure 4. Air pollution in the 10 most crowded cities in Nigeria



Figure 5. Improper waste treatment in Nigeria.

Large number of modern private cars creates only very slight amount of pollutants. The pollution is mainly generated by defective vehicles, leaded fuel and fuel mixed with oils that are unacceptable in developed countries. Therefore, the explanation for the enormous excess in the concentration of pollutants in the air of Nigeria is not just the traffic emission, but rather the nature of the traffic.

In addition, there are more reasons for the bad air quality in Nigeria like improper waste treatment as burning of waste and unfiltered emission from industrial plants near living area as can be seen in Figure 5.

The air pollution generated by transportation means has been significantly reduced during last years and it is no more an acute concern; therefore it is unreasonable to spend billions of dollars to subsidize trains which will yield almost no improvement in air quality.

5. Driverless cars are not less safe than rails

Nowadays, it is customary to accept as true that among all transportation means, train travel is the safest. In 2015, there were only 749 recorded deaths in the US in rail related accidents; whereas in the same period 35,092 people died in the US in highway crashes [34]. Road crashes are the leading cause of death among young people ages 15–29 and account for 2.2% of all deaths globally.

In addition, road crashes impose significant costs. Simulations of traffic accidents indicate that more damages are generated to cars in accidents, because they are feebler than train bodies [35,36,37]. The annual cost of road crashes is USD \$518 billion globally, costing individual countries from 1%-2% of their annual GDP [38].

In [39] it is claimed that in cities where the rail transit is a major component of the transportation system, there will be 36% lower per capita traffic fatalities (7.5 versus 11.7 annual deaths per 100,000 residents) even though a single rail accident on its own statistically claims more lives than a single car accident [40].

Accordingly, various authorities in more than a few countries believe that many lives can be saved by shifting some of the traffic to a train.

However, all of this line of reasoning will be irrelevant when the driverless cars are available. By automating driving, 95% of car crashes could be eliminated [41], because many safety gadgets will be installed in the driverless cars [42,43,44]. Most of the trips in the US are currently undertaken by cars; whereas trains carry only a small percentage of passengers. According to the US Department of Transportation, 3,130,509 million miles have been traveled on US highway system in 2015; whereas in the same period only 532 million miles have been traveled by trains [45]. So even now, it is not clear the rail system is safer, but when the driverless cars are available, it will be as clear as daylight that driverless cars are much safer than conventional trains.

However, the rail system will be also driverless [46], so their safety will be also improved and both the driverless cars and the driverless trains will have an almost zero probability to have fatal accident [47,48,49], for that reason it will unreasonable to subsidize trains with the aim of convincing people to travel in this means of transportation that essentially will have almost the same safety attributes and qualities.

6. Conclusions

Trains are a means of transportation that was invented more than 200 years ago [50]. In this paper we have shown that in the age of driverless cars, a means of transportation that takes many people from one central station to another central station has lost the justifications for its existence. The reasons detailed in the paper and are commonly accepted as true are no longer valid.

Driverless cars are much more comfortable and restful for passengers than rails. Moreover, train stations are not often in a close proximity of the passenger, so the passenger should use another means of transportation to arrive at a train station; whereas when using driverless cars there is no need for the hassle of these connections [51]. As a result, driverless cars will gradually take control of the transportation market [52]. As more and more driverless cars are on the roads, the trains will slowly but surely fade away from our lives.

7. References

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