Abstract

Isolated regions do not have right and proper advantageous motives for railways construction. Therefore, isolated territories like islands will have no economic justification for railway systems. Railway systems can only achieve an economic viability in a substantial territory where there can be a need to convey a large number of people in one means of transportation.

Keywords: Rails, Islands, Autonomous Vehicles, Transportation Means.

1. Introduction

Isolated non-large countries do not have good reasons for construction of railways. In a non-isolated country even if the country is very small, a railway system can connect the county to its neighbor countries. E.g. Monaco's size is only 2.2 km² and even though Monaco has a railway system that connects Monaco to French and other countries in Europe [1].

There are also some Islands very adjacent to the mainland like Long Island in New York, USA, Sicily in Italy or Hainan in China. In such islands the railways are usually connected via bridges, tunnels or ferries to the mainland and they can actually be considered as an undivided portion of the mainland.

On the other hand, isolated territories like islands even if their size is larger than Monaco's size, there will be no economic viability for a railway system. Railway system can only succeed in a large territory where there is a necessity to convey a large number of people as will be explained in this paper.

2. Cases of Island without Active Railways

Cyprus is an island that is surrounded by the Mediterranean Sea from all its sides. Therefore, there is no railway system in Cyprus. As a matter of fact, there was a railway of 122 km in Cyprus, but since it was unprofitable, it was closed in 1951 and currently no railway system exists in Cyprus [2].

There are still railway remnants in some locations in Cyprus. E.g. the Abandoned Railway Crossing Lights shown in Figure 1.
Republic of Trinidad and Tobago has a similar railway history to Cyprus. There was a railway of 173 km in The Republic of Trinidad and Tobago, but since it was unprofitable just as Cyprus railway system was, the railway system of this republic was closed in 1968 and currently no railway system exists in The Republic of Trinidad and Tobago [3].

Crete railways have been shut down even earlier. Although there have never been a train passenger in Crete, an industrial railway focusing in the aim of construction the harbor in Iraklion was constructed in 1922. However, when the harbor's construction was over, the train was pointless and unprofitable, so in 1937, the train was closed and
since then, there is no train in Crete [4]. An old and inoperative locomotive dumped in a field in Crete can be seen in Figure 2.

![An old and inoperative locomotive in Crete](image)

**Figure 2. An old and inoperative locomotive in Crete**

A similar story to Crete was in Negros Island in the Philippines that has never had a passenger railway. Negros Island is a large sugar producer and exporter. Actually, sugar is the largest industry in Negros Island and the railway was constructed to transport freights of sugar.

In 1985, the price of sugar in the international market crashed. Most of the sugar factories in Negros Island went bankrupt and there was no good reason to keep on the railway, so it has been closed and currently there is no sugar railway in Negros Island, nor any other kind of railways [5].

Like the fail of the railways in the Philippines, the railways in Jamaica were an unsuccessful business as well. The railway system of Jamaica was opened in 1845 and this system was the first system outside Europe and North America. The British government built railways in many of its colonies and Jamaica was the second British Colony to have a railway system. Actually, the railway system of Jamaica was built only twenty years after the British government started to build railway system in the United Kingdom itself [6].
The railway system of Jamaica was on and off for more than a century until its closure in 2012. Sometimes the railway system was opened only for freight like bananas or bauxite, whereas sometimes the railway system was opened for passengers. There were also times the railway system was opened for both freight and passengers. In each of these openings, the trains were loss-making, so the railway system went out of business. In point of fact, any attempt to revive the railway system followed by insolvency [7]. A defunct train station with some defunct rolling stock in Jamaica is shown in Figure 3.

![Figure 3. Defunct train station in Jamaica](image)

Another railway system in a British Colony was built by the British government in the island of Salsette. This island is nowadays under India sovereignty; however, the railway system was already shut by the British governor in order to make way for an airport [8].

The airport was for military flights, but when India gained independence, the government of India decided to convert the airport to a civilian airport and to keep the railway closed. Although the rails in India mainland are prevalent, the government did not believe that a railway in this island is capable to be cost-effective, so until this day, there is no railway in the island of Salsette.

Not only in British colonies were railroads built, but also in German colonies. During the time of German sovereignty in the island of New Guinea, many railways had been built in the German part of the island.
At the beginning of the 20th century, Germany has decided to give a boost to New Guinea’s economy by building a railroad system. The railroads were an extensive failure. Some dozens of million German Marks were invested with little return. In the First World War Germany lost its part in the island of New Guinea to Australia. The Australians did not want to go on with this unproductive rail project, so the railroads fell into poor condition. In the other parts of the island there has never been a railroad system, so as a result, nowadays there is no active railroad in the entire island of Papua New Guinea [9].

3. Cases of Islands with Unsuccessful Rail Systems

Ireland is a country within an island in the north east Atlantic Ocean. Even though Ireland is isolated, the government owns a lengthy railway system of 1,200 miles. The Irish railway infrastructure is poorly developed and ineffectively functions [10]. In addition, the Irish railways have the lowest rail electrification rate in the EU (2.7% in 2016).

In contrast to the poor railway infrastructure, the subsidy for the railway company is high-priced. USD $887 million are annually paid to the Irish rail company - Iarnród Éireann by the Irish government as a subsidy. However, only 1.7 billion passenger-kilometers are travelled annually in Ireland, that is to say the subsidy cost is USD $0.52 for each passenger-kilometers [11].

Even when comparing this subsidy price tag to China which provides an excessive subsidy to its rail system, the numbers are thought-provoking. China annually subsidizes its sizeable rail systems with USD $128 billion and the train usage of China’s rail system is 1,160.48 billion passenger-kilometers, that is to say the subsidy cost is USD $0.11.

China economy leans towards planned economy and heavily intervention in the market, whereas Ireland leans towards free market. Nevertheless, Ireland rail subsidy is significantly higher.

Another territory with unsuccessful rail system is Puerto Rico. Puerto Rico is an unincorporated territory of the United States located in an island in the Caribbean Sea. There is an unsuccessful train in Puerto Rico called "Tren Urbano". The train consists of 16 stations operating on only 10.7 miles all owned by the Government of Puerto Rico.

Puerto Rico's Highways and Transportation Authority who manages this train, complains on a regular basis on finance difficulties of this train and declares that as a matter of fact the train is completely running at a loss. The trains are averagely 90.43% empty [12]. Figure 4 shows a train with only single passenger within a carriage of Tren Urbano.
The expected ridership of a minimum of 115,000 passengers per day [13] seems to be absolutely overstated when in 2018 the average weekday Daily ridership was only 18,600 passengers [14].

In a hearing before the Subcommittee on Regulatory Reform, Commercial and Antitrust Law, The Puerto Rico's Highways and Transportation Authority gave this disapproving statement: "There are rising operating subsidy requirements to the Tren Urbano light rail, an underperforming and underutilized asset, which has long been a burden on the overall system. Recent reports also indicate that the system has stopped paying third-party vendors amid mounting cash flow pressures." [15]. Therefore, the future of this railway is unclear.

4. Unsuccessfulness of Rail Systems

The information given above is gathered in Table 1. The statistic in this table indicates that the potential of railway system to succeed in an island is improbable. Only in large territories where there is a necessity to convey a large number of people, a rail system can be effective.
<table>
<thead>
<tr>
<th>Name</th>
<th>Population (million)</th>
<th>Sovereignty</th>
<th>Area (square miles)</th>
<th>Does railway exist?</th>
<th>Profitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salsette</td>
<td>15.1</td>
<td>India</td>
<td>239</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>New Guinea</td>
<td>12.6</td>
<td>Papua New Guinea, Indonesia</td>
<td>303,381</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Irland</td>
<td>6.8</td>
<td>Ireland, United Kingdom</td>
<td>32,595</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Negros</td>
<td>4.5</td>
<td>The Philippines</td>
<td>5,048</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>3.5</td>
<td>United States</td>
<td>3,500</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Jamaica</td>
<td>3</td>
<td>Jamaica</td>
<td>4,320</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Cyprus</td>
<td>1.5</td>
<td>Cyprus, Turkey</td>
<td>3,565</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Trinidad</td>
<td>1.4</td>
<td>Trinidad and Tobago</td>
<td>1,934</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Crete</td>
<td>0.63</td>
<td>Greece</td>
<td>3,220</td>
<td>No</td>
<td>NA</td>
</tr>
</tbody>
</table>

Table 1. Practicability of rail systems in Islands

In the US, only the Amtrak routes in the northeast region which is the densest region in the US are moneymaking [16]. In the northeast region (Massachusetts, Connecticut, New Hampshire, Maine, Rhode Island, Vermont, New York, Pennsylvania, New Jersey, Virginia, Maryland, West Virginia, Delaware, District of Columbia) live 74,035,662 people [17] and the region is connected to the rest of the US and to Canada, so this is the opposite set of circumstances of an island. All the other routes of Amtrak run at a loss, even some of the routes within the northeast region like Amtrak's Hartford Line from New Haven to Springfield.

5. Autonomous Vehicles Renounce the Need for Rail Systems

In [18] the authors provide evidences that public buses in the near future will remain economically competitive only in dense and large urban areas. Rails have separated and dedicated pathways, so their construction costs are higher and moreover they endeavor to stop near more passengers' destinations, so all the more rails will not be economically competitive [19].

Furthermore, drivers do dot drive the same way. They take turns differently. They also accelerate and apply the brakes in their own way. This different way of driving is
the reason for almost all the traffic jams and traffic congestions as was explained in various researches [20,21].

In contrast, autonomous vehicles of even competing companies fulfill the driving assignments almost in the same way. Moreover, they can drive in a platoon [22] which means all the vehicles on the road will go like a long train keeping the same distance from the vehicle ahead and also the same speed [23]. Such a platoon can be seen in Figure 5.

![Figure 5. Platoon of cars.](image)

When such platoons are the everyday site in the roads, the railroads will be of no use, because a train takes many passengers from one central station to another central station; whereas an autonomous car can take each passenger from a different location and give him a ride to anywhere a road is present which is a much better service than a train can offer [24,25].

6. A Country in an Island-Like Location - Israel

Even though Israel is part of the Middle East, Israel is in fact an island. Israel is surrounded by the Mediterranean Sea and Arab countries – Lebanon, Syria, Jordan and the Egypt. Lebanon and Syria are enemy countries of Israel and from time to time there are even armed conflicts between countries. Jordan and Egypt are not formally considered as enemy countries of Israel, but the commute is sparse. Only in the Hajj which is an annual Islamic pilgrimage to Mecca in Saudi Arabia, many Israeli Muslims residents travel from Israel to Saudi Arabia via Jordan and the border crossings between Israel and Jordan are getting busy. At present, there is no train from Israel to any adjacent country.
The trains in Israel run at a massive loss and therefore Israel Railways is subsidized by an enormous ratio of 85% [26]. While there are occasionally overloaded trains, most of the routes are commonly unfilled and actually in average they are 70% empty [27]. Even with these openhanded conditions, the trains in Israel serve only 5% of the travels [26].

In Israel, the expansion of road no. 1 to Jerusalem from 2 to 3 lanes has been carried out concurrently to the construction of the adjacent new railroad to Jerusalem. The expansion cost of road no. 1 was NIS 2.35 billion [28] and 133,000 vehicles averagely travel on this road every day; whereas the construction cost of the adjacent railroad is estimated between NIS 6.9 billion to NIS 9 billion [29] and 9,300 passengers averagely travel in this train every day [30]. The rate of car occupancy in Israel is 1.24 to 1.34 of only private cars [31]. 133,000 of all kinds of vehicles including buses are about 200,000 people, which give unreasonable relative amount. The 9,300 train passengers are a small portion of the passengers and the investment in railroad is out of all proportion.

6. Conclusions

Rails were invented more than 200 years ago [32]. The model of rail systems is conveying many passengers from one central station to another central station. In islands such a model cannot economically do well. As was reviewed in this paper of various rail systems in islands in a variety of locations in the world, no rail system can be successful, nor can it be profitable.

In the coming years autonomous vehicles will be prevalent and these vehicle will travel in platoons which means keeping invariable distance from the vehicle ahead. These platoons will be similar to trains, but with the ability to take each passenger to his destination rather than to a central station For that reason, people will prefer to go in autonomous vehicles and there will be no financial justification for rail systems anymore [33].

The looming technology of autonomous vehicles along with the current unsuccessfully and ineffectively functioning of the rail systems in islands should discourage the transportation authorities of islands from investing in rail systems in their territories.

7. References


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