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ASSESSMENT OF BUS PRODUCTIVITY LEVEL AND RESTRUCTURING SCENARIOS IN THE WEST BANK, PALESTINE

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Abstract

Developed countries pay great attention to public transport (PT) in terms of development and evaluation, as it is one of the foundations of national success. In the West Bank (WB) of Palestine, the PT is generally neglected and worn out. There is no periodic study of the productivity, efficiency, and effectiveness of bus services. Despite the relatively high number of daily passengers, only 15% use buses due to a lack of confidence in the service. Therefore, this study aimed to measure the productivity of buses on intercity lines in the WB and to identify ways for the bus sector to become more productive. Field surveys for all WB governorates, data from official authorities or previous studies, and two interviews with service providers and decision makers for 22 bus lines were used to collect the required data. PT productivity is a measure of the number of passengers, daily trips, income, and operating expenses. Generally, the PT system in Palestine is non-productive; most routes have fewer than four daily trips, the daily distance covered is less than 100 kilometers; and the daily ridership is less than 120 people per bus. Passengers' trust in buses should be revamped by modernizing the fleet. It is also essential to carry out periodic studies on this sector and collect statistical data. Work with service operators must be integrated at the institutional and legal levels, including organizing and institutionalizing the sector, merging companies and lines, improving and expanding road networks, and providing marketing and necessary financing for this sector. In addition, service providers must be restructured by merging them and merging some weak lines, replacing buses with a capacity of less than 25 passengers to reduce journey and waiting times.

Keywords: Public transportation, bus service, productivity, West Bank.

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INTRODUCTION

The public transport (PT) system is one of the most important axes in urban planning in all of its aspects, and it is the lifeblood of economic and social life in any country. The contribution of the transport sector to the Palestinian national product in 2021 was 1.6% (Ministry of Transport, 2022), and the percentage of the workforce in the transportation sector reached 6.5% (Palestinian Central Bureau of Statistics, 2022).

At present, virtually all PT in the West Bank (WB) of Palestine is provided by privately owned buses, shared taxis, and private taxis, and it is regulated by a traditional system that dates back many years. The Ministry of Transport (MoT) has the authority to regulate the PT sector. Bus services are provided by fragmented private companies, consisting of 86 companies of various sizes, each operating their own bus on a limited number of routes (Ministry of Transport-General Directorate of General Traffic Controller, 2023). Transportation development is probably one of the most difficult issues confronting the future development of the Palestinian economy(Purwoko et al., 2022). There are a variety of reasons for this statement, not the least of which is the context of deep economic, social, and political uncertainty in which Palestinian institutions operate. Furthermore, the transport sector also faces certain unique challenges as a result of Israeli control over major external routes, in addition to physical constraints (roadblocks, poor roads, security checkpoints, etc.) and a lack of a coherent strategy on the part of the Palestinian government, which prevents actors in the sector from being able to propose and implement sectorial improvements.

Passengers mostly use private vehicles or shared taxis when traveling. Only 15% of daily passengers use buses (Rebel Economics & Transactions BV, 2019). The PT system in the WB, in general, faces several problems. The system is not capable of attracting individuals to use buses. This can be attributed to several factors, including an old fleet, with more than 76% of buses manufactured before 2010 (Ministry of Transport, 2022), as well as low frequencies and long waiting times (Olaian, 2017). Furthermore, based on field observations, many of the working buses suffer mechanical problems, inadequate safety measures, and a low level of comfort. At the same time, no comprehensive evaluation criteria were in place for the service. As a result, productivity is severely affected, and the level of service (LOS) offered to customers and the financial sustainability of the bus companies are insufficient.

The current transport sector suffers many problems, as identified in the Transport Sector Strategy (2021-2023) (Ministry of Transport, 2021a) and interviews with the General Director of Road Transport of the Ministry of Transportation. The major problems include: a conventional system, no conducting a demand and supply analysis for the award of several buses and taxis licenses, the WB governorates' lack of geographic continuity due to Israel's

control over lands, weak coordination among governments, poor state of the road system, and illegal taxis are prevalent in metropolitan and peri-urban regions.

This is a complicated collection of issues, many of which are interconnected. Problem-solving is made more challenging by the split of responsibilities between the Palestinian and Israeli administrations, not least because of the disparity in priorities. As a result, this article presented suggestions on how to grow this sector and increase its productivity in light of the current situation. Therefore, the main objective of the study is to evaluate the productivity of existing public buses in the WB using criteria for route efficiency and effectiveness. The study also offered scenarios for restructuring the passenger transport sector in the WB into a permanent and viable business capable of providing high-quality service and making necessary business investments.

LITERATURE REVIEW

A new sustainable development agenda was adopted by the United Nations in 2015, which included a list of 17 targets. Making cities inclusive, safe, resilient, and sustainable is goal number eleven (United Nations, 2018). Everyone should have access to secure, cheap, accessible, and sustainable transportation systems by 2030 (United Nations, 2015). Prioritizing traffic safety and expanding public transportation should be top priorities (Othman & Hj. Ali, 2020). Lack of urban planning prevents PT providers from providing adequate service if they are not paid more (Lee & Bencekri, 2021). In order to meet transportation needs, people are more likely to use a private vehicle when there are no PT options available (Gorzelanczyk & Madajczak, 2023). To increase bus productivity, one must increase PT demand, especially in bus lines, and diminish private car dominance (Zhao & Zhou, 2018).

Productivity indicators provide crucial information about the performance of the transportation industry, including how effectively carriers move people and products (Cazorla, 2021; Purwoko et al., 2022). Labor (single factor) productivity and multifactor productivity are the two primary metrics for transportation productivity (MFP) (Vaidya, 2014). Cazorla (2021) indicated that improving productivity is done by improving infrastructure and making it sustainable, and increasing asset utilization might result in annual savings of up to $400 billion (Keblawi & Al-Sahili, 2022). Al-Sahili and Abdelmajid (2004) studied travel demand elasticity, which is a major tool for determining the rider's sensitivity to changes in one or more service-related variables.

Performance measurement refers to the examination of an organization's output as a result of the management of its internal resources (cash, people, vehicles, and buildings) and the environment in which it operates (Transportation Research Board, 2003). Six categories of performance metrics were proposed by Carter and Lomax (1992) and Litman (2009), these include

cost-effectiveness, cost efficiency, service utilization/effectiveness, service quality, vehicle utilization/efficiency, and labor productivity.

Vaidya (2014) used 19 operational, financial, and accident-based criteria to assess the relative performance of public urban transportation firms; the criteria included the following examples: average fleet utilization in the year, staff and vehicle productivity, fuel efficiency, passenger kilometers performed, total annual revenue earnings, and annual accident rate. Al-Sahili and Abdelmajid (2003) found that many external and internal factors affect public transportation demand. External factors like income, car ownership, population, employment, and other household characteristics are linked to socioeconomic development. Internal elements, such as PT rates, trip duration, travel times, and service levels, are features of the PT system and are susceptible to policy decisions.

Cambini et al. (2007) and Olaian (2017) mentioned that restructuring the transportation sector was the best solution for increasing productivity, with public transport operators benefiting from lower operational costs by increasing the number of seats used per km. Based on this research review, it is possible to use some of the indicators used to measure bus productivity, as well as predict the size of the demand for this sector in order to make future recommendations to decision-makers on ways to develop and meet future needs.

METHODOLOGY

The mixed-methods methodology was based on field data collection and data from official sources. Due to the lack of some statistical data from the Ministry of Transport or through statistical reports, there were two sources for collecting data: the first was through projects implemented for the benefit of the Palestinian Ministry of Transport, and the second was through interviews with decision-makers and service providers. After collecting the data, it was analyzed to obtain evaluation indicators.

- **Statistical Information**

Statistical data, or statistical analysis, can be obtained from previous studies or official sources. In addition, two important projects are currently being implemented in Palestine. One is the Master Plan project (Road and Transportation Master Plan), while the other is the Orio project (Improving Public Transport Infrastructure in the State of Palestine), which is a PT project. Survey and statistical information were used from these sources, as they have recent and accurate statistics.

- **Interviews**

Interviews with decision-makers and service providers were conducted to collect data from their resources. The first interview was with General Traffic Controller in Ministry of Transport as he is responsible for monitoring and developing the

current transportation system. The second interview was conducted with an official from the Transport Sector Union in the West Bank governorates, as private companies provide bus service under the supervision of the Ministry of Transport and Communications.

STUDY AREA

The study area consisted of intercity bus lines connecting the ten major cities in the WB (Hebron, Bethlehem, Ramallah/Al-Bireh, Jericho, Salfit, Nablus, Jenin, Tubas, Qalqilya, and Tulkarm) that serve as capital cities for their respective governorates and districts. The study focused on the 22 main bus routes in the WB, with the exception of Jerusalem, as shown in Figure 1, and Figure 2 presents actual photos for the current bus stations in different cities.

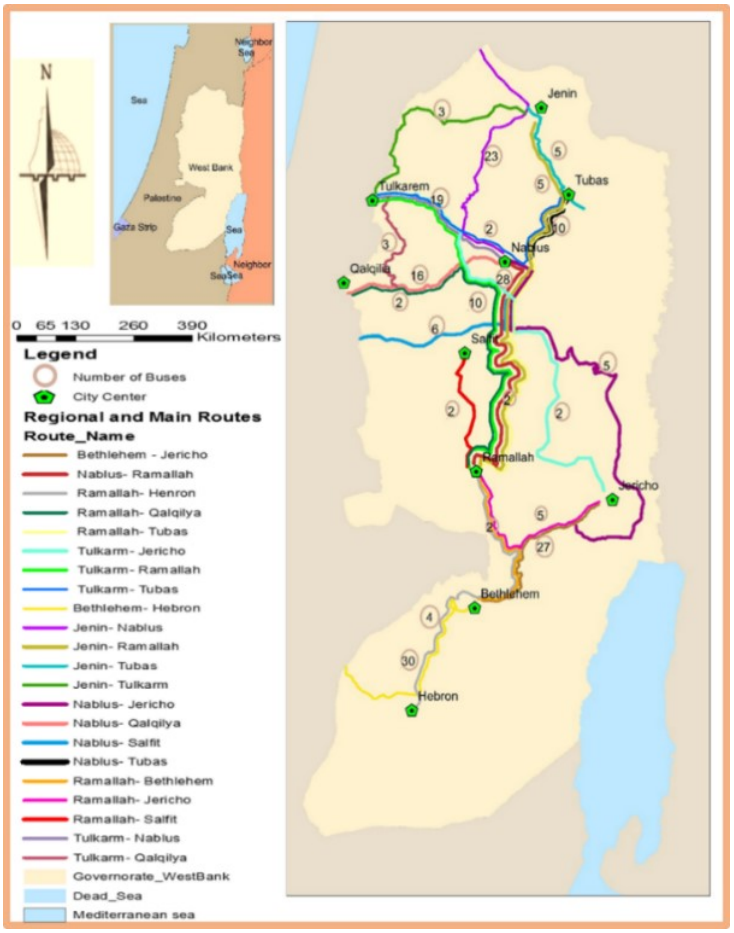

Figure 1: Main Bus Routes in the Study Area

Figure 2: Bus Stations in Different Cities in West Bank

DATA COLLECTION, ASSESSMENT OF TRANSPORT SERVICES, AND RESULTS

Passenger Transport Services in the WB

Passenger transport services in the WB consist of scheduled intercity bus services, local bus services that link small towns and villages to major urban centers, shared taxi services, and individual-use taxis. Figure 3 summarizes the percentage of all types of vehicles in the WB in 2022, while Figure 4 summarizes the number of all buses according to production year.

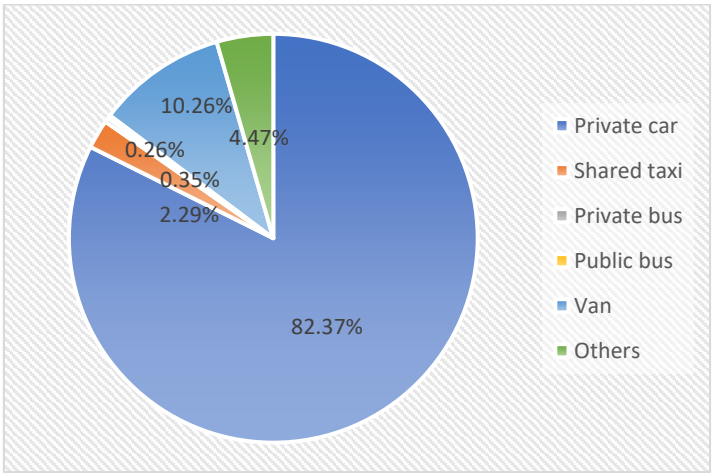

Figure 3: Distribution of Registered Vehicle Types in WB in 2023 (MoT, 2024)

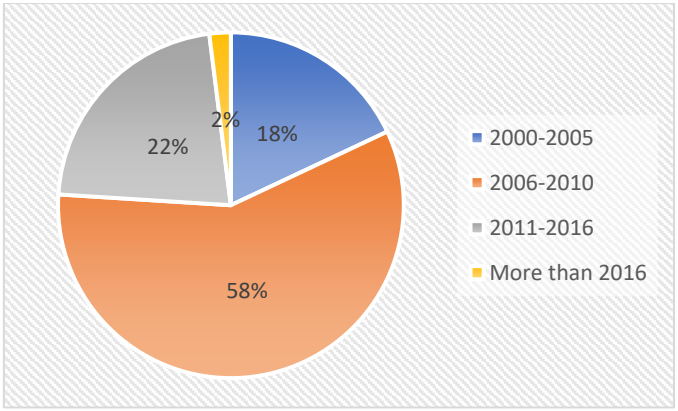

Figure 4: Percentage of Buses According to Production Year (MoT, 2024)

Based on an interview with the General Traffic Controller at the MoT, there is a reluctance to use PT in Palestine in general, and on external roads in particular, with only 35% of travellers using PT for transportation and preferring to use shared taxis. This is due to the general culture among citizens, in which there is no preference for using buses. It is common among people that traveling by bus takes a longer time and is uncomfortable. In addition, there is no actual PT system in place that obliges companies to adhere to a schedule and continuously update their fleet.

Transport Operators

The WB's PT businesses are family-owned and managed in accordance with conventional commercial lines. They are often small businesses that use conventional methods of capital raising, such as bank loans or share subscriptions, to finance fleet renewal and operations. Figure 5 illustrates the number of bus permits for the 22 routes, while Figure 6 depicts the relationship between the number of buses and the number of operating businesses.

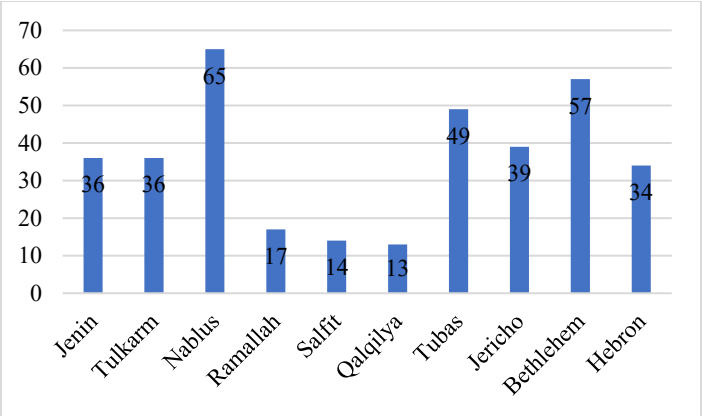

Figure 5: Number of Permits for Main Bus Routes
(Ministry of Transport, 2023)

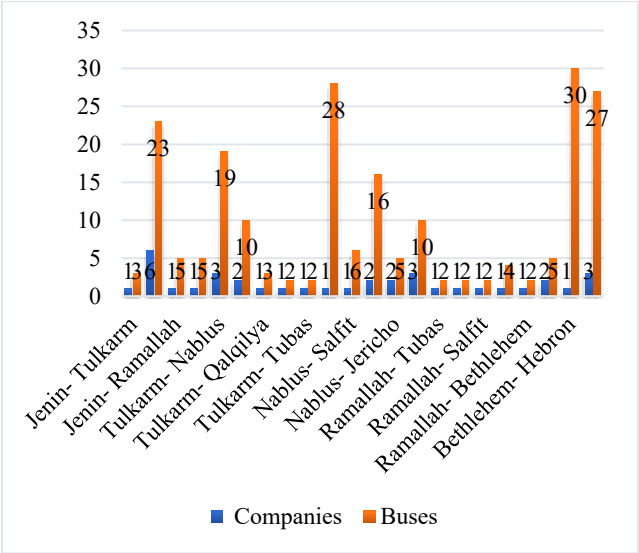

Figure 6: Relationship between the Number of Companies and the Number of Buses on All Routes
(Ministry of Transport, 2023)

There is no direct correlation between the number of buses and the number of operator companies. Thus, no particular standard is followed in this case. The routes are exclusive to specific companies. In addition, when there is a need to add a bus, the MoT asks the service provider company on that route provide one. The companies are working on concession rights for each route, and are not open to tendering.

Productivity of Transport Operators

The productivity of the transport services and operators on 22 routes was examined according to criteria established by the World Bank (2008), as follows:

- Bus utilization of less than 3-4 trips/day is considered low by any standards.
- Passengers per vehicle per day less than 120, and revenue per vehicle less than 400 NIS are considered low.
- Less than 100 km/day for a bus is considered low.

Table 1 shows the results of checking these standards on those lines for working buses only; not all of the buses are working, as some lines have permits for more than the actual working buses.

Table 1: Actual Bus Productivity for Intercity Routes in the WB

Routes	**Journeys/ Day**	**No. of Permits**	**No. of Working Buses (*)**	**Passenger/ Bus/Day**	**Bus Km/Day**	**Passenger/ Bus Km/ Day**
Jenin-Tulkarm	14	3	3	196	243	0.80
Jenin-Nablus	42	23	14	897	130	6.9
Jenin-Ramallah	6	5	3	130	187	0.69
Jenin- Tubas	6	5	3	210	**48**	4.37
Tulkarm-Nablus	40	19	8	1900	209	9.09
Tulkarm-Ramallah	8	10	5	288	142	2.02
Tulkarm-Qalqilya	**3**	3	1	153	**93**	1.64
Tulkarm-Jericho	/	2	3	/	/	/
Tulkarm-Tubas	4	2	2	**102**	**96**	1.06
Nablus-Ramallah	50	28	26	969	103	9.40
Nablus-Salfit	**2**	6	3	**86**	**18**	4.77
Nablus-Qalqilya	20	16	9	201	**71**	2.83
Nablus-Jericho	**2**	5	1	170	150	1.13
Nablus-Tubas	20	10	8	200	**55**	3.63

Routes	**Journeys/ Day**	**No. of Permits**	**No. of Working Buses (*)**	**Passenger/ Bus/Day**	**Bus Km/Day**	**Passenger/ Bus Km/ Day**
Ramallah-Tubas	4	2	1	**52**	280	0.18
Ramallah-Qalqilya	**2**	2	3	**27**	**56**	0.48
Ramallah-Salfit	4	2	2	**80**	**74**	1.08
Ramallah-Hebron	**2**	4	2	160	**46**	3.47
Ramallah-Bethlehem	4	2	2	160	**60**	2.66
Ramallah-Jericho	20	5	3	1000	247	4.04
Bethlehem-Hebron	20	30	25	432	**19**	22.73
Bethlehem-Jericho	17	27	20	252	**45**	5.6

As a result of working buses only, seven of the 22 routes have relatively good productivity. Some routes are better than the others. Some routes need to increase their ridership, while others need to decrease the number of working buses or parallel shared taxis on those routes.

The average travel time, average speed, and seating occupancy on buses are shown in Table 2. The results show that the percentage of seat occupancy ranges from 24 to 88%. About 30% of current buses are large in size, with more than 49 seats (Ministry of Transport-General Directorate of General Traffic Controller, 2023). The average waiting time was 30 minutes. Some standards limit the delay to a maximum of 5 to 8 minutes of additional travel time for a one-way bus trip (Saberi et al., 2013). Therefore, all routes experience long delays, which can be resolved by replacing big buses with 50 seats, with small buses with a maximum capacity of 20 seats as shown in Figure 7.

Figure 7: The Two Types of Buses in WB

Table 2: Average Travel Time, Average Number of Passengers, Average Waiting Time, and Seating Occupancy.

Routes	Travel Time (min)	Avg. No. of Passengers per Bus	Avg. Waiting Time (min)	Percentage Seat Occupation (%)
Jenin-Tulkarm	45	14	35	56
Jenin-Nablus	60	13	35	52
Jenin- Ramallah	120	13	40	52
Jenin-Tubas	30	21	20-40	84
Tulkarm- Nablus	40	20	35	80
Tulkarm- Ramallah	100	18	35	72
Tulkarm- Qalqilya	30	17	35	68
Tulkarm- Jericho	/	/	/	/
Tulkarm- Tubas	60	/	35	/
Nablus- Ramallah	75	18	35	72
Nablus-Salfit	40	22	35	88
Nablus-Jericho	80	17	35	24
Nablus-Tubas	45	8	35	68
Ramallah- Tubas	100	7	20-45	32
Ramallah- Qalqilya	100	20	20-40	28
Ramallah- Salfit	45	20	20-40	80
Ramallah- Hebron	150	40	30-45	80
Ramallah-Bethlehem	90	40	30-45	80
Ramallah- Jericho	60	30	35	80
Bethlehem- Hebron	60	18	15-35	60
Bethlehem-Jericho	90	11	35	72
Nablus- Jericho	80	17	35	44

Source: Author's Calculation

About 23% of passengers do not prefer using buses because they have to wait too long before departure (Rebel Economics & Transactions BV, 2019).

This is one of the key reasons that reduces the attractiveness of bus services, thus reducing ridership and productivity levels. As a result, seating occupancy on several routes is low (less than 60%), with only seven routes having a reasonable seating occupancy (80% or more).

Quality of Current PT Service

The results of rating the quality of PT services based on a questionnaire prepared by Rebel Economics & Transactions BV (2019) are presented in Figure 8. Bus service in the southern part of the WB was rated lower than in the north (note that there are almost no large buses in the south), 1 is the lowest quality and 10 is the highest. The overall score for bus service was 6.37. In terms of negative points towards the current bus service, 20% of the users found buses to be uncomfortable, and 23% felt they had to wait too long before departure, as confirmed by the results in Table 2.

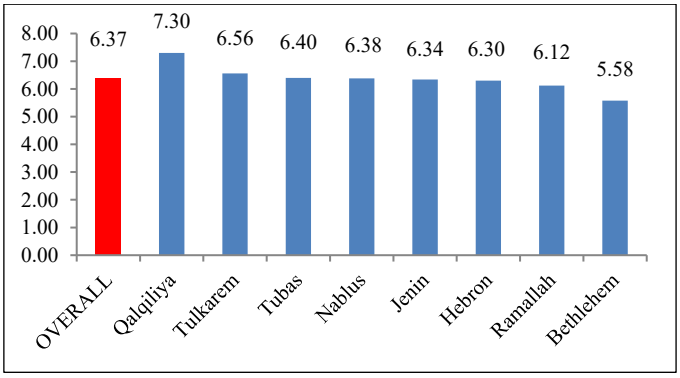

Figure 81: Rating Quality of Bus Service.
(Rebel Economics & Transactions BV, 2019).

RECOMMENDATIONS TO INCREASE PRODUCTIVITY

Based on the previous analysis of the main bus lines in the WB, it has been determined that productivity is low; the following are scenarios for improving service quality and productivity.

Fleet Condition and Renewal

The loss of profitability and decreased financial capacity have had a direct impact on the condition of the fleet and the increase in average vehicle age. Only a few recent buses have been licensed annually. In 2021, the percentage of new registered public buses (2021 manufacture) was 0.26% (Ministry of Transport, 2022); in 2020, it was 0.29% (Ministry of Transport, 2021b); and in 2019, it was 0.32% (Ministry of Transport, 2020). The percentage of new public buses has not

exceeded 1% in the past three years. This means that the fleet is not periodically updated, and 33% of the fleet's operating buses are now older than the permitted maximum age of 20 years (Ministry of Transport, 2022). In general, most of the buses are old; this could be one of the reasons why passengers use alternative means of transportation, as disclosed by the users. As a result, the bus fleet needs to be updated, and MoT laws need to be changed to shorten the bus's life expectancy, perhaps by 10 years instead of 20 years.

Financial Capacity and Sustainability

Following meetings with the service providers, consideration of the expenses and revenues of various bus operators in the WB, as well as an evaluation of capacity and productivity, the following key conclusions were made:

- The amount received per bus barely covers direct operating expenses (fuel and maintenance account for more than 65% of income); Table 3 includes a breakdown of all operational expenses.
- The majority of operators do not use surpluses to pay for necessary maintenance or fleet replacements.
- Operators can continue using depreciated buses for the rest of their usable lives at the present productivity levels, but they cannot be replaced.

Table 3: Operating Costs for Bus Companies

Expense Items	**Proportion of Total Expenses**
Fuel	35 – 42%
Maintenance and Parts	25 – 33%
Salaries	12 – 16%
Insurance and Fees	1.0 %
Other Expenses	~ 15%

Source: Service Providers (2023)

As a result, the bus industry is currently unsustainable and unproductive. To identify strategies for bringing the sector back to stability and re-establishing an efficient transportation capacity, buses must travel farther, operate longer, and make more trips; the number of passengers and income per bus must rise; and more effective deployment strategies and routes.

Potential for Improvements and Efficiencies

There are many areas where improvements could be made on several levels, and institutional issues must be addressed as well. The main areas identified for improvement are:

- Institutional Level: by developing laws and regulations, reorganizing the passenger transport services sector, developing the road network, and activating the fine system.
- Operators Level: by organizing and structuring the company. Increasing the efficiency of non-operating companies through consolidation, promotion, good marketing, activating smart transportation, and improving the network and road.
- Practical level: by restructuring the network, optimizing fuel consumption, approving bus sizes according to the demand volume, adopting maintenance schedules, training employees, and raising the level of services provided.
- Regulatory framework for the merger of companies (consolidation): by combining small operators into groups that are sufficiently large to improve network, organizational, and operational efficiency, and then restructure their businesses so they can turn a profit after expenses

CONCLUSIONS AND RECOMMENDATIONS

When evaluating the PT, it is important to determine its efficiency and to assess the people's satisfaction in order to encourage them to use it. Generally, the PT system in Palestine is inefficient and unproductive. The proportion of buses to all registered vehicles in the WB is 0.26%; additionally, 50–60% of the registered fleet is really in use. Furthermore, only 2% of the buses are contemporary (newer than 2018). About 76% of the working buses are more than 12 years old. There are no remedial measures to renew the fleet, as the Ministry of Transportation allows buses of 20 years old to operate on the lines, and this is the reason for the reluctance of passengers to use buses; only 6% prefer buses.

There are 86 companies that provide bus transportation services in the West Bank, the majority of which are unproductive due to line damage, and they are also unable to renew their fleet and provide the service at all times. The Ministry of Transportation did not resort to addressing the problem by merging companies and monitoring them through the government. Therefore, to increase productivity, the bus fleet should be updated, with an emphasis on improving bus quality and comfort. Instead of the 20-year life span, provide a 10-year bus life allowance. Some routes must be merged with others to be productive, as the number of passengers, the distance, and the number of daily journeys are insufficient. Service providers must provide specific timetables for the buses and comply with them to reduce waiting time.

Among the proposed scenarios for resolving the bus waiting time problem, based on the interview with the General Directorate of General Traffic Controller, it is possible to suggest replacing large buses (50 seats) with small buses (24 or 13 seats) on external lines and granting companies privileges to replace and upgrade buses. It is also possible to integrate service provider

companies, their governance, control their efficiency, and give concession areas to government companies in partnership with the private sector.

Therefore, the Ministry of Transportation must balance supply and demand between shared taxis and buses, replace weak bus lines with shared taxis, merge unproductive lines, and restructure service companies while providing some tax breaks to companies to replenish the fleet. More studies on bus and shared taxi lines must be done together to predict the number of buses expected on the lines. Special lanes for buses must be made, and private cars must be prohibited from entering city centers and ministries compound at various times to encourage passengers to use public transport.

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