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National Transport Connectivity Assessment for Landlocked Area –Cross Border Transport in Palestine

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Abstract: This research investigates the dynamics of national connectivity, with an emphasis on its implications for economic, social, and environmental aspects. A review of the literature reveals that globally, there is no standard way of measuring connectivity, which drove the United Nations Economic Commission for Europe to create the Sustainable Inland Transport Connectivity Indicators (SITCIN). This novel approach consists of a range of indicators spread across 40 thematic clusters to evaluate sustainability. The focus shifts to Palestine, where road transport dominates while plans are underway for multimodal transportation systems. The distinct political setting in Palestine characterized by different levels of control over land, roads, and borders necessitates an adapted methodology for diagnosing and analyzing the national linkage process. Based on the data collected from official sources, questionnaires for thirteen key stakeholders, and interviews, indicators were identified, and the data were collected. Palestine's SITCIN analysis showed a moderate weighted sustainability score of 42.7%, which indicates socioeconomic-political limitations. The safety and security, infrastructure, and transportation of perishable goods/dangerous materials have relatively higher scores, whereas intermodality and environmental sustainability face considerable challenges. The study recommends investing in individual and organizational capabilities, embracing technological advancements, comprehensive multimodal transport planning, environmental monitoring, and road safety initiatives. Furthermore, stringent regulation of emissions and vehicle noise, establishment of a centralized transportation databank, and streamlined information exchange among pertinent authorities are also recommended. This study underscores the necessity of periodic updates to SITCIN indicators to align with the evolving transport landscape.

Keywords: National Connectivity; Sustainable Inland Transport Connectivity Indicators; Landlocked; Transport Sustainability; Border Crossing; Palestine.

Introduction and background

National connectivity, which is a measure to assess the ease with which people can get around within (intra-urban connectivity) and between (inter-urban connectivity) different places in the country, is a complex issue with broad implications for consumers, trade, services, economic growth, businesses, and overall development in the country. In the context of this research, 'connectivity' refers to transportation, trade, logistics operations, and customs focusing on cross border transport. A well-developed inland transportation interconnection system enables seamless integration of transportation modes. Consequently, transport connectivity emerges as a national priority, garnering good attention from the public and private sectors. This attention facilitates the exchange of information among various entities involved in the transportation sector, thereby enhancing comprehensive connectivity.

Landlocked countries are defined as "countries that do not have territories connected to an ocean or whose coastlines are located solely on endorheic basins" [1]. Landlockedness significantly contributes to structural constraints and high rates of poverty in landlocked developing countries, which constitute 32 nations globally and are generally among the poorest developing countries [2]. In the recent past, there has been a noticeable rise in transportation activity, encompassing both goods and passengers, leading to economic expansion and heightened interconnectedness. This trend has garnered significant attention on the global political agenda, particularly in developing countries, with a particular emphasis on landlocked nations [3].

The concept of transport sustainability is multifaceted, typically encompassing three interconnected dimensions—environmental, social, and economic—that must be considered together rather than in isolation [4,5]. Given its complexity, there is no single definition of transportation sustainability. However, several interpretations exist. For example, Zito and Salvo [6] describe it as "meeting current transportation and mobility needs without compromising the ability of future generations to fulfill their own needs." Similarly, Rodrigue [7] defines sustainable transportation as "the ability to meet the mobility needs of society in a way that causes minimal harm to the environment and does not hinder the mobility needs of future generations."

Enhancing strategic transport corridors would have the potential to stimulate economic development in their vicinity and improve accessibility to jobs, education, and healthcare for a larger population, thereby contributing to poverty reduction in the region, particularly for disadvantaged groups and those

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vulnerable to social exclusion [8]. At the same time, improvements in infrastructure and logistics, along with reductions in delays, interruptions in movement, and border tariffs, as well as the harmonization of standards and procedures across countries, have the potential to positively impact their economies.

The availability of sustainable transportation can drive economic growth and enhance mobility [9]. Sustainable transport modes not only promote economic integration but also contribute to environmental sustainability, social equity, public health, and urban resilience. Additionally, they improve urban-rural connectivity and support rural productivity [10]. A key objective of the World Road Association – PIARC Strategic Plan 2024-2027 is “to provide an up-to-date and comprehensive overview of trends, tools, best practices in investment planning and analysis of economic and social impacts of road infrastructure with a focus on decarbonization, gender inclusion and social equity, impact of the change of economy in low and middle income countries, and importance of roads in achieving equitable and sustainable development” [11].

Transport infrastructure is key to sustainable development and it is closely interconnected with various other sectors [12,13]. It brings major contribution to a wide range of socioeconomic benefits globally. The authors highlighted that the rural transportation sector has strong links to key areas of sustainable development, including economics and agriculture, policy and governance, health, gender, education, and climate change and the environment, with a particular focus on low- and middle-income countries (LMICs). The research concludes that improvement and extension of rural transportation infrastructure brings substantial benefits to rural communities [12]. Furthermore, Irshad et al. [14] conducted a study to analyze the contribution of infrastructure to economic growth in 18 lower-middle income countries (LMICs) from 1995 to 2017. The study identified that the gap in infrastructure development is widening between developed countries and LMICs. It concluded that investment in transportation, along with other sectors, contributes to economic growth in LMICs; therefore, continuous investment is needed to achieve the target of high economic growth.

Ng et al. [15] also assessed the role of road infrastructure development in economic growth across 60 countries. While the road infrastructure is essential for providing efficient mobility for people and goods, as well as access to various commercial and social activities, the study emphasized that focusing solely on road infrastructure development is insufficient for achieving sustainable economic growth. Therefore, integrated infrastructure and socio-economic policies should be implemented to realize a sustainable economic growth. While Nawir, et al. [16] applied a systematic analysis approach to project the future role of the central government in developing road infrastructure and its significance in Indonesia’s economic growth. On the other hand, Lucas and Adeel [17] demonstrated that there is an extreme unequal distribution of transport and mobility resources between nations and within countries’ rural and urban areas, thus creating horizontal and vertical social inequalities. Furthermore, Bastiaanssen, et al. [18] reviewed the role of transport’s contribution to providing access to employment. Although the literature is not conclusive or consistent and often shows mixed results, the study established a positive association between transport and employment outcomes, with varying effects.

Transport sustainability is often assessed through indexes, which serve as comprehensive evaluation tools incorporating the social, economic, and environmental dimensions of sustainable transport systems and services [19]. Indicators and indexes are based on various criteria and policies that can be evaluated and applied. Some studies set criteria for selecting these indicators, while others explore the types of indicators that can be assessed to achieve sustainability. Initially, many indicators for sustainable transportation were developed in developed countries [20], and nations worldwide are now adopting sustainable transport solutions to address global challenges [21]. However, applying the same set of indicator for both developing and developed countries may not be appropriate [22], and it is crucial for developing countries to collaborate in developing indicators tailored to their context [23]. While a smaller collection of indicators may be easier to use, it risks overlooking important factors, whereas a larger set may be more comprehensive but could involve high data collection costs [24].

Since the function of sustainable transport indicators depends strongly on a particular context, Hester [25] showed that there is not one uniform approach nor one general application that would serve different users with different priorities. Moreover, there is some agreement on common elements for sustainable development and transport. Among those are contributions to climate change, impairment of urban air quality, regional air pollution, depletion of oil and land resources, traffic casualties, etc.

Thiberge & Berg [26] highlighted that governments in developing countries must collaborate to achieve more sustainable transportation options. The study identified five major transportation difficulties confronting emerging countries. These are related to the environment, infrastructure, logistics, advanced technologies, and financing. Litman [27] delineated the factors crucial for selecting indicators of sustainable transportation, emphasizing the need for clear definitions in terms of goals, objectives, targets, and thresholds. The author also identified various levels of analysis for these indicators (41 indicators), measuring impacts on people, the environment, and the economy, from the planning process to travel behavior.

The "avoiding-shift-improving" strategies at the national Palestinian level was used by Abu-Eisheh et al. [28]. The study identified appropriate, applicable measures and created plans of action. It was concluded that particular focus should be placed on vehicle-related initiatives that accompany the "improve" approach. Such initiatives include promoting fuel economy and alternative fuel use, creating pollution standards, and putting in place tax-related incentives and policies. Furthermore, attention must be given to the "avoiding" strategies' connected measures, which must be linked with the "shift" strategies' relevant behavioral, educational, and awareness-raising initiatives for drivers and passengers.

In the process of interconnection, it is necessary to adopt a strategy that prioritizes environmentally friendly, sustainable, and intelligent solutions that are integrated with urban planning [29]. This strategy should focus on reducing greenhouse gas (GHG) emissions by enhancing air quality management systems and decreasing air pollution, ensuring that newly built infrastructure is climate-neutral and sustainable. On a global scale, transportation is responsible for more than one-third of CO2 emissions from end-use sectors [29] and approximately responsible for a quarter of (GHG) emissions [30]. Additionally, in the capitals and metropolises of many developing countries, transport activities generate particulate emissions that surpass the WHO's maximum thresholds, contributing to various health issues and premature deaths in those communities [30].

Moreover, there is no unified methodology for measuring the degree of connectivity (connectivity level), particularly for landlocked countries, in terms of the transport network, trade,

and logistics. A consistent approach for evaluating inland transport connectivity has also been lacking. To address this gap, the United Nations for Economic and Social Commission for Western Asia (ESCWA) addressed this problem by developing a set of indicators called Sustainable Inland Transport Connectivity Indicators (SITCIN) to measure the degree of connectivity of sustainable internal transport [31]. These indicators were constructed by reviewing existing research and practices from organizations worldwide. The developed indicators take into account aspects such as the Logistics Performance Index (LPI), how easy it is to do business (Ease of Doing Business), productive abilities (Productive Capacities Index), transport and trade facilitation in Southeast Europe, improving connections and freight transport in Central Asia, and insights gathered from interviews with key stakeholders across various sectors [31].

The SITCIN provides a five-step assessment tool to help countries improve how people and goods move within their country. The SITCIN criteria are used to comprehensively measure the degree of transportation connectivity systems in landlocked countries and transit developing countries. It provides a detailed look at performance at small, large, and day-to-day levels. Additionally, these signs allow countries to watch their progress toward reaching the United Nations Sustainable Development Goals (SDGs), specifically aiming for SDG8 (Decent Work and Economic Growth) and SDG9 (Industry, Innovation and Infrastructure), as well as the "2030 Agenda for Sustainable Development" [31]. The methodology utilizes 40 thematic clusters, each with different weights, covering the three distinct inland modes of transport and the sustainability pillars; these clusters are divided into 6 assessment aspects, for a total of 215 indicators, as presented in Table 1.

As shown in Table 1, the three pillars of sustainability are addressed through different clusters. Within each pillar and cluster, sets of indicators have been developed for the three modes of transportation, ensuring a comprehensive coverage of their various aspects. Furthermore, the pillars and clusters have been transformed into six aspects of indicators, as shown in Table 2.

Table (1): Summary of SITCIN Indicators [31].

Pillar	Cluster	Road	Railway	Inland Waterways
Economic	Efficiency	11	9	3
	Time	5	3	-
	Cost	6	3	5
	Infrastructure	9	4	4
	Operations	6	10	2
	Intermodality/Combined Transport	4	4	2
	ICT and ITS Solutions	11	4	4
Social	Traffic Rules/Behavior	18	-	2
	Road Infrastructure	5	7	-
	Vehicle Regulations	5	-	5
	Perishable Foodstuffs Transport	5	-	-
	Dangerous Goods Transport (Administrative)	19	5	6
	Dangerous Goods Transport (Infrastructure)	4	-	2
Environmental	Fleet	6	3	2
	Emission	6	2	3
	Infrastructure	1	-	-
Total sub-indicators by transport mode		121	54	40

Table (2): SITCIN Scores by Country [31].

Aspects of Assessment	Georgia	Kazakhstan	Jordan	Serbia	Paraguay
Border-Crossing Facilitation	79.4%	67.7%	27.0%	72.0%	58.0%
Transport Infrastructure	79.4%	70.5%	54.0%	69.0%	77.0%
Security and Safety	79.4%	90.0%	77.0%	91.0%	61.0%
Transport of Dangerous Goods & Perishable Foodstuffs	75.0%	84.8%	53.0%	92.0%	86.0%
Intermodality	53.8%	62.0%	63.0%	31.0%	53.0%
Environment and Energy	17.2%	48.6%	28.0%	25.0%	34.0%
Weighted Road Score	67%	80.0%	40.0%	72.0%	60.0%
Weighted Rail Score	75%	53.0%	-	57.0%	-
Weighted Water Score	-	68.0%	89.0%	79.0%	74.0%
Total Weighted Score	69.6%	69.4%	53.2%	69.8%	65.2%

Five countries voluntarily piloted using the SITCIN standards in preparing their National Connectivity Reports; these countries are Georgia, Kazakhstan, Jordan, Serbia, and Paraguay. The SITCIN scores (as percentages) for these countries are illustrated in Table 2. The scoring of indicators varies both within individual countries and across different countries. The overall scores of four countries are relatively close, with Jordan achieving the lowest score. It is also noteworthy that the environment and energy indicators generally received the lowest scores among all the indicators in all five countries. Additionally, Jordan scored particularly low in border-crossing facilitation, indicating that major improvements are needed in this aspect.

Other indicators have been used to measure transportation sustainability and connectivity. For instance, Ali et al. [32] employed certain key performance indicators (KPIs) to assess sustainable freight transportation in Pakistan, drawing from existing research and sustainability measurement standards in the freight transport sector. This research pinpointed obstacles that impede freight transport performance in Pakistan, hindering the attainment of sustainable development objectives. Several significant obstacles encompassed strategic determinants, infrastructure management systems, information systems, and city logistics. Similar barriers were also identified by Rietveld & Stough [33] and Kessler & Macmillan [34]. Meyrick [35] focused

on eco-efficiency and sustainability indicators for urban freight and identified eco-efficiency measures as ratios relating output to input. The research proposed a framework to define four measures of sustainability and eco-efficiency: holistic outcome, specific output, policy effectiveness, and policy implementation. The Economic and Social Commission for Asia and the Pacific (ESCAP) listed 10 guiding principles for sustainable freight transport in the region. These principles focused on infrastructure and operation, decarbonization, inclusiveness, and digitalization [36].

Through qualitative interviews, Andersson [37] investigated cross-border collaboration (CBC) in Europe aiming to develop sustainable (environmentally friendly) transportation alternatives and solutions. Based on the general view among the actors, the study concluded that collaboration projects are necessary for sustainable development. The study identified major obstacles facing such collaboration, which were related to administrative burden, financial aspects, and limited knowledge.

A coherent methodology has been presented by UNCTAD [38] when planning, developing, and implementing a sustainable freight transport (SFT) strategy, taking into consideration local requirements, stakeholder perspectives, and available resources. The study recognized that some steps under the SFT framework may be more critical than others and may require more attention and resources.

While the aforementioned studies explored various aspects of transport sustainability and connectivity using sound scientific methodologies, they did so in a less comprehensive manner compared to the SITCIN indicators. Overall, the literature presents numerous indicators, methodologies, and models for defining and measuring the sustainability of the transport sector or its subsectors. However, very limited studies have addressed cross-border sustainability and connectivity issues, or providing measurements for these aspects. Conversely, the UNECE [31] has developed an extensive collection of 215 SITCINs, which have been tested at the national level in five countries. Therefore, this methodology and tool are considered comprehensive and reliable for use and implementation in other countries. In this study, an appropriate set of indicators for Palestine will be developed drawing on the studied literature and taking into account the peculiar political context, characterized by varying levels of control over land, roads, and borders between the Israeli and Palestinian sides.

Research objective

The main objective of this research is to explore the use SITCIN indicators and methodology for cross-border transport in Palestine, develop a set of indicators tailored for the Palestinian context, and assess the national connectivity through the achieved scores. The results will be compared with those from other countries where the SITCIN framework has been tested, allowing for an evaluation of how Palestine compares to these countries. Ultimately, the research will provide a measure of the sustainability of Palestinian cross-border commercial transport (goods movement) and its related elements within the three pillars of sustainability: economic, social, and environmental. This approach will help identify gaps and areas that require improvement in cross-border transport and connectivity, providing a clear understanding of where enhancements are needed to strengthen the overall system.

Methodology

To achieve the objectives of this study, the following approach was adopted after reviewing relevant literature on the sustainability of internal transport and national reports from various countries:

Literature Review: The literature related to indicators and methodologies for transport sustainability, connectivity, and cross-border transport was thoroughly reviewed.

Selection of SITCIN Indicators: Based on the literature review, the SITCIN indicators and methodology were deemed appropriate for this study, given their comprehensive nature and focus on connectivity and cross-border transport. A modified set of SITCIN indicators was developed for Palestine, taking into account local conditions. This set was reviewed and validated by the Ministry of Transport, which oversees the transport sector and leads the National Steering Committee. The finalized set of indicators was then adopted (see Annex).

Evaluation of Indicators for Palestine: The selected indicators were evaluated for Palestine through the following steps:

1. Stakeholder Identification: Key stakeholders in Palestine, including relevant line ministries and official agencies associated with the various indicators, were identified to gather necessary information.
2. Questionnaire Preparation: Questionnaires were designed to suit the Palestinian context and distributed to stakeholders for data collection.
3. Interviews with Stakeholders: Interviews were conducted with stakeholders to obtain additional information for the SITCIN assessment.
4. Secondary Data Collection: Information from secondary sources such as reports, studies, official national statistics, and field reviews was also gathered to support the SITCIN assessment.
5. Assessment Across Sustainability Dimensions: The three sustainability dimensions (environmental, economic, and social) were assessed across strategic land routes in Palestine, given that only land roads are currently in operation. The assessment also covered the legal and institutional framework, regulatory environment, and administrative procedures related to border crossings, transit, and customs.
6. Establishment of Weights: Weights for each aspect of the assessment were determined.
7. Review of Scores and Weights: The National Steering Committee reviewed the weights and scores, making adjustments as necessary. The final SITCIN scores were then calculated.

Policy Dialogue: A national policy dialogue was held to verify and validate the research findings, including the proposed improvements.

Finalization of National Connectivity: Based on feedback from the policy dialogue, the national connectivity situation for Palestine was finalized.

Further details on the stakeholders, interviews, and analysis methodology are provided in the Data Collection and Analysis sections.

Data Collection

The research relied on obtaining information and views of as many stakeholders as possible in the Palestinian context from policy makers of transport, trade, customs, border management, relevant ministries, carriers, and representative bodies/organizations. This included:

- Public Sector: Ministry of Transport, Ministry of Public Works and Housing, Ministry of National Economy, Ministry of Local

Government, Environmental Quality Authority, Standards and Metrology Institution, Directorate of Crossings/Customs Department, and Police Directorate.

- Private sector: shipping and clearing companies and the Palestinian Shippers Council.
- Civil Society Organizations: Union of Chambers of Commerce, Industry and Agriculture and the Palestinian Trade Center – Paltrade.

An electronic/paper questionnaire was prepared for different stakeholders according to their role in the transport sector. A key person from each of the thirteen stakeholders was identified by the respective ministry or agency. In total, these questionnaires covered the sustainability dimensions (economic, social, and environmental) for the modes of transport available in the country, which are exclusively land roads, as there are currently no railways or commercial ports. The questionnaires used multiple-choice questions and a Likert scale, where the stakeholder determines the level of agreement or disagreement with a series of statements, in addition to a set of open questions. In addition to information collected through the questionnaires, interviews (face to face and phone) were followed with selected stakeholders to get more insight into the current situations and any future plans.

Thirteen different stakeholders were surveyed through a questionnaire, an interview, or both. Additional information, as needed, was obtained from official sources such as reports and statistics published by the government [39–43]; Palestinian Economic Policy Research Institute [39, 44], Palestinian Economic Policy Research Institute [45–47], and international organizations working in Palestine [48–51]. This was further verified through field surveys, as needed.

The interviews were conducted with relevant ministries, official agencies, and institutions, ensuring that the information collected was based on factual data and actual figures, rather than opinions. Furthermore, the information gathered came from experts in the field. For instance, an interview with the Environmental Quality Authority provided insights into the available equipment, laws, regulations, procedures, and actions taken regarding environmental sustainability in transport. Similarly, an interview with the police department provided critical data on road crashes, injuries, traffic laws, and related procedures. To ensure accuracy, the collected data and results were verified by the National Steering Committee. This approach ensures that the sample is representative, and the findings presented in this manuscript directly reflect the data obtained.

Contextual Country Information for the Case Study

The estimated population in the State of Palestine by the end of 2023 is approximately 5.48 million, with a population growth rate of 2.5%. This population is distributed with approximately 3.25 million residing in the WB (59.3%) and 2.23 million residing in the Gaza Strip (40.7%) [47]. Table 3 illustrates the country's demographic and trade data.

Table (3): Demography and Trade Figures in Palestine in 2022(1).

Population	**5.48 million**
Area	6,024.82 km^2
Population Density	910 people/km^2
Human Development Index	0.715(2)
Exports and imports (% of GDP)	85.9%(3)
Average age	74 years

(1) Source: [47].
(2) Source: [52]
(3) Source: [53]

Border crossing points (BCPs)

The Palestinian situation is distinctive. The State of Palestine encompasses two primary territories: the West Bank (WB) and the Gaza Strip. In the WB, the land is politically categorized into "A" and "B" areas, subject to Palestinian administrative control, and "C" areas, under Israeli jurisdiction. The WB shares borders with Israel and Jordan. Gaza, bordered by Israel and Egypt, is governed by the Palestinian National Authority (PNA); see Figure 1.

In territories under the control of the PNA, several border crossings facilitated movement. These include the King Hussein Bridge with Jordan, the Rantis in Ramallah, and the Karam Abu Salem in Gaza, as shown in Figure 1. Except for the Rafah Crossing, where control is by Egyptian authorities, the movement of goods at these points is overseen to varying degrees by Israeli authorities. These crossing points are used for the import and export of goods in both directions, but they fall under Israeli control. As such, they are subject to Israeli procedures, closures, restrictions, and control measures. Therefore, they are not categorized as border crossings in this research, as they do not fall under the jurisdiction of the PNA and lack development opportunities.

The Rafah border crossing between Egypt and Gaza experiences irregular commercial movements, often subject to closures by Egyptian authorities due to unstable political conditions in the region. These closures result in crossing primarily operating under emergency and humanitarian conditions rather than for commercial purposes, making all procedures at this crossing unstable. Additionally, due to the ongoing war in Gaza at the time of writing this research, all the borders were closed. Therefore, it would be inappropriate to include the Rafah crossing in the scope of national measures for Palestine. As a result, this research focused exclusively on crossing with Jordan.

Figure (1): Border Crossing Points in Palestine and Area Division in the West Bank.

Trade and Economy

The gross domestic product (GDP) was 15.8 billion US dollars in the year 2022, with a per capita GDP of 3,800 (US dollars); the per capita GDP in the WB was more than three times that in the Gaza Strip [47]. Based on the GDP data for the period 1994-2019 [54], a steady development trend of the Palestinian GDP can be observed during this period, as shown in Figure 2.

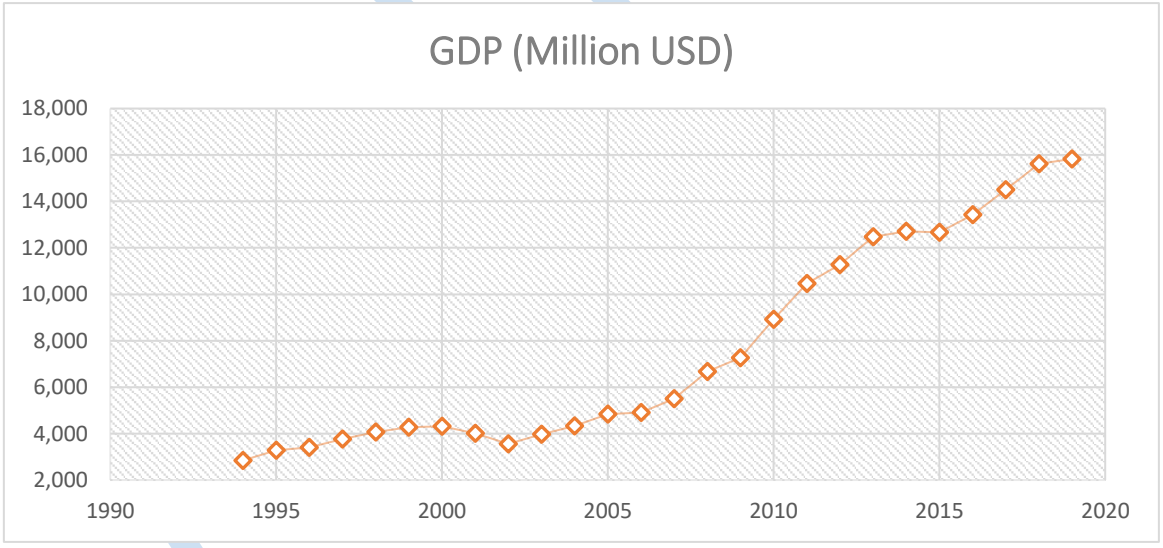

Figure (2) Palestinian GDP (1994-2019) (Source: [54]).

The economy of Palestine is predominantly driven by commerce, accounting for 21.3% of its GDP in 2022. Services follow closely behind, making a slightly smaller contribution of 19.6% to the country's economic output [47]. Figure 3 illustrates the percentage contribution of various economic activities to Palestine's GDP.

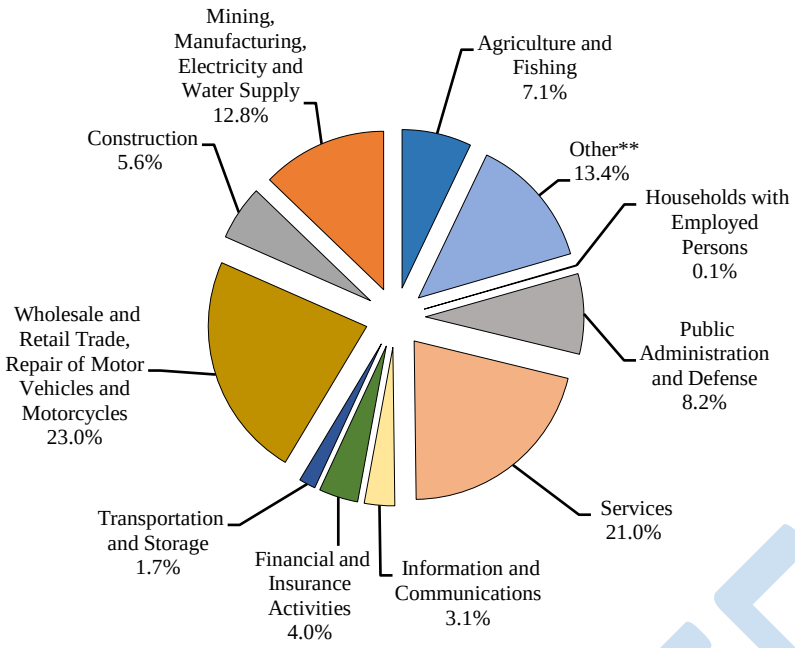

Figure (3): Contribution to the gross domestic product (GDP) in Palestine at current prices, 2022 (source: [47]).

The performance of the Palestinian economy is generally weak, as evidenced by three main indicators. First, the per capita income growth rate in the Palestinian economy failed to match that of non-oil-exporting Arab countries by a large margin. Second, the per capita GDP of the Palestinian economy is less than half that of its counterpart countries, such as Jordan, Egypt, and Tunisia; and third, the increase in poverty levels, as the latest official figures for poverty rates for the Palestinian economy reached 29.2% in 2017 and 25.8% in 2011 [47].

Regarding merchandise trade, the total recorded imports amounted to 6,613.5 million US dollars in 2019, while exports reached 1,103.8 million US dollars [46]. By 2022, these figures increased to 9,088.6 million for imports and 1,525.2 million for exports [47]. A total of 71,125 trucks crossed the border with Jordan (King Hussein Bridge) in 2019. The share of the Palestinian economy's exports of goods and services in GDP is less than half that of a group of comparable countries, and the trade deficit (as a percentage of GDP) is more than double that of those countries; at 41%, it is considered one of the highest rates in the world [48].

Transport Sector

The transportation sector in the State of Palestine is entirely a road sector (land roads), as there is currently no sea, air, or railway port, despite the existence of studies and plans to establish them. The transportation sector has played a minor role in the country's economy over the years, as it represents approximately 1.6% of the country's GDP in 2021 [42], while it reached approximately 4% in the period between 1996 and 2000; however, it decreased significantly during the Al-Aqsa Intifada (2000–2005) and has not fully recovered since then. It is thus much lower than its counterparts in the world and in neighboring Arab countries; for example, in Jordan, it is 8.4% [55].

The length of the road network in the WB (there is no updated data for the Gaza Strip) for 2022 was approximately 3,930 km, distributed among 681 km of main roads, 1,160 km of regional roads, 1,628 km of local roads, and 461 km of unpaved roads [47]. The number of vehicles has witnessed a clear and rapid increase in recent years (after 2013), especially in the WB, as a result of several factors, including banking facilities and lower taxes on vehicles. The vehicle ownership rate in 2022 reached 91.5 vehicles per 1000 people, compared to 85.2 in 2019, while it was approximately 45 vehicles per 1000 people in 2010 [47]; i.e., nearly double in almost ten years. Vehicles are primarily fueled by gasoline or diesel, with only a small number of hybrid and electric vehicles [56]. This constituted an increasing burden on the existing road networks that did not keep pace with this increase.

Before the PNA was established, the transportation sector and road network in Palestine were severely neglected. There were no programs in place to maintain existing roads or construct new roads, particularly roads outside urban areas. However, after the establishment of the PNA, some transportation development projects began to emerge, although they were limited compared to the actual needs. Most of these initiatives focused on improving transportation within cities rather than addressing infrastructure outside urban areas. Regarding road projects outside city limits, the majority were aimed at road maintenance and rehabilitation, with some aimed at enhancing city entrances. Consequently, there was a clear lack of projects focused on constructing new roads to accommodate the natural and consistent development of the region.

Notably, a strategic initiative, the Road and Transport Master Plan project of 2016, was developed with international technical assistance to outline a comprehensive plan for transportation development in Palestine. This plan, prepared by the MOT, encompasses all the technical aspects and structures, providing a strategic roadmap for the sector's development through 2050 [40]. Generally, the allocated funds, whether from the PNA's budget or from external international support, are insufficient relative to the considerable needs of the country. Additionally, local expertise in this domain has historically been limited, but it has gradually improved over time.

The existing issues within the transportation system can be succinctly outlined as follows: a marked deterioration in both the traffic environment [57] and the traffic safety system [58], a rise in traffic congestion, constraints on the necessary spaces for development, political mobility constraints, and a lack of standardized design specifications being implemented consistently.

The Current State of International Trade

Foreign Trade Crossings: Foreign trade crossings occur through King Hussein Bridge and Rafah, facilitating trade with the rest of the Arab countries and some European countries. However, trade with the rest of the world predominantly takes place through Israeli ports (primarily Ashdod and Haifa), through full Israeli procedures, and through crossing points between the WB and Gaza Strip.

The data indicated a minimal increase in the value of trade in 2019 of 0.29% compared to that in 2018, while there was a significant increase in 2022 of 24.1% compared to that in 2021. Moreover, the value of the trade balance deficit increased by 33.3%. Imports were distributed between the WB and Gaza at approximately 90% to 10%, while exports were distributed between them at approximately 98% and 2%, respectively. Approximately 90% of the imports were imported through land routes, while 100% were exported through land routes [47].

It is clear that the largest volume of trade exchange is with Israel (approximately 62%) due to the dependence of the Palestinian economy on it as a result of Israeli control. This is followed by Turkey, China, Germany, Jordan, Italy, France, and Saudi Arabia. Saudi Arabia ranks second, after Jordan, in the list of Arab countries, followed by Egypt and the United Arab Emirates [47].

Building stone and marble were the most common exported goods, followed by plastic bags, olive oil, and furniture. For imported goods, the top of the list is energy sources (electricity and liquid petroleum fuels), followed by feed, cement, cigarettes, and medicines. The largest exports take place through the King Hussein Bridge with Jordan, while the largest imports take place through Israeli crossings.

Ease of Doing Business (EDB): Introduced in 2002, the Doing Business project offers an impartial assessment of business regulations and their implementation. Economies worldwide are ranked based on the ease of conducting business within them, ranging from 1 to 190. A higher ranking indicates a regulatory environment more favorable for initiating and managing local businesses. Rankings are determined by aggregating total scores across 10 categories, each comprising multiple indicators, with equal importance assigned to each category. Rankings for all economies were assessed up to May 2019 [49].

WB and Gaza were ranked 13th out of the 20 countries in the Middle East and 117th (out of 190) globally, with a DB score of 60. It was ranked high (second to the Middle East group) in terms of access to credit (25 globally) and cross-border trade (54 globally), while it was ranked low (16-19 on the Middle East group) in terms of issuing building permits, solving the problem of bankruptcy (168 globally), and the worst in terms of starting a business (173 worldwide). Figure 4 shows this evaluation [49].

SITCIN Data Analysis

SITCIN is a set of indicators used to measure a country's inland transport connectivity through the collection of information from its sources, coordination, and consultation with relevant stakeholders. This approach provides a valuable assessment of national connectivity that is consistent across UN ESCWA member countries but relevant to that country's individual indicators. One of SITCIN's goals is “to give countries the ability to measure their progress in achieving the UN SDGs” [31]. The indicators adopted three pillars of sustainability, with their elements and indicators:

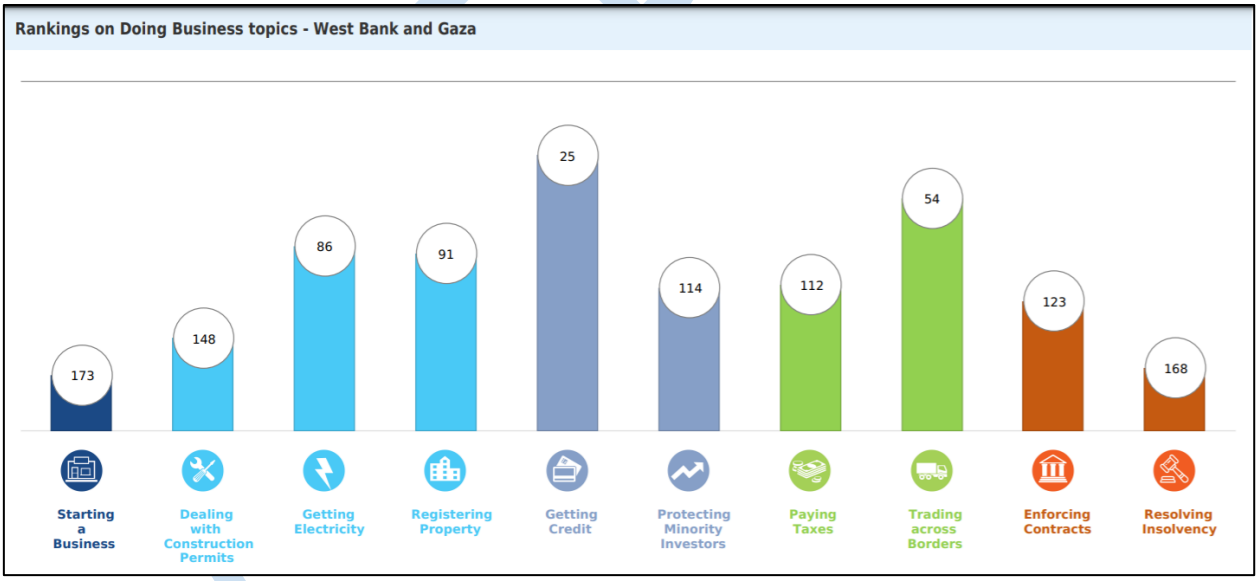

Figure (4): Ranking of Ease of Doing Business in the West Bank and Gaza Strip (source: [49]).

1. Economic Sustainability: efficiency, cost, operations, infrastructure, intermodal transport, ICT, and ITS solutions.
2. Social Sustainability: traffic rules/behavior, infrastructure, vehicle systems, transportation of perishable food, administrative requirements, and infrastructure/hardware requirements.
3. Environmental Sustainability: fleet and emissions.

The three pillars are applied to the three main transportation systems (roads, rail, and inland waterways). However, for the Palestinian case, it is solely road transport. For each element of the three sustainability pillars, a set of indicators is identified.

The number of indicators that fit the Palestinian situation was identified, reviewed, and verified by the Ministry of Transport; 114 indicators were reached (out of 215 total indicators set by the UNECE [31]: 121 for road, 54 for railway, and 40 for inland waterways).

The data were collected mainly through questionnaires, interviews, official sources (national reports and statistics), and supported by field reviews, as needed. After the data were collected and validated by other sources and personal interviews, a score was assigned to each indicator. It should be noted that some information was also complemented by the general knowledge and experience of the researchers in the country. The following is a brief description of the six primary indicators of the SITCIN extracted from [31].

Border Crossing Facilitation: This metric evaluates efficiency; processing time at borders; costs; operations; and the

utilization of information and communication technology (ICT) and intelligent transportation systems (ITS). It falls under the Economic Pillar and is used to gauge the ease of transit performance.

Transport Infrastructure: This indicator encompasses the Infrastructure Index within the Economic Pillar and includes road traffic infrastructure indicators within the Social Pillar. It measures the accessibility, safety, and quality of transport infrastructure in the country.

Safety and Security: This metric consolidates factors such as road traffic regulations, laws, behaviors, and vehicle standards. The Social Pillar evaluates the extent to which a country maintains safety and security in international transportation.

Transport of Perishable Foodstuffs and Dangerous Goods: This indicator, situated within the Social Pillar, assesses the transportation of perishable foodstuffs and hazardous materials. It measures the degree to which safety standards are upheld during transportation.

Intermodality: This metric, which falls under the Economic Pillar, focuses on multimodal transportation modes. It evaluates the share of goods transported and the proportion of goods transported via multimodal means.

Environment and Energy: This indicator, part of the Environmental Pillar, examines sustainable fleet deployment and the implementation of measures to reduce emissions. It assesses the environmental impact and energy efficiency of transportation activities.

The national indicator was calculated where 10 points were given for each subitem, and each item was evaluated by assigning a score of 10. Then, all the points were collected for each subitem and for each aspect of the six indicators.

A National Policy Dialog meeting was held with all the stakeholders to validate the findings of the SITCIN indicators and the scoring results. The results were finalized on the basis of the feedback on the indicators used and the scoring points. Table 4 presents a summary of these results for the Palestinian case.

It can be concluded that the sustainability index for Palestine is generally low (43.2%), especially in the field of energy and the environment (the lowest points), followed by crossing border facilitation and intermodality of the transport system. However, it is moderate in the areas of safety and security, infrastructure, and perishable foodstuffs and dangerous goods.

Normalization of Indicators

The relative importance of each item or indicator varies, and the country's special natural and financial conditions, along with the modes of transport, contribute to determining the importance of each item in the sustainability of national transport. Therefore, in cooperation with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and the ESCWA Committee, the UNECE has prepared a guide that defines a set of weights reflecting the level of importance of these indicators, the priority level for transport modes, and the determinants that hinder the provision of other modes of transport [31].

Subsequently, the indicators were subjected to normalization. This step was crucial because countries with varying geographical conditions encounter diverse challenges concerning transportation modes and infrastructure. The normalization process, as instituted by the UNECE, aims to facilitate fair and accurate comparisons among countries [31], thereby preventing SITCIN from penalizing nations unable to develop specific infrastructure due to financial or geographical constraints. This normalization is achieved through a process of weighting, reflecting the collective input of stakeholders gathered during consultative phases of the study. The evaluation methodology integrates four layers of weights [31]:

Table (4): Summary of SITCIN results for the Palestinian land transport sector.

Indicators	No. of indicators	Maximum points	Points attained	%Attained
Border Crossing Facilitation	36	360	109	30.3
Efficiency	12	120	56	46.7
Time required at borders	5	50	23	46.0
Cost	5	50	12	24.0
Operations	3	30	16	53.3
ICT and Intelligent Transport System (ITS) Solutions	11	110	2	1.8
Transport Infrastructure	12	120	66	55.0
Infrastructure	7	70	41	68.3
Road Traffic Infrastructure	5	50	25	50.0
Safety and Security	23	230	153	66.5
Road Traffic Rules/Behavior	18	180	109	60.6
Vehicle Regulations	5	50	44	88.0
Transport of Perishable Foodstuffs and Dangerous Goods	26	260	130	50
Perishable Foodstuffs Transport	5	50	28	56.0
General provisions for the transport of dangerous goods by road	5	50	38	76.0
Training of personnel involved in the transport of dangerous goods	4	40	14	35.0
Checks and other support measures to ensure compliance with safety requirements	8	80	30	37.5
Provisions concerning transport equipment and transport operations involving dangerous goods	2	20	12	60.0
Dangerous Goods Transport – Infrastructure/Hardware Requirements	2	20	8	40.0
Intermodality	4	40	16	40.0
Intermodality/Shared Transport	4	40	16	40.0
Environment and Energy	13	130	18	13.9
Fleet	6	60	6	10.0
Emission	6	60	12	20.0
Infrastructure	1	10	0	0.0
Overall	114	1140	492	43.2

The fixed weights of the transport modes include 4 categories, as shown in Table 5.

Table (5): Transport Mode Fixed Weights.

No.	Mode	Road	Rail	Inland Waterway
1	Road, Rail, IWW	0.6	0.3	0.1
2	Road, IWW	0.9	0	0.1
3	Road, Rail	0.65	0.35	0
4	Road	1	0	0

Thematic cluster weights: Thematic cluster weights: The evaluation methodology incorporates 40 thematic clusters spanning the three sustainability pillars. Clusters deemed to have a greater impact on achieving the desired output and outcome are assigned higher weights. These weights were established based on expert knowledge and insights gleaned during national policy dialogs and aligned with the mandates of

the UN Sustainable Development Goals. (SDGs) and the Vienna Programme of Action. Specifically, the following weight assignments were made: most important (1.2), most important (1), least important (0.8), and environmentally/socially important (0.6). Detailed information regarding the specific weight of each thematic cluster is available through the UNECE [55].

1. Modal share weights, where a weight score of 1.0 is assigned for mode priority 1, a weight score of 0.9 for mode priority 2, and a weight score of 0.8 for mode priority 3.
2. Financial and geographical limitations are assigned a weight of 1 for no limitations, 0.5 for financial limitations, and 0.5 for geographic limitations.

To calculate the relative results for each country, the relative value of the indicators is calculated based on the following mathematical equation:

$$\text{Country overall score} = \left((\sum CS * CW) * TW * TP\right) + NR \quad (1)$$

where CS is the country score of each cluster, CW is the cluster weight, TW is the transport mode fixed weight, TP is the transport mode priority, and NR is normalized considering natural restrictions.

Regarding the Palestinian situation, the weights of the importance of each indicator were applied according to the UNECE guidelines, and because land roads are the only means of transportation at present, they were given a weight of (1.0). As a result of the presence of financial and natural determinants that limit (and currently prevent) the use or provision of other modes of transportation, such as railways, seaports or airports, a weight was given of (1.0). Accordingly, the total relative value of the indicators measuring the connectivity of internal transport for the country was calculated, and the result was 42.7%.

Discussion of the SITCIN for Palestine

The degree of connectivity of sustainable internal transport for Palestine is generally low (<50%), which is understandable given the socioeconomic and political challenges the country faces. Compared to the overall road weight scores of other countries, Palestine's score is lower than four out of the five piloted countries (Georgia, Kazakhstan, Serbia, and Paraguay), which is expected. However, it is higher than Jordan's score of 40%. Palestine's SITCIN scores exceeded Jordan's in the areas of Border Facilitation and Transport of Perishable Foodstuffs and Dangerous Goods, but scored lower in the other indicators. The relatively high scores in these areas can be attributed to the dual border control system (Israeli and Palestinian), where the Israeli side enforces strict protocols regarding procedures, regulations, and operations. The following is a discussion of the main indicators and results.

Border Crossing Facilitation

This indicator has a low score (<50%), with one fair score (51 – 70%). The assessment of border facilitation in Palestine reveals both positive and negative aspects that influence the efficiency of cross-border transport. The staffing levels at the border are deemed sufficient to manage operations effectively. Regulations and specifications for border operations are well-established and are consistently applied, ensuring compliance with necessary standards. Additionally, development plans for border infrastructure are either available or currently under preparation, which demonstrates a commitment to improving the sector. Some of the essential infrastructure is already in place, supporting smoother transit across the borders. Moreover, there is a standardized tariff system, which is also clear and comprehensible as all clearance companies have information on cost structures published. There is also interest from international donor countries to extend both technological and financial assistance, which will further improve the capacity for border management. All these factors cumulatively make it possible to achieve a commendable performance in efficiency, cost and operational resources.

Notwithstanding these positive aspects, there are a number of remaining issues that lower the efficiency of border procedures considerably. Of these, the most important one is the border operating times, which do not allow goods and passengers movement any time of the day. Also, there are no dedicated express lanes for the transit of hazardous or perishable commodities, which further retards the movement of such time sensitive goods. The flow of information between the internal and external parties involved and even stakeholders remains weak at best and this also compounds the operational efficiency. Political instability in the region remains a primary challenge since it automatically affects the cross-border mobility. The Israeli processes tend to be typical in nature; that is, they have numerous stages that necessitate even more delays. In addition, Israeli authorities do not allow the entrance of non-Palestinian vehicles or drivers from other countries, which extend processing times and adds to inefficiencies.

Another major concern in practice criticism is raised regarding the expenses incurred during the enforcement of border operations, which in the case of Palestine is the multiple customs clearances such as Palestinian clearance and Israeli clearance that inflates the financial expenses. There is also a marked deficiency in the application of technology in the areas of regulation of movement of goods, inspections, as well as the clearance of goods. The lack of Intelligent Transport Systems (ITS) at the border crossing points and the absence of smart traffic management systems makes the management process less effective adding more delays and costs.

Consequently, the indicator for border facilitation fares badly in terms of costs effectiveness, ICT as well as the use of ITS. These problems demonstrate the weakness of border facilitation in a sustainable manner, particularly the globalization of movement as in the modern world; the majority of barcodes are technological based processes designed to enable for cost-effective management of the border.

Transport Infrastructure

While the transport infrastructure in Palestine is relatively performing better for some reasons, there are areas that need further improvement. One of the advantages of the transport infrastructure is the presence of a road classification system that is organized and has specifications that meet international standards. This guarantees that the road network is properly organized and is able to provide the necessary transport demands. In addition, there is a notable international interest on the enhancement of the facilities at the border crossing points, which is also favorable in sustaining the development and the modernization of the transport system.

However, the complete efficiency of the transport infrastructure is still affected by some bottlenecks. One of the problems is related to the fact that most of the external roads are only two-lane highways that cannot sustain the projected traffic volumes in the future. This may lead to traffic congestion and delays. Also, there is the issue of road infrastructure mismatch at both ends of the border that causes inefficiencies and difficulties in cross-border transport. Another serious problem is the absence of the logistical zones at the border points, which are crucial in ensuring that all border processes are effective and the goods flow is well managed.

Furthermore, the transport infrastructure relies heavily on external support for its development, which may lead to dependency as well as slow pace. There is also a significant gap in the traffic data of the international roads, which makes it complicated to evaluate the traffic flow accurately, make predictions, and use the roads effectively. Such deficiencies emphasize the necessity of sufficiently focused investments and enhancements in the road system and local and international logistic centers to respond to the current requirements of inter-border transport and the expected increase.

Safety and Security

This indicator receives the highest score among the various transport indicators, hence higher performance in certain areas of road safety and security is evident. There exists a "Traffic Law", which follows the international protocols and practices, thus providing a solid and legal road safety backdrop. Furthermore, the crash data recording system is well-organized as it captures accident data with sufficient details, which is important for evaluating road safety conditions and improvements. Getting regular traffic awareness campaigns and yearly seasonal vehicle inspections are also ways to make sure that drivers behave safely and vehicles are properly maintained. The driver licensing system confers that drivers are adequately educated and have valid licenses before take to the roads. Vehicles need to pass an annual inspection as part of the license renewal procedure, which ensures that they are roadworthy and compliant with safety standards. In addition, external highways are controlled by a system with strict controls, and violations are actively enforced. Over time, Palestinian people have become better at handling road safety issues thus showing an increased capacity in managing road safety issues.

However, the key problem is the regular rise of both traffic crashes and injuries, even though the death figures are not so high. This trend indicates a need for more targeted interventions to reduce road crashes and improve overall road safety. The first critical flaw of traffic enforcement is the lack of personnel in the traffic police, which in effect undermines the capability of the police to enforce the traffic law. This, in turn, is usually accompanied by the police's weak enforcement efforts and the consequent limited monitoring and control of traffic violations. Moreover, there is also a dearth of a systematic post-accident response system, which actually poses a limitation to the ability of the competent authorities to deal with the situation of road accidents and also to minimize the negative impacts of accidents. Although safety standards are generally good, the gapping issues such as the shortage of police officers and the lack of a post-accident response system are the most important ones to be improved to make the whole safety and security of the road transport network much better.

Transport of perishable foodstuffs and dangerous goods

This indicator shows a fairly good performance due to the presence of several strengths, although there are still some areas that require improvement. A key strength is the presence of a list of perishable food, dangerous substances, and dual-use goods, which are mainly regulated for security purposes at crossings. The list is not only in line with international regulations but is also more stringent in some cases, ensuring higher standards of control. Besides, tests are conducted for these materials, and special instruments are brought into play to ensure safe inspections and management. Goods transported in this category are clearly labeled, which helps with identification and compliance during transit. Furthermore, restrictions regarding transporting these materials are published and available to shippers, aiding in compliance and reducing the risk of improper handling. Special provisions are also in place for vehicles transporting dangerous goods, ensuring they meet necessary safety standards.

Nevertheless, one notable gap is the lack of statistics on the share of international transport involving food, hazardous materials, and perishable goods. This, in turn, limits the possibility of smooth and efficient control of the movement of these commodities. In addition, delay in inspection and clearance procedures for these goods is another key issue, as they not only lead to disruption of the transport of critical materials, but may also cause safety risks and financial losses. Furthermore, there are no specific requirements for appointing a safety supervisor to oversee the transport of dangerous goods, which could improve safety and regulatory compliance. The fact that there are no particular procedures for reporting incidents involving dangerous goods presents a risk that limits the ability to act quickly and properly in the emergency events. Overall, while the framework for dealing with the hazardous and perishable substances is relatively good; however, it is necessary to address such areas as data collection, delays, supervisory safety, and incident reporting to ensure the transport system of these materials is safe and efficient.

Intermodality

This indicator, which has a low score of 40%, is a sign of the difficulties that Palestine has to overcome in its commercial transportation sector. The dependence on land transportation for all the commercial activities with Palestinian territories is a major limitation, especially given the absence of multimodal transport systems. Although the transport master plan developed in 2016 [40] includes plans for multiple modes of transport; however, there has not been a proper implementation or integration of these modes into the current infrastructure.

From an economic development perspective, the lack of a specific system and laws for multimodal transport is a limiting factor in moving goods efficiently across borders, where multiple modes (such as road, rail, and sea transport) could potentially improve the flow of commercial goods. The lack of local human expertise in this area aggravates the problem even more, making it difficult to manage, regulate, and optimize the integration of different transportation systems.

Environment and Energy

This indicator scored the least due to several challenges. While there are already enacted emissions and vehicle noise laws; however, the use of alternative fuels is still very limited. Furthermore, the older vehicle models currently in use increase the fuel consumption of the whole fleet. In addition, there are no systems to measure the vehicle noise level, no models to predict the climate-related risks, and the monitoring systems are either weak or almost nonexistent.

Therefore, the core policy development must be toward improving intermodal transport while addressing environmental and energy issues. This typically involves implementing a comprehensive strategy that strengthens environmental regulations, and introduces laws promoting alternative fuels and adopting cleaner vehicle technologies. In addition, investing in multimodal infrastructures and simultaneously bringing local skills in both multimodal transport planning and environmental management to high levels are absolutely essential. These are crucial steps to creating a more sustainable and efficient transport system.

Overall Evaluation

Based on the scores of the previous indicators, the overall evaluation of the cross-border transport system in Palestine is relatively low. The system has got some challenges, mostly in the areas of border facilitation, infrastructure,

environmental/emissions and energy management, and multimodal transport integration. While some areas show positive aspects, such as safety and security (which has the highest score); however, the shortcomings in other areas affect the overall efficiency and sustainability of the transport system, and would have a significant impact on Palestine's economic development.

- Inefficiencies and delays in border facilitation and transport infrastructure are obstacles for the smooth operation of goods across borders. This causes high transportation costs, long transit times, and potential disruptions to the supply chain process. These would negatively affect the Palestinian's business environment, and discourage domestic and foreign investment.
- The Palestinian economy is less competitive due to the lack of modern infrastructure and multimodal transport solutions. This impacts Palestine's ability to fully engage in regional and international markets, limiting opportunities for economic integration.
- The environmental and energy management indicates scored low; therefore, not properly aligned with global sustainability trends. As the international market is moving towards environmentally friendly practices and carbon reduction, this, in turn could cause a long-term economic challenge. Weak sustainable practices and promotion of cleaner technologies in transport could lead to higher operating costs and reduced access to global markets.
- An efficient transport system would attract investment. Domestic and international investors target business success through stable, reliable, and cost-effective transport infrastructure. Therefore, the overall inefficiency of the Palestinian transport system would be a barrier to such potential investments, further hindering Palestine's economic development.
- The lack of expertise in multimodal transport suggests a need for capacity building and training programs, which, if addressed, could contribute to job creation and a more skilled workforce in logistics and transport sectors. This is important for sustainable development in Palestine.

Conclusions and recommendations

Competitive markets and adherence to sustainability standards and requirements will certainly enhance the performance of transportation in any country, and this is the global approach that aims to favor sustainability and competitive markets that are efficient without compromising quality. National connectivity emerges as a multifaceted challenge with implications for economic development, social well-being, and environmental sustainability.

A review of the literature reveals various indicators and methodologies used globally to assess transportation sustainability and reveals the absence of a unified methodology for measuring connectivity and its indicators. Recognizing the importance of addressing connectivity, the UNECE has developed the SITCIN with a methodology offering a comprehensive evaluation tool to measure the degree of transport connectivity in landlocked and transit developing countries. The tool comprises a set of indicators across 40 thematic clusters, assessing the three pillars of sustainability: economic, social, and environmental. The methodology provides a comprehensive tool for assessing the effectiveness and efficiency of cross-border sustainability. Therefore, this study aimed to use this tool to assess national connectivity in Palestine.

The land transport sector, particularly road transport, is currently the only mode of transportation in Palestine with plans for multimodal transportation systems. The appropriate set of indicators for Palestine was established through consultation with a national steering committee. Information regarding the transportation sector and selected indicators was collected from official sources and statistics, questionnaires, and interviews with stakeholders. The peculiar political situation of Palestine, which has varying levels of control over land, roads, and borders (between the Israeli and Palestinian sides), imposes a different method for diagnosing and analyzing the national linkage process.

The analysis of the SITCIN for Palestine reveals an overall weighted sustainability score of 42.7%, which is low compared with other piloted countries but largely expected under the existing socioeconomic-political constraints and is also higher than the results of the national interconnectivity indicators for roads in the neighboring country, Jordan. Safety and security, infrastructure, and the transport of perishable goods and dangerous materials have relatively higher scores, while intermodality and environmental sustainability face substantial deficiencies, highlighting significant challenges in the country's efforts toward sustainable transport.

Based on the analysis and evaluation of the results, the followings are suggested recommendations for improving the national interconnectivity and sustainability of the transport sector in Palestine:

- It is necessary to continue developing the capabilities of individuals and institutions and strengthening them to adapt to global and local developments; this must include both the public and private sectors.
- A one-stop-window policy and system should be developed, and technology applications should be used for all goods transportation procedures to facilitate movement and increase efficiency.
- Based on the comprehensive transport master plan, it is necessary to prepare a framework for organizing a multimodal transport system.
- A national road safety programme should be developed, including increasing traffic police crews and police control operations, intensifying the seasonal inspection of vehicles on roads and campaigns related to traffic awareness, and developing a post-accident response system policy.
- To develop clear strategies and policies regarding vehicle noise and gas emissions and a detection and monitoring system for these emissions and to adopt rules to encourage the use of renewable energy and alternative fuels.
- A transportation database is created, and the data are regularly updated.
- The policy of coordinating information and exchanging information among all official institutions related to goods transport operations should be institutionalized.
- Finally, periodic updating of the SITCIN indicators was conducted.

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