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Regional Transformation via Rail: A Historical and Analytical Examination of Iran's Railway Network and its Socio-Economic Impacts

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Abstract: The role of transport infrastructure, especially railways, in shaping a nation's socio-economic and cultural dynamics is of paramount importance. The present research delves into the profound influence of the railway network on Iran's regional transformation, from its inception to present times. An in-depth historical evaluation uncovers the genesis and expansion of the Iranian railway system, linking it intricately with pivotal junctures in the nation's trajectory. Emphasis is placed on regions undergoing substantial developmental shifts, attributable to enhanced rail connectivity, offering distinct examples of varied growth paradigms. Economic repercussions manifest as interregional trade augmentation, resurgence of industries, and alterations in employment landscapes, thereby positing railways as an integral component of Iran's economic blueprint. Concurrently, an exhaustive scrutiny of socio-cultural realms underscores railways' pivotal role in fostering intercultural exchanges and expediting urbanisation trends. From an environmental perspective, the sustainability merits of rail transport are illuminated, accentuating the increasing pertinence of ecological considerations in railway's prospective expansion. Through meticulous case studies, a comparative narrative emerges between areas endowed with rail connectivity and those situated in relative isolation. The objective is to elucidate railways as instigators of transformative shifts. This study culminates with projections grounded in potential technological advancements poised to reshape Iran's railway infrastructure and the ensuing regional implications. Findings underscore railways' monumental impact on Iran's socio-economic fabric, illuminating their potential as change agents and offering invaluable insights for global infrastructure strategising.

Keywords: Railway geography; Railway infrastructure; Regional differentiation; Regional disparity; Transport policy

1 Introduction

The advancement of nations' socio-economic conditions has often been mirrored in the expansion of their infrastructures [1]. Among these, the railway system, historically, has acted as a potent catalyst for regional growth, fostering intercultural exchange and bolstering economic amalgamation [2, 3]. Equally transformative is the airport system, as evidenced by numerous studies [4, 5]. In diverse nations like Iran, characterised by its multifaceted socio-economic and geographical configurations, this transformative power becomes particularly pronounced [6].

Characterised by a rich mosaic of cultural variances and latent economic potentialities, Iran has, through the ages, been positioned for integration. The railway system has been observed to be instrumental in this integration endeavour [7]. Stretching across vast landscapes, this iron network, since the onset of the 20th century, has functioned not merely as a means for the transit of individuals and goods. It has also facilitated the exchange of ideas, customs, and economic visions [8, 9]. From its very inception, the Iranian rail network was crafted with a dual purpose: not just as a transportation medium but also as an apparatus in nation-building [10]. The intricate relationship between Iran's vibrant historical tapestry and its railway proliferation, albeit significant, has received limited attention, even as railway evolutions in diverse global contexts have been extensively studied [11]. This research endeavour seeks to

address this lacuna, casting light on the multi-faceted role of railway infrastructure in Iran, especially as an enhancer and, in select instances, a harbinger of regional development opportunities.

The topographical challenges intrinsic to the Iranian plateau — its expansive deserts, formidable mountain ranges, and fecund plains — presented unique challenges to the railway's inception and its subsequent proliferation [12, 13]. However, investigations indicate that these very challenges ignited creative fervour. Engineers and decision-makers were driven to conceive innovative solutions, which, in turn, stimulated growth in regions intersected by this iron lattice.

This research posits that the railway's impact can be discerned across multiple dimensions. Beyond the overt economic outcomes, like trade facilitation, tourism augmentation, and business expansion, there exist nuanced influences on the socio-cultural fabric of the regions ensnared by this infrastructure. Railways not only bridged physical distances between towns and cities but also played a pivotal role in diminishing cultural chasms, offering diverse populations a unified sense of identity and purpose.

Embarking on this academic journey involves traversing diverse terrains, initiating with historical drivers that paved the way for railway evolution and culminating in its contemporary implications. Concurrently, an exploration into prospective trajectories, accentuated by technological advancements, will be undertaken. Through an intensive examination of both primary and secondary data sources, supplemented by targeted case studies, this study aims to provide a panoramic appraisal of the railways' transformational role in Iran's regional development.

The research further aims to chronicle the Iranian railway system's historical trajectory from the 20th century and its pivotal role in nation-building. The multidimensional impact of this infrastructure on Iran's socio-economic and cultural landscape will also be ascertained. Potential future trajectories, underscored by technological innovations, and their implications on the narrative of railway-induced transformation in Iran will also form an integral component of this investigation. Essential research queries encompass the historical antecedents influencing Iran's railway evolution, the tangible and intangible economic impacts, the socio-cultural repercussions, and the potential future innovations that could reshape the existing narrative.

2 Study Area

Situated at the strategic confluence of Central Asia, the Middle East, and South Asia, implications for Iran's settlement patterns, agricultural development, and economic undertakings have been profound due to its positioning [14]. With a vast expanse covering approximately 1.648 million km^2, Iran's varied topography and climatic zones have been delineated (see Figure 1). The country is bisected into its western and eastern segments by the Zagros Mountain range, which extends from the northwest to the southeast. Concurrently, the Alborz Mountain range, positioned to the northeast, shelters Mount Damavand, recognised as Iran's zenith. Enclosed between these mountainous terrains, the central Iranian plateau harbours significant deserts such as Dasht-e Kavir and Dasht-e Lut. Being an integral component of the historic Silk Road, exchanges of commodities, cultural elements, and intellectual frameworks between the East and West were facilitated through Iran. The late 19th and early 20th centuries saw regional developmental dynamics being influenced by the establishment of railway systems. Over the ensuing years, a centralised railway framework, with primary channels stemming from Tehran, has been observed to expand within Iran.

The railway infrastructure has been identified as pivotal in bridging significant urban conglomerates, industrial sectors, and maritime ports, thereby enhancing both internal and global trade [15]. Additionally, a pivotal role is played by Iran's railways in the International North-South Transport Corridor (INSTC), ensuring a robust link between Central Asia, Russia, Europe, the Indian Ocean, and the Persian Gulf. Iran's regional development has been deeply influenced by the evolution of its railway network [16]. In the northern territories, marked by the Caspian Sea's coastline, fertile expanses, and the Alborz Mountain range, notable developmental strides in agriculture and tourism sectors have been recorded. Industrial augmentation, driven by the railway infrastructure, has been noted in the western and southwestern terrains, which are characteristically mountainous and abundant in hydrocarbon reserves. Despite their historical limited economic dynamism attributed to arid landscapes, the railway network has ignited growth in distinctive nodes within the central regions. The eastern and southeastern peripheries, sharing borders with Afghanistan and Pakistan, have been ascertained as strategically crucial for transit and commerce, bolstering their developmental trajectory.

Given its strategic geographical positioning bridging Central Asia, the Middle East, and South Asia, the development of Iran has been significantly influenced by its railway network. It has been observed that the late 19th and early 20th-century establishment of railways acted as a pivotal conduit for economic vigour, binding paramount urban conglomerates, industrial precincts, and maritime ports, thus enriching both internal and global commerce. The progression of Iran's railway infrastructure appears to have centralized around Tehran, from which principal channels disseminate throughout the nation. It is also discerned that this network serves an indispensable function within the International North-South Transport Corridor (INSTC), thereby bolstering Iran's nexus to Central Asia, Russia, Europe, the Indian Ocean, and the Persian Gulf.

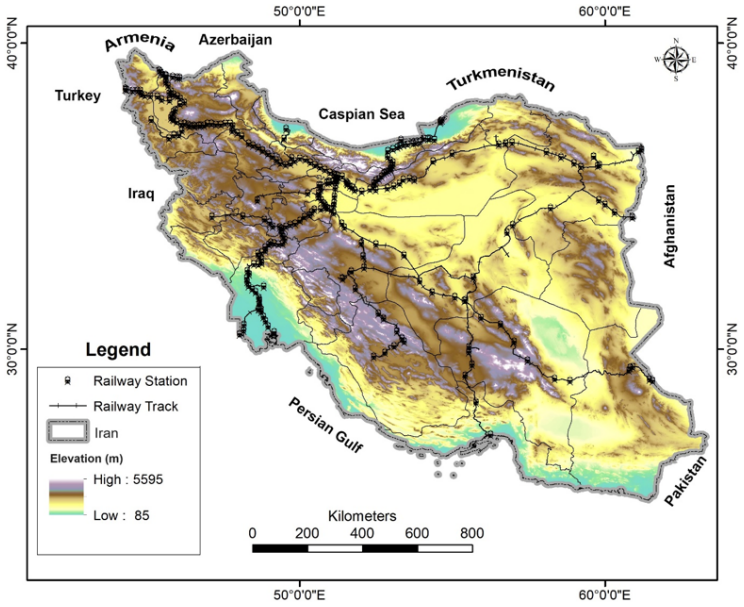

Figure 1. Railway transport system of Iran

The regional impacts of railways on developmental dynamics include the following:

Northern regions: Defined by the Caspian Sea's coastline, arable expanses, and the Alborz Mountain range, an escalation in the sectors of agriculture and tourism has been recorded. The facilitation of transport, owing to the railway's presence, appears to have expedited the conveyance of agricultural outputs and accentuated the ingress of tourists, culminating in economic augmentation.

Western and southwestern regions: Distinguished by their mountainous terrains and affluent hydrocarbon reserves, a marked industrial proliferation has been attributed to the railway's influence. The efficient transit of raw materials to processing units and the dispatch of finalised commodities to marketplaces have been facilitated by this network.

Central regions: Areas historically demarcated by economic dormancy, owing to arid terrains such as Dasht-e Kavir and Dasht-e Lut, have undergone metamorphosis in distinct nodes, as attributed to the railway system. These once secluded terrains seem to have evolved into vibrant centres of commerce and industry.

Eastern and southeastern regions: Flanking Afghanistan and Pakistan, these sectors' strategic prominence in transit and commerce is undeniable. It has been posited that the railway infrastructure augments the regions' economic stature both nationally and globally by ensuring seamless flow of commodities and populace.

It has been inferred that by bridging these topographically and economically disparate regions, the railway system has not merely catalysed economic progress, but has also precipitated a harmonized developmental narrative across Iran. This phenomenon aligns with a broader understanding of railways as a transformative entity, adept at reallocating resources and prospects throughout a nation's expanse. In the context of Iran's diverse topographical backdrop and strategic locus, the impact of the railway infrastructure in crafting a unified developmental tale across its multiple terrains appears paramount.

3 Methodology

3.1 Archival Investigation of Railway Evolution in Iran

A comprehensive examination of Iran's railway transport system's chronological evolution was undertaken through meticulous archival research. Historical documents were retrieved from newspaper archives and pertinent governmental records, elucidating the origins and progressive augmentation of the railway infrastructure within Iran.

3.2 Mathematical Timeline Analysis

A mathematical function, represented as $R(t)$, was utilised to analyse the chronological progression of the railway system, enabling the quantification of either the railway's length or the total number of railway stations. The geographical configuration of Iran's railway transport system was calibrated through advanced geostatistical techniques, specifically the mean centre of distribution, directional distribution, and hot spots analysis. Furthermore, a beneficiary index, denoted as β_i, was devised to quantify the regional benefits derived from the railway infrastructure, based on a prescribed formula.

$$\beta_i = \frac{R_{di}}{A_i} \times 100 \tag{1}$$

where, R_{di} signifies the density of the railway network in region i, and A_i denotes the area of region i.

The index is formulated to quantify benefits realised in diverse regions as a consequence of the railway system. Such benefits might encompass variables such as diminished transportation expenses and enhanced accessibility, among others. Through this statistical index, a sophisticated comprehension of benefit distribution is attained, pinpointing regions of profound impact and those relatively underserved.

Econometric models have been constructed to scrutinise the correlation between urban growth and the proliferation of railways. The coefficient delineating railway influence was ascertained using the subsequent formula:

$$G_i = \alpha + \beta R_{di} + \varepsilon \tag{2}$$

where, industrial G_i pertains to railway expansion, α represents the constant, β signifies the coefficient of railway influence, and ε denotes the error term.

3.3 Geostatistical Calibration of the Railway System

The geographical framework of Iran's railway transport was scrutinised using established geostatistical techniques, encompassing:

Mean centre of distribution: This analytical method discerned the average latitudinal and longitudinal coordinates of the railway stations, granting insights into the geographic nucleus of the system.

Directional distribution: This approach was pivotal in ascertaining the principal trajectory of railway expansion, thus offering insights into its synchronicity with urban growth patterns and emergent economic regions.

Hot spots analysis: This method pinpointed zones characterised by a significant concentration of railway stations, especially where intersections occurred with densely populated areas or key commercial centres, denoting potential zones of high railway impact.

3.4 Development of the Beneficiary Index

A beneficiary index was meticulously crafted, aiming to encapsulate the regional benefits ascribable to the railway infrastructure. These benefits span variables such as diminished transportation expenses and enhanced accessibility. Through this index, a refined comprehension of the distribution of accrued advantages was achieved, spotlighting regions reaping the most significant benefits while also highlighting those that appeared relatively underserviced.

3.5 Econometric Analysis and Urban Growth Correlation

Econometric models were devised, focusing on the intricate interrelation between burgeoning urban landscapes and the expansive railway system. A specific coefficient, signifying the influence of railways, was derived through a detailed formula. Further, to draw a comparison between the urbanisation rate adjacent to the railway networks and the national standard, a comprehensive analysis of demographic data was conducted [17].

3.6 Sustainability Assessment and Projections

Railway initiatives were stringently evaluated against prevailing sustainability metrics, employing the United Nations Sustainable Development Goals (SDGs) framework as a reference point. A regression model was utilised, forecasting potential socio-economic growth trajectories contingent upon prospective railway projects. Furthermore, through a conceptual model, a thorough exploration was conducted into the possible ramifications of cutting-edge technologies, specifically high-speed train systems, on regional progression. Special emphasis was placed on the alignment of railway initiatives with specific SDGs, notably Goal 9 (Industry, Innovation, and Infrastructure) and Goal 11 (Sustainable Cities and Communities).

4 Results and Discussion

An examination of the data revealed that only one province, specifically Tehran, benefits substantially from the railway transport system (see Figure 2). This province hosts approximately 25 (9.40%) railway stations and 399km (7.92%) of railway tracks. The Beneficial Index (β) analysis indicates that the regions in Iran benefitting most significantly from the railway are East Azerbaijan and Khuzestan, with β values of 0.74 and 1.0 respectively. Conversely, regions exhibiting minimal railway benefits include West Azerbaijan, Zanjan, Gilan, Markazi, Lorestan, Esfahan, Yazd, Razavi Khorasan, and Hormozgan.

Further analyses showed regions with extremely limited benefits, namely Ardebil, Bushehr, Chahar Mahall and Bakhtiari, Ilam, Kohgiluye and Buyer Ahmad, Kordestan, South Khorasan, North Khorasan, Sistan and Baluchestan, Kermanshah, Kerman, Fars, Hamadan, and Semnan. Here,beneficial index values ranged between 0.00 and 0.15.

The normality of the data was assessed through Shapiro-Wilk's test, favoured over the K-S test and Anderson-Darling test due to its superior power [18]. This test, founded on the correlation between observed data and its corresponding normal scores, asserts that should the p-value be less than 0.05 , the assumption of data normality is negated. Alongside this, Quantile-Quantile Plots (Q-Q plots) were employed to visually inspect the normality of observational datasets (Railway Track Length and Number of Railway Stations) as illustrated in Figure 3. For a dataset adhering to normality, its observations are plotted at a 45-degree angle from the (0,0) point on the Q-Q plot [19]. From this analysis, it was discerned that the province-wise distribution of railway infrastructure (encompassing both railway stations and tracks) in Iran does not adhere to a normal distribution. The Q-Q plot, a widely-acknowledged method for evaluating normality, substantiates this observation [20–22].

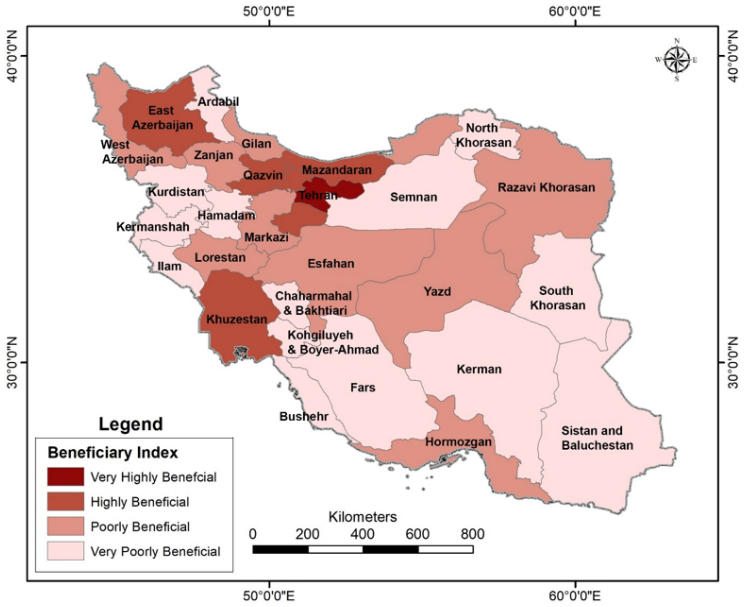

Figure 2. Beneficiary index of the railway transport system in Iran

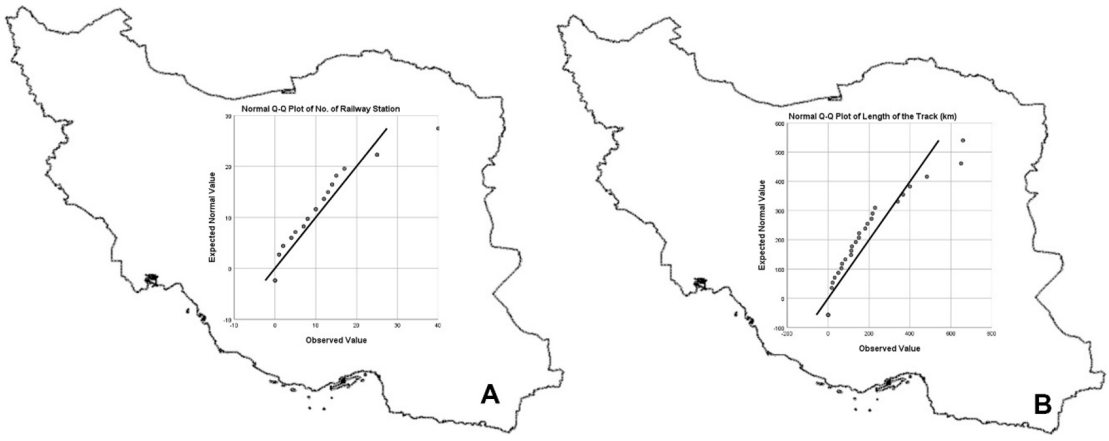

Figure 3. Q-Q plot detailing railway track and station data in Iran

Given the non-normal nature of the data, the median centre of railway stations was identified using geospatial techniques. This approach was favoured as the mean proves unsuitable for central tendency measurements in skewed datasets. The median centre for Iran's railway stations was pinpointed near the Istgah-e-kuh pank railway station, situated in the Qom province (Figure 4).

The spatial distribution of railway infrastructure in Iran is an outcome of an intricate balance of historical, geographical, economic, political, and strategic determinants. Similar determinants can be observed influencing

railway distributions in a plethora of nations. In Iran, several distinctive factors deviate this distribution from conventional norms.

Iran's varied topography introduces substantial challenges to railway development. Specifically, mountain ranges like the Zagros and Alborz present formidable barriers (Figure 5). The complexities of these terrains, from steep ascents to challenging geological conditions, mandate advanced engineering solutions. These solutions, including the deployment of tunnels, bridges, and reinforced track beds, are critical to maintain rail connectivity. Additionally, expansive deserts such as the Dasht-e Kavir and Dasht-e Lut [23] pose operational impediments due to elements like shifting sands, extreme climatic conditions, and potential track deformations [24]. Hence, regions like the northern Caspian plains and the southwestern Khuzestan plain, with their more forgiving terrains, have been more conducive to railway expansion [25]. However, topographically challenging areas witness limited connectivity, which inadvertently might create regional development discrepancies.

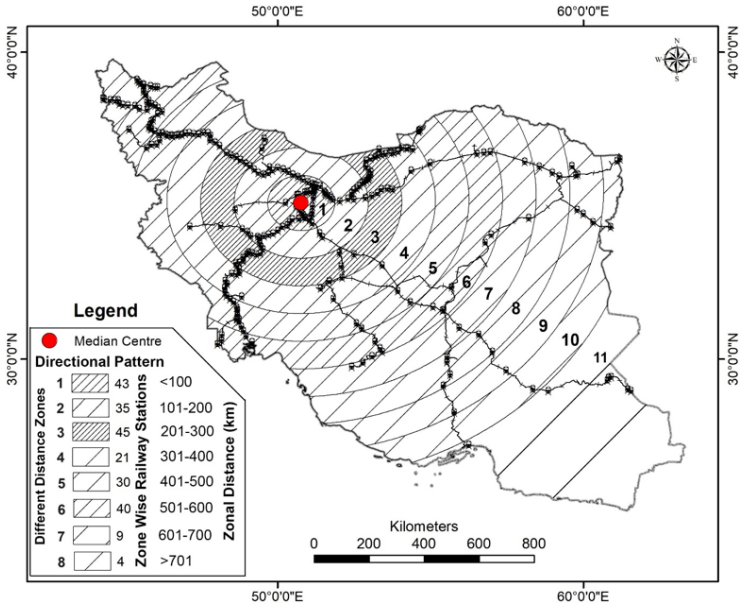

Figure 4. Directional pattern of the railway transport system in Iran

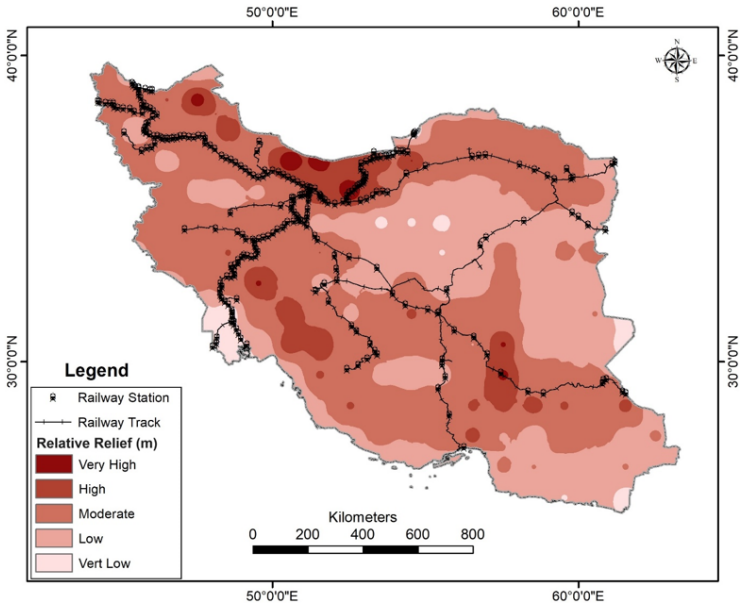

Figure 5. Comparative relief and railway transport system of Iran

Economic centres within a region inherently influence its railway infrastructure [26]. In Iran, this dynamic becomes evident in the railway networks concentrated around principal urban locales. Such layouts cater to the high

population densities and thriving economies of these regions (Figure 6). Tehran, the capital and economic nucleus of Iran, stands as a testament to this dynamic. Given its dense population and an array of enterprises, industries, and institutions, a sprawling railway system has been established. This intricate system, extending in various directions, facilitates the daily movement of commuters, goods, and services, underscoring Tehran's pivotal role in the nation's economic matrix.

Beyond Tehran, notable industrial and commercial hubs such as Isfahan, Tabriz, and Mashhad exhibit a similar reliance on an expansive railway infrastructure. Given the economic significance of these cities coupled with their dense populations, an exigent need arises for robust transport networks to fuel their continued growth. It is understood that railway systems not only adapt to existing urbanisation and economic patterns but also actively shape future trajectories of urban growth and economic activity.

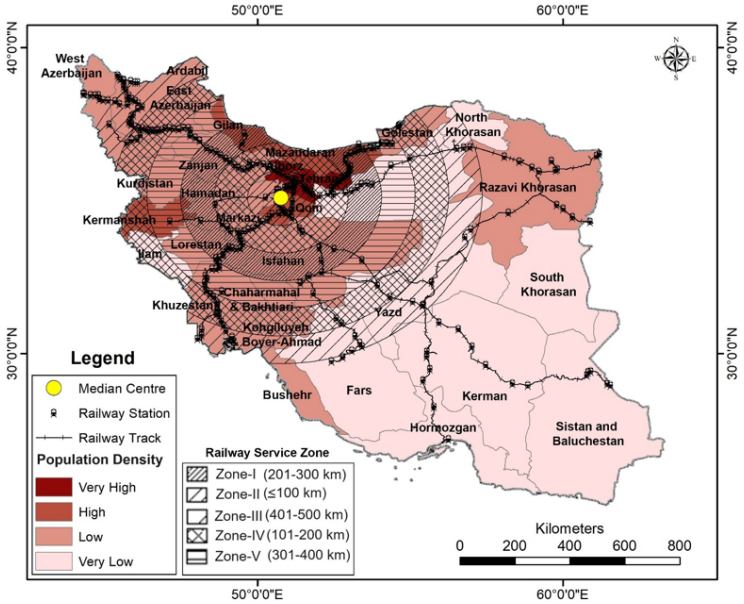

Figure 6. The interrelation between population density and the railway transport system of Iran

In Table 1, a significant positive correlation is observed (r=0.871, p-value < 0.05) between heightened population densities and the proliferation of railway networks. As regions experience denser concentrations of inhabitants and heightened economic activities, an intrinsic demand for more expansive, efficient, and cost-effective transportation networks emerges. Consequently, regions with a larger populace are more likely to witness the establishment of extensive railway infrastructures, catering to diverse transportation needs. Conversely, areas characterised by a sparse population might not witness similar railway expansions. Given their efficiency and speed, railways emerge as the optimal solution. Thus, the growth of major economic centres in Iran can be perceived both as a consequence of and an impetus for the expansion of the nation's burgeoning railway infrastructure.

Table 1. Correlations between population density and beneficial index of railway transport system

		Beneficiary Index	**Population Density**
Beneficiary Index	Pearson Correlation	1	.871**
	Sig. (2-tailed)		.000
	N	31	31
Population Density	Pearson Correlation	.871**	1
	Sig. (2-tailed)	.000	
	N	31	31

** Correlation is significant at the 0.01 level (2-tailed)

Historical trade and movement patterns leave a discernible footprint on the evolution of Iran's railway infrastructure [27]. Historical trade routes, such as the renowned Silk Road, not only reshaped ancient communities by facilitating the exchange of goods, ideas, and cultures, but also inspired modern railway network designs [28]. When contemporary railway infrastructures began emerging, it became imperative to align with these historically significant pathways, as they once served as pivotal conduits for trade and knowledge exchange. Existing land use patterns, deeply intertwined with these historic trade routes, further solidified the foundation for modern railway

expansions [29]. Urban centres, which burgeoned around these ancient trade hubs, continued to influence the distribution of modern railway infrastructure, owing to their enduring socio-economic importance and established connectivity patterns [30].

The intricate relationship between urbanisation and railway infrastructure further complicates this dynamic. A concurrent rise in the need for efficient transport infrastructure has been noted with the growth and urbanisation of historically significant commercial hubs [31]. This urban growth, in turn, actively propels the expansion of the railway network. A notable positive correlation (r=0.629) between the emergence of urban centres and the proliferation of the railway system can be discerned, attesting to the railways' efficiency over other modes of transport (Table 2). As illustrated in Figure 7, a comparative analysis of historical urban prominence against the contemporary railway network intricacies suggests a complementary relationship between the two.

Table 2. Correlations between the urbanisation beneficial index and the railway transport system

		Beneficiary Index	No. of Urban Centres
Beneficiary Index	Pearson Correlation	1	.629
	Sig. (2-tailed)		.090
	N	31	31
No. of Urban Centres	Pearson Correlation	.629	1
	Sig. (2-tailed)	.090	
	N	31	31

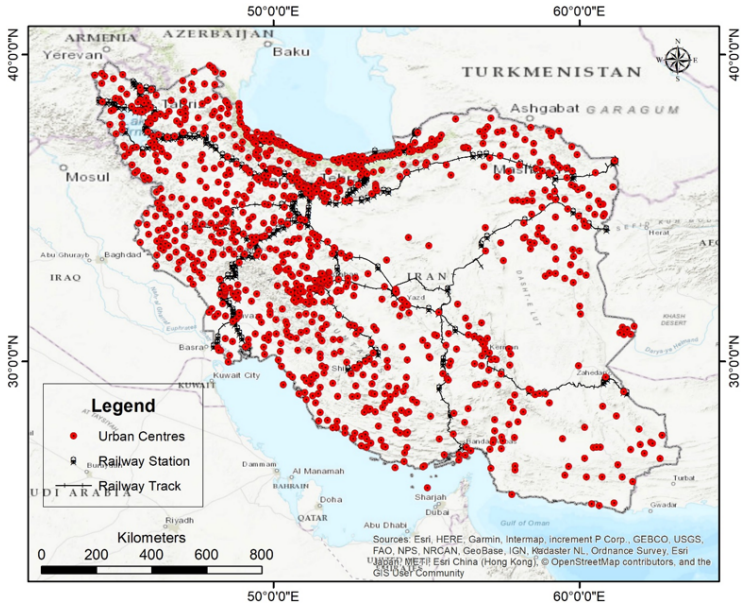

Figure 7. The juxtaposition of Iran's railway transport system with its urban centres

Due to their geostrategic positioning, the border regions of Iran demonstrate a pronounced potential for railway infrastructure development. This is particularly evident in regions adjacent to countries such as Turkey, Iraq, and Afghanistan [32]. The primary driver for such developments, trade facilitation, suggests that railways could crucially enhance bilateral and regional commerce, ensuring a streamlined transit of commodities, raw materials, and energy resources. The interdependencies and mutual economic interests between Iran and its neighbouring nations underscore this premise.

In the depicted Figure 8, the complementary role of road networks alongside railway systems within Iran becomes evident. While the expansive rail networks found in these provinces play a pivotal role in military logistics [33], the road network supplements this framework, ensuring that goods, services, and people reach their final destinations, especially in regions where topographical challenges preclude rail infrastructure development. Although railways often serve as the bedrock for large-scale transport, road networks act as essential conduits, aiding in the movement on a more granular level [34]. Furthermore, in a geopolitical context, these transport avenues, when combined, can potentially foster soft diplomacy by enhancing interpersonal relations, nurturing cultural interchanges, and fortifying economic ties, a concept termed "people-to-people diplomacy" [35]. Hence, the geopolitical significance of Iran's

border provinces necessitates a holistic development of both transport modalities, aligning with trade, defence, and diplomatic objectives [36].

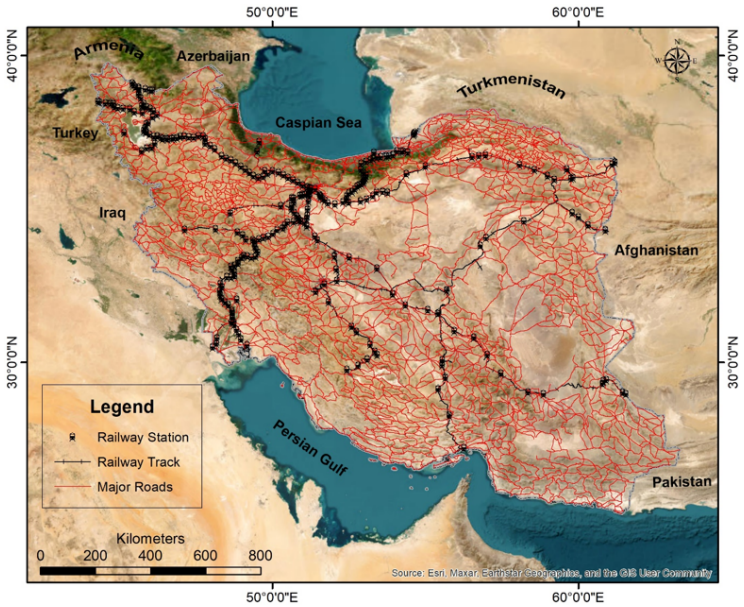

Figure 8. Integrated road and railway transport systems of Iran

Several provinces, endowed with copious natural resources, especially those abundant in oil and gas, have been observed to enhance their railway infrastructure, primarily to facilitate the effective transit of these commodities [37, 38]. This trend is notably pronounced in provinces with significant hydrocarbon reserves, with Khuzestan exemplifying this behavioural pattern. Positioned in Iran's southwestern region, Khuzestan accounts for nearly 80% of the nation's oil output and about 60% of natural gas production as of 2021.

The expansive railway network in this province serves dual functions. Firstly, it is utilised for the domestic distribution of resources, especially towards refining and processing hubs. Secondly, it streamlines exports, targeting ports and neighbouring countries. Evident linkages exist between key oil sources, refineries in Khuzestan, and the Persian Gulf ports, the latter being critical gateways for Iran's oil exports [39].

Economic considerations often hinge on the cost-to-benefit analysis when deliberating infrastructure development. The economic feasibility of infrastructural projects, particularly rail networks demanding considerable capital outlays, requires rigorous scrutiny. The Return on Investment (ROI) emerges as a crucial metric in such evaluations. In regions with significant infrastructural investments, revenue generated from the transportation of oil, gas, and petrochemicals often vindicates these expenditures. Additional benefits, including swift market access and reduced transport expenses, further contribute to the perceived value.

It must be noted, however, that certain provinces might not mirror the infrastructural advancements of resource-rich counterparts like Khuzestan. Such disparities can be attributed to a gamut of factors, from geographical challenges to historically lower ROIs. Yet, as Iran pivots towards fostering regional connectivity and equitable development, several of these regions are witnessing planned or in-progress railway infrastructure projects. Beyond merely connecting resource epicentres, the overarching strategy gravitates towards invigorating inter-province trade, facilitating citizen mobility, and accelerating socio-economic advancements [40]. Therefore, while provinces like Khuzestan's railway advancements can be primarily attributed to its hydrocarbon wealth, a broader perspective reveals influences from economic viability, strategic imperatives, and a vision for comprehensive national railway integration.

5 Conclusions

The rail network in Iran has served as an illuminating lens, shedding light on the intricate patterns of regional development within the nation. Throughout this analysis, the interplay between the rail infrastructure and regional dynamics was examined in depth.

Initially, the establishment and expansion of the railway system in Iran were observed not merely as feats of engineering prowess but as manifestations of political, economic, and societal agendas. From the early 20th century onwards, railway lines have been instrumental in connecting remote areas to urban hubs, thereby fostering national cohesion and stimulating economic development. It was discerned that regions, once isolated due to formidable

deserts or challenging mountainous terrains, have been seamlessly integrated into the national tapestry via this railway framework.

Moreover, the research underscored the symbiotic relationship between the railway system and regional economies. It was found that while the introduction of railroads invariably catalysed local economic activities via enhanced trade and transit, prosperous areas reciprocally provided the financial and motivational impetus for the augmentation and sustenance of rail infrastructure. Key economic nuclei, such as Mashhad, Tabriz, and Isfahan, have not only reaped benefits from the rail network but also significantly contributed to its proliferation.

Furthermore, the railway system was identified as a medium facilitating both centralised and dispersed development. While economic activities, especially around Tehran, experienced consolidation, the network has also dispersed populace and industries, mitigating pressures on overpopulated urban zones. Such a balance, it was concluded, stemmed from meticulous strategising and vision on the part of regional architects and decision-makers.

Nevertheless, challenges persist. Notable disparities in regional progression were highlighted, with certain zones, predominantly in the east and southeast, necessitating further railway enhancements to harness their latent potential fully. Additionally, in light of evolving environmental paradigms, the imperative for sustainable approaches in the establishment and upkeep of rail infrastructure has become paramount.

In sum, the railway framework of Iran stands as a poignant testament to the nation's advancement trajectory, epitomising technical acumen, economic aspirations, and intricate regional interlinks. As global imperatives shift towards sustainability and interconnectedness, the insights garnered from the evolution of Iran's rail-mediated regional growth hold profound implications for both Iranian policymakers and global regional strategists.

Author Contributions

The contributions of each author in the following statement: Conceptualisation, S.R. and S.G.; methodology, S.R..; software, S.R.; validation, S.G. and S.R.; formal analysis, S.R.; investigation, S.G..; data curation, S.G.; writing—original draft preparation, S.R.; writing—review and editing, S.R. and S.G. visualisation, S.R.; All authors have read and agreed to the publication of the manuscript.

Data Availability

The data supporting our research results are included within the article or supplementary material.

Conflicts of Interest

The authors declare no conflict of interest.

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