

Identifying the Socio-Economic Requirements of Multi-Modal Hub Stations_ Literature Review

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Abstract

The importance of transportation networks and the system can be explained through the analogy of blood circulating in different parts of the body, effective transportation networks and systems are necessary for the development of the entire nation. To improve or provide better living and working conditions for people, there are numerous infrastructure projects: residential, industrial, and commercial. These projects are in many locations, necessitating the need for an extremely effective transportation network and system. Transportation system inefficiency may result in increased resource consumption and prolonged project duration, both of which eventually increase costs. [1]

Transportation systems consist of a complex array of roads, bridges, ferries, ports, public stations, bike lanes, and walking paths that allow people and goods to get from one place to another, the transport stations are essential to promote sustainable development in society, which calls for connecting different modes of transportation in one location to foster interaction between users and the facilities. [2] This paper offers a literature review of multi-modal hub stations requirements with the **aim** of defining socio-economic requirements in multi-modal hub stations. After identifying the problem of the paper, the requirements of multi-modal hub stations focus on specific design aspects and the lack of previous knowledge of the social and economic requirements of multi-modal hub stations. This paper analyzes 60 peer-reviewed journal papers on multi-modal hub stations requirements and socio-economic requirements in public buildings & public spaces from 2000 to 2021. The findings are formed from five main requirements that study multi-modal hub stations. These requirements include (functional requirements, circulation requirements, security and safety requirements, environmental design requirements, social and economic requirements), and defining the elements of the Socio-economic requirements in multi-modal hub stations. This paper recommends finding a framework for the design aspects of multi-modal hub stations.

Keywords: Multi-Modal hub stations; Social-economic requirements; Requirements of multi- Modal hub stations.

Introduction

Transportation is the lifeline of the physical and socio-economic growth of any town and city. In urban regions, a multi-modal transit system has proven to be an effective way to accommodate diverse forms of travel demands, where the multi-modal transport system is a comprehensive strategy for integrating all urban transportation elements into a single coordinated planning and management system for effective utilization [3], as it provides seamless mobility and an atmosphere that allows for easy flow between public transportation and public space, boosting the city's economic situation while also establishing a social identity. The multi-modal transit hub is more than just a beginning or ending place for a journey; it also functions as a node for the community that surrounds or lives near the transit hub system. [4]

Hubs for public transportation emerge in places that are convenient for residents. The location needs to be connected to other significant regional hubs using the same or a different mode of transportation to become an integrated public transport hub. [5] - [6].

This will reduce the amount of fare the traveler must pay to transfer to their next form of transportation. [7]. To enhance passenger convenience and simplicity of travel, the hub's location and design are crucial, not only that, but also the hub idea gives the nation a wonderful source of income and economic growth. Many other

developing nations, like the United Kingdom, China, and Japan have used the hub model. [8]. Due to the economic changes, and demand for public transportation, many public transportation hubs are currently experiencing difficulties. The population is growing, consequently, so are the city's transportation requirements. people should make plans to avoid traffic jams by switching to public transportation during rush hour, which requires rearranging and re-planning the transport modes and links for the public transportation network. [9]

▪ **Research Problem Statement**

Planning for multi-modal passenger transportation is a burgeoning area of research, and there are many distinct problems to take into account when working on transportation projects. Planning for urban transportation involves applying scientific and technical knowledge to urban action, numerous smart devices have been marketed recently to address urban issues. To guarantee the promotion of environmentally friendly and innovative low-carbon and other sustainable transport solutions, as well as increased accessibility for public transit, intermodal terminals, and multi-modal transport chains,[10].

Therefore, this paper discusses; the requirements of multi-modal hub stations focusing on specific design aspects and the lack of previous knowledge of the social and economic requirements in multi-modal hub stations.

▪ **Research Aim**

This paper undergoes a literature review based on three rounds. At first, the research paper is discussing the different researchers' opinions on the design requirements of multi-modal hub stations. second, study socio-economic requirements in public buildings & public spaces, finally, define the (mixture of new and old) socio-economic requirements in multi-modal hub stations. As shown in Figure (1).

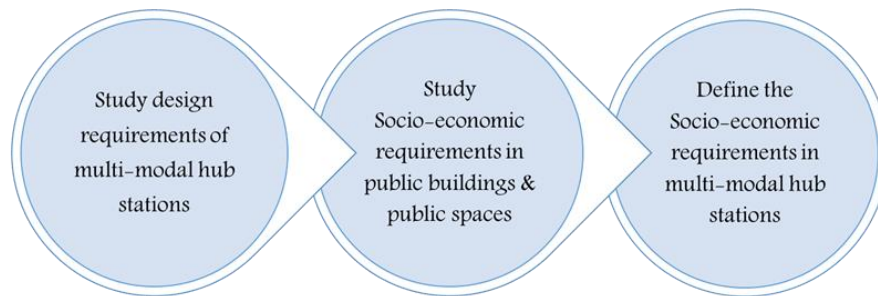


Figure 1: Stages of achieving paper aim, **Source:** Authors.

▪ **Research Methodology.**

This paper takes the form of a literature review of relevant studies related to the requirements of multi-modal hub stations. The paper is divided into several axes,

- Identifying research database (SCOPUS database). Where the SCOPUS database is the widest and most comprehensive base in covering research papers. As shown in Table [1]
- Finding keywords.
- Setting criteria to select collect and exclude papers that are out of the criteria.
- Analyzing and discussing results.
- Finding research gaps.
- Collecting papers for the gaps that have been found and analyzing it.
- Defining the result of the paper.

Table 1: criteria of selection.

Filter Category	Criteria
Keyword	hub stations; social-economic; requirements train stations.
Language	English and Arabic
Document Type	Article and review.

Subject Area	Architecture Engineering.
Date range	Article published between 2012 and 2021
Journal categories	Scopes
Content	Full articles, Clarity of abstract, Articles that are a relevant topic

Source- Authors based on extant literature sources.

1. Literature Review

The literature study provides an overall summary of some literature studies based on numerous research publications in the areas of multi-modal hub station design requirements and socio-economic requirements. This paper defines multi-modal transit hubs, the requirements multi-modal hub stations, and socio-economic requirements in public buildings & public spaces.

1.1-Multi-modal transit hub

A multi-modal transportation system can be described as a system that combines more than one mode of transportation in one place, it also allows passengers to go from one point to another using several modes based on time, cost, weather, and desired level of comfort. [11] .As shown in Figure (2). Such a location that manages multiple types of transportation is referred to as a transportation hub. There are many different types of transportation, including trams, buses, cars, ships, pedestrian lanes, trains, rapid transit systems, buses, trucks, and ferries. As a result, both passenger and cargo transportation operations can be referred to as transportation hubs. Transportation hubs are anticipated to provide many benefits. They may provide services with a high frequency. The spectacular creation of an effective distribution system because of the transportation hubs' increased capacity is the second benefit. Most transportation hubs use shared transshipment facilities, allowing the public to benefit from higher-quality infrastructure at reduced prices. [12]. Because it is necessary to handle the growing flow of people and goods both inside and between metropolitan centers, transportation hubs are crucial to ensure that people and commodities are carried in a secure, effective, and ecologically responsible. [13]

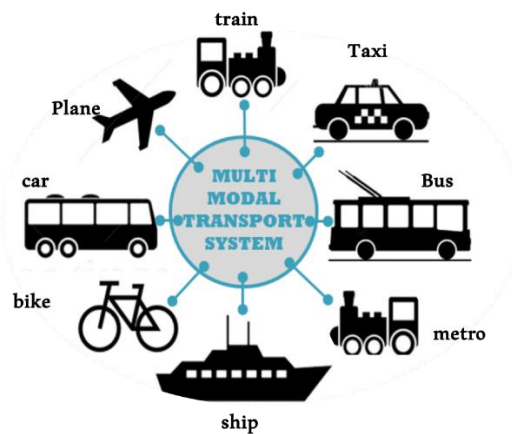


Figure 2: about multi-modal transit hub, **Source:** Authors.

1-2. Concept of multi-modal transit hub

Multi-modal transit hubs are defined as efforts aimed to increase the general level of commuter services and encourage utilization of public transportation. Integration refers to the operation of all modes and types of transportation as a single 'Seamless' entity for commuters' sake and the system in its entirety. [14] Effective service planning and design may make this happen so that when a change of mode is required, passengers can benefit from convenient interchange facilities that are safe, comfortable, and well-maintained in addition to decreased wait times. [15]

The factors that influence users' decisions to switch from private vehicles to public transportation include travel time and cost, distance from home to public transportation, and distance from home to work. Modern

transportation must be efficient, sustainable, and functionally integrated to meet passenger demand. [16]. To encourage more passengers to switch to public transportation, the hub transportation system should enhance the quality of its services. [17] A transportation system may contain nodes, terminals, and locations. Through design and restructuring the fundamental relationship components, these three components can be optimized, functionally connected, and be better managed. The fact that a hub transportation system is intended to meet the needs of communities from their point of origin to other final destinations is one of its most significant design features. [18]

1-3. Advantages of multi-modal transit hub

Multi-modal transportation has several advantages that make it one of the most widely used systems in the world. These benefits include: [19]

- Address existing and future needs.
- Moving from one transportation to another.
- Unified fare collection system.
- Seamless transfers from one mode to another.
- Spillover reduction of passengers to the adjoining areas and discouraging informal transport activities.

1-4. Disadvantages of multi-modal transit hub

Despite the numerous advantages provided by the multi-modal transportation system, it does have some disadvantages, such [20]

- Certain legal and operational limits due to variances in international standards.
- High security needs are due to regular inspections by authorities at stations or other roads.
- In the transportation sector, there may be a lack of technological advancements.

2. Architectural studies and requirements of multi-modal hub stations

In this part of the paper studies 45 peer-reviewed journal papers on multi-modal hub stations and the requirements of multi-modal hub stations from 2002 to 2021. As shown in Chart (1).

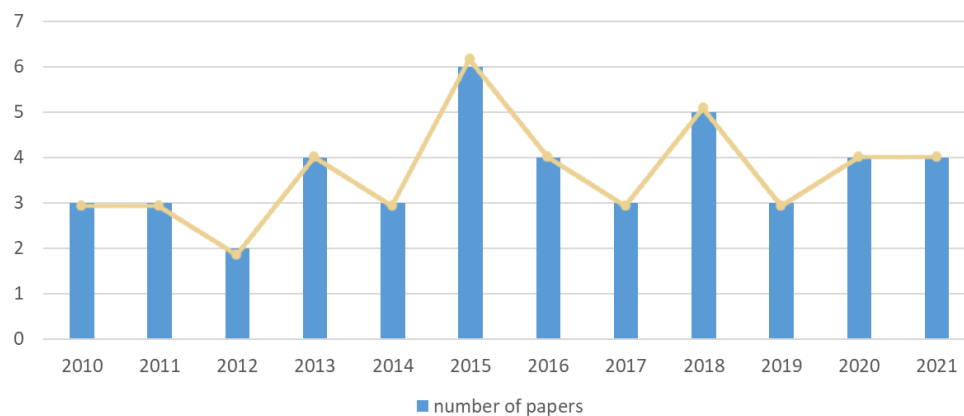


Chart 1: Number of articles by year of publication from 2010 to 2021, **Source:** Authors.

2-1. Architectural studies of multi-modal hub stations

Multi-modal hub stations are very important parts of modern urban history where diverse modes of transportation are connected, and it serves as a gathering area for people, as well as a commercial, recreational, and cultural hub. Therefore, the design requirements for multi-modal hub stations were divided into basic groups of design requirements, each of which contains groups of peer-reviewed journal papers.

2-1-1. Functional requirements group

The research relied on different literature resources and previous studies in functional requirements in multi-modal hub station. As shown in Table [2].

Table 2: Literature sources discussing functional requirements in multi-modal hub stations.

	NO	Title	Authors	Year
functional requirements	1	Developing a Multimodal Transport Hub and Bus Service Improvements for Battaramulla	network rail	2022
	2	Station Design Guidance	N. Rail	2021
	3	Architecture of Train Stations: Analysis of Governing Design Components-Kenitra Station, Morocco	Tork et al	2020
	4	Requirements for Functional Integration in the Design of Train Stations	Ammar et al	2019
	5	Developing a Multimodal Transport Hub and Bus Service Improvements for Battaramulla	Waruni Jayawardane	2017
	6	Design Standards for Accessible Railway Stations	transport scotland comhdhail alba	2015
	7	Multi-modal Transport and Application Requirements in Lattakia Port	Hermez et al.	2014
	8	Model complexities and requirements for multimodal transport network design: Assessment of classical, state-of-the-practice, and state-of-the-research models	an Eck, Brands, Wismans, Pel	2014
	9	Amtrak Station Program and Planning Guidelines	Amtrak	2013
	10	Gathering Requirements for Multimodal Mobile	Baillie	2005

Source- Authors based on extant literature sources.

Literature studies examined the functional requirements of multi-modal hub stations, which focus on.

- The deterioration of local stations, particularly in terms of functional requirements such as providing necessary amenities, movement, and waiting area, as well as a lack of sustainability in the design of these stations. [21]
- Developing the requirements of functional integration in local stations design. [22], and incorporate user's needs and context-specific requirements into the development process. [23]
- Achieving the requirements to promote good design. [24]-[25]
- Achieving the spatial organization, the physical and visual interconnection of the station's spaces. [26]-[27]
- Providing service and recreational spaces, information areas, and ticket sales areas. [24]-[28]
- Customizing service spaces for operators.
- Determining the capacity in the different spaces. [29]
- The theoretical conventional and state-of-the-art approaches do lead to unreasonable predictions of multi-modal travel behavior. On the other hand, the flexibility of the requirement of the hub station is ideally suited to explaining the projected impact of changes on travel behavior in the majority of circumstances. [30]

2-1-2. Circulation requirements group

The research relied on different literature resources and previous studies in circulation requirements in multi-modal hub station. As shown in Table [3].

Table 3: Literature sources discussing circulation requirements in multi-modal hub stations.

	NO	Title	Authors	Year
1	1	Accessible Train Station Design For Disabled People	fastcoo	2022

	2	Design requirements for contextual integration for train stations (Iraqi stations as a model)	Saadoon & Com	2019
	3	Train platforming problem in busy and complex railway stations.	Bai	2016
	4	A Study towards the Efficiency of Public Transportation Hub Characteristics: A Case Study of Northern Region, Peninsular Malaysia,	Ustadi & Shopi	2016
	5	Policies to Develop Transportation Systems: Alawi Region in Baghdad City	Nsma.maan	2013
	6	Intermodal Passengers Terminals: Design Standards for Better Level of Service	Pitsiava-Latinopoulou & Iordanopoulos	2012
	7	Planning and designing for pedestrians: guidelines - public transport	Department of Transport & Department of Planning & Public Transport Authority	2012
	8	Accessible Train Station Design For Disabled People.	Great Britain. Department for Transport	2011
	9	Design of multimodal transport networks: A hierarchical approach,	Nes	2002

Source- Authors based on extant literature sources.

The literature studies of circulation requirements in multi-modal hubs indicated the main elements that should be taken into consideration when designing the stations, which are:

- Creating methods and regulations to alleviate traffic congestion, as well as addressing how people and vehicles interact with one another.[31]- [32]
- The need for separation circulation of people and vehicles [33], as well as the creation of alternative solutions including the building of automobiles and pedestrian-friendly bridges and tunnels, as well as the availability of extra paths.[34] [35]
- Studying economic, and social dimensions and services. [19]
- Usage of technology will reduce the amount of time people have to wait in lines to buy tickets and the hub requires cutting-edge technology to support its operations because it will make users more accessible. [36]
- Poor planning, design, location selection, and operational management practices can result in significant travel delays and malfunctions, each terminal should adhere to specified design criteria appropriate to its nature. [37]
- Public transportation networks should have stop spacing of 600 to 800 meters and line spacing of 750 to 800 meters, while a speed scale factor of the passenger is 1.5 to 1.67. Private transportation networks should ideally have a scale factor of about 3km for road spacing and access spacing and a scale factor of about 1.67 for speed. [38]

2-1-3. contextual integration, functional, and circulation requirements group.

The research relied on different literature resources and previous studies in contextual integration, functional, and circulation requirements in multi-modal hub station. As shown in Table [4].

Table 4: Literature sources discussing contextual integration, functional, and circulation requirements in multi-modal hub stations.

	NO	Title	Authors	Year
contextual	1	Improved guidance on pedestrian planning and design	Austroroads	2020
	2	The impact of spatial configuration on street vendors distribution at terminals	Farouk	2019

	3	The 'Foundations and Criteria's' the Integration of Transportation Systems in Large Cities' Centre's	Mohessen & Shahin	2019
	4	Key considerations for integrated multimodal transport planning Global Future Cities Program	International & Centre,	2017
	5	multimodal assess desing guidelines	M Lee Corporation	2017
	6	Service performance evaluation in large railway station in Indonesia.	Caroline Sutandi & Olzon Paladan	2016
	7	Design requirements of Sustainable passengers' Land-transportation stations	Ibrahim Ali Mohammed Saad Al-Jorani Khalilali	2015
	8	From Typology Concept to Smart Transportation Hub.	Elshater & Ibraheem	2014
	9	Guidelines for preparation of integrated transport plans.	western asutralian planning comission	2012
	10	Intermodal Passengers Terminals: Design Standards for Better Level of Service.	Pitsiava- Latinopoulou & Iordanopoulos	2012
	11	Role of Hubs in Resolving the Conflict between Transportation and Urban Dynamics in GCR	Khalifa & Fayoumi	2012

Source- Authors based on extant literature sources.

Hub stations are important in addition to serving as vital economic and cultural hubs in addition to their principal role in the transportation of people and commodities, hub stations are among the significant structures that differentiate cities and give them their identity and distinctive character. In order to properly integrate its many activities, serve the community on multiple levels, and promote the use of public transit, it must be protected and developed. [39]-[40]-[41]

As the studies indicated the main elements that should be considered when designing the stations, which are:

- Intermodal terminals are a crucial component in the intermodal passenger transport chain, and their effective design may enhance the proportion of commuters who use urban public transportation while also consolidating the system in metropolitan areas' [37]
- The necessity of developing a thorough theoretical framework for the idea of contextual integration at multi-modal hub stations. [42]
- The need to integrate multi-modal transportation modes in central locations with numerous uses and activities' [13]
- Relying on achieving the requirements of integration with the surrounding environment mainly. [43]
- Focusing on the requirements of the stations' accessibility. [44]. The multi-modal station's access design guidelines include simple instructions as well as minimum/maximum and suggested criteria for arranging access for vehicles, bicycles, transit, and pedestrians. [45]
- Sustainable design strategy for Hub stations. Multi-modal stations dress the ecological, social, and economic issues in the context of their surroundings, and there is broad consensus among all stakeholders regarding the high importance of safety and security, information to passengers, car parking facilities, ticket purchasing, and waiting for modes in reasonable comfort.[46]-[47]

2-1-4. Environmental design requirements group.

The research relied on different literature resources and previous studies in environmental design requirements in multi-modal hub station. As shown in Table [5].

Table 5: Literature sources discussing Environmental design requirements in multi-modal hub stations.

	NO	Title	Authors	Year
En vir	1	Multi-modal transport in the context of sustainable development of a city	Kramarz & Przybylska,	2021

	2	Design requirements of Sustainable Passengers' Land-transportation stations	Alfatlawi & Almaamouri	2019
	3	Influence of microscale environmental factors on perceived walk accessibility to metro stations	Bivina, G. R. Gupta, Akshay Parida, Manoranjan	2019
	4	A comprehensive analysis of the planned multimodal public transportation HUB	Yatskiv & Budilovich,	2017
	5	Directorate general for internal policies.	European Parliament	2016
	6	An Approach to Sustainable Design of Intermodal Stations in Greater Cairo Region.	O,Emad & Din Bakry	2008

Source- Authors based on extant literature sources.

Public transportation stations are regarded as necessary for society's development, [48] which necessitates the integration of diverse means of transportation into a single location that allows passengers and facilities to interact. [49]. The literature studies indicate the main elements that should be considered when designing the stations, which are:

- Achieving functional requirements mainly, in addition to focusing on the requirements of sustainable environmental design. [48]
- Planning the rehabilitation of all current stations with the design requirements of sustainable passenger transport stations, considering the specificity of the local aspect in these projects in terms of cultural identity. [14]
- Reducing the operating cost and saving energy by achieving natural ventilation - natural lighting. [50]
- Using recycled materials, and collection of rainwater, recycling, and increase green spaces.
- Maintaining the internal environment of the station.
- Changes in the transportation network affect accessibility difficulties, the environment around the network, and, of course, sustainable development' [10]
- Environmental and psychological factors affecting pedestrian accessibility to metro stations, as well as comprehend different facets of users' satisfaction with pedestrian facilities which encourage planners to support various design philosophies that will result in a more acceptable and satisfying pedestrian environment around the metro stations' [51]

2-1-5. Safety and security requirements group.

The research relied on different literature resources and previous studies in safety and security requirements in multi-modal hub station. As shown in Table [6].

Table 6: Literature sources discussing Safety and security requirements in multi-modal hub stations.

	NO	Title	Authors	Year
Safety and security requirements	1	Basic parameters for the design of intermodal public	Lida Margarita & María Durán Bernal,	2016
	2	Public Transport Infrastructure Manual (PTIM)	TransLink Division Public Transport Infrastructure Manual.	2015
	3	Station Design Principles for Network Rail	Rail	2015
	4	Fairfax Multimodal Transit Hub Niehoff Urban Studio Wasson Way Planning Capstone Spring 2014	Charles & Meng	2014
	5	Rail passenger perceptions of risk and safety and priorities for improvement	Thomas et al	2005
	6	Inclusive Design Guidance-Ticket Sales	Rail	-----

Source- Authors based on extant literature sources.

The stations must be designed to accommodate peak passenger movement, as well as to permit safe and efficient entry and exit, in addition to the methodical, safe, and efficient collecting of passengers at the station [52]. From that, the studies emphasized the need to apply safety and security requirements in the designs of passenger transport stations through the following: [53][54]

- Stations’ design should promote passengers' security.
- Stations should be designed to minimize the possibility of accidents. [55]
- Stations should be designed to be safe and secure without depending on technology.
- Several factors might affect a passenger's experience when changing modes of transportation information that is accurate and readable, travel and waiting times, the availability of amenities, and a feeling of safety and security are all crucial factors. [56]

There are additional considerations that must be made, such as giving walking flows priority, heavily utilizing travelators, and sustainability-related considerations.[57]

2.2-Architectural Requirements of multi-modal hub stations

The requirements of a multi-modal hub are formed from five main requirements, these requirements included (functional requirements, circulation requirements, security and safety requirements, environmental design requirements, and social and economic requirements). As shown in Table [7]

Table 7: Classification requirements of multi-modal hub stations

Basic Requirements	Secondary requirements
functional requirements	• Connecting different types of transportation in one place
	• Station's overall design should follow the flow of passengers from arrival to departure, ensuring that each stage in the passenger's journey is as fluid as feasible
	• Each function should have its area, and space should be allocated according to the function's priority. Free circulation must be given the greatest amount of space.
	• Functional integration according to social and environmental changes, and providing service and commercial spaces
	• Optimal use of space
	• Design spaces, and platforms according to the number of passengers at peak hours
	• Provide usability requirements
	• Considering the individual's share in the different spaces.
	• Provide special spaces for operators
	• Physical, visual interconnection, and aesthetic form. • Maintain visual/aesthetic continuity with the rest of the system while incorporating site-specific aspects.
circulation requirements	• Provide sufficient space for movement and waiting.
	• Providing horizontal and vertical movement.
	• Considering people with special needs.
	• Separation of automobile and pedestrian traffic.
	• Reducing walking distances.
	• paths should be as straightforward as feasible.
	• Station's design must allow for free-flowing passenger movement to avoid severe congestion within the Station, particularly on platforms and escalators.
	• Passenger movement must be unhindered from the time enters the Station until he leaves.
	• Using technology will reduce the amount of time people have to wait in lines to buy tickets

	<ul style="list-style-type: none"> • Create a clear, logical, and sequential spatial structure for the station that corresponds to the order of the passenger's activities and supports effective passenger circulation (entry-tickets-waiting-departure).
Environmental design requirements	<ul style="list-style-type: none"> • Using biophilic design to achieve a comfortable healthy environment inside the station.
	<ul style="list-style-type: none"> • Using local materials that are resistant to weather conditions and recyclable.
	<ul style="list-style-type: none"> • Rainwater collection and reuse.
	<ul style="list-style-type: none"> • Reducing the operating cost and saving energy.
	<ul style="list-style-type: none"> • Increasing green spaces inside and around the station.
	<ul style="list-style-type: none"> • Respect the privacy of the site.
Safety and security requirements	<ul style="list-style-type: none"> • Station design should promote security for the passenger.
	<ul style="list-style-type: none"> • Stations should be designed to minimize the possibility of accidents.
	<ul style="list-style-type: none"> • Stations should be designed to be safe and secure without depending on technology.
	<ul style="list-style-type: none"> • Pedestrian paths shall be direct, and well-lit.
	<ul style="list-style-type: none"> • Slip-resistant walking surfaces.
	<ul style="list-style-type: none"> • Controlling entrances and exits.
	<ul style="list-style-type: none"> • Protection of personal property.
	<ul style="list-style-type: none"> • maintenance requirements.
	<ul style="list-style-type: none"> • Provide emergency requirements.
Socio-economic requirements	<ul style="list-style-type: none"> • Providing investment and rental spaces.
	<ul style="list-style-type: none"> • The link between production and consumption areas.

Source- Authors based on extant literature sources.

The results of previous studies showed that there is a discrepancy in achieving design requirements, as (functional requirements) were the most fulfilled criterion out of all the others, followed by the (circulation requirements), followed by (environmental design requirements) and then (safety and security requirements), while each of (social and economic requirements) achieved the least of design requirements.

1- Architectural studies and requirements of socio-economic requirements.

Socio-economic requirements in multi-modal hub stations achieved the least of design requirements of the multi-modal hub while socio-economic requirements have taken interest in public buildings & public spaces. [58] from that, an analysis of 15 peer-reviewed journal papers on socio-economic requirements from 2000 to 2021. As shown in Chart (2).

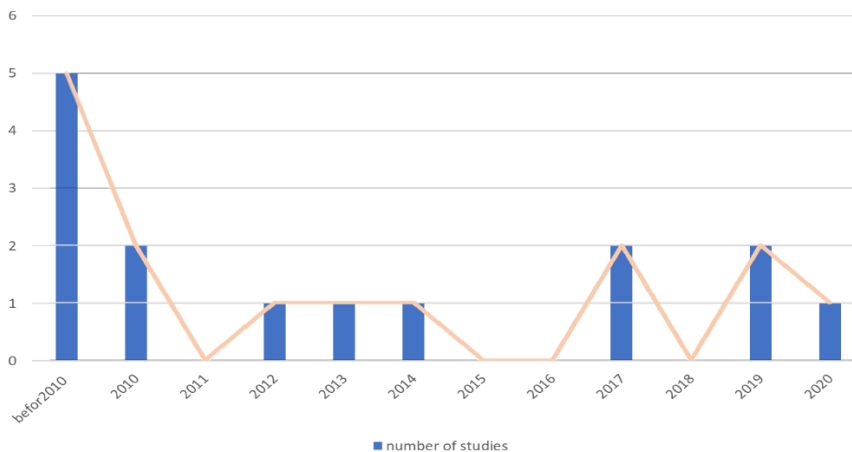


Chart 2: Number of articles by year of publication from 2010 to 2020, **Source:** Authors.

3.1- Architectural studies of socio-economic requirements in public buildings & public spaces.

The research relied on different literature resources and previous studies in socio-economic requirements in public buildings & public spaces. As shown in Table [6].

Table 8: Literature sources discussing Socio-economic requirements in public buildings & public spaces.

	NO	Title	Authors	Year
contextual integration, functional, and circulation requirements	1	Social Sustainability Concepts and Benchmarks STUDY Requested by the EMPL committee	McGUINN	2020
	2	Economic, environmental and social aspects of buildings' refurbishment - A case study	Zygmunt & Piczulski	2019
	3	The Mutual Effect between Design of Space Building and Escape Paths	Adel abass	2017
	4	Mutual influence between urban planning and human behavior in urban communities.	Yousri A. Azzam	2017
	5	Socio Economic Benefits of Commercial Plazas in Faisalabad City.	Kamboh et al	2014
	6	The resource for the evaluation of Socio-Economic Development	G. to the evaluation of S. Development	2013
	7	Socio-economic Development and Empowerment of Disadvantaged Groups	national institute of open schooling	2012
	8	Socio environmental impact in eco-architecture	I. Ibrahim	2010
	9	Socio Economics aspects of Architecture and Planning	Archi-fied,	2010
	10	Building-centred community development as a method to promote social, environmental, and economic sustainability	Floras Phelps et al	2007
	11	A literature review of the social, economic and environmental impact of architecture and design	McIntyre & Scotland. Social Research	2006
	12	Economic Principles of Sustainable Construction Link to publication record in Manchester Research Explorer Citation for published version (APA)	The University of Manchester Research	2003
	13	A Guide to Socioeconomic Assessments for Ecoregion Conservation two primary goals of socioeconomic assessments.	wwf	2000
	14	Economic, social, and environmental sustainability in development theory and urban planning practice	A. D. Basiago	2000
	15	Human rights requirements to social and economic development,	A.Eide	1996

Source- Authors based on extant literature sources.

The literature studies of socio-economic requirements in public buildings & public spaces indicated the main elements that should be taken into consideration, which are.

- Studying social-economic and human development ideas, increasing people's choices, and raising levels of well-being. [59]-[60]
- Focuses on the economics of sustainable architectural design by clarifying the role that architectural design can play in contributing to the many cost-effective solutions that connect the building to the environment [61] Ensuring the application of the concepts of sustainable design, and achieving economic, social, and environmental efficiency. [62] [63][64]
- Study human behavior [65] and, studying the relationship between urban and architectural changes in human behavior. [66][67]
- Efforts are currently being made to bring the promotion of human rights and development, two goals that are closely related in the United Nations Charter, closer together. This is especially evident in the declaration on the right to development, which was adopted by the general assembly of the United Nations in 1986. [68]

- Community development can promote healthier and more sustainable growth by embracing more holistic strategies. The design and construction of buildings, which are an important part of a community, offer a chance to influence the community's progress for the better. [69]
- Planning for social sustainability must promote people's cooperative rather than competitive instincts. [70]
- The behaviors of people are influenced by social and economic factors, and numerous social components include:
 - Population density will affect quality of life.
 - Age group - different age groups have different habits.
 - Degree in literacy
 - Various civilizations and customs

These determine societal culture which have an impact on planning and architecture, either directly or indirectly. [71]

The best way to make money and gain several social and economic advantages for the advancement of a nation is through shopping malls. People improve their quality of life by being inspired by the appealing shopping malls, which should be created by investors to make money. [72]

3.2- Socio-economic requirements in a public building& public spaces.

literature studies of socio-economic requirements in public buildings & public spaces focus on some basic and secondary requirements [73]. As shown in Figure (3).

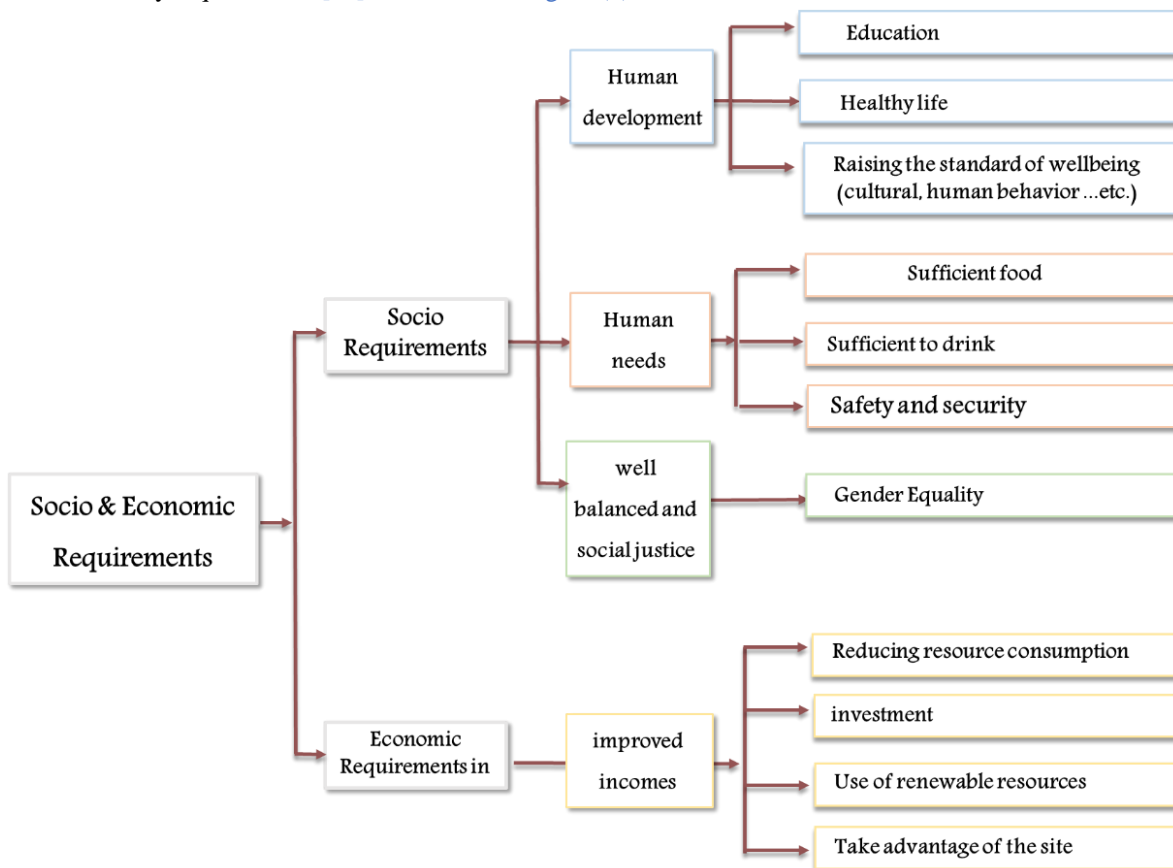


Figure 3: Socio-economic requirements, **Source:** Authors based on extant literature sources.

The results of previous studies on socio-economic requirements showed that many requirements must be considered.

- Socio requirement (human development- well balanced and social justice- humanitarian needs)
- Economic requirement (improved incomes – upgrade what is available).

2- Findings.

In this study, an effort was made to identify the aspects of socio-economic requirements in multi-modal hub stations.

The literature studies produced design requirements for multi-modal hub stations, the following were achieved:

- The theoretical framework for the paper consists of five main requirements that were drawn from a Literature review of multi-modal hub stations. These requirements included (functional requirements, circulation requirements, safety and security requirements, environmental design requirements, and social and economic requirements). As shown in Figure (4).

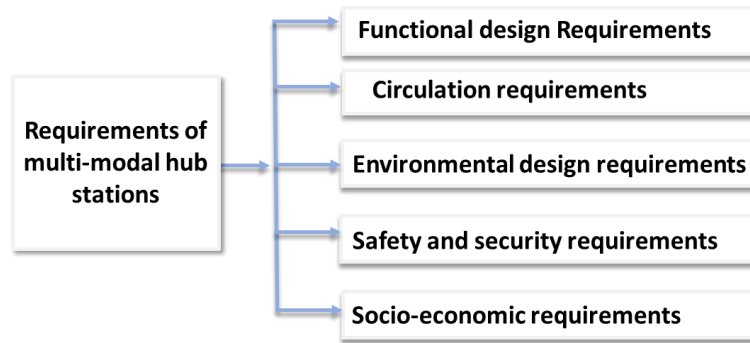


Figure 4: main requirements for multi-modal hub stations, **Source;** Authors based on extant literature sources.

- Despite the diversity and multiplicity of design requirements for multi-modal hub stations, and deficiency in previous knowledge in creating a theoretical vision that explains the social and economic requirements of multi-modal hub stations. Therefore, the designs of multi-modal hub stations consider the following requirements: As shown in Table [9]

Table 9: Socio-economic requirements in multi-modal hub stations.

Main socio-economic requirements		Secondary socio-economic requirements	Basic requirements in multi-modal hub stations
Socio requirement	Human development	Education	Awareness and education
		Healthy life	
		Raising the standard of well-being (cultural, human behavior ...etc.)	Providing the people with multiple choices.
	Well-balanced and social justice	Gender Equality	N/B
	Humanitarian needs	Availability of food	providing service (cafes and restaurants).
Availability of drinks			
Safety and security		Achieve safety and security requirements.	
Economic	improved incomes	Take advantage of the site	Achieve environmental design requirements.
		Reducing resource consumption	
		Use of renewable resources	
	investment	providing service and commercial spaces	
Upgrade	Reconsidering available resources	Reconsider the resources and capabilities available	

Source- Authors based on extant literature sources.

- The results of previous studies of socio-economic requirements in multi-modal hub stations indicated the main elements that should be taken into consideration when designing the stations, which are:
 - Achieve environmental design requirements (take advantage of the site- reduce resource consumption- use renewable resources- use local materials and recyclables- rainwater collection and reuse- reduce the operating cost and save energy- increase green spaces inside and around the station.... etc.).
 - Achieve safety and security requirements (promote security for the passenger- minimize the possibility of accidents- safe and secure without depending on technology- slip-resistant walking surfaces -provide emergency requirements.... etc.).
 - Increase investments by providing service and commercial spaces.
 - Awareness and education of people
 - Achieve social justice.
 - Raising the standard of well-being (cultural, human behavior ...etc.)
 - Providing the people with multiple choices.

3- Conclusion

The aim of this paper is mainly to identify socioeconomic requirements in multi-modal hub stations. The authors were able to partially fulfill this aim by reviewing extant literature sources were reached as follows:

- The emergence of multi-modal hub stations is a response to the social, technological, and environmental changes of the current era, in addition to the technological development witnessed by the world in the field of modern transport.
- The requirements of a multi-modal hub are formed from five main requirements; included (functional requirements, circulation requirements, security and safety requirements, environmental design requirements, and social and economic requirements), the results of previous studies showed that functional requirements were the most fulfilled criterion out of all the others, while the social and economic requirements achieved the least of design requirements.
- The results of previous studies on socio-economic requirements showed the main elements that should be taken into consideration.
- Socio requirement (human development- well balanced and social justice- humanitarian needs), while economic requirement (improved incomes – upgrade what is available). From this defining the elements of the socio-economic requirements in multi-modal hub stations.
- This paper suggests that the changes in the socio-economic requirements in multi-modal hub stations lead to changes in all requirements of multi-modal hub stations and it has an impact upon the transport system environment and, of course, sustainable development. In many countries and cities.
- This paper recommends.
 - Using the intermodal idea in rail stations, due to an increase in passengers which made it necessary for stations to be designed in a contemporary and logical manner. Station design now serves more purposes. The building's shape grows increasingly intricate. As a result, complex stations that serve travel sooner or later will replace traditional stations. They serve as entryways into and exits from communities rather than just being locations where trains stop to pick up and drop off people.
 - Finding a framework for the design aspects of multi-modal hub stations.

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